Network Master™ Series

Network Master Pro  MT1000A

10G Multirate Module  MU100010A
100G Multirate Module  MU100011A
High Performance GPS Disciplined Oscillator  MU100090A
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.
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**

- Ethernet testing
- 10G/25G Ethernet testing
- High load traffic generation function at full wire rate
- Ethernet testing up to 10 Gbps including RFC 2544, RFC 6349, and Y.1564

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

- SyncE testing up to 25 Gbps
- PTP testing up to 25 Gbps
- MU100090A 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

- Supported to 1GFC, 2GFC, 4GFC, 8GFC, 10GFC, 16GFC
- Network Performance Testing
- Latency test
- BER tests including service disruption measurement

- 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

- 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)

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**Evolving Networks and Required Test Equipment**

- 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

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

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<tr>
<td>QSFP28</td>
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<td>QSFP+</td>
<td>40 GbE</td>
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<tr>
<td>SFP28</td>
<td>25 GbE</td>
<td>—</td>
<td>—</td>
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<td>CPRI 10</td>
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<tr>
<td>SFP/SFP+</td>
<td>GbE/10 GbE</td>
<td>OTU1x/OTU2x</td>
<td>STM1-64/OC3-192</td>
<td>1G/2G/4G/8G/10G FC</td>
<td>CPRI 1/2/3/4/5/6/7/8</td>
<td>OBSAI 1x/2x/4x/8x</td>
</tr>
<tr>
<td>RJ45</td>
<td>10/100/1000M</td>
<td>—</td>
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<td>RJ48</td>
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<td>—</td>
<td>—</td>
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<td>E1</td>
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<tr>
<td>BNC</td>
<td>—</td>
<td>—</td>
<td>STM-1e/ST5-3</td>
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<td>E1/E3/E4/DS3</td>
<td>—</td>
</tr>
<tr>
<td>Bantam</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>DS1</td>
<td>—</td>
</tr>
</tbody>
</table>

*: MU100010A Only : MU100011A Only : Both MU100010A & MU100011A Supported

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

Supporting Network Commissioning by Remote Control

The MT1000A remote control function increases network I&M efficiency. Remote control via WLAN at front-line network commissioning enables back-office engineers to monitor tester screens while making settings and running tests, which increases the network commissioning efficiency.

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.
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 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

**Wireshark®** is a registered trademark of the Wireshark Foundation.
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.

* 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).

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.

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.
Ethernet Application

Carrier Ethernet Installation and Troubleshooting

Pass-through Mode
Configuring the MU100010A/MU100011A to Pass-through mode supports detailed troubleshooting, especially in bi-directional networks requiring traffic monitoring from both ends.

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.

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 MU100010A/MU100011A tests the network using all supported OAM functions.

Ethernet Multistream
The MU100010A/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.

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 MU100010A/MU100011A is a powerful tool for testing MPLS and MPLS-TP networks including OAM functions.
Etherneet 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 MU100010A/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 MU100010A/ 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 MU100010A/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 Testing with OTN Signaling

OTN Testing with Client Signals

The MU100010A/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

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 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 MU100010A/MU100011A with ODU Flex option supports ODUflex tests, allowing operators to verify this new technology on their networks.

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.

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.

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.

FEC Error Insertion

OTU Alarms and Errors View

OTU Header Capture

OTN Statistics Summary

OTU Level Statistics
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 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

![Diagram of eCPRI Frame Setting](image)

**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
• Returnen Time Delay (RTD)
• Perform OBSAI APS measurements

*1: Requires MU100011A for high-resolution measurement; requires two MT10000A/MU100011A/MU100009A units for measurement at distant location
*2: CPRI Option 9 and Option 10 not supported
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)-compliant time and phase-synchronized networks. The High Performance GPS Disciplined Oscillator MU100090A 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.
**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 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 and it also supports other technologies like OTN, Ethernet, CPRI/OBSAI, SDH/SONET and PDH/DSn. 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 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](image)

![FC Performance Test](image)

### 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 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

**Flow Control**

**Credit-based Flow Control**

BB Credit

Flow control between physically connected ports. Used for propagation of data of all classes.
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
• Powerful testing of PDH (E1, E3, E4) and DSn (DS1, DS3) systems
• Simultaneous bi-directional monitoring of SDH/SONET and PDH/DSn lines
• SDH/SONET mapping and de-mapping of PDH/DSn signals
• 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 and PDH/DSn delay measurements
• Analysis of service disruption with APS application

SDH/SONET Installing and Commissioning Testing

The MU100010A/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.

Speeds-up SDH/SONET Troubleshooting

The MU100010A/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. Information is also available on embedded PDH/DSn signals.

PDH (E1, E3, E4) and DSn (DS1, DS3) Testing

The MU100010A/MU100011A has powerful statistical measurements for BER testing at installing/commissioning and troubleshooting out-of-service PDH/DSn lines. Statistics are also collected for in-service analysis of line transmission-error performance of PDH/DSn lines, and G.826 or M.2100 error-performance parameters are calculated. Furthermore, PDH/DSn signals can be mapped to the SDH/SONET signal.

Quick and Easy Tests of SDH/SONET and PDH/DSn Networks
## Optical Modules Selection Guide

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<th>Model/Order No.</th>
<th>Description (Approx. Distance)</th>
<th>Max. Input Power</th>
<th>Input Sensitivity</th>
<th>Input Wavelength</th>
<th>Output Power</th>
<th>Output Wavelength</th>
<th>Loop Back</th>
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</thead>
<tbody>
<tr>
<td>G0322A 100M FX 1310 nm MM SFP</td>
<td>10GBASE - FX 1310 nm multi mode (2 km)</td>
<td>-14 dBm</td>
<td>-31 dBm</td>
<td>1270 nm to 1600 nm</td>
<td>-20 to -15 dBm</td>
<td>1280 nm to 1380 nm</td>
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<tr>
<td>G0319A Up to 2.7G 1310 nm 15 km SFP</td>
<td>ST-1/4/8 short haul 1310 nm single mode (15 km)</td>
<td>0 dBm</td>
<td>-18 dBm</td>
<td>1270 nm to 1580 nm</td>
<td>-5 to 0 dBm</td>
<td>1260 nm to 1360 nm</td>
<td>OK</td>
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<tr>
<td>G0320A Up to 2.7G 1310 nm 40 km SFP</td>
<td>ST-1/4/8 long haul 1310 nm single mode (40 km)</td>
<td>-9 dBm</td>
<td>-27 dBm</td>
<td>1270 nm to 1580 nm</td>
<td>-2 to +3 dBm</td>
<td>1280 nm to 1335 nm</td>
<td>&gt;12 dB ATT</td>
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<tr>
<td>G0321A Up to 2.7G 1550 nm 80 km SFP</td>
<td>ST-1/4/8 long haul 1550 nm single mode (80 km)</td>
<td>-9 dBm</td>
<td>-28 dBm</td>
<td>1270 nm to 1580 nm</td>
<td>-2 to +3 dBm</td>
<td>1500 nm to 1580 nm</td>
<td>&gt;12 dB ATT</td>
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<tr>
<td>G0328A 1G/2G/4G FC 850 nm SFP+</td>
<td>1GFC, 2GFC, 4GFC 850 nm multi mode (0.5 km)</td>
<td>-3 dBm</td>
<td>-15 dBm</td>
<td>830 nm to 860 nm</td>
<td>-9 to 0 dBm</td>
<td>830 nm to 860 nm</td>
<td>&gt;3 dB ATT</td>
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<tr>
<td>G0322A 1G/2G/4G FC 1310 nm SFP</td>
<td>1GFC, 2GFC, 4GFC 1310 nm single mode (10 km)</td>
<td>-3 dBm</td>
<td>-18 dBm</td>
<td>1470 nm to 1600 nm</td>
<td>0 to +5 dBm</td>
<td>1510 nm to 1590 nm</td>
<td>&gt;8 dB ATT</td>
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<tr>
<td>G0323A 1G/2G/4G FC 1550 nm SFP+</td>
<td>1GFC, 2GFC, 4GFC 1550 nm single mode (40 km)</td>
<td>-3 dBm</td>
<td>-18 dBm</td>
<td>1470 nm to 1600 nm</td>
<td>0 to +5 dBm</td>
<td>1510 nm to 1590 nm</td>
<td>&gt;8 dB ATT</td>
</tr>
<tr>
<td>G0356A 10G LR/LW 1310 nm SFP+</td>
<td>10GBASE - LR 1310 nm single mode (10 km)</td>
<td>+0.5 dBm</td>
<td>-14.4 dBm</td>
<td>1260 nm to 1565 nm</td>
<td>-6 to -1 dBm</td>
<td>1290 nm to 1330 nm</td>
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<tr>
<td>G0361A 10G ER/EW 1550 nm 40 km SFP+</td>
<td>10GBASE - ER 1550 nm single mode (40 km)</td>
<td>-1 dBm</td>
<td>-15.8 dBm</td>
<td>1260 nm to 1565 nm</td>
<td>-3 to +3 dBm</td>
<td>1530 nm to 1560 nm</td>
<td>&gt;4 dB ATT</td>
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<tr>
<td>G0318A 10G LR/LW 1310 nm SFP+</td>
<td>10GBASE - LR 1310 nm single mode (10 km)</td>
<td>-8 dBm</td>
<td>-22 dBm</td>
<td>1260 nm to 1565 nm</td>
<td>0 to +5 dBm</td>
<td>1525 nm to 1565 nm</td>
<td>&gt;13 dB ATT</td>
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<tr>
<td>G0359A 10G ER/EW 1550 nm 80 km SFP+</td>
<td>10GBASE - ER 1550 nm single mode (80 km)</td>
<td>-9.5 dBm</td>
<td>-28 dBm</td>
<td>1260 nm to 1565 nm</td>
<td>0 to +5 dBm</td>
<td>1525 nm to 1565 nm</td>
<td>&gt;13 dB ATT</td>
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<td>G0329A 10G LR 1310 nm SFP+</td>
<td>10GBASE - LR 1310 nm single mode (10 km)</td>
<td>+0.5 dBm</td>
<td>-14 dBm</td>
<td>1260 nm to 1355 nm</td>
<td>-8.2 to +0.5 dBm</td>
<td>1260 nm to 1355 nm</td>
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<tr>
<td>G0356A 8G FC/10G SR 850 nm SFP+</td>
<td>8GFC, 10GFC, 10GBASE - SR 850 nm multi mode (0.3 km)</td>
<td>-1 dBm</td>
<td>-11.1 dBm</td>
<td>840 nm to 860 nm</td>
<td>-7.3 to -1 dBm</td>
<td>840 nm to 860 nm</td>
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<td>G0386A 16GFC SR 850 nm SFP+</td>
<td>16GFC 850 nm multi mode (0.035 km)</td>
<td>0 dBm</td>
<td>-10.5 dBm</td>
<td>840 nm to 860 nm</td>
<td>-7.5 dBm ~ 840 nm to 860 nm</td>
<td>OK</td>
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<td>G0387A 16GFC LR 1310 nm SFP+</td>
<td>16GFC 1310 nm single mode (10 km)</td>
<td>+2 dBm</td>
<td>-12 dBm</td>
<td>1295 nm to 1325 nm</td>
<td>-5 to +2 dBm</td>
<td>1295 nm to 1325 nm</td>
<td>OK</td>
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<td>G0388A 25G SR 850 nm SFP28</td>
<td>25GBASE - SR 850 nm multi mode (0.1 km)</td>
<td>+2.4 dBm</td>
<td>-10.3 dBm</td>
<td>840 nm to 860 nm</td>
<td>-8.4 to +2.4 dBm</td>
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<td>G0389A 25G LR 1310 nm SFP28</td>
<td>25GBASE - LR 1310 nm single mode (10 km)</td>
<td>+2 dBm</td>
<td>-13.3 dBm</td>
<td>1260 nm to 1350 nm</td>
<td>-7 to +2 dBm</td>
<td>1295 nm to 1325 nm</td>
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<td>G0359A 40G SR 850 nm QSFP+</td>
<td>40GBASE - SR 850 nm multi mode (0.1 km)</td>
<td>+2.4 dBm (per Lane)</td>
<td>-9.9 dBm</td>
<td>840 nm to 860 nm</td>
<td>-8 to +2.4 dBm</td>
<td>840 nm to 860 nm</td>
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<tr>
<td>G0344A 40G LR4 1310 nm QSFP+</td>
<td>40G Ethernet/OTN 1310 nm single mode (10 km)</td>
<td>+2.3 dBm (per Lane)</td>
<td>-11.5 dBm (per Lane)</td>
<td>1264.5 nm to 1277.5 nm</td>
<td>-8.3 dBm (max.) (Total)</td>
<td>1264.5 nm to 1277.5 nm</td>
<td>OK</td>
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<tr>
<td>G0366A 100G SR4 850 nm QSFP28</td>
<td>100G Ethernet 850 nm multi mode (0.1 km)</td>
<td>+2.4 dBm (per Lane)</td>
<td>-9.9 dBm (per Lane)</td>
<td>840 nm to 860 nm</td>
<td>-8.9 dBm (max.) (Total)</td>
<td>840 nm to 860 nm</td>
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<tr>
<td>G0364A 100G LR4 1310 nm QSFP28</td>
<td>100G Ethernet 1310 nm single mode (10 km)</td>
<td>+4.5 dBm (per Lane)</td>
<td>-8.6 dBm (per Lane)</td>
<td>1294.53 nm to 1296.59 nm</td>
<td>+10.5 dBm (max.) (Total)</td>
<td>1294.53 nm to 1296.59 nm</td>
<td>OK</td>
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<tr>
<td>G0365A 100G LR4 Dual Rate 1310 nm QSFP28</td>
<td>100G Ethernet/OTN 1310 nm single mode (10 km)</td>
<td>+4 dBm (per Lane)</td>
<td>-8.4 dBm (per Lane)</td>
<td>1294.53 nm to 1296.59 nm</td>
<td>+10 dBm (max.) (Total)</td>
<td>1294.53 nm to 1296.59 nm</td>
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<tr>
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<td>+4.5 dBm (per Lane)</td>
<td>-8.6 dBm (per Lane)</td>
<td>1294.53 nm to 1296.59 nm</td>
<td>+10.5 dBm (max.) (Total)</td>
<td>1294.53 nm to 1296.59 nm</td>
<td>OK</td>
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</table>

### Notes:
- **Input Wavelength**: The input wavelength range for each module is specified in the table. The input range is typically between 1260 nm to 1550 nm for multimode fiber and between 1310 nm to 1550 nm for single-mode fiber.
- **Output Wavelength**: The output wavelength range is also provided, indicating the range of wavelengths that can be transmitted through the module. For example, 10GBASE-LR modules output wavelengths range from 1290 nm to 1330 nm.
- **Loop Back**: This indicates whether the module can be used in a loopback configuration. Modules marked 'OK' can be used in a loopback mode without damage to the module or system.
## Optical Modules Selection Guide

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name Form Factor</th>
<th>10G Gig Ethernet</th>
<th>10G SR Gig Ethernet</th>
<th>10G LR Gig Ethernet</th>
<th>100G Gig Ethernet</th>
<th>100G SR Gig Ethernet</th>
<th>100G LR Gig Ethernet</th>
<th>100G LR4 Gig Ethernet</th>
<th>100G LR4 Gig Ethernet Dual Rate</th>
<th>25G Gig Ethernet</th>
<th>40G Gig Ethernet</th>
<th>40G SR4 Gig Ethernet</th>
<th>40G LR4 Gig Ethernet</th>
<th>88G Gig Ethernet</th>
<th>96G Gig Ethernet</th>
<th>110G Gig Ethernet</th>
<th>110G Gig Ethernet Dual Rate</th>
<th>155G Gig Ethernet</th>
<th>10G Gig Ethernet</th>
<th>400G Gig Ethernet</th>
<th>100G OTN</th>
<th>100G OTN</th>
<th>100G OTN</th>
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<td>✓ G0332A</td>
<td>100M FX 1310 nm MM SFP</td>
<td>SFP 1310 nm MM 2 km</td>
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<td>✓ G0319A</td>
<td>1G/2G/4G FC 850 nm SFP</td>
<td>SFP 1310 nm SM 15 km</td>
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<td>SFP 1310 nm SM 40 km</td>
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<td>SFP 1550 nm SM 80 km</td>
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<td>SFP 850 nm MM 0.5 km</td>
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<td>SFP+ 1550 nm SM 80 km</td>
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<td>100G LR4 Dual Rate 1310 nm QSFP28</td>
<td>QSFP28 1310 nm SM 10 km</td>
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* SM: Single Mode, MM: Multi-Mode
### 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)
  - MT1000A operates as device: USB 2.0 type Mini-B (1 port)
- **Ethernet Interface**: Ethernet 10M/100M/1000M, Connector: RJ45
- **WLAN Interface**: 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.

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#### Other Interfaces
- **Audio Interface**: For connection of CTIA Standard head set
  - Connector: 3.5-mm diameter jack
- **AUX Connector**: For connection of optional G0325A GPS receiver
  - With MT1000A-005: For connection of Optional MU100090A
- **Built-in Loudspeaker**: Monitors speech of voice channel
  - 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:
  - SETS (E1: 2.048 Mbps), BITS (DS1: 1.544 Mbps) or 2.048 MHz TTL signal in accordance with ITU-T G.703, 10 MHz
  - Connector: BNC (50Ω)

#### 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 V(ac) to 240 V(ac), 50 Hz/60 Hz
  - Output: 18 V(dc), 3.62 A (max.)
  - Power Consumption: ≤120 W
  - With MT1000A-006
  - Input: 100 V(ac) to 240 V(ac), 50 Hz/60 Hz
  - Output: 18 V(dc), 6.6 A (max.)
  - Power Consumption: ≤65 W
- **Dimensions and Mass**:
  - 257 (W) × 164 (H) × 82 (D) mm (Exclude Projection, MT1000A + MU100010A)
  - 257 (W) × 164 (H) × 89 (D) mm (Exclude Projection, MT1000A + MU100011A)
  - 2.7 kg (including MT1000A, MU100010A and battery)
  - 2.7 kg (including MT1000A, MU100011A and battery)
- **Environmental**:
  - **Temperature**:
    - Operating: 0° to +50°C (non-condensing)
    - Charging: 0° to +40°C (non-condensing)
    - Storage: -30° to +60°C (non-condensing, without battery or AC adapter)
    - -20° 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)
    - ≤85% RH (non-condensing, with battery and AC adapter)
- **CE**
  - LVD: 2014/35/EU, EN61010-1
  - RoHS: 2011/65/EU, EN50581
- **Laser Safety**
  - IEC 60825-1:2007 Class 1M
    - CFP4: 100GBASE-SR4
    - QSFP+: 100GBASE-SR4
    - IEC 8025-1:2007 Class 1
    - CFP4: 100GBASE-LR4
    - QSFP+: 100GBASE-LR4
    - QSFP28: 100GBASE-SR4
    - QSFP28: 40GBASE-SR4
    - QSFP28: 25GBASE-SR4
    - SFP28: 100GBASE-LR4
    - SFP28: 40GBASE-LR4
    - SFP28: 25GBASE-LR
    - SFP: 100BASE-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 21 CFR 1040.10 and 1040.11
  - IEC 60825-2:2011 Class 1M
  - IEC 60825-3:2011 Class 1M
  - IEC 60825-4:2011 Class 1M
  - IEC 60825-5:2011 Class 1M
  - IEC 60825-6:2011 Class 1M
  - IEC 60825-7:2011 Class 1M
  - IEC 60825-8:2011 Class 1M
  - IEC 60825-9:2011 Class 1M
  - IEC 60825-10:2011 Class 1M
  - IEC 60825-11:2011 Class 1M
  - IEC 60825-12:2011 Class 1M
  - IEC 60825-13:2011 Class 1M
  - IEC 60825-14:2011 Class 1M
  - IEC 60825-15:2011 Class 1M
  - IEC 60825-16:2011 Class 1M
  - IEC 60825-17:2011 Class 1M
  - IEC 60825-18:2011 Class 1M
  - IEC 60825-19:2011 Class 1M
  - IEC 60825-20:2011 Class 1M
  - IEC 60825-21:2011 Class 1M

*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
Panel Layout

Network Master Pro MT1000A

9-inch active TFT display and touch screen

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 Bantam (DS1)
10. Port 1, Tx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
11. Port 1, Rx Bantam (DS1)
12. Port 1, Rx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
13. Port 2, Tx Bantam (DS1)
14. Port 2, Tx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
15. Port 2, Rx Bantam (DS1)
16. Port 2, Rx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
17. Port 1, Tx/Rx RJ48 (E1 balanced)
18. Port 2, Tx/Rx RJ48 (E1 balanced)
19. Port 1, Tx/Rx SFP/SFP+ (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
20. Port 2, Tx/Rx SFP/SFP+ (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
21. Port 1, Tx/Rx RJ45 (Ethernet, eCPRI/RoE electrical)
22. Port 2, Tx/Rx RJ45 (Ethernet, eCPRI/RoE electrical)
23. Port1, Tx/Rx CFP4 (OTN, Ethernet, eCPRI/RoE)
24. Port1, Tx/Rx SFP/SFP+/SFP28 (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET)
25. Port2, Tx/Rx SFP/SFP+/SFP28 (OTN, Ethernet, eCPRI/RoE/CPRI/OBSAI, Fibre Channel, SDH/SONET)
26. Port1, Tx/Rx QSFP+/QSFP28 (OTN, Ethernet, eCPRI/RoE)
27. Port1, Sync. Clock Output
28. AUX (D-SUB 9 pin)
29. 1 pps Output (REF)
30. 10 MHz Output
31. OCS LED
32. GPS received LED
33. 1 pps Sync In
34. Antenna Input

10G Multirate Module MU100010A

100G Multirate Module MU100011A

High Performance GPS Disciplined Oscillator MU100090A

Rechargeable and replaceable Li-ion battery
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

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT1000A</td>
<td>Network Master Pro</td>
</tr>
</tbody>
</table>

#### Standard Accessories

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT1000A-006</td>
<td>High Power Supply: Installed</td>
</tr>
<tr>
<td>B0745A</td>
<td>Softcase: 1 pc</td>
</tr>
<tr>
<td>B0728A</td>
<td>Rear Panel kit: 1 pc</td>
</tr>
<tr>
<td>G0385A*4</td>
<td>High Power AC Adaptor: 1 pc</td>
</tr>
<tr>
<td>G0310A</td>
<td>Li-ion Battery: 1 pc</td>
</tr>
<tr>
<td>Z1746A</td>
<td>Stylus: 1 pc</td>
</tr>
<tr>
<td>Z1747A*6</td>
<td>Carrying Strap: 1 pc</td>
</tr>
<tr>
<td>Z1748A*6</td>
<td>Handle: 1 pc</td>
</tr>
<tr>
<td>Z1817A*7</td>
<td>Utilities ROM: 1 pc</td>
</tr>
</tbody>
</table>

### Optional Accessories

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>B0691B*10</td>
<td>Hard Case</td>
</tr>
<tr>
<td>B0720A</td>
<td>Rear Panel Panel</td>
</tr>
<tr>
<td>B0729A*11</td>
<td>Screw 1U</td>
</tr>
<tr>
<td>B0730A*11</td>
<td>Screw 2U</td>
</tr>
<tr>
<td>B0731A*11</td>
<td>Screw 3U</td>
</tr>
<tr>
<td>B0732A*12</td>
<td>Screw Kit</td>
</tr>
<tr>
<td>G0382A*13</td>
<td>Autofocus Video Inspection Probe</td>
</tr>
<tr>
<td>G0306B*13</td>
<td>Video Inspection Probe</td>
</tr>
<tr>
<td>G0309A*4</td>
<td>AC Adapter</td>
</tr>
<tr>
<td>G0324A</td>
<td>Battery Charger</td>
</tr>
<tr>
<td>G0325A</td>
<td>GPS Receiver</td>
</tr>
<tr>
<td>J1569B</td>
<td>Car 12 Vdc Adapter</td>
</tr>
<tr>
<td>J1667A*14</td>
<td>GPIB–USB Converter</td>
</tr>
<tr>
<td>Z1821A*15</td>
<td>Utilities in USB Stick</td>
</tr>
</tbody>
</table>

### Softcase B0745A (Standard Accessory)

This bag with shoulder strap can hold the MT1000A with up to three installed modules.

### Module Configuration

#### 1 Module

- Transport
- OTDR
- CPRI RF

#### 2 Modules

- Transport
- OTDR
- GPS/3G
- CPRI RF

#### 3 Modules

- Transport
- OTDR
- GPS/3G
- CPRI RF

#### Hard Case B0691B

This strong plastic case can hold the MT1000A with up to two installed modules. 462 (W) × 372 (H) × 207 (D) mm

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.

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 MU100090A. To retrofit to the already shipped item, please contact us.

10: Can use module 1 to 2 in combination

11: Includes 4 bolts of same length

12: Includes B0729A, B0730A and B0731A

13: This fiberscope uses the VIP function in the MT1000A Utility menu. Different tip types are used by the G0382A and G0306B.

14: J1667A is required for SCPI remote control via GPIB


16: Any modular combination as shown in a figure.

17: Required if the transport module is not used rear cover.

18: Modules may be used in combination as shown on the figure.
Network Master Pro MT1000A Ordering Information

### 10G Multirate Module MU100010A

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU100010A</td>
<td>10G Multirate Module</td>
<td>W3935AE MT1000A Transport Module Quick Reference Guide: 1 pc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B0692A*1 ESD Box (for optical modules): 1 pc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options*2</th>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Rate</td>
<td>MU100010A-001**</td>
<td>Up to 2.7G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-011</td>
<td>Ethernet 10G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-012</td>
<td>Ethernet 10G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-020**</td>
<td>TCP Throughput</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-051</td>
<td>OTN 10G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-052</td>
<td>OTN 10G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-061**</td>
<td>ODU Multiplexing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-062**</td>
<td>ODU Flex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-071</td>
<td>CPR/ICP/ICS Up to 5G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-072</td>
<td>CPR/ICP/ICS 6G to 10G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-073</td>
<td>CPR/ICP/ICS 6G to 10G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-002</td>
<td>FC 1G 2G 4G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-091</td>
<td>FC 8G 10G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-092</td>
<td>FC 8G 10G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-081</td>
<td>STM-64 OC-192 Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100010A-082</td>
<td>STM-64 OC-192 Dual Channel</td>
<td></td>
</tr>
</tbody>
</table>

**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. In addition, specify
one of the following media along with the required option.

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z1849A</td>
<td>DVD-ROM for Retrofit Options</td>
<td></td>
</tr>
<tr>
<td>Z1850A</td>
<td>USB Stick for Retrofit Options</td>
<td></td>
</tr>
</tbody>
</table>

**3:** 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 DSh (DS1, DS3)

**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

### 100G Multirate Module MU100011A

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU100011A**</td>
<td>100G Multirate Module</td>
<td>W3935AE MT1000A Transport Module Quick Reference Guide: 1 pc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B0763A*7 ESD Box (for Optical modules): 1 pc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options*2</th>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>MU100011A-001**</td>
<td>Up to 10G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-003**</td>
<td>Up to 10G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-013</td>
<td>Ethernet 40G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-015</td>
<td>Ethernet 100G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-017</td>
<td>Ethernet 25G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-020**</td>
<td>TCP Throughput</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-023**</td>
<td>RS-FEC for 100GBase-SR4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-053</td>
<td>OTN 40G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-055</td>
<td>OTN 100G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-062**</td>
<td>ODU Flex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-063**</td>
<td>ODU Multiplexing/Multi Stage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-004</td>
<td>Up to 10G FC Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-005</td>
<td>Up to 10G FC Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-091</td>
<td>FC 16G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-071</td>
<td>eCPRI/ROE/CPRI/ICP/ICS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-072</td>
<td>eCPRI/ROE/CPRI/ICS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-073</td>
<td>eCPRI 12/25G Single Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-074</td>
<td>eCPRI 12/25G Dual Channel</td>
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<tr>
<td></td>
<td>MU100011A-075</td>
<td>eCPRI/ROE 25G Dual Channel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MU100011A-083**</td>
<td>STM-256/OC-768 Client Signal</td>
<td></td>
</tr>
</tbody>
</table>

**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:** Requires that at least one of the following option is installed:
MU100011A-001, MU100011A-003, MU100011A-053, MU100011A-055

**10:** Requires to MU100011A-015

**11:** Requires that at least one of the following option is installed:
MU100011A-001, MU100011A-003, MU100011A-053, MU100011A-055

**12:** MU100011A does not have a physical interface of the option.

The option is required for client signal mapped in the OTN.

### High Performance GPS Disciplined Oscillator MU100090A

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
<th>Standard Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU100090A**</td>
<td>High Performance GPS Disciplined Oscillator</td>
<td>J1705A AUX Conversion Adaptor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J1706A GPS Antenna</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J1710A BNC Cable (20 cm) × 2</td>
</tr>
</tbody>
</table>

**13:** Excellent Eco Product non-compliant.

MT1000A-005 is required for MU100090A.
## Optional Accessories for Transport Module

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3933AE</td>
<td>MT1000A Transport Module Operation Manual</td>
</tr>
<tr>
<td>W3736AE</td>
<td>MT1000A/MT1100A Remote Scripting Operation Manual</td>
</tr>
</tbody>
</table>

### Optical Module

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>G0332A</td>
<td>100M FX 1310 nm MM SFP</td>
</tr>
<tr>
<td>G0319A</td>
<td>Up to 2.7G 1310 nm 15 km SFP</td>
</tr>
<tr>
<td>G0320A</td>
<td>Up to 2.7G 1310 nm 40 km SFP</td>
</tr>
<tr>
<td>G0321A</td>
<td>Up to 2.7G 1550 nm 80 km SFP</td>
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<tr>
<td>G0328A</td>
<td>1G/2G/4G FC 850 nm SFP</td>
</tr>
<tr>
<td>G0322A</td>
<td>1G/2G/4G FC 1310 nm SFP</td>
</tr>
<tr>
<td>G0323A</td>
<td>1G/2G/4G FC 1550 nm SFP</td>
</tr>
<tr>
<td>G0315A</td>
<td>10G LR/LW 1310 nm SFP+</td>
</tr>
<tr>
<td>G0316A</td>
<td>10G ER/EW 1550 nm 40 km SFP+</td>
</tr>
<tr>
<td>G0318A</td>
<td>10G ZR/ZW 1550 nm 80 km SFP+</td>
</tr>
<tr>
<td>G0329A</td>
<td>10G LR 1310 nm SFP+</td>
</tr>
<tr>
<td>G0356A</td>
<td>8G FC/10G SR 850 nm SFP+</td>
</tr>
<tr>
<td>G0386A</td>
<td>16GFC SR 850 nm SFP+</td>
</tr>
<tr>
<td>G0387A</td>
<td>16GFC LR 1310 nm SFP+</td>
</tr>
<tr>
<td>G0388A</td>
<td>25G SR 850 nm SFP28</td>
</tr>
<tr>
<td>G0389A</td>
<td>25G LR 1310 nm SFP28</td>
</tr>
<tr>
<td>G0359A</td>
<td>40G SR4 850 nm QSFP+</td>
</tr>
<tr>
<td>G0334A</td>
<td>40G LR4 1310 nm QSFP+</td>
</tr>
<tr>
<td>G0366A</td>
<td>100G SR 850 nm SFP28</td>
</tr>
<tr>
<td>G0364A</td>
<td>100G LR 1310 nm QSFP28</td>
</tr>
<tr>
<td>G0365A</td>
<td>100G LR4 Dual Rate 1310 nm QSFP28</td>
</tr>
<tr>
<td>G0369A</td>
<td>100G LR4 Dual Rate 1310 nm CFP4</td>
</tr>
</tbody>
</table>

### Cables

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1571A</td>
<td>Optical Cable SM LC/PC to SC/PC 3 m</td>
</tr>
<tr>
<td>J1575A</td>
<td>Optical Cable SM LC/PC to FC/PC 3 m</td>
</tr>
<tr>
<td>J1579A</td>
<td>Optical Cable SM LC/PC to LC/PC 3 m</td>
</tr>
<tr>
<td>J1581A</td>
<td>Optical Cable MM LC/PC to LC/PC 3 m</td>
</tr>
<tr>
<td>J1583A</td>
<td>Optical Attenuator 10 dB LC/PC to LC/PC</td>
</tr>
<tr>
<td>J1584A</td>
<td>RJ45 Cable 3 m</td>
</tr>
<tr>
<td>J1585A**</td>
<td>RJ48 to Crocodile Clips Cable 3 m</td>
</tr>
<tr>
<td>J1586A**</td>
<td>RJ48 to Crocodile Clips Cable 20 dB ATT 3 m</td>
</tr>
<tr>
<td>J1588A**</td>
<td>BNC Cable 2.5 m</td>
</tr>
<tr>
<td>J1589A**</td>
<td>BNC to 1.6/5.6 Cable 2.5 m</td>
</tr>
<tr>
<td>J1591A**</td>
<td>RJ48 to Two 3-pin Banana Plug Cable 2.5 m</td>
</tr>
<tr>
<td>J1597A**</td>
<td>RJ48 Balanced PDH Cable Crossed 3 m</td>
</tr>
<tr>
<td>J1598A**</td>
<td>Bantam Cable 3 m</td>
</tr>
<tr>
<td>J1710A**</td>
<td>BNC Cable 0.2 m</td>
</tr>
<tr>
<td>J0127B**</td>
<td>COAXIAL CORD, 2.0 M</td>
</tr>
</tbody>
</table>

1: E1 interface cable.
2: E1, E3, E4, DS3, STM-1e, STS-3 interface cable. Impedance: 75Ω
3: DS1 interface cable.
4: 50Ω impedance cable for MU100090A and main-frame external clock input connector

## Maintenance Service

<table>
<thead>
<tr>
<th>Model/Order No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT1000A-ES210</td>
<td>2 Years Extended Warranty Service</td>
</tr>
<tr>
<td>MT1000A-ES310</td>
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</tr>
<tr>
<td>MT1000A-ES510</td>
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Network Master Pro MT1000A

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

Installing an OTDR Module MU100020A/MU100021A 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 MU100010A or MU100011A. In addition to supporting Ethernet, OTN, etc., networks, Mobile base station CPRI and OBSAI, as well as SyncE protocols are also supported.

CPRI RF Module MU100040B

Installing the CPRI RF Module MU100040B in the MT1000A supports analysis of IQ signal frequency characteristics included in CPRI signals between the LTE base station RRH and BBU. This can be used to check operation of the RRH after installation. MU100040B supported BBU emulation for RRH.

Network Master Flex MT1100A

All-in-one, up to 4-port transport tester supporting from 1.5 Mbps to 100 Gbps including OTN, Ethernet, eCPRI/ROE/CPRI/OBSAI, Fibre Channel, SDH/SONET and PDH/DSn.

MT9090A Series

µOTDR Module MU909014/15
Compact OTDR for full automatic verification of optical networks, FTTH-PON, Metro and Core.

Gigabit Ethernet Module MU909060A
Dedicated field test solution for installation and troubleshooting Ethernet links in access networks.

CMAS 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