

# T-BERD®/MTS-6000A, -8000 CSAM

## Unparalleled 100 G Network Testing Versatility

100 G testing flexibility



T-BERD/MTS-8000 with CSAM and MSAM

T-BERD/MTS-6000A with CSAM

The CSAM provides ultimate 100 G network testing flexibility. Test 100 G with an ultra-portable test instrument, or test 100 G with an instrument that can test every interface in your central office.

### Key Benefits

- Enables ultra-portability for testing 100 G network interfaces.
- Easily troubleshoot 40 and 100 G optics problems with the only field-optimized optics self-test that ensures CFP2 and QSFP+ optics modules run error-free.
- Save valuable test time by using the industry's fastest RFC 2544 and Y.1564 SAMComplete™ Ethernet service-activation SLA-verification tests coupled with the J-QuickCheck Ethernet pretest.
- Raise network confidence with a 40/100 G committed burst size (CBS) test that verifies correct traffic management and policing configuration on core network elements, which is especially critical for connections traversing at 10/100 GE rates.
- Eliminate tough-to-diagnose Ethernet control-plane issues with integrated J-Proof control-plane transparency testing.
- Increase 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

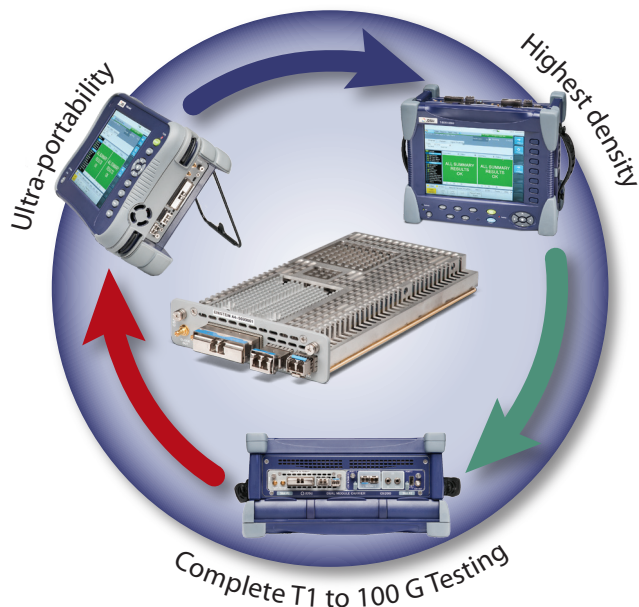
- Core network technicians at fixed line and mobile operators tasked with installation and maintenance on 40 and 100 G core network equipment
- Business services technicians who install and repair 100 G Ethernet and OTN services for financial and other high-value business customers

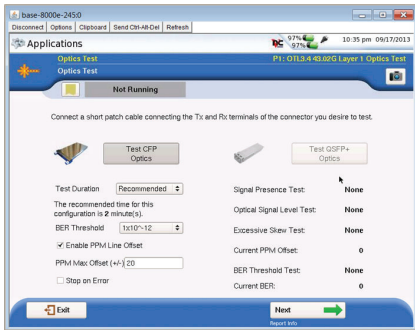
### Applications

- Install, commission, and troubleshoot 100 G OTN (OTU4) and 40 G OTN (OTU3)
- OTN troubleshooting at intermediate network locations using ODU0, ODU1, and ODU2 multiplexing
- Test 40 and 100 G Ethernet service activation as well as test and troubleshoot service disruption with RFC 2544, Y.1564 SAMComplete, and J-Proof Ethernet control plane transparency automated workflows
- Characterize service disruption times on OTN and Ethernet interfaces

The 100 G Service Application Module (CSAM) delivers unparalleled 100 G network testing versatility letting core technicians and network operators test 100 G circuits based on their testing needs. Leveraging next-generation CFP2 optics, users can install the CSAM in the T-BERD/MTS-6000A test platform for the industry's smallest ultra-portable 100 G tester. Alternatively, technicians can install the CSAM in the T-BERD/MTS-8000 to create the industry's smallest central-office-compatible dual-port 100 G field tester. This compact tool can test T1/E1 to 100 G and virtually all interfaces in between or a combined 100 G network test and high-resolution optical spectrum analyzer (OSA) tool.

The choice is yours. With JDSU, 100 G testing will never be the same.





Optics Test window

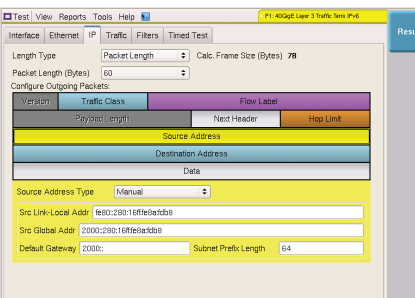
## Optics Testing and Support

The CSAM enables network engineers and technicians to prove that CFP2 and QSFP+ optics work properly either before network turn up or as a troubleshooting tool. 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.

The CSAM provides native support for both CFP2 and QSFP+ optics. For example, users who need to switch between 100 GE and 40 GE testing do not need to swap optics using the CFP2 and QSFP+ slots. JDSU sources and tests optics from multiple vendors for use in the module. A CFP2/QSFP+ 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).

## Ethernet Testing

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



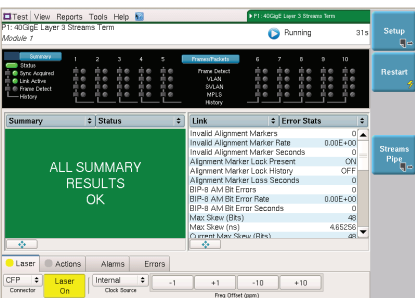
40 GE IPv6 setup

### The Basics of Layer 1 Support

Test capabilities such as skew injection and monitoring, PCS alarms and errors, pause frame support and basic Layer 1 patterns, such as the IEEE 802.3ba scrambled idle pattern, are available on 40/100 GE. In addition, field troubleshooting support is provided at Layer 1 with injections and monitoring of multiple errors/alarms on a per-lane basis.

### Ethernet VLAN, Q-in-Q, and MPLS Technologies

Ethernet tagging and encapsulation is commonly used to improve the scalability of Ethernet networks by isolating customer traffic. Support for virtual local area network tags (VLAN tags), Q-in-Q VLAN tags, and multiprotocol label switching (MPLS) enables the module to test any part of a metro or long-haul network.



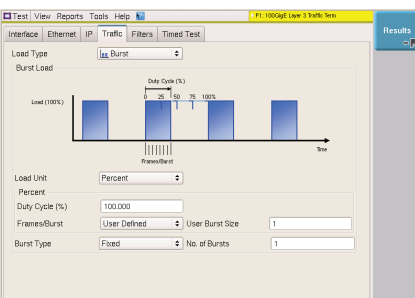
40 GE streaming

### J-QuickCheck Ethernet Pretest

A quick, automated test that can be used as part of RFC 2544 or Y.1564 workflows or as a stand-alone test to validate auto-negotiation configuration, end-to-end connectivity, loopback device presence, and basic Ethernet throughput.

### ITU-TY.1564 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 the possibility of high-accuracy latency (100 ns), frame delay variation (FDV), and frame loss rate (FLR) are provided independently for up to ten simultaneous services. The test suite also integrates the unique JDSU J-QuickCheck pre-test procedure and works with different test interfaces such as GE/10 GE (on T-BERD/MTS MSAM), 40 GE, and 100 GE.



100 GE burst setup

### 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 module also tests for 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 (100 ns).

### J-Proof Ethernet Transparency Test

J-Proof is a 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 J-Proof to confirm the transparent transport of control-plane messages such as STP, GARP, and Cisco® proprietary protocols such as CDP. Testing with J-Proof lets customers guarantee that an intermediate network is not filtering their control-plane traffic.

### 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.

### 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.

## OTN Testing

OTN testing is provided for both OTU3 and OTU4 interfaces (with provisions for OTU1/2/2e on MSAM), which includes the ability to run service-activation testing and troubleshooting on native OTN interfaces whether serial or multi-wavelength. OTN wraps client signals, provides alarm and error support in its overhead, and offers signal robustness using forward error correction (FEC). In addition, more recent OTN implementations support ODU multiplexing with a possibility of providing Layer 1 switching at the ODU level. With OTU3/4, optical channel transport lane (OTL) layer support provides error/alarm injection and monitoring. This module features two methods for round-trip delay (RTD) measurements: a 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 module 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). Connectivity to nonstandard FECs is also possible via the use of an all-zero algorithm. The module can also monitor OTN signals while connected in-line on a circuit. An overhead editor provides full manipulation of OTN overhead bytes with additional capabilities for editing and monitoring trace messages (TTI), payload type (PT), and fault signaling (FTFL).

### 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. In addition, the module supports RTD measurements using G.709 DMp/DMti which interworks with network equipment and runs concurrently with other tests. Another value-add function is the ability to test network management channel transparency using PRBS over the general communication channels (GCC).

Lane #	Vbit Lane ID	Size (bits)	Size (ms)	Sync	Make Lock	Code	Message
0	0	20	3.88	ON	ON	0	
1	1	20	3.88	ON	ON	0	
2	2	14	2.72	ON	ON	0	
3	3	15	2.91	ON	ON	0	
4	4	14	2.72	ON	ON	0	
5	5	14	2.72	ON	ON	0	
6	6	19	3.68	ON	ON	0	
7	7	20	3.88	ON	ON	0	
8	8	0	0.00	ON	ON	0	
9	9	0	0.00	ON	ON	0	

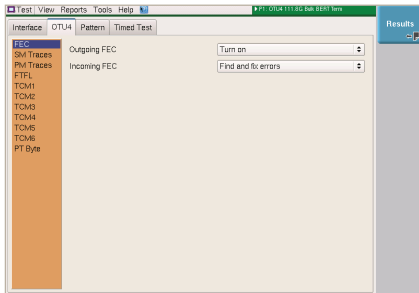
Per-lane results

Summary	Ping	Summary	Status
Ping Requests Tx	5		
Ping Requests Rx	5		
Loop Pings %	0		
Lost Pings %	0		
Delay (ms) [D]			
Minimum	< 1		
Average	< 1		
Maximum	< 1		
Ping Requests Rx	5		
Ping Requests Tx	5		

100 GE ping

Summary	Status	OTU4	OTL
Logical Lane Marker Errors	0		
Logical Lane Marker Error Rate	0.00E+00		
Logical Lane Marker Error Seconds	0		
Marker Lock	1		
Max Skew (bits)	29		
Cur Max Skew (bits)	29		
Max Skew (ns)	5.62		
Cur Max Skew (ns)	5.62		

OTU4 OTL



OTU4 overhead settings

**Mappings**

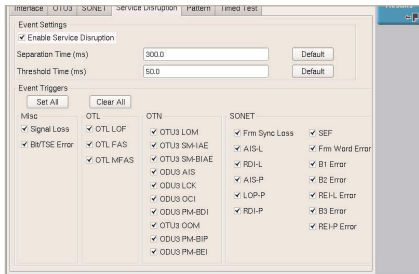
The module supports multiple PRBS patterns as bulk OTN payload, including PRBS 9, 23, 31, and inverts. A full-featured STS-768/STM-256 and 40 GE transcoded in OTU3 and 100 GE client mapped into OTU4 using generic mapping procedures (GMP) are available for dual-layer service activation and troubleshooting.

**ODU Multiplexing**

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

**Service Disruption Measurements**

The module 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 JDSU 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.



**North America**  
Tel: 1 855 ASK-JDSU  
1 855 275-5378

**Latin America**  
Tel: +1 954 688 5660  
Fax: +1 954 345 4668

**Asia Pacific**  
Tel: +852 2892 0990  
Fax: +852 2892 0770

**EMEA**  
Tel: +49 7121 86 2222  
Fax: +49 7172 86 1222

[www.jdsu.com/nse](http://www.jdsu.com/nse)