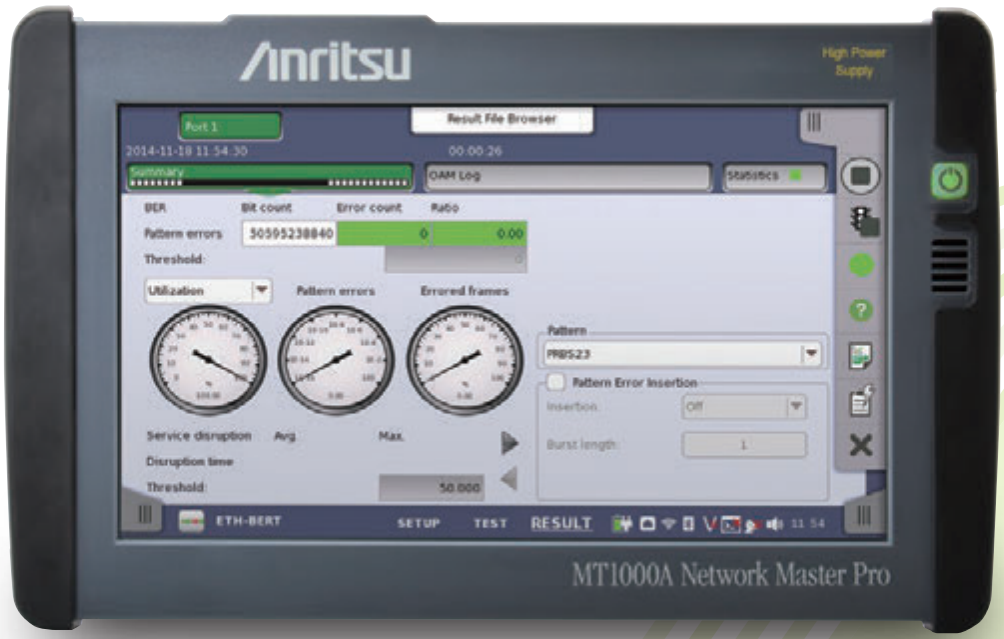
Anritsu Advancing beyond

# Network Master™ Series

## Network Master Pro MT1000A

| | |
|---|---|
| 10G Multirate Module | MU100010A1 |
| 100G Multirate Module | MU100011A |
| High Performance GNSS Disciplined Oscillator | MU100090B |

Network Master Pro




Excellent Eco Product

# All-in-One Tester for Network

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.

MT1000A

# Reliability

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**
- **WLAN*, *Bluetooth*® and LAN connectivity ensure quick and simple tester access in any situation.**

*: 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 logs are owned by Bluetooth SIG, Inc. and are used by Anritsu under license.

### Evolving Networks and Required Test Equipment

100G interfaces are being introduced progressively on Core and Metro networks.
Additionally, introduction of the eCPRI/RoE protocol is being examined for 5G mobile networks in combination with 5G speed increases and diversifying applications.
Onsite network I&M work requires cost-effective support for diversifying services at speeds from 1G to 100G with a field tester that improves work efficiency.

## Key Applications → Details P.6

**Ethernet / 100G/25G Ethernet**
- 10M to 10G/25G/40G/100G Ethernet testing
- FEC testing of 100G/25G Ethernet
- High load traffic generation function at full wire rate
- Ethernet testing up to 10 Gbps including RFC 2544, RFC 6349 and Y.1564
- RS-FEC (544,514) FEC analysis, FEC error transmission
- 100ZR Pluggable Coherent

**Mobile Fronthaul / eCPRI**
- BER and Latency tests at eCPRI/RoE (IEEE1914.3) frame
- Supported to CPRI 1 to 10
- Supported to OBSAI 1x, 2x, 4x, 8x
- Verifying Link connection with REC/RE using CPRI

**Mobile Backhaul / PTP Network**
- SyncE testing up to 25 Gbps
- PTP testing up to 25 Gbps
- MU100090B enables easy Pass/Fail evaluations when installing and commissioning time and phase synchronous networks
- Supported Profiles: G.8265.1, G.8375.1, G.8275.2, SMPTE2059-2

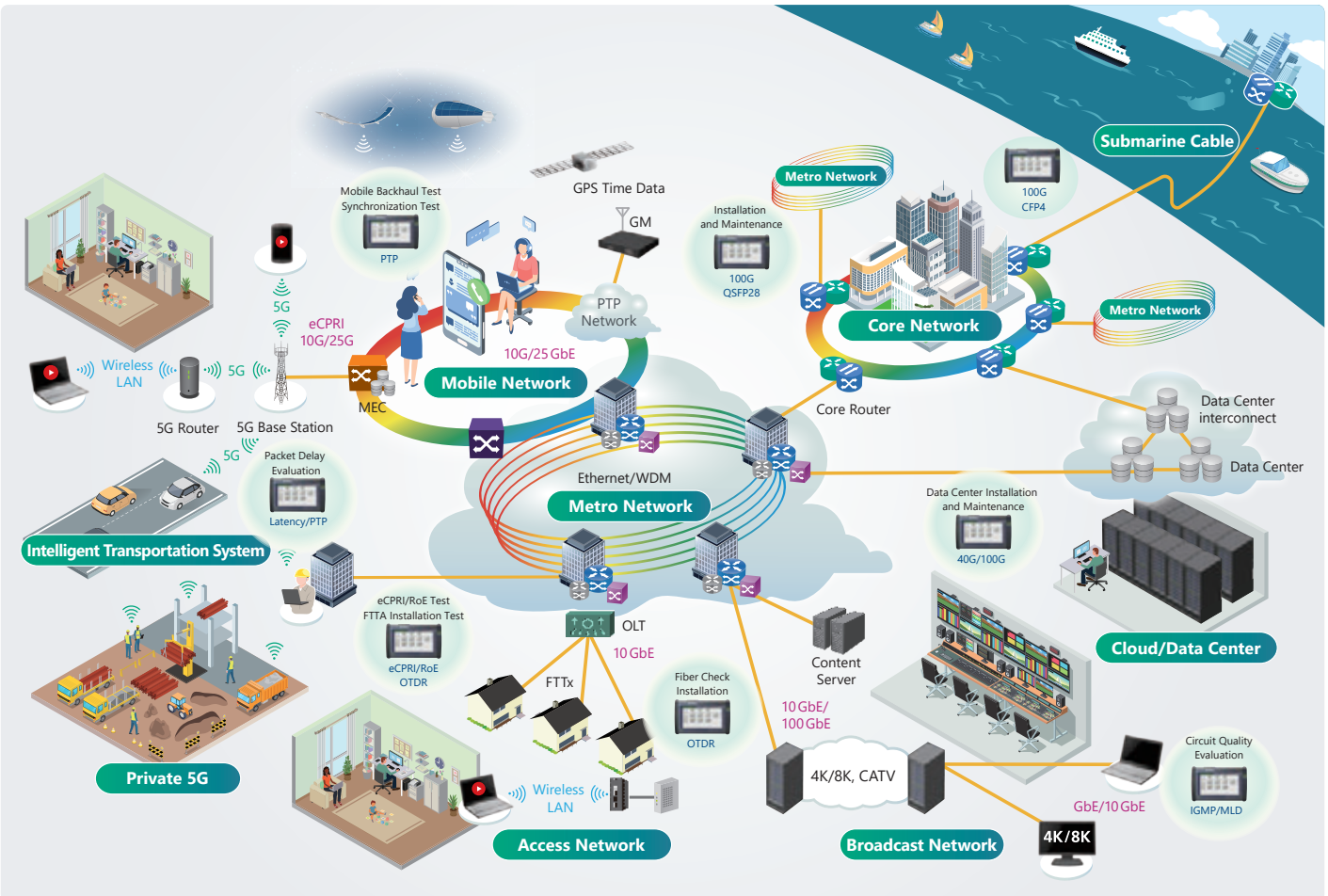
**Data Center / Fibre Channel**
- Supported to 1GFC, 2GFC, 4GFC, 8GFC, 10GFC, 16GFC
- Network Performance Testing
- Latency test
- BER tests including service disruption measurement

**OTN**
- OTN up to OTU4 including mapping of Ethernet, CPRI, Fibre Channel, SDH/SONET client signals, multistage mapping and FEC (Forward Error Correction)
- OTN error performance measurement in accordance with G.8201 or M.2401
- ITU-T O.182-compliant FEC test
- Delay measurement

**SDH/SONET**
- Powerful testing of SDH (STM-64, STM-16, STM-4, STM-1), SONET (OC-192, OC-48, OC-12, OC-3, STS-3) systems
- Analysis of service disruption with APS application
- Error-performance test (G.826, G.828, G.829, or M.2100)

## I&M Support for All Networks

The Network Master supports all types of network I&M.



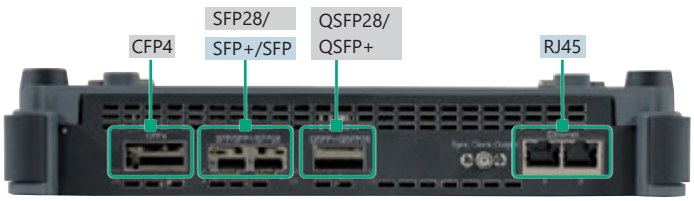

The modular design of the Network Master Pro MT1000A platform makes it easy to support I&M for different network configurations. Combining it with the 10G Multirate Module MU100010A1 offers the necessary functions for I&M of networks at speeds from 10 Mbps to 10 Gbps. Combining with the 100G Multirate Module MU100011A, it supports more interface standards than any other handheld transport tester on the market such as CFP4/QSFP28, QSFP+, SFP28 (25GbE), 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.

| Interface* | Ethernet | OTN | SDH/SONET | Fibre Channel | CPRI/OBSAI |
|---|---|---|---|---|---|
| CFP4 | 100 GbE | OTU4 | — | — | — |
| QSFP28 | 100 GbE | OTU4 | — | — | — |
| QSFP+ | 40 GbE | OTU3x | — | — | — |
| 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<br>OBSAI 1x/2x/4x/8x |
| | | | | 16G FC | CPRI 9 |
| RJ45 | 10/100/1000M | — | — | — | — |

: MU100011A Only  : Both MU100010A1 & MU100011A Supported

*: The interface depends on the module. For details, refer to the following.

10G Multirate Module MU100010A1



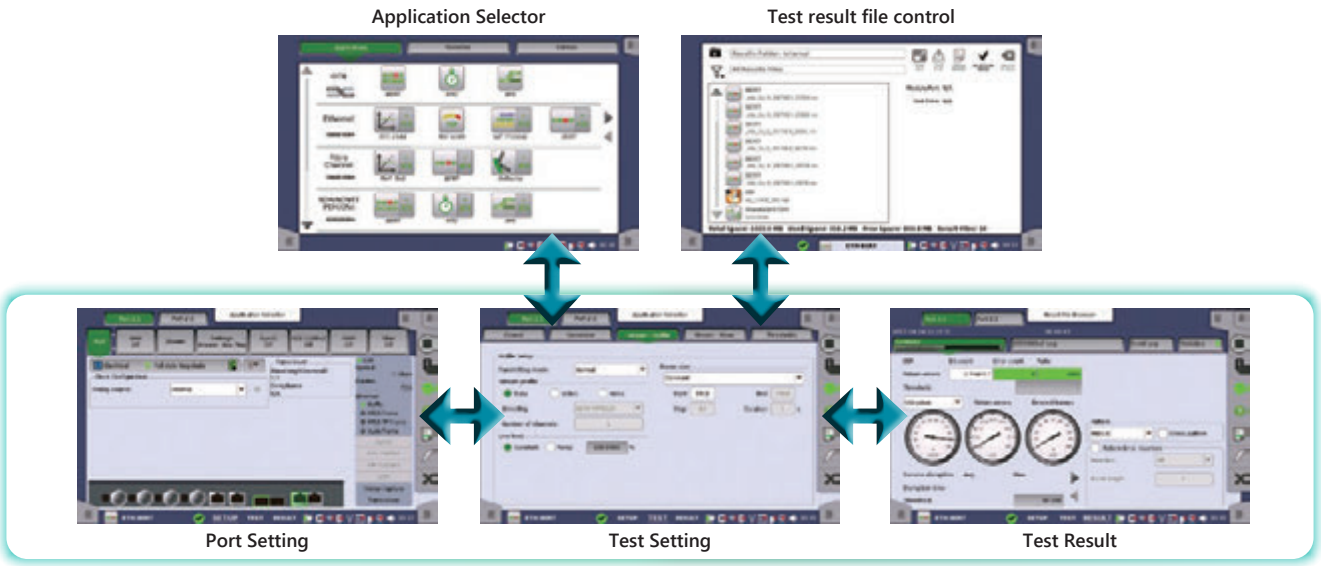

100G Multirate Module MU100011A

## Strong Support for I&M Field Technicians

As networks get faster, I&M field technicians must not only master the relevant technical knowledge for each network type that includes metro networks, mobile networks, data centers, etc., but must also understand the detailed tester operations for each of these networks.
In addition, sometimes multiple items must be measured at each commissioning, increasing the risk of operator errors.
But with the versatile and easy-to-use MT1000A functions, the risk of operator errors are decreased.

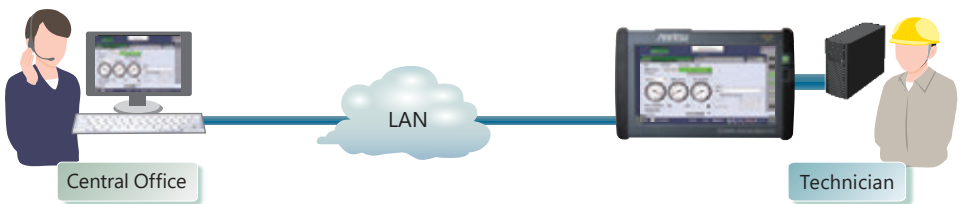
### Easy-to-Use GUI

The MT1000A GUI (graphical user interface) is designed for intuitive onsite operation and speeds-up I&M test-result evaluations as well as problem troubleshooting. Training time is also cut by the intuitive interface.




### Remotely Controlled Network Installation, Start-up, and Maintenance

The MT1000A has a useful remote function for network installation, start-up and maintenance. Connecting the office and job site via LAN allows engineers in the office to see screens at the on-site instrument while making settings and measurements, and troubleshooting. This provides an efficient link between engineers and on-site measurements to help cut network installation and maintenance costs.



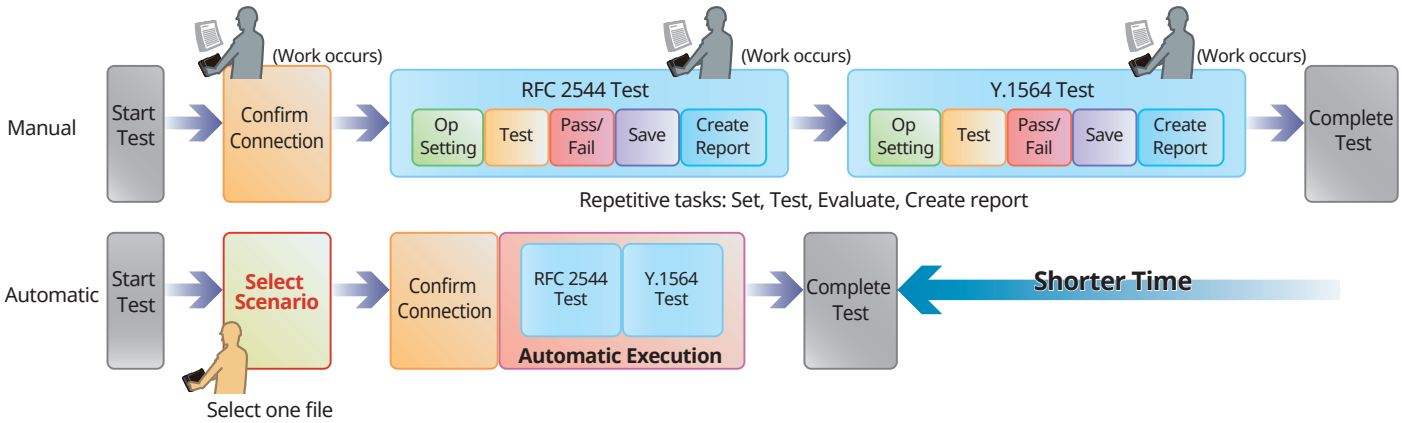
## Strong Support for I&M Field Technicians

### One Button Testing
### (Scenario Environment Editing Kit (SEEK) MX100003A)

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
Executing Test: Manual
Evaluating Results: Based on data

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




## Quality Control with Virtual Networks Including Cloud and Data Centers

# Virtual Network Master (VNM) MX10903xPC

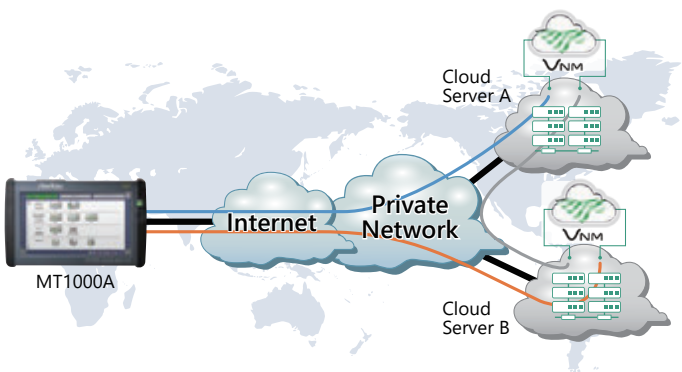
The Virtual Network Master (VNM) MX10903xPC is a software-based measuring device that provides a quantitative measurement environment for cloud servers and data centers. When installed in a cloud environment, the device can conduct quantitative evaluations of one-way latency and frame loss in conjunction with the MT1000A.

## Use Cases

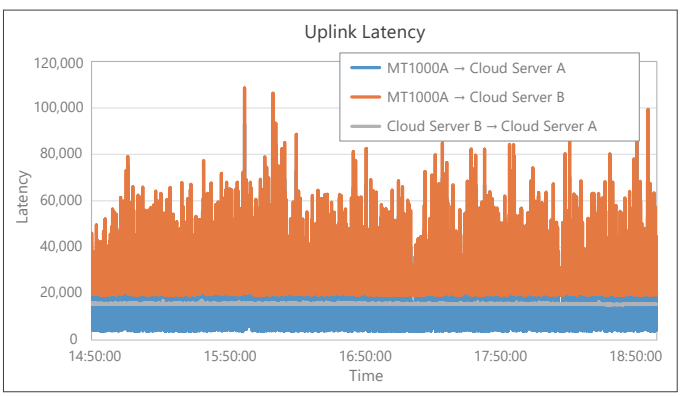
### Communication Quality Between Cloud Servers

The communication quality of different routes can be measured simultaneously by deploying the MX10903xPC on multiple Cloud servers. Visualizing the differences between internet routing and inter-Cloud regional network routing can assist switching decisions on redundant configurations and backup-route reliability.

**■ Evaluating System Between Cloud Servers**




**■ Comparing One-Way Latency Of Each Route**

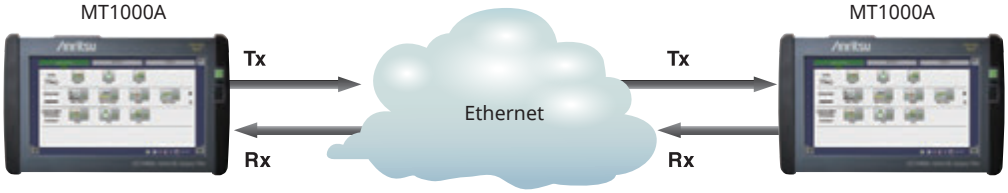



For details, go to https://www.anritsu.com/en-au/test-measurement/products/mx109030pc (MX10903xPC product page).

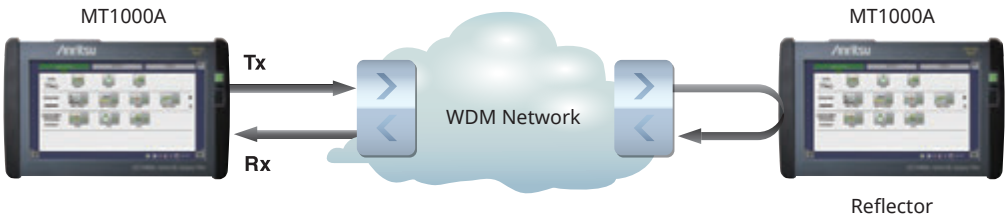
# Ethernet Application

## Carrier Ethernet Installation and Troubleshooting

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 MU100010A1/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

**Ethernet test features include:**

- Ethernet tests at 100 Gbps, 40 Gbps, 25 Gbps, 10 Gbps, 1 Gbps, 100 Mbps, and 10 Mbps
- Traffic generation up to full line rate
- Support for IPv4 and IPv6
- Ethernet Service Activation Test (Y.1564)
- Automated RFC 2544 tests of Throughput, Frame Loss, Latency or Packet Jitter, Burstability
- TCP Throughput (RFC 6349, iPerf) [Option]
- BER tests – include Frame Loss and Sequence Error tests
- Service disruption measurements
- Comprehensive statistics
- Filters – to extract relevant parts of traffic
- Thresholds – to highlight abnormalities
- Simultaneous monitoring in both line directions
- IP Channel Statistics to identify error streams, top talkers, network attacks
- Ethernet OAM tests
- 10G WAN-PHY tests
- Synchronous Ethernet test (SyncE), PTP (IEEE 1588 v2)
- IEEE 1588 v2 Phase/Time synchronization test (For optical 1G/10G/25G bps)
- Ethernet Multistream
- Stacked VLAN (Q-in-Q)
- Link Fault Signaling (LFS) Emulation (10G/25G/40G/100G bps)
- IGMP/MLD client function
- MPLS tests
- MPLS-TP and PBB tests
- Ping
- Traceroute
- Frame capture for protocol analysis with Wireshark
- Electrical cable tests and optical signal level displays

Ethernet Statistics

Ethernet BER Tests Statistics Summary

Ethernet BER Tests Results

Wireshark® is a registered trademark of the Wireshark Foundation.

# Ethernet Application

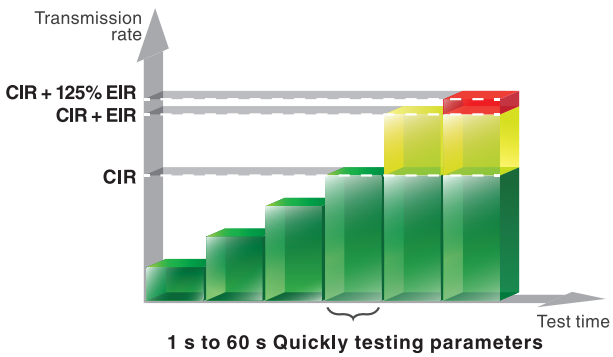
## Carrier Ethernet Installation and Troubleshooting

### 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:**

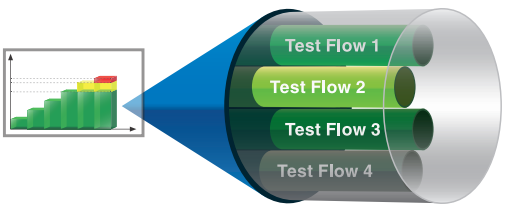
This section is completed quickly, within seconds per stream.
It confirms the end-to-end configuration while quickly checking the Information Rate (IR), Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR), Committed Burst Size (CBS) and Excess Burst Size (EBS) sequentially 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 MU100010A1/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 Summary

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 MU100010A1/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.

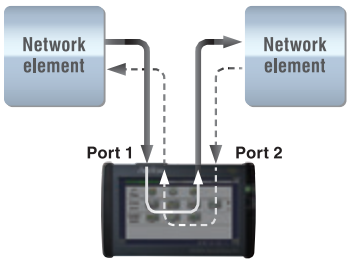
Test Result

# Ethernet Application

## Carrier Ethernet Installation and Troubleshooting

### Pass-through Mode

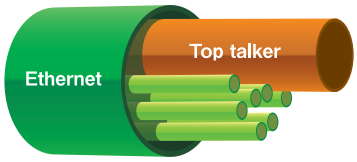
Configuring the MU100010A1/MU100011A to Pass-through mode supports detailed troubleshooting, especially in bi-directional networks requiring traffic monitoring from both ends.




Pass-through monitoring by inserting MT1000A in network

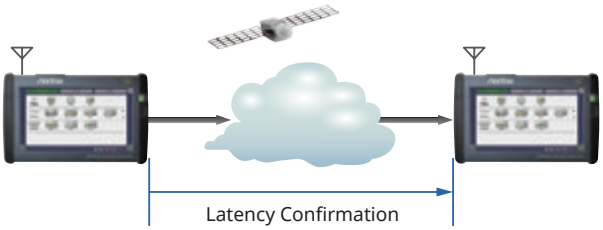
### IP Channel Statistics – Multiflow Counters

Up to 230 flows can be selected and filtered by MAC and IP Source/ Destination addresses, VLAN and MPLS to monitor selected streams and display detailed information. This allows the user to identify error streams, top talkers, and network attacks, as well as troubleshoot network issues more deeply.




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

One-way delay can be measured with high accuracy using two MT1000A/ MU100010A1/MU100011A units at a distant location with installed MU100090B.




### 100G Single-λ FEC Measurement

Adding the MU100011A-024 option supports FEC error correction analysis of single-λ 100G optical transceivers. The FEC function is critically important for single-λ 100G transceivers because many transmission errors occur using the PAM4 transmission method. This option validates the error correction status, contributing to transmission quality as well helping troubleshoot optical transceivers and other transmission equipment to assure durable transceivers and raise network quality.

FEC Analysis Screen

### Ethernet OAM

To improve the performance of Ethernet-based networks and provide Carrier Class service, many network providers have enhanced their systems with Ethernet OAM (Operation, Administration and Maintenance), supporting the ability to detect network faults and measure performance. Ethernet OAM is defined by three standards covering different network sections.
The ITU-T Y.1731 and IEEE 802.1ag standards are similar and support end-to-end network functionality, while the IEEE 802.3 (previously IEEE 802.3ah) standard supports first (or last) mile functionality.
The MU100010A1/MU100011A tests the network using all supported OAM functions.

### Ethernet Multistream

The MU100010A1/MU100011A Ethernet Multistream function allows simulation and testing of a congested network's ability to prioritize high-priority traffic over low-priority traffic. The user can set different priorities for up to 16 streams per port to measure how frame loss affects network performance.
The Multistream function displays clear information on Packet Jitter and Latency per stream, helping troubleshoot problematic issues for VoIP services, etc.

Multi Stream Setting

### MPLS and MPLS-TP

Multi-Protocol Label Switching (MPLS) supports efficient traffic routing on packet-based networks. MPLS – Transport Profile (MPLS-TP) technology is based on standard MPLS and aims to give service providers reliable connection-oriented packet-based transport over the network. MPLS-TP offers service providers QoS, end-to-end Carrier Class OAM, and protection switching. With its ability to insert up to 8 levels of MPLS labels, the MU100010A1/MU100011A is a powerful tool for testing MPLS and MPLS-TP networks including OAM functions.

Protocol Counter

# Ethernet Application

## Carrier Ethernet Installation and Troubleshooting

### Stacked VLAN

Stacked VLAN (Q-in-Q) is used increasingly by several types of Ethernet-based networks, allowing operators to split traffic from different customers on one line or to shape traffic by priority.
The MU100010A1/MU100011A supports up to 8 levels of VLAN tags, offering a powerful network test tool.

### PBB

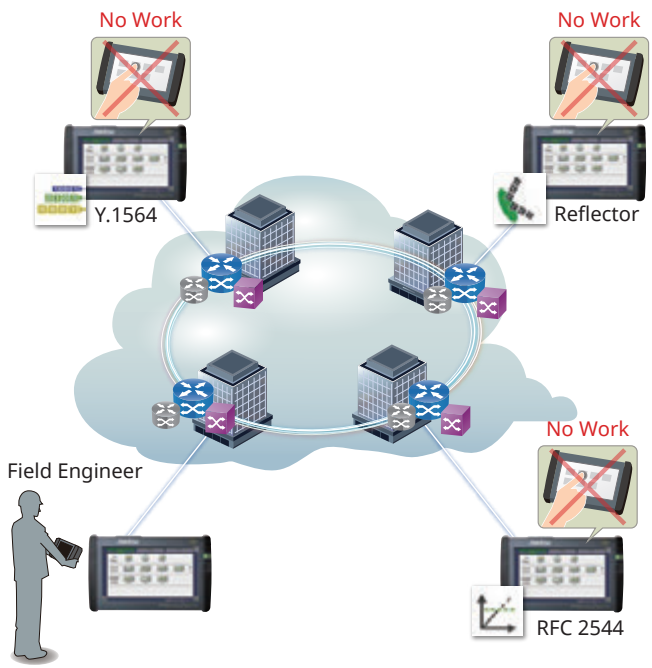
The Provider Backbone Bridge (PBB) technology is designed to provide Carrier Class division of the networks at layer 2 often referenced as MAC-in-MAC. Allowing multiple provider bridge networks to be interconnected without VLAN addresses conflict.

### Protocol Analysis

For advanced Ethernet troubleshooting the MU100010A1/MU100011A supports a frame capture function for capturing frames of live traffic on the monitored line. Captured frames are analyzed using the Wireshark protocol analysis software.

### In-Band Test

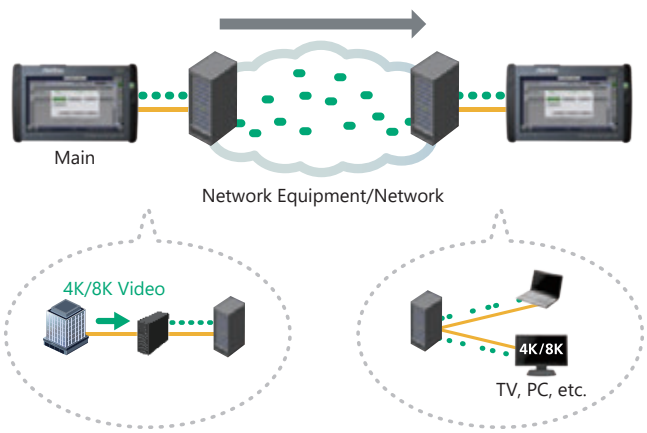
Usually at least two field technicians must be dispatched for end-to-end testing, but using the MU100010A1/MU100011A in-band measurement function to control the remote MT1000A from the local MT1000A via the test network, cuts the number of required field technicians and increases work efficiency.




## Broadcast Network Inspection

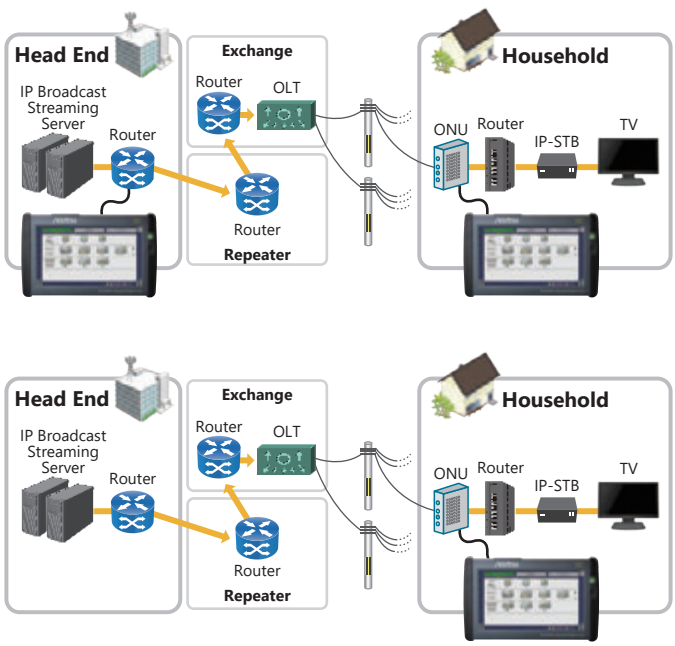
### Quality Assurance

Ethernet is used for live video at events such as Olympics and concerts and for interactive video at public viewing, etc.
Video image quality is degraded by latency and jitter. The MT1000A assures stable network quality using efficient throughput and packet jitter evaluations.




### Multicast Group

Assuring video streaming services requires joining a multicast group. The MT1000A has a IGMP/MLD client function for measurements using multicast packets as well as analysis of actual multicast packets.



# OTN Application

## Comprehensive OTN Testing for Metro and Core Networks Installation and Maintenance

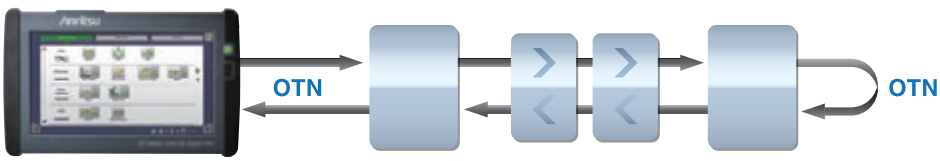
OTN carries client signals, but current OTN field testers only support OTN testing at the OTN line rate with bulk test signals. This means that problems in the carried client signals are invisible when testing an in-service OTN system.
Using the MU100010A1/MU100011A, OTN lines can be tested at the client 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.

### OTN Testing with Client Signals

The MU100010A1/MU100011A is a powerful and full toolset for testing OTN signals. It supports complete Bit Error Rate (BER) tests with bulk signals at the OTN level as well as tests all the way to the Ethernet, Fibre Channel and SDH/SONET client signals mapped onto the OTN signal.

### OTN tests features include:

- OTU4, OTU3, OTU3e1, OTU3e2, OTU2, OTU2e, OTU2f, OTU1, OTU1e, OTU1f tests
- Multi Stage Mapping and ODU Flex support
- OTN tests with bulk signals (PRBS, Null or User pattern) at OTN level
- Comprehensive OTN error and alarm statistics
- OTN error performance measurement in accordance with G.8201 or M.2401
- ITU-T O.182-compliant FEC test
- Test of Ethernet, CPRI, Fibre Channel or SDH/SONET client signals mapped onto OTN signal
- Delay measurement
- OTN header edit and capture
- OTN TCM monitoring and generation
- Service disruption analysis using APS application
- OTN tributary scan
- Full flexibility to monitor insert/overwrite client overhead and payload within OTN signal




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

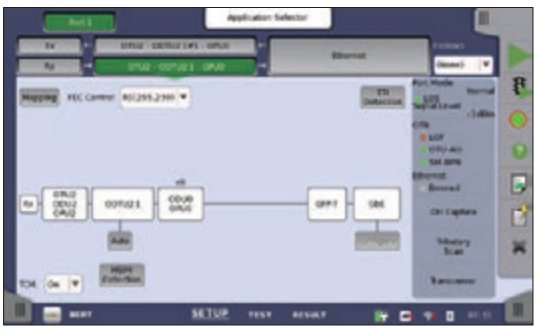
### Out-of-service OTN Error and Alarm Statistics

The MU100010A1/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.

Error/Alarm Setting

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

The MU100010A1/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.



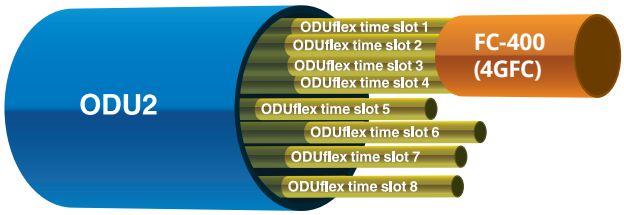
OTN Mapping Setting

# OTN Application

## Comprehensive OTN Testing for Metro and Core Networks Installation and Maintenance

### 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 MU100010A1/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.**

OTN Statistics Summary

OTU Level Statistics

### ITU-T O.182-compliant FEC Test

Anritsu proposed the FEC performance tests using Poisson-distributed random errors adopted by ITU-T Recommendation O.182.
This method supports reproducible and accurate FEC error correction tests by generating truly random signal errors.
High-speed networks cannot be tested accurately without using the ITU-T O.182 Poisson error distribution.

FEC Error Insertion

### OTN Tributary Scan

The tributary scan feature supports quick inspection of the OTN signal by examining it for major problems and highlighting them in an easy-to-understand manner.

OTU Alarms and Errors View

OTU Header Capture

# Mobile xhaul Application

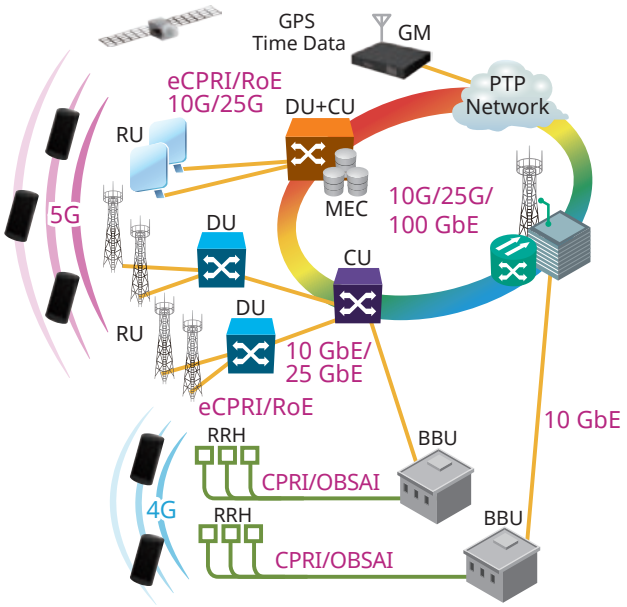
## Tests using Throughput and Protocols

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.

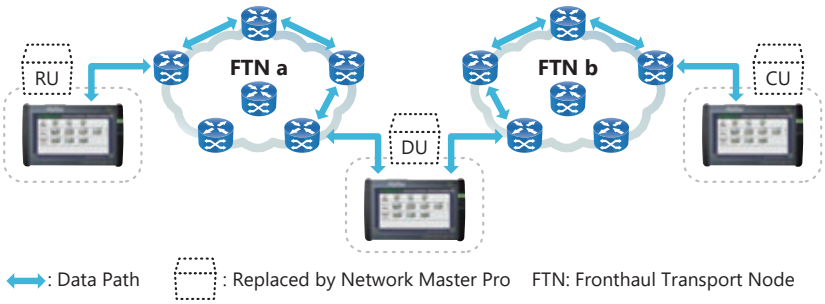
However, in addition to faster speeds, the key requirements for 5G mobile are higher reliability, lower latency, and multiple simultaneous user connections. As a result, mobile front haul requires:

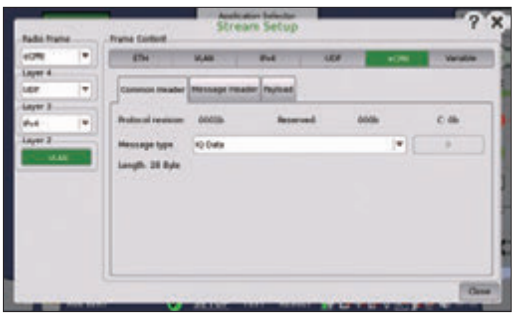
- Change of interface between BBU and RRH from CPRI/OBSAI to eCPRI/RoE (IEEE1914.3)
- Improved time synchronization accuracy
- Large decreases in latency.




### 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

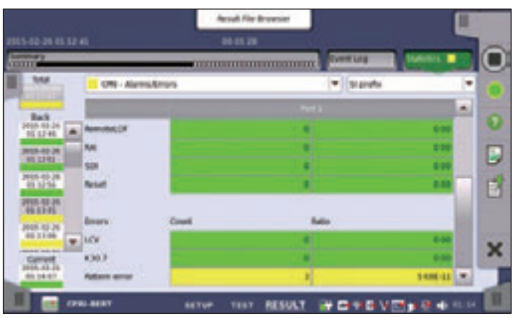


eCPRI Frame Setting

### 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.



CPRI/OBSAI BER Test

### OBSAI Test

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

CPRI Link Status

*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

# Mobile xhaul Application

## Time Synchronization, Phase Evaluation

Mobile networks apply PTP (IEEE1588 v2) and syncE technologies on their network. All base stations have to be precisely synchronized each other to avoid degradations due to interference and make fine-of-art radio technologies come true.
Therefore, mobile operators must test that the SyncE and PTP technologies are functioning correctly.

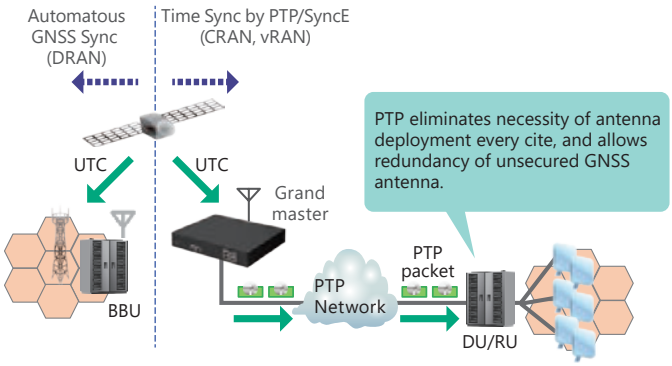
### Synchronous Ethernet test

The MU100010A1/MU100011A support SyncE and PTP (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 clock devices from different vendors.
With MU100011A-021 option, SyncE wander measurement is supported. It allows users to conduct pass/fail test in the field with MTIE/TDEV mask complied with ITU-T G.8261.1 .

### Time/Phase Synchronization Accuracy Tests

Mobile network is starting construction of PTP (G.8275.1 and G.8275.2)-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), dTE (Dynamic Time Error), and MTIE metrics.*
Combining it with the MU100010A1/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 Error Measurement by MU100090B

Result Display of SyncE Wander

# Fibre Channel Application

## Powerful Storage Area Networking (SAN) Testing

Many operators need to support Fibre Channel links in Storage Area Networks (SAN) together with other transport technologies like OTN, Ethernet, and SDH/SONET. Having one tool for all technologies is important for efficient testing. The multi-protocol MU100010A1/MU100011A with Fibre Channel option is the perfect tool for deploying Fibre Channel with support for testing links at rates up to 10 Gbps and it also supports other technologies like OTN, Ethernet, CPRI/OBSAI and SDH/SONET. The all-in-one MT1000A gives the user less equipment to maintain and learn, helping reduce operating expenses.

**Fibre Channel test features include:**

- 1GFC, 2GFC, 4GFC, 8GFC, 10GFC, and 16GFC tests
- Latency measurement
- BER tests including service disruption measurement
- Line alarm and error monitor
- Normal or Reflector mode
- Performance Test
- Buffer Credit environment
- Optional mapping to OTN

### Latency

High latency is a problem for many applications, including SAN, and network operators and service providers urgently need a tool like the MU100010A1/MU100011A with Fibre Channel option to test latency on Fibre Channel lines and equipment.

### Fibre Channel BER Tests

The MU100010A1/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

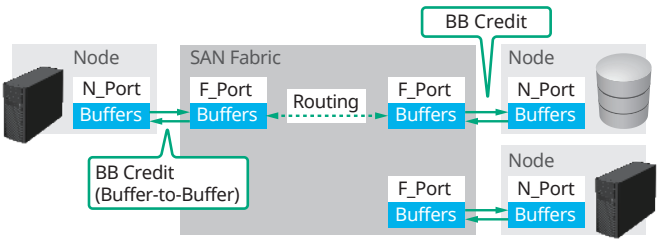
Fibre Channel achieves frame-loss-free transmissions using buffer-credit-based flow control. On the other hand, throughput rates drop due to the wasted wait times if the buffer size is small compared to the network transmission delay time.
The MU100010A1/MU100011A measures the buffer size needed to achieve 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

Flow Control

Credit-based Flow Control




BB Credit

Flow control between physically connected ports.
Used for propagation of data of all classes.

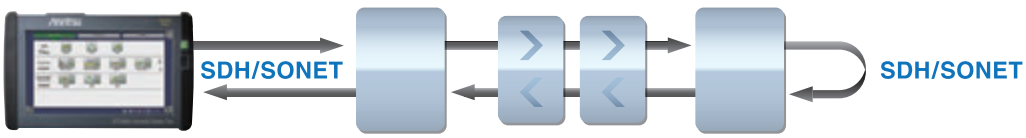
# SDH/SONET Application

## Quick and Easy Tests of SDH/SONET Networks

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 test options, the MU100010A1/MU100011A is a powerful and easy-to-use tool for testing SDH/SONET up to STM-64/OC-192. The MT1000A can support new and legacy technologies, leaving the user less equipment to maintain and learn, and reducing operating expenses.

**SDH/SONET Test Features Include:**

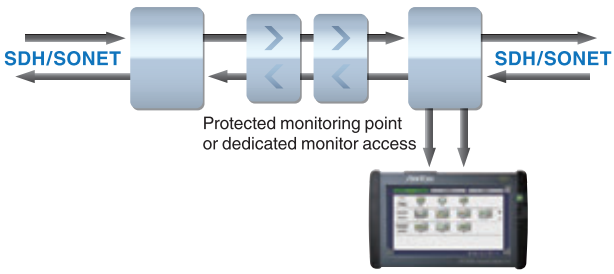
- Powerful testing of SDH (STM-64, STM-16, STM-4, STM-1), SONET (OC-192, OC-48, OC-12, OC-3, STS-3) systems
- Simultaneous bi-directional monitoring of SDH/SONET lines
- SDH/SONET mapping and de-mapping of PDH/DSn protocol
- Comprehensive error and alarm statistics
- SDH/SONET overhead byte testing and monitoring
- SDH/SONET tributary scan
- SDH/SONET pointer event generation and monitoring
- SDH/SONET delay measurements
- Analysis of service disruption with APS application




Looping-back test signal from MT1000A at far end supports SDH/SONET line quality tests

### SDH/SONET Installing and Commissioning Testing

The MU100010A1/MU100011A has powerful statistical measurements for BER testing at installing/commissioning and troubleshooting out-of-service SDH/SONET lines. Statistics are also collected for in-service analysis of line transmission-error performance together with information on pointer operations. G.826, G.828, G.829, or M.2100 error-performance parameters are calculated and the measurement result is highlighted by easy-to-understand color coding. Errors, alarms, pointer operations and overhead byte changes can be inserted into the transmitted signal for stress testing.




Bi-directional in-service monitoring of SDH/SONET lines

Quick overview of errors and alarms for both sides of SDH/SONET line

### Speeds-up SDH/SONET Troubleshooting

The MU100010A1/MU100011A monitor function speeds-up troubleshooting by providing key information on the monitored system, including line alarms and errors, input frequency and deviation, optical input level and overhead bytes.

# Optical Modules Selection Guide

| Model/Order No. | Description (Approx. Distance) | Max. Input Power | Input Sensitivity | Input Wavelength | Output Power | Output Wavelength | Loop Back |
|---|---|---|---|---|---|---|---|
| G0332A<br>100M FX 1310 nm MM SFP | 100BASE - FX 1310 nm<br>multi mode (2 km) | –14 dBm | –31 dBm | 1270 nm to 1600 nm | –20 to –15 dBm | 1280 nm to 1380 nm | OK |
| G0319A<br>Up to 2.7G 1310 nm 15 km SFP | STM-1/4/16 short haul 1310 nm<br>single mode (15 km) | 0 dBm | –18 dBm | 1270 nm to 1580 nm | –5 to 0 dBm | 1260 nm to 1360 nm | OK |
| G0320A<br>Up to 2.7G 1310 nm 40 km SFP | STM-1/4/16 long haul 1310 nm<br>single mode (40 km) | –9 dBm | –27 dBm | 1270 nm to 1580 nm | –2 to +3 dBm | 1280 nm to 1335 nm | >12 dB<br>ATT |
| G0321A<br>Up to 2.7G 1550 nm 80 km SFP | STM-1/4/16 long haul 1550 nm<br>single mode (80 km) | –9 dBm | –28 dBm | 1270 nm to 1580 nm | –2 to +3 dBm | 1500 nm to 1580 nm | >12 dB<br>ATT |
| G0328A<br>1G/2G/4G FC 850 nm SFP | 1GFC, 2GFC, 4GFC 850 nm<br>multi mode (0.5 km) | –3 dBm | –15 dBm | 830 nm to 860 nm | –9 to 0 dBm | 830 nm to 860 nm | >3 dB<br>ATT |
| G0322A<br>1G/2G/4G FC 1310 nm SFP | 1GFC, 2GFC, 4GFC 1310 nm<br>single mode (10 km) | –3 dBm | –18 dBm | 1260 nm to 1360 nm | –8 to 0 dBm | 1260 nm to 1360 nm | >3 dB<br>ATT |
| G0323A<br>1G/2G/4G FC 1550 nm SFP | 1GFC, 2GFC, 4GFC 1550 nm<br>single mode (40 km) | –3 dBm | –18 dBm | 1470 nm to 1600 nm | 0 to +5 dBm | 1510 nm to 1590 nm | >8 dB<br>ATT |
| G0315A<br>10G LR/LW 1310 nm SFP+ | 10GBASE - LR 1310 nm<br>single mode (10 km) | +0.5 dBm | –14.4 dBm | 1260 nm to 1565 nm | –6 to –1 dBm | 1290 nm to 1330 nm | OK |
| G0316A<br>10G ER/EW 1550 nm 40 km SFP+ | 10GBASE - ER 1550 nm<br>single mode (40 km) | –1 dBm | –15.8 dBm | 1260 nm to 1565 nm | –3 to +3 dBm | 1530 nm to 1560 nm | >4 dB<br>ATT |
| G0318A<br>10G ZR/ZW 1550 nm 80 km SFP+ | 10GBASE - ER 1550 nm<br>single mode (80 km) | –8 dBm | –22 dBm | 1260 nm to 1565 nm | 0 to +5 dBm | 1525 nm to 1565 nm | >13 dB<br>ATT |
| G0329A<br>10G LR 1310 nm SFP+ | 10GBASE - LR 1310 nm<br>single mode (10 km) | +0.5 dBm | –14 dBm | 1260 nm to 1355 nm | –8.2 to +0.5 dBm | 1260 nm to 1355 nm | OK |
| G0356A<br>8G FC/10G SR 850 nm SFP+ | 8GFC, 10GFC,<br>10GBASE - SR 850 nm<br>multi mode (0.3 km) | –1 dBm | –11.1 dBm | 840 nm to 860 nm | –7.3 to –1 dBm | 840 nm to 860 nm | OK |
| G0386A<br>16GFC SR 850 nm SFP+ | 16GFC 850 nm<br>multi mode (0.035 km) | 0 dBm | –10.5 dBm | 840 nm to 860 nm | –7.5 dBm ～ | 840 nm to 860 nm | OK |
| G0387A<br>16GFC LR 1310 nm SFP+ | 16GFC 1310 nm<br>single mode (10 km) | +2 dBm | –12 dBm | 1295 nm to 1325 nm | –5 to +2 dBm | 1295 nm to 1325 nm | OK |
| G0388A<br>25G SR 850 nm SFP28 | 25GBASE - SR 850 nm<br>multi mode (0.1 km) | +2.4 dBm | –10.3 dBm | 840 nm to 860 nm | –8.4 to +2.4 dBm | 840 nm to 860 nm | OK |
| G0389A<br>25G LR 1310 nm SFP28 | 25GBASE - LR 1310 nm<br>single mode (10 km) | +2 dBm | –13.3 dBm | 1260 nm to 1350 nm | –7 to +2 dBm | 1295 nm to 1325 nm | OK |
| G0359A<br>40G SR4 850 nm QSFP+ | 40GBASE - SR4 850 nm<br>multi mode (0.1 km) | +2.4 dBm<br>(per Lane) | –9.9 dBm | 840 nm to 860 nm | –8 to +2.4 dBm | 840 nm to 860 nm | OK |
| G0334A<br>40G LR4 1310nm QSFP+ | 40G Ethernet/OTN 1310 nm<br>single mode (10 km) | +2.3 dBm<br>(per Lane) | –11.5 dBm<br>(per Lane) | 1264.5 nm to 1277.5 nm<br>1284.5 nm to 1297.5 nm<br>1304.5 nm to 1317.5 nm<br>1324.5 nm to 1337.5 nm | +8.3 dBm (max.) (Total)<br>–2 to +2.3 dBm<br>(per Lane) | 1264.5 nm to 1277.5 nm<br>1284.5 nm to 1297.5 nm<br>1304.5 nm to 1317.5 nm<br>1324.5 nm to 1337.5 nm | OK |
| G0366A<br>100G SR4 850 nm QSFP28 | 100G Ethernet 850 nm<br>multi mode (0.1 km) | +2.4 dBm<br>(per Lane) | –9.9 dBm<br>(per Lane) | 840 nm to 860 nm | +8.9 dBm (max.) (Total)<br>–9.1 to +2.4 dBm<br>(per Lane) | 840 nm to 860 nm | OK |
| G0434A<br>100G LR4 Dual Rate 1310 nm<br>QSFP28 | 100G Ethernet /OTN 1310 nm<br>single mode (10 km) | +4 dBm<br>(per Lane) | –8.4 dBm<br>(per Lane) | 1294.53 nm to 1296.59 nm<br>1299.02 nm to 1301.09 nm<br>1303.54 nm to 1305.63 nm<br>1308.09 nm to 1310.19 nm | +10 dBm (max.) (Total)<br>–0.6 to +4 dBm<br>(per Lane) | 1294.53 nm to 1296.59 nm<br>1299.02 nm to 1301.09 nm<br>1303.54 nm to 1305.63 nm<br>1308.09 nm to 1310.19 nm | OK |
| G0426A<br>QSFP28 100GBASE-DR | 100G Ethernet 1310 nm<br>single mode (0.5 km) | +4 dBm<br>(per Lane) | –5.9 dBm | 1304.5 nm to 1317.5 nm | –2.9 to +4 dBm | 1304.5 nm to 1317.5 nm | OK |
| G0427A<br>QSFP28 100GBASE-FR1 | 100G Ethernet 1310 nm<br>single mode (2 km) | +4.5 dBm<br>(per Lane) | –6.4 dBm | 1304.5 nm to 1317.5 nm | –2.4 to +4 dBm | 1304.5 nm to 1317.5 nm | OK |
| G0369A<br>100G LR4 Dual Rate 1310 nm CFP4 | 100G Ethernet /OTN 1310 nm<br>single mode (10 km) | +4.5 dBm<br>(per Lane) | –8.6 dBm<br>(per Lane) | 1294.53 nm to 1296.59 nm<br>1299.02 nm to 1301.09 nm<br>1303.54 nm to 1305.63 nm<br>1308.09 nm to 1310.19 nm | +10.5 dBm (max.) (Total)<br>–4.3 to +4.5 dBm<br>(per Lane) | 1294.53 nm to 1296.59 nm<br>1299.02 nm to 1301.09 nm<br>1303.54 nm to 1305.63 nm<br>1308.09 nm to 1310.19 nm | OK |

# Optical Modules Selection Guide

| MU110010A1 | MU110011A | 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 | |
| | ✓ | G0434A | 100G LR4 Dual Rate 1310 nm QSFP28 | QSFP28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1310 nm, SM, 10 km | |
| | ✓ | G0426A | QSFP28 100GBASE-DR | QSFP28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1310 nm, SM, 0.5 km | |
| | ✓ | G0427A | QSFP28 100GBASE-FR1 | QSFP28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1310 nm, SM, 2 km | |
| | ✓ | G0369A | 100G LR4 Dual Rate 1310 nm CFP4 | CFP4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1310 nm, SM, 10 km | |

# 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 |

| Service Interfaces | |
|---|---|
| USB Data Interface | MT1000A operates as host: USB 2.0 type A (2 ports)<br>MT1000A operates as device: USB 2.0 type Mini-B (1 port) |
| Ethernet Interface | Ethernet 10M/100M/1000M, Connector: RJ45 |
| WLAN Interface*1 | IEEE 802.11 b/g/n |
| Bluetooth® Interface | Bluetooth 2.1 +EDR |

*1: Available for certified countries and regions including USA, Canada, Japan and EU countries. Please visit the Anritsu web site for updated information.

| Other Interfaces | |
|---|---|
| Audio Interface | For connection of CTIA Standard head set<br>Connector: 3.5-mm diameter jack |
| AUX Connector | For connection of optional G0325A GPS receiver<br>With MT1000A-005: For connection of Optional MU100090B |
| Built-in Loudspeaker | Monitors speech of voice channel<br>Output level: user-controlled from user Interface |
| Internal Clock | Accuracy: ±4.6 ppm or less, STRATUM3 compliant |
| Ext. Clock Input | For connection of external clock signals:<br>SETS (E1: 2.048 Mbps), BITS (DS1: 1.544 Mbps) or 2.048 MHz TTL signal in accordance with ITU-T G.703,<br>10 MHz TTL signal in accordance with ITU-T G.703<br>Connector: BNC (50Ω) |

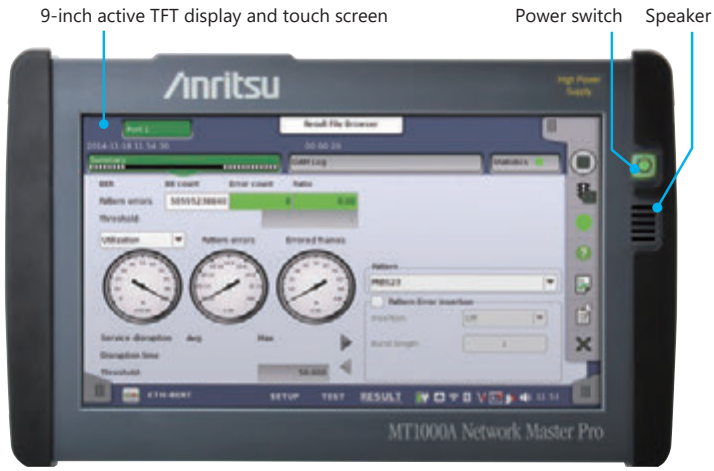
| Miscellaneous | | |
|---|---|---|
| Battery | | 10.8 V rechargeable and replaceable intelligent Li-ion battery<br>Operating time: 1.5 hours (typ., in case of 100 GbE)<br>Charging time: 6 hours (Max.)<br>Remaining capacity indication: % |
| Mains Adapter | | Input: 100 VAC to 240 VAC, 50 Hz/60 Hz<br>Output: 18 V(dc), 3.62 A (max.)<br>Power Consumption: ≤65 W<br>With MT1000A-006*2<br>Input: 100 VAC to 240 VAC, 50 Hz/60 Hz<br>Output: 18 V(dc), 6.6 A (max.)<br>Power Consumption: ≤120 W |
| Dimensions and Mass | | 257 (W) × 164 (H) × 82 (D) mm (Exclude Projection, MT1000A + MU100010A1)<br>257 (W) × 164 (H) × 89 (D) mm (Exclude Projection, MT1000A + MU100011A)<br>2.7 kg (including MT1000A, MU100010A1 and battery)<br>2.7 kg (including MT1000A, MU100011A and battery) |
| Environmental | | Temperature<br>Operating : 0°C to +50°C (non-condensing)<br>Charging: 0°C to +40°C (non-condensing)<br>Storage: –30°C to +60°C (non-condensing, without battery or AC adapter)<br>–20°C to +50°C (non-condensing, with battery and AC adapter)<br>Humidity<br>Operating: ≤85% RH (non-condensing)<br>Storage and Transportation: ≤90% RH (non-condensing, without battery and AC adapter)<br>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 |
| UKCA | EMC | S.I. 2016 No.1091, EN 61326-1, EN61000-3-2 |
| | LVD | S.I. 2016 No.1101, EN 61010-1 |
| | RoHS | S.I. 2012 No.3032, EN IEC 63000:2018 |
| Laser Safety*3 | | IEC 60825-1: 2014 CLASS 1<br>21CFR1040.10 and 1040.11*4 |

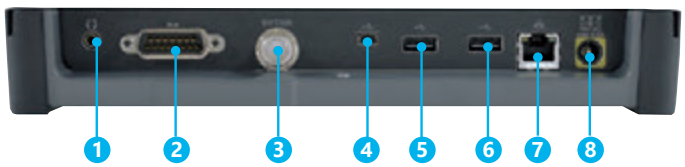
*2: MT1000A-006 is required for MU100011A.
*3: Safety measures for laser products
This product complies with optical safety standards in 21CFR1040.10, 1040.11 and IEC 60825-1; the following descriptive labels are affixed to the product.
*4: Excludes deviations caused by conformance to Laser Notice No. 56 dated MAY 8, 2019

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

# Panel Layout

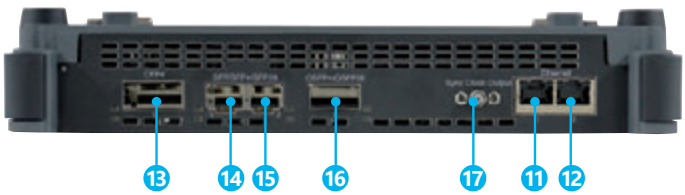
### Network Master Pro MT1000A



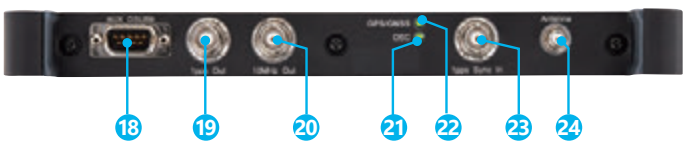




### 10G Multirate Module MU100010A1

### 100G Multirate Module MU100011A




### High Performance GNSS Disciplined Oscillator MU100090B




1. Audio (3.5ø: CTIA Standard)
2. AUX (D-SUB 15 pin)
3. Clock Input
4. USB Mini-B
5. USB A
6. USB A
7. Ethernet Service Interface
8. DC Input (18 Vdc)
9. Port 1, Tx/Rx SFP/SFP+ (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
10. Port 2, Tx/Rx SFP/SFP+ (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
11. Port 1, Tx/Rx RJ45 (Ethernet, eCPRI/RoE electrical)
12. Port 2, Tx/Rx RJ45 (Ethernet, eCPRI/RoE electrical)
13. Port1, Tx/Rx CFP4 (OTN, Ethernet, eCPRI/RoE)
14. Port1, Tx/Rx SFP/SFP+/SFP28 (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET)
15. Port2, Tx/Rx SFP/SFP+/SFP28 (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET)
16. Port1, Tx/Rx QSFP+/QSFP28 (OTN, Ethernet, eCPRI/RoE)
17. Port1, Sync. Clock Output
18. AUX (D-SUB 9 pin)
19. 1 pps Output (REF)
20. 10 MHz Output
21. OCS LED
22. GNSS received LED
23. 1 pps Sync In
24. GNSS Antenna Input

Rechargeable and replaceable Li-ion battery

# Network Master Pro MT1000A Ordering Information

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

## Mainframe

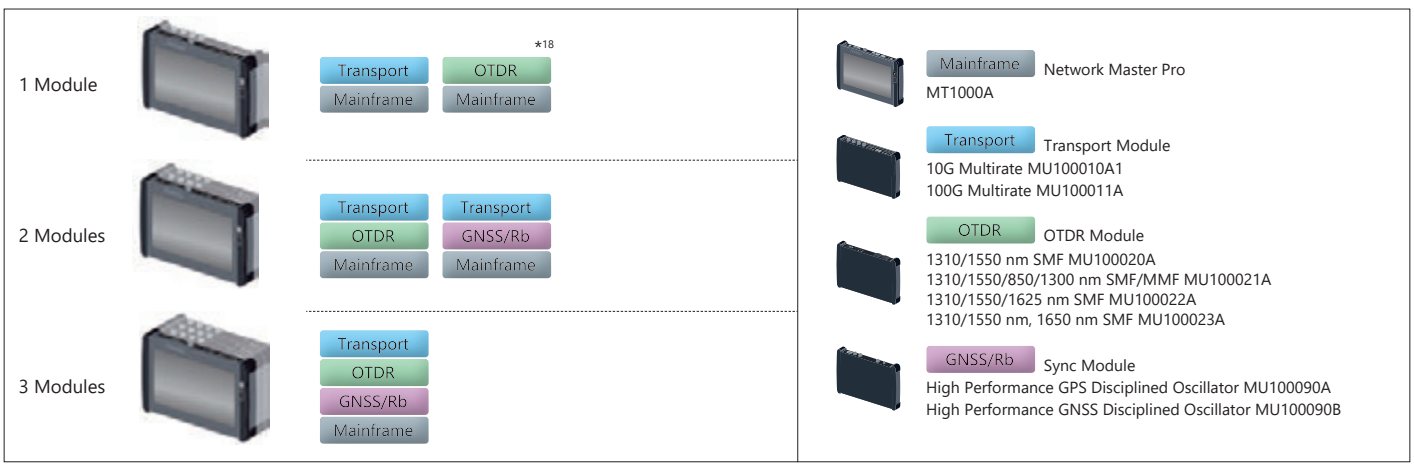
| Model/Order No. | Name | |
|---|---|---|
| MT1000A | Network Master Pro | |
| **Standard Accessories** | | |
| MT1000A-006*1 | High Power Supply: | Installed |
| | Line Cord*2: | 1 pc |
| B0745A | Softcase: | 1 pc |
| B0728A*3 | Rear Panel kit: | 1 pc |
| G0385A*4 | High Power AC Adaptor: | 1 pc |
| G0436A | 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 | |

| Model/Order No. | Name |
|---|---|
| **Optional Accessories*10** | |
| B0784A*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*15 | Battery Charger |
| G0325A | GPS Receiver |
| Z1821A*16 | Utilities in USB Stick |

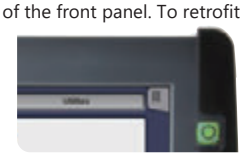
**Softcase B0745A (Standard Accessory)**
This bag with shoulder strap can hold the MT1000A with up to three installed modules.

**Hard Case B0784A**
This strong plastic case can hold the MT1000A with up to two installed modules.
495 (W) × 391 (H) × 205 (D) mm

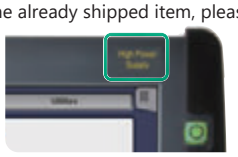
## Module Configuration*17




*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: WLAN is 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: Optional Accessories cannot be repaired.
*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. When checking the end face of some SC-APC-F and FC-APC-F adapters, sometimes, there may be a dark region at the screen edge and the end face may not be checked correctly.

G0382A

G0306C

*15: This product must not be exported to China.
*16: Include MT1000A Operation Manual and the Remote Script Manual.
*17: Any modular combination as shown in a figure.
*18: Required if the transport module is not used rear cover.

## Transport Module

### 10G Multirate Module MU100010A1

| Model/Order No. | Name |
|---|---|
| MU100010A1 | 10G Multirate Module |
| **Standard Accessories** | |
| W3935AE | MT1000A Transport Module Quick Reference Guide: 1 pc |
| B0692A*1 | ESD Box (for optical modules): 1 pc |

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

Options*2

| Model/Order No. | Name |
|---|---|
| **Low Rate** | |
| MU100010A-001*3 | Up to 2.7G Dual Channel |
| **Ethernet** | |
| MU100010A-011 | Ethernet 10G Single Channel |
| MU100010A-012 | Ethernet 10G Dual Channel |
| MU100010A-020*4 | TCP Throughput |
| **OTN** | |
| MU100010A-051 | OTN 10G Single Channel |
| MU100010A-052 | OTN 10G Dual Channel |
| MU100010A-061*5 | ODU Multiplexing |
| MU100010A-062*5 | 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 |
| **Fibre 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 |

*2: 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 |

*3: Includes OTN (OTU1), Ethernet (10 Mbps, 100 Mbps, 1 Gbps), SDH up to STM-16, SONET up to OC-48
*4: Requires that at least one of the following options is installed: MU100010A-001, MU100010A-011, MU100010A-012
*5: Requires that at least one of the following options is installed: MU100010A-001, MU100010A-051, MU100010A-052

### High Performance GNSS Disciplined Oscillator MU100090B

| Model/Order No. | Name |
|---|---|
| MU100090B*16 | High Performance GNSS Disciplined Oscillator |
| **Standard Accessories** | |
| J1705A | AUX Conversion Adaptor |
| J1886A*17 | GNSS Antenna |
| J1710A | BNC Cable (20 cm) × 2 |
| Z2122A | Tripod for GNSS Antenna |
| **Optional Software** | |
| MU100090B-001 | High Stability/Multi-Band |
| MU100090B-002 | Multi-GNSS |

*16: Excellent Eco Product non-compliant.
*17: With 5 m cable, IP67 Ingress protection.
MT1000A-005 and Ethernet options are required for MU100090B.

### 100G Multirate Module MU100011A

| Model/Order No. | Name |
|---|---|
| MU100011A*6 | 100G Multirate Module |
| **Standard Accessories** | |
| W3935AE | MT1000A Transport Module Quick Reference Guide: 1 pc |
| B0763A*7 | ESD Box (for Optical modules): 1 pc |

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

Options*2

| Model/Order No. | Name |
|---|---|
| **Standard** | |
| MU100011A-001*8 | Up to 10G Single Channel |
| MU100011A-003*8 | Up to 10G Dual Channel |
| **Ethernet** | |
| MU100011A-006 | 100G Pluggable Coherent |
| MU100011A-013*9 | Ethernet 40G Single Channel |
| MU100011A-015*9 | Ethernet 100G Single Channel |
| MU100011A-017*10 | Ethernet 25G Single Channel |
| MU100011A-020*11 | TCP Throughput |
| MU100011A-021*12 | SyncE Wander |
| MU100011A-023*13 | RS-FEC for 100GBASE-SR4 |
| MU100011A-024*13 | RS-FEC(544,514) for 100GBASE-xR |
| **OTN** | |
| MU100011A-006 | 100G Pluggable Coherent |
| MU100011A-053 | OTN 40G Single Channel |
| MU100011A-055 | OTN 100G Single Channel |
| MU100011A-062*14 | ODU Flex |
| MU100011A-063*14 | 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*10 | eCPRI/RoE 25G Dual Channel |
| **SDH/SONET** | |
| MU100011A-083*15 | STM-256/OC-768 Client Signal |

*8: 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.
*9: The MU100011A-023 is required for 100GBASE-SR4 FEC control.
*10: FEC selectable On/Off.
*11: Requires that at least one of the following option is installed: MU100011A-001, MU100011A-003
*12: In addition to the MT1000A-005, at least one of the following options is required: MU100011A-001, MU100011A-003, MU100011A-017
*13: Requires to MU100011A-015
*14: Requires that at least one of the following option is installed: MU100011A-001, MU100011A-003, MU100011A-053, MU100011A-055
*15: MU100011A does not have a physical interface of the option.
In combination with MU100011A-053, can be used as a client signal by OTN.

### High Performance GPS Disciplined Oscillator MU100090A

| Model/Order No. | Name |
|---|---|
| MU100090A*18, *19 | High Performance GPS Disciplined Oscillator |
| **Standard Accessories** | |
| J1705A | AUX Conversion Adaptor |
| J1706A*18 | GPS Antenna |
| J1710A | BNC Cable (20 cm) × 2 |

*18: Cannot be shipped to EU/EFTA countries and UK because of not being RoHS 10 compliant.
*19: Excellent Eco Product non-compliant.
MT1000A-005 and Ethernet options are required for MU100090A.

# Network Master Pro MT1000A Ordering Information

### Optional Accessories for Transport Module*1

| Model/Order No. | Name |
|---|---|
| **Operation Manuals** | |
| W3933AE | MT1000A Transport Module Operation Manual |
| W3736AE | MT1000A/MT1100A Remote Scripting Operation Manual |
| **Optical Modules** | |
| 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 |
| G0434A | 100G LR4 Dual Rate 1310 nm QSFP28 |
| G0426A | QSFP28 100GBASE-DR |
| G0427A | QSFP28 100GBASE-FR1 |
| G0369A | 100G LR4 Dual Rate 1310 nm CFP4 |
| **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 |
| J1710A*2 | BNC Cable 0.2 m |
| J0127B*2 | COAXIAL CORD, 2.0 M |
| **MU100090B Antenna Extension Cables** | |
| J1904A | Antenna Extension Cable 25 m Kit |
| J1905A | Antenna Extension Cable 50 m Kit |
| J1906A | Antenna Extension Cable 75 m Kit |
| J1901A | Antenna Extension Cable 25 m (TNC-P, N-J) |
| J1902A | Antenna Extension Cable 25 m (N-P, N-J) |
| J1903A | Antenna Extension Patch Cable 0.4 m (N-P, SMA-P) |

*1: Optional Accessories cannot be repaired.
*2: 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 |
| MU100010A1-ES210 | 2 Years Extended Warranty Service |
| MU100010A1-ES310 | 3 Years Extended Warranty Service |
| MU100010A1-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 |
| MU100090A-ES210 | 2 Years Extended Warranty Service |
| MU100090A-ES310 | 3 Years Extended Warranty Service |
| MU100090A-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 |

## Related Products

### Network Master Pro MT1000A

| | |
|---|---|
| **OTDR Module 1310/1550 nm SMF** | **MU100020A** |
| **OTDR Module 1310/1550/850/1300 nm SMF/MMF** | **MU100021A** |
| **OTDR Module 1310/1550/1625 nm SMF** | **MU100022A** |
| **OTDR Module 1310/1550/1650 nm SMF** | **MU100023A** |

Installing an OTDR Module MU100020A/MU100021A/MU100022A/MU100023A provides the OTDR functions required for optical fiber I&M. Work efficiency is increased by all-in-one support for optical fiber tests and data communications network commissioning.
I&M tests of 1.5 Mbps to 100 Gbps communications networks can be executed by simultaneously installing the MU100010A1 or MU100011A. In addition to supporting Ethernet, OTN, etc., networks, Mobile base station CPRI and OBSAI, as well as SyncE protocols are also supported.

### Network Master Pro MT1040A

The Network Master Pro MT1040A for 400G networks is a portable tester for evaluating the communications quality of various network types operating at speeds from 10 Mbps to 400 Gbps. The stackable module configuration facilitates dual-port 400G Ethernet measurements using two installed 400G measurement modules.

- All-in-one, multiport network evaluation
- Flexible stackable measurement-module combinations
- Efficient on-site automated testing and remote control

### Virtual Network Master

MX10903xPC is a test solution designed for virtual environments. Its key feature is the ability to accurately measure communication quality in virtual and cloud environments using software. Even in situations where physical measurement devices cannot be installed, it enables one-way latency and real IP traffic load testing.

- Enables software-based measurement of communication quality in virtual and cloud environments
- Can be combined with MT1000A/MT1040A for one-way latency and real IP traffic load testing
- Provides convenience and remote control through web browser operation and API integration

### CMA5 Series

**Light Source/Optical Power Meter**

For optical fiber installation and maintenance.

### ACCESS Master MT9085 Series

**For WAN/MFH/DCI/FTTH Optical Fiber I&M**

- Improved operability with powerful synergy of 8-inch touchscreen and hardware keys
- At-a-glance Pass/Fail evaluation using Fiber Visualizer
- All OTDR, OLTS, and Visible Light Source operations on one screen
- Short event dead zone of ≤0.8 m and high dynamic range of 46 dB max.
- Power meter option for measuring optical power up to +30 dBm

## Note

## Note

## Note

Anritsu Advancing beyond

Specifications are subject to change without notice.


• **United States**
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