



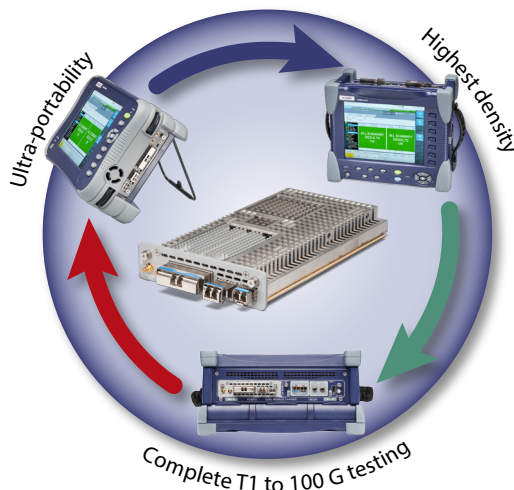
T-BERD[®]/MTS-6000A, -8000 CSAM

Compact, unparalleled 100 G network testing versatility

The CSAM provides superior 100 G network testing flexibility in the most compact format. Test 10 Mbps to 100 G with an ultra-portable test instrument that can test every interface in your central office.

The CSAM delivers unparalleled 100 G testing versatility letting core technicians and network operators test circuits based on their needs. Leveraging next-generation CFP2 optics, users can install the CSAM in the T-BERD/MTS-6000A test platform and get the smallest portable 100 G tester. Alternatively, technicians can install the CSAM in the T-BERD/MTS-8000 and get the industry's smallest, most scalable multiport 100 G field tester. Covering T1/E1 to 100 G and all interfaces in between, the T-BERD/MTS-8000 combines 100 G network verification and fiber testing by including a high-resolution optical spectrum analyzer (OSA) tool, dispersion testing or OTDR.

Viavi Solutions™ brings unparalleled portability and flexibility to testing 100 G and below.



Key Benefits

- Ultra-portable 10 Mbps to 100 G interface testing
- Ensures CFP2 and QSFP+ modules run error-free with the only field-optimized optics self-test; CFP4 also available
- Saves valuable test time with the industry's fastest RFC 2544 and Y1564 SAMComplete™ Ethernet service-activation SLA-verification tests including high-accuracy latency measurements coupled with the QuickCheck Ethernet pretest
- Eliminates tough-to-diagnose Ethernet control-plane issues with integrated control-plane Layer 2 transparency testing
- Increases testing flexibility from the 100 G core to any network aggregation point with a wide range of ODU multiplexing options and a unique GCC transparency test

Intended Audience

- Core network technicians at fixed line and mobile operators installing and maintaining 10 Mbps through 100 G equipment
- Business services technicians installing and maintaining 100 G

Applications

- OTN troubleshooting at intermediate network locations using ODU multiplexing
- Measuring high-accuracy latency at the nanosecond level and overall Ethernet SLA verification, including CBS
- 1/10/40/100 G Ethernet, OTN, and SONET/SDH installation, commissioning, service activation, and troubleshooting

Ethernet Testing

The CSAM provides comprehensive Ethernet testing for electrical, Gigabit optical, and 10, 40, and 100 GE as well as Ethernet into OTN spanning Layers 1, 2, 3, and 4.

| Line # | Virtual Lane ID | Skew (bits) | Skew (ns) | Sync Acquired | Marker Lock | Code Violations |
|--------|-----------------|-------------|-----------|---------------|-------------|-----------------|
| 0 | 0 | 20 | 3.88 | ON | ON | 0 |
| 1 | 1 | 20 | 3.88 | ON | ON | 0 |
| 3 | 2 | 14 | 2.72 | ON | ON | 0 |
| 2 | 3 | 15 | 2.91 | ON | ON | 0 |
| 4 | 4 | 14 | 2.72 | ON | ON | 0 |
| 5 | 5 | 14 | 2.72 | ON | ON | 0 |
| 7 | 6 | 19 | 3.88 | ON | ON | 0 |
| 6 | 7 | 20 | 3.88 | ON | ON | 0 |
| 8 | 8 | 0 | 0.00 | ON | ON | 0 |
| 9 | 9 | 0 | 0.00 | ON | ON | 0 |

Per-lane results

Latency Testing

The CSAM provides advanced latency testing based on ATPv3 test packets. Round-trip testing is accurate down to the ±65 ns level for 100 GE testing and ±80 ns for 10 GE. One-way delay testing is also available.

QuickCheck Ethernet Pretest

This quick, automated test is used as part of RFC 2544 or Y1564 workflows or as a stand-alone test. It is used to validate the auto-negotiation configuration, end-to-end connectivity, loopback device presence, and measure Ethernet throughput.

Summary

ALL SUMMARY RESULTS OK

Link Error Stats

- Invalid Alignment Markers: 0
- Invalid Alignment Marker Rate: 0.00E+00
- Invalid Alignment Marker Seconds: 0
- Alignment Marker Lock Present: ON
- Alignment Marker Lock History: OFF
- Alignment Marker Loss Seconds: 0
- BIP-8 AM Bit Errors: 0
- BIP-8 AM Bit Error Rate: 0.00E+00
- BIP-8 AM Bit Error Seconds: 0
- Max Skew (bits): 48
- Max Skew (ns): 465256
- Current Max Skew (bits): 48

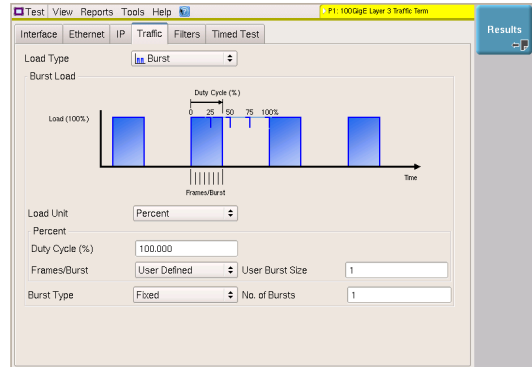
40 GE low-level testing

ITU-T Y1564 SAMComplete Service Activation Testing

SAMComplete enables fast and straightforward SLA verification for differentiated services. Tests include validating different bandwidth profiles such as committed information rate (CIR), extended information rate (EIR), maximum information rate (MIR), and CBS. KPI pass/fail results for CIR, frame delay (FD) with high-accuracy latency, frame delay variation (FDV), and frame loss rate (FLR) provided independently for multiple simultaneous services. The test suite also integrates the unique Viavi QuickCheck pre-test procedure and works with different test interfaces such as GE, 10 GE, 40 GE, and 100 GE. It also provides the fastest Y1564 test completion when benchmarked against similar implementations using comparable parameters.

RFC 2544 Testing

RFC 2544 is an industry standard for Ethernet link activation. In addition to supporting Ethernet throughput for CIR verification, FD/latency, frame loss, and back-to-back burst testing as specified in the RFC, the CSAM also integrates tests for CBS and FDV/packet jitter to ensure circuit readiness for transporting time-sensitive services such as IPTV and VoIP. It can measure FD/latency with high accuracy. It also provides the fastest RFC 2544 test completion when benchmarked against similar implementations using comparable parameters.



100 GE burst setup

RFC 6349 TrueSpeed

Traditionally, an operator installs Ethernet services using RFC 2544 or Y1564; however, business applications such as YouTube, Facebook, and file downloads (FTP) are transported on the TCP layer. This gap in testing often shows passing results for traditional Layer 2 or Layer 3 tests, even when customers complain of poor application performance, leading to customer dissatisfaction and churn. Problems like these significantly increase operating expenses (OpEx) because of additional truck rolls for each service activation.

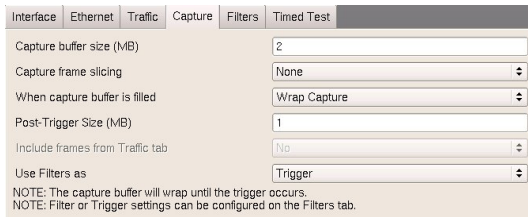
The automated TrueSpeed RFC 6349 suite enables service providers to combine traditional Layer 2 and Layer 3 installation tests and stateful TCP tests in the same truck roll with the same skill-level technician. Customer case studies show that the TrueSpeed test methodology prevents future truck rolls and saves at least 20 percent on overall installation OpEx.

Novice technicians can perform the test in as little as 3 minutes because of its simple push-button execution. Also, more experienced network engineers can use its automated reporting to verify and implement SLAs. The CSAM supports TrueSpeed on interfaces up to 10 GE. The IETF RFC 6349 framework was co-developed by Viavi and operator users in order to address real network problems via a repeatable and reliable methodology.

100G Capture and Decode

CSAM provides a capture and decode capability for 100 GE which includes the capture of any incoming frames and the capture of control plane transmit information. In addition, it is possible to trigger or filter based on parameters set by the user. This capability not only includes decoding via Wireshark but also provides post-analysis using

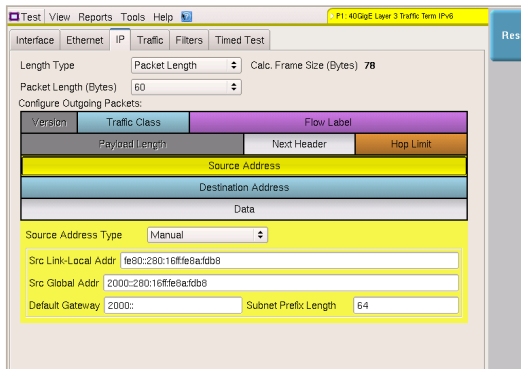
a unique tool looking for utilization, error sources, conversations, and retransmissions at various layers.



100 G Capture

Ethernet Transparency Test

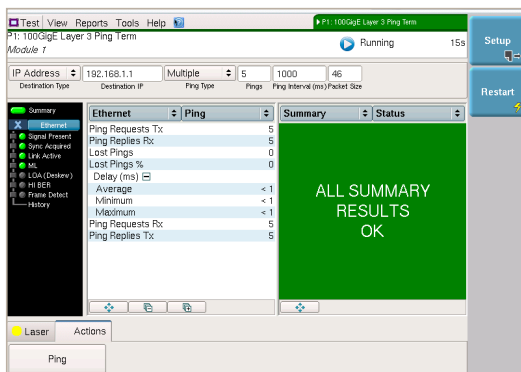
The Ethernet transparency test is a layer 2 carrier Ethernet test that confirms end-to-end transparency of Ethernet between two end points anywhere on a network using slow protocol data unit (PDU) generation that will not interrupt an existing service. Service providers can use the Ethernet transparency test to confirm the transparent transport of control-plane messages such as STP, GARP, and Cisco® proprietary protocols such as CDP. This test lets customers guarantee that an intermediate network is not filtering their control-plane traffic.



IPv6 setup

IPv4 and IPv6 Testing

Layer 3 test features incorporate traffic generation and analysis for both IPv4 and IPv6. Router connectivity is enabled via support of the ARP protocol to dynamically determine destination MAC addresses. In addition, the T-BERD/MTS supports ping and traceroute testing. Specific to IPv6, the neighbor discovery protocol provides support for IPv6 address resolution.



100 GE ping

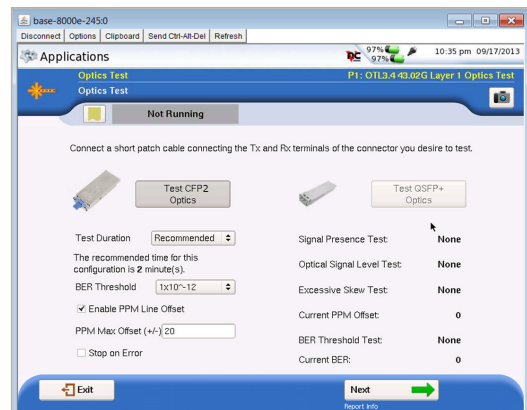
Service Disruption Test

The T-BERD/MTS measures service interruption based on the time interval when the Ethernet frame flow is disrupted. This capability also extends to Ethernet clients mapped in OTN.

Optics Testing and Support

When used as a troubleshooting tool for service activation, the CSAM enables network engineers and technicians to prove that CFP2 and QSFP+ optics are performing adequately. The field-optimized optics self test saves time and ensures optics modules run error-free using low-level patterns, automated clock offset variations, and alarm/skew verification. The process is streamlined with report generation. In addition, the T-BERD/MTS mainframe fully supports the P5000i fiber microscope for connector end-face inspection and analysis.

The CSAM provides native support for CFP2, QSFP+, and SFP+ optics and protects investments for upcoming optics form factors such as CFP4. Therefore, it eliminates the need for users to swap any optics modules to switch between GE, 10 GE, 40 GE, and 100 GE testing. Viavi sources and tests optics from multiple vendors for use in CSAM. A CFP2/QSFP+/SFP+ information menu displays the type of optics used and an expert mode lets users tweak the CFP2 parameters as needed via management data input output (MDIO).



Optics Test window

OTN Testing

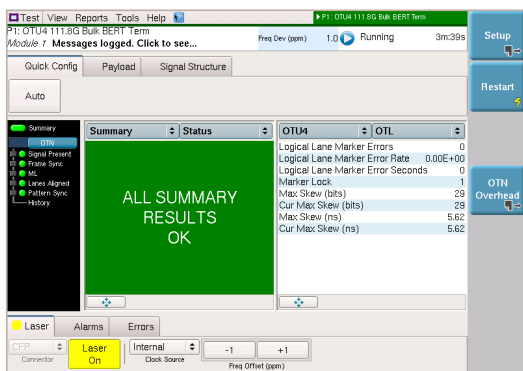
OTN wraps client signals, provides alarm and error support in its overhead, and offers signal robustness using forward error correction (FEC). The CSAM provides OTN testing for OTU2/2e/1e, OTU3, and OTU4 interfaces in addition to ODU multiplexing. With OTU3/4, the optical channel transport lane (OTL) layer support provides error/alarm injection and monitoring. CSAM features two methods for round-trip delay (RTD) measurements in addition to a unique service-activation GCC transparency test and multiple client mappings including ODU multiplexing capabilities.

Alarms, Errors, and FEC Testing

High-speed OTN interfaces require the standard G.709 FEC. The CSAM enables monitoring and correcting the FEC on incoming signals; conversely, it can inject correctable or uncorrectable errors in the transmit direction. Furthermore, it can verify OTN alarms and errors with injection capabilities such as loss of frame (LOF), alarm indication signal (AIS), and backward defect indication (BDI).

Support for Overhead Features and Six TCM Sets

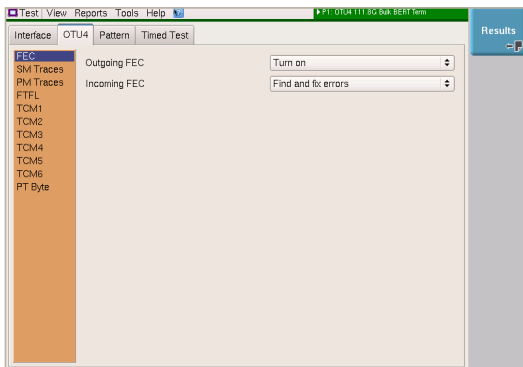
The T-BERD/MTS supports all six tandem connection monitoring (TCM) sets, including testing of associated alarms and trail trace identifiers (TTI), which includes concurrently checking expected trace messages on all TCMs and SM/PM.



OTU4 OTL

Mappings

The CSAM provides multiple PRBS patterns as bulk OTN payload, including PRBS 9, 23, 31, and inverts. A fully-featured 40 GE transcoded into OTU3 and 100 GE client mapped into OTU4 using generic mapping procedures (GMP) are available for dual-layer service activation and troubleshooting.



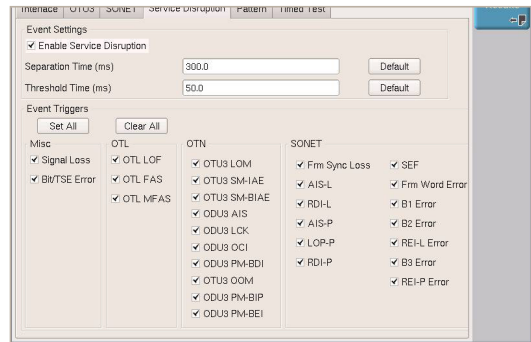
OTU4 overhead settings

ODU Multiplexing

Advanced mappings including single- and multi-level ODU multiplexing of ODUFLEX, ODU0, ODU1, ODU2/2e, and ODU3 are available. Hence, the module provides extensive coverage for all OTN deployment and troubleshooting activities.

Service Disruption Measurements

The CSAM measures the protection switch times of core backbone links and rings and their effects on clients. Simultaneous monitoring of various error and alarm conditions lets providers verify that their transport network is providing adequate redundancy to guarantee OTN-level SLAs.



OTN SD

StrataSync — Empower Your Assets

StrataSync is a hosted, cloud-enabled solution that provides asset, configuration, and test-data management of Viavi instruments and ensures all instruments have the latest software and options installed. StrataSync manages inventory, test results, and performance data anywhere with browser-based ease and improves technician and instrument efficiency. StrataSync manages and tracks test instruments, collects and analyzes results from the entire network and informs and trains the workforce.



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