The MTS-8000 Transport Module
SDH, PDH, and Ethernet Test Module for the MTS-8000

Key Features

- Optical testing at 155 Mb/s, 622 Mb/s, 2.5 Gb/s, and 10 Gb/s SDH/SONET

- PDH and T-Carrier testing at T1, E1, E3, DS3, and E4 interfaces and mappings

- Optical GigE and 10 GigE LAN and WAN PHY testing at 850 nm, 1310 nm, and 1550 nm wavelengths

- Ethernet testing with 10/100/1000 Mb/s electrical RJ-45 interfaces

- Reduce CAPEX with a stackable design that allows for a cost effective upgrade path

- Identify Fiber Optics problems quicker with the User Interfaces optical power source, high accuracy power meter, Visual Fault Locator, and Fiber Microscope

- The only integrated field SDH, PDH, and Ethernet solution available to the market, weighing less than 7 kg

As providers expand their offerings into new data and wavelength services, test responsibilities are expanding beyond traditional SDH and PDH needs into Data and Optical layer technologies. These users now have the responsibility to install and maintain new network elements and service types that were not present in yesterday's legacy networks. The Transport Module addresses these trends by providing the necessary test functionality to support all these services in one integrated module.

Weighing less than 7 kg and operating on battery power for two hours at 10 Gb/s rates, the MTS-8000 is conveniently sized and packaged for mobile applications.

In addition, advanced applications such as measuring Round trip delay identifying dropped packets, and verifying automatic protection switch times enable providers to quickly and accurately resolve problems, speed network deployment, and enjoy the convenience of a truly field solution.

For productivity enhancements, the easy to use graphical interface enables users with limited test experience verify performance parameters and ensure that services meet desired quality metrics. In addition, the user interface is based on the industry standard TestPad and MTS product families, allowing existing migrate to the MTS-8000 platform. In combination with saved setups and remote operation, this solution enables time efficient deployment and maintenance of revenue generating services. However, in contrast to today's test solutions, the Transport Module doesn't sacrifice scalability or feature depth for convenience.

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Module Overview

One integrated solution

As new service offerings arise, Multi-Service Provisioning Platforms (MSPPs) are combining Data and Transport technologies on the same linecards. These network elements give providers the flexibility to configure new services quickly in support of customer demand. The Transport Module replicates this design by providing Ethernet and SDH/SONET test functionality in one module. Enabling providers to deploy and commission these new services quickly, efficiently and conveniently. Users no longer need to carry, manage, or maintain multiple modules or test sets in support of today's service offerings.

Remote operation

Increase efficiency by testing remotely, the MTS-8000 Transport Module's remote operation functionality allows technicians to use any standard Web browser to operate the test set, perform test routines, and analyze results. Remote operation is supported by a variety of connectivity interfaces including both Ethernet and Modem interfaces. Remote operation turns what used to be two-person testing into one-person testing, increasing efficiency by 50%. Many other network elements and test solutions require the installation of application-specific software clients. By allowing the use of any standard Web browser, the MTS-8000 Transport Module gives users maximum convenience and flexibility to test when they need to, where they need to.

Module overview

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Flexibility and configurability

The MTS-8000 Transport Module demonstrates unparalleled technological integration, providing SDH, PDH, 10GigE, GigE, and Optical functionality in one briefcase-sized unit. Recognizing that customers don't need or can't always buy all of this functionality, the Transport Module gives customers the flexibility to buy SDH or Ethernet only configurations and upgrade them as new needs arise. This features gives customers the flexibility to meet current needs without sacrificing the scalability of the module. Supported configurations of the MTS-8000 Transport Module include STM-64 only, 10 GigE only, and E1 to STM-64 – just to name a few.

Field exchangeable optical connectors

The emergence of new LC interfaces has caused yet another optical connector in today's work environment. Most networks have a combination of ST, SC, FC, DIN, and now LC connector types. Test equipment has typically had fixed connector types, forcing users to find adapter cables and connectors before testing can occur. These field removable connectors give users maximum flexibility to adapt their test set to different connector types in just seconds. Never lose time again trying to find the correct crossover cable or adapter when turning up a customer circuit or troubleshooting a service effecting fault.

Real time Histogram and Event Log

Visually analyze and monitor error alarms and events in real time. Correlate specific errored conditions to time of day and other conditions present in the network. Efficiently and effectively troubleshooting your network by correlating results quickly and easily.

## 850 nm, 1310 nm, and 1550 nm wavelength support for all optical interfaces

The design of the Transport Module allows users to install 850 nm, 1310 nm, and 1550 nm transmitters and receivers all in one package. This eliminates the need to purchase and manage separate test modules, GBICs, or SFPs to support additional wavelength types ensuring that users always have the proper test equipment to test the service.

Battery operation

Taking battery operation to another level, the MTS-8000 Transport Module is configurable with up to two batteries. It can function at a line rate up to 10 Gb/s for up to two hours on battery power.

Field exchangeable optical connectors

Histogram

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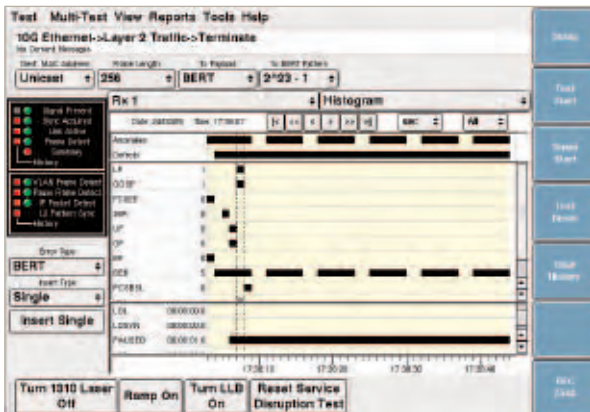
SDH/SONET

E1 to STM-64 BER testing

Perform BER testing on all line interfaces in end-to-end or loopback applications. Insert errors and alarms to verify network element conformance and connectivity. Measure bit error rates to ensure quality of service.

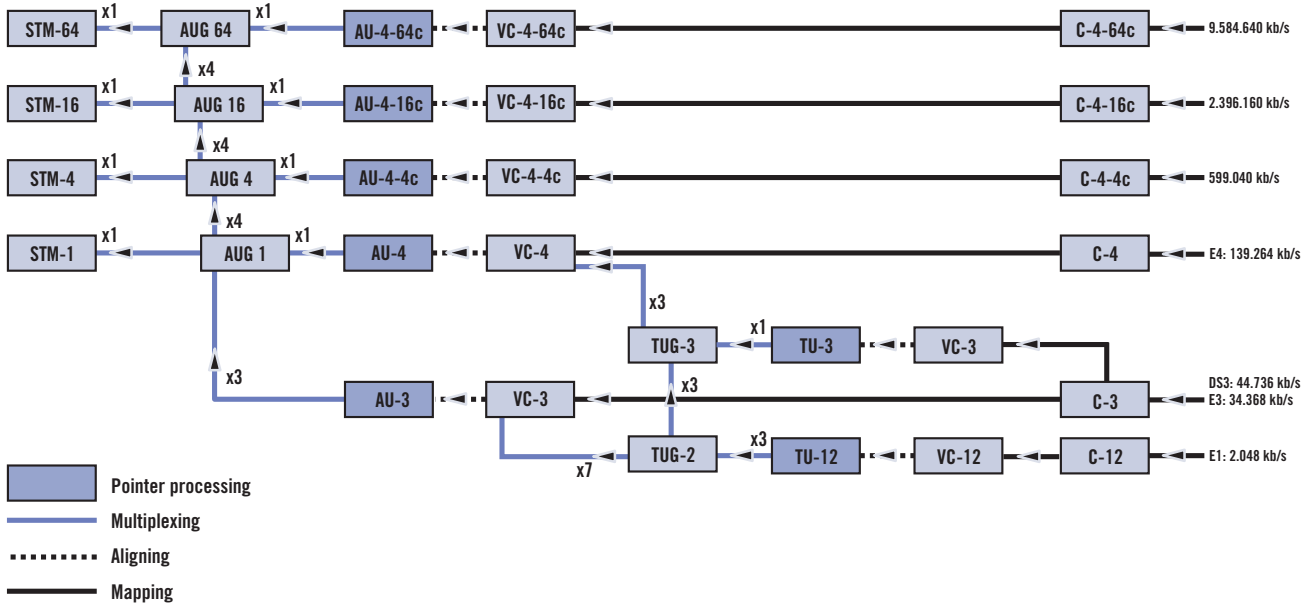### Muxed payload and bulk payload generation and analysis from 10 Gb/s to 2Mb/s

Muxed and bulk signals can be analyzed with a full array of mapping support. As an example, 2 Mb/s channels can be monitored from a STM-64 interface.

SDH/SONET overhead byte manipulation and analysis

Using the overhead byte manipulation and analysis capability of the MTS-8000 Transport Module, users can modify K1 and K2 bytes to test Automatic Protection Switching (APS): specify and identify user configurable path trace messages and payloads.

APS measurements

Measure the protection switch times of SDH/SONET rings and their effects on tributaries. By measuring various error and alarm conditions on the tributaries, providers can verify that their transport network is providing adequate redundancy to guarantee Service Level Agreements (SLAs). In addition, when operating on the SDH ring itself, capture APS sequences via the K1/K2 bytes and decode the definition of these messages per the selected network architecture.

STM-64	AUG 64	AU-4-64c	VC-4-64c	C-4-64c ← 9.584.640 kb/s
STM-16	AUG 16	AU-4-16c	VC-4-16c	C-4-16c ← 2.396.160 kb/s
STM-4	AUG 4	AU-4-4c	VC-4-4c	C-4-4c ← 599.040 kb/s
STM-1	AUG 1	AU-4	VC-4	C-4 ← E4: 139.264 kb/s

TUG-3 — TU-3 — VC-3
AU-3 — VC-3 — C-3   DS3: 44.736 kb/s / E3: 34.368 kb/s
TUG-2 — TU-12 — VC-12 — C-12 ← E1: 2.048 kb/s

Legend:
- Pointer processing
- Multiplexing
- Aligning
- Mapping

SDH Mapping

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Round Trip Delay

Immediately identify network latency with the round trip delay pattern at all linerates.

### Optical and electrical signal level measurements

Optical power and frequency offset testing ensures that received signals are within acceptable limits and network elements thresholds are within specifications.

Performance measures including T1.231, T1.510, T1.514, G.821, G.826, G.828, G.829, M.2100, and M.2101 for circuit acceptance

Bit error measurements are used to measure the quality of a circuit. The ITU-T and ANSI recommend various Pseudo Random Bit Sequence (PRBS) test patterns that simulate real traffic and stress the network. In addition to these patterns, different measurement methods are used to analyze the circuit performance. These measurements and test patterns are used as the basis for Service Level agreements. The Transport Module performs conformance analysis in accordance with ITU-T and ANSI recommendations.

Dual-Direction E1, T1, and DS3 receivers

Reduce test time by up to 50%, two electrical receivers allows users to simultaneously monitor two directions of a circuit under test, allowing users to quickly determine the source of errors (East versus West). Especially valuable when intermittent problem are present and monitoring one direction doesn't guarantee trouble isolation. Alternate solutions with a single receiver, requires the use of two test sets, which may not always be present or cost effective. With this functionality, sectionalize the network and focus on fixing the source of errors as opposed to spending time finding the problem.
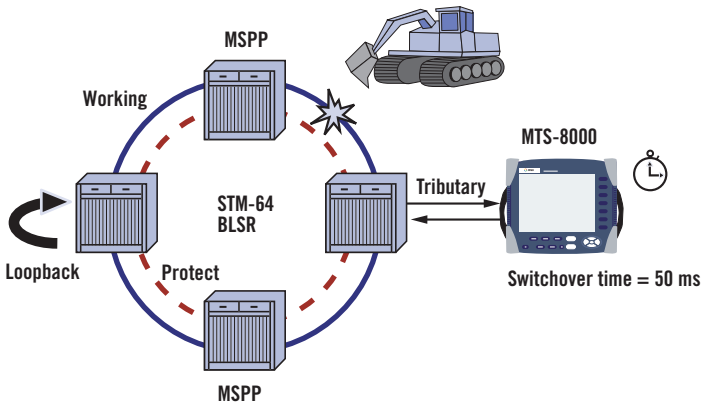
APS and service disruption
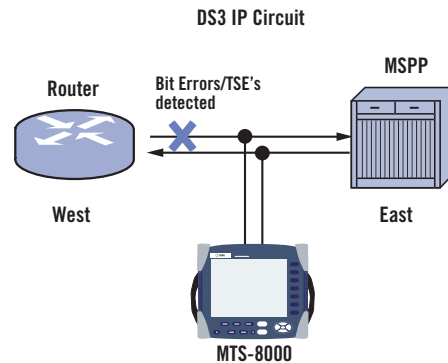
Dual-direction PDH receivers

Ethernet

The MTS-8000 Transport Module supports all optical Ethernet interfaces at all three wavelengths – 850 nm, 1310 nm, and 1550 nm. By supporting all three wavelengths simultaneously, the MTS-8000 Transport Module eliminates both the need to carry multiple GBIC, SFP and/or XFP modules, and the need to manage multiple optical interfaces to perform testing.

10 GigE LAN PHY

10GBASE-R (LAN PHY) interfaces offer a 10-fold performance improvement in comparison to Gigabit Ethernet interfaces. The effective line rate achieved by this interfaces is 10.3125 Gb/s, which translates into 10 Gb/s of data traffic at Layer 2, encoded in 64B/66B protocol. Moreover, 10 GigE technology is positioned to revolutionize network architectures by providing 8x cost efficient over existing 10 Gb/s SDH/SONET interfaces. Service Providers and Operators are rapidly deploying 10 GigE LAN circuits to offer higher bandwidth speeds at a minimal cost and network complexity, while preserving many of the same characteristics of other Ethernet technologies, such as 10/100/1000 Mb/s and GigE.

10GigE LAN Frame
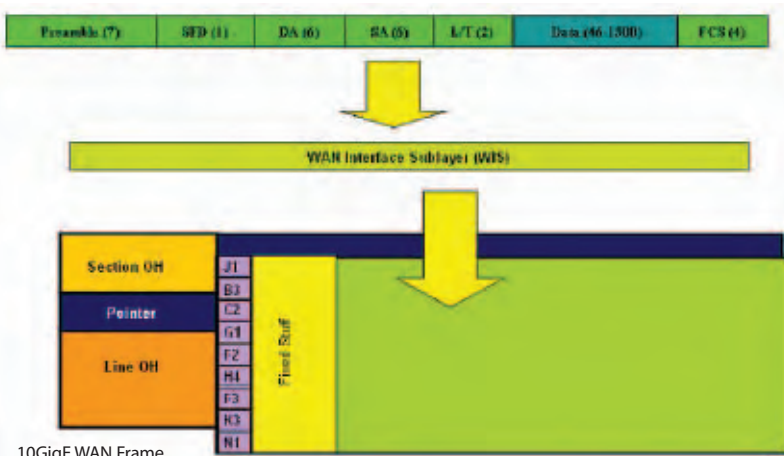
10GigE WAN Frame

	10 Gigabit Ethernet Interface	Data Rate	Nominal Operating Wavelength	Fiber Interface	Operating Transmission Range
10GigE LAN	10GBASE-SR	10.3125 Gb/s	850 nm	Multimode (50 μm)	2 to 300 m
				Multimode (62.5 μm)	2 to 33 m
	10GBASE-LR		1310 nm	Singlemode	2 m to 10 km
	10GBASE-ER		1550 nm	Singlemode	2 m to 30 km
10GigE WAN	10GBASE-SW	9.95328 Gb/s	850 nm	Multimode (50 μm)	2 to 300 m
				Multimode (62.5 μm)	2 to 33 m
	10GBASE-LW		1310 nm	Singlemode	2 m to 10 km
	10GBASE-EW		1550 nm	Singlemode	2 m to 40 km

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10GigE WAN PHY

10GigE WAN PHY offers an Ethernet interface that is compatible with the existing SDH network and adaptable to the growing Ethernet market. The 10GigE WAN standard uses a concatenated STM-64 signal operating at 9.9Gb/s with a SDH framing structure. Standard Ethernet frames are mapped directly into the payload of the SDH frame, using a WAN Interface Sublayer (WIS). In addition, since SDH framing is used, users also have sectionalization capability for their Ethernet services (regenerator, multiplexer, and path layers). Most importantly, the 10GigE WAN standard allows providers to manage Ethernet services in their already existing SDH networks. With the transport module, troubleshoot both Ethernet and SDH layer issues in one single 10GigE WAN test application, speeding trouble recognition and isolation times.

10/100/1000 Mb/s Ethernet and GigE

With Ethernet services dominating metro data services landscape, the Transport Module has been designed to meet the needs of Service Providers and Operators offering various Ethernet and IP services. Test capability ranges from BER testing and verifying end-to-end Connectivity to determining Throughput, Utilization, Frame Loss, and Round Trip Delay for Ethernet and IP service deployment. The Transport Module supports testing 10/100/1000 Mb/s electrical interfaces, as well as GigE optical interfaces at all three wavelengths.

Connectivity and loopback testing

Ensure physical layer integrity and verify end to end connectivity of the Ethernet circuit by establishing an end to end link. The user configurable auto negotiation capability of the module makes this instrument compatible with any installed Ethernet interface.

Throughput Verification

The Transport Module can verify error-free throughput of the Ethernet link by generating respective traffic (Constant, Bursty, or Ramp) at a specified bandwidth. With the functionality to loop back frames at the far end, the instrument enables the qualification of the link in both directions.
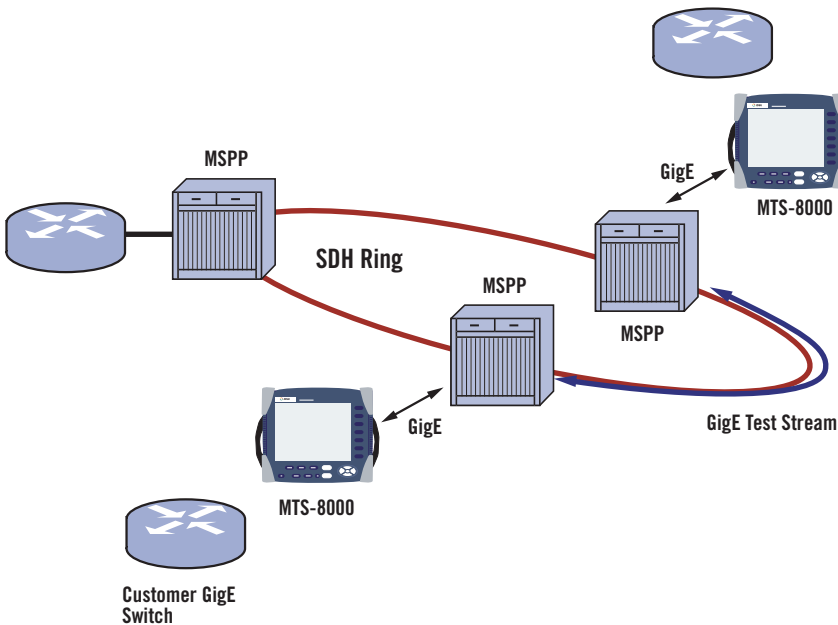
Connectivity and loopback testing

Throughput verification

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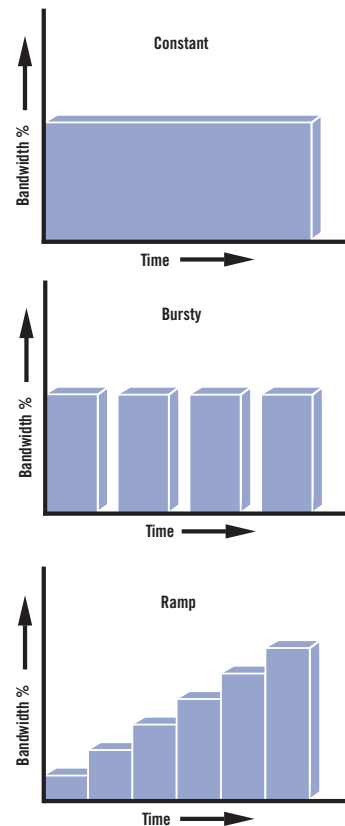
Quality of Service measurements

The RTD measurement is a critical parameter for delay sensitive Triple Play applications such as Video and Voice over IP (VoIP). Round trip delay measurements are a critical measure of a links capability to transport delay sensitive applications. Use the Transport Module to verify links RTD for Ethernet and IP services and ensure that it conforms to SLA parameters.

Optical Power Measurements

To ensure that Ethernet interfaces and spans are operating within the correct optical signal power levels. The Transport Module allows users to measure the optical signal level on the Ethernet test interface. Enabling a user to qualify a circuit without needing a separate handheld power meter.

RFC2544 Conformance Testing

RFC2544 addresses the need of Service Providers to perform the QoS measurements in Ethernet and IP networks. It represents a bench-marking methodology for performing these measurements. As such, the Transport Module enables the users to perform automated RFC2544 testing, and turn-up Ethernet and IP service by performing: Throughput, Frame Loss, Round Trip Delay, and Burstability tests. Such automated testing removes possibility for error and ensures that technicians will run the tests uniformly and obtain reliable results every time.
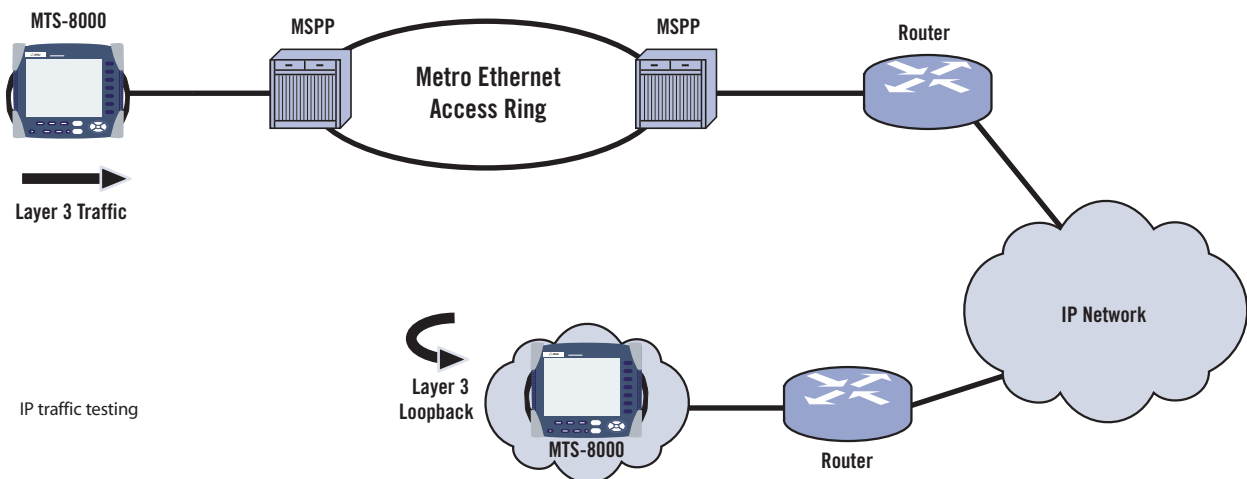
Dual Port Operation

In addition to generating two separate traffic streams up to full-bandwidth of the test interfaces, the support for dual port 10/100/1000 Mb/s and GigE interfaces on the Transport Module enables technicians to gain access to circuits under test to perform in service monitoring in both directions. The test instrument allows for unobtrusive monitoring of 10/100/1000 Mb/s Ethernet circuits to verify the capability of network elements to support reliable communications. Moreover, the through mode allows for monitoring of the traffic in lieu of using a splitter, and allows the service providers to solve finger pointing situations.

IP Testing

Prior to testing throughput in a routed network, technicians may need to verify if the provisioned path in the network will carry IP traffic to its destination. The first step in verifying this end-to-end connectivity will be to perform an IP Ping. Once connectivity is verified, the feature enables users to generate IP traffic at the line rate specified for the service. While verifying end to end connectivity and throughput, user can also verify QoS by ensuring that no data has been errored and/or dropped during transit. In addition, for troubleshooting applications, users can localize network congestion locations by using the IP Traceroute application.

MTS-8000

MSPP

Metro Ethernet Access Ring

MSPP

Router

Layer 3 Traffic

IP traffic testing

Layer 3 Loopback

MTS-8000

Router

IP Network

Fiber Optics

One of the most common problems in today's Transport networks is faulty fibers and connectors. Even the smallest problem with the fiber plant can adversely affect high speed transmission services. The MTS user interface module provides fiber test functionality without adding excess size or weight. Eliminating the need to carry and manage separate test sets or additional modules. Never lose time again due to faulty patch cords or optical connectors when turning up services.

Loss Test Set

Using the MTS-8000's Stable power source and high accuracy power meter, users can measure power at any point of an active network, measure the insertion loss of a link between transmitter and receiver and verify the loss characteristics of patch cords before turning up services. Providing this high accuracy loss test set eliminates the need for a separate handheld instruments or additional test modules.

Visual Fault Locator (VFL)

Considered a mandatory tool for any technician dealing with fiber patch cords, the built-in visible light source allows for quick fiber continuity checks and visual break locations.

Fiber Optic Video Microscope

Upon installation and maintenance of transmission systems, the optical inspection scope allows for the quality verification of the front optical connector, when problems occur during measurement or system turn-up. The use of the video probe allows for visualization of the connector in a safe environment, even if the fiber is active.

Fiber Break
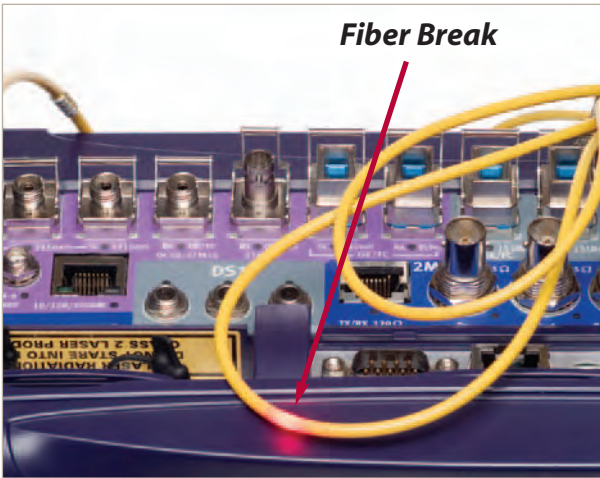
Visual fault locator
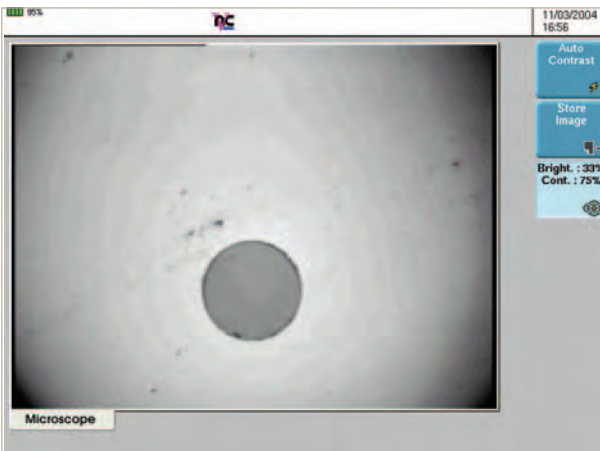
Connector surface inspection

Jumper loss measurement

Physical Characteristics

Secondary Port Bank
– Includes GigE Tx/Rx at 850 nm, 1310 nm, and 1550 nm; and 10/100/1000 Mb/s Ethernet

Primary Port Bank
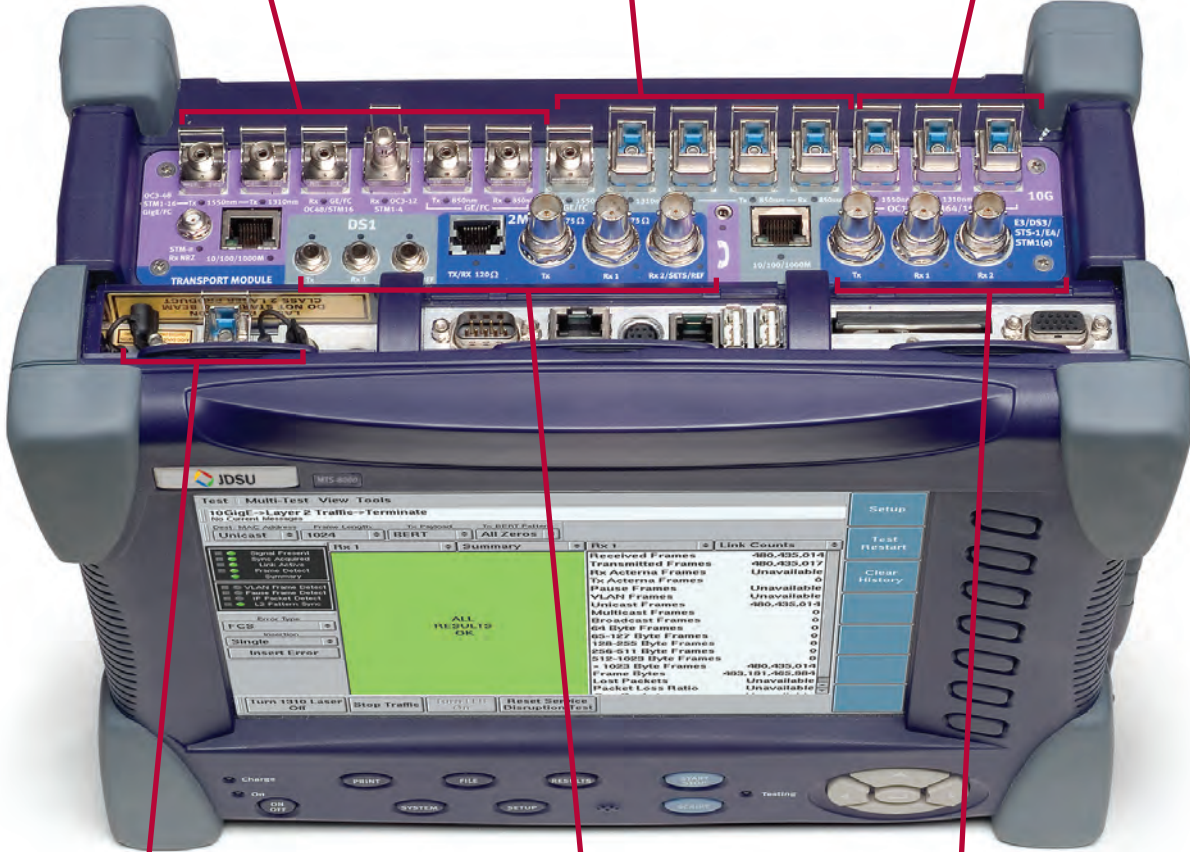– Includes 2.5 Gb/s, 622 Mb/s, and 155 Mb/s SDH/SONET Tx/Rx, GigE Tx/Rx at 850 nm, 1310 nm, and 1550 nm; and 10/100/1000 Mb/s Ethernet

10 Gb/s Port Bank
– 10 Gb/s SDH/SONET and 10 GigE LAN/WAN Phy at 850 nm, 1310 nm, and 1550 nm

Optical Connection Check Interfaces
– High accuracy Power Meter
– Continuous Wave Power Source
– Visual Fault Locator

Port Bank #4
– T1 and E1 (balanced and unbalanced Tx/Rx

Port Bank #5
– E3, DS3, STS-1, E4, and STM-1 (e) Tx/Rx BNCs

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