

Anritsu envision : ensure

Network Master™ Series

Network Master Flex MT1100A

| | |
|-------------------------|-----------|
| 10G Multirate Module | MU110010A |
| 100G Multirate Module | MU110011A |
| 40/100G Module CFP2 | MU110012A |
| 40/100G Advanced Module | MU110013A |

 Network Master Flex



Redefining Transport Testing

All-in-one Support for R&D, Manufacturing and I&M of 100 Gbps Core and Metro Networks

Today's core and metro communications networks are implementing 100 GigE and OTN technologies rapidly to provide sufficient bandwidth supporting the explosive increase in mobile communications data. These high-bit-rate networks demand very high reliability due to the large data volumes and variety of client signals in use.

Consequently, every stage from R&D through to manufacturing, installation, and maintenance, requires precision testing and verification of network equipment and transport devices.

The all-in-one Network Master Flex MT1100A supports all the latest communications network technologies.

Selecting and installing up to two modules from a range of four module options supports all-in-one R&D, manufacturing, installation and maintenance tests of network and transport equipment operating at bit rates from 1.5 Mbps to 100 Gbps. The large, 12.1-inch color LCD touch panel with easy-to-use GUI plus remote operation of a full range of test functions over an Internet connection greatly improves test efficiency and helps cut costs.



400G

100G

Core and Metro Networks

OTN flex mapping

**All in
One**

**100G
4ports**

**OTN
flex
mapping**

All-in-one Transport Tester

- Supports testing from 1.5 Mbps to 100 Gbps
- Support for various transport commissioning tests

Supports Up to 400 Gbps (100G × 4)

- Install any two modules from choice of four module options
- Test up to four independent 100 Gbps ports simultaneously to increase manufacturing efficiency for 100 Gbps transport equipment
- Support 400 Gbps (100G × 4) R&D by simulating client signals

OTN Flexible Mapping

- Various OTN mappings up to 100 Gbps
- Supports both multi-stage mappings and ODUflex
- Supports mapped client-signal tests

Main Applications

R&D

- Research and development of 400 Gbps networks and transport equipment

Manufacturing

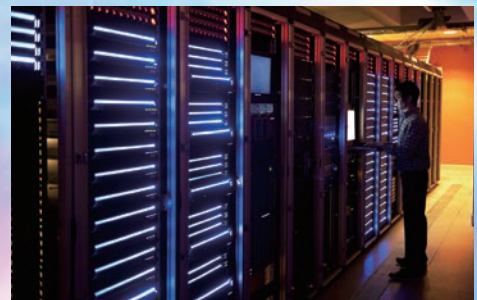
- Quality and assurance tests of 100 Gbps transport equipment

Commissioning

- Verification of Service Level Agreement (SLA) at commissioning of 1.5 Mbps to 100 Gbps lines

Maintenance

- Troubleshooting 1.5 Mbps to 100 Gbps line faults



MT1100A

Network Master Flex MT1100A Function Overview

The all-in-one Network Master Flex MT1100A supports all the latest communications network technologies. Selecting and installing up to two modules from a range of three module options supports all-in-one R&D, manufacturing, installation and maintenance tests of network and transport equipment operating at bit rates from 1.5 Mbps to 100 Gbps. The large, 12.1-inch color LCD touch panel with easy-to-use GUI plus remote operation of a full range of test functions over an Internet connection greatly improves test efficiency and helps cut costs.

All-in-one

The all-in-one MT1100A has the functions required for developing, manufacturing, installing and maintaining networks at bit rates from 1.5 Mbps to 100 Gbps. With four 100 Gbps ports, it supports R&D of the latest OTN 400 Gbps technologies using client signals, including Ethernet, CPRI, Fibre Channel, SDH/SONET and PDH/DSn, now in development.

• OTN Testing with Client Signals

The MT1100A can map Ethernet, CPRI, Fibre Channel, and SDH/SONET client signals onto OTN signals. Mapped OTN client-signal tests under near-to-live conditions support faster troubleshooting.

• Easy-to-Use GUI

The user interface is optimized for troubleshooting by field technicians and to reduce training time. It has a logical structure and self-explanatory graphical symbols. Tests are started by launching an intuitive application, and main results are displayed as GO/NO-GO indications. User-programmed application favorites including all required test parameters make operation fast and easy.



• Simultaneous Testing and In-band Monitoring with Dual Port

Configuring the MT1100A with two ports*1 at all supported rates reduces test times by completing independent tests simultaneously on two lines using a single tester. Or separate measurement test applications can be run independently at the same time.

Support for dual ports is also important at analysis of in-service lines when analyzing the performance of both line directions simultaneously.

*1: MU110011A 100G:1 port

• Optical Transceiver Analysis

The MT1100A reads and displays the main MDIO parameters of optical transceivers for at-a-glance confirmation of settings and monitoring data. It displays details for each alarm item for CFP/CFP2/CFP4*2/QSFP28*2 and can also read from/write to each MDIO/I2C address. Additionally, settings such as VOD, Pre-Emphasis, Rx Equalizer can be changed for each PCS lane to test the impact on the performance of each electrical I/F. Last, adding an option*3 enables error/alarm insertion at CAUI4 interfaces for isolating optical transceiver and network faults.

*2: Requires following adaptors when using CFP4/QSFP28 optical modules:
CFP2-CFP4 Adaptor J1665A
CFP2-QSFP28 Adaptor J1686B

*3: MU110013A only

• 12.1-inch Touch Screen for Easy Viewing and Operation

The large 12.1-inch, high-resolution, full-color, touch screen is perfect for viewing results. And the touch screen makes instrument operations easy.

• Fast Measurement Overview

Using the Overall Test Status screen, viewing the test status for all current test applications belonging to one user from a distance is easy. For each test application, the Measurement Summary function allows rapid overview of measurements using GO/NO-GO indications with user-defined thresholds. Statistical histograms facilitate error tracking over time.

• Flexible Connectivity

WLAN, Bluetooth and LAN connectivity ensure quick and simple tester access in any situation. While remote operation allows an experienced engineer to assist colleagues in the field.

• Report Generation

The powerful and flexible report generator creates PDF, CSV or XML files for selected measurements to output results in a professional and attractive looking format. The user can customize the detailed contents of the statistical reports, allowing only the most important information to be included.

• Remote Operation and Control

Remote operation from a distance is simple using the Remote Operation function, allowing operation as if on-site. The dedicated remote GUI operation software allows multiple users not only remote operation but also remote boot-up, file transfer, firmware update via Ethernet or WLAN. Moreover, the dedicated Remote Control software can work stand-alone, allowing users to generate reports and analyze results offline in addition to setting-up files without accessing a MT1100A. The remote scripting function cuts the manual operation time, eliminating human testing errors. The MT1100A supports Ethernet, WLAN and GPIB for remote scripting.

• Portable

The high portability and robustness of the MT1100A ensure quick location of faults wherever you are. This light, small instrument is just a fraction larger than its 12.1-inch screen, offering easy access in the tightest locations. The large GUI makes it easy to quickly configure, locate, solve, and report on network issues.

• Long Battery Life

Since AC power is not always available when needed. The battery-operated MT1100A (operating time depends on configuration) is convenient for instant on-site troubleshooting with no need to search for a power outlet.

• SkyBridge Tools™ Test Manager

SkyBridge Tools™ is a cloud-hosted management system for test equipment. Allowing the test equipment manager to understand and oversee the critical details of the test equipment fleet such as Location, Software version, current user and usage details.

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Network Master Flex MT1100A Function Overview

R&D for 400 Gbps Networks

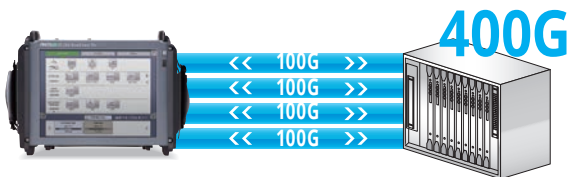
R&D into faster 400 Gbps networks is being driven by the explosive growth in smartphone mobile data traffic.

The MT1100A can send and receive a variety of 100G × 4 client signals, offering strong support for R&D of 400 Gbps networks and transport equipment.

Features

- World-first portable transport testers supporting simultaneous installation of four independent 100 Gbps ports
- Multiple users can log in one MT1100A via PC and operate each port independently using the dedicated remote GUI operation software.
- Each 100 Gbps port supports 40 GigE/100 GigE and OTU4/OTU3/OTU3e1/OTU3e2 interfaces
- Detailed client-signal analysis using Ethernet frame capture
- Support various OTN mappings including ODUflex
- FEC Performance tests using ITU-T O.182 recommended Poisson-distribution error insertion
- Display test results for four ports on one screen

Recommended modules: MU110013A × 2



Higher 100 Gbps Transport Equipment Manufacturing Efficiency

Manufacturing of 100 Gbps WDM, switches and optical transceiver modules is growing rapidly. With all the functions needed for testing transport equipment, the 4-port, all-in-one MT1100A with automatic testing using SCPI commands is the ideal platform for maximizing equipment investment through higher test efficiency and lower cost per port.

Features

- Supports OTN, Ethernet, CPRI, OBSAI, Fibre Channel, SDH/SONET and PDH/DSn at bit rates from 1.5 Mbps to 100 Gbps using combination of modules
- RFC 2544-based transmission equipment performance tests
- Color display of threshold settings and Pass/Fail evaluation results
- Optical transceiver modules analysis using MDIO analysis and VOD, Pre-emphasis, Rx equalizer control.
- Various high speed interfaces support CFP2, CXP, QSFP+, CFP4, QSFP28 (CFP4, QSFP28 are adaptor required)
- Automatic repeat testing using SCPI remote commands via Ethernet, WLAN or GPIB
- Multiple users can log in one MT1100A via PC and operate each port independently using the dedicated remote GUI operation software.

Recommended modules: MU110013A × 2 (for four 40 Gbps/100 Gbps ports)



Quick Network Commissioning Tests

Efficient and accurate network commissioning tests in a limited time window are a key issue for network operators. With its all-in-one support for transport tests, including OTN, CPRI, OBSAI, SyncE (ITU-T G.826x), PTP (IEEE 1588 v2), ITU-T Y.1564, RFC 6349 etc., plus simultaneous multiple-line tests using two ports, the MT1100A helps cut costs by slashing test times.

Features

- All-in-one support for network commissioning transport tests up to 100 Gbps
- Large, 12.1-inch touch-panel GUI with battery operation
- Frame loopback using remote-controlled MT1100A as Ethernet reflector
- One-way latency tests using operation at Master side at remote control Master/Slave setup
- Built-in GPS supporting SyncE, IEEE 1588 v2, and one-way latency time syncing tests
- Support Mobile fronthaul deployment and maintenance by CPRI/OBSAI test.
- Network performance check at the end users site by TCP throughput testing with RFC 6349 or iPerf.
- Remote operation over VNC for operations-center support of on-site engineers
- Remote boot-up, operation, file transfer, firmware update
- Halved measurement times using simultaneous 2-port, multi-line testing

Recommended modules: MU110011A



Fast and Flexible Troubleshooting

Today's data centers have a mix of interfaces ranging from old legacy network equipment to the latest 100 Gbps core networks. With excellent built-in troubleshooting functions as well as dual ports for simultaneous two-way monitoring, the MT1100A locates problems quickly.

Features

- Dual ports supporting bit rates from 1.5 Mbps to 100 Gbps for two-way monitoring and equipment insertion tests
- Top talker, network attack, and fast error-frame capture using IP Channel Statistics (up to 10 Gbps)
- Ethernet frame capture and Wireshark analysis
- Live line monitoring at Through testing
- Battery operation for fast on-site troubleshooting anywhere
- Long-term monitoring using remote operation over VNC or the dedicated remote GUI operation software

Recommended modules: MU110010A + MU110013A

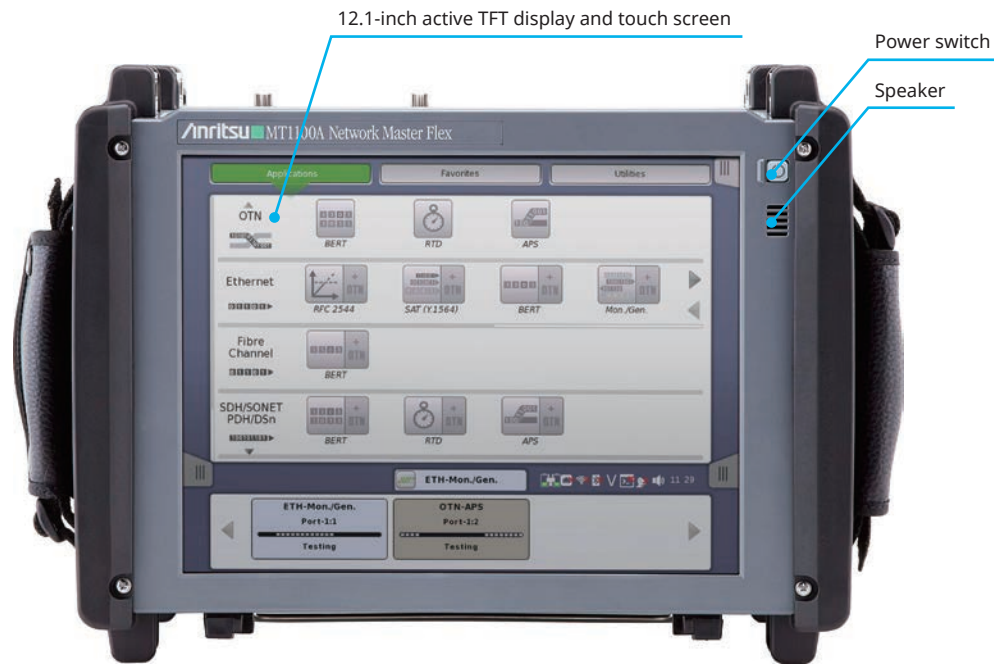
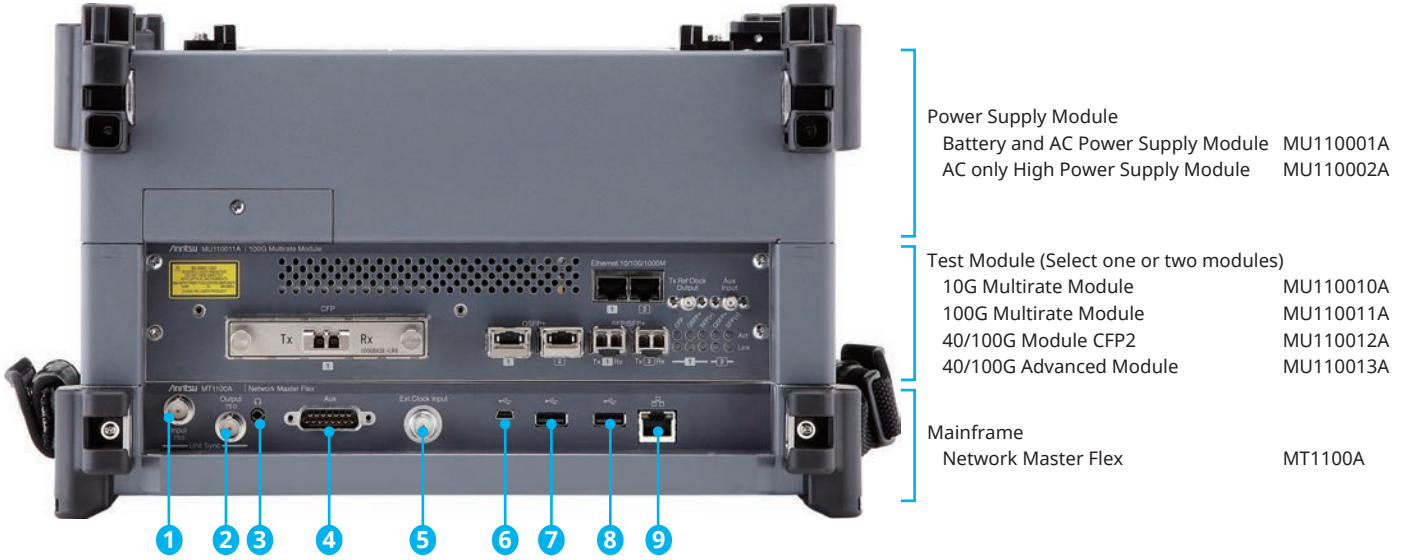
(two ports for 1.5 Mbps to 100 Gbps ports)



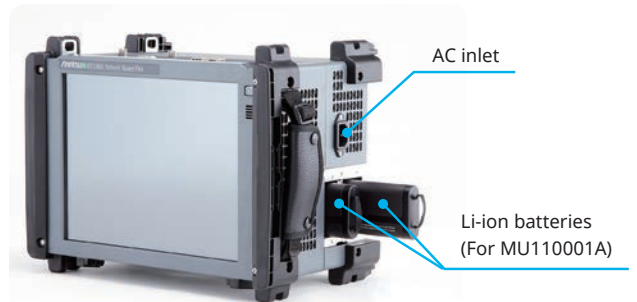
Wireshark® is a registered trademark of the Wireshark Foundation.

Panel Layout (Main frame)

Connector Panel Overview



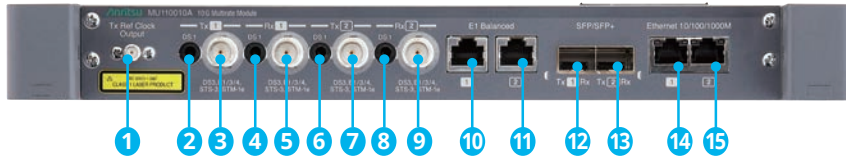
- 1 Unit Sync. Input (for future use)
- 2 Unit Sync. Output (for future use)
- 3 Audio (3.5ø: CTIA Standard)
- 4 AUX (for G0325A, GPS receiver)
- 5 External Clock Input
- 6 USB Mini-B
- 7 USB A
- 8 USB A
- 9 Ethernet Service Interface



MT1100A + MU110001A + MU110011A Overview

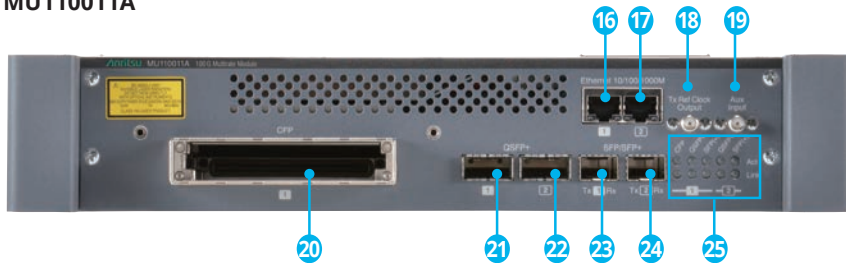
Panel Layout (Measurement Module)

10G Multirate Module MU110010A



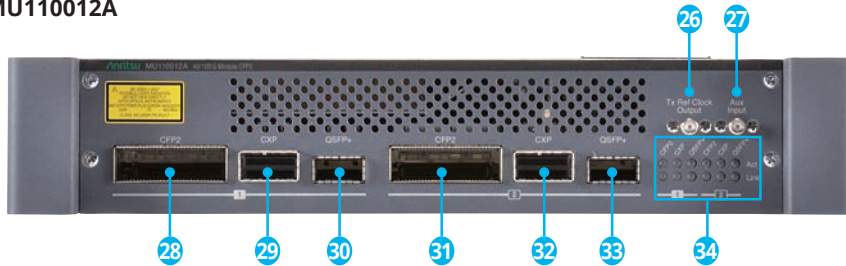
- 1 Tx Reference Clock Output
- 2 Port1, Tx Mini-bantam (DS1)
- 3 Port1, Tx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
- 4 Port1, Rx Mini-bantam (DS1)
- 5 Port1, Rx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
- 6 Port2, Tx Mini-bantam (DS1)
- 7 Port2, Tx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
- 8 Port2, Rx Mini-bantam (DS1)
- 9 Port2, Rx BNC (E1, E3, E4, DS3, STM-1e, STS-3)
- 10 Port1, Tx/Rx RJ48 (E1 balanced)
- 11 Port2, Tx/Rx RJ48 (E1 balanced)
- 12 Port1, Tx/Rx SFP/SFP+ (OTN, Ethernet, CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
- 13 Port2, Tx/Rx SFP/SFP+ (OTN, Ethernet, CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
- 14 Port1, Tx/Rx RJ45 (Ethernet electrical)
- 15 Port2, Tx/Rx RJ45 (Ethernet electrical)

100G Multirate Module MU110011A



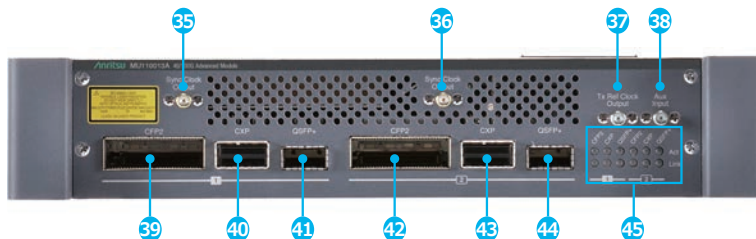
- 16 Port1, Tx/Rx RJ45 (Ethernet electrical)
- 17 Port2, Tx/Rx RJ45 (Ethernet electrical)
- 18 Tx Reference Clock Output
- 19 AUX Input (for future use)
- 20 Tx/Rx CFP (OTN, Ethernet, SDH/SONET optical)
- 21 Port1, Tx/Rx QSFP+ (OTN, Ethernet optical)
- 22 Port2, Tx/Rx QSFP+ (OTN, Ethernet optical)
- 23 Port1, Tx/Rx SFP/SFP+ (OTN, Ethernet, CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
- 24 Port2, Tx/Rx SFP/SFP+ (OTN, Ethernet, CPRI/OBSAI, Fibre Channel, SDH/SONET optical)
- 25 Act, Link Indicators

40/100G Module CFP2 MU110012A



- 26 Tx Reference Clock Output
- 27 AUX Input (for future use)
- 28 Port1, Tx/Rx CFP2 (OTN, Ethernet optical)
- 29 Port1, Tx/Rx CXP (Ethernet optical)
- 30 Port1, Tx/Rx QSFP+ (OTN Ethernet optical)
- 31 Port2, Tx/Rx CFP2 (OTN, Ethernet optical)
- 32 Port2, Tx/Rx CXP (Ethernet optical)
- 33 Port2, Tx/Rx QSFP+ (OTN Ethernet optical)
- 34 Act, Link Indicators

40/100G Advanced Module MU110013A



- 35 Port1, CFP2 Sync. Clock Output
- 36 Port2, CFP2 Sync. Clock Output
- 37 Tx Reference Clock Output
- 38 AUX Input (for future use)
- 39 Port1, Tx/Rx CFP2 (OTN, Ethernet optical)
- 40 Port1, Tx/Rx CXP (Ethernet optical)
- 41 Port1, Tx/Rx QSFP+ (OTN Ethernet optical)
- 42 Port2, Tx/Rx CFP2 (OTN, Ethernet optical)
- 43 Port2, Tx/Rx CXP (Ethernet optical)
- 44 Port2, Tx/Rx QSFP+ (OTN Ethernet optical)
- 45 Act, Link Indicators

Comprehensive OTN Testing for Core and Metro Networks Installation and Maintenance

OTN carries client signals, but current OTN transport 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 MT1100A, 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 MT1100A can also test OTN lines at the line rate with bulk signals.

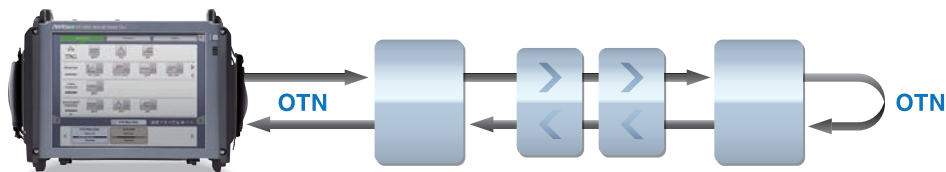
The user can identify problems at all levels in the OTN signal, solving OTN issues efficiently, reducing system downtime, and reducing operating expenses for network operators.

OTN Testing with Client Signals

The MT1100A 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:

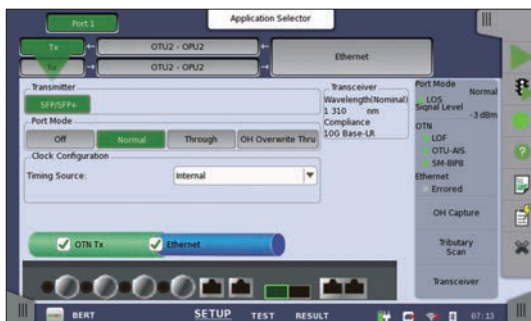
- Supports OTU4, OTU3, OTU3e1, OTU3e2, OTU2, OTU2e, OTU2f, OTU1, OTU1e, OTU1f
- Supports multi-stage mapping and ODUflex
- OTN tests with bulk signals (PRBS, Null or User pattern) at OTN level
- Comprehensive OTN error and alarm statistics
- OTN error performance measurement in accordance with G.8201 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 (up to 10 Gbps)
- Full flexibility to monitor insert/overwrite client overhead and payload within OTN signal



Looping-back test signal from MT1100A at far end supports easy OTN line quality tests

Out-of-service OTN Error and Alarm Statistics

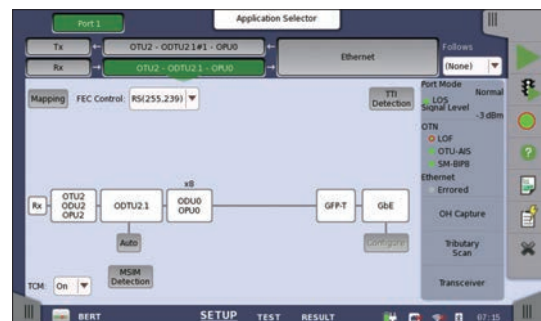
The MT1100A supports powerful statistical measurements for BER tests as well as OTN level alarms and errors for installing/commissioning and troubleshooting out-of-service OTN lines. G.8201 or M.2401 error-performance parameters are calculated during measurement. Stress testing of network elements is 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 MT1100A tests OTN links carrying Ethernet, CPRI, or SDH/SONET client signals, allowing the operator to test embedded client signals.

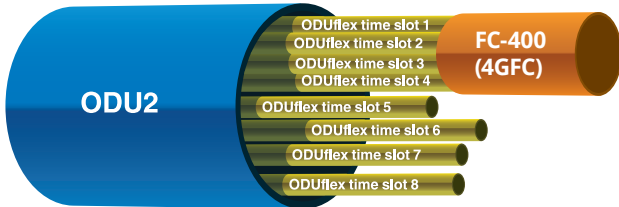
For example, an RFC 2544 or Y.1564 test can be performed with an Ethernet signal carried over the OTN signal, allowing the service engineer to run tests emulating the real-world requirements of end users.



Comprehensive OTN Testing for Core and Metro 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 MT1100A 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

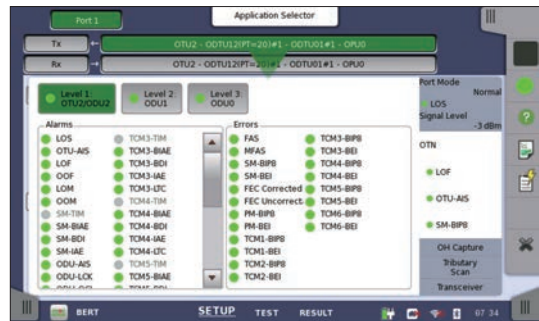
ITU-T O.182-compliant FEC Test

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.

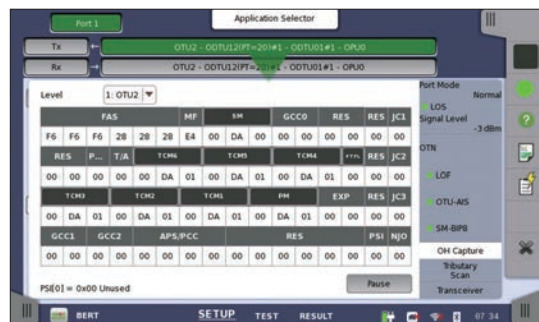


OTN Tributary Scan

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. (up to 10 Gbps)



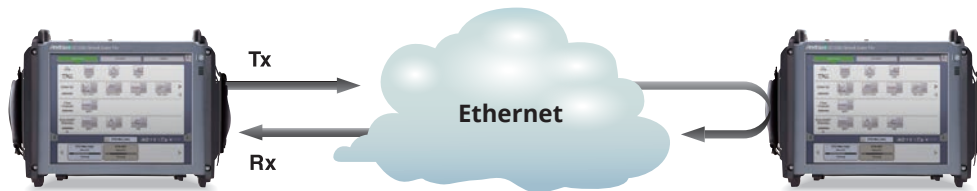
OTU Alarms and Errors View



OTU Header Capture

Carrier Ethernet Installation and Troubleshooting

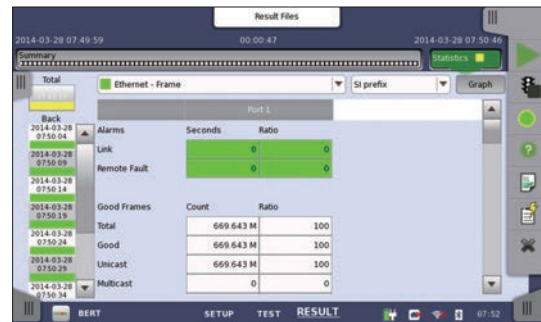
Ethernet technology is used by many applications today, including Carrier Class Ethernet, VLAN, Q-in-Q, Ethernet OAM and MPLS and, recently, PBB and MPLS-TP. Network operators must handle all these technologies, leading to long and complex test procedures. The MT1100A with Ethernet option is a comprehensive solution for easy testing, installing, and faster troubleshooting of Ethernet lines up to 100 Gbps using functions for verifying bandwidth, and testing connectivity, Quality of Service (QoS), and service availability, cutting additional truck rolls, tech support calls, and customer churn to improve operating expenses.



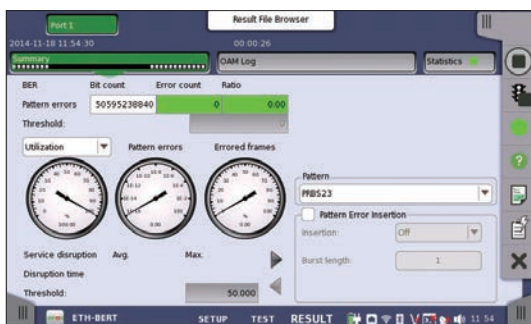
Single-end test using MT1100A as Ethernet reflector

Ethernet test features include:

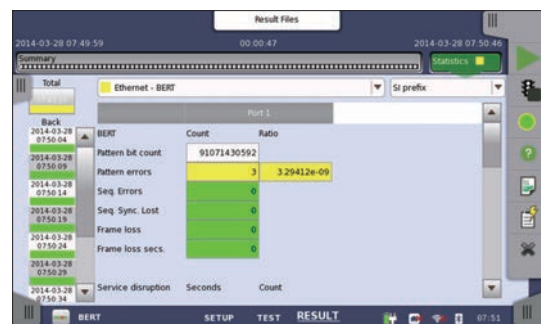
- Supports 100 Gbps, 40 Gbps, 10 Gbps, 1 Gbps, 100 Mbps, and 10 Mbps Ethernet tests
- Supports 100 Gbps RS-FEC test
- Traffic generation up to full line rate
- Support for IPv4 and IPv6
- Ethernet Service Activation Test (Y.1564)
- Automated RFC 2544 tests of Throughput, Frame Loss, Latency or Packet Jitter, Burstability
- TCP Throughput option (RFC 6349, iPerf) (up to 10 Gbps)
- 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 (up to 10 Gbps)
- Synchronous Ethernet test (ITU-T G.826x and IEEE 1588 v2) (up to 10 Gbps)
- Ethernet OAM tests
- 10G WAN-PHY tests
- Ethernet Multistream
- Stacked VLAN (Q-in-Q)
- 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

Carrier Ethernet Installation and Troubleshooting

100 GigE RS-FEC Test

Forward Error Correction (FEC) is a technology for preventing errors when sending and receiving data. It assigns redundancy to the Tx data beforehand so any errors in the data occurring during transmission can be detected and corrected at the receiver side. FEC helps keep the average data throughput high by preventing the need to resend data.

The MT1100A can send and receive* FEC signals supported by 100GBASE-SR4, and 100GBASE-ER4-lite (FEC Code: RS (528, 514, 7,10)) to help evaluate network equipment and facilitate RS-FEC communications.

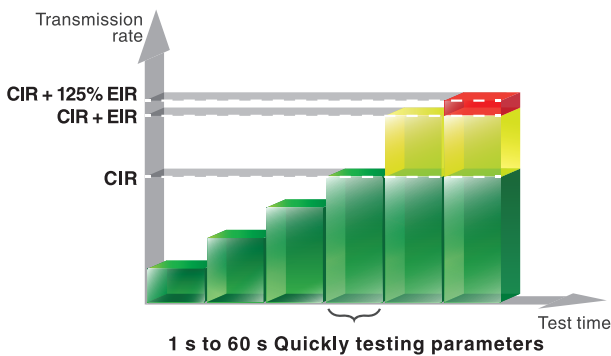
*: Enabled for CFP2 and QSFP28 optical-module settings.

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:

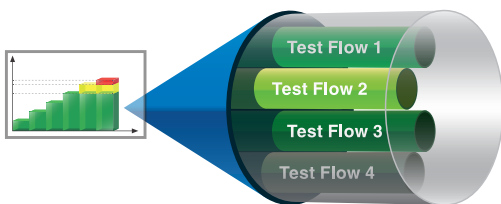
This section is completed quickly, within seconds per stream. It confirms the end-to-end configuration while quickly checking the Information Rate (IR), Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR), Committed Burst Size (CBS) and Excess Burst Size (EBS) sequentially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

The MT1100A Ethernet Service Activation Test application supports user tests in accordance with Y.1564 for up to 8 services. Testing is typically performed with two testers running the Service Activation Test in a local-remote setup. However, it can be run using one tester and a far-end loopback device.



Running Service Activation Test in local - remote configuration using two MT1100A testers

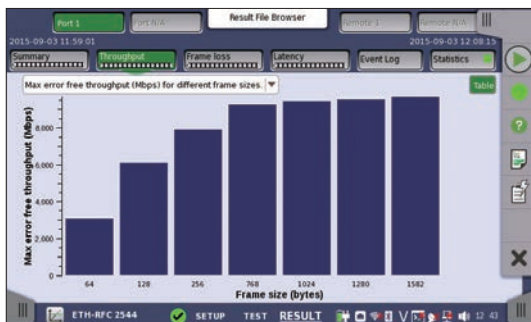
Running the Service Activation Test in a local-remote configuration with two MT1100A testers supports control from the local instrument. Relevant data is transferred to the remote and results from both testers are displayed on the local instrument after the test is completed. Easy-to-understand graphics show passed and failed tests. When further analysis is required, the display can be expanded to show all test details. For measurements of Frame Transfer Delay (FTD) between two MT1100A testers, the GPS option provides synchronization for true one-way FTD measurement.



Carrier Ethernet Installation and Troubleshooting

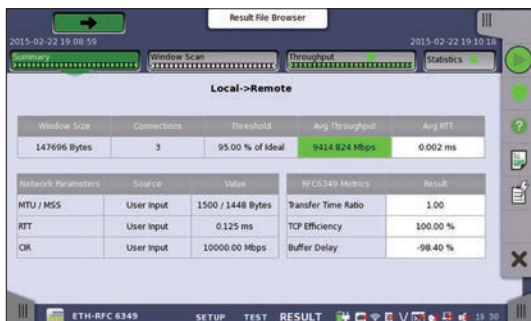
RFC 2544 Test

RFC 2544 testing of Throughput, Frame Loss, Latency, Packet Jitter and Burstability is straightforward with the MT1100A. 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 MT1100A 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.



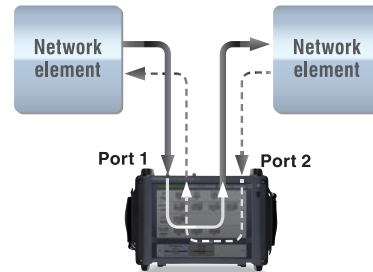
TCP Throughput Option (RFC 6349, iPerf) (Up to 10 Gbps)

Optimizing performance is essential in modern communication networks. In IP networks, operators can test based on IETF RFC 2544 and ITU-T Y.1564, but even if they find that their networks are working fine using these tests, customers may complain that the achieved throughput is below their agreement with the operator. This may be caused by a non-optimum configuration of the Transmission Control Protocol (TCP) providing higher layer connections through the network. RFC 6349 is a test methodology that operators can use to optimize TCP throughput. The MT1100A with TCP Throughput option is ideally suited to supporting TCP throughput optimization based on RFC 6349. iPerf client for TCP Throughput testing is also supported.



Pass-through Mode

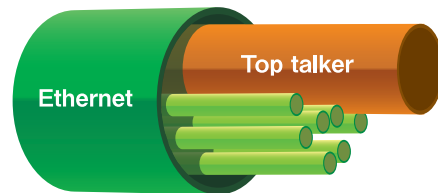
Configuring the MT1100A to Pass-through mode supports detailed troubleshooting, especially in bi-directional networks requiring traffic monitoring from both ends.



Pass-through monitoring by inserting MT1100A 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. (Up to 10 Gbps)



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 MT1100A tests the network using all supported OAM functions.

Ethernet Multistream

The MT1100A 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.

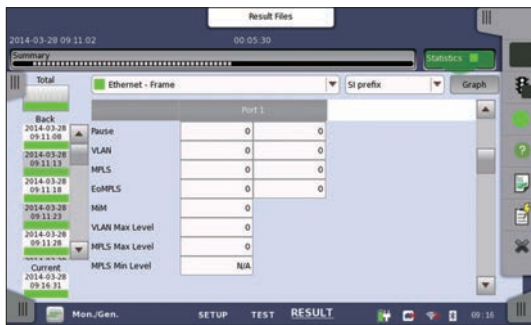


Stacked VLAN

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 MT1100A supports up to 8 levels of VLAN tags, offering a powerful network test tool.

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 MT1100A is a powerful tool for testing MPLS and MPLS-TP networks including OAM functions.



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 MT1100A 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.

Mobile Backhaul/Mobile Fronthaul/Fibre Channel

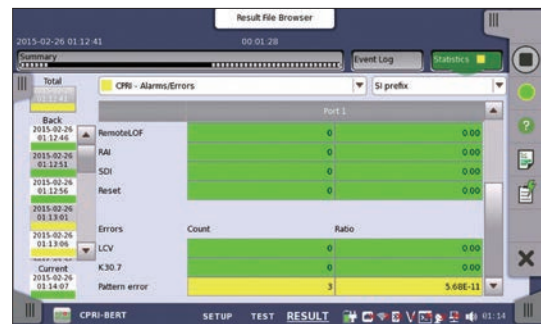
Mobile Backhaul Installation and Verification (Up to 10 Gbps)

Synchronous Ethernet is an essential technology in mobile backhaul networks and faults in Synchronous Ethernet seriously jeopardize the performance of mobile networks and can cause system downtime. Consequently, mobile operators need a test tool to verify the correct functioning of Synchronous Ethernet. The Synchronous Ethernet test function of the MT1100A supports comprehensive testing and analysis of both Synchronous Ethernet technologies: SyncE (ITU-T G.826x), and PTP (IEEE 1588 v2). The user can quickly identify problems at all levels in Synchronous Ethernet, solving issues quickly, reducing system downtime and customer churn, and improving operating expenses for mobile operators. (up to 10 Gbps)



Mobile Fronthaul Installation and Verification (Up to 10 Gbps)

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 communications systems, typified by adoption of Centralized-Radio Access Networks (C-RAN). Using C-RAN, the mobile fronthaul is configured from centralized Base Band Units (BBU) and multiple Remote Radio Head (RRH) units connected via general-purpose interfaces, such as the Common Public Radio Interface (CPRI) or Open Base Station Architecture Initiative (OBSAI). Support from CPRI interface rate option 1 (614.4 Mbit/s) to option 8 (10.1376 Gbit/s) ensures testing of all current and future requirements. Combining testing at any rate with the ability to exercise the BBU or RRH up to the Passive link state (as per the latest CPRI standard) or in pass-through mode supports a complete solution for detailed installation and maintenance testing. Checking for and inserting of Layer-2 Alarms and Errors between the BBU and RRH ensures that engineers can complete advanced fault finding and evaluate the root cause of any issue. CPRI testing as a client signal mapped on OTN is also supported.



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 MT1100A 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 MT1100A gives the user less equipment to maintain and learn, helping reduce operating expenses.

Fibre Channel test features include:

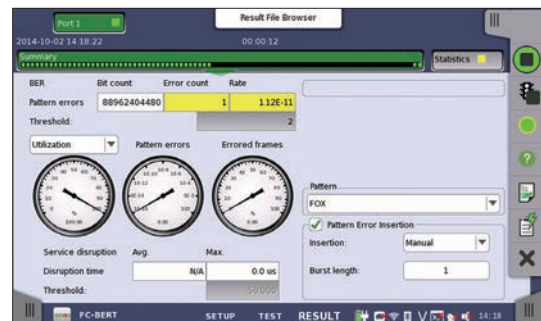
- 1GFC, 2GFC, 4GFC, 8GFC, and 10GFC tests
- Optional mapping to OTN
- Latency measurement
- BER tests including service disruption measurement
- Line alarm and error monitor
- Normal or Reflector mode

Latency

High latency is a problem for many applications, including SAN, and network operators and service providers urgently need a tool like the MT1100A with Fibre Channel option to test latency on Fibre Channel lines and equipment.

Fibre Channel BER Tests

The MT1100A with Fibre Channel option supports BER tests to measure the performance of Fibre Channel lines and equipment. Service disruption measurement is also supported.



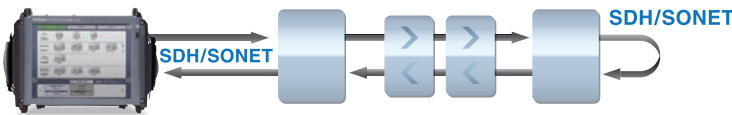
Quick and Easy Tests of SDH/SONET and PDH/DSn Networks

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.

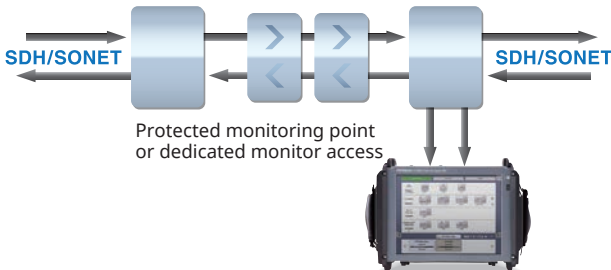
With its SDH/SONET and PDH/DSn test options, the MT1100A is a powerful and easy-to-use tool for testing SDH/SONET up to STM-64/OC-192. PDH/DSn systems (E1, E3, E4, DS1 and DS3) can be tested directly or embedded into SDH/SONET. The MT1100A can support new and legacy technologies, leaving the user less equipment to maintain and learn, and reducing operating expenses.

SDH/SONET and PDH/DSn test features include:

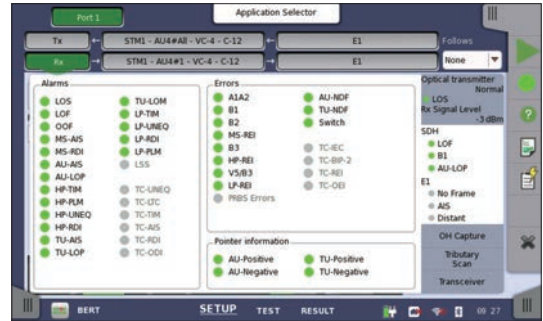
- Powerful testing of SDH (STM-256, STM-64, STM-16, STM-4, STM-1), SONET (OC-768, OC-192, OC-48, OC-12, OC-3, STS-3) systems and embedded PDH (E1, E3, E4) and DSn (DS1, DS3) systems
- Powerful testing of PDH (E1, E3, E4) and DSn (DS1, DS3) systems
- Simultaneous bi-directional monitoring of SDH/SONET 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



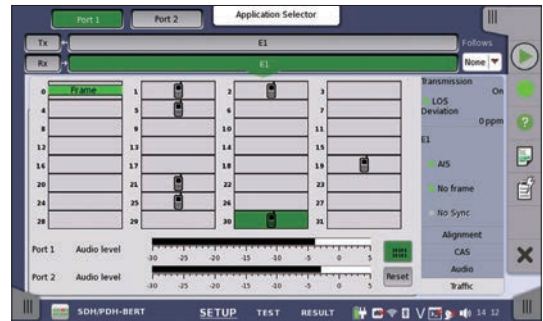
Looping-back test signal from MT1100A at far end supports SDH/SONET line quality tests



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



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



Monitor 64 kbps traffic channels on bidirectional E1 line with MT1100A traffic display

Optical Modules Selection Guide

Optical interface tests can be run using the MT1100A just by inserting an optical module supporting the relevant standard into the SFP/SFP+ slot.

The following table lists the lineup of CFP, CFP2, CXP, QSFP+, QSFP28, and SFP/SFP+ application parts, and the corresponding standards.

| MU110010A | MU110011A | MU110012A | MU110013A | Model/ Order No. | Name | Form Factor | 100 Meg Ethernet | 156 Meg STM-1 | 614 Meg CPRI | 622 Meg STM-4 | 768 Meg OBSAI | 1 Gig FC | 1.23 Gig CPRI | 1.25 Gig Ethernet | 1.54 Gig OBSAI | 2 Gig FC | 2.46 Gig CPRI | 2.488 Gig STM-16 | 2.67 Gig OTU1 | 3.07 Gig CPRI OBSAI | 4 Gig FC | 4.92 Gig CPRI | 6.14 Gig CPRI OBSAI | 8 Gig FC | 9.83 Gig CPRI | 9.95 Gig STM-64 | 10.1 Gig CPRI | 10.3 Gig Ethernet | 10.5 Gig FC | 10.7 Gig OTU2 | 11.05 Gig OTU1e | 11.09 Gig OTU2e | 11.27 Gig OTU1f | 11.3 Gig OTU2f | 40G SDH/SONET | 40G Ethernet | 40G OTN | 100G Ethernet | 100G OTN | | | | | | | | | |
|-----------|-----------|-----------|-----------|---------------------|------------------------------|----------------|-------------------|--------------------|--------------|---------------|---------------|----------|--------------------|-------------------|----------------|----------|---------------|------------------|---------------|---------------------|----------|---------------|---------------------|--------------------|---------------|-----------------|---------------|--------------------|-------------|---------------|-----------------|-----------------|-----------------|----------------|---------------|--------------|---------|---------------|----------|--|--|--|--|--|--|--|--|--|
| ✓ | ✓ | | | G0332A | 100M FX 1310 nm MM SFP | SFP | 1310 nm, MM, 2 km | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | ✓ | | | G0329A | 10G LR 1310 nm SFP+ | SFP+ | | | | | | | | | | | | | | | | | | | | | | 1310 nm, SM, 10 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 | | | | | | | | | | | | | | | | | | | | |
| ✓ | ✓ | | | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | ✓ | | | G0356A | 8G FC/10G SR 850 nm SFP+ | SFP+ | | | | | | | | | | | | | | | | | | 850 nm, MM, 0.3 km | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | ✓ | ✓ | | G0334A | 40G LR4 1310 nm QSFP+ | QSFP+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | | | | G0335A | 40G LR4 1310 nm CFP | CFP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | | | | G0336A | 40G FR 1550 nm CFP | CFP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ✓ | | | | G0337A | 100G LR4 1310 nm CFP | CFP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ✓ | ✓ | | G0338A | 100G LR4 1310 nm CFP2 | CFP2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ✓ | ✓ | | G0339A | 100G 850 nm CXP | CXP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ✓ | ✓ | | G0366A | 100G BASE-SR4 QSFP28 | QSFP28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ✓ | ✓ | | G0364A | 100G BASE-LR4 QSFP28 | QSFP28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Mainframe/Power Module Specifications

Network Master Flex MT1100A Mainframe

| User Interfaces | |
|---------------------|---|
| Display | 12.1-inch active matrix TFT display (800 × 600 pixels) and touch screen |
| Supported Languages | English, Chinese, Japanese, French, Russian, Spanish |

| Service Interfaces | |
|----------------------|--|
| USB Interface | MT1100A operates as host: USB 2.0 type A (2 ports) MT1100A 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 |

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

| Other Interfaces | |
|-----------------------------|--|
| Unit synchronization Input | (Not used) |
| Unit Synchronization Output | (Not used) |
| Audio Interface | For connection of CTIA Standard head set Connector: 3.5-mm diameter jack |
| AUX Connector | For connection of G0325A GPS receiver |
| Built-in Loudspeaker | Monitors speech of voice channel Output level: user-controlled from user Interface |
| 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 |

| Miscellaneous | |
|---------------------|--|
| Dimensions and Mass | 320 (W) × 225 (H) × 46 (D) mm (excluding projections), ≤2.5 kg |
| Environmental | Temperature and Humidity • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |

Battery and AC Power Supply Module MU110001A

| | |
|---------------------|--|
| Battery | 14.4 V rechargeable and replaceable intelligent Li-ion battery Operation time: 1 hour (typ.) (with MU110011A, 100 Gbps Ethernet operation) Charging time: 6 hours (typ.) (25°C) Remaining capacity indication:% |
| Power Supply | 100 V(ac) to 240 V(ac), 50 Hz/60 Hz 380 VA (max.) |
| Dimensions and Mass | 320 (W) × 225 (H) × 82 (D) mm (excluding projections), ≤3.0 kg (without battery) |
| Environmental | Temperature and Humidity • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing, without battery) -20° to +50°C, ≤80% RH (non-condensing, with battery) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |

AC only High Power Supply Module MU110002A

| | |
|---------------------|--|
| Power Supply | 100 V(ac) to 240 V(ac), 50 Hz/60 Hz 700 VA (max.) |
| Dimensions and Mass | 320 (W) × 225 (H) × 72 (D) mm (excluding projections), ≤3.0 kg |
| Environmental | Temperature and Humidity • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |

Measurement Module Specifications

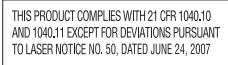
10G Multirate Module MU110010A

| | |
|------------------------------|--|
| Test Port/Reference Standard | <p>SFP/SFP+: 2 ports</p> <ul style="list-style-type: none"> • SFF-8431, SFF-8472 compliant, IEEE 802.3ae-2002, IEEE 802.3-2008 compliant <p>RJ45: 2 ports</p> <ul style="list-style-type: none"> • IEEE 802.3-2008 10BASE-T, 100BASE-TX, 1000BASE-T compliant • Auto MDI-X • 10 Mbps/100 Mbps full/half duplex, 1000 Mbps full duplex <p>BNC: 2 ports</p> <ul style="list-style-type: none"> • ITU-T G.703 compliant <p>RJ48: 2 ports</p> <ul style="list-style-type: none"> • ITU-T G.703 compliant <p>RTT Bantam: 2 ports</p> <ul style="list-style-type: none"> • ANSI DS1.102 compliant |
| Tx Ref. Clock Output | <p>Frequency:</p> <ul style="list-style-type: none"> • Selectable from 1/16, or 1/64 against the bit rate. (Available only when one of SFP ports is selected) <p>Level: 250 mVp-p (min.), 550 mVp-p (max.)</p> <p>Termination: 50Ω/AC (Single ended)</p> <p>Connector: SMA</p> |
| Dimensions and Mass | 320 (W) × 225 (H) × 37 (D) mm, ≤1.4 kg |
| Environmental | <p>Temperature and Humidity</p> <ul style="list-style-type: none"> • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |
| Laser Safety*2 | IEC 60825-1: 2007 CLASS 1 21CFR1040.10 and 1040.11*1 |

*1: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

*2: 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.



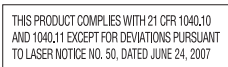
100G Multirate Module MU110011A

| | |
|------------------------------|--|
| Test Port/Reference Standard | <p>CFP: 1 port</p> <ul style="list-style-type: none"> • CFP MSA Hardware Specification, Rev. 1.4 compliant • CFP MSA Management Interface Specification V2.2 R06a compliant (Not supported to MSA 100GLH) • IEEE 802.3ba-2010 compliant <p>QSFP+: 2 ports</p> <ul style="list-style-type: none"> • SFF-8436, SFF-8472 compliant • IEEE 802.3ba-2010 compliant <p>SFP/SFP+: 2 ports</p> <ul style="list-style-type: none"> • SFF-8431, SFF-8472 compliant • IEEE 802.3ae-2002, IEEE 802.3-2008 compliant <p>RJ45: 2 ports</p> <ul style="list-style-type: none"> • IEEE 802.3-2008 10BASE-T, 100BASE-TX, 1000BASE-T compliant • Auto MDI-X • 10 Mbps/100 Mbps full/half duplex, 1000 Mbps full duplex |
| Tx Ref. Clock Output | <p>Frequency: Select 1/16 or 1/64 for bit rates of 10G or less.</p> <ul style="list-style-type: none"> • Select 1/16 or 1/64 for each lane rate for XLAUI and OTL3.4 of 40G. • Select 1/16 or 1/64 for each lane rate for CAUI and OTL4.19 of 100G. <p>(RJ45 port cannot be selected)</p> <p>Level: 250 mVp-p (min.), 550 mVp-p (max.)</p> <p>Termination: 50Ω/AC (Single ended)</p> <p>Connector: SMA</p> |
| Dimensions and Mass | 320 (W) × 225 (H) × 60 (D) mm, ≤3.0 kg |
| Environmental | <p>Temperature and Humidity</p> <ul style="list-style-type: none"> • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |
| Laser Safety*2 | <p>IEC 60825-1: 2007 CLASS 1 21CFR1040.10 and 1040.11*1</p> <p>CFP : 100GBASE-LR4, 40GBASE-LR4, 40GBASE-FR QSFP+ : 40GBASE-LR4 SFP : 4GFC(SX), 4GFC(LX), 4GFC(EX), OC-48 LR-1/STM L-16.1, OC-48 LR-2/STM L-16.2, 100BASE-FX, 100BASE-LX SFP+ : 100GBASE-SX/LX/ZX, 10GBASE-LR, 10GBASE-ER, 10GBASE-ZR</p> <p>IEC 60825-1: 2007 CLASS 1M 21CFR1040.10 and 1040.11*1</p> <p>CFP : 100G BASE-SR10 QSFP+ : 40GBASE-SR4</p> |

*1: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

*2: 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.



Measurement Module Specifications

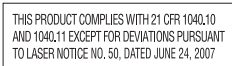
40/100G Module CFP2 MU110012A

| | |
|------------------------------|--|
| Test Port/Reference Standard | <p>CFP2: 2 ports</p> <ul style="list-style-type: none"> • CFP MSA CFP2 Hardware Specification, Rev. 1.0 compliant • CFP MSA Management Interface Specification V2.2 R06a compliant (Not supported to MSA 100GLH) • IEEE 802.3ba-2010 compliant <p>CXP: 2 ports</p> <ul style="list-style-type: none"> • InfiniBand Architecture 1.2.1 Annex A6: CXP compliant • SFF-8642, IEEE 802.3ba-2010 compliant <p>QSFP+: 2 ports</p> <ul style="list-style-type: none"> • SFF-8436, SFF-8472 compliant • IEEE 802.3ba-2010 compliant |
| Tx Ref. Clock Output | <p>Frequency</p> <p>Select 1/16 or 1/64 for each lane rate of XX.</p> <p>40 GigE: XLAUI OTU3, OTU3e1, OTU3e2: OTL3.4 100 GigE: CAUI OTU4: OTL4.10</p> <p>Level: 250 mVp-p (min.), 550 mVp-p (max.) Termination: 50Ω/AC (Single ended) Connector: SMA</p> |
| Dimensions and Mass | 320 (W) × 225 (H) × 60 (D) mm, ≤3.0 kg |
| Environmental | <p>Temperature and Humidity</p> <ul style="list-style-type: none"> • Operating: 0° to +40°C, ≤80% RH (non-condensing) • Storage: -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |
| Laser Safety*2 | <p>IEC 60825-1: 2007 CLASS 1</p> <p>21CFR1040.10 and 1040.11*1</p> <p>QSFP+ : 40G BASE-LR4 CFP2 : 100G BASE-LR4 CFP4 : 100G BASE-LR4 QSFP28: 100G BASE-LR4</p> <p>IEC 60825-1: 2007 CLASS 1M</p> <p>21CFR1040.10 and 1040.11*1</p> <p>QSFP+ : 40G BASE-SR4 CXP : 100G BASE-SR10 QSFP28: 100G BASE-SR4</p> |

*1: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

*2: 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.



Measurement Module Specifications

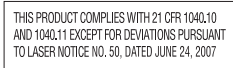
40/100G Advanced Module MU110013A

| | |
|------------------------------|--|
| Test Port/Reference Standard | <p>CFP2: 2 ports</p> <ul style="list-style-type: none"> • CFP MSA CFP2 Hardware Specification, Rev. 1.0 compliant • CFP MSA Management Interface Specification V2.2 R06a compliant (Not supported to MSA 100GLH) • IEEE 802.3ba-2010 compliant <p>CXP: 2 ports</p> <ul style="list-style-type: none"> • InfiniBand Architecture 1.2.1 Annex A6: CXP compliant • SFF-8642, IEEE 802.3ba-2010 compliant <p>QSFP+: 2 ports</p> <ul style="list-style-type: none"> • SFF-8436, SFF-8472 compliant • IEEE 802.3ba-2010 compliant |
| Tx Ref. Clock Output | <p>Frequency</p> <p>Select 1/16 or 1/64 for each lane rate of XX.</p> <p>40 GigE : XLAUI OTU3, OTU3e1, OTU3e2: OTL3.4 100 GigE : CAUI OTU4 : OTL4.10</p> <p>Level: 250 mVp-p (min.), 550 mVp-p (max.) Termination: 50Ω/AC (Single ended) Connector: SMA</p> |
| Sync Clock Output | <p>Frequency</p> <p>Select 1/8 or 1/16 against the bit rate of the data lane for CFP2 port.</p> <p>100 GigE : CAUI4 OTU4 : OTL 4.4</p> <p>Level: 150 mVp-p (min.), 650 mVp-p (max.) Termination: 50Ω/AC (Single ended) Connector: SMA</p> |
| Dimensions and Mass | 320 (W) × 225 (H) × 60 (D) mm, ≤3.0 kg |
| Environmental | <p>Temperature and Humidity</p> <ul style="list-style-type: none"> • Operating : 0° to +40°C, ≤80% RH (non-condensing) • Storage : -20° to +60°C, ≤80% RH (non-condensing) |
| EMC | EN61326-1, EN61000-3-2 |
| LVD | EN61010-1 |
| Laser Safety*2 | <p>IEC 60825-1: 2007 CLASS 1 21CFR1040.10 and 1040.11*1</p> <p>QSFP+ : 40G BASE-LR4 CFP2 : 100G BASE-LR4 CFP4 : 100G BASE-LR4 QSFP28: 100G BASE-LR4</p> <p>IEC 60825-1: 2007 CLASS 1M 21CFR1040.10 and 1040.11*1</p> <p>QSFP+ : 40G BASE-SR4 CXP : 100G BASE-SR10 QSFP28: 100G BASE-SR4</p> |

*1: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

*2: 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.



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.

1. Mainframe

| Model/Order No. | Name |
|---|--|
| Mainframe | |
| MT1100A | Network Master Flex |
| Standard accessories for MT1100A | |
| Z1746A | Stylus |
| Z1870A | Utilities ROM |
| W3734AE | MT1100A Quick Reference Guide (English) |
| W3734AW | MT1100A Quick Reference Guide (Japanese) |
| Z1861A | Carrying Strap |
| Z1862A | Module Combination Kit |
| B0699A | Soft Case |
| Option | |
| MT1100A-003*1 | Connectivity for WLAN/Bluetooth |

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

2. Power Supply Module

| Model/Order No. | Name |
|---|------------------------------------|
| MU110001A*2 | Battery and AC Power Supply Module |
| MU110002A*2 | AC only High Power Supply Module |
| Standard accessories for MU110001A | |
| G0327A*3 | Li-ion Battery: 2 pcs |

*2: Select MU110001A or MU110002A.
When installing two test modules in an MT1100A mainframe, one module must be an MU110010A to select MU110001A, battery powered power module.

*3: MU110001A requires two G0327A.

3. Measurement Module*4

| Model/Order No. | Name |
|-----------------|-------------------------|
| MU110010A | 10G Multirate Module |
| MU110011A | 100G Multirate Module |
| MU110012A | 40/100G Module CFP2 |
| MU110013A | 40/100G Advanced Module |

*4: One or two modules of MU110010A/11A/12A/13A can be installed in one mainframe.

4. Protocol Options*5, *6

MU110010A

| Model/Order No. | Name |
|----------------------|-------------------------------------|
| Ethernet | |
| MU110010A-001 | Up to 2.7G Dual Channel |
| MU110010A-011 | Ethernet 10G Single Channel |
| MU110010A-012 | Ethernet 10G Dual Channel |
| MU110010A-020 | TCP Throughput |
| CPRI/OBSAI | |
| MU110010A-071 | CPRI/OBSAI Up to 5G Dual Channel |
| MU110010A-072 | CPRI/OBSAI 6G to 10G Single Channel |
| MU110010A-073 | CPRI/OBSAI 6G to 10G Dual Channel |
| OTN | |
| MU110010A-001 | Up to 2.7G Dual Channel |
| MU110010A-051 | OTN 10G Single Channel |
| MU110010A-052 | OTN 10G Dual Channel |
| MU110010A-061 | ODU Multiplexing |
| MU110010A-062 | ODU Flex |
| SDH/SONET | |
| MU110010A-001 | Up to 2.7G Dual Channel |
| MU110010A-081 | STM-64 OC-192 Single Channel |
| MU110010A-082 | STM-64 OC-192 Dual Channel |
| Fibre Channel | |
| MU110010A-002 | FC 1G 2G 4G Dual Channel |
| MU110010A-091 | FC 8G 10G Single Channel |
| MU110010A-092 | FC 8G 10G Dual Channel |

*5: "channel" means physical port or client signal test mapped in OTN.
Refer to data sheet for OTN and client signals.

*6: These options can be retrofitted.

The Model/Order No. of retrofit options is "-3***".

Example

MU110010A-001 Up to 2.7G Dual Channel becomes MU110010A-301 Up to 2.7G Dual Channel Retrofit. In addition, specify one of the following media along with the required option.

| Model/Order No. | Name |
|-----------------|--------------------------------|
| Z1863A | DVD-ROM for Retrofit Options |
| Z1864A | USB Stick for Retrofit Options |

MU110011A

| Model/Order No. | Name |
|----------------------|-------------------------------------|
| Ethernet | |
| MU110011A-001 | Up to 10G Single Channel |
| MU110011A-003 | Up to 10G Dual Channel |
| MU110011A-013 | Ethernet 40G Single Channel |
| MU110011A-014 | Ethernet 40G Dual Channel |
| MU110011A-015 | Ethernet 100G Single Channel |
| MU110011A-020 | TCP Throughput |
| CPRI/OBSAI | |
| MU110011A-071 | CPRI/OBSAI Up to 10G Single Channel |
| MU110011A-072 | CPRI/OBSAI Up to 10G Dual Channel |
| OTN | |
| MU110011A-001 | Up to 10G Single Channel |
| MU110011A-003 | Up to 10G Dual Channel |
| MU110011A-053 | OTN 40G Single Channel |
| MU110011A-054 | OTN 40G Dual Channel |
| MU110011A-055 | OTN 100G Single Channel |
| MU110011A-061 | ODU Multiplexing |
| MU110011A-062 | ODU Flex |
| MU110011A-063*7 | 40G/100G ODU Multi Stage |
| SDH/SONET | |
| MU110011A-001 | Up to 10G Single Channel |
| MU110011A-003 | Up to 10G Dual Channel |
| MU110011A-083 | STM-256 OC-768 Single Channel |
| MU110011A-084 | STM-256 OC-768 Dual Channel |
| Fibre Channel | |
| MU110011A-005 | Up to 10G FC Single Channel |
| MU110011A-004 | Up to 10G FC Dual Channel |

MU110012A

| Model/Order No. | Name |
|----------------------|-------------------------------|
| Ethernet | |
| MU110012A-001*8 | Up to 10G Single Channel |
| MU110012A-003*8 | Up to 10G Dual Channel |
| MU110012A-013 | Ethernet 40G Single Channel |
| MU110012A-014 | Ethernet 40G Dual Channel |
| MU110012A-015 | Ethernet 100G Single Channel |
| MU110012A-016 | Ethernet 100G Dual Channel |
| CPRI/OBSAI | |
| MU110012A-071*8 | CPRI Up to 10G Single Channel |
| MU110012A-072*8 | CPRI Up to 10G Dual Channel |
| OTN | |
| MU110012A-001*8 | Up to 10G Single Channel |
| MU110012A-003*8 | Up to 10G Dual Channel |
| MU110012A-053 | OTN 40G Single Channel |
| MU110012A-054 | OTN 40G Dual Channel |
| MU110012A-055 | OTN 100G Single Channel |
| MU110012A-056 | OTN 100G Dual Channel |
| MU110012A-061 | ODU Multiplexing |
| MU110012A-062 | ODU Flex |
| MU110012A-063*7 | 40G/100G ODU Multi Stage |
| SDH/SONET | |
| MU110012A-001*8 | Up to 10G Single Channel |
| MU110012A-003*8 | Up to 10G Dual Channel |
| MU110012A-083*8 | STM-256 OC-768 Single Channel |
| MU110012A-084*8 | STM-256 OC-768 Dual Channel |
| Fibre Channel | |
| MU110012A-005*8 | Up to 10G FC Single Channel |
| MU110012A-004*8 | Up to 10G FC Dual Channel |

Ordering Information

MU110013A

| Model/Order No. | Name |
|----------------------|-------------------------------|
| Ethernet | |
| MU110013A-001*8 | Up to 10G Single Channel |
| MU110013A-003*8 | Up to 10G Dual Channel |
| MU110013A-013 | Ethernet 40G Single Channel |
| MU110013A-014 | Ethernet 40G Dual Channel |
| MU110013A-015 | Ethernet 100G Single Channel |
| MU110013A-016 | Ethernet 100G Dual Channel |
| MU110013A-023*9 | RS-FEC for 100GBASE-SR4 |
| CPRI/OBSAI | |
| MU110013A-071*8 | CPRI Up to 10G Single Channel |
| MU110013A-072*8 | CPRI Up to 10G Dual Channel |
| OTN | |
| MU110013A-001*8 | Up to 10G Single Channel |
| MU110013A-003*8 | Up to 10G Dual Channel |
| MU110013A-053 | OTN 40G Single Channel |
| MU110013A-054 | OTN 40G Dual Channel |
| MU110013A-055 | OTN 100G Single Channel |
| MU110013A-056 | OTN 100G Dual Channel |
| MU110013A-062 | ODU Flex |
| MU110013A-063 | 40G/100G ODU Multi Stage |
| SDH/SONET | |
| MU110013A-001*8 | Up to 10G Single Channel |
| MU110013A-003*8 | Up to 10G Dual Channel |
| MU110013A-083*8 | STM-256 OC-768 Single Channel |
| MU110013A-084*8 | STM-256 OC-768 Dual Channel |
| Fibre Channel | |
| MU110013A-005*8 | Up to 10G FC Single Channel |
| MU110013A-004*8 | Up to 10G FC Dual Channel |
| Device Test | |
| MU110013A-008 | 4 × 25G/28G BERT |

- *7: These options including MU11001xA-061 function.
 *8: MU110012A/13A does not have a physical interface of these options. These options are required for the client signal mapped in the OTN. Please refer to the OTN mapping pages on the datasheet.
 *9: Required to MU110013A-015 or MU110013A-016.

5. Optional Accessories

| Model/Order No. | Name |
|---|------------------------------|
| Optical modules | |
| G0332A | 100M FX 1310 nm MM SFP |
| G0329A | 10G LR 1310 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+ |
| 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 |
| G0356A | 8G FC/10G SR 850 nm SFP+ |
| G0334A | 40G LR4 1310 nm QSFP+ |
| G0335A | 40G LR4 1310 nm CFP |
| G0336A | 40G FR 1550 nm CFP |
| G0337A | 100G LR4 1310 nm CFP |
| G0338A | 100G LR4 1310 nm CFP2 |
| G0339A | 100G 850 nm CXP |
| G0366A | 100G BASE-SR4 QSFP28 |
| G0364A | 100G BASE-LR4 QSFP28 |
| Mainframe optional accessories | |
| B0717A | Hard Case |
| Z1860A | Battery Charger |
| G0325A | GPS Receiver |
| Z1871A | Utilities in USB Stick |
| B0692A*10 | ESD Box |
| G0306B | Video Inspection Probe |
| J1667A*11 | GPIB-USB Converter |
| B0705A | Rack Mount Kit |
| Interface convertor for optical module | |
| J1665A*12 | CFP2-CFP4 Adaptor |
| J1686B*12 | CFP2-QSFP28 Adaptor |

| Model/Order No. | Name |
|--|--|
| Electrical interface for optical module | |
| MZ1223C*13, *14 | 10 Lane Extender |
| J1675A*15 | SMP-SMA (male) Cable 40 cm |
| J1676A*15 | SMP-SMP Cable 40 cm |
| J1677A*15 | SMP-GPPO Cable 40 cm |
| J1666A*12 | 4 Lanes Extender for CFP2 |
| J1669A*16 | K (female)-GPPO Cable 5 cm |
| J1670A*16 | V (female)-GPPO Cable 5 cm |
| J1672A*16 | V (male)-GPPO Cable 40 cm |
| J1661A*16 | GPPO-GPPO Cable 40 cm |
| 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 |
| J1585A | RJ48 to Crocodile Clips Cable 3 m |
| J1586A | RJ48 to Crocodile Clips Cable 20 dB ATT 3 m |
| J1588A | BNC Cable 2.5 m |
| J1589A | BNC to 1.6/5.6 Cable 2.5 m |
| J1591A | RJ48 to Two 3-pin Banana Plug Cable 2.5 m |
| J1597A | RJ48 Balanced PDH Cable Crossed 3 m |
| J1598A | Bantam Cable 3 m |
| J0775D | Coaxial Cord, 2.0 m (75Ω) |
| Manuals | |
| W3735AE | MT1100A Operation Manual (English) |
| W3735AW | MT1100A Operation Manual (Japanese) |
| W3736AE | MT1000A/MT1100A Remote Scripting Operation Manual (English) |
| W3736AW | MT1000A/MT1100A Remote Scripting Operation Manual (Japanese) |
| Z1578A | MZ1223C Operation Manual (CD-ROM) |
| Cloud-hosted System | |
| MX002001B-TL101*17 | Anritsu SkyBridge Tools |

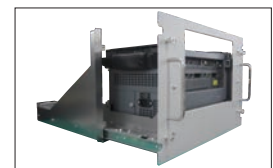
- *10: Up to 4 SFP+/SFPs can be stored.
 *11: J1667A is required for SCPI remote control via GPIB.
 *12: CFP2 Interface.
 *13: CFP Interface. Supplied with Z1578A
 *14: Use J1675A, J1676A or J1677A when connecting to the DUT. If the cables other than J1675A, J1676A or J1677A are used, the required performance may not be obtained.
 *15: Application parts for MZ1223C. Cables sold as single units.
 *16: Application parts for J1666A. Cable sold as single units.
 *17: This product provides one license for up to 5 instruments for 1 year.

6. Extended Warranties

| Model/Order No. | Name |
|-----------------|-----------------------------------|
| MT1100A-ES210 | 2 Years Extended Warranty Service |
| MT1100A-ES310 | 3 Years Extended Warranty Service |
| MT1100A-ES510 | 5 Years Extended Warranty Service |
| MU110001A-ES210 | 2 Years Extended Warranty Service |
| MU110001A-ES310 | 3 Years Extended Warranty Service |
| MU110001A-ES510 | 5 Years Extended Warranty Service |
| MU110002A-ES210 | 2 Years Extended Warranty Service |
| MU110002A-ES310 | 3 Years Extended Warranty Service |
| MU110002A-ES510 | 5 Years Extended Warranty Service |
| MU110010A-ES210 | 2 Years Extended Warranty Service |
| MU110010A-ES310 | 3 Years Extended Warranty Service |
| MU110010A-ES510 | 5 Years Extended Warranty Service |
| MU110011A-ES210 | 2 Years Extended Warranty Service |
| MU110011A-ES310 | 3 Years Extended Warranty Service |
| MU110011A-ES510 | 5 Years Extended Warranty Service |
| MU110012A-ES210 | 2 Years Extended Warranty Service |
| MU110012A-ES310 | 3 Years Extended Warranty Service |
| MU110012A-ES510 | 5 Years Extended Warranty Service |
| MU110013A-ES210 | 2 Years Extended Warranty Service |
| MU110013A-ES310 | 3 Years Extended Warranty Service |
| MU110013A-ES510 | 5 Years Extended Warranty Service |



Hard case B0717A



Rack Mount Kit B0705A

Related Products

Network Master Pro MT1000A



10G Multirate Module MU100010A

Installing the MU100010A in the MT1000A supports commissioning and maintenance tests of communications networks operating at speeds from 1.5 Mbps to 10 Gbps. In addition to Ethernet, OTN, etc., networks, the CPRI, OBSAI, and SyncE protocols used by mobile-network base stations are supported too.

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/MU100022A 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 10-Gbps communications networks can be executed by simultaneously installing the MU100010A. In addition to supporting Ethernet, OTN, etc., networks, Mobile base station CPRI and OBSAI, as well as SyncE protocols are also supported.



MT9090A Series



μOTDR Module MU909014/15

Compact OTDR for full automatic verification of optical networks, FTTH-PON, Metro and Core.

Optical Channel Analyzer Module MU909020A

Compact CWDM channel analyzer to verify power levels, drift and channel presence of CWDM networks.

Gigabit Ethernet Module MU909060A

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



MU909014/15



MU909020A



MU909060A

CMA5 Series

Light Source/Optical Power Meter

For optical fiber installation and maintenance.



MT9083 Series

ACCESS Master Mini-OTDR

All-in-one test tool for fiber construction and maintenance.



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