Acterna FST-2802 TestPad Gigabit Ethernet Services Module

Now able to test Ethernet, Fibre Channel, and IP services in a single test instrument!

Many worldwide service providers and operators are planning transitions from their current networks to next generation IP/MPLS converged networks. Despite lean capex spending environments, service providers are increasing their investments in IP, MPLS, broadband, and metro Ethernet technologies.

There are multiple reasons why providers and operators are getting ready for data network convergence. These include:

– a reduction of operational expenditures through simpler networks that eliminate network duplication.
– an ability to converge voice, data, and video applications by investing in additional application layers (such as IP).
– allows operators to seek new opportunities to boost revenues, such as offering managed IP/MPLS VPNs.

A major theme of this overall convergence is the movement to the next generation of IP networks. With this developing market trend, Acterna has enhanced the FST-2802 to enable providers and operators to utilize this tool for turning up and troubleshooting IP services. The FST-2802 enables technicians to use one test set to turn up services ranging from 10/100 Ethernet, Gigabit Ethernet, Fibre Channel and IP – all from a single TestPad module!

The Acterna FST-2802, a member of the TestPad family of products, is a rugged, battery operated test instrument that enables field technicians to turn-up and maintain Ethernet, Fibre Channel, and IP services. The testing capabilities of the FST-2802 range from BER testing and verifying end-to-end connectivity to determining throughput, link usage, and round-trip delay in Ethernet, Fibre Channel, and IP test scenarios. In addition, a new Fibre Channel login feature allows users to test buffer crediting and sub-rate Fibre Channel services. The easy-to-use graphical interface of the FST-2802 facilitates technicians with limited Ethernet, Fibre Channel, or IP testing experience to verify performance parameters and ensure that the services conform to service level agreements (SLAs).

Highlights

– **Full line rate traffic generation to test IP services**
– **Ability to generate full line rate 10/100 and GigE services**
– **Ability to test 1.0625 and 2.125 Gbps Fibre Channel services at 100% wire speed**
– **Support for Fibre Channel login and buffer crediting for sub-rate testing**
– **BER testing at Layer 1 and Layer 2 for Ethernet and Fibre Channel circuits**
– **Ability to perform RFC2544 benchmarking testing**
– **VLAN and TOS/DSCP traffic prioritization testing**
– **Variable traffic load characteristics to measure the true performance of the link**
– **Dual-port capability for Ethernet, Fibre Channel, and IP traffic generation**
– **Loopback frame generation to loop the far-end test instrument automatically**
– **Easy-to-use graphical interface to minimize the training requirements**

ACTERNA™
Communications Test and
Management Solutions

Product Features

Ethernet Traffic Testing

The FST-2802 allows users to transmit traffic up to 100% of wire speed and specify either an Acterna or BERT payload when turning up an Ethernet link. Robust traffic generation capabilities of the FST-2802 enable generation of Ethernet frames with various configurable parameters such as bandwidth utilization, frame length, and frame payload. The user can also choose to transmit a PRBS pattern or a 32-bit fixed pattern as a defined sequence of 1's and 0's. In either case, different traffic conditions can be simulated by choosing constant, ramp, or bursty traffic load settings. Finally, an analysis can be done on the performance of the link through an easy-to-use result interface.

VLAN Protocol Support

VLAN tag manipulation supported on the FST-2802 enables generation of Ethernet traffic stream with specific VLAN ID (802.1Q) and traffic priority (801.p). This enables technicians to verify the correct transmission and prioritization of the stream through the network. In addition, VLAN filtering allows the users to isolate a specific VLAN stream and compare its performance to the total link performance. VLAN protocol support is available for both Layer 2 and Layer 3 traffic testing.

Fibre Channel Testing

The 1G and 2G Fibre Channel testing (FC-100™ and FC-200™) enables users to test both Fibre Channel and FICON services. The user is able to select different routing controls, destination and source identifiers, data structures, and sequence counts in each frame to further test specific Fibre Channel traffic. In addition to testing up to 100% traffic rate, a new feature is added to the FST-2802 which enables a user to perform a login and setup buffer credits in order to test sub-rate Fibre Channel and/or distance-extended Fibre Channel links. By performing this type of testing, it is assured that the throughput and round trip delay specifications are maintained per SLAs over long Fibre Channel links. With this feature, the FST-2802 also allows users to troubleshoot the Fibre Channel login process.
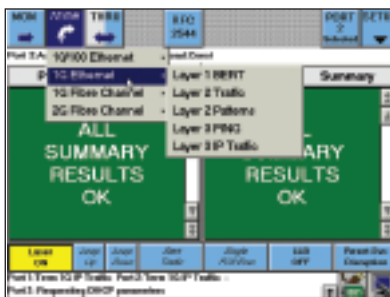

Figure 1. Term Application Test Selections

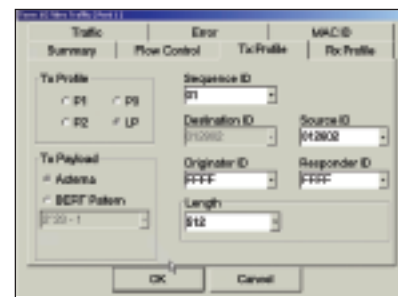*Figure 2. Fibre Channel Login Set-up Page*
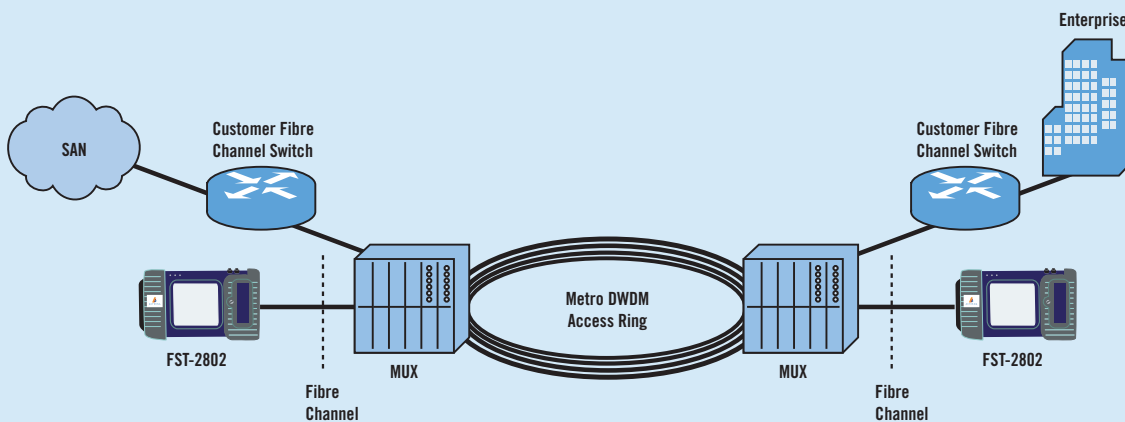

Figure 3. Fibre Channel Transmit Set-up Page

Diagram 1. Fibre Channel Testing on Metro DWDM Network

IP Traffic Testing

The IP Traffic testing feature enables users to generate and receive valid IP packets. The FST-2802 allows for configuration of IP header fields such as TTL, TOS/DSCP, Source IP Address, and Destination IP Address. The FST-2802 supports both Static and Dynamic IP addressing, given that a Source IP address may be assigned by a DHCP server. If the Destination IP address is known, the far end MAC address can also be discovered by the FST-2802 through the Address Resolution Protocol (ARP). Basic domain name service testing can be completed to ensure that the DNS server is able to resolve the name to the appropriate address. Traffic load settings can be configured for constant, ramp, and bursty traffic to simulate different network traffic conditions.

Dual Port Testing

The dual-port capability allows the users to generate traffic on two independent ports at the same time, thereby allowing them to stress test two circuits with specific tests simultaneously. For example, users may specify different frame/packet sizes, traffic characteristics, and filters on each port, exposing the network elements to varying traffic patterns, as it would be the case in live networks.

Remote Control and Results Storage

The FST-2802, in combination with the Version 6 UIM, enables remote users to access the FST-2802, using an analog modem and/or Ethernet access and a standard Web Browser. In addition, this test instrument features an FTP server, which enables users to store and transfer files to and from other network locations.
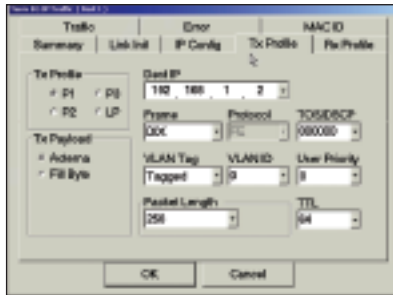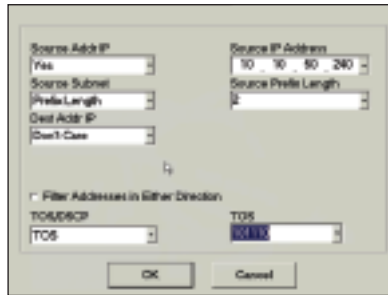

Figure 4. IP Packet Set-up Page

Figure 5. Receive Profile Page for IP Traffic

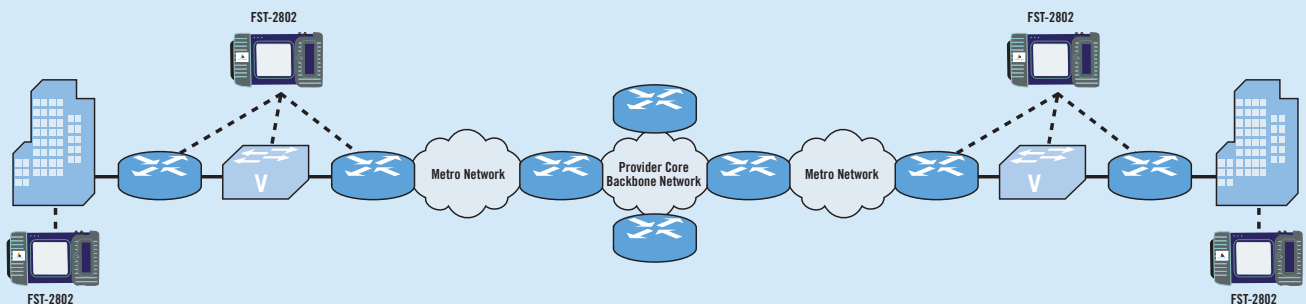*Figure 6. Configuration Page for Source IP Address*

Diagram 2. IP Traffic Testing in Metro Networks

Applications

Throughput and Round Trip Delay Measurements

In order for Ethernet, Fibre Channel, or IP service hand-offs to take place between the provider and an end customer, many customers require proof that the circuit can handle the service that they are buying. Therefore, providers are required to measure the throughput to verify that the network can carry the bandwidth allocated to the end customer. To prove this, technicians generate valid traffic at the line rate specified for the service. Moreover, an additional purpose of this test is to verify that no data has been errored and lost during its transition through the network. In addition to verifying the throughput of the service sold, providers may want to verify additional items in the SLAs, such as number of errored frames/packets, frame loss rate, and round-trip delay (RTD) measurement. In verifying the RTD, technicians will have the ability to terminate a circuit and measure a network delay of a transmitted frame/packet. This test will be performed using a loop-back functionality of the FST-2802.

Traffic Analysis and Filtering

In order to perform more detailed troubleshooting in the network, technicians may use the FST-2802 to filter on a specific traffic stream. In particular, if an end customer utilizes L2 prioritization techniques (VLAN ID and Priority) along with L3 prioritization schemes (TOS or DSCP fields), a technician may be asked to verify that a particular traffic stream is being generated successfully and sent through the network without any errors. The FST-2802's filtering capability allows technicians to complete this verification thoroughly, thereby providing end customers with a proof that their traffic will transition the provider's network error-free.

Bit Error Testing

The FST-2802 features the BER testing at both Layer 1 (physical layer) and Layer 2 of Ethernet and Fibre Channel circuits using a variety of stress test patterns designed specifically for these technologies. According to physical layer specifications, Ethernet and Fibre Channel circuits should conform to BER of 10^{-12} or better.

Loopback Frame Generation

The loopback buttons on the main application window of the FST-2802 enable generation of Ethernet and Fibre Channel frames and IP loopback packets to loop-up and loop-down the far end test instrument. This capability enables a technician to leave one test instrument at the far end and perform loopback tests for measuring bi-directional throughput and round-trip delay on the circuit. In addition, the loopback

functionality allows the user to set-up specific traffic to be looped back, based on receive filter characteristics (i.e., MAC addresses, IP addresses, VLAN, TOS/DSCP Prioritization, etc.)

Bi-directional Monitoring/Thru Mode

In addition to generating two separate traffic streams, the dual-port feature of the FST-2802 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 Ethernet and Fibre Channel circuits to verify the capability of network elements to support reliable communications. Moreover, the Thru mode allows for monitoring of the traffic in lieu of using a splitter.

Service Disruption Measurement

The FST-2802 enables service providers to measure the service disruption of their Ethernet, Fibre Channel, and IP traffic. This measurement may be used by service providers as a troubleshooting benchmark to verify the network switch-to-protect time on Layer 1, Layer 2, and Layer 3 networks.
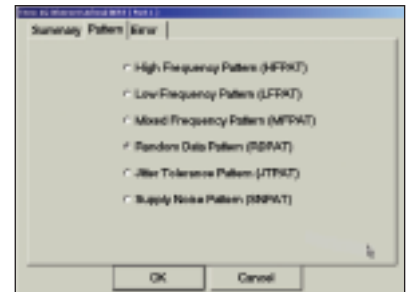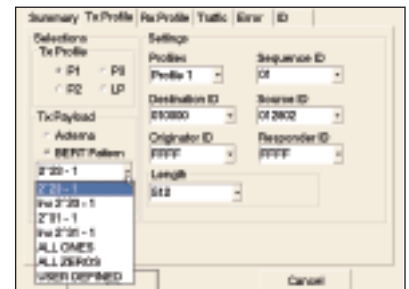

Figure 7. Layer 1 BERT Pattern Selection

Figure 8. Layer 2 BERT Pattern Selection

General Specifications

Dimensions	7.5 x 13.5 x 2.2 in
Weight	5 lb (with battery)
AC adapter	19 VDC, 2.6 amps/90-240 VAC, 45-60Hz
Menu Language	English
Speaker and Microphone	Built-in
PC card access	Standard dual PCMCIA interface slots

Interfaces

Ethernet/IP

10/100 Mbps	RJ-45 connector
1000 Mbps	GBIC Interface (SX, LX), Copper, 1550 nm

Fibre Channel

1.0625 Gbps	GBIC Interface
2.125 Gbps	GBIC Interface
Duplex Modes	Full/Half
Flow Control	Supported
Modes of Operation	Terminate, Monitor, Thru

Ethernet Traffic Generation:
- Constant, Ramp, Bursty
- Configurable Source and Destination MAC Address, Frame Format, Type Field (for DIX), Frame Length (including undersized and Jumbo frames), VLAN ID, VLAN Priority, Frame Payload, Utilization %

Fibre Channel Traffic Generation
- Constant, Ramp, Bursty
- Configurable Buffer Credits
- Configurable Source and Destination ID, Sequence ID, Originator ID, Responder ID, Frame Length, Utilization %

IP Traffic Generation
- Constant, Ramp, Bursty
- Configurable Source and Destination IP Address, Packet Length, Packet Payload, Utilization %
- Configurable VLAN ID, VLAN Priority, TOS/DSCP fields

Ethernet Traffic Filtering
- MAC Source and Destination Address, Frame Type/Length, VLAN ID, VLAN Priority

Fibre Channel Traffic Filtering
- Routing Control, Destination and Source Identifier, Data Structure Type, Sequence Count

IP Traffic Filtering
- Source and Destination IP Addresses, Subnet Masks, TOS/DSCP fields

Bit Error Testing Patterns

Layer 1 (Unframed) Bit Error Testing Patterns
Per IEEE 802.3, 2000 Edition, Annex 36A:
- High-frequency test pattern
- Low-frequency test pattern
- Mixed frequency test pattern

Per NCITS TR-25-1999:
- Random Data Pattern (RPAT)
- Jitter Tolerance Test Pattern (JTPAT)
- Supply Noise Test Sequence (SPAT)

Layer 2 (Framed) Bit Error Testing Patterns
- PRBS (2^{23-1}, 2^{31-1}, and inverted selections)
- All 1s
- All 0s
- User defined

Framed Pattern Test Per NCITS TR-25:1999:
- Long Continuous Random Test Pattern (CRPAT)
- Long Continuous Jitter Test Pattern (CJPAT)
- Long Compliant Supply noise Pattern (CSPAT)

Key Results

Link Status
- Loss of Signal
- Link Active
- Frame Detected
- VLAN Tagged Frame Detected

Auto-negotiation Status
- Link Configuration ACK
- Link Advertisement Status
- Pause Capable
- Remote Fault

Fibre Channel Login Stats
- Login Status
- ELP TX/RX
- ACK TX/RX
- Accept TX/RX
- Reject TX/RX

Link Counts
- Bandwidth Utilization, Frame Rate, Rx/Tx Mbps, Round Trip Delay, Service Disruption Time
- Total Received and Transmitted Frames/Packets, PAUSE Frames, Lost Frames, Out of Sequence Frames/Packets, VLAN Frames, Unicast Frames/Packets, Multicast Frames/Packets, Broadcast Frames/Packets, Frame Length/Packets (Bins)

Errored Counts
- Symbol Errors, Code Violations, FCS Errored Frames, Runts, Jabbers, Oversized Frames, Undersized Frames, IP Checksum Errors, Acterna Payload Errors

BER Testing	BER, BER rate
Packet Testing	In conformance with IETF RFC 1242, RFC 2544, RFC 791

Ordering Information

|	
2000-V6	Acterna FST-2000 TestPad User Interface Module (UIM)
2802-GIGE	FST-2802 1G Ethernet Single Port Mainframe
2802-DUAL	FST-2802 1G Ethernet Dual Port Mainframe
2802-ELEC	FST-2802 10/100 Ethernet Single Port Mainframe
2802-ELEC-DUAL	FST-2802 10/100 Ethernet Dual Port Mainframe
2802-FE	10/100 Mbps Ethernet Option (only available on 2802-GIGE and 2802-DUAL)
2802-VLAN	VLAN Option
2802-IPSW	IP Traffic Option
2802-1G-FC	Fibre Channel 1.0625 Gbps Option
2802-2G-FC	Fibre Channel 2.125 Gbps Option
AC-GBIC-COPPER	Copper GBIC (1000BaseT)
AC-GBIC-ALLRATE-SX	All Rate MM GBIC (850 nm) (1GigE, 1G, and 2G Fibre Channel)
AC-GBIC-ALLRATE-LX	All Rate SM GBIC (1310 nm) (1GigE, 1G, and 2G Fibre Channel)
AC-GBIC-LONGHAUL	Long Haul 1550 nm GBIC
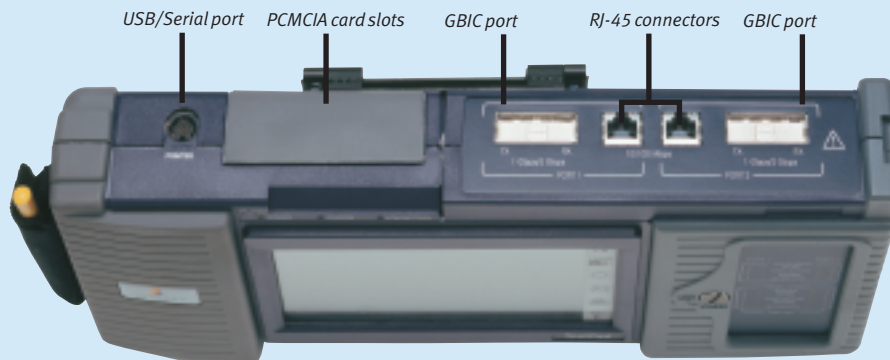
Diagram 4. Acterna FST-2802 Dual Port Configuration

USB/Serial port · PCMCIA card slots · GBIC port · RJ-45 connectors · GBIC port

Global Service Solutions from Acterna provide the expertise and resources to enhance your communications test and management capabilities. From basic instrument support for your field technicians, to the management of complex, company-wide initiatives, Acterna's service professionals are committed to helping you maximize your performance. Whatever your needs — product support, system management, education solutions, consulting services, or refurbished equipment — Acterna offers the programs that will give you the competitive edge. To learn more about how Acterna's Global Service Solutions can help your business be more sucessful, visit the "Services" section at www.acterna.com.

Acterna is the world's largest provider of communications test solutions for telecommunications and cable network operators. A trusted communications test partner for more than eight decades, Acterna offers an unmatched portfolio of award-winning instruments, systems, software and services that help its customers reduce network costs while improving performance and reliability. Headquartered in Germantown, Maryland, USA – with European and Asia-Pacific operations based in Eningen, Germany and Hong Kong – Acterna serves nearly every major communications service provider and equipment manufacturer around the world through a skilled sales and support organization in 31 countries.

Note: Specifications, terms and conditions are subject to change without notice.

ACTERNA
Communications Test and Management Solutions

FST2802GIGE/DS/ACC/03-05/AE