Acterna FST-2802 TestPad

Gigabit Ethernet Services Module

User's Guide

ACTERNA

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Gigabit Ethernet Services Module

User's Guide

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The Keepers of Communications

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This guide is a product of Acterna's Technical Information Development Department, issued as part of the Acterna FST-2802 Gigabit Ethernet Services Module. The ordering number for a published guide is ML-2802-1103.

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Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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This product was tested and conforms to the EMC Directive, 89/336/EEC as amended by 92/31/EEC and 93/68/EEC for electromagnetic compatibility. A copy of the Declaration of Conformity is provided with this manual.

If you purchase the 2802-FE to perform 10/100 Ethernet testing, you must use the shielded twisted pair cable (STP) provided to maintain CE compliance.

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Declaration of conformity

ACTERNA
50-19272-01, Rev. A

Declaration of Conformity

Application of Council Directives:	LVD: 73/23/EEC as amended by 93/68/EEC EMC: 89/336/EEC as amended by 92/31/EEC and 93/68/EEC
Standards to which Conformity is Declared:	EN60950:2000, EN55022:1994 (A1 and A2), EN55024:1998, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11, EN61000-3-2, and EN61000-3-3

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Model No:

FST-2802

Product Description:

Acterna TestPad Gigabit Ethernet Services Module

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

30 September, 2003
Date

Stephen Bryant
Director of Quality & Reliability
Germantown, MD

Important Safety Instructions

The following table defines safety terms. Failure to observe these precautions while using the FST-2802, violates the intended use of this product.

Safety definitions

Term	Description
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

When using this product, always follow basic safety precautions to reduce the risk of fire, shock, and injury to persons. Basic safety precautions are as follows:

1. Read and follow all warning notices and instructions marked on the product and included in the manual.
2. Use only the AC Adapter/Charger supplied with the product.
3. Do not use AC Adapter/Charger outdoors or in wet or damp locations.
4. Connect the AC Adapter/Charger to the correct mains voltage, as indicated on the ratings label.
5. Do not allow anything to rest on the power cord, and do not locate the product where people can walk on the power cord.
6. Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.
7. Do not use this product in the vicinity of a gas leak or in any explosive environment.
8. Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous, high voltage points and other hazards. Contact qualified service personnel for all service.

9 **CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with (part number 11-18066). Dispose of used batteries according to the manufacturer's instructions.

10 **CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

11 **CAUTION:** The FST-2802 is a Class 1 laser product.

Save these instructions

Symbols

The following safety symbol is used on the FST-2802. All safety precautions must be observed when operating, servicing, or repairing the FST-2802. Failure to comply with the following safety precautions or with hazard cautions and warnings used throughout this manual violates the intended use of this instrument.

GENERAL HAZARD

This icon represents a general warning or caution.

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About This Guide

The topics discussed in this chapter are as follows:

– "Purpose and scope" on page xxii
– "Assumptions" on page xxii
– "Related information" on page xxii
– "Technical assistance" on page xxiii
– "Conventions" on page xxiv

Purpose and scope

The purpose of this guide is to help you successfully use the FST-2802 TestPad features and capabilities. This guide includes task-based instructions that describe how to install, configure, use, and troubleshoot the FST-2802 TestPad. Additionally, this guide provides a complete description of Acterna's warranty, services, and repair information, including terms and conditions of the licensing agreement.

Assumptions

This guide is intended for novice, intermediate, and experienced users who want to use the FST-2802 TestPad effectively and efficiently. We are assuming that you have basic computer, mouse/track ball, and networking experience and are familiar with basic telecommunication concepts and terminology.

Related information

Use this guide in conjunction with the *FST-2802 Online Help*.

Technical assistance

If you need assistance or have questions related to the use of this product, call or e-mail Acterna's Technical Assistance Center for customer support.

Table 1 Technical assistance centers

Region	Phone Number	
Americas (except Brazil)	1-866-ACTERNA 301-353-1550	(1-866-228-3762) tac@acterna.com
Brazil	0800-7015370 4617 3839 4617 3729	
Europe, Africa, and Mid-East	+800 882 85822 (European Freephone)	support.uk@acterna.com
	(Acterna UK)	support.uk@acterna.com
	+49 (0) 7121 86 1345 (Acterna Germany)	hotline.germany@acterna.com
	+33 (0) 1 39 30 24 24 (Acterna France)	hotline.germany@acterna.com
Asia and the Pacific	+852 2892 0990 (Hong Kong)	
	+8610 6833 7477 (Beijing-China)	
Australia	+61 3 9690 6700	

During off-hours, you can request assistance by doing one of the following: leave a voice mail message at the Technical Assistance number in your region; e-mail North American Technical Assistance Center, tac@acterna.com, or European Technical Assistance Center, support.uk@acterna.com; or submit your question using our online Technical Assistance Request form at www.acterna.com.

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 2 Typographical conventions

Description	Example
User interface actions appear in this **typeface**.	On the Status bar, click **Start**.
Buttons or switches that you press on a unit appear in this **Typeface**.	Press the **On** switch.
Code and output messages appear in this `typeface`.	`All results OK`
Text you must type exactly as shown appears in this **`typeface`**.	Type: **`a:\set.exe`** in the dialog box.
Variables appear in this *typeface*.	Type the new *hostname*.
Book references appear in this *typeface*.	Refer to *Newton's Telecom Dictionary*
A vertical bar | means "or": only one option can appear in a single command.	`platform [a|b|e]`
Square brackets [ ] indicate an optional argument.	`login [platform name]`
Slanted brackets < > group required arguments.	`<password>`

Table 3 Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive key strokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Table 4 Symbol conventions

	This symbol represents a general hazard.
	This symbol represents a risk of electrical shock.
	NOTE: This symbol represents a Note indicating related information or tip.

Table 5 Safety definitions

	**WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	**CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

FST-2802 TestPad Overview

1

This chapter provides a general description of the FST-2802 TestPad. Topics discussed in this chapter are as follows:

– “About the FST-2802 TestPad” on page 2
– “What’s new” on page 2
– “Features and capabilities” on page 3
– “Configurations and options” on page 6
– “Accessories” on page 8
– “Exploring the FST-2802” on page 15
– “Powering the TestPad” on page 20
– “Navigating the user interface” on page 21

About the FST-2802 TestPad

The FST-2802 TestPad Gigabit Ethernet Services Module is the ideal telecommunications solution for testing and verifying Ethernet and Fibre Channel network elements and services. The FST-2802 is optimized for field use because it is portable and easy-to-use. As a member of the Acterna TestPad 2000 family of products, the FST-2802 has an easy-to-use touch screen user interface that simplifies test setup and reduces test configuration time. The “smart tester” icon-driven interface is easy to learn, and the large display provides ample space for viewing test results.

The following items ship with the FST-2802:

- FST-2802 application module—The application module connects to the UIM, allowing you to test 1G Ethernet links. Options are available which enable you to test 10BaseT/100BaseT Ethernet, 1G Fibre Channel, and 2G Fibre Channel links. You can also purchase the optional dual port configuration to generate and analyze Ethernet or Fibre Channel traffic from two ports simultaneously.
- Y cable—The Y cable connects to the USB/Serial port, enabling you to connect USB and serial devices to the FST-2802.
- User documentation—The FST-2802 ships with a User’s Guide and a comprehensive help system.

Before testing, the FST-2802 must be connected to a FST-2000 user interface module (UIM), which can be ordered separately (part number 2000-V6). The UIM ships with a VGA display, a battery, and an AC adapter, which you use to supply power to the TestPad.

What’s new

The FST-2802 is a significant enhancement over previous TestPads. The primary changes are as follows:

- BER testing—You can now use the FST-2802 to verify circuit performance by sending BER patterns over switched (layer 2) and unswitched (layer 1) networks.

- 1G and 2G Fibre Channel testing—1G and 2G Fibre Channel options are now available for the FST-2802 which enable you to test and verify Fibre Channel network elements and services by testing connectivity, measuring service disruption time and round trip delay, and transmitting patterns to stress the jitter and noise characteristics of Fibre Channel network elements and systems.
- Dual port configuration—An optional dual port configuration is now available which allows you to generate and analyze Ethernet or Fibre Channel traffic from two ports simultaneously.
- THRU mode for 10/100 Ethernet testing—If you purchase the optional dual port configuration and the 10/100 option, you can now monitor 10/100 traffic in THRU mode.
- Optional single-mode and multi-mode GigE and Fibre Channel GBICs—You can now test Fibre Channel (and GigE Ethernet) on an optical link using a single-mode or multi-mode GigE and Fibre Channel GBIC.
- Optional copper GigE GBIC—You can now test 1G Ethernet on a copper link using a copper GBIC.
- Optional single-mode long-haul GBIC—You can now test 1G Ethernet over very long distances using a long-haul GBIC.

Features and capabilities

The FST-2802 provides you with the tools you need to provision Ethernet or Fibre Channel service, verify end-to-end connectivity, and analyze link performance by simulating different traffic conditions.

Features and capabilities of the FST-2802 include the following:

- Traffic generation—Using the FST-2802, you can generate frames and configure traffic parameters such as bandwidth utilization, frame length, and frame rate. You can simulate different network traffic conditions and analyze the performance of a link by configuring traffic loads for constant, bursty, and ramped traffic.
- Filtered traffic—Using the FST-2802, you can filter received traffic by defining a profile which specifies the frame characteristics of the traffic you want to monitor.

- Link status—Using the easy-to-interpret LEDs on the FST-2802, you can obtain a quick summary of the state of the link you are analyzing. The LEDs indicate the status of the link or a specific traffic stream, allowing you to quickly verify circuit integrity or identify the source of a problem.
- Verify end-to-end connectivity—Using the FST-2802, you can ensure physical layer integrity and verify end-to-end connectivity of a circuit.
- Link utilization and throughput verification—Using the FST-2802, you can generate traffic at a specific bandwidth to verify the error free throughput of a link. The FST-2802 allows you to loopback frames at the far end to qualify the link in both directions.
- Identify problems with faulty interfaces—Using the FST-2802, you can perform basic troubleshooting of links and verify the capability of network elements to support reliable communications by transmitting standard frames over a circuit.
- Round trip delay measurement—Using the FST-2802, you can verify that a link complies with round trip delay requirements as specified in a customer's service level agreement. You can also ensure frame loss and frame error statistics fall within the range specified as acceptable.
- Service disruption time measurement—Using the FST-2802, you can measure the amount of time it takes to switch service to a protect line.
- Pattern transmission—Using the FST-2802, you can stress the jitter and noise characteristics of Gigabit Ethernet and Fibre Channel components and systems on physical layer networks by transmitting continuous random test patterns (CRPAT), continuous jitter test patterns (CJPAT), and the compliant supply noise pattern (CSPAT).

Ethernet features

In addition to the standard features, the following features are available when performing Ethernet tests using the FST-2802:

- Auto-negotiation—You can configure auto-negotiation before establishing the link, which ensures compatibility between the FST-2802 and any installed Ethernet interface.

– Frame verification—You can verify that the size and format of Ethernet frames conforms to IEEE 802.3 or DIX (Digital/Intel/Xerox) requirements, ensuring the capability of network elements to support reliable communications.
– Jumbo frames—You can optionally transmit jumbo frames which exceed the IEEE 802.3 maximum length of 1518 bytes.
– Loopback frame generation—You can generate loopback frames to loop up a second FST-2802 at the far end. This feature allows you to leave one FST-2802 at a central location to measure bi-directional throughput.
– IP Ping testing—You can send ping requests and respond to ping messages from another Ethernet device to verify connectivity.
– RFC 2544 script—You can run a script which automates the test procedures recommended in RFC 2544. The script prompts you to select key parameters for each of the tests, runs the tests, and then automatically generates a text file of results for the tests.
– User-assigned source MAC address—You can optionally change the default MAC address assigned to each port of the FST-2802 when you configure tests.

Fibre Channel features

In addition to the standard features, the following features are available when performing Fibre Channel tests using the FST-2802:

– Frame verification—You can verify that the size and format of Fibre Channel frames conforms to ANSI X3T11 requirements, ensuring the capability of network elements to support reliable communications.
– Loopback testing—You can generate loopback frames to loop up a second FST-2802 at the far end. This feature allows you to leave one FST-2802 at a central location to measure bi-directional throughput.

FST-2000 TestPad features

The FST-2802 uses the Acterna FST-2000 TestPad Version 6 User Interface Module (UIM), which runs under the Windows XP operating system. The FST-2000 provides a variety of connectivity tools which make installation and troubleshooting more efficient. Options and accessories are also available which allow you to establish network connections to the TestPad, use the TestPad to access a local Web browser, or emulate a VT-100 terminal. Standard features of the FST-2000 include:

– Print capability—You can print test configurations and test results using the FST-2802. You can generate a print file at timed intervals or whenever a test ends. You can also manually print test configurations, test results, and histograms at any time, and you can encrypt print file data to ensure the integrity of the data transmitted to your supervisor or Technical Support department.
– Email test configurations and test results—If you purchase the Networking option, you can email test configurations and test results to your supervisor directly from the FST-2802.
– View Portable Document Format (PDF) files—You can launch and view PDFs on the FST-2802.
– Command line remote control—You can configure the FST-2802 and perform tests from a remote PC or laptop by issuing remote control commands.
– Remote GUI—If you purchase the Networking option, you can use the Remote GUI to run the TestPad GUI from any remote device with a Web browser, such as a PC or laptop. When viewing the GUI from a remote device, you can configure and perform tests, view test results, and do anything you could do using the FST-2802 itself.
– VNC Viewer—You can launch the Virtual Network Computing (VNC) viewer to run remote applications from the FST-2802.
– FTP—If you purchase the Networking option, you can use FTP to transfer files to and from the FST-2802.
– FST-2802 Help—You can display FST-2802 Help which includes detailed instructions for configuring and performing tests, comprehensive result descriptions, and a glossary of terms.

Configurations and options

When you order a FST-2802, you order a single or dual port configuration which allows you to test 1G Ethernet. You can also expand your testing capabilities by purchasing optional interfaces for the FST-2802, including a 10/100 BaseT Ethernet interface, a 1G Fibre Channel interface, and a 2G Fibre Channel interface. Options are also available for the FST-2000 which allow you to launch a Web browser, emulate a VT-100 terminal, run the GUI from a remote device, or automate tests using test scripts.

Table 1 lists the FST-2802 configurations.

Table 1 FST-2802 configurations

Configuration	Part Number	Allows you to test:
Single port	2802-GIGE	1G Ethernet using one GBIC port.
Dual port	2802-DUAL	1G Ethernet using two GBIC ports.

FST-2802 options

The FST-2802 offers the following application module options:

– 10/100 interface (part number 2802-FE)—Using this option, you can test 10BaseT and 100BaseTX links. If you purchase the optional dual-port configuration, you can transmit and analyze 10/100 and/or 1G Ethernet traffic from both ports simultaneously.

– 1G Fibre Channel interface (part number 2802-1G-FC)—Using this option, you can test 1G Fibre Channel network elements and services. If you purchase the optional dual-port configuration and 2G Fibre Channel interface, you can transmit and analyze 1G and/or 2G Fibre Channel traffic from both ports simultaneously.

– 2G Fibre Channel interface (part number 2802-2G-FC)—Using this option, you can test 2G Fibre Channel network elements and services. If you purchase the optional dual-port configuration and 1G Fibre Channel interface, you can transmit and analyze 1G and/or 2G Fibre Channel traffic from both ports simultaneously.

– VLAN Tagging (part number 2802-VLAN)—Using this option, the FST-2802 can transmit VLAN (virtual LAN) tagged frames, enabling you to verify that an Ethernet link supports VLAN tagging. The FST-2802 can also analyze received traffic to verify that the required bandwidth is allocated to tagged frames on a link and determine that VLAN prioritization is functioning properly.

– Layer 2 IP Address Filter (part number 2802-IP FILTER)—Using this option, you can monitor Ethernet traffic for IP addresses, and view filtered layer 2 link statistics for a selected IP address.

FST-2000 TestPad options

The features provided by FST-2000 TestPad options are available for any application module you attach to the TestPad.

The FST-2000 TestPad offers the following options:

- Web browser (part number 2000-WEB)—Using this option, you can launch a Web browser on the FST-2802 to access information on the Internet or your company's intranet.
- VT100 emulation (part number 2000-VT100)—Using this option, the FST-2802 can emulate a VT100 terminal. This option includes a DB-9 Female to DB-9 Male cable, enabling you to establish a serial connection for VT100 emulation.
- Scripting (part number 2000-SCR)—Using this option, you can write your own test scripts using the Tcl/Tk scripting language to automate and standardize your testing processes.
- Networking (part number 2000-NET)—Using this option, you can establish network connections to the FST-2802 for a variety of applications.

Accessories

You can also purchase accessories for the FST-2802 such as GBICS for testing GigE Ethernet and Fibre Channel links, card and cables for establishing remote connections, and printers. To order accessories for the FST-2802, contact Acterna Customer Care.

GBIC accessories

Table 2 lists the GBICs available for testing GigE Ethernet and Fibre Channel links. Please consult your GBIC manufacturer's data sheet for detailed specifications.

Table 2 GBIC accessories

Accessory	Part Number	Used to…
Multi-mode GigE GBIC	AC-GBIC-SX	Test 1G Ethernet on optical links over distances up to: – 275 meters with 62.5µm multi-mode fiber – 550 meters with 50µm multi-mode fiber **NOTE:** This GBIC is not recommended for use with 10µm single-mode fiber.
Single-mode GigE GBIC	AC-GBIC-LX	Test 1G Ethernet on optical links over distances up to: – 275 meters with 62.5µm multi-mode fiber – 550 meters with 50µm multi-mode fiber – 10,000 meters with 10µm single-mode fiber **NOTE:** This GBIC is not recommended for use with multi-mode fiber.

Table 2 GBIC accessories

Accessory	Part Number	Used to…
Multi-mode GigE and Fibre Channel GBIC	AC-GBIC-ALLRATE-SX	Test 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel on optical links over distances up to: **1G Ethernet** – 275 meters with 62.5µm multi-mode fiber – 550 meters with 50µm multi-mode fiber **1G Fibre Channel** – 300 meters with 62.5µm multi-mode fiber – 550 meters with 50µm multi-mode fiber **2G Fibre Channel** – 150 meters with 62.5µm multi-mode fiber – 300 meters with 50µm multi-mode fiber **NOTE:** This GBIC is not recommended for use with 10µm single-mode fiber.

Table 2 GBIC accessories

Accessory	Part Number	Used to…
Single-mode GigE and Fibre Channel GBIC	AC-GBIC-ALLRATE-LX	Test 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel over distances up to: **1G Ethernet** – 275 meters with 62.5μm multi-mode fiber – 550 meters with 50μm multi-mode fiber **1G Fibre Channel** – 300 meters with 62.5μm multi-mode fiber – 550 meters with 50μm multi-mode fiber **2G Fibre Channel** – 225 meters with 62.5μm multi-mode fiber – 225 meters with 50μm multi-mode fiber – 10,000 meters with 10μm single-mode fiber
Copper GigE GBIC	AC-GBIC-COPPER	Test 1G Ethernet on copper links over distances up to 100 meters. **NOTE:** This copper GBIC (AC-GBIC-COPPER) does not support auto-negotiation; therefore, the FST-2802's link partner must also use a copper GBIC that does not support auto-negotiation.
Single-mode Long-haul GigE GBIC	AC-GBIC-LONGHAUL	Test 1G Ethernet over distances up to 80 kilometers on optical links. **NOTE:** This GBIC is not recommended for use with multi-mode fiber.

NOTE:

The optional SX, LX, and copper GBICs offered by Acterna as accessories comply with the Revision 5.5 GBIC specification. The long-haul GBIC complies with the Revision 5.4 GBIC specification. Please refer to your GBIC manufacturer’s site for detailed specifications.

Connectivity accessories

Table 3 lists the accessories available for establishing remote connections.

Table 3 Connectivity accessories

Accessory	Part Number	Used to…
DB-9 Female to DB-9 Female null modem cable	CB-014491	Connect a laptop to the serial connector of the Y cable. Typically used for remote control command operation.
Serial PCMCIA card	2000-SERIAL	Provide a second serial connection to the TestPad. This allows you to connect two serial devices to the TestPad—one to the serial connector of the Y cable, and one to the connector provided on the serial PCMCIA card.
Analog dial-up modem PCMCIA card	2000-ANLG-MODEM	Establish an analog dial-up connection to the TestPad. Ships with an RJ-11 phone cable.
RJ-11 phone cable (replacement)	CB-834011	Connect an Analog Dial-Up Modem PCMCIA card to a phone jack.

Table 3 Connectivity accessories (Continued)

Accessory	Part Number	Used to…
Ethernet 10/100 Base-T LAN PCM-CIA card	2000-LAN	Establish an Ethernet connection from the TestPad to a laptop or LAN. – Ships with an Ethernet LAN cable for LAN connections (replacement cables can be ordered if necessary). – Laptop connections require an Ethernet cross-over cable (part number CB-834251).
Ethernet Type III LAN PCMCIA card	2000-LAN-TYPE3	Establish an Ethernet connection from the TestPad to a laptop or LAN. – Ships with a 6 ft. Ethernet LAN extension cable for LAN connections (replacement cables can be ordered if necessary). – Laptop connections require an Ethernet cross-over cable (Part number: CB-834251).
Ethernet LAN cable (replacement)	CB-016267	Connect an Ethernet PCM-CIA card in the TestPad to an Ethernet jack.
802.11b Wireless LAN PCMCIA card	2000-WLAN	Establish an 802.11 wireless connection to the TestPad.
Bluetooth Wireless PCMCIA card	2000-BT-MODEM	Establish a Bluetooth wireless connection to the TestPad.
USB Direct Connect cable	CB-18944	Establish a direct USB connection from the TestPad to a laptop via the USB connector on the Y cable.

Table 3 Connectivity accessories (Continued)

Accessory	Part Number	Used to…
Ethernet cross-over cable (6 ft.)	CB-834251	Connect a PCMCIA Ethernet card in the TestPad to a laptop.
Y cable (replacement)	CB-45570	Connect to the USB/Serial port, enabling you to connect serial and USB devices to the TestPad.

Print accessories

Table 4 lists the available print accessories.

Table 4 Print accessories

Accessory	Part Number	Used to…
Serial Printer	PR-40B	Print test configurations, test results, and histograms from the TestPad. – Requires DB-9 Female to DB-9 Male cable (part number: CB-018179) to connect to the TestPad.
DB-9 Female to DB-9 Male cable	CB-018179	Connect a PR-40B printer to the serial connector of the Y cable.
DB-9 Female to DB-25 Male Cable	CB-45766	Connect a PR-40A printer to the serial connector of the Y cable. NOTE: The PR-40A printer is no longer available for purchase.

Table 4 Print accessories (Continued)

Accessory	Part Number	Used to…
USB Printer	2000-USB-PRINTER	Print test configurations, test results, and histograms from the TestPad. The USB Printer connects to the USB connector on the Y cable via a cable (supplied with the printer).

Additional accessories

Table 5 lists additional accessories available for the FST-2802.

Table 5 Additional accessories

Accessory	Part Number	Connects to…
USB Portable Keyboard	2000-USB-KEYBRD	The USB connector of the Y cable.
USB Mouse	2000-USB-MOUSE	The USB connector of the Y cable.
USB Hub	2000-USB-HUB	The USB connector of the Y cable. Connecting a USB hub enables you to connect multiple USB devices to the TestPad simultaneously.
2.5mm Headset	2000-HEADSET	The Headset jack on the bottom panel of the Test-Pad.
ATA PCMCIA Storage Card	2000-STORAGE	The top or bottom PCMCIA card slot on the TestPad.

Exploring the FST-2802

The following sections introduce you to the top, bottom, front, and LED display panels of the FST-2802.

Top panel

The top panel provides the USB/Serial port, dual PCMCIA card slot, RJ-45 connector(s) for 10/100 Ethernet testing, and GBIC port(s) for 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel testing. Figure 1 illustrates the single port configuration with one RJ-45 connector and one GBIC port (outlined in grey).

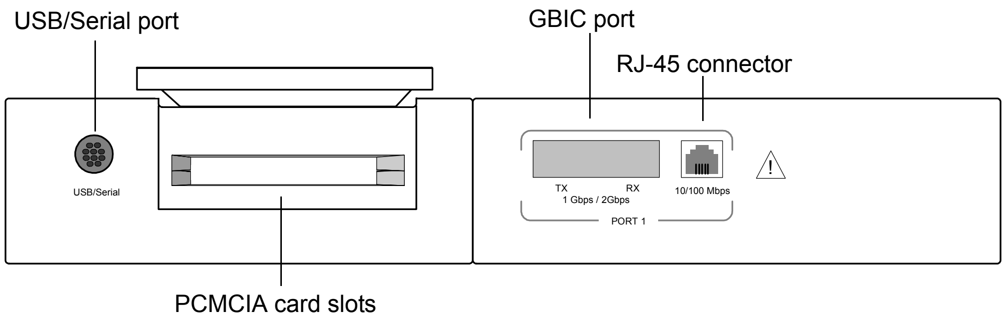


Figure 1 FST-2802 top panel (single port configuration)

If you purchase the dual port configuration (see Figure 2), a second RJ-45 connector and GBIC port is available. The Port 1 GBIC port and RJ-45 connector are outlined on the unit in grey; the Port 2 GBIC port and RJ-45 connector are outlined on the unit in blue.

> **NOTE:**
>
> You can easily determine which port is currently selected by looking at the buttons on the main screen. When Port 1 is selected, the buttons on the main screen are grey. When Port 2 is selected, the buttons are blue.

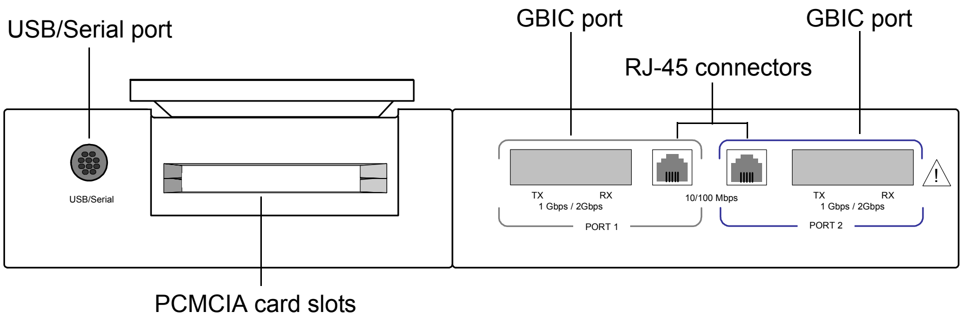


Figure 2 FST-2802 top panel (dual port configuration)

USB/Serial port

The USB/Serial port provides a 10-pin connector for the Y cable. By attaching the Y cable shipped with the FST-2802 (see Figure 3), you can connect serial devices such as a printer, laptop, or PC, and USB devices, such as a keyboard, mouse, printer, or hub to the TestPad. The serial connector of the Y cable is configured as a Data Terminal Equipment (DTE) connector; the USB port is configured as a USB host.

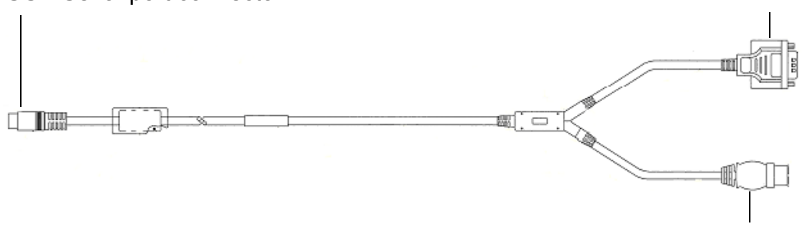


Figure 3 Y cable

To connect serial and USB devices to the TestPad, first connect the Y cable to the TestPad. If you are connecting USB devices such as a mouse, keyboard, hub, or printer, you connect the device directly to the USB connector of the Y cable. If you are connecting a serial device, you connect an intermediate cable to the Y cable, and then connect the other end of the cable to the device.

For descriptions of each of the intermediate cables, see Table 3 on page 12 and Table 4 on page 14.

PCMCIA card slots

Two PCMCIA card slots are provided on the TestPad. PCMCIA cards are available for the TestPad which allow you to establish modem, wireless, Ethernet, or serial connections to the TestPad and store test configurations, test results, and print files.

Ethernet LAN, Ethernet cross-over, and some serial cables are also attached to associated PCMCIA cards which are inserted in the Test-Pad.

For descriptions of each of the connectivity cards offered as an accessory by Acterna, see Table 3 on page 12.

Bottom panel

The bottom panel provides the battery access panel, headset jack, DC IN jack (used with the AC adapter to power the TestPad), and the power switch. See Figure 4.

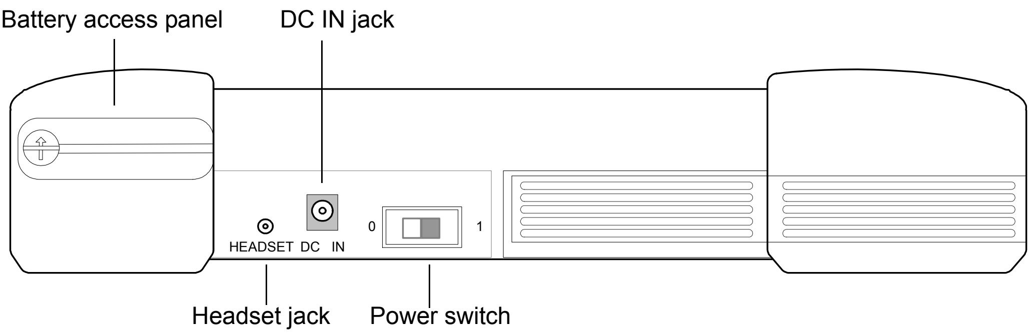


Figure 4 FST-2802 bottom panel

Front panel

The front panel provides a touch-sensitive LCD screen that displays the user interface. The user interface allows you to set up the TestPad, configure tests, and display test results (see "Navigating the user interface" on page 21). The power LEDs, status LEDs, speaker, and microphone are also located on the front panel. See Figure 5.

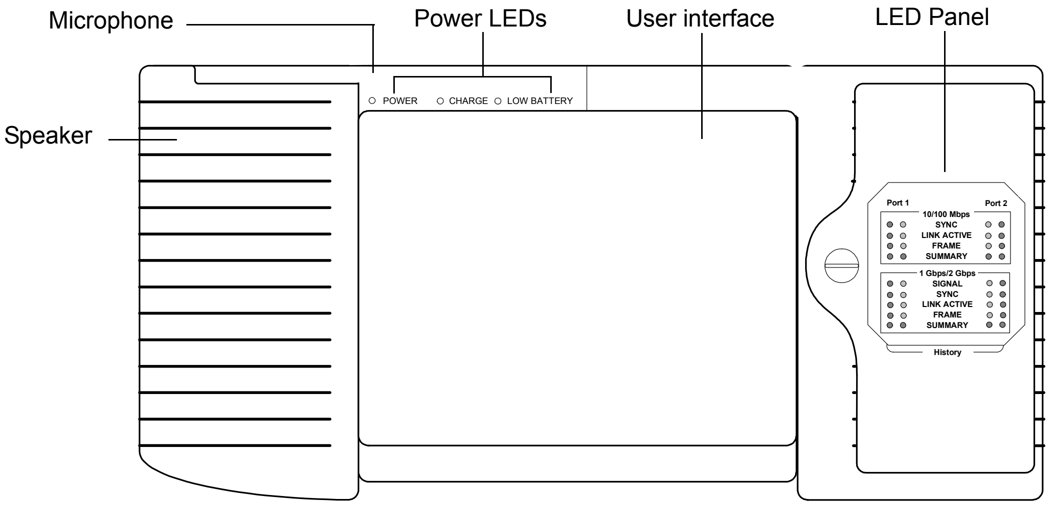


Figure 5 FST-2802 front panel

LED display panel

The LED display panel provides current and historical Status and Alarm LEDs for each port. The inside column of LEDs indicates the current condition or state of the link; the outside column of LEDs indicates the historical condition of the link. See Figure 6.

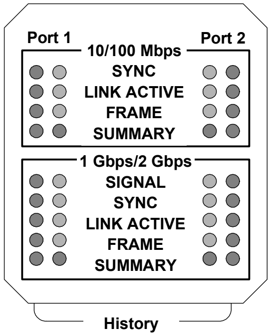


Figure 6 LED display panel

For a detailed description of each LED, see Chapter 7 “Test Results”.

Powering the TestPad

Power is supplied to the FST-2802 by the battery or the AC power adapter. To supply power using the adapter, plug the adapter into the DC IN jack located on the bottom panel of the FST-2802. For power specifications see “Electrical specifications” on page 247.

WARNING:

RISK OF DAMAGE TO UNIT. Do not use the adapter supplied with the Acterna FST-2000 User Interface Module (UIM) with older UIMs labeled TTC 2000 or TestPad 2000. Do not use the adapter supplied with older UIMs with the Acterna FST-2000 UIM.

To power the TestPad

– Turn the power switch to the ON position.

The Power LED, located on the front panel, illuminates green when the TestPad is powered.

Navigating the user interface

The user interface lets you set up the TestPad, configure tests, and display test results. The touch-sensitive screen is divided into separate areas for TestPad set up, test configuration, and test results.

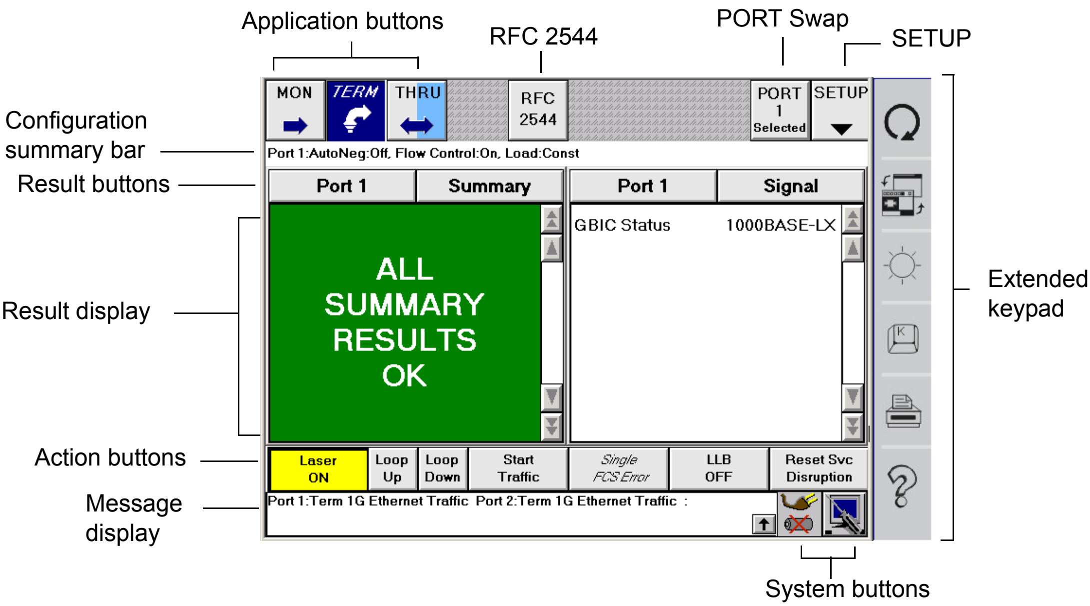


Figure 7 FST-2802 dual port user interface

NOTE:

We recommend using the stylus supplied with the TestPad to activate functions on the touch-sensitive screen.

Application buttons

The application buttons, located on the upper-left corner of the interface, provide quick access to each test for the currently selected port. The buttons are organized by operating mode (MON, TERM, and for dual port units, THRU), rate and protocol (for example, 1G Ethernet), and then test.

RFC 2544 button

The RFC 2544 button runs a script which automates the Ethernet test procedures recommended in RFC 2544. The script prompts you for key parameters, runs the tests, and then automatically generates a text file of results for the tests.

Port Swap button

If you have a dual port FST-2802, the Port Swap button toggles between Port 1 (grey) and Port 2 (blue), and allows you to select a port before choosing a test application, configuring a test, or performing an action (such as turning the laser on).

The default port is Port 1. When Port 1 is selected, the buttons on the main screen are grey, and “Port 1 Selected” appears on the button. When Port 2 is selected, the buttons are blue, and “Port 2 Selected” appears on the button. The THRU button for dual port units is always blue and grey, since thru mode applies to both ports.

The Port Swap button does not appear on the single port user interface.

SETUP button

The SETUP button provides access to the tabs used to configure your tests. After you select the port and application for a test, you select the Setup button to configure the test. For details on configuring a test, see “Step 1: Configuring a test” on page 94.

Configuration summary bar

The configuration summary bar displays the application selected for each port. For example, if you select and configure a 1G Ethernet traffic generation test on Port 1, and a 1G Ethernet pattern test application on Port 2, the following information appears in the configuration summary bar:

```
PORT 1:Term 1G Ethernet Traffic  Port 2:Term 1G
Ethernet Pattern Test
```

Result buttons

In each result pane there is a Result Group and Result Category button. The Result Group button allows you to set the port for the results; the Result Category button allows you to set the results category. By selecting a different port or category for each pane, you can view two sets of results at the same time.

Result display

The test results for the TestPad appear in the result display.

Action buttons

The action buttons are located above the message display. The action buttons perform additional functions specific to the application you specified for the currently selected port. A different set of action buttons appears each time you select a mode of operation. For example, if you configure a port for a 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel test, the Laser On/Off action button appears, enabling you to turn the laser on and off. The buttons may or may not be active depending on the application you select.

Message display

The message display shows the operating mode, protocol, rate, status, and current events for each active port. For example, the message display might display a confirmation message informing you that a TestPad on the far end of a circuit is in loopback mode.

– To view historical messages, select the up arrow in the message display. The Message History Pane appears, listing up to ten historical messages.
– To close the pane and return to the main screen, select the down arrow.

System buttons

Two system buttons are located to the right of the message display.

Tools button

Selecting the Tools button displays the Tools menu which lists the commands in Table 6.

Table 6 Tools menu commands

Command…	Used to…
Programs	Access a variety of applications, such as the On-screen Keyboard, PDF Viewer, and VNC Viewer. If you purchase the Web browser or VT-100 emulation options, the associated applications are also listed as menu commands.
TestPad Settings	Specify screen saver, brightness, speaker, and date and time settings.
Connectivity	Specify parameters for printer, network, Serial Remote Command Line, and Remote GUI connections.
File Management	Access the File Management dialog box to manage files and transfer files to and from the TestPad using FTP.
FST-2802 Settings	Access the FST-2802 revision information and load upgrades and options. You can also reset the FST-2802 by clearing NOVRAM and returning the unit to factory default settings.
Print Management	Set up and schedule print events, create headings for print output, and print test configurations, test results, and histograms.
Store/Recall Setups	Access the Saved Setups dialog box. Using the options on the screen, you can store test configurations. After you store a configuration, you can recall and load the configuration to automatically configure a test.
AutoMATE	If you purchase the scripting option, access the automated test scripts you develop using Tcl/Tk.
Help	Launch FST-2802 Help.
Restart Port 1	Restart the test on Port 1.
Restart Port 2	Restart the test on Port 2.

Table 6 Tools menu commands (Continued)

Command…	Used to…
Restart Both Ports	Restart tests on Port 1 and Port 2. **NOTE:** You can also restart tests on both ports using the Test Restart button on the Extended Keypad.

Power Status button

The Power Status button displays current battery strength by bar graph and percentage and indicates whether the TestPad is powered using an AC power adapter.

Extended Keypad

The Extended Keypad is located to the right of the touch-sensitive screen. The keys are used to initiate specific operations on the TestPad (such as a test restart or screen toggle), launch the on-screen keyboard or online help, or access dialog boxes to control the brightness of the screen and to set up print events. Table 7 describes the function of each key.

Table 7 Extended Keypad keys

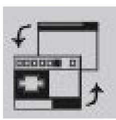
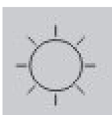
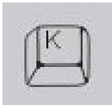
Icon	Description
	Restart—Press this key to restart the tests on each active port simultaneously. When you restart a test, the TestPad resets the current test result totals and clears any errors and/or alarms. **NOTE:** If you want to restart a test on a specific port, select **Tools > Restart Port 1 or Tools > Restart Port 2**.
	Toggle Screen—Press this key to toggle between applications. For example, if you launched the Web browser, press this key to toggle between the TestPad user interface and the browser.
	Brightness—Press this key to access the Screen Brightness tab.

Table 7 Extended Keypad keys (Continued)

Icon	Description
	Keyboard—Press this key to launch the on-screen keyboard.
	Printer Setup—Displays a series of tabs which allow you to schedule or generate print output on the TestPad.
	Help—Launches FST-2802 Help.

NOTE:

When you use the Remote GUI, you can use the Tools menu to access each of the commands associated with the Extended Keypad keys.

Basic Operations

2

This chapter provides step-by-step instructions for each of the basic operations you can perform using the FST-2802. Topics discussed in this chapter are as follows:

– “Connecting and swapping application modules” on page 28
– “Maintaining the battery” on page 30
– “Connecting a USB device” on page 33
– “Setting up the FST-2802” on page 34
– “Defining the Custom result category” on page 45
– “Restoring factory defaults” on page 46
– “Printing test configurations, test results, and histograms” on page 47
– “Using the on-screen keyboard” on page 61
– “Sending e-mail” on page 62
– “Launching Adobe Acrobat Reader” on page 66
– “Launching the VNC Viewer” on page 67
– “Launching the Web browser” on page 68
– “Emulating a VT100 terminal” on page 69
– “Using the Remote GUI” on page 69
– “Managing files” on page 71

Connecting and swapping application modules

Connecting an application module involves holding it at a slight angle to the UIM, inserting the UIM into the application module slot, gently rotating the application module into a parallel position with the UIM, and then sliding the application module into the UIM.

Swapping application modules involves turning the TestPad off, disconnecting the attached application module from the UIM, and then attaching the new application module to the UIM.

NOTE:

FST-2802's which are compatible with the Version 6 UIM are identified with a "Version 6 Compatible" label on the back of the application module.

FST-2802 application modules running software version 3.0 and higher require a Version 6 or higher UIM. If you connect a FST-2802 application module running software version 3.0 or higher to an older UIM, a message will appear on the user interface instructing you to remove the application module and attach it to a newer UIM.

To connect or swap application modules

1. If an application module is connected to the UIM and the TestPad is on, turn off the TestPad.
2. If you are swapping application modules, turn the screw on the front of the application module counter-clockwise to release the application module; otherwise, proceed to step 4.
3. Disconnect the application module from the UIM by slowly pulling the two modules apart, and then gently rotating the right side of the UIM into an upwards position.
4. On the back of the application module you are about to connect, verify that the following labels appear (indicating that the application module is compatible with a Version 6 or higher UIM):
   – If you are connecting a FST-2802, verify that a label appears stating "Version 6 Compatible".
   – If you are connecting any other application module, verify that a label appears stating "FST-2000 INTEROPERABLE".

5 While holding the application module at a slight angle (see Figure 8), insert the bottom right corner of the UIM no more than 1/4 inch into the inside bottom edge of the application module slot.

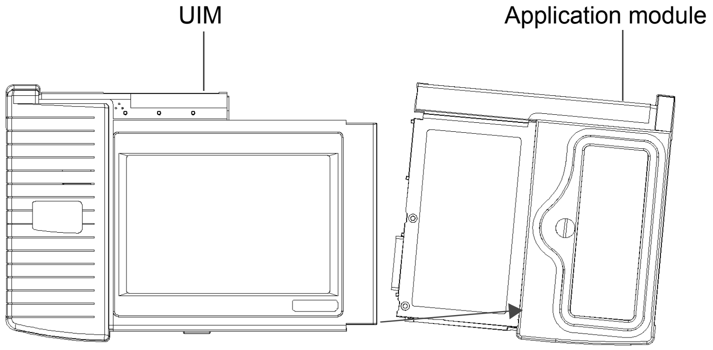


Figure 8 UIM insertion into application module slot

6 Gently rotate the application module into a parallel position with the UIM (see Figure 9 on page 29).

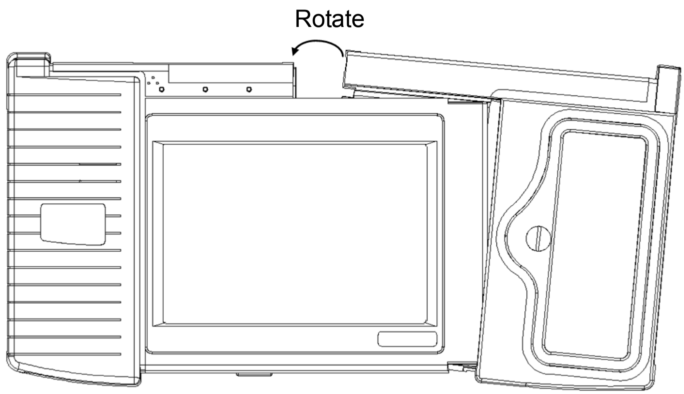


Figure 9 Rotating the application module

CAUTION: DAMAGE TO TESTPAD

If you attempt to connect the UIM and application module at an angle, you may damage the TestPad. Be certain to align the UIM and application module in a parallel position before connecting the modules.

7 Slide the application module into the UIM, keeping the two modules parallel at all times (see Figure 10).

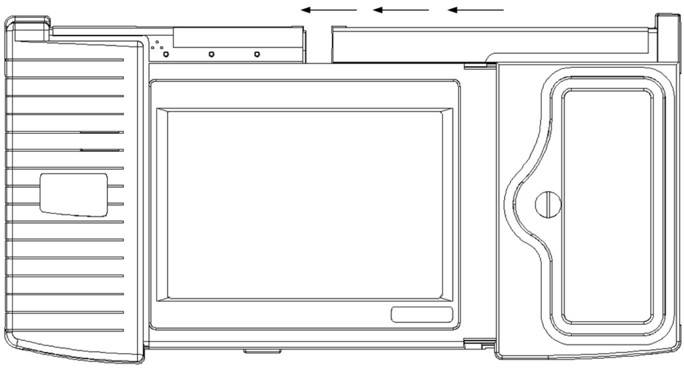


Figure 10 UIM and application module connection

8 Turn the screw clockwise to secure the TestPad.

The TestPad is ready for use.

NOTE:

When you turn the TestPad on for the first time, the UIM and the application module require several minutes to initialize the software. Do not turn the power off during initialization or you may corrupt the files.

Maintaining the battery

The TestPad comes equipped with a rechargeable Nickel-Metal Hydride (NiMH) battery. The battery life of a fully-charged battery varies depending on the type of functions that you are performing.

If the battery is not charged with sufficient capacity to power the TestPad, the TestPad will not completely power up, and the `LOW BATTERY LED` will illuminate. You can power the TestPad and recharge the battery using the supplied AC adapter.

To prolong the life span of the battery, follow the guidelines below:

– Store the battery in a cool, dry, and clean environment. Do not leave the battery in a car or truck, particularly during extremely warm weather.
– Use the AC adapter to power up the TestPad the first time you use the TestPad, or after prolonged storage.
– Before using the battery to power the TestPad, check the battery capacity.
– If the battery capacity is depleted or if the battery has been stored for a prolonged period, use the Acterna battery charger to charge the battery. Do not use an un-approved charger.
– Condition the battery after prolonged storage or 30 cycles of use. To condition the battery, deeply discharge the battery, and then recharge the battery fully three times.
– If the TestPad will not be used for more than a week, remove the battery.
– Do not charge the battery after exposure to extremely hot or cold temperatures.
– If the battery capacity is depleted and you are not ready to recharge the battery, turn the TestPad power OFF.
– Always carry a fully charged spare battery.

Viewing the battery charge status

To view the battery charge status

– Look at the Power Status button on the user interface. The button displays the current battery strength using a bar graph and percentage.

Charging the battery

The Low Battery LED illuminates when the battery is below 25 percent capacity. You can recharge the battery using an AC adapter.

NOTE:

Environmental conditions such as the temperature of the battery may cause the charging process to terminate before the battery is completely recharged. The internal battery charger can operate when the TestPad is on; however, to ensure a complete recharge, turn the TestPad off, remove the AC adapter, and then verify that the battery is cool to the touch before beginning a new charge cycle.

To charge the battery

1. Turn off the TestPad.
2. Verify that the battery is cool to the touch. If the battery is warm, wait for it to cool down before proceeding to step 3.
3. To start a new charge cycle, or to restart a charge cycle that was terminated, do one of the following:
   – If the battery is already in the TestPad, insert or reinsert the AC adapter.
   – If the AC adapter is already plugged in, insert or reinsert the battery into the TestPad.
4. Let the battery charge for up to two hours depending on the current charge state of the battery.

The battery is charged.

Replacing the battery

The following procedure describes how to replace the battery in a TestPad.

CAUTION: DANGER OF EXPLOSION

Risk of explosion if battery is replaced with an incorrect type.

Replace with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions.

NOTE:

The battery can be "hot swapped" which means if AC power is connected, you can replace the battery without affecting the current test.

To replace the battery

1. Turn off the TestPad or connect AC power.
2. Unlock the battery access panel by turning the screw counter-clockwise. See Figure 4 on page 18.
3. Open the battery access panel.
4. Pull the strap to remove the battery.
5. Align the new battery with the terminals facing up and pointing toward the battery compartment.
6. Verify that you can read the terminal markings (-) V D C (+) at the top end of the battery.
7. Slide the new battery into the battery compartment until the terminals click into place.

   The bottom of the battery should be about 0.25 inches (0.635 centimeters) inside the compartment.
8. Close the battery access door, and then lock the door by turning the screw clockwise.
9. If the TestPad is on, you can resume testing. If you turned the TestPad off, turn it on to resume testing.

The battery is replaced.

Connecting a USB device

You can connect a USB keyboard, mouse, or printer to the TestPad. If you want to use more than one USB device simultaneously, you can connect a USB hub to the TestPad, and then connect each device to one of the four ports available on the hub.

To connect a USB device to the TestPad

1. Turn the TestPad power ON.

2 Insert a Y cable into the USB/Serial port. This cable provides a USB connector.

NOTE:

You must connect the Y cable to the USB/Serial port before you connect the keyboard, mouse, printer, or hub cable to the USB connector.

3 Do one of the following:

To…	Do this…
Connect a keyboard or mouse	Insert the keyboard or mouse cable into the USB connector of the Y cable.
Connect a printer	Attach one end of the printer cable (supplied with the printer) to the printer, and then attach the other end to the USB connector of the Y cable.
Connect a USB hub	Attach the hub cable to the USB connector of the Y cable, and then connect the USB devices to the hub.

The USB device is connected.

NOTE:

The TestPad also provides an on-screen keyboard which allows you to type by tapping keys on a keyboard displayed on the touch-sensitive screen. For instructions on using the on-screen keyboard, see "Using the on-screen keyboard" on page 61.

Setting up the FST-2802

Setting up the FST-2802 involves specifying a password for the Remote GUI, and specifying various settings for the TestPad such as the date and time format, screen saver, screen brightness, and speaker volume. It may also involve loading software upgrades and options.

Specifying a Remote GUI password

If you intend to use the Remote GUI to control the TestPad from a remote PC or laptop, you must specify a Remote GUI password to secure access to the TestPad. Each time you initiate a Remote GUI session, you'll be required to enter the password.

The default Remote GUI password is `acterna`.

To specify a Remote GUI password

1 Select **Tools > Connectivity**.
   The Connectivity Menu appears.
2 Select **Remote GUI**.
   The Remote GUI Password dialog box appears.

3 In **Remote GUI Password**, type a password using up to eight characters, and then select **OK**.

The Connectivity Menu appears, and the Remote GUI password is set.

Specifying date and time settings

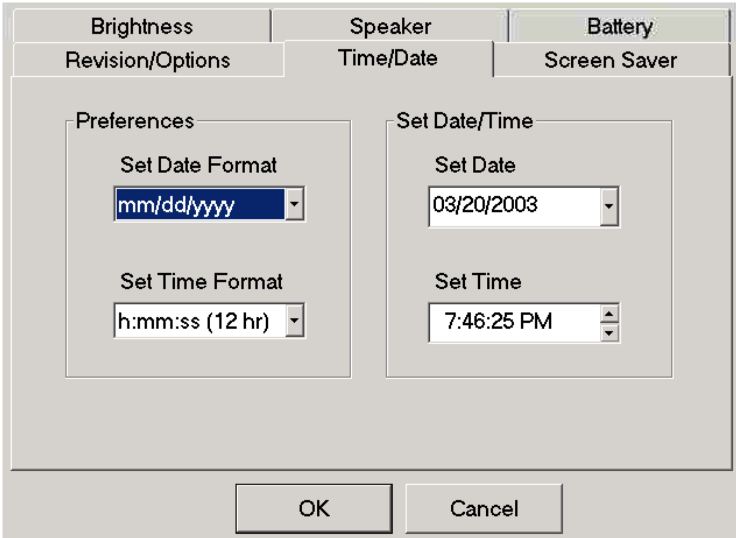
By default, the TestPad presents dates on print files using a standard MM/DD/YYYY format, and time using a standard Hour:Minute:Second format. You can change the date, time, or format at any time.

To specify date and time settings

1 Select **Tools** > **TestPad Settings**.

A series of setup tabs appears.

2 Select **Time/Date**.



3 To specify the settings, do the following:

To…	Do this…
Set the date format	In **Set Date Format**, select a date format.
Set the time format	In **Set Time Format**, select a time format.
Set the date	Select the arrow to the right of the Set Date field. A calendar appears. Do one of the following: – To select a date from the month and year displayed, simply select the date. – To navigate through the calendar to select a date from a different month or year, use the arrows at the top of the calendar to display the month, and then select the date.

To…	Do this…
Set the time	In Set Time, select the hour, minutes, or seconds you want to modify, and then select the up or down arrow to the right of the field to increase or decrease the value in increments of one.

4 Select **OK**.

The date and time settings are specified.

Setting up the screen saver

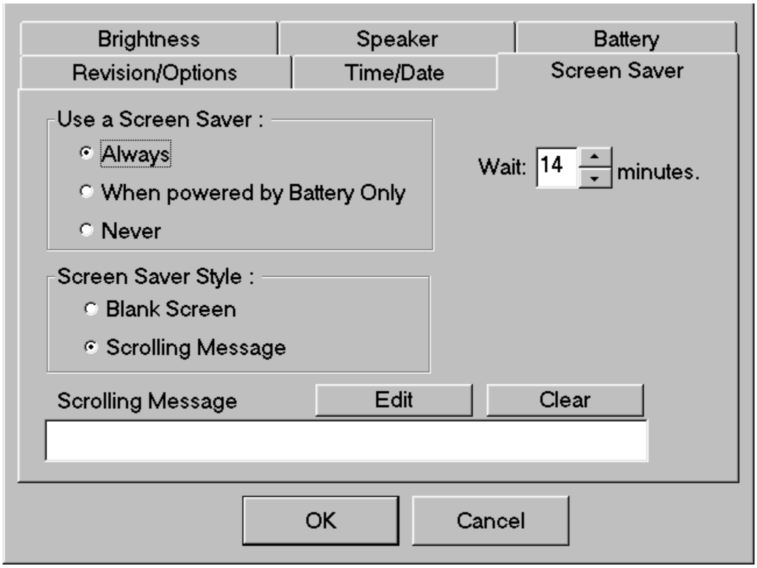
The TestPad is equipped with a screen saver. You can setup the TestPad to use the screen saver, or you can disable the screen saver entirely. If you use the screen saver, you can specify how much time must elapse before the TestPad displays the screen saver, and you can optionally display a blank screen or a scrolling message whenever the screen saver appears.

To set up the screen saver

1 Select **Tools** > **TestPad Settings**.

A series of setup tabs appears.

2 Select **Screen Saver**.



3 If you do not want to use a screen saver, under User a Screen Saver, select **Never**, and then proceed to step 4.

If you do want to use a screen saver, do the following:

a Select an option for Use a Screen Saver.

b Select a screen saver style: Blank Screen or Scrolling Message.

c If you selected Scrolling Message, select **Edit** to display the Enter new message dialog box, and then type the message.

Select **OK** to return to the Screen Saver tab.

d Select the time to elapse before the screen saver appears.

4 Select **OK**.

The screen saver is set up.

Setting the screen brightness

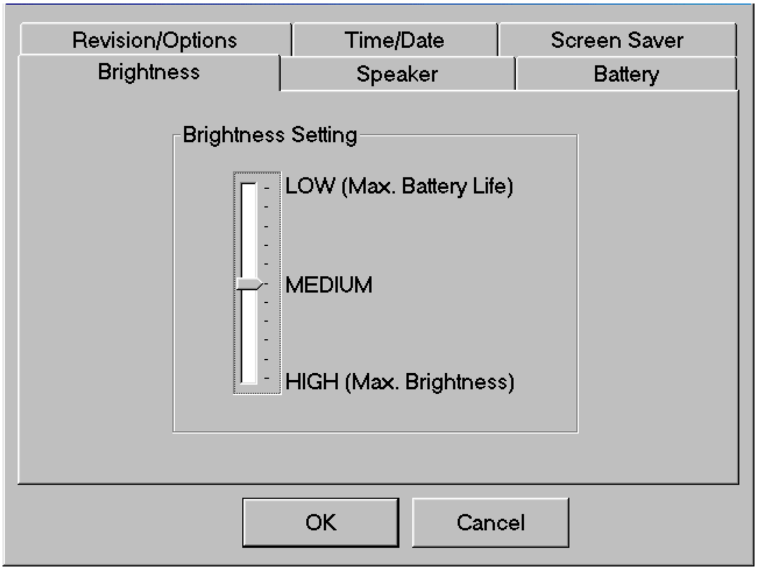
You can control the screen brightness on the TestPad. Higher brightness provides greater clarity when viewing the user interface.

To set the screen brightness

1 Select **Tools** > **TestPad Settings**.

A series of setup tabs appears.

2 Select **Brightness**.



3 Under Brightness Setting, drag the pointer to the level of brightness you want to use for the screen.

4 Select **OK**.

The screen brightness is set.

Specifying speaker settings

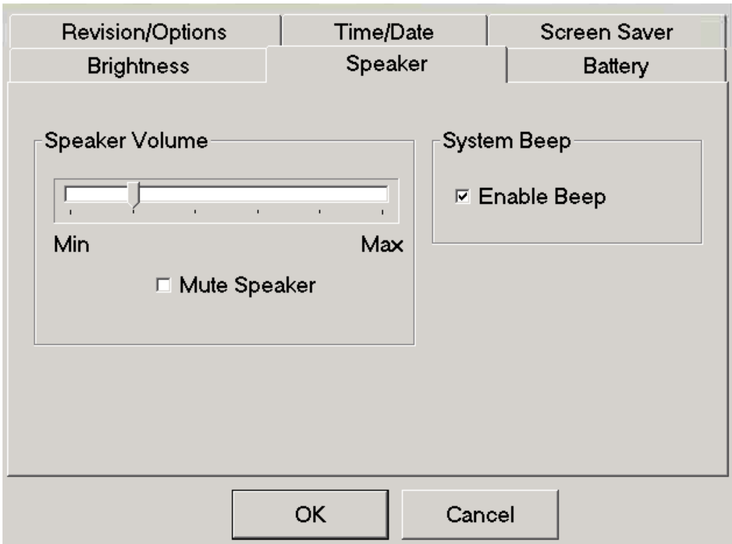
You can control the speaker volume on the TestPad or mute the speaker entirely. You can also setup the TestPad to beep whenever you insert or remove a PCMCIA card or whenever you select a button on the user interface.

To specify speaker settings

1 Select **Tools** > **TestPad Settings**.

A series of setup tabs appears.

2 Select **Speaker**.



3 To control the speaker's volume, do one of the following:

– If you want to adjust the speaker volume, under Speaker Volume, drag the pointer to the level of volume you want the speaker to use.

– If you want to mute the speaker volume entirely, select **Mute Speaker**.

4 To set up the TestPad to beep whenever you insert or remove a PCMCIA card or select a button on the user interface, select **Enable Beep**.

5 Select **OK**.

The speaker settings are specified.

Loading options and software upgrades

If you purchase options or obtain an FST-2802 or UIM software upgrade, you receive a PCMCIA card with the software for the options or upgrade. Loading options or FST-2802 software upgrades involves inserting the PCMCIA card into a PCMCIA card slot, loading the software, and then waiting for the TestPad to reboot. Loading options is typically a quick process; loading an FST-2802 software upgrade takes longer.

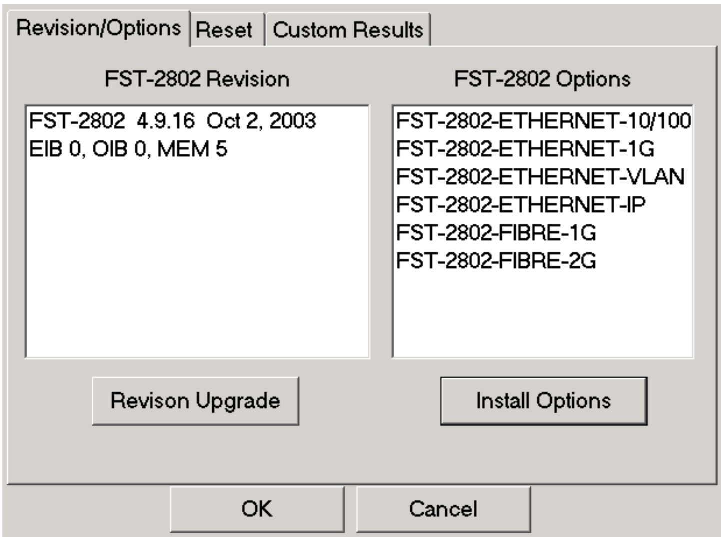
For instructions on loading UIM software upgrades, refer to the upgrade instructions provided with the upgrade card.

Loading options

You can load options from a single PCMCIA card or from two separate PCMCIA cards simultaneously.

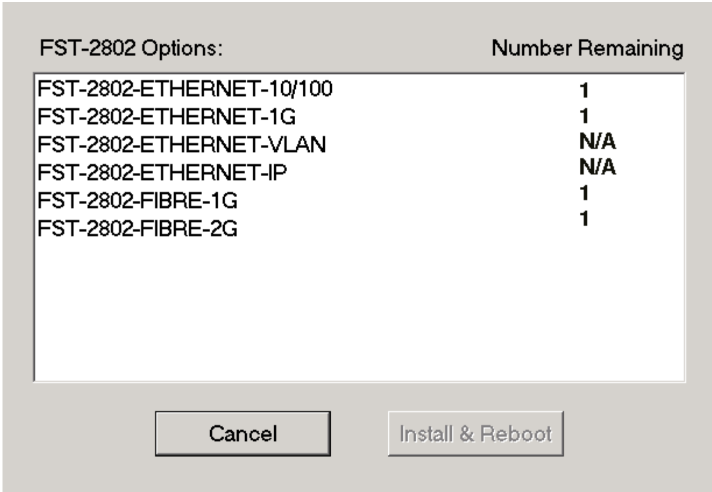
To load options

1. Insert the PCMCIA card or cards with the options in a PCMCIA card slot.
2. Select the **Tools** button, and then do one of the following:
   - To load UIM options, select **TestPad Settings**, and then select the **Revisions/Options** tab.
   - To load FST-2802 settings, select **FST-2802 Settings**. The Revisions/Options tab appears.

   Currently installed options on the TestPad appear under TestPad Options or FST-2802 Options.
3. Select **Install Options**.

The Options Installation dialog box appears, listing the options available on the PCMCIA card (or cards).



NOTE:

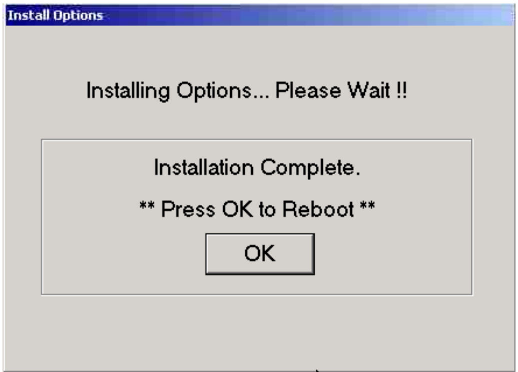
If you inserted two PCMCIA optioning cards into the TestPad, and both cards include the same option, the option appears twice in the list of options.

The Number Remaining field indicates the remaining copies of the option which are available for installation. Each time you install an option, the TestPad decreases the number remaining by one.

4 Select the option or options you want to install.

5 Select **Install & Reboot**.

The TestPad installs the options, and then the Install Options dialog box appears.



6 Select **OK** to acknowledge the message.

The TestPad reboots and the options are available.

Loading an FST-2802 software upgrade

Before you load an FST-2802 software upgrade, you must power the TestPad using an AC adapter. We also recommend using a battery charged to at least 50 percent capacity as a backup power supply.

If you insert a PCMCIA card into the TestPad with an FST-2802 software upgrade before you turn the TestPad on, the TestPad automatically detects a new version of the software when it boots up and asks if you want to upgrade the software.

Loading the upgrade typically takes about forty-five minutes.

> **CAUTION: DAMAGE TO TESTPAD**
>
> When you load a software upgrade, the TestPad deletes all existing application module software, automatically reboots, and then loads the upgrade. Therefore, if power is interrupted during the course of the upgrade, the TestPad may require factory service to operate.

To load a software upgrade

1 Insert the software upgrade card into a PCMCIA card slot.

2 Connect the AC adapter to the DC IN jack (located on the bottom panel of the TestPad), and then plug it in to an electrical outlet.

3 Turn the TestPad power ON.

The TestPad displays a series of boot-up messages. When the boot-up is complete, a dialog box appears informing you that a newer version of the application module software has been detected and prompts you to upgrade the software.

4 Select **OK**.

The TestPad displays the following warning:

```
WARNING

DO NOT TURN POWER OFF AT THIS TIME.

Transfer of system files in progress. System may
require factory service if power fails during
transfer.
```

At the bottom of the screen, a box appears which shows the percentage of each file transferred during the upgrade.

> **NOTE:**
>
> Between file transfers, a message appears informing you that the TestPad is preparing the system for another file transfer and advising you to be patient. It may take a couple of minutes for the TestPad to begin transferring the next file.

After the last file is transferred, the TestPad reboots.

The software upgrade is loaded.

> **NOTE:**
>
> If you insert a PCMCIA upgrade card after you turn the TestPad on, you can select **Tools > FST-2802 Settings** to display the Revisions/Options tab, and then select the Revision Upgrade option to load the upgrade.

Defining the Custom result category

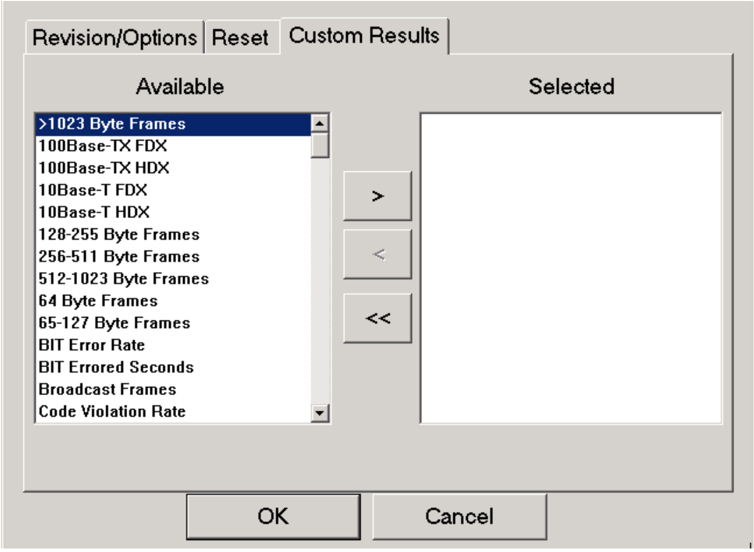
You can define a Custom result category with results from a variety of categories. This allows you to quickly view the results on a single result pane without navigating through each individual category.

To define the Custom result category

1 Select **Tools** > **FST-2802 Settings**.

The Reset tab appears.

2 Select the Custom Results tab.



3 Select the results you want to view in the Custom category from the Available list, and then do one of the following:

– Use the **>** and **<** arrows to move single results between the Available and Selected list boxes.

– Use the **<<** arrows to move all selected results back to the Available list box.

4 Select **OK** to return to the main screen.

Results are selected for the Custom result category.

Restoring factory defaults

You can restore the FST-2802 settings to the factory defaults using the Clear NOVRAM feature. When you clear NOVRAM, the TestPad restores the following settings for each port:

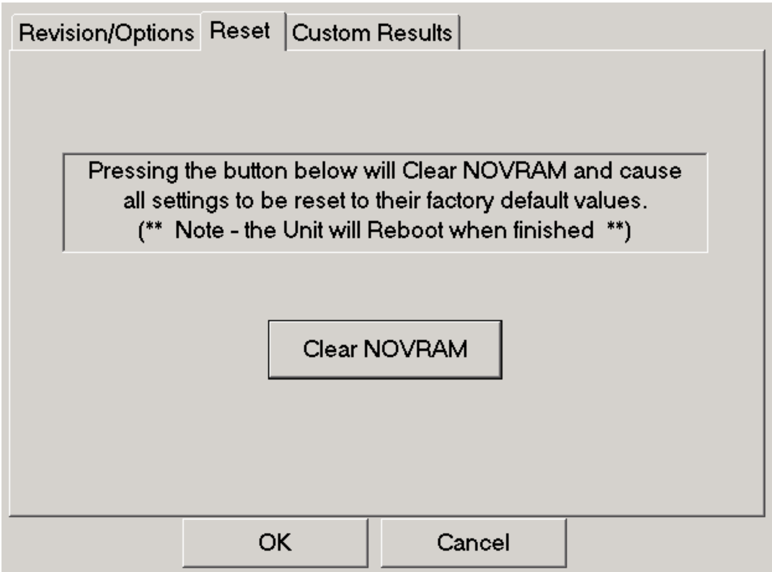
– Test applications. All test applications for the FST-2802 are restored to their default values.

– Print Management settings. The print management settings are restored to their default values.

To restore factory defaults

1 Select **Tools** > **FST-2802 Settings**.

The Reset tab appears.



2 Select **Clear NOVRAM**.

The TestPad restores the FST-2802 settings back to the factory defaults. This typically takes about ten seconds, and then a message appears informing you that the settings are restored.

3 Select **OK** to acknowledge the message.

The TestPad reboots, and the settings are restored.

Printing test configurations, test results, and histograms

You can print test configurations, test results, and histograms from the TestPad. Printing involves connecting a printer, and then specifying print parameters such as the print mode, print type, and print event triggers. If you connected a serial printer, you must also configure the printer.

After you specify the print parameters, you are ready to generate print output. When you generate print output, you can do the following:

– Encrypt the output to ensure the integrity of the data you sent to your supervisor or Technical Support department.
– Send the output directly to a printer.
– Store the output in a file on the TestPad to print at a later time.
– Automatically e-mail the output. For example, if you want your Technical Support department to review your test results, you can set up the TestPad to automatically e-mail the results to the department.

NOTE:

If your FST-2802 has two ports, and both ports are active, the Test-Pad generates output for each active port. For example, if you are testing using both Port 1 and Port 2, print output of test results will list test results for Port 1 first, and then the test results for Port 2.

The following sections introduce you to some basic concepts about printing, and then describe how to connect a printer, configure a serial printer, specify print parameters, and print your print files.

Printing to text files

The first time you generate print output, by default, the TestPad appends the output to the default print file, `default.txt` in the following directory:

`Acterna\Files\FST-2802`

When you specify print parameters for the output, you can do the following:

– You can clear the output in the `default.txt` file, and then repopulate the file with new output.
– You can direct the print output to a new or different `.txt` file.

Encrypting print files

You can optionally encrypt print files by selecting the **Encrypt print file** option on the Print Setup tab. When you generate an encrypted print file, the TestPad creates two files: the standard text (`.txt`) file, and an additional encrypted (`.crp`) file. For example, if you generate a print file named “1GPatt”, the TestPad creates the following files:

– `1GPatt.txt`
– `1GPatt.crp`

Sending an encrypted print file

You can send an encrypted print file to your supervisor or Technical Support department by selecting the option to automatically email the file after it is generated (see “Sending e-mail” on page 62) or using FTP (see “Managing files” on page 71).

The first time you send an encrypted (`.crp`) file to your supervisor or Technical Support department, you need to send the `decrypt.exe` executable which enables them to read the encrypted file. The file is located at:

```
[SYS] Z:/decrypt.exe
```

Reading an encrypted print file

To read an encrypted print file, you must launch `decrypt.exe` using the print filename as a parameter. For example, if the encrypted file’s name is `1GPatt.crp`, use the following command to launch the executable:

```
decrypt.exe 1GPatt.crp
```

The executable converts the encrypted (`.crp`) file to a text (`.txt`) file.

Print modes

Print modes identify the way you want to generate print output: manually, at timed intervals, or when a test ends. You specify the print mode for your print output in the Print Mode field of the Setup tab.

Print types

Print types represent the type of information you want to include in the print output (all test results, test results for a selected group of categories, test configurations, or histograms). When you specify print parameters, you specify the print type for your print output in the Print Type field of the Setup tab.

> **NOTE:**
>
> To print test configurations (controls) and histograms, you must generate print output in manual mode.

Print event triggers

Print event triggers cause the TestPad to generate print output whenever the event (a result change, test restart, or a remote user connects or disconnects to the TestPad) occurs. The event output includes a date and time stamp indicating when the event occurred.

Connecting a printer

The USB/Serial port, located on the top panel, is used to connect the standard Y cable provided with the TestPad. The Y cable provides a USB connector and a serial connector, allowing you to connect a USB printer, such as the 2000-USB-PRINTER, or serial printer, such as the PR-40B to the TestPad.

To connect the printer

1 Turn on the TestPad.

2 Attach the Y cable to the USB/Serial port.

3 Do one of the following:
   - If you are connecting a serial printer, using the supplied printer cable, connect the DB-9 female connector on the printer cable to the serial connector on the Y cable, and then connect the DB-9 male connector on the printer cable to the printer.
   - If you are connecting a USB printer, using the supplied printer cable, connect the cable to the USB connector of the Y cable, and then connect the other end of the printer cable to the printer.

> **NOTE:**
>
> When connecting to the PR-40B serial printer, use the printer cable provided with the printer. Operability of the printer port cannot be guaranteed if you use a cable longer than 3 meters.

By default, the baud rate for the serial printer interface is 9600, and the parity method is none. If you need to change these settings, see "Configuring a serial printer" on page 50.

Configuring a serial printer

Configuring a serial printer involves specifying the printer device, and then specifying the communications parameters, such as the baud rate, data bits, parity, stop bits, and flow control.

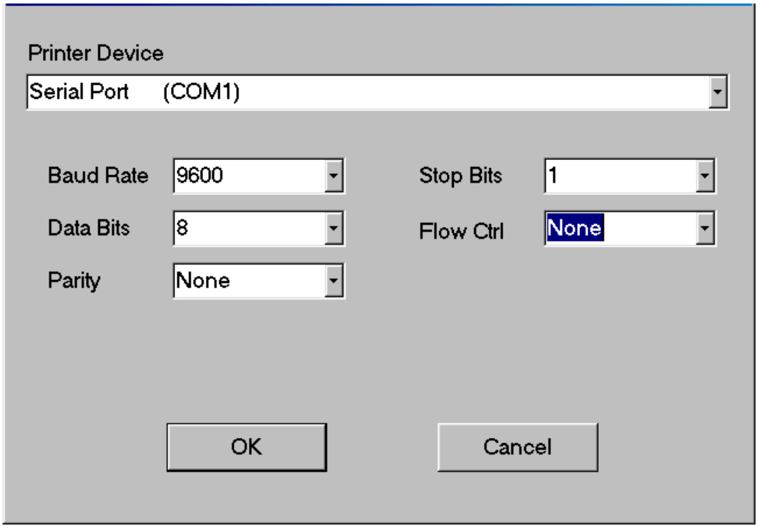
To configure a printer

1 Select **Tools** > **Connectivity**.

   The Connectivity Menu appears.

2 Select **Serial Printer**.

The Printer Configuration dialog box appears.



3 If you have either a serial card or a Y cable connected to the TestPad, the serial printer device available appears automatically under **Serial Printer Device**.

If you have both a serial card and a Y cable connected to the TestPad, under Serial Printer Device, select **Serial Card** to connect via a card, or **Serial Port** to connect via the serial port on the Y cable.

4 Specify the settings for the printer, and then select **OK**. Default values for each of the settings are as follows:

– Baud rate: 9600

– Data bits: eight

– Parity: None

– Stop bits: None

– Flow control: None

The printer is configured.

NOTE:

You can also use the Configure option on the Setup tab to configure a printer when you specify print parameters.

Creating a heading for print output

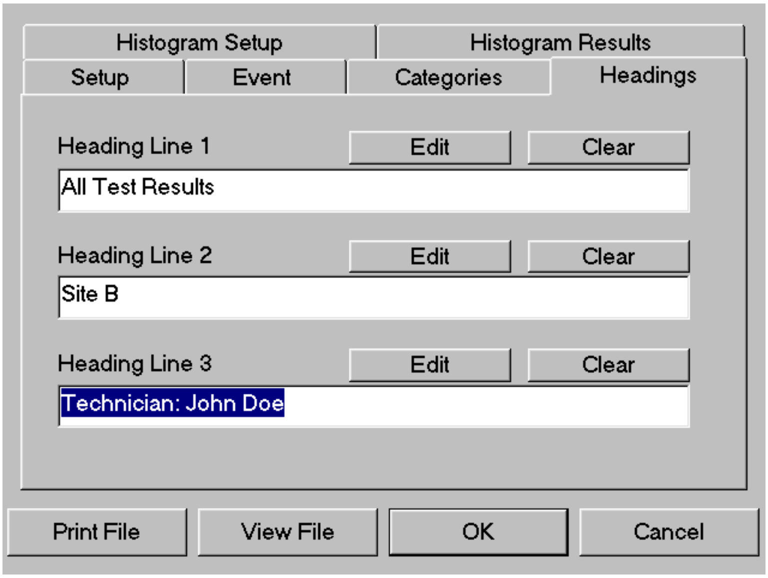
You can create a custom heading for print output. These headings are particularly helpful if you append print output to the same print file each time you print. By defining unique headings for your print output, you can easily identify the output associated with each test.

To create a heading

1. Select **Tools** > **Print Management**.

   A series of print management tabs appear.

2. Select **Headings**.



3. In **Heading Line 1**, type the first heading you want to appear on the print file.

4. If you want a second and third heading, type the headings in the corresponding fields.

5. Select **Setup** to return to the Setup tab, or **OK** to return to the main screen.

The heading is created and will appear above your print output.

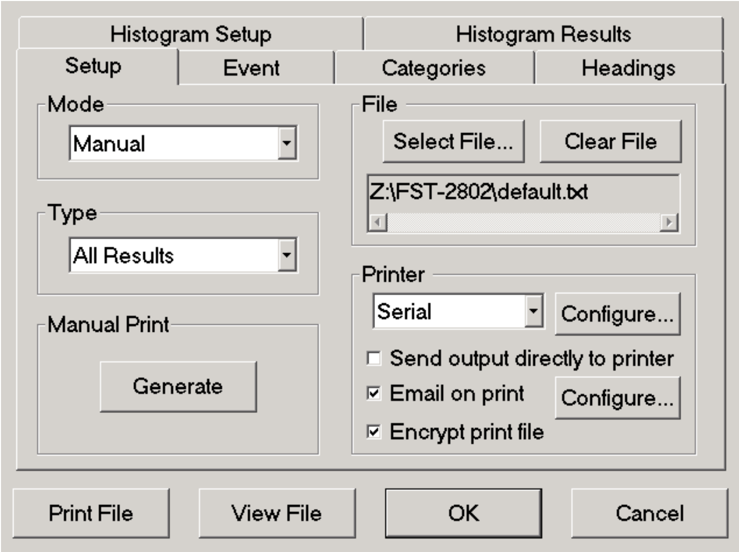
Generating print output

Generating print output involves specifying the print mode, specifying a print type (and defining print type parameters, if necessary), and then selecting the Generate button to generate the print output immediately, or scheduling the TestPad to automatically generate print output.

To generate print output

1 Select **Tools** > **Print Management**.

The Setup tab appears.



2 In Mode, select one of the following print modes:

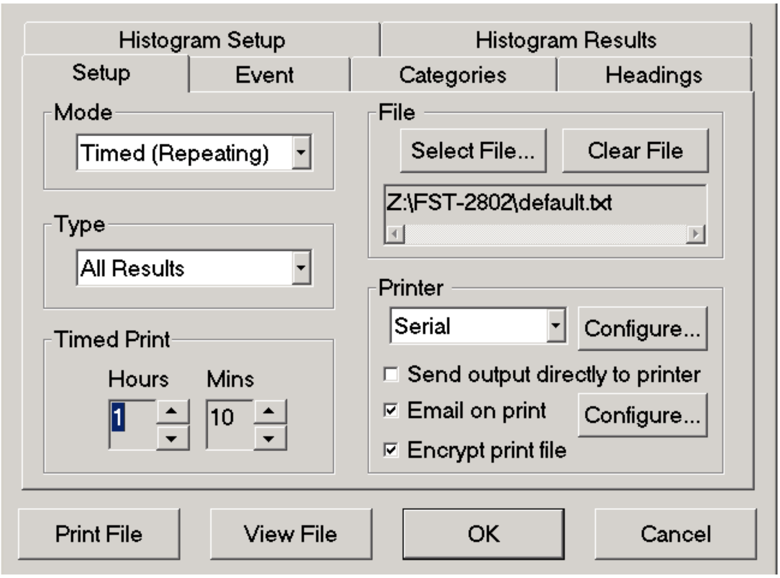
Select	To…
Manual	Manually generate print output. Proceed to step 4.
Timed (Repeating)	Generate print output at regularly scheduled intervals. For example, if you want the TestPad to generate test results output every ten minutes, select the Timed (Repeating) print mode, and then proceed to step 3 to specify the interval between generated print output.

Select	To…
Timed (Test End)	Generate print output whenever a test ends. For example, if you want the TestPad to generate test results output when a test ends in thirty minutes, select the Timed (Test End) print mode, and then proceed to step 3 to specify the amount of time after a test restart (thirty minutes) that will pass before the test ends.

NOTE:

You must select Manual mode to print test configurations (controls) and histograms.

If you selected **Timed (Repeating)** or **Timed (Test End)**, fields appear on the Setup tab which allow you to specify the interval between TestPad generated print output or the amount of time that will pass after a test restart before a test ends.

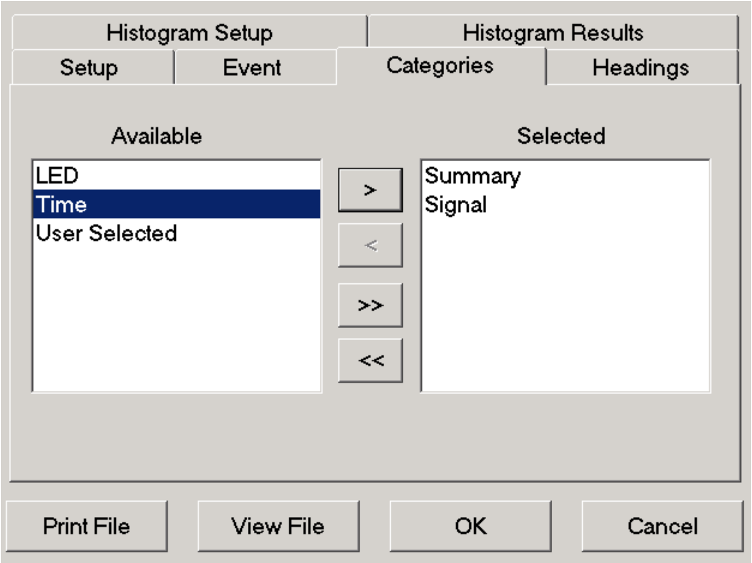


3 In **Hours** and **Mins**, type the hours or minutes, or select the up and down arrows next to the fields to increase or decrease the displayed value.

4 In **Type**, select one of the following print types:

Select…	To…
All Results	Print all test results for a test. Proceed to step 7.
Selected Categories	Print test results for a specific group of categories. Proceed to step 5.
Controls	Print the configuration for a test. Proceed to step 7.
Histogram	Print specific results based upon the histogram configuration. Proceed to step 6.

5 If you chose Selected Categories as the print type in step 4, select the **Categories** tab to choose the categories for the print output, and then do the following:



a To select categories, use the **>** and **<** arrows to move single categories between the Available and Selected list boxes, or use the **>>** and **<<** arrows to move all categories.

b Proceed to step 7.

6 If you selected Histogram as the print type in step 4, see "Setting up a histogram" on page 57 for instructions on setting up histogram output, and then proceed to step 7.

7 *Optional*. If you want the TestPad to generate print output whenever you restart a test, a result changes, or a remote user connects or disconnects to the TestPad, select the **Event** tab, and then select **Test Restart**, **Result Change**, or **Remote User Connect/Disconnect**.

8 Return to the Setup tab.

9 *Optional*. If you want to clear the displayed print file, or direct the print output to a new or different file, do one of the following:

To…	Do this…
Clear the displayed print file, and then repopulate the file with new output	Select **Clear File**.
Direct the print output to a new file	Choose **Select File** to display the File Management dialog box, and then do the following: – Select the **File Name** field. An Acterna keypad appears. – Type the new file name. – Select **OK** to return to the Setup tab.
Direct the print output to a different file	Choose **Select File** to display the File Management dialog box, and then do the following: – Under File Name, select the file you want to direct the output to. – Select **OK** to return to the Setup tab.

10 *Optional*. If you want to send the output directly to a printer, select **Send output directly to a printer**, and then select the printer you want to direct the output to (**Serial** or **USB**).

11 *Optional*. If you want to email the output when it is generated, select **Email on print**. See "Sending e-mail" on page 62 for instructions on sending e-mail from the TestPad.

12 *Optional*. If you want to encrypt the output, select **Encrypt print file**.

13 Select **Generate** or **Print File**.

14 If you want to store the print settings you specified, select **OK** to return to the Main Screen. If you do not want to store the print settings, select **Cancel**.

If you sent the print output directly to a printer, the TestPad prints the output and sends the output to the `.txt` file you specified. If you sent the print output to a file, the output is stored in the `.txt` file to be printed at a later time.

Setting up a histogram

A histogram is print output of test results in a bar graph format. Histograms enable you to quickly identify spikes and patterns of errors over a specific interval of time. Figure 11 shows a sample Histogram printout.

```
Histogram Print
Test Name: Terminate 1G Ethernet PING Test
03/23/2003  07:13:30 PM

Result: FCS Errored Frames
Duration: 0,01:39
                          0    10   20   30   40   50   60   70   80   90   100
                          +----+----+----+----+----+----+----+----+----+----+-+
03/23/2003 07:09:01 PM +                                                      0
03/23/2003 07:12:01 PM +                                                      0
03/23/2003 07:14:52 PM +********                                              16
No more samples available in collection
```

Figure 11 Histogram printout

Each time you run a test, the TestPad automatically accumulates data for a histogram in the histogram buffer. Whenever you start a new test, the histogram buffer clears, and then populates with data from the new test.

You can choose which results to collect for the histogram print output, and when the TestPad will collect the samples. If your FST-2802 has two ports and you are running tests on both ports, the TestPad will create a separate histogram for each test.

To set up histogram print output

1 Select the **Tools** button.

The Tools Menu appears.

2 Select **Print Management**.

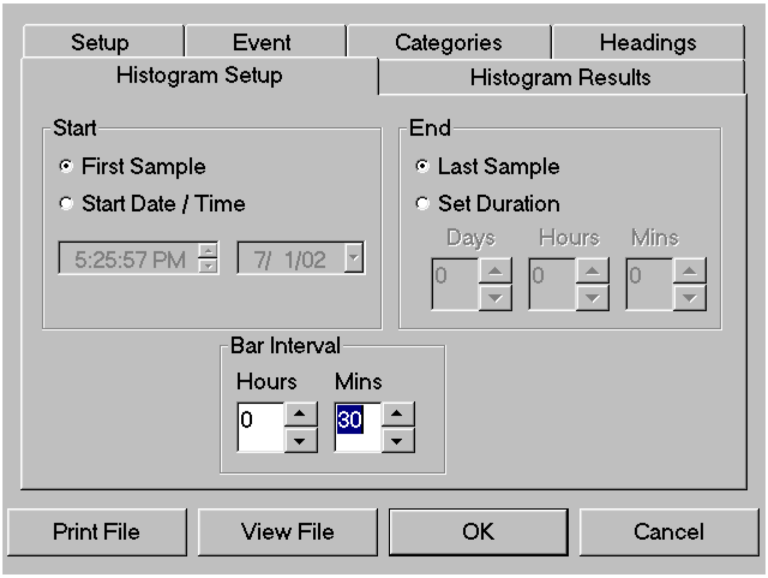
The Setup tab appears.

3 In Mode, select **Manual**.

> **NOTE:**
>
> You cannot print histograms in Timed (Repeating) or Timed (Test End) modes.

4 In Type, select **Histogram**.

5 Select the **Histogram Setup** tab.



6 Under Start, do one of the following:

- Select **First Sample** to select all available data for the print output from the moment the test starts.
- Select **Start Date/Time** to specify the start data and time for data collection for the histogram. If you select this option, you must type the date and time the TestPad will start collecting data in the associated fields.

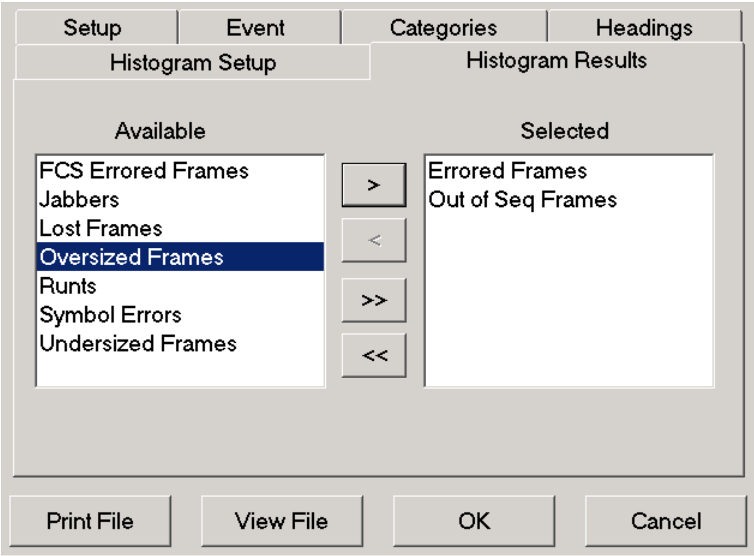
7 Under End, do one of the following:

– Select **Last Sample** to select all available data for the print output from the moment you select **Generate** to generate output for the histogram.

– Select **Set Duration** to specify a duration of time during which the TestPad will collect data for the histogram. If you select this option, you must type the days, hours, and minutes for the duration in the associated fields.

8 Under Bar Interval, type the hours and minutes represented in each histogram bar.

9 Select the **Histogram Results** tab.



10 To select the result categories for the histogram, do one of the following:

a Select the categories you would like to include in the print output. Use the **>** and **<** arrows to move single categories between the Available and Selected list boxes. Use the **>>** and **<<** arrows to move all categories.

b Select **OK**.

NOTE:

The result categories available for a histogram depend on the current test configuration. Each time you configure a test using the same settings, the histogram categories you selected previously for the configuration are automatically available; however, you can edit the categories at any time.

11 In Printer, select the printer you want to direct the histogram output to (**Serial** or **USB**).

12 *Optional*. If you want to send the histogram directly to a printer, select **Send output directly to a printer**.

13 *Optional*. If you want to email the histogram when it is generated, select **Email on print**. See “Sending e-mail” on page 62 for instructions on sending e-mail from the TestPad.

14 Select **Generate** or **Print File**.

If you sent the histogram directly to a printer, the TestPad prints the histogram and sends the output to the `.txt` file you specified. If you sent the histogram to a file, the output is stored in the `.txt` file to be printed at a later time.

Viewing stored print files

You can view stored print files using the View File button on the Setup tab.

NOTE:

You can also view stored print files from the File Management dialog box. See “Viewing, running, deleting, or renaming a file” on page 75.

To view a stored print file

1 Select **Tools > Print Management**.

   The Setup tab appears.

2 Under File, the most recently created print file appears. Do one of the following:

   – To view the displayed print file, proceed to step 3.

   – To view a different print file, choose **Select File**, and then select the print file you want to view.

3 Select **View File**.

The print file appears in the Print Viewer dialog box.

Printing a stored print file

You can print stored print files using the Print File button on the Setup tab.

To print a stored print file

1. Select **Tools** > **Print Management**.

   The Setup tab appears.

2. Under File, the most recently created print file appears. Do one of the following:
   - To print the displayed print file, proceed to step 3.
   - To print a different print file, choose **Select File**, and then select the print file you want to print.

3. Select **Print File**.

The print file is printed.

Using the on-screen keyboard

The FST-2802 provides an on-screen keyboard, which you can use to type information in the active window when you use the Web browser, use the VNC Viewer, or emulate a VT100 terminal using the TestPad.

> **NOTE:**
>
> You do not need to use the on-screen keyboard to type data in the FST-2802 user interface; a virtual keyboard is available whenever typing is required. If you need to type a lot of information, we recommend using a USB keyboard.

To use the on-screen keyboard

1. Press the Keyboard key.

   The on-screen keyboard appears.

2. In the active window, tap the field you need to type in.

3 Tap the keys on the on-screen keyboard to type text in the field. To type a symbol, tap the Shift key. The numeric keys change to symbol keys. Type the symbol. The symbol keys change back to numeric keys. You must tap the Shift key each time you need to type a symbol.

After you launch the on-screen keyboard, you can:

– Move the keyboard to a different location by dragging the title bar.
– Minimize the keyboard.
– Maximize the keyboard by pressing the **Keyboard** key.
– Type all capital letters by first tapping the **Caps Lock** key.

NOTE:

To optimize performance of the TestPad, secondary features of the on-screen keyboard such as online help have been disabled.

Sending e-mail

If you purchased the Networking option, you can send e-mail from the TestPad. Before you send e-mail, you must establish a modem dial-out, modem dial-in, or LAN connection to connect to a Simple Mail Transfer Protocol (SMTP) server.

When you compose e-mail, you can:

– Populate the Address Book with e-mail addresses.
– Type messages.
– Attach print files containing test results, test configurations, or histogram data.

NOTE:

The first time you compose an e-mail on the TestPad, you must specify the address for an SMTP server. Internet Service Providers (ISPs) typically provide an SMTP server. After you specify the SMTP server for the first e-mail, the TestPad stores the server address and provides it automatically each time you compose a new e-mail.

To send an e-mail

1 Establish a modem dial-out, modem dial-in, or LAN connection from the TestPad to a network for Internet access.

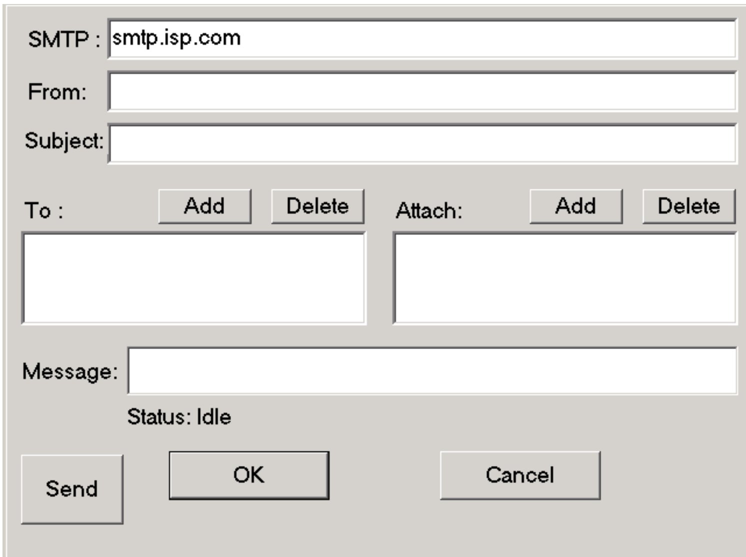
- For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
- For detailed instructions on establishing a modem dial-in connection, see "Establishing modem dial-in connections" on page 85.
- For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.

2 On the TestPad, select the **Tools > Connectivity**.

The Connectivity Menu appears.

3 Select **Email**.

The E-mail dialog box appears.



4 In **SMTP**, type the SMTP server address. The SMTP server address is typically one of the following:

- `smtp.internet provider name.com`
- `smtp.internet provider name.net`

where `internet provider name` represents the name of the company providing your internet service.

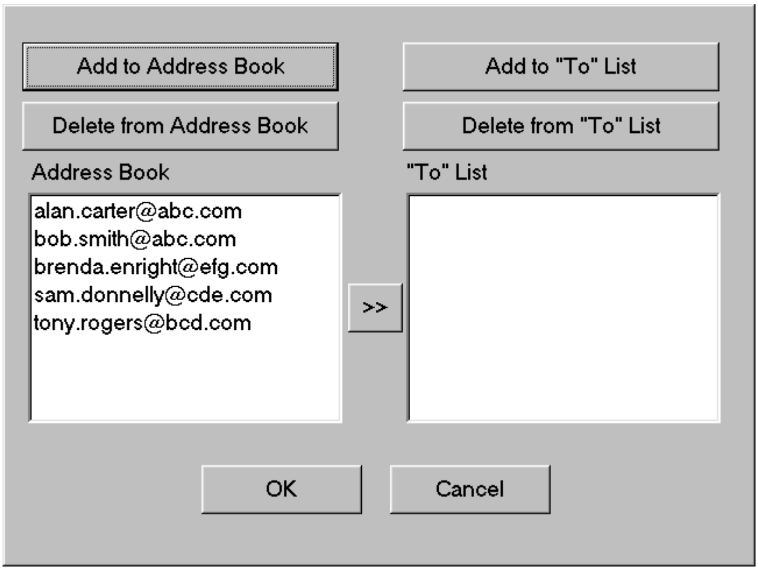
5 In **From**, type the address of an e-mail account you can retrieve messages from.

> **NOTE:**
>
> You can not retrieve and read e-mail messages using the FST-2802 user interface; however, if you purchased the Networking and the Web browser option, you can use the browser to access e-mail from an ISP account.

6 In **Subject**, type the subject of the e-mail.

7 To specify the destination e-mail address, under To:, select **Add**.

The Address Maintenance dialog box appears.



If you added addresses to the Address Book previously, the addresses appear in the Address Book.

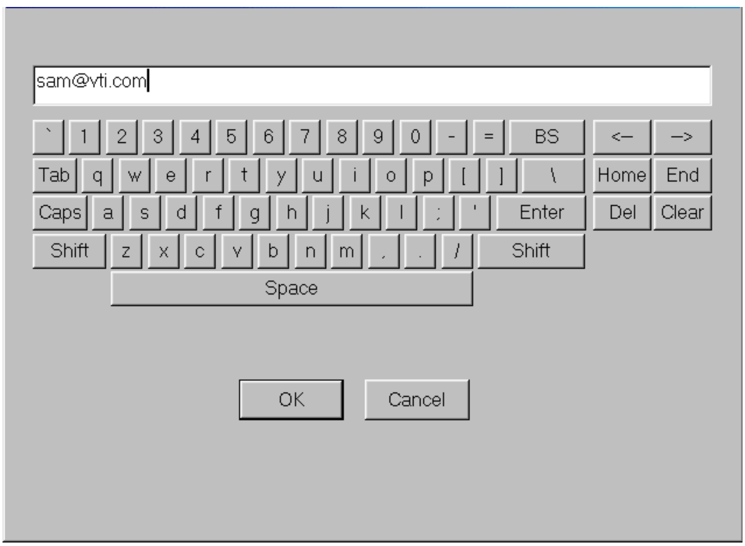
8 Do one of the following:

To…	Do this…
Select an existing address from the address book	– Under Address Book, select the address, and then select **>>** to copy the address to the "To" List. – Proceed to step 10.
Add a new address to the address book	– Select **Add to Address Book**. A keyboard dialog box appears allowing you to type the new address. – Proceed to step 9.
Add a new address without adding it to the address book	– Select **Add to "To" List**. A keyboard dialog box appears allowing you to type the new address. – Proceed to step 9.

9 If you are adding an address, do the following:

a Type the address in the field provided. To type the "@" symbol, select the **Shift** key.

The numeric keys change to symbol keys.



b Select **OK** to return to the Address Maintenance dialog box.

The new address appears in the Address Book or “To” List.

10 Select **OK** to return to the E-mail dialog box.

The To: address is automatically populated.

11 If you want to attach a file to the e-mail, do the following:

a Under Attach, select **Add**.

The Select Attachment dialog box appears.

b Navigate to the file you want to attach, and then select the file.

c Select **OK** to return to the E-mail dialog box.

The file appears in the attached box.

12 In **Message**, type the message to send with the e-mail, using up to 100 characters.

13 Select **Send**.

The TestPad sends the e-mail to the address you specified.

Launching Adobe Acrobat Reader

The FST-2802 provides Adobe Acrobat Reader, which enables you to read `.PDF` files on the TestPad.

To launch Adobe Acrobat Reader

– Select the **Tools > Programs > PDFReader**.

Acrobat Reader is launched.

> **NOTE:**
>
> To optimize performance of the TestPad, secondary features of Acrobat Reader such as online help have been disabled.

Launching the VNC Viewer

If you purchased the Networking option, you can run remote applications from the TestPad using the VNC Viewer.

For example, if you have a laptop in your truck which is running a work order application and a VNC server, and you are using the TestPad to test a circuit, after you complete the test, you can close out the work order from the TestPad without returning to your truck. To close the work order, you do the following:

– Establish an 802.11b or Bluetooth connection from the TestPad to the laptop.

– Launch the VNC Viewer on the TestPad.

– View the laptop's work order application.

– Close the work order.

Before you launch the VNC Viewer, you must first establish a modem dial-out, modem dial-in, or LAN connection to the network or laptop the VNC server is running on.

To launch the VNC Viewer

1 Establish a modem dial-out, modem dial-in, or LAN connection from the TestPad to the network or laptop the server is running on.

- For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
- For detailed instructions on establishing a modem dial-in connection, see "Establishing modem dial-in connections" on page 85.
- For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.

2 Connect a USB keyboard, or press the **Keyboard** key to launch the on-screen keyboard.

3 Select **Tools > Programs > VNC Viewer**.

The Connection Details dialog box appears.

4 In **VNC server**, type the IP address or computer name of the device running the server.

5 If required, log into the server by typing a password.

The desktop for the device running the VNC server appears.

> **NOTE:**
>
> To optimize performance of the TestPad, secondary features of the VNC Viewer such as online help have been disabled.

Launching the Web browser

If you purchased the Networking and Web browser options, you can launch a Web browser from the FST-2802. You can use the Web browser to view and retrieve intranet or Internet content (such as methods and procedures or engineering records) and configure network equipment.

Before you launch the Web browser, you must first establish a modem dial-out or LAN connection to a network.

To launch the Web browser

1. Establish a modem dial-out or LAN connection.
   - For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
   - For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.
2. Connect a USB keyboard, or press the **Keyboard** key to launch the on-screen keyboard.
3. Select **Tools > Programs > Web browser**.

   The Internet Explorer browser appears.
4. Verify your browser connection by typing the address for the site you want to access. If the browser displays the site, the connection is established.

> **NOTE:**
>
> To optimize performance of the TestPad, secondary features of the Web browser such as online help have been disabled.

Emulating a VT100 terminal

If you purchased the VT100 option, the FST-2802 can emulate a VT100 terminal. When you use the TestPad to emulate a VT100 terminal, the TestPad launches a HyperTerminal session. You can use the session to retrieve performance information from network elements and configure the elements.

Before starting VT100 emulation, you must first establish a serial connection to the network element.

To emulate a VT100 terminal

1. Establish a serial connection. For detailed instructions on establishing a serial connection, see "Establishing serial connections" on page 81.
2. Press the **Keyboard** key to launch the on-screen keyboard.
3. Select **Tools > Programs > VT100**.

   The HyperTerminal session window appears.
4. The menu for the network element appears after a few seconds. Verify that you can retrieve information from the network element.
5. Use the menu selections to retrieve performance information or configure the element.
6. Select **File > Exit** to end the HyperTerminal session.

> **NOTE:**
>
> To optimize performance of the TestPad, secondary HyperTerminal features such as the ability to add a printer and online help have been disabled.

Using the Remote GUI

If you purchased the Networking option, you can run the TestPad remotely from any device with a Web browser using a VNC session. You can use the Remote GUI to perform any of the tests available for the FST-2802.

When you set up the TestPad, you should specify a Remote GUI password to restrict remote access to the TestPad. For detailed instructions, see "Specifying a Remote GUI password" on page 35.

Before you run the Remote GUI, the TestPad must be connected to the network your PC or laptop is connected to via a modem dial-in, modem dial-out, or LAN connection, or locally via a USB connection. You also need the IP address or computer name of the TestPad.

Determining the TestPad's IP address or computer name

To determine the TestPad's IP address or computer name

1. On the TestPad, select **Tools** > **Connectivity**.

   The Connectivity Menu appears.

2. Select the Network Info tab.

The TestPad's IP address and computer name appear.

Running the Remote GUI

To run the Remote GUI

1. Establish a network connection to the TestPad.
   - For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
   - For detailed instructions on establishing a modem dial-in connection, see "Establishing modem dial-in connections" on page 85.
   - For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.
2. From the laptop or PC, launch a Web browser.
3. Type the following address:

   `http://ip address:5800`

   Where `ip address` is the IP address of the TestPad.

   A dialog box appears prompting you to enter the Remote GUI password.

4. Type the Remote GUI password, and then select **OK**.

   The Remote GUI for the TestPad appears on your screen.

5 Verify the connection for the Remote GUI by doing the following:

- Using the Remote GUI, change the default configuration for the TestPad.
- Verify the configuration settings in the configuration summary bar of the Remote GUI.

6 To use the Remote GUI:

- Use your mouse to select the elements on the GUI that you would typically "tap" on the TestPad. For example, if you want to select the Setup button to configure a test, using your mouse, simply click the Setup button on the Remote GUI.
- To access the Extended Keys for the TestPad, select the **Tools** button at the bottom right corner of the main screen to display the Tools menu, and then select the command that corresponds to the Extended key on the TestPad.

You are running the Remote GUI.

NOTE:

If you are running the RFC 2544 script from a Remote GUI session, you must use the Windows Task Manager to run the script. See "Running the script from a Remote GUI session" on page 169 for detailed instructions.

Managing files

You can view, run, delete, rename, copy, and paste files (for example, print files and test scripts) on the TestPad from the File Management dialog box. For example, you can rename print files, copy print files to a PCMCIA card, or delete print files. If you establish a network connection, you can also transfer files to and from local drives and FTP servers.

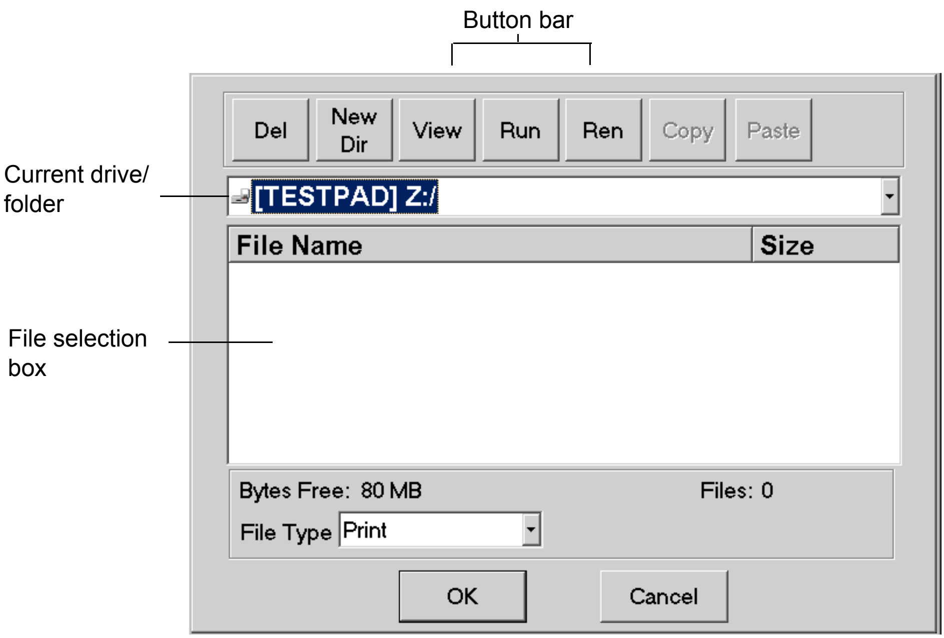
Selecting files

Before you view, run, rename, copy, or delete a file, you must first select the file.

To select a file

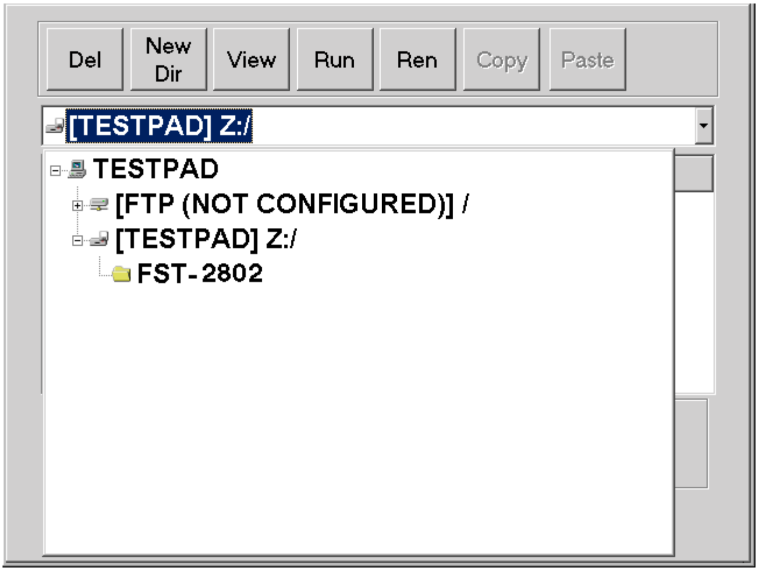
1 Select **Tools > File Management**.

The File Management dialog box appears with the local drive for the TestPad displayed as the current drive.



2 To navigate to the file, select the Current Drive/Folder drop-down arrow.

A drop-down list of drives and folders appears under the current drive/folder.



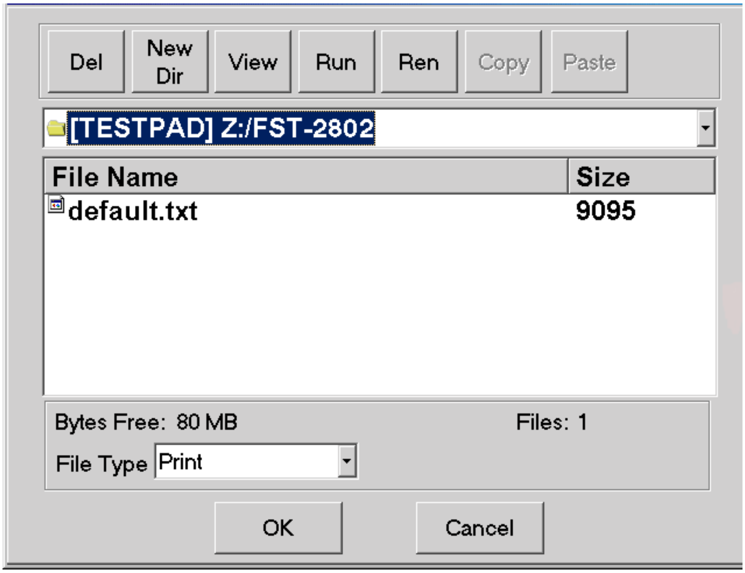
3 Do the following:

a Select + to expand a drive or folder.

b Tap or click the folder to select the folder with the file.

c Tap or click the Current Drive/Folder drop-down arrow to select the drive and folder and close the drop-down list.

The drop-down list of drives and folders disappears, the selected folder appears in the Current Drive/Folder field, and the files in the folder appear in the File Selection box.



4 Select a file from the File Selection box.

The file is selected.

Filtering files

You can filter the files in the File Selection box to display only specific types of files, such as print files or test scripts.

NOTE:

The print files you generate and store on the TestPad are stored as text (`.txt`) files.

To filter the displayed files

– Select the File Type drop-down arrow, and then select **Print**, **Scripts** or **All**.

Viewing, running, deleting, or renaming a file

After you select a file, you can view, run, delete, or rename the file.

To view, run, delete, or rename a file

1. Select **Tools > File Management**.

   The File Management dialog box appears.

2. Navigate to and select the file.
3. Do one of the following:
   - To view or run the file, select the corresponding button on the button bar.
   - To delete the file, select **Del**. When prompted to confirm the deletion, respond with **OK**.
   - To rename the file, select **Ren**, type the new name, and then select **OK**.

Copying and pasting files

You can copy and paste files on the TestPad to any of the available drives listed on the File Management dialog box, including PCMCIA drives and the FTP drive (which you map to an FTP server). If you want to transfer files to and from an FTP server, you must first establish a network connection, and then log in to the server.

To copy and paste files

1. Navigate to and select the drive and folder with the file you want to copy.
2. If you selected the FTP drive, log into the FTP server (see "Connecting to an FTP server" on page 76); otherwise, go to step 3.
3. Select the file, and then choose **Copy**.
4. Navigate to the folder you want to paste the file to.
5. If you are copying the file to a folder on the FTP server, log into the FTP server.
6. Select **Paste**.

The file is pasted.

Connecting to an FTP server

Before you connect to an FTP server from the TestPad, you must establish a modem dial-out, modem dial-in, or LAN connection. After you establish a network connection, you connect to an FTP server by selecting the FTP drive in the File Management dialog box.

To connect to an FTP site

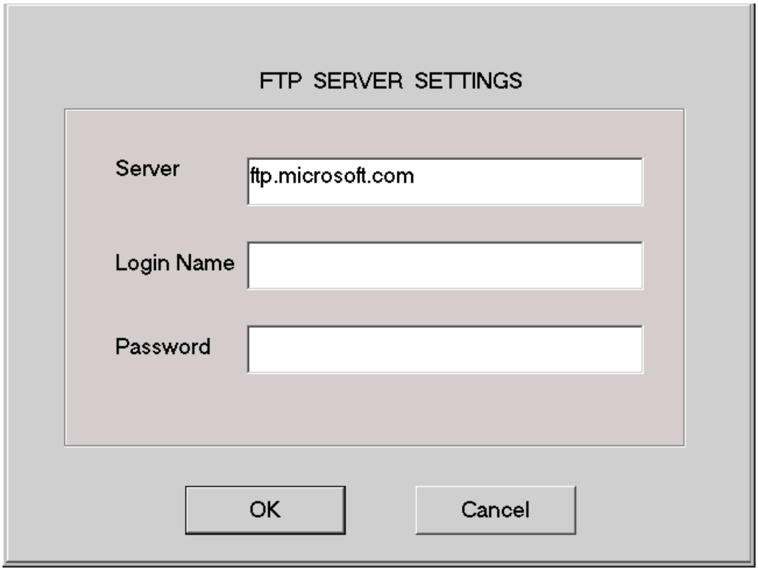
1. Establish a modem dial-out, modem dial-in, or LAN connection from the TestPad to the network your device is connected to.
   - For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
   - For detailed instructions on establishing a modem dial-in connection, see "Establishing modem dial-in connections" on page 85.
   - For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.
2. Select **Tools > File Management**.

   The File Management dialog box appears.
3. Select the FTP drive. The FTP drive is identified as follows:
   - If this is the first time you are connecting to an FTP server from the TestPad, the drive is identified as:

     `[FTP (Not Configured)]/`
   - If you previously connected to an FTP server from the TestPad, the drive is identified with an FTP prefix, and the name of the last FTP server you connected to. For example, if you connected to Microsoft's FTP server the last time you used the TestPad, the FTP drive is identified as:

     `[FTP.Microsoft.com]/`

The **FTP Server** button appears on the button bar, and the FTP Server Settings dialog box appears.



4 Do one of the following:

- If you are connecting to the server displayed in the Server field, proceed to step 5.
- If you are connecting to a different FTP server, tap or click the Server field. An Acterna keyboard appears. Type the address for the server, and then select **OK**.

5 In Login Name and Password, type your login and password, and then select **OK**.

The TestPad connects to the FTP server. You can transfer files to and from the TestPad.

Connecting to the TestPad's FTP server

You can also log into the TestPad's FTP server from a remote device to transfer files. Before you connect to the TestPad's FTP server, you must establish a modem dial-out, modem dial-in, or LAN connection to the remote device.

To connect to the TestPad's FTP server

1. Establish a modem dial-out, modem dial-in, or LAN connection from the TestPad to the network your device is connected to.
   - For detailed instructions on establishing a modem dial-out connection, see "Establishing modem dial-out connections" on page 83.
   - For detailed instructions on establishing a modem dial-in connection, see "Establishing modem dial-in connections" on page 85.
   - For detailed instructions on establishing a LAN connection, see "Establishing LAN connections" on page 87.
2. Launch an FTP session on your device.
3. Connect to the TestPad's FTP server by specifying the following parameters:
   - Server name: `TestPad's computer name` (see "Determining the TestPad's IP address or computer name" on page 70).
   - Login: `acterna`
   - Password: `acterna`

You are connected to the TestPad's FTP server, and you can copy and paste files to and from the TestPad.

Serial and Network Connections

3

This chapter provides step-by-step instructions for establishing serial and network connections to the TestPad. Topics discussed in this chapter are as follows:

– “About serial and network connections” on page 80
– “Requirements for serial and network connections” on page 80
– “Establishing serial connections” on page 81
– “Establishing modem dial-out connections” on page 83
– “Establishing modem dial-in connections” on page 85
– “Establishing LAN connections” on page 87
– “Establishing IP socket connections” on page 90

About serial and network connections

You can establish serial and network connections to the TestPad, enabling you to use a variety of tools such as VT100, the Web browser, VNC Viewer, and FTP. When you establish serial and network connections, you must specify connection parameters using the options provided on the Connectivity tab (see Figure 12). The tab is displayed by selecting the Connectivity option from the Tools menu.

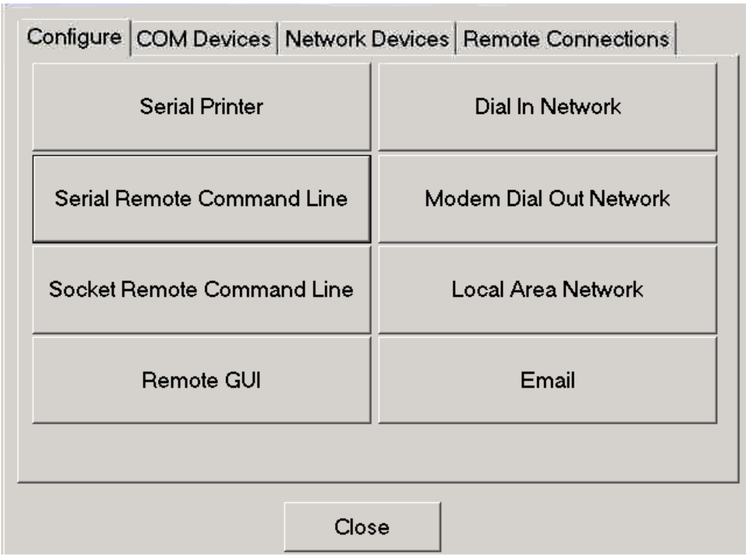


Figure 12 Connectivity tab

Requirements for serial and network connections

To establish modem dial-out, modem dial-in, LAN, USB direct, and IP socket network connections, you must purchase the Networking option and the associated connectivity accessories required for the connection.

You do not need to purchase the Networking option to establish serial connections to the TestPad; however, you may need to purchase connectivity accessories.

For descriptions of the connectivity accessories offered as accessories by Acterna, see Table 3 on page 12.

Establishing serial connections

You can establish a serial connection from a laptop or PC to a TestPad using a serial PCMCIA card or a serial cable (connected to the serial port of the Y cable).

After you establish a serial connection, you can do the following:

– Emulate a VT100 terminal (see "Emulating a VT100 terminal" on page 69).
– Issue remote control commands (see Appendix B).

To establish a serial connection

1 Insert the PCMCIA serial card into a PCMCIA card slot on the TestPad, or connect the Y cable to the USB/Serial port.

2 Do one of the following:

– If you are connecting via a serial PCMCIA card, connect a DB-9 female connector on the serial null modem cable to the connector on the cable attached to the card.

– If you are connecting via the Y cable, connect a DB-9 female connector on the serial null modem cable to the serial connector of the Y cable.

3 Connect the end of the serial null modem cable to the serial port of the laptop or PC.

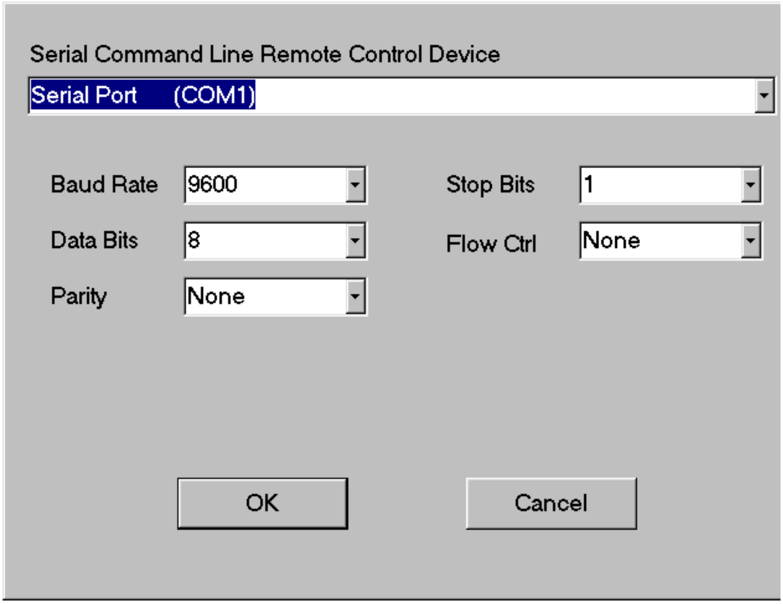
4 Do one of the following:

– If you are establishing the connection to emulate a VT100 terminal, see "Emulating a VT100 terminal" on page 69.

– If you are establishing the connection to allow a user to issue remote control commands or run the Remote GUI, proceed to step 5.

5 On the TestPad, select **Tools > Connectivity > Serial Remote Command Line**.

The Serial Command Line dialog box appears.



6 If a serial card is inserted in the TestPad and the Y cable is connected to the USB/Serial port, you must select the serial device you are using to establish the connection.

- To establish a connection using a serial card, select **Serial Card**.
- To establish a connection using the serial port of the Y cable, select **Serial Port**.

7 Specify the parameters for the connection, and then select **OK**. Default values for each of the settings are as follows:

- Baud rate: 9600
- Data bits: 8
- Parity: None
- Stop bits: None
- Flow control: None

The connection is established.

Establishing modem dial-out connections

Establishing a modem dial-out connection from the TestPad involves inserting the PCMCIA analog modem card into a PCMCIA card slot, configuring the modem dial-out parameters, and then connecting the PCMCIA card to a phone jack using the supplied RJ-11 phone cable. Finally, you dial out to your Internet Service Provider (ISP). This establishes the modem dial-out connection.

You must have access to a PSTN network for a modem dial-out connection.

After you establish a dial-out connection, you can do the following:

– Launch the Web browser (see "Launching the Web browser" on page 68).
– Run the Remote GUI (see "Using the Remote GUI" on page 69).
– Transfer files using FTP (see "Copying and pasting files" on page 75).
– Establish an IP socket connection to the TestPad (see "Establishing IP socket connections" on page 90), and then issue remote control commands (see Appendix B).

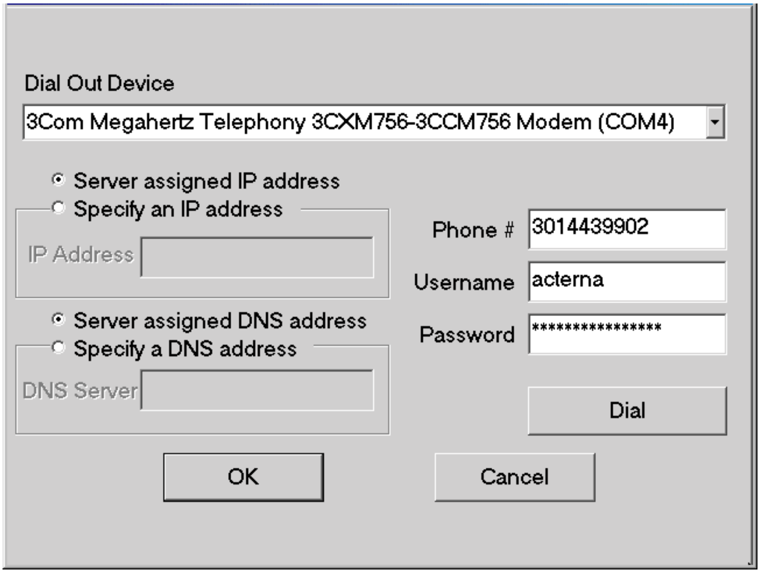
To establish a modem dial-out connection

1 Insert the PCMCIA modem card into a PCMCIA card slot on the TestPad.

2 Connect the PCMCIA modem card to a phone jack using the supplied RJ-11 phone cable.

3 On the TestPad, select **Tools > Connectivity > Modem Dial Out Network**.

The Modem Dial-out dialog box appears.



4 Specify the following dial-out parameters:

a In **Dial Out Device**, select one of the available devices.

b To set the IP address, do one of the following:

– To allow a server to assign the IP address, select **Server assigned IP address**.

– To manually assign the IP address, select **Specify an IP address**, and then type the address in **IP Address**.

c To set the DNS address, do one of the following:

– To allow a DNS server to assign the DNS address, select **Server assigned DNS address**.

– To manually assign the DNS address, select **Specify a DNS address**, and then type the address in **DNS Address**.

d In **Phone #**, type the dial-out phone number.

e In **Username**, type your ISP username.

f In **Password**, type your ISP password.

5 Select **Dial** to establish the connection.

The modem dial-out connection is established.

Establishing modem dial-in connections

Establishing a modem dial-in connection to the TestPad involves inserting a PCMCIA analog modem card into a PCMCIA card slot on the TestPad, configuring the modem dial-in parameters, and then connecting the PCMCIA modem card to a phone jack using the supplied RJ-11 phone cable. Finally, you dial-in to the TestPad.

You must have access to a PSTN network for a modem dial-in connection.

After you establish a dial-in connection, you can do the following:

– Run the Remote GUI (see “Using the Remote GUI” on page 69).
– Transfer files using FTP (see “Copying and pasting files” on page 75).
– Establish an IP socket connection to the TestPad (see “Establishing IP socket connections” on page 90), and then issue remote control commands (see Appendix B).

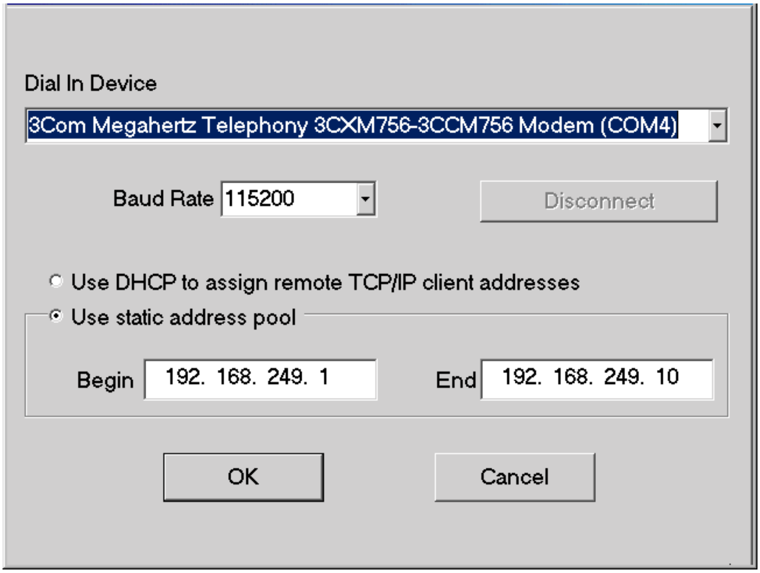
To establish a modem dial-in connection

1 Insert the PCMCIA analog modem card into a PCMCIA card slot on the TestPad.

2 Connect the PCMCIA modem card to a phone jack using the supplied RJ-11 phone cable.

3 On the TestPad, select **Tools > Connectivity > Dial In Network**.

The Dial-in Network dialog box appears.



4 To specify the dial-in parameters, do the following:

a In **Dial In Device**, select one of the available dial-in devices.

b To set the TCP/IP client address, do one of the following:

– To allow DHCP to assign the address, select **Use DHCP to assign remote TCP/IP client addresses**.

– To use a static address pool, select **Use static address pool**, and then type the range of addresses in the **Begin** and **End** fields.

5 From the remote device, dial into the TestPad. When you are prompted to log on to the TestPad, type the following username and password:

– Username: `acterna`

– Password: `acterna`

Be certain to type the username and password in lowercase.

You are connected to the TestPad.

Establishing LAN connections

You can establish a LAN connection from the TestPad to a network via an Ethernet connection, or directly to another computer via an Ethernet, 802.11, Bluetooth, or USB direct connection. If you are connecting to a network with Dynamic Host Configuration Protocol (DHCP), you can let DHCP assign a TCP/IP client address, or you can use a static address pool and assign a range of valid addresses.

Table 8 lists the technologies and requirements for network and direct connections.

Table 8 LAN connections

Connection	Technology	Requirements
Network	Ethernet	– Ethernet network – Ethernet PCMCIA card – Ethernet LAN cable
Direct	Ethernet	– Ethernet PCMCIA card – Ethernet LAN crossover cable
	802.11b	– 802.11b network – 802.11b PCMCIA card
	Bluetooth	– Bluetooth network – Bluetooth PCMCIA card
	USB direct	– USB direct connect cable – Y cable

After you establish a LAN connection to a network or another computer, you can do the following:

– Run the Remote GUI (see “Using the Remote GUI” on page 69).

– Transfer files using FTP (see “Copying and pasting files” on page 75).

– Establish an IP socket connection to the TestPad (see “Establishing IP socket connections” on page 90), and then issue remote control commands (see Appendix B).

- If you establish a LAN connection to a network, you can also launch the Web browser (see "Launching the Web browser" on page 68).

To establish a LAN connection

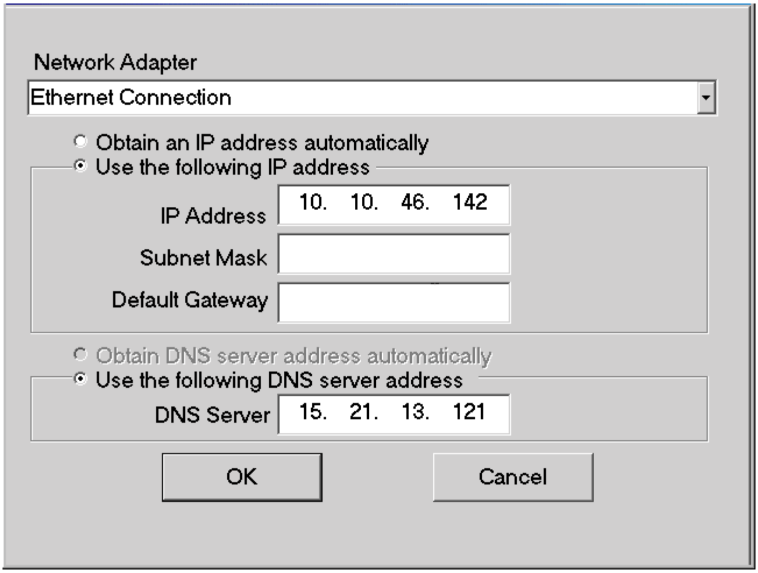
1. If you are establishing an Ethernet, 802.11, or Bluetooth connection, insert the associated PCMCIA card into a PCMCIA card slot on the TestPad.

WARNING: RISK OF DAMAGE TO UNIT

If you are using Bluetooth to establish a LAN connection, do not remove the Bluetooth PCMCIA card from the TestPad. If the TestPad is configured for a Bluetooth connection, and you turn the TestPad on without a Bluetooth card in a PCMCIA card slot, the TestPad will lock up and may require factory service. We recommend leaving the Bluetooth card in the slot at all times.

2. If you are establishing an Ethernet or direct USB connection, do one of the following:
   - To connect to an Ethernet network, connect the Ethernet LAN cable to the PCMCIA card, and then connect the other end to the network.
   - To connect to a laptop or PC via Ethernet, connect the Ethernet cross-over cable to the PCMCIA card, and then connect the other end to the laptop or PC.
   - To establish a USB direct connection to a laptop or PC, connect the Y cable to the TestPad, and then connect one end of the USB direct connect cable to the USB connector on the Y cable and the other end to the laptop or PC.
3. On the TestPad, select **Tools > Connectivity > Local Area Network**.

The Network Settings dialog box appears.



4 To set the TCP/IP client address, do one of the following:

- To allow DHCP to assign the address, select **Obtain an IP address automatically**.
- To use a static address, select **Use the following IP address**, and then type the IP address in the **IP Address**, **Subnet Mask**, and **Default Gateway** fields.

5 To set the DNS server address, do one of the following:

- To obtain the DNS server address automatically, select **Obtain DNS server address automatically**.
- To use a specific DNS server address, select **Use the following DNS server address**, and then type the address in the **DNS Server** field.

6 If you are connecting via Bluetooth or 802.11b, configure your PC or laptop using the following case-sensitive values:

Connection	Parameter	Value
Bluetooth	Friendly Name	`TestPad`
802.11b	SSID	`TestPad`
	WEP key	`FST2k`

Connection	Parameter	Value
802.11b (continued)	Static IP address	`192.168.252.2`

The connection is established.

Establishing IP socket connections

You can establish an IP socket connection to the TestPad from a laptop or PC. Before you establish an IP socket connection to the TestPad, you must establish a network connection. You should also identify the IP address of the TestPad (see “Determining the TestPad’s IP address or computer name” on page 70).

To establish an IP socket connection

1 On the TestPad, select **Tools > Connectivity > Socket Remote Command Line**.

The Socket Port # dialog box appears.

2 In **Port #**, enter the port number for the connection.

3 Establish a network connection to the TestPad.

- For detailed instructions on establishing a modem dial-out connection, see “Establishing modem dial-out connections” on page 83.
- For detailed instructions on establishing a modem dial-in connection, see “Establishing modem dial-in connections” on page 85.
- For detailed instructions on establishing a LAN connection, see “Establishing LAN connections” on page 87.

4 On the laptop or PC, launch a terminal emulation application (such as HyperTerminal).

5 Connect using the following parameters:

- TCP/IP (Winsock)
- Port number: `Port number` (specified in step 2).
- IP address: `TestPad's IP address or computer name` (see "Determining the TestPad's IP address or computer name" on page 70).

The connection is established.

Basic Testing

4

This chapter explains basic testing concepts and procedures common to the tests. Topics discussed in this chapter are as follows:

– "Running a test" on page 94
– "Managing test configurations" on page 107
– "Running test scripts" on page 109

Running a test

Running a test involves configuring the test, connecting the TestPad to an access element on the circuit, allowing the TestPad to establish a link, starting the test, and then viewing test results.

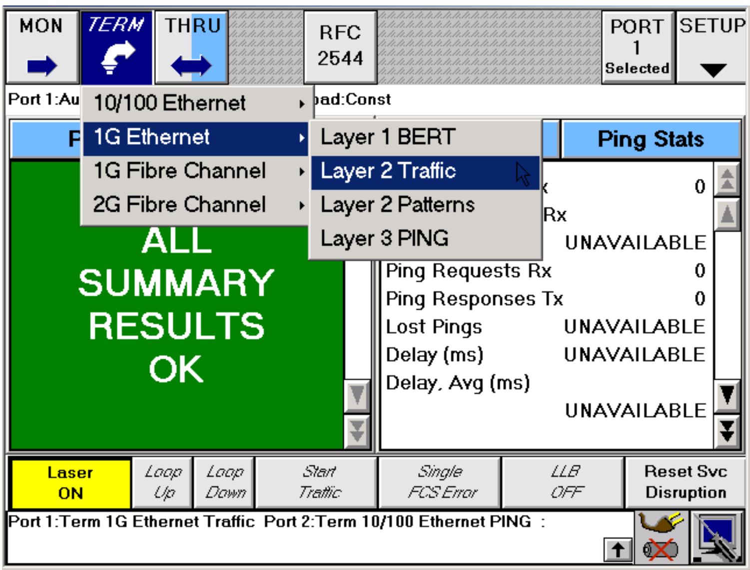
Step 1: Configuring a test

Before you start a test, you need to configure the test and if necessary, specify link initialization parameters.

To configure a test

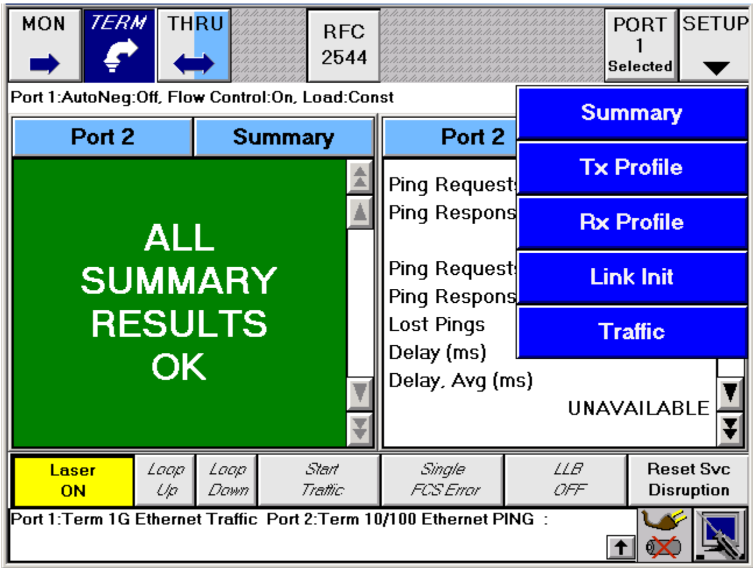
1 Select the port for the test you are configuring.

2 On the Application Button bar, select the mode, rate and protocol, and application for the test you want to perform (for example **TERM > 1G Ethernet > Layer 2 Traffic**).



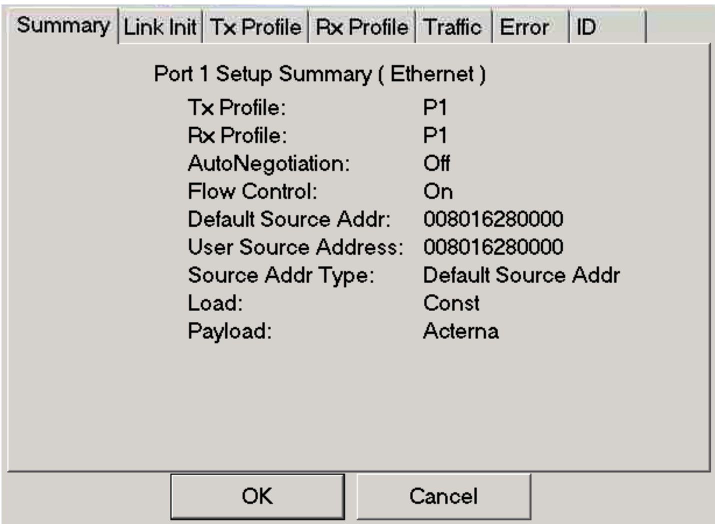
3 To configure the test, select **SETUP**.

A group of Quick Configuration buttons appears.



4 Select **Summary** to access the setup tabs.

The Summary tab appears with additional setup tabs for the test you selected.



> **NOTE:**
>
> Some setup tabs are available for every test, such as Summary and Error. Other tabs only appear for a specific operating mode, rate, or application.

5 Review the existing configuration on the Summary tab.

- If the existing configuration is correct, select **OK** to return to the main window, and then proceed to step 8.
- If the configuration needs to be modified or you need to specify link initialization parameters for an Ethernet test, proceed to step 6.

6 Select the appropriate setup tabs and specify the parameters required for the test.

- For details on Ethernet link initialization and test parameters, refer to Chapter 5 “Ethernet Testing”.
- For details on Fibre Channel test parameters, refer to Chapter 6 “Fibre Channel Testing”.

7 After you specify the parameters for the test configuration, select **OK** to store the configuration and return to the main window.

8 If you are testing using a second port, repeat step 1 through step 7.

The test is configured.

Step 2: Connecting the TestPad for testing

After you configure a test (or tests), you are ready to connect the FST-2802 to an access element (or elements) on the circuit.

When you connect the TestPad to perform 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel tests, the optical jacks of the access element dictate the type of fiber cable you need to use to connect to the TestPad. For example, if the access element has 1310nm (single mode) transmit and receive jacks, you must use a single mode fiber cable to connect the TestPad to the access element.

The transmit and receive jacks of the GBIC on the TestPad are color coded to allow you to quickly identify whether the interface provides 1310nm or 850nm capability. Optical fiber cables are also color coded by wavelength. See Table 9.

Table 9 Short and Long wavelength jack and cable colors

Wavelength	GBIC Jacks	Fiber Cable
1310nm	blue	yellow
850nm	black or beige	orange

NOTE:

When performing Ethernet tests on most networks, we recommend using two TestPads as end stations on the circuit, one at each end.

For some networks, it may be possible to use a hard loopback at the far end of the network instead of a second TestPad. Consult your network element specifications to determine if this is possible.

Connecting to a splitter to monitor 1G/2G traffic

Using the FST-2802, you can monitor 1G and 2G traffic when the network is in service using a splitter (see Figure 13).

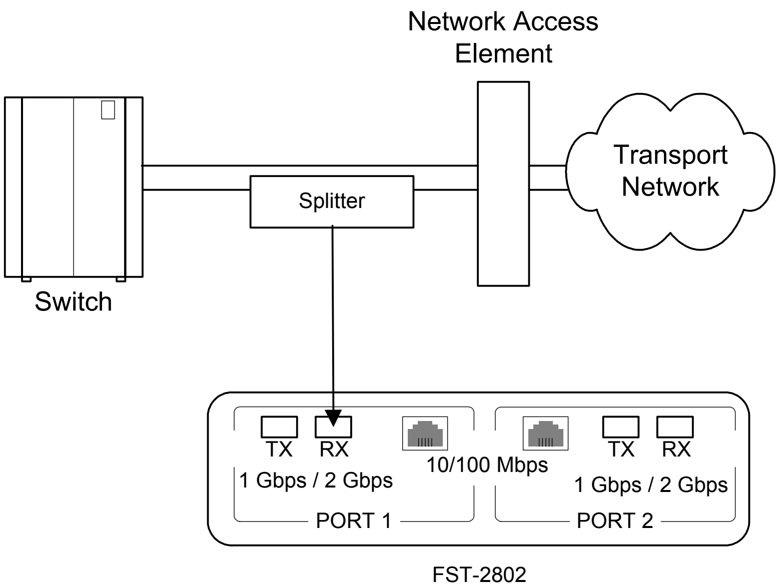


Figure 13 Monitoring traffic using a splitter

To connect the TestPad to a splitter

1. Using the correct cable for the splitter, connect one end of the cable to the Port 1 RX jack of the TestPad, and the other end to the TX jack of the splitter.
2. *Optional*. If you want to monitor traffic on Port 2, repeat step 1 for the second port.

The TestPad is connected.

Connecting to monitor 1G/2G traffic in single port THRU mode

You can also monitor 1G and 2G traffic on a circuit in THRU mode. Figure 14 illustrates the connection for monitoring 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel traffic in THRU mode using a single port.

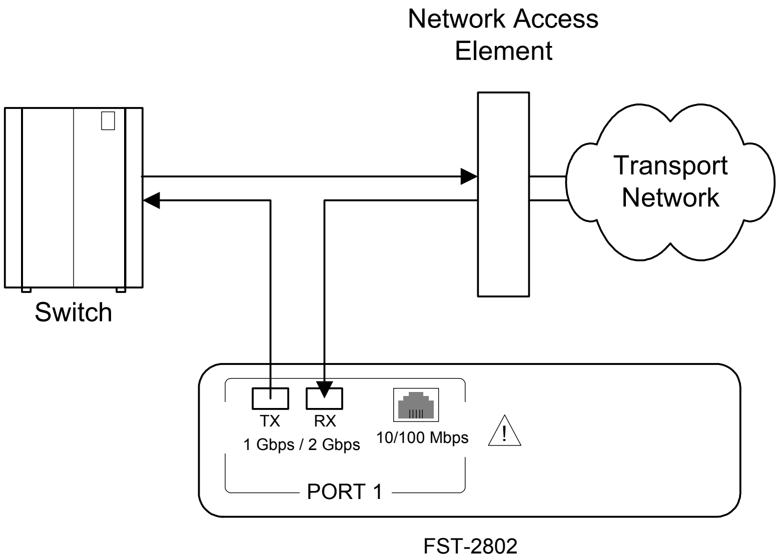


Figure 14 Monitoring 1G or 2G traffic in Single Port THRU mode

> **NOTE:**
>
> When you configure a test to monitor 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel traffic in single port THRU mode, you can specify that the TestPad should transmit idle frames (the default), or loop received frames back through the transmitter.

To monitor 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel traffic in single port THRU mode

1. Using the correct cable for the switch, connect one end of the cable to the TX jack of the TestPad, and the other end to the RX jack of the switch.
2. Using the correct cable for the network access element, connect one end of the cable to the RX jack of the TestPad, and the other end to the TX jack of the network access element.

The TestPad is connected.

Connecting to monitor 1G/2G traffic in dual port THRU mode

If your FST-2802 has dual ports, you can monitor full duplex 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel traffic from both directions in dual port THRU mode (see Figure 15 on page 100).

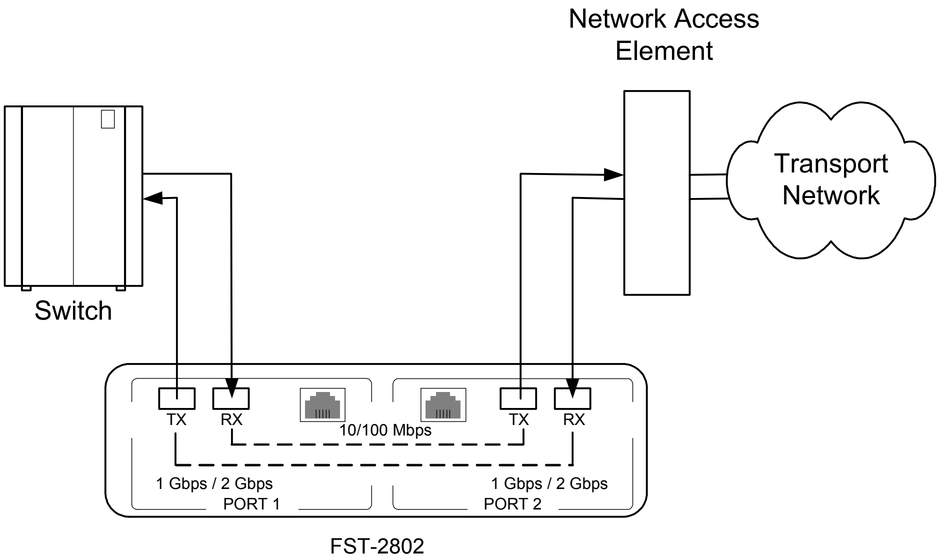


Figure 15 Monitoring 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel traffic in dual port THRU mode

When you monitor traffic in dual port THRU mode, the application configures the TestPad to pass traffic through from the Port 1 receiver to the Port 2 transmitter, and the traffic from the Port 2 receiver to the Port 1 transmitter.

To monitor 1G Ethernet, 1G Fibre Channel, or 2G Fibre Channel traffic in dual port THRU mode

1. Using the correct cable for the switch, connect one end of the cable to the Port 1 TX jack of the TestPad, and the other end to the RX jack of the switch.
2. Using a second cable, connect one end of the cable to the Port 1 RX jack of the TestPad, and the other end to the TX jack of the switch.
3. Using the correct cable for the network element, connect one end of the cable to the Port 2 TX jack of the TestPad, and the other end to the RX jack of the network element.
4. Using a second cable, connect one end of the cable to the Port 2 RX jack of the TestPad, and the other end to the TX jack of the network element.

The TestPad is connected.

Connecting to monitor 10/100 traffic in Thru mode

If your FST-2802 has dual ports, you can monitor bidirectional 10/100 Ethernet traffic in THRU mode. Both 10/100 ports are configured as MDI (medium dependent interface) ports; therefore, for some applications, you may need to use a crossover cable on one of the ports to convert it to MDI-X (medium dependent interface crossover).

Figure 16 illustrates the connection for monitoring 10/100 Ethernet traffic in THRU mode.

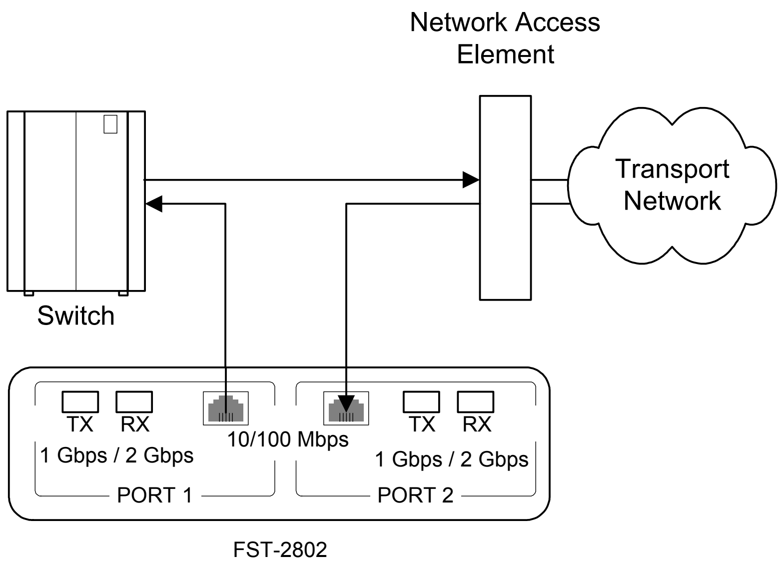


Figure 16 Monitoring 10/100 Ethernet traffic in THRU mode

To monitor 10/100 Ethernet traffic in THRU mode

1. Using the correct cable for the switch, connect one end of the cable to the Port 1 10/100 Mbps jack of the TestPad, and the other end to the RX jack of the switch.
2. Using the correct cable for the network access element, connect one end of the cable to the TX jack of the network access element, and the other end to the Port 2 10/100 Mbps jack of the TestPad.

The TestPad is connected.

Connecting for Ethernet Loopback testing

Using two FST-2802s, you can generate and transmit Ethernet traffic from one TestPad, and then loop the traffic back through a second TestPad on the far end of the circuit. See Figure 17.

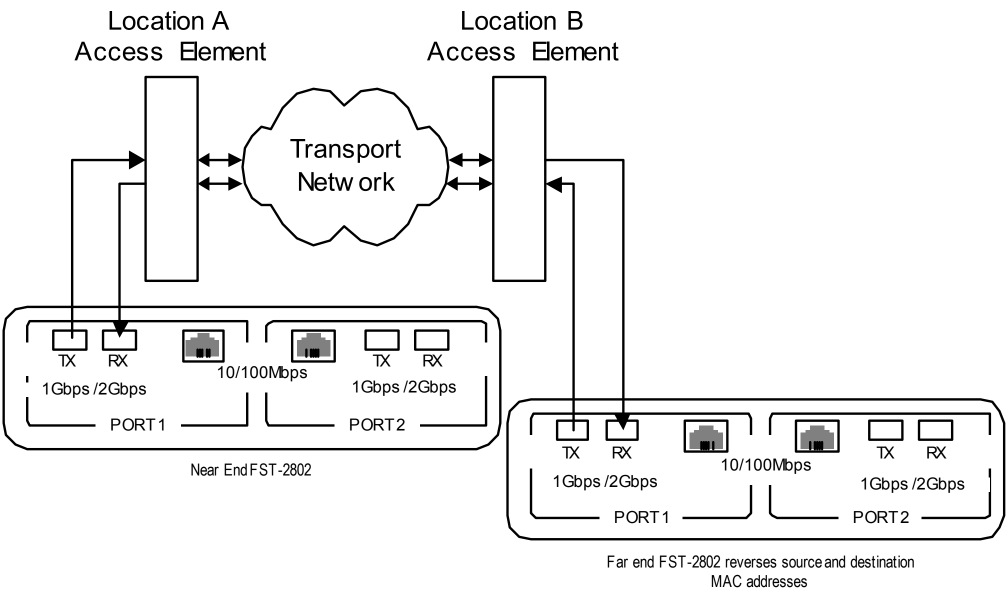


Figure 17 Loopback test using two FST-2802s

To connect the TestPads for an Ethernet loopback test

1. Using the correct cable for the access element, connect one end of the cable to the TX jack of the first TestPad, and the other end to the RX jack of the access element.
2. Connect a second cable from the TX jack of the access element to the RX jack of the first TestPad.
3. On the far end of the circuit, connect one end of a cable to the TX jack of the access element, and the other end to the RX jack of the second TestPad.
4. Connect a second cable from the TX jack of the second TestPad to the RX jack of the access element.
5. *Optional*. If you want to perform a second loopback simultaneously using Port 2, repeat step 1 through step 4 for Port 2.

The TestPad is connected.

Connecting for Fibre Channel loopback testing

If you are performing a Fibre Channel test on an unswitched network, you can also loop traffic back through a hard loopback at the far end of the circuit. See Figure 18.

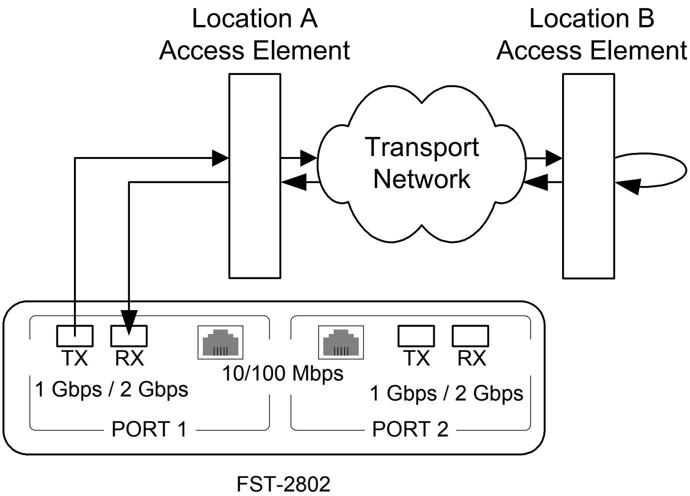


Figure 18 Loopback test using a hard loopback

To connect the TestPad for a Fibre Channel loopback test

1. On the near end of the circuit, using the correct cable for the access element, connect one end of the cable to the TX jack of the TestPad, and the other end to the RX jack of the access element.
2. Connect a second cable from the TX jack of the access element to the RX jack of the first TestPad.
3. On the far end of the circuit, establish a hard loopback by connecting a cable from the TX jack to the RX jack of the access element.

The TestPad is connected.

Connecting for a dual port loopback connection

If you are testing a Fibre Channel circuit or an unswitched Ethernet circuit using a FST-2802 with two ports, you can also perform a loop-back using a single FST-2802 by implementing a hard loopback at the far end of the circuit. See Figure 19.

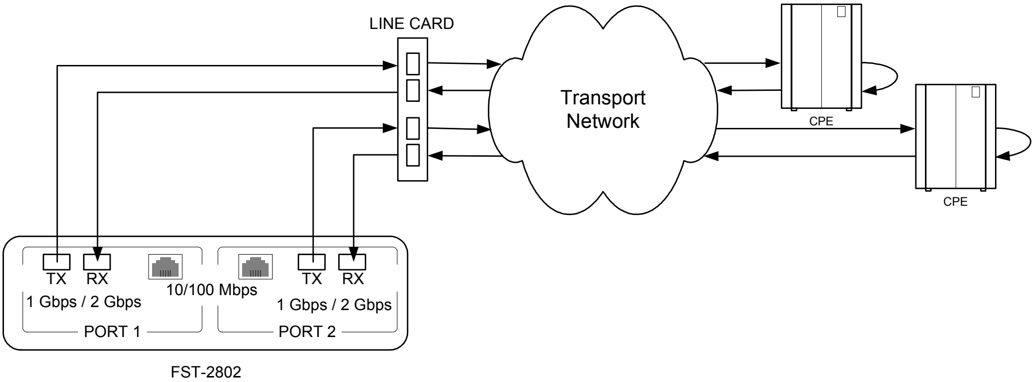


Figure 19 Dual port loopback connection

If you are testing a switched Ethernet circuit, you can implement a loopback at the far end of the circuit using a single FST-2802 with two ports.

To connect the TestPads for a dual port loopback test

1. Using the correct cable for the line card, connect one end of the cable to the TX jack of the first port on the TestPad, and the other end to the RX jack of the first port on the line card.
2. Using the correct cable for the line card, connect one end of the cable to the RX jack of the first port on the TestPad, and the other end to the TX jack of the first port on the line card.
3. Repeat step 1 and step 2 for the second port on the TestPad.
4. On the far end of the circuit, establish hard loopbacks from each customer premise equipment back to the ports on the TestPad.

The TestPad is connected.

Connecting for end-to-end testing

Using two FST-2802s, you can verify that a provisioned path will carry traffic from one TestPad to a second TestPad on the far end of a circuit.

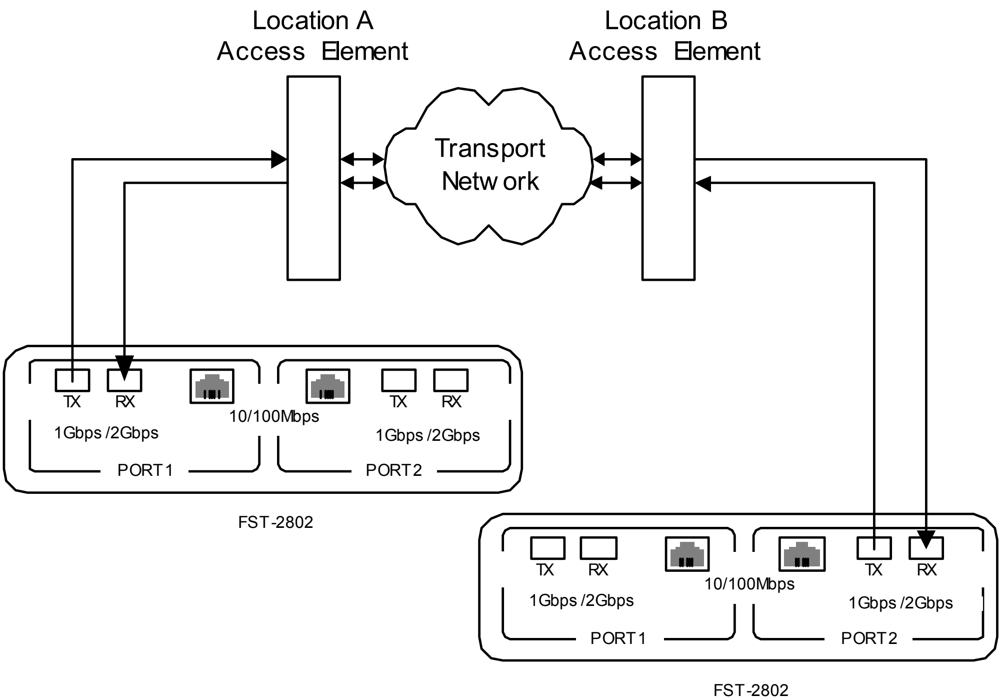


Figure 20 End-to-end test

To connect the TestPads for an end-to-end test

1. Using the correct cable for the access element, connect one end of the cable to the TX jack of the first TestPad, and the other end to the RX jack of the access element.
2. Connect a second cable from the TX jack of the access element to the RX jack of the first TestPad.
3. On the far end of the circuit, connect one end of a cable to the TX jack of the access element, and the other end to the RX jack of the second TestPad.
4. Connect a second cable from the TX jack of the second TestPad to the RX jack of the access element.
5. *Optional*. If you want to perform a second end-to-end test simultaneously using Port 2, repeat step 1 through step 4 for Port 2.

The TestPad is connected.

Step 3: Starting a test

After you configure a test, connect the TestPad to an access element on the circuit, and allow the TestPad to establish a link (if you are testing on an Ethernet circuit), you can start the test. Each time you start a test, the TestPad clears existing alarms, and then starts the test.

To start a test, do one of the following

- Press the **Restart** key to start the test(s) on each active port.
- Select **Tools > Restart Port 1** or **Tools > Restart Port 2** to start a test on a specific port.
- If you are running the GUI from a remote laptop or PC, select **Tools > Restart Both Ports**, **Tools > Restart Port 1,** or **Tools > Restart Port 2**.

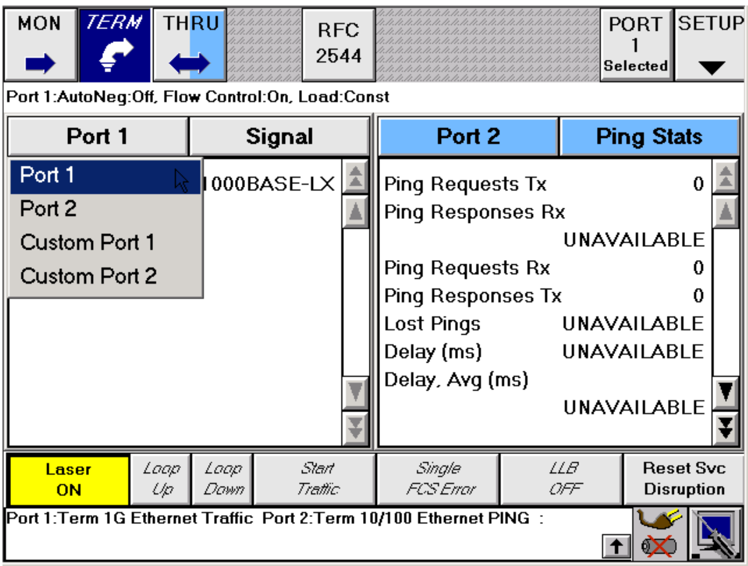
The test starts.

Step 4: Viewing test results

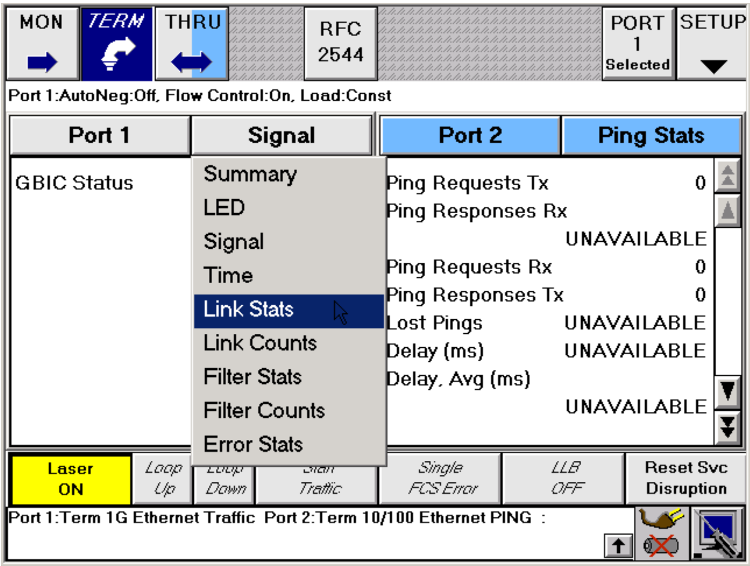
After you connect the TestPad to the circuit and receive a valid signal, it automatically begins to accumulate results. To view the test results, set the Result Group and Result Category for each pane. You may want to do this before you connect the TestPad to the circuit.

To view test results

1 On the left results pane, set the Result Group to Port 1 or Port 2.



2 On the left results pane, set the Result Category.



3 Repeat step 1 and step 2 for the right results pane.

You can now view results for two different ports and results categories simultaneously. For result descriptions, refer to Chapter 7 “Test Results”.

Managing test configurations

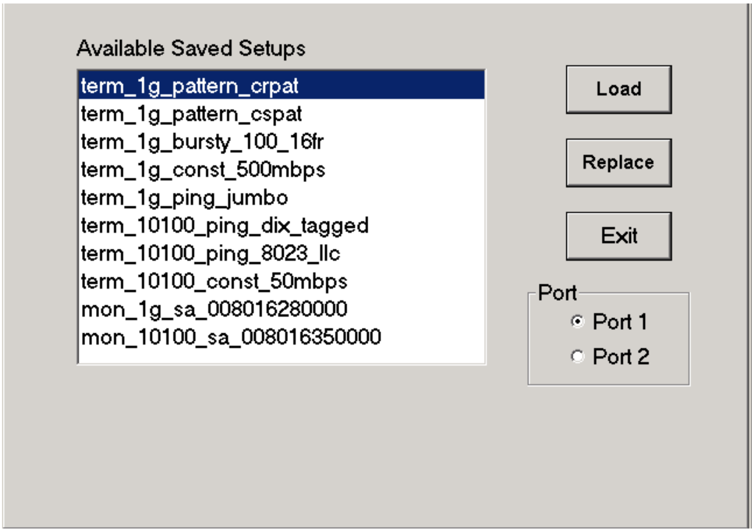
The TestPad allows you to define and store up to ten test configurations (setups) for each port. You can then use these test configurations to run your most common tests.

Storing test configurations

To store a test configuration

1 After you configure your test, select the **Tools** button, and then select **Store/Recall Setups**.

The Saved Setups dialog box appears.



2 If your TestPad has two ports, select **Port 1** or **Port 2** to display the existing configurations for the port.

3 Select the configuration to replace, and then select **Replace**.

4 Type the name of the configuration to be saved, and then select **OK**.

The configuration now appears in the list and is stored.

Loading test configurations

The TestPad allows you to load a stored test configuration.

To load a test configuration

1 Select **Tools > Store/Recall Setups**.

The Saved Setups dialog box appears.

2 If your TestPad has two ports, select **Port 1** or **Port 2** to display the configurations for the port.

3 Select the configuration you want to load, and then select **Load**.

4 Select **Exit**.

The test is set up using the configuration you selected.

> **NOTE:**
>
> If your TestPad has two ports, and you load a saved configuration for a different protocol, the TestPad displays a message to inform you that it will load the saved configuration onto both ports. For example, if both ports on the TestPad are currently setup to test Ethernet, and you load a saved Fibre Channel configuration onto Port 1, the TestPad will also load the Fibre Channel configuration onto Port 2.

Running test scripts

If you purchase and install the 2000-SCR automated test script option, you can write test scripts using the Tcl/Tk scripting language to automate your testing processes.

> **NOTE:**
>
> Acterna does not provide Tcl/Tk support. For information on Tcl/Tk scripting, refer to the web sites published by Scriptics.

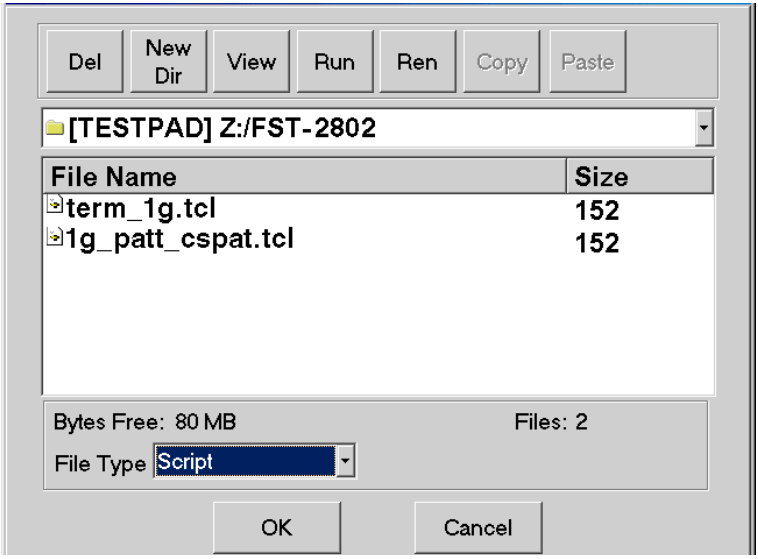
Running a test script

The AutoMATE option on the Tools Menu provides access to the File Management screen, from which you can run your automated test scripts.

To run a script

1 Select the **Tools > AutoMATE**.

The File Management screen appears.



2 Select the script you want to run.

3 Select **Run**.

The script begins to run.

NOTE:

You can also run the RFC 2544 script (developed by Acterna) to automate Ethernet testing. See "Running the RFC 2544 script" on page 165 for detailed information on the RFC 2544 script.

Viewing, renaming, and deleting script and results print files

You can view, delete, and rename test scripts and results print files from the File Management screen. For detailed instructions on managing files, see "Viewing, running, deleting, or renaming a file" on page 75.

Ethernet Testing

5

This chapter provides step-by-step instructions for performing Ethernet tests using the TestPad. Topics discussed in this chapter are as follows:

– “About Ethernet testing” on page 112
– “Ethernet link initialization” on page 112
– “Ethernet traffic” on page 113
– “Out-of-service testing” on page 121
– “In-service testing” on page 174

About Ethernet testing

Ethernet is a physical (layer 1) and data link (layer 2) technology. When you perform Ethernet tests using the FST-2802, the TestPad essentially operates as an Ethernet switch port on a circuit. Ethernet switches are capable of interpreting Ethernet frames (data); therefore, you can use the TestPad to ensure physical and data layer integrity by transmitting and analyzing Ethernet frames.

Ethernet link initialization

Before you transmit and receive traffic (Ethernet frames) over a circuit, you must initialize an Ethernet link. At a minimum, initializing a link with a switch that doesn't use auto-negotiation involves connecting a TestPad or TestPads (which emulate Ethernet switch ports) to a circuit, and allowing the TestPad(s) to transmit idle traffic.

Initializing a link with switches on the circuit that use auto-negotiation involves turning auto-negotiation on the TestPad(s), specifying link initialization parameters (see "Specifying link initialization parameters" on page 123), and then connecting the TestPad(s) to the circuit. The TestPad(s) and switches auto-negotiate their capabilities (see "Auto-negotiation and flow control" on page 113), and then transmit idle traffic over the circuit.

The link is considered active after idle traffic is transmitted. Table 10 illustrates the possible link status for each link partner when auto-negotiation is on and off.

Table 10 Possible Link Status for Link Partners

Auto-Negotiation		Link Status	
Switch A	**Switch B**	**Switch A**	**Switch B**
Off	Off	Active	Active
On	On	Active	Active
Off	On	Active	Inactive
On	Off	Inactive	Active

By default, auto-negotiation is turned off on the TestPad. If you turn auto-negotiation on, you may need to change the default capabilities before you connect the TestPad (or TestPads) to the circuit. You may also turn flow control off and specify the speed and duplex settings for 10/100 traffic (see "Specifying link initialization parameters" on page 123).

Auto-negotiation and flow control

After you turn auto-negotiation on and connect a TestPad to a circuit, the TestPad and the switches on the circuit that have auto-negotiation on immediately "advertise" their capabilities to each other, and then negotiate to the highest common capability. For example, Switch A and B in Table 11 advertise and then negotiate to use the following capabilities:

Table 11 Negotiated Capabilities of Switch A and Switch B

Capability	Switch A	Switch B	Negotiated Capability
Pause	Both Tx and Rx	Neither	Neither
Full Duplex	Yes	Yes	Yes
Half Duplex	Yes	Yes	Yes

> **NOTE:**
> By default, auto-negotiation is off on the FST-2802. If the Ethernet devices on the circuit do not support auto-negotiation, leave auto-negotiation off.

Ethernet traffic

After the TestPad and the Ethernet switch complete the auto-negotiation process, the Ethernet link is initialized, and the Link Active LED illuminates on the TestPad. You can now use the FST-2802 to transmit and analyze Ethernet traffic to verify that the circuit can support standard Ethernet frames.

Before you start testing, you can optionally specify the traffic load type for the traffic (see “Traffic loads” on page 117). You can also optionally define profiles for the traffic which specify, at the field level, the characteristics of the transmitted and received frames (see “Traffic profiles” on page 120).

Because the FST-2802 emulates an Ethernet switch port, for most networks, we recommend using two TestPads as end stations on the circuit (one TestPad at each end). For a detailed explanation of Ethernet switching, see “Ethernet switching” on page 115.

Ethernet frame formats

Ethernet frames are variable length frames ranging in size from 64 to 1518 bytes (excluding the preamble). When you configure tests for the FST-2802, you specify one of two frame formats: DIX or 802.3.

DIX frames

Figure 21 illustrates the structure of a DIX frame. Overhead fields are a fixed-length; the payload field can range in size from 46 to 1500 bytes.

# bytes:					
8	6	6	2	46-1500	4
Preamble	Destination Address	Source Address	Type	Data (Payload)	FCS

Figure 21 Ethernet DIX frame

Each DIX frame is comprised of the following fields:

- **Preamble/SFD**. Data that allows the receiver to synchronize with the incoming transmissions and locate the start of an Ethernet frame. The SFD (Start of Frame Delimiter) indicates that the destination address of the frame is about to begin.
- **Destination address**. Address of the network element the frame is being transmitted to.
- **Source address**. Address of the network element originating the frame.
- **Type**. The type of Layer 3 protocol in the payload of the frame.

– **Payload**. The actual information being transmitted in the frame (all other fields are considered overhead).
– **FCS**. Frame Check Sequence. A value calculated by the originating device and inserted into the frame. The receiving device performs the same calculation, and compares its FCS value with the FCS value in the frame. If the values don't match (suggesting the frame is errored), an FCS error is declared. Switching devices will discard the frame.

802.3 frames

The FST-2802 can also transmit 802.3 frames (illustrated in Figure 28 on page 160). A Length field replaces the Type field of a DIX frame, and simply indicates the length of the data payload in bytes.

VLAN tagged frames

If you purchase the VLAN Tagging option, you can transmit and analyze virtual LAN (VLAN) tagged DIX or 802.3 frames, which include an additional VLAN field. The VLAN field contains the protocol ID, priority, and VLAN ID. In Ethernet, the protocol ID is fixed at 81-00 hexadecimal.

Figure 22 on page 115 illustrates the structure of a VLAN tagged Ethernet frame.

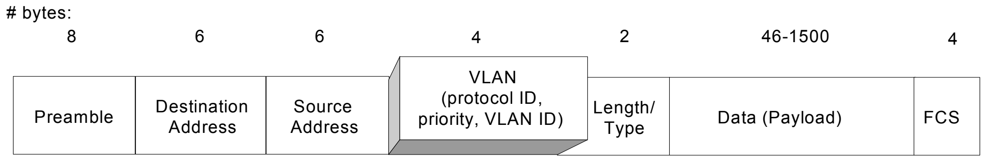


Figure 22 Ethernet frame with VLAN tag

Ethernet switching

In general, many out-of-service tests can be performed using a single TestPad. The TestPad generates traffic, and using a hard loopback at the far end of the circuit, the traffic is returned to the TestPad. The TestPad then analyzes the traffic for integrity. In a switched (layer 2) Ethernet network, this test methodology does not work because of the way Ethernet switches handle traffic.

Before you transmit traffic for a test using a hard loopback, you configure the outgoing traffic using a destination address that matches the source address of the transmitting port on the TestPad so that all traffic leaving the port returns to the port. When an Ethernet switch receives a frame on Port A from a TestPad port with source address 00404D000001, the switch remembers that because traffic generated from source address 00404D000001 comes in on Port A, all future traffic with destination address 00404D000001 should also be forwarded to Port A. However, if the switch then receives the frame from Port B with a source address of 00404D000001, the switch assumes that source address 00404D000001 comes in via Port A, and therefore, the frame has already been received. The switch decides the frame must be errored and discards the frame (see Figure 23 on page 116).

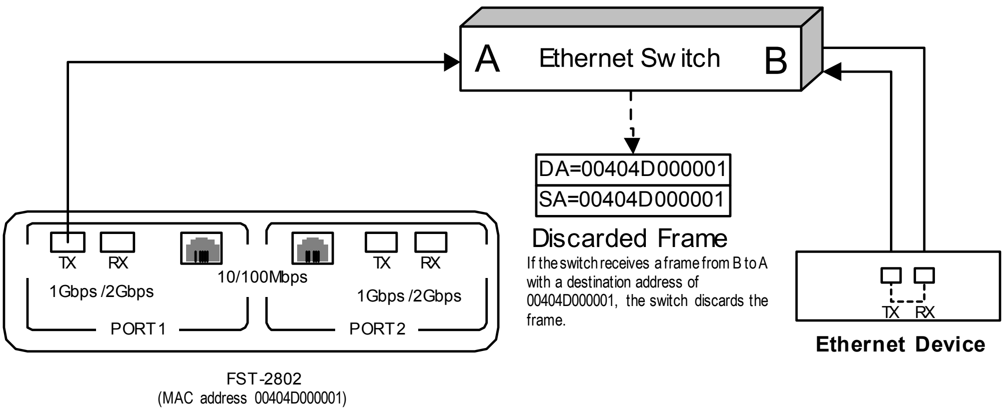


Figure 23 Hard loopback on a network with Layer 2 switches

Due to this function of Ethernet switches, a second FST-2802 must be used on the far end of the circuit instead of a hard loopback. The traffic originating port on the TestPad (for example, source address 00404D000001) sends the frame with a source address of 00404D000001 to the far end TestPad port's destination address (for example, source address 00404D000002). Then, the TestPad on the far end swaps the destination address and the source address, ensuring the frame is returned to the originating TestPad port (see Figure 24 on page 117).

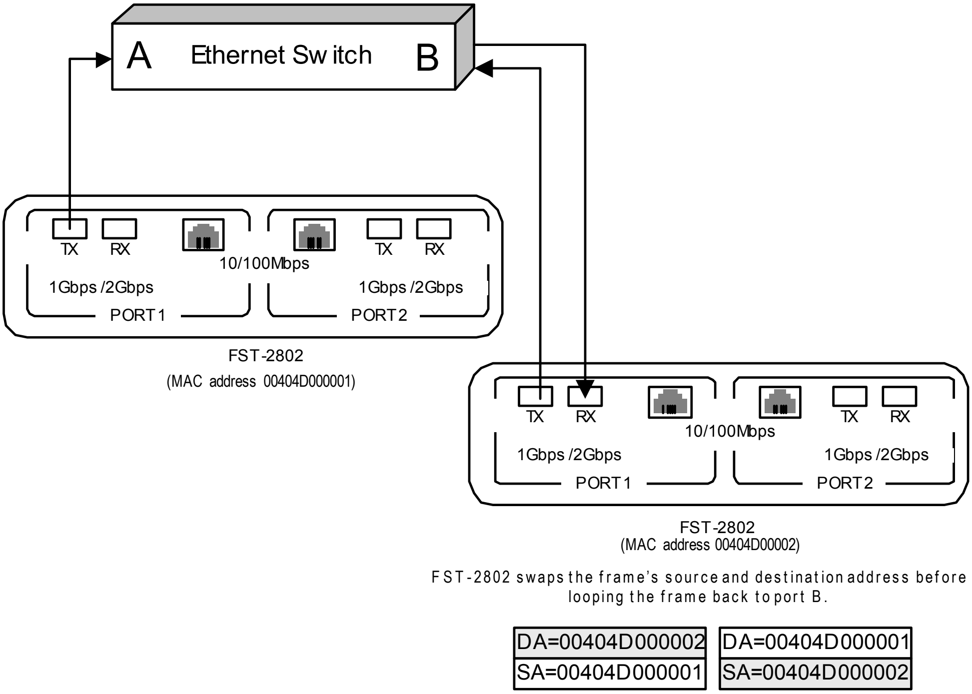


Figure 24 Loopback application using two FST-2802s

Traffic loads

By default, the FST-2802 transmits traffic in a constant load. You can also optionally transmit Ethernet and Fibre Channel traffic in a bursty or ramp load by configuring the load on the Traffic tab (see "Configuring the traffic load" on page 128).

> **NOTE:**
>
> Constant, Bursty, and Ramped traffic loads do not apply when you transmit ping packets or test patterns. When you configure the FST-2802 to transmit ping traffic, you can send a single, multiple, or continuous stream of ping packets. When you configure the FST-2802 to transmit test patterns, the test patterns are transmitted continuously.

Constant traffic

When the TestPad transmits a constant load of traffic, frames are transmitted constantly at the bandwidth you specify when you configure your test. See Figure 25.

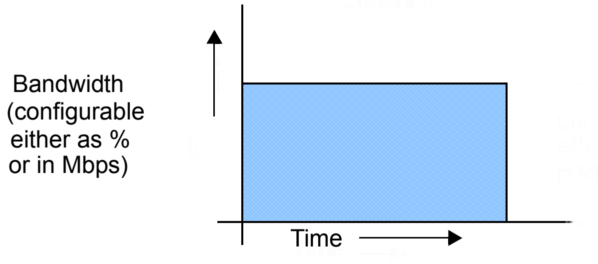


Figure 25 Constant traffic

When you setup a constant traffic load, you can specify the bandwidth as a percentage of the line rate (%BW) or in total Mbps.

Bursty traffic

When the TestPad transmits bursty traffic, frames are transmitted at 100% bandwidth, followed by no frame transmissions for a specific time interval. See Figure 26.

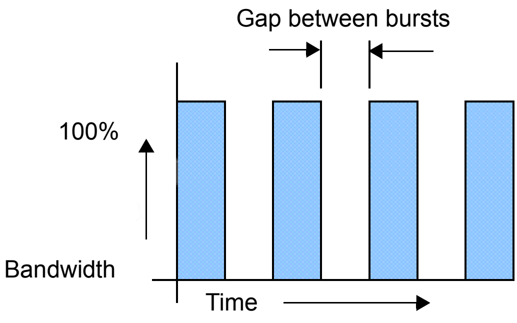


Figure 26 Bursty traffic

When you configure bursty traffic, you can specify the burst bandwidth as a percentage of the line rate, or by specifying the burst gap interval. If you specify the burst bandwidth as a percentage of the line rate, and then specify the number of frames per burst, the TestPad automatically calculates the burst gap for you.

You can also specify the number of bursts (fixed or continuous) for bursty traffic. The maximum number of fixed bursts is 65,535. If you select a BERT pattern for the traffic payload (in the transmit profile), you can specify the frame size (fixed or random).

Ramped traffic

When the TestPad transmits ramped traffic, frames are transmitted at a user-specified percentage of bandwidth for a user-specified time interval. After the time interval expires, the bandwidth is increased by the percentage specified and the process is repeated. This allows you to easily verify the maximum throughput of a link. See Figure 27.

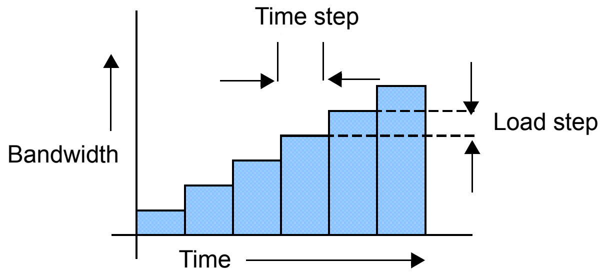


Figure 27 Ramp traffic

For example, if you specify a time step of 10 seconds, and a load step of 5% bandwidth, every ten seconds the TestPad will increase the traffic by an additional 5% of the line rate.

You can also specify criteria to tell the TestPad to stop ramping if an error (or errors) occur in a load step. For example, you can set up the ramp load to stop ramping if a single errored frame or dropped frame occurs during a load step. For Ethernet traffic, you can also set up the ramp load to stop ramping traffic if a single pause frame occurs in a load step. This allows you to determine the threshold at which errors occur on a specific link.

Traffic profiles

When you configure the FST-2802 to generate or monitor traffic, you can specify the frame characteristics of the traffic by defining a transmit or receive profile.

> **NOTE:**
>
> When you configure the FST-2802 to transmit ping packets or test patterns, you do not need to define a profile.

Transmit profiles

When you set up the TestPad, you can optionally define up to three transmit profiles to specify at the field level the characteristics of transmitted Ethernet frames such as the destination address for the traffic, the frame format, and the frame length. Before you transmit Ethernet traffic, you select the appropriate profile for your test.

Although the payload is not part of the transmit profile, you also specify the payload for the frames on the Tx Profiles tab.

If you purchase the VLAN tagging option, you can setup the profile to transmit tagged frames.

A fourth profile is available for loopback tests using two FST-2802's. When you perform a loopback test using the Loop Up button on the traffic originating FST-2802, the destination address in the loopback profile is populated automatically. See "Defining transmit profiles" on page 136 for details on defining a transmit profile.

Receive profiles

Before you monitor, terminate, or loopback Ethernet traffic, you can optionally define or select a receive profile to filter the traffic. You can then view results for the filtered traffic on the Results Display in the Filter Stats and Filter Counts result categories. See "Defining receive profiles" on page 133 for details on defining a receive profile.

Out-of-service testing

Using the FST-2802, you can generate and analyze Ethernet traffic when the network is out of service. To perform out-of-service tests, you first establish connectivity, and then transmit Ethernet traffic (generated from a TestPad) over a circuit.

NOTE:

Bandwidth transmission is accurate within ±2% if the frame size is ≤120 bytes or the utilization is ≥80%. Otherwise, bandwidth transmission is accurate within ±1%.

Establishing connectivity

Establishing connectivity involves connecting a TestPad (or TestPads) to an access element on a circuit. If an Ethernet device is on the circuit, and the TestPad is set up for auto-negotiation, the TestPad and the device automatically go through the auto-negotiation process (see “Auto-negotiation and flow control” on page 113). After auto-negotiation is complete, an Ethernet link is established, and idle traffic is transmitted over the circuit.

To establish connectivity

1. If your TestPad has two ports, select the port you are establishing connectivity for; otherwise, proceed to step 2.
2. Using the application buttons, select one of the following applications for the port:
   - **TERM > 10/100 Ethernet > Layer 2 Traffic**
   - **TERM > 10/100 Ethernet > Layer 3 PING**
   - **THRU > 10/100 Ethernet**
   - **TERM > 1G Ethernet > Layer 1 BERT**
   - **TERM > 1G Ethernet > Layer 2 Traffic**
   - **TERM > 1G Ethernet > Layer 2 Patterns**
   - **TERM > 1G Ethernet > Layer 3 PING**
   - **THRU > 1G Ethernet > Layer 1 BERT**
   - **THRU > 1G Ethernet > Layer 2 Traffic**
   - **THRU > 1G IP Over Ethernet**

3 If you need to turn auto-negotiation on, change the default capabilities, turn flow control off, or specify 10/100 Ethernet speed or duplex settings, specify the link initialization parameters (see "Specifying link initialization parameters" on page 123).

– If you want to establish connectivity for a second port, select the port, and then repeat step 2 and step 3.

NOTE:

Auto-negotiation must be off when you transmit patterns; therefore, the TestPad automatically turns Auto-Negotiation off when you configure a pattern test.

4 Using the correct cable for the access element, connect one end of the cable to the TX jack of the first TestPad, and the other end to the RX jack of the access element.

– If you are establishing connectivity for a second port, repeat this step for the second port.

5 Connect a second cable from the TX jack of the access element to the RX jack of the first TestPad.

– If you are establishing connectivity for a second port, repeat this step for the second port.

6 If you are establishing connectivity for a 1G Ethernet test, verify that a signal is present by checking the SIGNAL LED on the front panel for each active port. If the LED is illuminated, a signal is present.

7 If another Ethernet device is on the circuit, verify that the TestPad has obtained synchronization by checking the SYNC LED for each active port. If the LED is illuminated, the TestPad has obtained synchronization.

8 If you are establishing connectivity for a 1G Ethernet test, select **Laser OFF** to turn the laser on for the currently selected port. The Laser OFF button changes to Laser ON.

– If you are establishing connectivity for a second port, select the other port, and then select **Laser OFF** to turn the laser on for the second port.

9 If you turned auto-negotiation on, allow the TestPad and the access element to auto-negotiate their capabilities for each active port.

10 Verify that the link is established for each active port by checking the LINK ACTIVE LED on the front panel. If the LED is illuminated, the link is established for the port.

Specifying link initialization parameters

When you specify link initialization parameters, you can:

– Turn flow control off to ignore pause frames sent to the TestPad by devices at the far end of a circuit.

– Specify the speed and duplex settings for 10/100 Ethernet traffic.

– Turn auto-negotiation on to tell the TestPad to negotiate its capabilities with another switch before transmitting idle traffic. If you need to validate the auto-negotiation capabilities of the switch you are negotiating with, you can change each of the TestPad's default capabilities.

NOTE:

The FST-2802 does not support auto-negotiation when testing 1G Ethernet on copper links. If you insert a copper GBIC into the TestPad while auto-negotiation is on, a message appears informing you that auto-negotiation is not supported.

To specify link initialization parameters

1 If your TestPad has two ports, select the port you are specifying parameters for; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications for the port:

– **TERM > 10/100 Ethernet > Layer 2 Traffic**

– **TERM > 10/100 Ethernet > Layer 3 PING**

– **THRU > 10/100 Ethernet > Layer 2 Traffic**

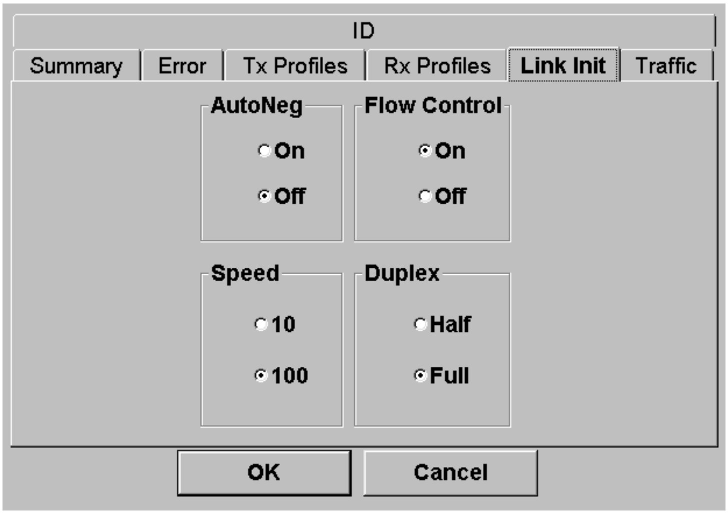
– **TERM > 1G Ethernet > Layer 1 BERT**

– **TERM > 1G Ethernet > Layer 2 Traffic**

– **TERM > 1G Ethernet > Layer 2 Patterns**

– **TERM > 1G Ethernet > Layer 3 PING**

3 Select **SETUP > Link Init**.



NOTE:

The Speed and Duplex parameters only appear on the Link Init tab when you configure a link for 10/100 Ethernet traffic.

4 If you are configuring the link for 10/100 Ethernet, do the following:

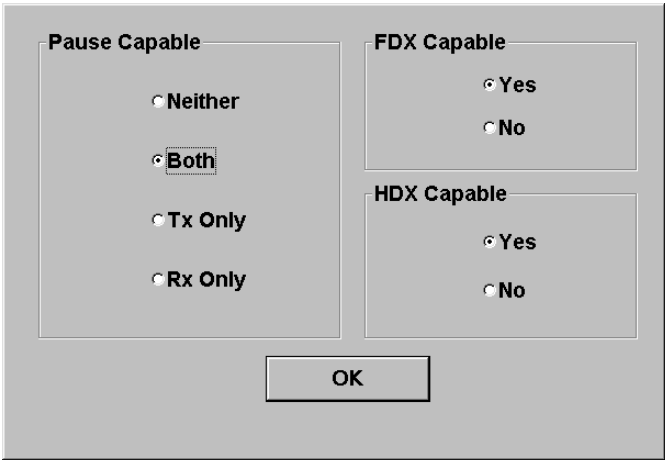
To…	Do this…
Turn auto-negotiation on	– Under AutoNeg, select **On**. The AutoNeg button appears. – By default, the TestPad advertises it is capable of transmitting and receiving Full and Half duplex traffic for both 100 Base Tx and 10 Base T. If you need to change the default capabilities, select **AutoNeg**. A dialog box with auto-negotiation capabilities appears. – Select the capabilities for 100 Base Tx and 10 Base T. – Proceed to step 7.

To…	**Do this…**
Turn auto-negotiation off	– Under AutoNeg, select **Off**. – Specify the speed (10 or 100) and duplex (Half or Full) settings. – Proceed to step 7.
Turn flow control off	Under Flow Control, select **Off**.

5 If you are configuring the link for 1G Ethernet, do the following:

To…	**Do this…**
Turn auto-negotiation on	– Under AutoNeg, select **On**. The AutoNeg button appears. – By default, the TestPad advertises it is capable of transmitting and interpreting received pause frames, and it advertises both full and half-duplex transmission. If you need to change the default capabilities, select **AutoNeg**. A dialog box with auto-negotiation capabilities appears. – Proceed to step 6.
Turn auto-negotiation off	Under AutoNeg, select **Off**.
Turn flow control off	Under Flow Control, select **Off**.

6 If you turned auto-negotiation on and selected **AutoNeg** in step 5, a window appears listing the 1G Ethernet auto-negotiation capabilities.



If you need to change the default settings, do one or more of the following:

To…	Select…
Change FDX capability	**Yes:** If you select Yes, the TestPad will support full-duplex (bi-directional) transmission. Yes is the default FDX capable setting. **No:** If you select No, the TestPad will not support full-duplex transmission.
Change HDX capability	**Yes:** If you select Yes, the TestPad will advertise half-duplex transmission. Yes is the default HDX capable setting. **No:** If you select No, the TestPad will not advertise half-duplex transmission.

To…	Select…
Change pause capability	**Neither:** If you select Neither, the TestPad will advertise it is not capable of transmitting or receiving (interpreting) pause frames. **Both:** If you select Both, the TestPad will advertise a capability to transmit and receive (interpret) pause frames. Both is the default pause capable setting. **Tx Only:** If you select Tx Only, the TestPad will advertise it is capable of transmitting pause frames, but it is not capable of receiving (interpreting) pause frames. **Rx Only:** If you select Rx Only, the TestPad will advertise it is capable of receiving (interpreting) pause frames, but it is not capable of transmitting pause frames.

7 Select **OK** to return to the main window.

8 *Optional*. If you want to specify link initialization parameters for a second port, select the port, and then repeat step 2 through step 7.

The link initialization parameters are defined.

Troubleshooting 1G connectivity

The inside green LEDs for SIGNAL, SYNC, and LINK ACTIVE illuminate sequentially when the TestPad detects a signal, obtains synchronization, and then recognizes a link is active. All three LEDs must illuminate to indicate you have established connectivity.

Table 12 lists symptoms and potential issues with devices on the circuit which prevent the link from being established.

Table 12 Troubleshooting 1G connectivity

Symptom…	Potential issues…
SIGNAL does not illuminate	– The access device transmitter is off or faulty. Verify the optical power level coming into the device from the network. – The GBIC is not properly seated. Verify that the “GBIC detected” result appears in the Summary result category. If “Not Detected” appears, reseat the GBIC.
SIGNAL illuminates, but SYNC does not illuminate	– The far end TestPad is not connected to the circuit. – The near end element on the network side has a faulty receiver, or the far end element on the network side has a faulty transmitter.
SIGNAL and SYNC illuminate, but LINK ACTIVE does not illuminate	– The far end TestPad is not acquiring synchronization. – The far end TestPad is acquiring synchronization; however, there is a problem with auto-negotiation. Verify that auto-negotiation is turned ON on both devices with at least one common capability or OFF on both devices. – You have configured the TestPad(s) for an Unframed (Layer 1) BERT test. The LINK ACTIVE LED does not illuminate when performing this test.

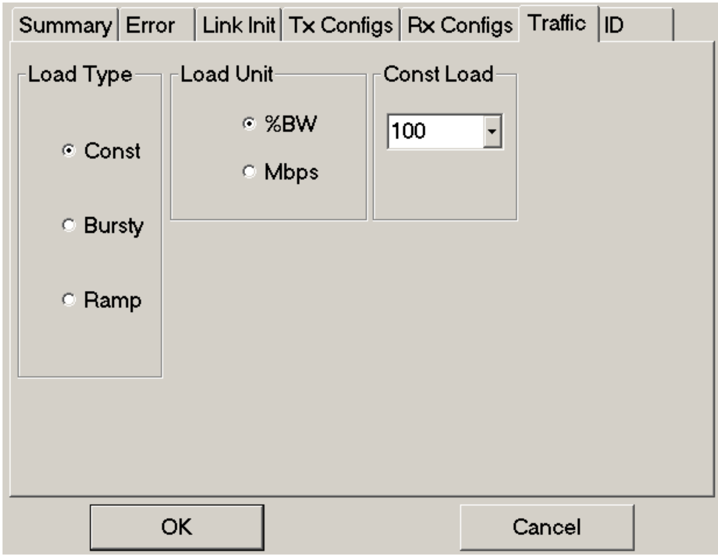
Configuring the traffic load

By default, the FST-2802 transmits a constant load of traffic at 100%. You can optionally configure the FST-2802 to transmit a different constant load, or bursty or ramped traffic. See “Traffic loads” on page 117 for a detailed description of each load type.

> **NOTE:**
>
> You do not need to configure the traffic load for ping, 1G pattern, or BER pattern tests; the FST-2802 automatically configures the traffic load for you.

To configure the traffic load

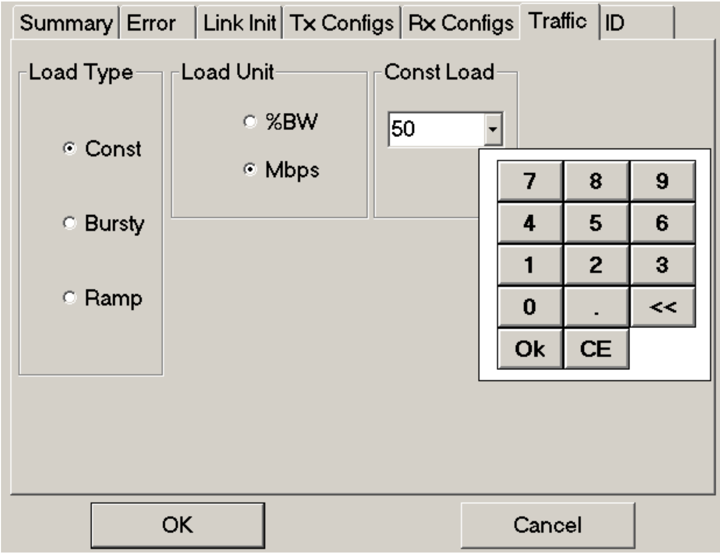
1. If your TestPad has two ports, select the port you are configuring the traffic load for; otherwise, proceed to step 2.
2. Using the application buttons, select one of the following applications:
   - **TERM > 10/100 Ethernet > Layer 2 Traffic**
   - **TERM > 1G Ethernet > Layer 2 Traffic**
3. Select **SETUP > Traffic**.



4. Under Load Type, select one of the following:

To transmit	Select
A constant load of traffic	**Const**, and then proceed to step 5 on page 130.
A bursty load of traffic	**Bursty**, and then proceed to step 6 on page 131.
A ramped load of traffic	**Ramp**, and then proceed to step 7 on page 132.

5 If you selected Const in step 4, you can specify the bandwidth as a percentage of the line rate, or in Mbps.



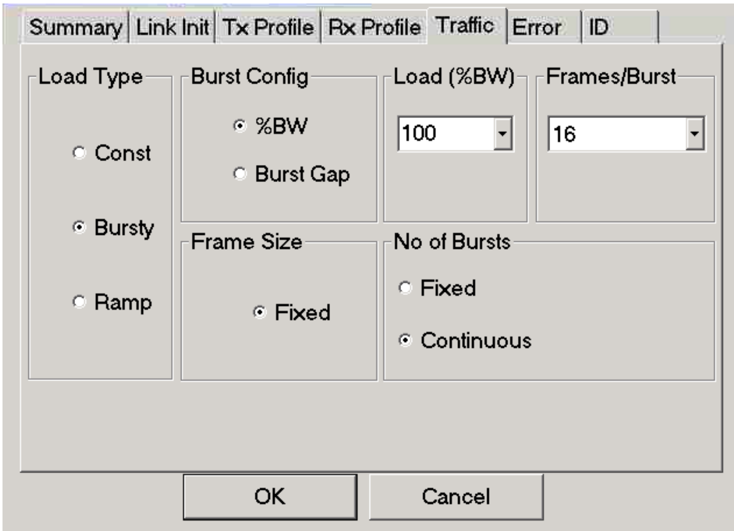
To configure a constant load, do the following:

a Under Load Unit, select **%BW** to specify the bandwidth as a percentage of the line rate, or **Mbps** to specify the bandwidth in total Mbps.

b In **Const Load**, type the percentage or Mbps.

c Proceed to step 8 on page 133.

6 If you selected Bursty in step 4, you can specify the burst bandwidth as a percentage of the line rate, or by specifying the burst gap interval.



To configure a bursty load, under Burst Config, do the following:

a Select one of the following:

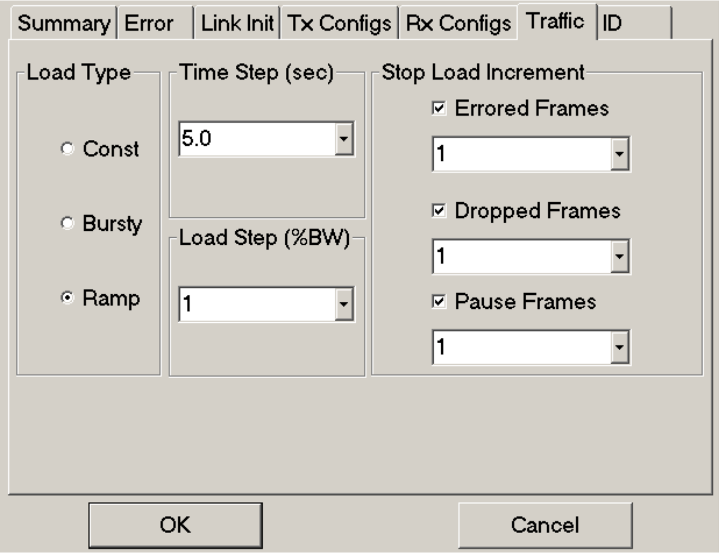
To…	Select…
Specify the gap between bursts	**Burst Gap**, and then do the following: – Select the time interval (sec, msec, usec, or nsec) – Type the gap and burst times in the corresponding fields.
Specify the load as a percentage of the bandwidth	**%BW**, and then type the load and frames per burst (up to 16,500,000) in the corresponding fields.

b If you are transmitting a BERT pattern in the payload of the frames, under Frame Size, select **Fixed** or **Random**.

c Under No of Bursts, select **Fixed**, and then specify the fixed number of bursts (up to 65,535), or select **Continuous**.

d Proceed to step 8 on page 133.

7 If you selected Ramp in step 4, you must specify a percentage of bandwidth and a time interval for each step in the ramp.



To specify the ramp traffic parameters, do the following:

a In **Time Step (sec)**, type the number of seconds to transmit each step in the ramp.

b In **Load Step (%BW)**, type the percentage of bandwidth to transmit for each step in the ramp.

c *Optional.* If you want to stop the load from ramping when a specific number of errored frames, pause frames (for Ethernet tests only), or dropped frames occur in a step, under Stop Load Increment, select the corresponding option, and then type the number of frames in a step which will stop the ramp.

The TestPad will continue to transmit traffic when the ramp stops; however, the traffic bandwidth will not be incremented. A message will appear in the message display to let you know the ramp was halted.

> **NOTE:**
>
> If you select Dropped Frames as the trigger, you must loop up the far-end FST-2802 to receive valid results. If you do not loop up the far-end FST-2802, and you select the Dropped Frames trigger, the ramp will stop soon after it starts because the near-end FST-2802 will compare the number of frames transmitted to the number of frames received to determine whether frames were dropped. In other words, the ramp will stop because the test is not configured properly; not because elements in the network dropped the frames.

   d Proceed to step 8 on page 133.

8 Select **OK** to return to the main window, or select another tab to continue configuring your test.

9 *Optional*. If you want to configure the traffic load for a second port, select the port, and then repeat step 2 through step 8.

The traffic load is configured.

Defining receive profiles

Defining a receive profile involves selecting the profile to define, and then specifying the characteristics of the frames you want to monitor. You can define up to four receive profiles on the Rx Profiles setup tab.

To define a receive profile

1 If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:

   – **MON > 10/100 Ethernet > Layer 2 Traffic**

   – **THRU > 10/100 Ethernet > Layer 2 Traffic** (dual port units only)

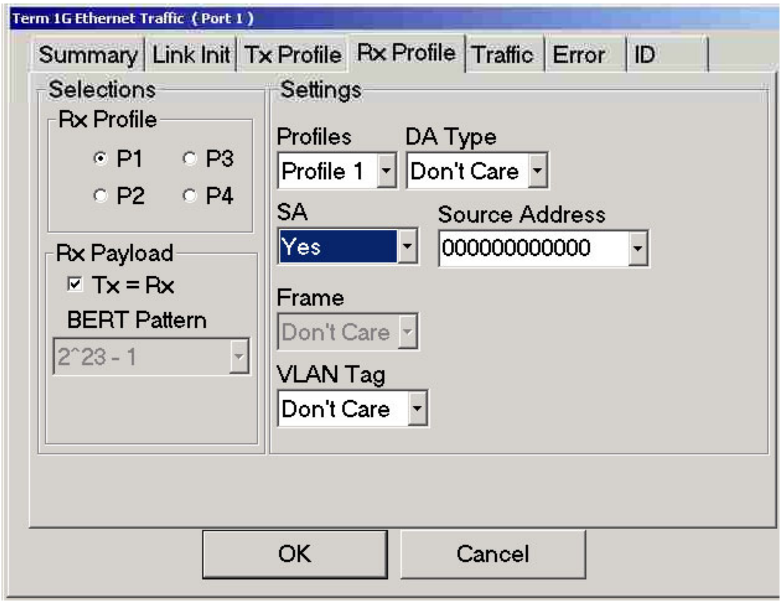
   – **TERM > 10/100 Ethernet > Layer 2 Traffic**

   – **MON > 1G Ethernet > Layer 2 Traffic**

   – **THRU > 1G Ethernet > Layer 2 Traffic** (dual port units only)

   – **TERM > 1G Ethernet > Layer 2 Traffic**

3 Select **SETUP > Rx Profiles**.



4 If you are filtering traffic with a BERT pattern in the payload, under Rx Payload, select **Tx = Rx** to monitor traffic with the same BERT pattern specified in the Transmit (Tx) profile, or select a BERT pattern for the filter.

5 Under Settings, in **Profiles**, select the profile you want to define.

6 Specify the frame characteristics for the traffic filtered using the profile.

In…	Do this…
DA Type	– If you want to monitor frames sent to a single destination address and network device, select **Unicast**, and then type the destination address in **Dest Address** using a 6 byte hexadecimal format. – If you want to monitor frames sent to a single destination address which then distributes the frames to multiple network devices, each with its own destination address, select **Multicast**, and then specify the destination address using a 6 byte hexadecimal format. – If you want to monitor frames sent to all network devices on the link, select **Broadcast**. – If you want to monitor all frames regardless of their destination address type, select **Don't Care**.
SA	– If you want to monitor frames sent from a specific source address, select **Yes**, and then type the source address in **Source Address** using a 6 byte hexadecimal format. – If you want to monitor all frames regardless of their source address, select **Don't Care**.
Frame	– If you want to monitor DIX frames, select **DIX**, and then specify the DIX protocol using a 2 byte hexadecimal format. – If you want to monitor 802.3 frames, select **802.3**, and then specify the data length. – If you want to monitor all frames regardless of their format, select **Don't Care**. **NOTE:** If you purchased the VLAN Tagging option, you must select **Tagged** or **Non-Tagged** for the VLAN Tag filter to specify a frame type for the Frame filter.

In…	Do this…
VLAN Tag	– If you want to monitor tagged frames, select **Tagged**, and then specify the VLAN ID and User Priority using a decimal format. If you want to monitor all VLAN tagged frames regardless of their User Priority, select **Don't Care** as the User Priority filter value. – If you want to monitor non-tagged frames, select **Non-Tagged**. – If you want to monitor all frames regardless of their tagged status, select **Don't Care**. If you select Don't Care, the TestPad automatically sets the frame type for the profile to Don't Care. **NOTE:** The VLAN Tag field only appears if you purchased the VLAN Tagging option for the FST-2802.

7 Select **OK**.

8 *Optional*. If you want to define a receive profile for a second port, select the port, and then repeat step 2 through step 7.

The profile is stored and the main window appears.

Defining transmit profiles

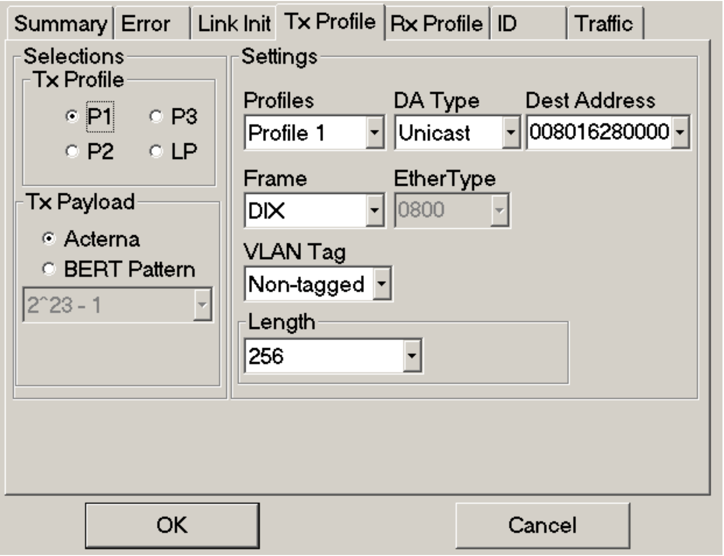
Defining a transmit profile involves selecting the profile to define, and then specifying the characteristics for each frame the TestPad transmits using the profile. Although the frame payload is not part of the profile, you also select the type of payload to transmit (Acterna or BERT) on the Tx Profiles tab.

To define a transmit profile

1 If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   - **TERM > 10/100 Ethernet > Layer 2 Traffic**
   - **TERM > 1G Ethernet > Layer 2 Traffic**

3 Select **SETUP > Tx Profiles**.



4 Under Payload, select one of the following:

- **Acterna.** To transmit frames with a time stamp and sequence number, select **Acterna**. You must select an Acterna payload to measure round trip delay and count lost frames.
- **BERT Pattern.** To populate the payload by repeating a specific BER pattern, select **BERT Pattern**, and then select **2^23-1**, **Inv 2^23-1**, **2^31-1**, **Inv 2^31-1, ALL ONES, ALL ZEROS**, or **USER DEFINED**. If you selected USER DEFINED, type the user defined BER pattern using a 4 byte hexadecimal format.

  You must select the BERT Pattern payload to perform BER testing on a switched (layer 2) network (see "BER testing on switched (layer 2) networks" on page 146).

5 Under Settings, in **Profiles**, select the profile you want to define, and then specify the frame characteristics for the traffic transmitted using the profile.

In…	Do this…
DA Type	Select the type of transmission for the frames transmitted using the profile: – **Unicast** (to a single destination address and network device) – **Multicast** (to a single destination address which then distributes the frames to multiple network devices, each with its own destination address) – **Broadcast** (to all network devices on the link)
Dest Address	Type the destination address for Unicast or Multicast transmissions. Enter the destination address in a 6 byte hexadecimal format. No destination address is required for Broadcast transmissions.
Frame	Select the frame format (**802.3** or **DIX**). The default format is DIX.
Protocol	Type the protocol ID for the data in the frames using a 2 byte hexadecimal format. **NOTE:** When transmitting Acterna payload frames, the EtherType is automatically set to x0800 and cannot be changed.
VLAN Tag	– If you want to transmit tagged frames, select **Tagged**, and then specify the VLAN ID and User Priority using a decimal format. – If you want to transmit non-tagged frames, select **Non-Tagged**. **NOTE:** The VLAN Tag field only appears if you purchased the VLAN Tagging option for the FST-2802.

In…	Do this…
Length	Select the frame length by selecting the arrow to the right of the field to display a drop-down menu of lengths appears. The default length is 64 bytes. You can select: – An RFC 2544 recommended length (**64**, **128**, **256**, **512**, **1024**, **1280**, or **1518**). – **User Defined**, and then specify a length ranging from 64 to 1518 bytes (or 64 to 1522 bytes for VLAN tagged frames). – **Jumbo Frame**, and then specify a length ranging from 1519 to 10,000 bytes (or 1523 to 10,000 bytes for VLAN tagged frames).

6 Select **OK**.

7 *Optional*. If you want to define a transmit profile for a second port, select the port, and then repeat step 2 through step 6.

The profile is stored and the main window appears.

End-to-end testing

End-to-end testing allows you to verify that a provisioned path will carry Ethernet traffic generated from one TestPad to a second TestPad on the far end of a circuit. See Figure 20 on page 105 for an illustration of end-to-end testing.

When you perform an end-to-end test on a switched (layer 2) Ethernet network, you must specify the far end TestPad port's source address as the destination address for traffic generated by the first TestPad, and you must specify the first TestPad port's source address as the destination address for traffic generated by the far end TestPad.

NOTE:

You can easily determine the factory-assigned (default) source address and the user-assigned source address for a TestPad port by displaying the Summary tab. The addresses appear in the Default Source Address and User Source Address fields.

In a point-to-point unswitched (layer 1) network, you do not have to specify the source address and destination addresses for the TestPad ports.

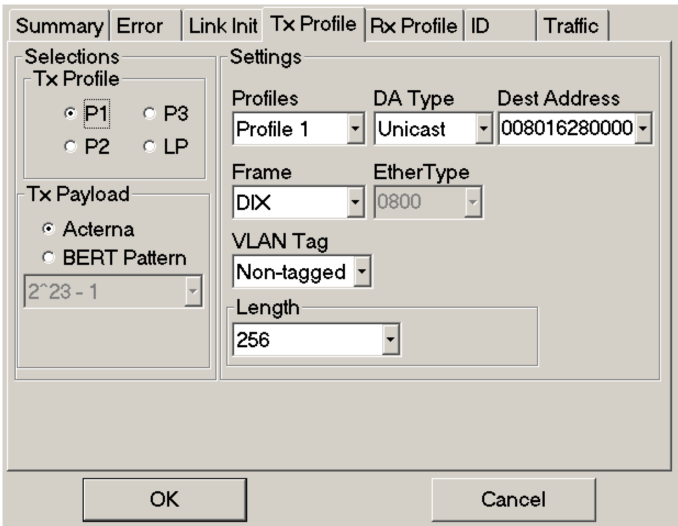
To perform an end-to-end test

1 Establish connectivity (see “Establishing connectivity” on page 121), and then do one of the following.

   – If you are performing the test on a switched Ethernet network, proceed to step 2.

   – If you are performing the test on an unswitched point-to-point network, proceed to step 5 on page 142.

2 Select **SETUP > Tx Profiles**.



3 Under Payload, select one of the following:

   – **Acterna.** To transmit frames with a time stamp and sequence number, select **Acterna**. You must select an Acterna payload to measure round trip delay.

   – **BERT Pattern.** To populate the payload by repeating a specific BER pattern, select **BERT Pattern**, and then select the pattern to transmit in the payload.

4 Select or define a profile:

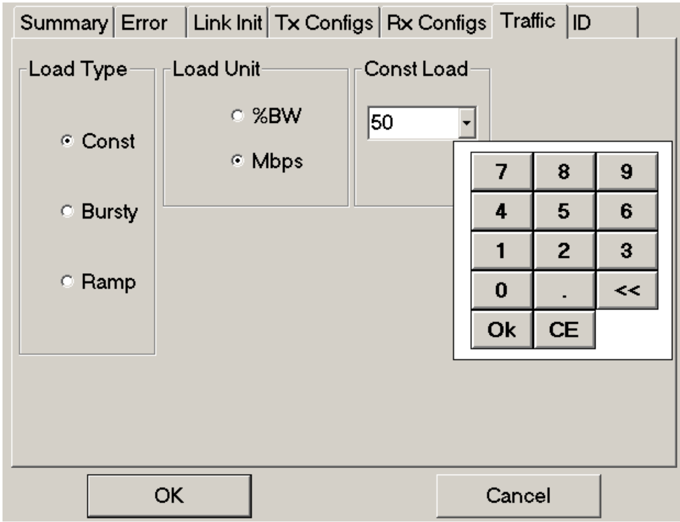
To…	Do this…
Use an existing profile with the source address of the Test-Pad port on the far end as the destination address for the traffic.	Under **Selections**, select the profile.
Define a profile with the far end TestPad port's source address as the destination address for the traffic.	– Under **Settings**, select the profile to define from the **Profiles** field. – In **Dest Address**, select the arrow to the right of the field to display a key-pad. Using the keypad, type the source address of the TestPad port on the far end, and then select **OK** to enter the address in the field. – Be sure **Unicast** is selected as the address type for the profile.

For additional information on frame profiles, see "Defining transmit profiles" on page 136.

5 Do one of the following to configure the traffic load:

– If you specified or defined a transmit profile in step 4, select **Traffic**, and then configure the load (see "Configuring the traffic load" on page 128).

– If you didn't specify or define a transmit profile (because you are performing the test on an unswitched point-to-point network), select **SETUP > Traffic**, and then configure the load.



6 Select **OK** to return to the main window.

– If you are performing an end-to-end test using a second port, repeat steps step 1 through step 6 for the second port before proceeding to step 7.

7 On the TestPad on the far end of the circuit, do the following:

– If you are performing the test on a switched Ethernet network, repeat step 2 through step 6.

– If you are performing the test on an unswitched point-to-point network, repeat step 5 and step 6.

8 If you are transmitting 1G Ethernet traffic, for each active port on both TestPads, turn the laser on by selecting the **Laser OFF** button.

The Laser OFF button changes to Laser ON.

9 For each active port on both TestPads, select **Start Traffic** to transmit traffic over the circuit.

10 View and verify results for each transmitting port on the Results Display of the receiving TestPad.

BER testing on unswitched (layer 1) networks

If you are testing on an unswitched 1G Ethernet network, when you perform an end-to-end test, you can transmit BER patterns in the bit stream to determine the ratio of erroneous bits to the total bits received.

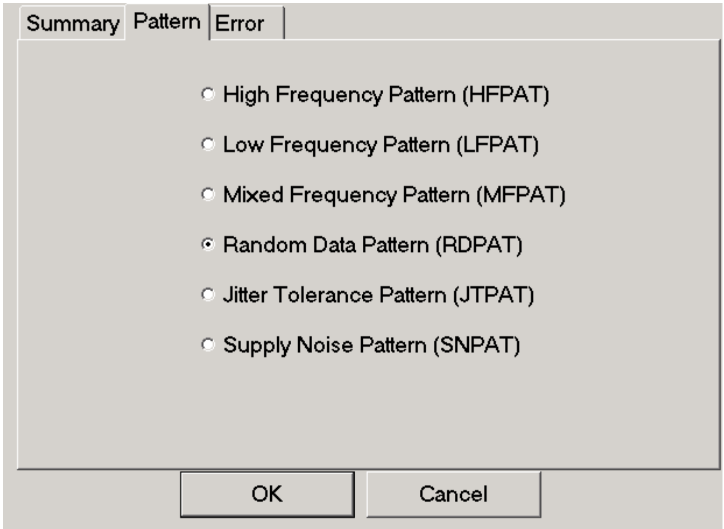
NOTE:

The FST-2802 does not support Layer 1 BER testing of 1G Ethernet on copper links. If you insert a copper GBIC into the TestPad when it is configured for a Layer 1 BER test, a message appears informing you that Layer 2 BER testing is not supported.

To perform BER test on an unswitched network

1. If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.
2. Using the application buttons, select one of the following applications:
   - **MON > 1G Ethernet > Layer 1 BERT**
   - **THRU > 1G Ethernet > Layer 1 BERT** (dual port units only)
   - **TERM > 1G Ethernet > Layer 1 BERT**
3. Select **SETUP > Pattern**.

The Pattern tab appears.



4 Select one of the following patterns:

To…	Select…
– Test random jitter at a BER of 10^{-12} – Test asymmetry of transition times	**HFPAT**
– Test low frequency random jitter – Test PLL tracking errors	**LFPAT**
Test random and deterministic jitter (combined)	**MFPAT**
Emulate a worst case scenario for deterministic jitter	**RDPAT**
Stress timing margins in the received eye by exposing the data sampling circuits to large systematic phase jumps	**JTPAT**
Emulate a worse case scenario for power supply noise within network transceivers	**SNPAT**

5 *Optional*. If you want to insert bit errors or code violations into the bit stream, select the Error tab, and then do the following:

To…	Select…
Setup the TestPad to allow you to insert BIT errors into the bit stream	**BIT**. – If you want the TestPad to beep each time it receives a bit error (or errors), under Beep On Error, select **ON**. – If you want to insert a rate of bit errors, select **Rate**, and then select the error rate.
Setup the TestPad to allow you to insert code violations into the bit stream	**Code Violations**. – If you want the TestPad to beep each time it receives code violation (or violations), under Beep On Error, select **ON**. – If you want to insert a rate of code violations, select **Rate**, and then select the rate.

6 Select **OK** to return to the main window.

- If you want to perform a BER test from a second port, select the port, and then repeat step 2 through step 6 for the second port.

7 For each active port, establish connectivity (see “Establishing connectivity” on page 121).

8 If you are performing the BERT in single port THRU mode (using the **MON** application button), for each active port on the far end TestPad, select **Connect RX to TX**.

9 For each active port, start the traffic using the **Start BERT Pattern** button.

10 For each active port, verify that the Pattern Sync LED is illuminated in the LED result category.

11 *Optional*. To insert bit errors or code violations into the bit stream, for each active port, select the **Bit Error** or **CV Error** button.

12 Verify the Error Stats: Bit Errors and Bit Error Rate results for each active port on a Results Display.

BER testing on switched (layer 2) networks

If you are testing on a switched Ethernet network, when you perform an end-to-end test you can transmit BER patterns in the frame payload to determine the ratio of erroneous bits to the total bits received.

To transmit a BER pattern on a switched network

1. If your TestPad has two ports, select a port for the test; otherwise, proceed to step 2.
2. Using the application buttons, select one of the following applications:
   – **TERM > 10/100 Ethernet > Layer 2 Traffic**
   – **TERM > 1G Ethernet > Layer 2 Traffic**
3. Select **SETUP > Rx Profiles**, and then define the receive profile for the traffic you want to BERT (see “Defining receive profiles” on page 133).
4. Select the **Tx Profiles** tab, and then do the following:
   - **a** Under Payload, select **Bert Pattern**.
   - **b** Select **2^23-1**, **Inv 2^23-1**, **2^31-1**, **Inv 2^31-1, ALL ONES, ALL ZEROS**, or **USER DEFINED**. If you selected USER DEFINED, type the user defined BER pattern using a 4 byte, hexadecimal format.
5. *Optional*. If you want to insert a framed bit error into the traffic, select the Error tab, and then do the following:
   - **a** Select **Framed Bit**.
   - **b** If you want the TestPad to beep each time it receives a framed bit (or bits), under Beep On Error, select **ON**.
   - **c** If you want to insert a rate of framed bits, select **Rate**, and then select the error rate.
6. Select **OK** to return to the main window.
7. *Optional.* If you want to transmit a BER pattern from the second port, select the second port, and then repeat step 4 through step 6.

8 Establish connectivity (see "Establishing connectivity" on page 121).

9 For each active port, select **Start BERT Pattern** to transmit the pattern over the circuit.

10 For each active port, verify that the FRAME LED is illuminated.

11 *Optional*. To insert one or more framed bits into the traffic, for each active port, select the **Framed Bit Error** button.

12 For each active port, verify the Error Stats: Bit Errors and Bit Error Rate results on a Results Display.

NOTE:

When performing a BERT on a switched (layer 2) network, Bit Errors and Bit Error Rate results may indicate one or more physical layer (layer 1) bit errors.

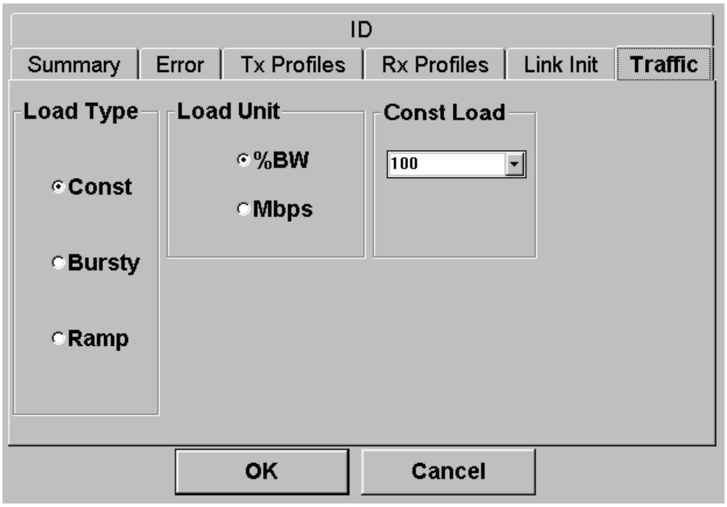
Measuring service disruption time

When you perform an end-to-end test, you can measure the service disruption time resulting from a switch in service to a protect line.

To measure service disruption time

1 Setup and configure an end-to-end test (see "End-to-end testing" on page 139).

2 On the far end FST-2802, select **SETUP > Traffic**.



3 Configure the traffic load (see "Configuring the traffic load" on page 128). When measuring service disruption time, we recommend transmitting a constant load at 100 percent by specifying the following parameters:

   a Load Type: **Const**

   b Load Unit: **%BW**

   c Const Load: **100**

4 Select **OK** to return to the main window.

5 If you are transmitting 1G Ethernet traffic, turn the laser on by selecting the **Laser OFF** button.

   The Laser OFF button changes to Laser ON.

6 Select **Start Traffic** to transmit traffic over the circuit.

7 On the near end FST-2802, clear the service disruption time by selecting the **Reset Svc Disruption** action button.

8 Initiate the switch to the protect line.

9 *Optional*. If you want to measure service disruption time from a second port, select the port, and then repeat step 1 through step 8.

10 For each active port, verify the Link Stats: Svc Disruption (ms) result on a Results Display.

Transmitting patterns

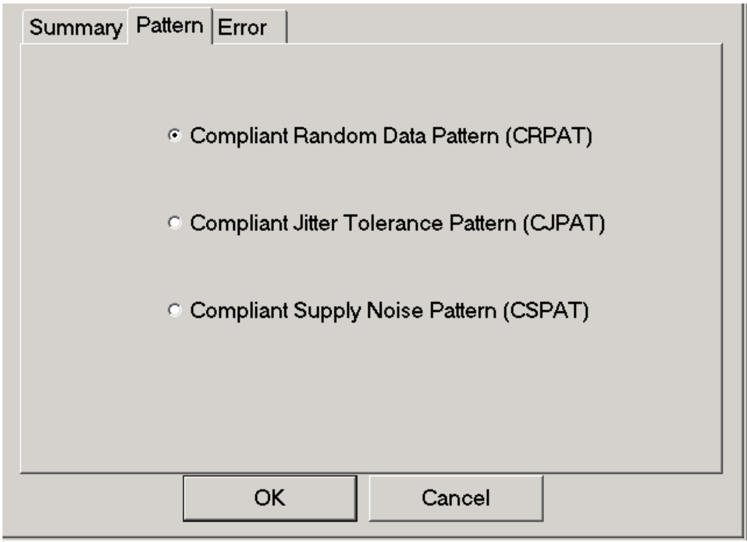
Using the FST-2802, you can stress the jitter and noise characteristics of Gigabit Ethernet components and systems by transmitting continuous random test patterns (CRPAT), continuous jitter test patterns (CJPAT), and the compliant supply noise pattern (CSPAT). To transmit a pattern, you select the pattern on the Pattern tab, and then you establish connectivity to an Ethernet link. Finally, you transmit the pattern over the link.

> **NOTE:**
>
> These patterns are designed to test physical layer networks. By definition, these framed patterns populate the Ethernet header with invalid address information; therefore, these frames will not traverse a layer 2, switched network.
>
> For the same reason, if the pattern frames are transmitted to a far-end TestPad that is looped-up, the far-end TestPad tries to swap the source address and destination address for the pattern frames (see the discussion of "Ethernet switching" on page 115). As a result, the patterns received by the near-end TestPad are modified, and the results are not valid. Therefore, you must run pattern tests using an end-to-end configuration at all times.

To transmit a pattern

1. If your TestPad has two ports, select a port for the test; otherwise, proceed to step 2.
2. On the application button bar, select **TERM > 1G Ethernet > Layer 2 Patterns**.
3. Select **SETUP > Summary** to display the setup tabs, and then select **Pattern**.

The Pattern tab appears.



4 Select a pattern:

To…	Select…
Emulate a worst case scenario for deterministic jitter by transmitting frames with a broad spectral content.	**CRPAT**
Stress the timing margins in the received eye by exposing the data sampling circuits to large systematic phase jumps.	**CJPAT**
Emulate a worse case scenario for power supply noise within network transceivers.	**CSPAT**

5 Select **OK** to return to the main window.

6 Establish connectivity (see "Establishing connectivity" on page 121). The TestPad automatically turns auto-negotiation off when you select a pattern test.

7 Turn the laser on by selecting the **Laser OFF** button.

The Laser OFF button changes to Laser ON.

8 Select **Start Pattern** to transmit the pattern over the circuit.

9 *Optional*. If you want to transmit patterns from a second port, select the port, and then repeat step 2 through step 8.

10 For each active port, verify results on the Results Display of the TestPad. At a minimum, verify the following Pattern Stats results:

- Transmitted Frames
- Received Frames
- FCS Errored Frames

Loopback testing

Loopback testing allows you to generate and transmit Ethernet traffic from one TestPad, and then loop the traffic back through a second TestPad on the far end of a circuit. See Figure 24 on page 117 for an illustration of Ethernet Loopback testing.

Using the Line Loopback feature

You can manually perform a line loopback in a switched Ethernet network by specifying the source address of the TestPad port on the far end as the first TestPad port's destination address (when you define or select the loopback profile), and then selecting the LLB button on the far end TestPad to loop frames back to the originating TestPad.

In a point-to-point unswitched network, you do not have to specify the destination address for the far end TestPad port.

To manually perform a line loopback

1 If your TestPad has two ports, select the port for the loopback test; otherwise, proceed to step 2.

2 Establish connectivity (see "Establishing connectivity" on page 121).

3 Do one of the following:

- If you are performing the loopback on a point-to-point network, proceed to step 5.
- If you are performing the loopback on a switched Ethernet network, on the transmitting TestPad, configure the traffic for each active port (see step 2 through step 6 of "End-to-end testing" on page 139).

NOTE:

If you want to filter the traffic looped back to the near end TestPad, the parameters you specify in the transmit profile for the near end TestPad must match the parameters specified in the receive profile for the far end TestPad.

For example, if you want to loop back VLAN tagged frames for a specific VLAN ID and User Priority, the same VLAN ID and User Priority must be specified in both profiles.

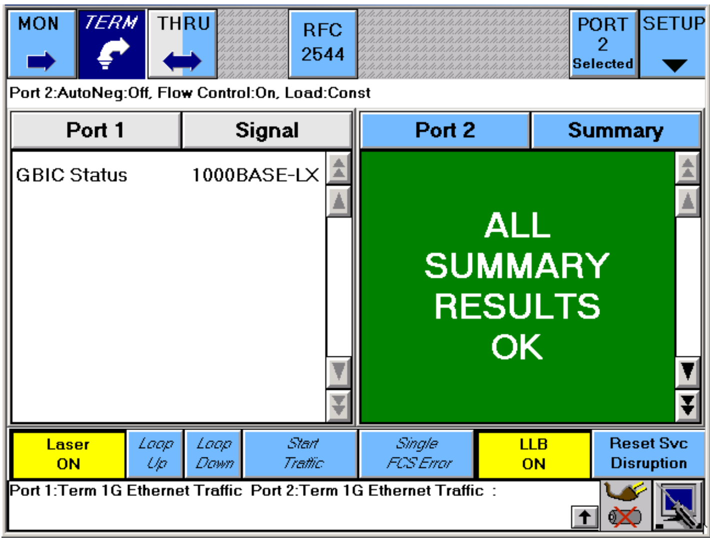
If you want to loop back all frames, select **Don't Care** for each of the receive profile parameters.

4 If you are performing a line loopback for 1G Ethernet, on the far end TestPad, turn the laser on by selecting **Laser OFF**.

The Laser OFF button changes to Laser ON.

5 On the far end TestPad, select **LLB OFF** to put the TestPad into loopback mode.

The LLB OFF button changes to LLB ON.



6 On the transmitting TestPad, select **Start Traffic** to transmit traffic over the circuit to the TestPad on the far end.

When the far end TestPad receives the traffic, it will swap the destination address and source address of every frame it receives before looping the frames back to the transmitting TestPad.

7 *Optional*. If you want to perform a line loopback from the second port, select the port, and then repeat step 3 through step 6.

8 Verify results for each active port on the Results Display of the transmitting TestPad. At a minimum, verify the following results:

   – Link Stats: Total Util%, Avg, Total Util %, Cur, and Total Util % Peak.

   – Error Stats: All results are 0.

> **WARNING:**
>
> The TestPad allows you to change setup parameters while testing in loopback mode. Be aware that certain changes may bring down the link.

Using the Automatic Loopback feature

You can perform an automatic loopback by selecting the Loop Up button on the traffic generating TestPad. A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the far end TestPad is in loopback mode. The destination address in the loopback profile for the first TestPad is also automatically populated with the source address of the TestPad on the far end.

When you configure TestPads for an automatic loopback test, you can optionally specify text identifiers for each TestPad (for example, “Joe’s 2802” and “Sam’s 2802”). When the TestPads send confirmation messages to each other indicating the status of the loopback, the message will identify each TestPad using the text identifier.

> **NOTE:**
>
> If you want to filter the traffic looped back to the near end TestPad, the parameters you specify in the transmit profile for the near end TestPad must match the parameters specified in the receive profile for the far end TestPad.
>
> For example, if you want to loop back VLAN tagged frames for a specific VLAN ID and User Priority, the same VLAN ID and User Priority must be specified in both profiles.
>
> If you want to loop back all frames, select **Don’t Care** for each of the receive profile parameters.

To perform an automatic loopback

1. If your TestPad has two ports, select the port for the loopback test; otherwise, proceed to step 2.
2. Establish connectivity (see “Establishing connectivity” on page 121).
3. Do one of the following:
   – If you are performing the loopback on a point-to-point network, proceed to step 4.
   – If you are performing the loopback on a switched Ethernet network, on the transmitting TestPad, configure the traffic for the test (see step 3 through step 6 of “End-to-end testing” on page 139), and then proceed to step 4.

> **NOTE:**
>
> If you want to filter the traffic looped back to the near end TestPad, the parameters you specify in the transmit profile for the near end TestPad must match the parameters specified in the receive profile for the far end TestPad.
>
> For example, if you want to loop back VLAN tagged frames for a specific VLAN ID and User Priority, the same VLAN ID and User Priority must be specified in both profiles.
>
> If you want to loop back all frames, select **Don’t Care** for each of the receive profile parameters.

4. *Optional*. If you want to provide an identifier in the confirmation messages sent between TestPads, for each TestPad, do the following:
   - **a** Select **SETUP > Summary** to display the setup tabs.
   - **b** Select **ID** to display the ID tab, and then select **Edit** to display a keypad.
   - **c** Using up to ten characters, type the identifier for the TestPad, and then select **OK** to store the identifier and return to the ID tab.
   - **d** Select **OK** to return to the main window.
5. On the traffic generating TestPad, select **Loop Up** to put the receiving TestPad on the far end into loopback mode.

A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the far end TestPad is in loopback mode. The destination address field of the loopback profile is automatically updated with the source address of the far end TestPad.

6. If you are performing a line loopback for 1G Ethernet, on the traffic generating TestPad, turn the laser on by selecting **Laser OFF**.

   The Laser OFF button changes to Laser ON.

7. On the traffic generating TestPad, select **Start Traffic** to transmit traffic over the circuit to the TestPad on the far end.

   When the far end TestPad receives the traffic, it will swap the destination address and source address of every frame it receives before looping the frames back to the traffic generating TestPad.

8. *Optional*. If you want to perform a loopback from the second port, select the port, and then repeat step 3 through step 7.

9. Verify results for each active port on the Results Display of the traffic generating TestPad. At a minimum, verify the following results:

   – Link Stats: Total Util%, Avg, Total Util %, Cur, and Total Util % Peak.

   – Error Stats: All results are 0.

10. When the test is complete, for each active port, select **Loop Down** to take the receiving port on the far end TestPad out of loopback mode.

    A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the port on the far end TestPad is out of loopback mode.

Inserting an FCS error

You can insert an FCS error when you perform end-to-end and loop-back tests.

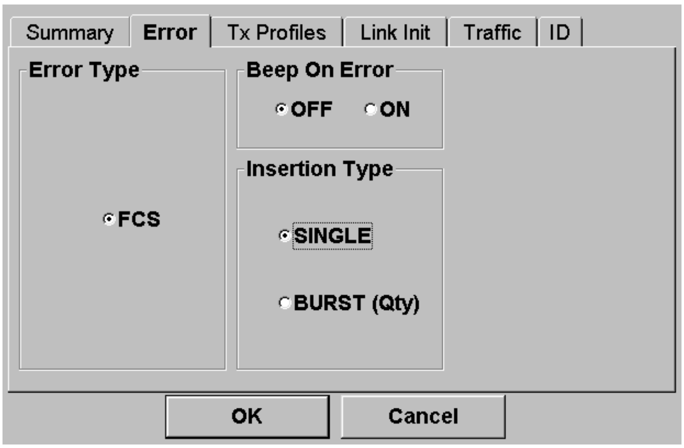
> **NOTE:**
>
> For 1G testing, if you insert an FCS error on an unswitched point-to-point network using two FST-2802s, and you want to receive the FCS back at the originating TestPad, put the TestPad on the far end of the circuit in Monitor mode, and then select the **Set Rx to Tx** button to transmit received traffic back to the originating TestPad.

To insert an FCS error

1 If your TestPad has two ports, select the port for the error insertion; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   – **TERM > 10/100 Ethernet > Layer 2 Traffic**
   – **TERM > 1G Ethernet > Layer 2 Traffic**

3 Select **SETUP > Summary** to display the setup tabs, and then select **Error**.



4 To specify the error parameters, do the following:

To…	Do this…
Specify that the TestPad should beep whenever an FCS error occurs	Under Beep on Error, select **ON**.
Insert a single FCS error	Select **SINGLE**.
Insert a burst of FCS errors	Select **BURST**. A BURST (Qty) field appears. – Select the arrow to the right of the BURST (Qty) field to display a key-pad. – Using the keypad, type the number of FCS errors to insert in the burst.

5 Select **OK** to store the error parameters and return to the main window.

6 If you are inserting an FCS error into 1G traffic, turn the laser on by selecting **Laser OFF**.

The Laser OFF button changes to Laser ON.

7 Select **Start Traffic** to transmit traffic over the circuit.

8 Select the **FCS Error** action button to insert the error or burst of errors.

9 *Optional*. If you want to insert errors from the second port, select Port 2, and then repeat step 3 through step 8.

The error is inserted into the traffic and is handled as follows:

– For end-to-end applications, the error is transmitted to the TestPad on the far end of the circuit.

– For loopback applications using a hard loopback, the error is typically looped back to the TestPad. Consult your network element documentation to determine if the network element drops errored traffic.

– For loopback applications using a second TestPad in loopback mode on the far end of the circuit, the far end TestPad drops each frame with a FCS error. The dropped FCS error (or errors) is interpreted by the near end TestPad as a single out-of-sequence (OOS) frame, and each individual error is counted as a lost frame.

  See “Ethernet switching” on page 115 for an explanation of how the FST-2802 handles Ethernet frames in a switched network.

Measuring round trip delay

When you perform loopback tests, you can measure round trip delay by transmitting an Acterna payload with frames of an RFC 2544 recommended length. The Acterna payload carries frames with time stamps, enabling the FST-2802 to calculate the round drip delay.

NOTE:

When you measure round trip delay, you must implement a loopback on the far end of the circuit, and then transmit and receive an Acterna payload with test frames from a FST-2802 on the near end of the circuit. If you do not use a loopback and transmit an Acterna payload with frames of an RFC 2544 length, the test results will be invalid.

To measure round trip delay

1 Setup and configure a loopback test (see “Loopback testing” on page 151).

2 On the near end TestPad, select **SETUP > Tx Profiles**, and then do the following:

   – Under Payload, select **Acterna.** The Acterna payload transmits frames with a time stamp and sequence number. You must select an Acterna payload to measure round trip delay.

   – In **Length**, select an RFC recommended length (**64**, **128**, **256**, **512**, **1024**, **1280**, or **1518**).

3 Select **OK** to return to the main window.

4 If you are measuring round trip delay for 1G Ethernet traffic, select **Laser OFF** to turn the laser on.

   The Laser OFF button changes to Laser ON.

5 Select **Start Traffic** to transmit traffic over the circuit.

6 *Optional*. If you want to measure round trip delay from a second port, select the port, and then repeat step 2 through step 5.

7 For each active port, verify results on the Results Display of the transmitting TestPad. At a minimum, verify the following Link Stats results:

– Delay, Max (us)

– Delay, Min (us)

– Delay, Avg (us)

Ping testing

Using the FST-2802, you can verify connectivity with another layer 3 or IP device by sending ping request packets to the device. The device then responds to the ping request with a ping reply (if the device is responsive), or with another message indicating the reason no ping reply was sent.

Ping testing tells you if the destination device is responsive, how long it took the ping packet to travel to the destination device and back to the FST-2802, and if ping packets were dropped or lost along the way.

The FST-2802 handles ping packets as follows:

– **Successful ping requests.** If a ping request is successful, an `Echo Reply` message appears in the message display of the user interface.

– **Unsuccessful ping requests.** If a ping request is unsuccessful, an error message appears in the message display of the user interface.

– **Fragmented ping responses.** If the FST-2802 sends a ping request and then receives a fragmented response to the request, the ping is considered successful if the first fragment is received without an error. The remaining fragments are discarded.

– **Fragmented ping requests.** If the FST-2802 receives a fragmented ping request, it responds with a ping response equal in length to the first fragment of the request.

– **Ping packets with header options.** If the FST-2802 receives a ping packet with options in the header, the packet is discarded.

– **Multiple or continuous ping packets.** If you configure the FST-2802 to transmit multiple or continuous ping packets, the packets are sent at a rate of one packet per second.

– **Lost ping packets.** If the FST-2802 does not receive a response to a ping packet within 3 seconds, the packet is considered lost.

To send ping packets to an Ethernet device

1 If your TestPad has two ports, select the port for the test; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:

– **TERM > 10/100 Ethernet > Layer 3 PING**

– **TERM > 1G Ethernet > Layer 3 PING**

3 Establish a link (see "Establishing connectivity" on page 121).

4 Select **SETUP > Framing**, and then specify the following:

a In Frame Type, select **DIX**, **802.3 w/LLC**, or **802.3 w/LLC and SNAP**.

Figure 21 on page 114 illustrates a standard DIX frame. Figure 28 on page 160 illustrates an 802.3 frame with LLC and SNAP.

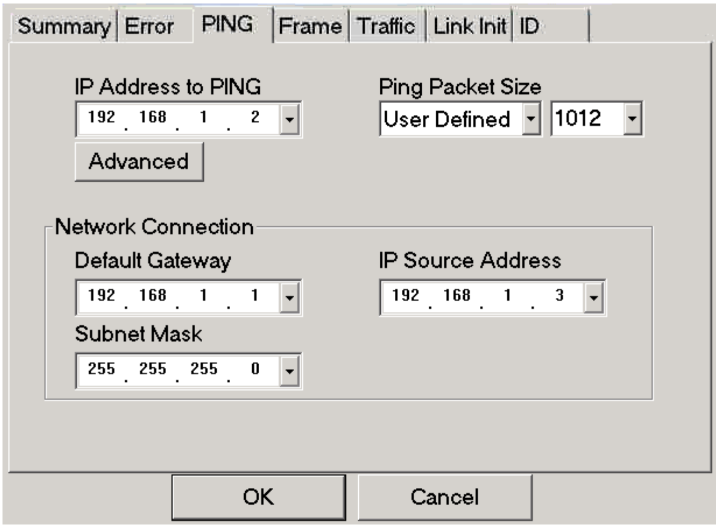
# bytes:							
8	6	6	2	3	5	38-1492	4
Preamble	Destination Address	Source Address	Length	LLC	SNAP	Ping Packet	FCS

Figure 28 Ethernet 802.3 frame with LLC and SNAP

The frame type you select dictates the allowable ping packet size you can specify in step 5 on page 161.

b *Optional.* If you want to transmit VLAN tagged ping packets, in VLAN Tagging, select **Tagged**, and then specify the VLAN ID and User Priority for the packets.

5 Select the **PING** tab.



Specify the following ping packet parameters:

a In **IP Address to PING**, type the IP address of the device you are verifying connectivity to.

b In **Ping Packet Size**, select one of the following:

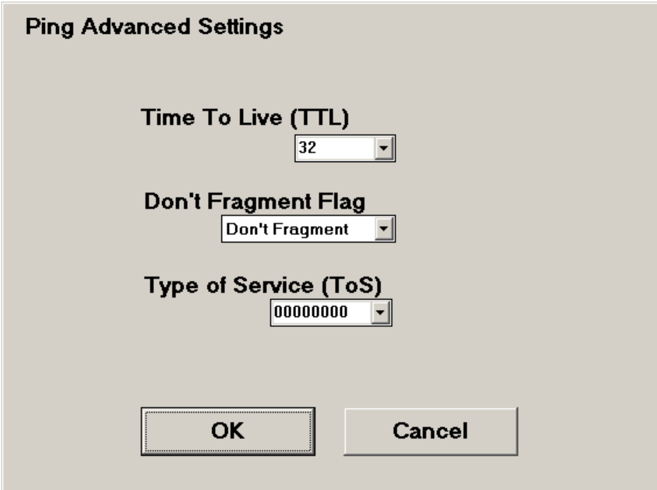
To…	Select…
Define packets which fit within a standard Ethernet frame	**User defined**, and then type the packet length. Allowable packet lengths for each frame type are: – DIX: 46 - 1500 bytes – 802.3 w/LLC: 43 - 1497 bytes – 802.3 w/LLC and SNAP: 38 - 1492 bytes

To…	Select…
Define packets which fit in Jumbo frames	**Jumbo Frame**, and then type the packet length. Allowable packet lengths for each frame type are: – DIX: 1501 - 9982 bytes – 802.3 w/LLC: 1498 - 9979 bytes – 802.3 w/LLC and SNAP: 1493 - 9974 bytes **NOTE:** Some routers do not support Jumbo frames; others might require provisioning to support Jumbo frames. Consult the provisioning documentation for your specific router to determine whether your router can support Jumbo frames.

c Under Network Connection, specify the following addresses:

In…	Specify…
Default Gateway	The address for the router through which ping traffic will be sent if the destination for the traffic is outside of the local subnet.
IP Source Address	The FST-2802's static IP source address.
Subnet Mask	The subnet mask address for the traffic.

d *Optional*. If you want to specify the time to live (TTL) or type of service (TOS), or if you want to set the fragmentation flag for the traffic, select **Advanced** to display the Ping Advanced Settings dialog box, and then proceed to step 6; otherwise, proceed to step 8.



6 Do one or all of the following:

To…	Do this…
Specify the time after which a fragmented ping request or response can be deleted by any device on a circuit	In **Time to Live (TTL)**, type the number of seconds. The default time to live setting is 64 hops.
Transmit ping packets which may be fragmented	In **Don't Fragment Flag**, select May Fragment.
Specify the type of service for the ping packets	In **Type of Service (ToS)**, type the type of service value.

7 Select **OK** to return to the PING tab.

8 Select the Traffic tab, and then choose one of the following:

To…	Choose…
Send a single ping packet	**SINGLE**. Single is the default value.

To…	Choose…
Send a fixed number of ping packets	**MULTIPLE**, and then type the number of packets. The default number of packets is 4; the maximum number of packets is 1024.
Send a continuous stream of ping packets	**CONTINUOUS**

NOTE:

The FST-2802 sends multiple and continuous pings at a rate of 1 ping per second.

9 Select **OK** to return to the main window.

10 If you are transmitting ping packets for a 1G test, turn the laser on by selecting **Laser OFF**.

The Laser OFF button changes to Laser ON.

11 Select the **PING** action button to transmit one or more ping packets with an `Echo Request`.

12 Check the message display to verify the response message.

– If the ping was successful, an `Echo Reply` message appears.

– If the ping was unsuccessful, one of the following messages appears:

Type	Code	Message
3		Destination Unreachable
3	0	Network Unreachable
3	1	Host Unreachable
3	4	Fragmentation Needed
8	0	Echo Request
11		Time Exceeded
11	0	TTL Exceeded During Transit
11	1	TTL Exceeded During Reassembly

13 *Optional*. If you want to send ping packets from a second port, select the port, and then repeat step 3 through step 12.

14 At a minimum, verify the following test results for each active port on the Results Display:

– Ping Stats

– Error Stats (for FCS Errored Frames)

Running the RFC 2544 script

Using the FST-2802, you can run a script which automates the test procedures recommended in RFC 2544. The script prompts you to select key parameters for throughput, latency, frame loss rate, and back to back frame tests, runs the tests, and then automatically generates a text file of results for the tests.

When you run the RFC 2544 script, the script automatically configures the FST-2802 to transmit an Acterna payload using the loop profile with DIX frames and no VLAN tagging. If you want to transmit 802.3 or VLAN-tagged frames, you must specify these settings in the loop profile before running the script.

Running the script from the TestPad

To run the RFC 2544 script

1 If your TestPad has two ports, select the port for the script; otherwise, proceed to step 2.

2 Using two FST-2802's, establish connectivity (see "Establishing connectivity" on page 121).

3 If you want to transmit 802.3 or tagged frames, select **SETUP > Tx Profiles**, and then proceed to step 4; otherwise, proceed to step 5.

4 To transmit 802.3 or tagged frames, do the following:

a Under Selections, select **LP**.

b If you want to transmit 802.3 frames, in Frame, select **802.3**.

c If you want to transmit tagged frames, select **Tagged**, and then specify the VLAN ID and User Priority.

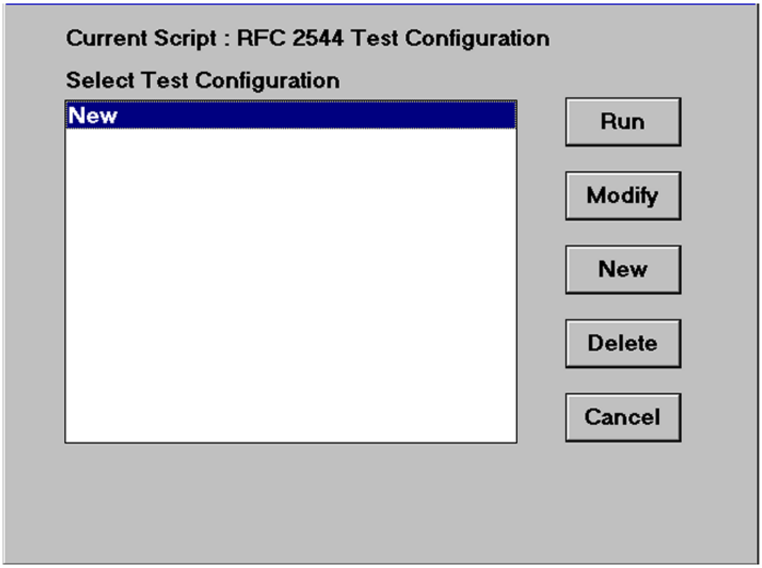
d Select **OK** to return to the main window.

5 If you are running the script with 1G Ethernet traffic, turn the laser on by selecting **Laser OFF**.

The Laser OFF button changes to Laser ON.

6 Verify that the LINK ACTIVE LED is illuminated on the LED display panel.

7 Select the **RFC 2544** button, and then wait for the RFC 2544 Test Configuration dialog box to appear. Depending on the number of processes you have running on the TestPad, it may take several seconds for the dialog box to appear.



8 Do one of the following:

If…	Select…
An existing configuration meets your test requirements	– The test configuration, and then choose **Run**. A screen appears which displays the status of key events for the test script. – Proceed to step 14.

If…	Select…
You want to modify the parameters for an existing configuration	The script configuration you want to modify, and then choose **Modify**. The Configuration Name dialog box appears. Select **OK** to accept the existing name and display a dialog box listing the existing parameters for the configuration. Proceed to step 9.
You want to create a new script configuration	**New**. The Configuration Name dialog box appears. Type a name for the new configuration, and then select **OK** to display a dialog box which provides instructions on navigating through the script. Proceed to step 10.

9 If you selected Modify in step 8, review the existing parameters for the script configuration, and then do one of the following:

– To run the script using the existing parameters, select **Start**. Proceed to step 13.

– To modify the parameters, select **Next**.

The RFC 2544 Test Setup Info dialog box appears, providing instructions on how to navigate through the test script. Proceed to step 10.

10 Select **Next**.

The Frame Lengths to Test dialog box appears. Select the frame lengths to test using the script.

11 Select **Next**.

The Test Options dialog box appears. Select the tests you want the script to run.

NOTE:

If you want to run the Latency test, you must also run the Throughput test.

12 Use **Next** to navigate through a series of dialog boxes which allow you to specify parameters for the tests you selected.

To test…	Specify…
Throughput	– the trial duration (in seconds)
Latency	– the trial duration (in seconds)
Frame Loss	– the trial duration (in seconds) – the bandwidth granularity (as a percentage)
Back to Back Frames	– the number of trials – the burst granularity – the maximum trial time

13 After you specify the final test parameter, select **Next** to run the script.

A screen appears which displays the status of key events for the test script.

NOTE:

You can stop the test script at any time by selecting **Abort Script**.

14 When the script is complete, the Save As dialog box appears, allowing you to save the test results to a text file. The default path for the text file is:

`Acterna\Files\FST-2802`

15 Type the file name, specify the path for the text file, and then select **Close**.

A final dialog box appears showing the end of the script text.

16 Select **Close** to close the dialog box and return to the main screen.

17 *Optional*. If you want to run the script from a second port, select the second port, and then repeat step 2 through step 16.

The test script is complete.

Running the script from a Remote GUI session

When you run the RFC 2544 script from a Remote GUI session, you must use the Windows Task Manager to run the script.

To run the RFC 2544 script from a Remote GUI session

1. Run the Remote GUI from your laptop or PC (see "Running the Remote GUI" on page 70).
2. Follow step 2 through step 6 of "Running the script from the TestPad" on page 165.
3. On the main screen of the FST-2802 user interface, select **RFC 2544**, and then immediately select **Send Ctrl-Alt-Del**. See Figure 29.

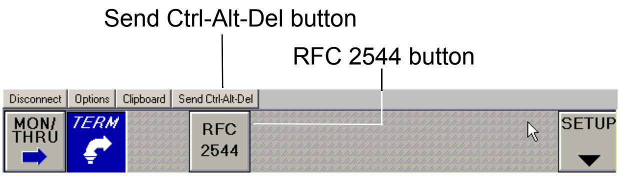


Figure 29 RFC 2544 and Send Ctrl-Alt-Del buttons

> **NOTE:**
>
> You can also send the Ctrl-Alt-Del key sequence using your VNC application. For details, refer to the support documents and mailing lists published on the VNC web site.

The Windows Security dialog box appears. See Figure 30.

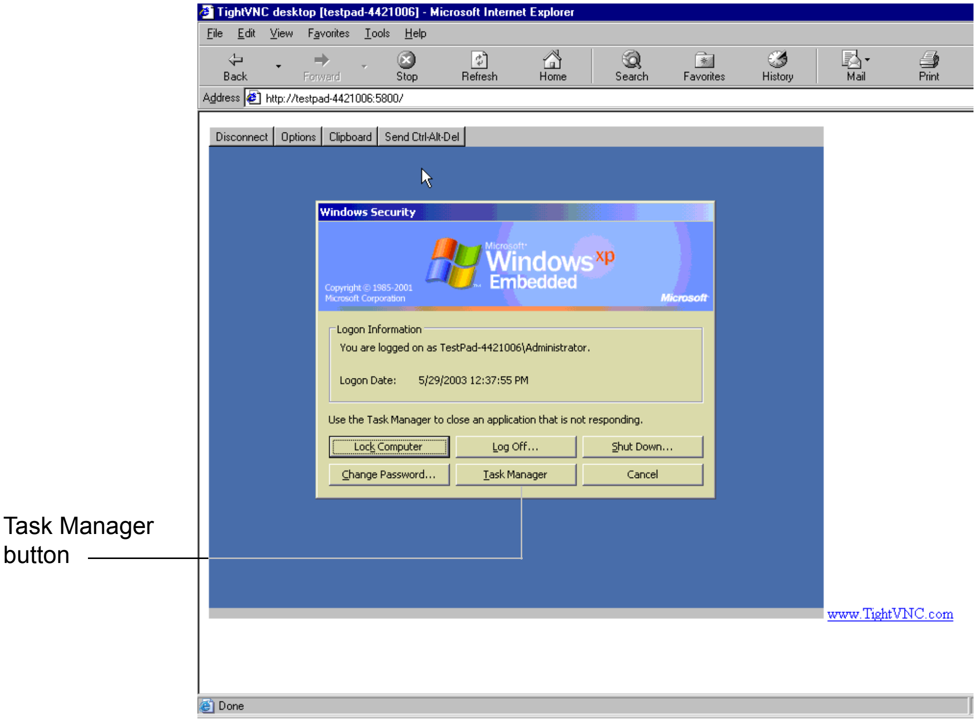


Figure 30 Windows Security dialog box

4 Immediately select the **Task Manager** button.

The Windows Task Manager dialog box appears briefly (see Figure 31 on page 171).

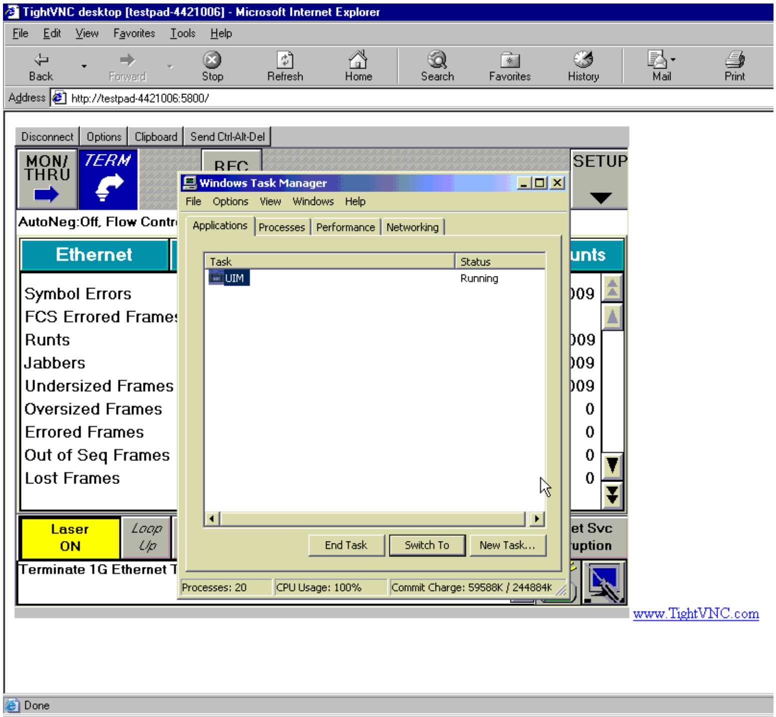


Figure 31 Windows Task Manager dialog box

NOTE:

Do not end, switch, or start a new task. The Task Manager will automatically display the RFC 2544 Test Configuration dialog box.

5 Wait for the RFC 2544 Test Configuration dialog box to appear. See Figure 32 on page 172.

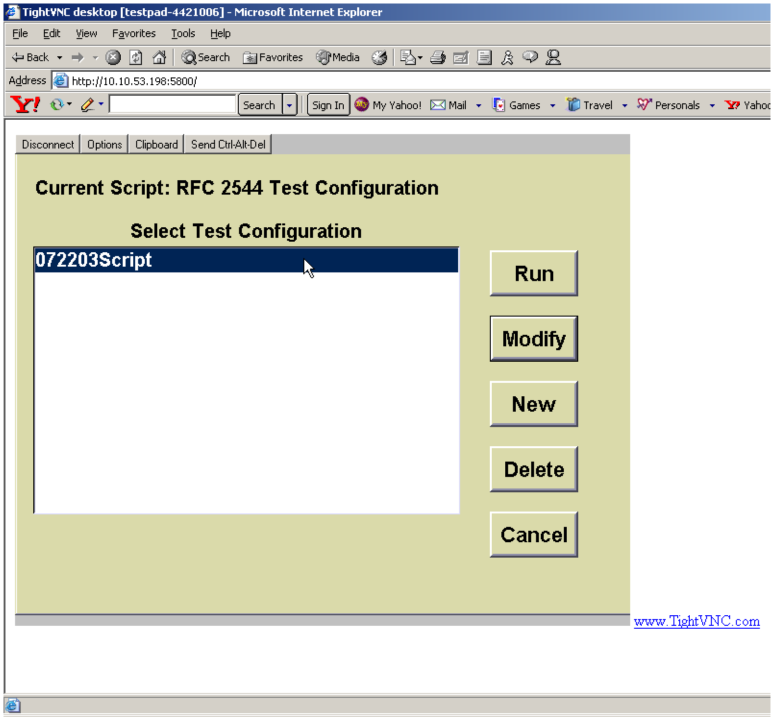


Figure 32 RFC 2544 Test Configuration dialog box

6 Follow step 8 through step 15 of "Running the script from the TestPad" on page 165 to run the script.

7 Select **Close** to close the final scripting dialog box and return to the Windows Task Manager.

8 Close the Windows Task Manager.

The test script is complete.

Assigning a source address to a TestPad port

A factory-assigned source (MAC) address is assigned to each TestPad port before shipment. A second, user-specified source address is available for each port which allows you to use the FST-2802 to emulate another device by assigning the device's source address to a port on the TestPad. After you assign another device's source address to a port, you can verify that the device's source address passes through the network and returns to the TestPad port by transmitting traffic from the port with the device's source address.

NOTE:

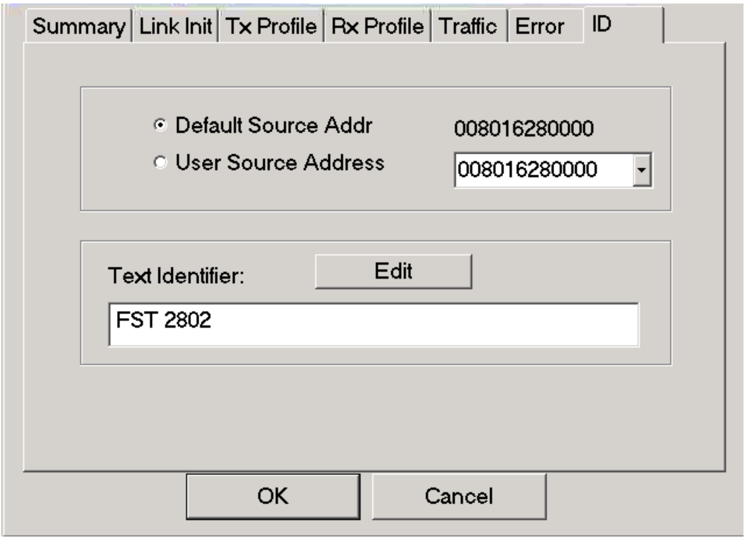
Assigning a user-specified source address to a port does not change the port’s factory-assigned source address.

To assign a user-specified source address

1 If your TestPad has two ports, select the port you want to assign a source address to; otherwise, proceed to step 2.

2 Select **SETUP > Summary**.

3 Select the **ID** tab.



Do the following:

– Select **User Source Address**.

– Type the address.

4 Select **OK** to return to the main window.

The source address is assigned.

In-service testing

Using the FST-2802, you can monitor Ethernet traffic when the network is in service. To perform in-service tests, you simply connect the TestPad to a network device on the circuit, and then monitor the Ethernet traffic on the circuit.

Monitoring 1G traffic using a splitter

You can monitor 1G Ethernet traffic on a circuit by connecting the TestPad to a splitter (see Figure 13 on page 97).

To monitor Ethernet traffic using a splitter

1 If your TestPad has two ports, select the port you want to monitor traffic on; otherwise, proceed to step 2.

2 On the application button bar, select one of the following applications:
   – **MON > 1G Ethernet > Layer 1 BERT**
   – **MON > 1G Ethernet > Layer 2 Traffic**

3 Using the correct cable for the splitter, connect one end of the cable to the RX jack of the TestPad, and the other end to the TX jack of the splitter.

4 *Optional*. If you want to monitor traffic from a second port, select the port, and then repeat step 3.

5 For each active port, verify the Error Stats results on the Results Display.

Monitoring 1G Ethernet traffic in single port THRU mode

If you have a single port configuration, you can monitor 1G Ethernet traffic in THRU mode (see Figure 14 on page 98). By default, the TestPad transmits idle frames when you monitor traffic in single port THRU mode. You can optionally specify that the TestPad should loop the frames received to the transmitter when you configure the test.

To monitor 1G Ethernet traffic in single port THRU mode

1 On the application button bar, select **MON > 1G Ethernet > Layer 2 Traffic**.

2 If you want to loop the frames received through to the transmitter (instead of transmitting idle frames), select the **Connect RX to TX** button.

3 Using the correct cable for the switch, connect one end of the cable to the TX jack of the TestPad, and the other end to the RX jack of the switch.

4 Using the correct cable for the network access element, connect one end of the cable to the RX jack of the TestPad, and the other end to the TX jack of the network access element.

5 Verify the Error Stats results on the Results Display.

Monitoring 1G Ethernet traffic in dual port THRU mode

If you have a dual port configuration, you can monitor full duplex 1G Ethernet traffic from both directions in THRU mode (see Figure 14 on page 98). When you monitor 1G Ethernet traffic in THRU mode, the TestPad routes all traffic received on Port 1 to the transmit jack on Port 2, and all traffic received on Port 1 to the transmit jack on Port 1.

To monitor 1G Ethernet traffic in dual port THRU mode

1 Using the correct cable for the switch, connect one end of the cable to the Port 1 TX jack of the TestPad, and the other end to the RX jack of the switch.

2 Using the correct cable for the network access element, connect one end of the cable to the Port 1 RX jack of the TestPad, and the other end to the TX jack of the network access element.

3 Using the correct cable for the switch, connect one end of the cable to the Port 2 TX jack of the TestPad, and the other end to the RX jack of the switch.

4 Using the correct cable for the network access element, connect one end of the cable to the Port 2 RX jack of the TestPad, and the other end to the TX jack of the network access element.

5 For each port, do the following:

   a Select the port.

   b On the application button bar, select **THRU > 1G Ethernet > Layer 1 BERT** or **Layer 2 Traffic**.

   c If you selected the Unframed BERT application, select **SETUP > Pattern**, and then choose the BERT pattern for the traffic you are monitoring.

6. Select **Laser OFF** to turn the laser on for both ports. The Laser OFF button changes to Laser ON.
7. Verify the Error Stats results for each active port.

NOTE:

When you select a MON (monitor) or TERM (terminate) application after testing in THRU mode, the TestPad will automatically configure both ports for the test you selected (using the default test parameters).

Monitoring IP addresses on 1G Ethernet traffic

If you purchase the Layer 2 IP Address Filter option, you can monitor 1G Ethernet traffic to view layer 2 statistics for specific IP addresses. In addition to the layer 2 statistics, the TestPad displays an IP Checksum Errors result in the Error Stats category which indicates whether IP checksum errors are detected within an IP packet.

To monitor IP addresses on 1G Ethernet traffic

1. If your TestPad has two ports, select a port; otherwise, proceed to step 2.
2. On the application button bar, select one of the following applications:
   - **MON > 1G IP Over Ethernet**
   - **THRU > 1G IP Over Ethernet** (dual port units only)
3. Connect the TestPad to the circuit.
4. In the left result pane, select the **IP List** category, and then select the **Refresh IP List** button.

   The first eight IP addresses detected appear on buttons in the result pane.

5 To view results for a specific IP address, select the button with the IP address in the left result pane, and then display one of the following result categories in the right result pane:
   - Filter Stats
   - Filter Counts
   - Error Stats

6 To view the next eight IP addresses, select the **Refresh IP List** button.

Monitoring 10/100 traffic in dual port THRU mode

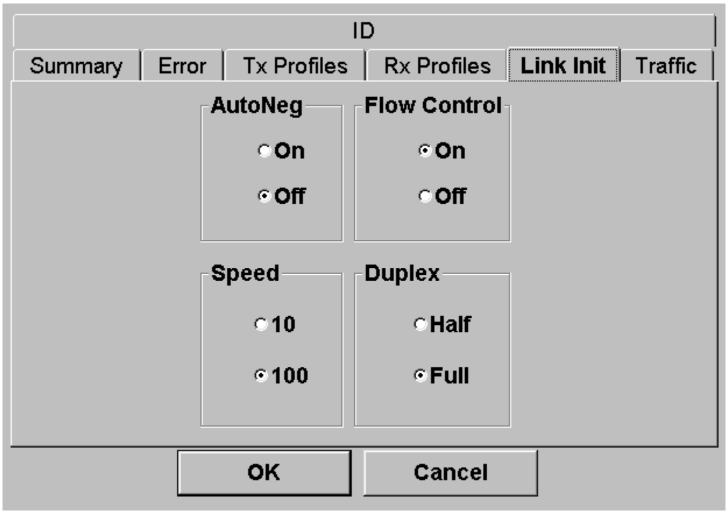
If your FST-2802 has a dual port configuration, you can monitor 10/100 Ethernet traffic in THRU mode (see Figure 16 on page 101). When you monitor 10/100 traffic in dual port THRU mode, each port on the TestPad auto-negotiates with its link partner. Therefore, you may need to specify link initialization parameters before establishing the link and monitoring traffic.

> **NOTE:**
>
> The FST-2802 does not pass Jumbo frames when monitoring 10/100 traffic in THRU mode. Frames ranging from 64 to 1518 bytes are supported.

To monitor 10/100 Ethernet traffic in THRU mode

1 On the application button bar, select **THRU > 10/100 Ethernet > Layer 2 Traffic**.

2 If the TestPad is establishing links with switches that support auto-negotiation, select **SETUP > Link Init**; otherwise, proceed to step 4.



3 To turn auto-negotiation on and specify the link initialization parameters, do the following:

a Under AutoNeg, select **On**. The AutoNeg button appears.

b By default, the TestPad advertises it is capable of transmitting and receiving Full and Half duplex traffic for both 100 Base Tx and 10 Base T. If you need to change the default capabilities, select **AutoNeg**. A dialog box with auto-negotiation capabilities appears.

c Select the capabilities for 100 Base Tx and 10 Base T.

d By default, flow control is on. If you want to turn it off, under Flow Control, select **Off**.

e Select **OK** to store the link auto-negotiation parameters and return to the main screen.

4 Using the correct cable for the switch, connect one end of the cable to the Port 1 10/100 Mbps jack of the TestPad, and the other end to the RX jack of the switch.

5 Using the correct cable for the network access element, connect one end of the cable to the TX jack of the network access element, and the other end to the Port 2 10/100 Mbps jack of the TestPad.

NOTE:

When testing 10/100 Ethernet in THRU mode, both 10/100 ports are configured as medium dependent interfaces (MDI). Depending on your test application, you may need to use a cross-over cable to convert one of the ports to a medium dependent interface cross-over (MDI-X) port.

6 Verify the Error Stats results.

Fibre Channel Testing

6

This chapter provides step-by-step instructions for performing Fibre Channel tests using the TestPad. Topics discussed in this chapter are as follows:

– “About Fibre Channel testing” on page 182
– “Link initialization” on page 182
– “Fibre Channel traffic” on page 182
– “Out-of-service testing” on page 185
– “In-service testing” on page 215

About Fibre Channel testing

Using the FST-2802, you can turn up and troubleshoot Fibre Channel services on point-to-point unswitched networks. The FST-2802 enables you to verify connectivity, measure throughput, and verify that quality of service statistics conform to those specified in a customer's Service Level Agreement. If you purchased the Dual Port configuration, you can verify two Fibre Channel interfaces simultaneously using a single FST-2802.

Link initialization

Before you transmit and receive traffic (Fibre Channel frames) over a circuit, you must initialize a Fibre Channel link. Initializing a link involves connecting a TestPad or TestPads to a circuit, and then allowing the TestPad(s) to transmit idle traffic. The link is considered active after idle traffic is transmitted and the LINK ACTIVE LED illuminates on the LED display panel.

Fibre Channel traffic

After the Fibre Channel link is initialized you can use the FST-2802 to transmit and analyze Fibre Channel traffic. Before you start testing, you can optionally specify the traffic load type for the traffic (see "Traffic loads" on page 184). You can also optionally define profiles for the traffic which specify, at the field level, the characteristics of the transmitted and received frames (see "Traffic profiles" on page 184).

Fibre Channel frame format

Fibre Channel frames are variable length frames ranging in size from 28 bytes (24 byte header plus a 4 byte CRC with no payload) to 2076 bytes, excluding the Start of Frame delimiter, optional headers, and the End of Frame delimiter.

Acterna test packet (ATP) frames require an additional eight bytes for the IEEE 802.3 LLC/SNAP header, 20 bytes for the IP header, and 20 bytes for the Test Frame information (such as the sequence number and time stamp); therefore, when you transmit an Acterna payload, the ATP frames are always at least 76 bytes long.

Frames with a BERT payload require an additional 4 bytes; therefore, when you transmit frames with a BERT payload, the frames are always at least 32 bytes long.

When you define a transmit profile for your test, you can configure the header fields listed in Figure 33. Overhead fields are a fixed-length; the payload field can range in size from zero to 2048 bytes.

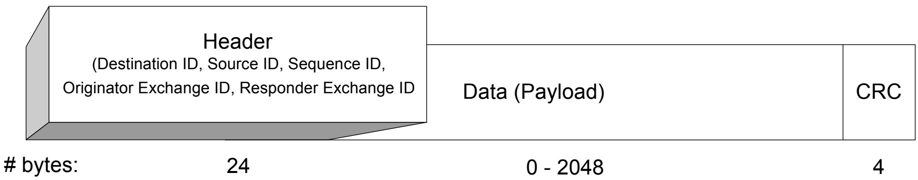


Figure 33 Fibre Channel frame

Each Fibre Channel frame is comprised of the following fields:

– **Destination Identifier**. Address of the N_port the frame is being transmitted to.
– **Source Identifier**. Address of the N_port transmitting the frame.
– **Sequence Identifier**. Identifier for each sequence of traffic. The FST-2802 transmits a single, unidirectional sequence of traffic from each active port; therefore, this number is the same for each transmitted frame. You can assign a sequence identifier for all frames transmitted from a port when you define a transmit profile.
– **Originator Exchange Identifier**. Identifier of the N_Port which originated an Exchange.
– **Responder Exchange Identifier**. Identifier of the N_Port to which an Exchange originator wishes to communicate.
– **Payload**. The actual information being transmitted in the frame (all other fields are considered overhead).

– **CRC**. Cyclic Redundancy Check. A value calculated by the originating device and inserted into the frame. The receiving device performs the same calculation, and compares its CRC value with the CRC value in the frame. If the values don't match (suggesting the frame is errored), a CRC error is declared.

Traffic loads

By default, the FST-2802 transmits traffic in a constant load. You can also optionally transmit Fibre Channel traffic in a bursty or ramp load by configuring the load on the Traffic tab before transmitting the traffic. For a detailed description and illustrations of each load type, see "Traffic loads" on page 117 of Chapter 5 "Ethernet Testing". For step-by step instructions on configuring a traffic load, see "Configuring the traffic load" on page 188.

> **NOTE:**
>
> Constant, Bursty, and Ramped traffic loads do not apply when you transmit test patterns or unframed BERT patterns. When you configure the FST-2802 to transmit patterns, the patterns are transmitted continuously.

Traffic profiles

When you configure the FST-2802 to generate, monitor, or loopback traffic, you can specify the frame characteristics of the traffic by defining a transmit or receive profile.

> **NOTE:**
>
> When you configure the FST-2802 to transmit test patterns or unframed BERT patterns, you do not need to define a transmit profile.

Transmit profiles

When you set up the TestPad, you can optionally define up to three transmit profiles to specify at the field level the characteristics of transmitted Fibre Channel frames such as the destination ID for the traffic and the frame length. Before you transmit Fibre Channel traffic, you select the appropriate profile for your test.

Although the payload is not part of the transmit profile, you also specify the payload for the frames on the Tx Profiles tab.

A fourth profile is available for loopback tests using two FST-2802's on an unswitched (layer 1) network. When you perform a loopback test using the Loop Up button on the traffic originating FST-2802, the destination ID in the loopback profile is populated automatically. See "Defining transmit profiles" on page 194 for details on defining a transmit profile.

Receive profiles

Before you monitor or terminate Fibre Channel traffic, you can optionally define or select a receive profile to filter the traffic. You can then view results for the filtered traffic on the Results Display in the Filter Stats and Filter Counts result categories. See "Defining receive profiles" on page 192 for details on defining a receive profile.

Out-of-service testing

Using the FST-2802, you can generate and analyze Fibre Channel traffic when the network is out of service. To perform out-of-service tests, you first establish connectivity, and then transmit Fibre Channel traffic (generated from a TestPad) over a circuit.

> **NOTE:**
>
> A resolution of 1% can only be achieved using frames ≥368 bytes. This is because the TestPad inserts IDLE's (4 bytes) to control bandwidth as follows:
>
> IDLE (4 bytes) / Overhead (32 bytes) + Frame (368 bytes) = 1%
>
> The resolution declines as the frame size decreases, with a worse case scenario of 6.7% at 28 bytes.

Establishing connectivity

Establishing connectivity involves connecting a TestPad (or TestPads) to an access element on a circuit, allowing the TestPad(s) to transmit idle traffic, and then verifying that the LINK ACTIVE LED illuminates.

To establish connectivity

1 If your TestPad has two ports, select the port you are establishing connectivity for; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   - **TERM > 1G Fibre Channel > Layer 1 BERT**
   - **TERM > 1G Fibre Channel > Layer 2 Traffic**
   - **TERM > 1G Fibre Channel > Layer 2 Patterns**
   - **TERM > 2G Fibre Channel > Layer 1 BERT**
   - **TERM > 2G Fibre Channel > Layer 2 Traffic**
   - **TERM > 2G Fibre Channel > Layer 2 Patterns**
3 If you establishing connectivity for a second port, select the second port, and then repeat step 2; otherwise, proceed to step 4.
4 Using the correct cable for the access element, connect one end of the cable to the TX jack of the TestPad, and the other end to the RX jack of the access element.
   - If you are establishing connectivity for a second port, repeat this step for the second port.
5 Connect a second cable from the TX jack of the access element to the RX jack of the TestPad.
   - If you are establishing connectivity for a second port, repeat this step for the second port.
6 For each active port, verify that a signal is present by checking the SIGNAL LED on the front panel. If the LED is illuminated, a signal is present.
7 If another Fibre Channel device is on the circuit, verify that the TestPad has obtained synchronization by checking the SYNC LED (for each active port). If the LED is illuminated, the TestPad has obtained synchronization.
8 For each active port, turn the laser on using the **Laser OFF** button. The Laser OFF button changes to Laser ON.
9 For each active port, verify that the link is established by checking the LINK ACTIVE LED on the front panel. If the LED is illuminated, the link is established for the port.

Troubleshooting connectivity

The inside green LEDs for SIGNAL, SYNC, and LINK ACTIVE illuminate sequentially when the TestPad detects a signal, obtains synchronization, and then recognizes a link is active. All three LEDs must illuminate to indicate you have established connectivity.

Table 13 lists symptoms that indicate a link has not been established and potential issues with devices on the circuit which prevent the link from being established.

Table 13 Troubleshooting connectivity

Symptom…	Potential issues…
SIGNAL does not illuminate	– The access device transmitter is off or faulty. Verify the optical power level coming into the device from the network. – The GBIC is not properly seated. Verify that the "GBIC detected" result appears in the Summary result category. If "Not Detected" appears, reseat the GBIC.
SIGNAL illuminates, but SYNC does not illuminate	– The far end TestPad is not connected to the circuit. – The near end element on the network side has a faulty receiver, or the far end element on the network side has a faulty transmitter. – The near end and far end devices are configured for different rates (1G and 2G Fibre Channel).
SIGNAL and SYNC illuminate, but LINK ACTIVE does not illuminate	– The far end TestPad is not acquiring synchronization. – You have configured the TestPad(s) for an Unframed (Layer 1) BERT test. The LINK ACTIVE LED does not illuminate when performing this test.

Configuring the traffic load

By default, the FST-2802 transmits a constant load of traffic at 100%. You can optionally configure the FST-2802 to transmit a different constant load, or bursty or ramped traffic. See "Traffic loads" on page 117 of Chapter 5 "Ethernet Testing" for a detailed description of each load type.

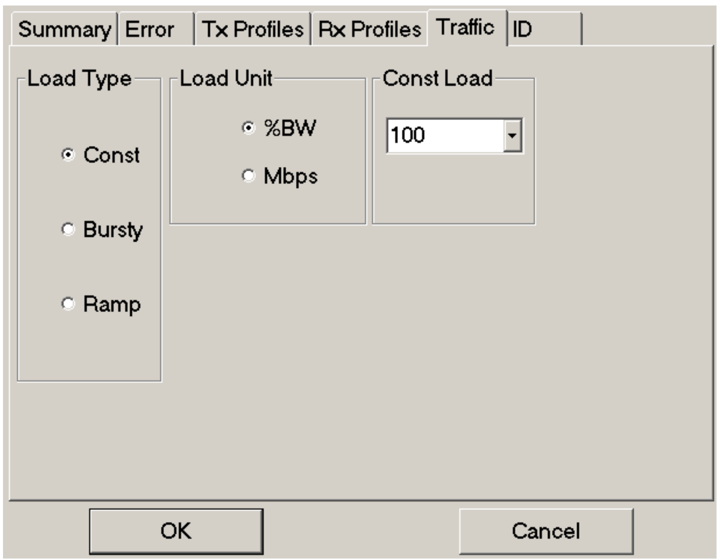
> **NOTE:**
>
> You do not need to configure the traffic load for 1G pattern, 2G pattern, or BER pattern tests; the FST-2802 automatically configures the traffic load for you.

To configure the traffic load

1 If your TestPad has two ports, select the port you are configuring the traffic load for; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   - **TERM > 1G Fibre Channel > Layer 2 Traffic**
   - **TERM > 2G Fibre Channel > Layer 2 Traffic**

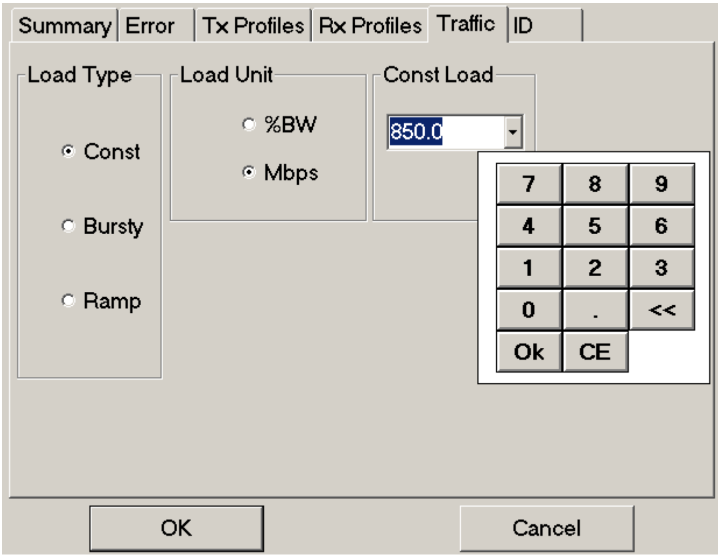
3 Select **SETUP > Traffic**.



4 Under Load Type, select one of the following:

To transmit	Select
A constant load of traffic	**Const**, and then proceed to step 5 on page 189.
A bursty load of traffic	**Bursty**, and then proceed to step 6 on page 190.
A ramped load of traffic	**Ramp**, and then proceed to step 7 on page 191.

5 If you selected Const in step 4, you can specify the bandwidth as a percentage of the line rate, or in Mbps.



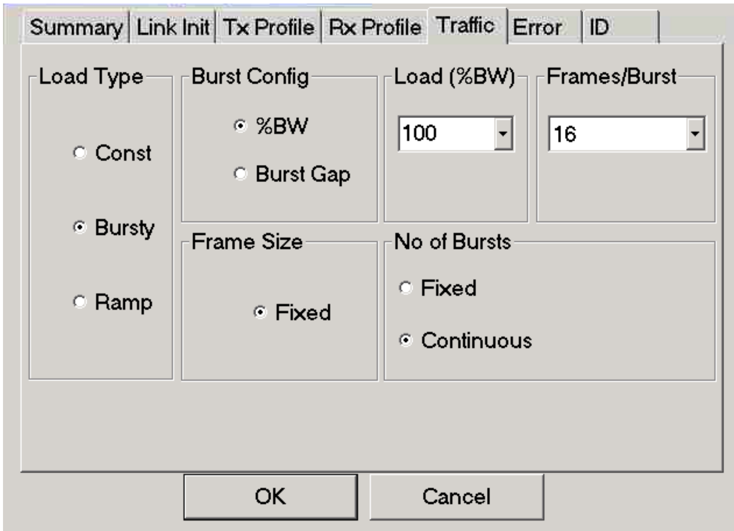
To configure a constant load, do the following:

a Under Load Unit, select **%BW** to specify the bandwidth as a percentage of the line rate, or **Mbps** to specify the bandwidth in total Mbps.

b In **Const Load**, type the percentage or Mbps.

c Proceed to step 8 on page 192.

6 If you selected Bursty in step 4, you can specify the burst bandwidth as a percentage of the line rate, or by specifying the burst gap interval.



To configure a bursty load, under Burst Config, do the following:

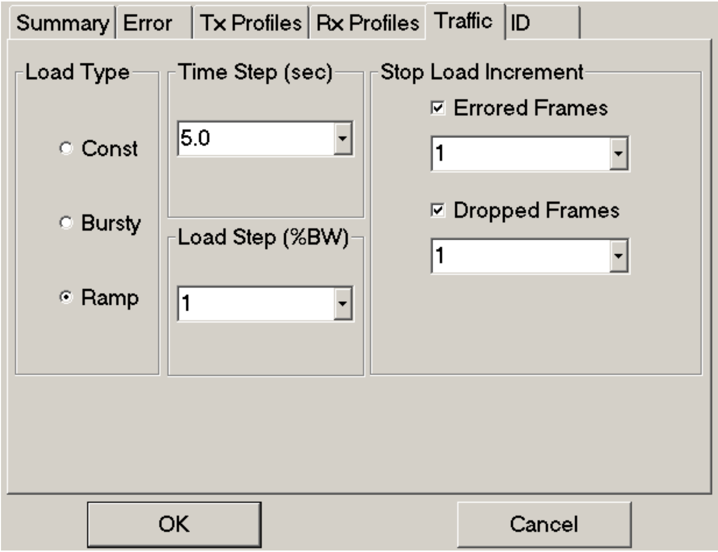
a Select one of the following:

To…	Select…
Specify the gap between bursts	**Burst Gap**, and then do the following: – Select the time interval (sec, msec, usec, or nsec) – Type the gap and burst times in the corresponding fields.
Specify the load as a percentage of the bandwidth	**%BW**, and then type the load and frames per burst (up to 16,500,000) in the corresponding fields.

b Under No of Bursts, select **Fixed**, and then specify the fixed number of bursts (up to 65,535), or select **Continuous.**

c Proceed to step 8 on page 192.

7 If you selected Ramp in step 4, you must specify a percentage of bandwidth and a time interval for each step in the ramp.



To specify the ramp traffic parameters, do the following:

a In **Time Step (sec)**, type the number of seconds to transmit each step in the ramp.

b In **Load Step (%BW)**, type the percentage of bandwidth to transmit for each step in the ramp.

c *Optional.* If you want to stop the load from ramping when errored frames or dropped frames occur, under Stop Load Increment, select the corresponding option, and then type the number of frames which will stop the ramp.

The TestPad will continue to transmit traffic when the ramp stops; however, the traffic bandwidth will not be incremented. A message will appear in the message display to let you know the ramp was halted.

> **NOTE:**
>
> If you select Dropped Frames as the trigger, you must loop up the far-end FST-2802 to receive valid results. If you do not loop up the far-end FST-2802, and you select the Dropped Frames trigger, the ramp will stop soon after it starts because the near-end FST-2802 will compare the number of frames transmitted to the number of frames received to determine whether frames were dropped. In other words, the ramp will stop because the test is not configured properly; not because elements in the network dropped the frames.

   d Proceed to step 8 on page 192.

8 Select **OK** to return to the main window, or select another tab to continue configuring your test.

9 *Optional*. If you want to configure the traffic load for a second port, select the port, and then repeat step 3 through step 8.

The traffic load is configured.

Defining receive profiles

Defining a receive profile involves selecting the profile to define, and then specifying the characteristics of the frames you want to monitor. You can define up to four receive profiles on the Rx Profiles setup tab.

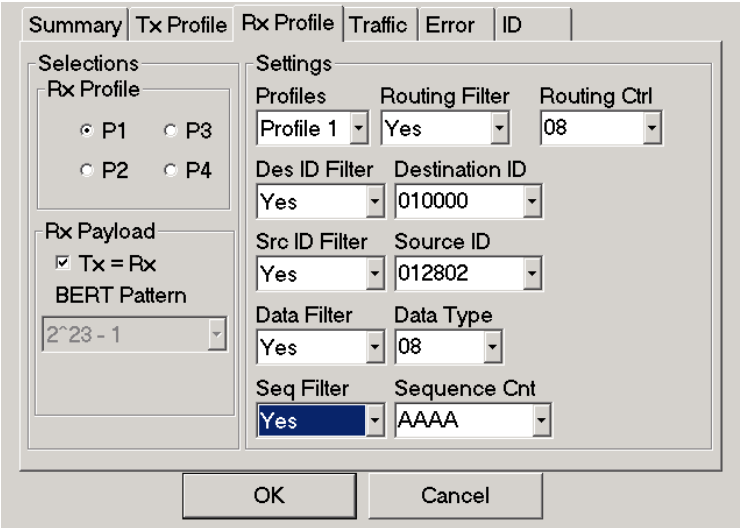
To define a receive profile

1 If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:

- **MON > 1G Fibre Channel > Layer 2 Traffic**
- **THRU > 1G Fibre Channel > Layer 2 Traffic** (dual port units only)
- **TERM > 1G Fibre Channel > Layer 2 Traffic**
- **MON > 2G Fibre Channel > Layer 2 Traffic**
- **THRU > 2G Fibre Channel > Layer 2 Traffic** (dual port units)
- **TERM > 2G Fibre Channel > Layer 2 Traffic**

3 Select **SETUP > Rx Profiles**.



4 If you are filtering traffic with a BERT pattern in the payload, under Rx Payload, select **Tx = Rx** to monitor traffic with the same BERT pattern specified in the Transmit (Tx) profile, or select a BERT pattern for the filter.

5 Under Settings, in **Profiles**, select the profile you want to define.

6 Specify the frame characteristics for the traffic filtered using the profile.

In…	Do this…
Des ID Filter	– If you want to monitor frames sent to a specific port, select **Yes**, and then type the destination ID in **Destination ID** using a 3 byte format. – If you want to monitor all frames regardless of their destination, select **Don’t Care**.
Src ID Filter	– If you want to monitor frames sent from a specific port, select **Yes**, and then type the source ID in **Source ID** using a 3 byte format. – If you want to monitor all frames regardless of their source, select **Don’t Care**.

In…	Do this…
Data Filter	– If you want to monitor frames of a specific data type, select **Yes**, and then type the code representing the type in **Data Type** using a 1 byte format. – If you want to monitor all frames regardless of their data type, select **Don't Care**.
Seq Filter	– If you want to monitor frames in a specific sequence, select **Yes**, and then type the sequence count in **Sequence Cnt** using a 2 byte, hexadecimal format. – If you want to monitor all frames regardless of sequence, select **Don't Care**.
Routing Filter	– If you want to monitor frames with the same routing control code, select **Yes**, and then type the code in **Routing Ctrl** using a 1 byte format. – If you want to monitor all frames regardless of their routing control code, select **Don't Care**.

7 Select **OK**.

8 *Optional*. If you want to define a receive profile for a second port, select the port, and then repeat step 3 through step 7.

The profile is stored and the main window appears.

Defining transmit profiles

Defining a transmit profile involves selecting the profile to define, and then specifying the characteristics for each frame the TestPad transmits using the profile. Although the frame payload is not part of the profile, you also select the type of payload to transmit (Acterna or BERT) on the Tx Profiles tab.

To define a transmit profile

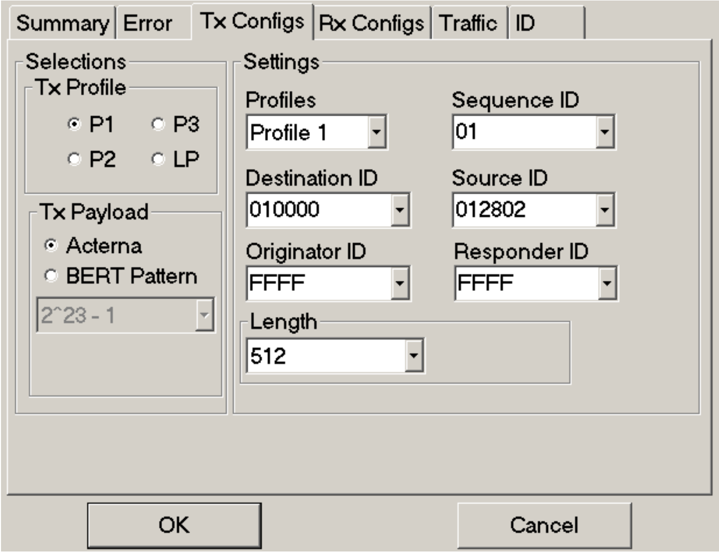
1 If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:

– **TERM > 1G Fibre Channel > Layer 2 Traffic**

– **TERM > 2G Fibre Channel > Layer 2 Traffic**

3 Select **SETUP > Tx Profiles**.



4 If you want to transmit frames without a payload, proceed to step 5. If you want to transmit an Acterna payload or BERT pattern, under Payload, select one of the following:

– **Acterna.** To transmit frames with a time stamp and sequence number, select **Acterna**. You must select an Acterna payload to measure round trip delay and count lost frames.

– **BERT Pattern.** If you want to perform a BER test on a switched (layer 2) network, select **BER Pattern** to populate the payload by repeating a specific BER pattern, and then select the BER pattern to transmit in the payload.

5 Under Settings, in **Profiles**, select the profile you want to define, and then specify the frame characteristics for the traffic transmitted using the profile.

In…	Do this…
Destination ID	Type the destination ID of the port the frames will be transmitted to using a 3 byte format.
Originator ID	Type the originator exchange ID for the frames using a 2 byte hexadecimal format.
Length	Select the arrow to the right of the field to display a drop-down menu of field lengths. The default length is 512 bytes. You can select: – **28 (no payload), 76**, **512**, **1024**, **1536**, or **2076** for Acterna payloads. – **28 (no payload)**, **32**, **512**, **1024**, **1536**, or **2076** for BERT payloads. – **User Defined**, and then specify a length ranging from 28 to 2076 bytes for BERT payloads, or 76 to 2076 bytes for an Acterna payload. **NOTE:** If you select a 28 byte (no payload) frame length for an Acterna payload, no results associated with a payload will be available since no payload is transmitted in the frames.
Sequence ID	Type the sequence ID for the frames using a 2 byte hexadecimal format.
Source ID	Type the source ID for the port transmitting the frames using a 3 byte format.
Responder ID	Type the responder ID for the frames using a 2 byte hexadecimal format.

6 Select **OK**.

7 *Optional*. If you want to define a transmit profile for a second port, select the port, and then repeat step 3 through step 6.

The profile is stored and the main window appears.

End-to-end testing

End-to-end testing allows you to verify that a provisioned path will carry Fibre Channel traffic generated from one TestPad to a second TestPad on the far end of a circuit (see Figure 20 on page 105).

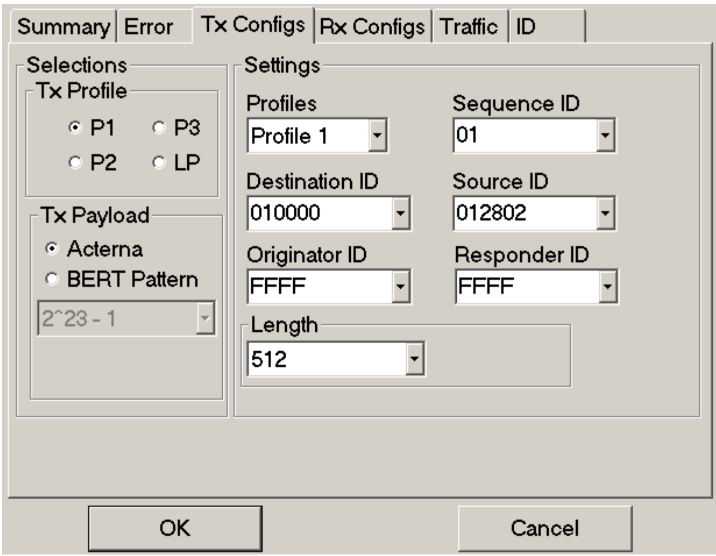
To perform an end-to-end test

1 Establish connectivity (see "Establishing connectivity" on page 185), and then do one of the following:

  – If you are performing the test on a switched (layer 2) Fibre Channel network, proceed to step 2.

  – If you are performing the test on an unswitched (layer 1) point-to-point network, proceed to step 5 on page 199.

2 Select **SETUP > Tx Profiles**.



3 Under Payload, select one of the following:

  – **Acterna.** To transmit frames with a time stamp and sequence number, select **Acterna**. You must select an Acterna payload to measure round trip delay and count lost frames.

  – **BERT Pattern.** To populate the payload by repeating a specific BERT pattern, select **BERT Pattern**, and then select the pattern to transmit in the payload. You must select the BERT Pattern payload to perform BER testing on a switched (layer 2) network.

4 Select or define a profile:

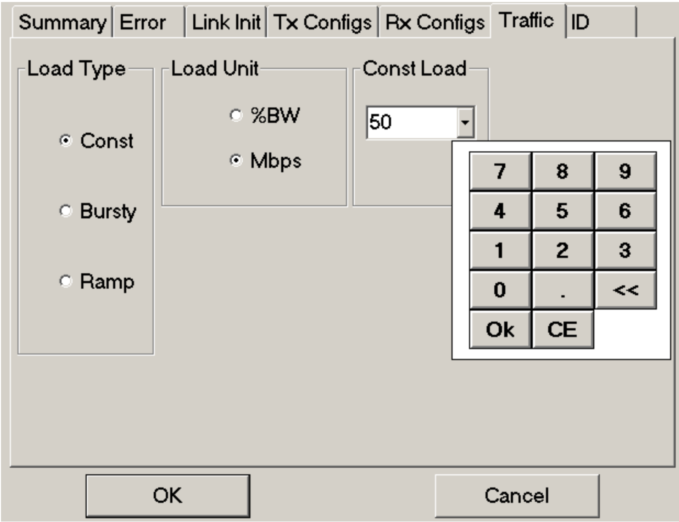
To…	**Do this…**
Select an existing profile with the source ID of the TestPad on the far end as the destination ID for the traffic.	Under **Selections**, select the profile.
Define a profile with the far end TestPad's source ID as the destination ID for the traffic.	– Under **Settings**, select the profile to define from the **Profiles** field. – In **Destination ID**, select the arrow to the right of the field to display a keypad. Using the keypad, type the source ID of the TestPad on the far end, and then select **OK** to enter the ID in the field.

For additional information on transmit profiles, see "Defining transmit profiles" on page 194.

5 Do one of the following to configure the traffic load:

– If you specified or defined a transmit profile in step 4, select **Traffic**, and then configure the load (see "Configuring the traffic load" on page 188).

– If you didn't specify or define a transmit profile (because you are performing the test on an unswitched point-to-point network), select **SETUP > Traffic**, and then configure the load.



6 Select **OK** to return to the main window.

– If you are performing an end-to-end test using a second port, repeat step 1 through step 6 for the second port before proceeding to step 7.

7 On the TestPad on the far end of the circuit, do the following:

– If you are performing the test on a switched (layer 2) network, repeat step 2 through step 6.

– If you are performing the test on an unswitched (layer 1) point-to-point network, repeat step 5 and step 6.

8 On both TestPads, turn the laser on by selecting the **Laser OFF** button for each active port.

The Laser OFF button changes to Laser ON.

9 On both TestPads, for each active port, select **Start Traffic** to transmit traffic over the circuit.

10 View and verify results for each transmitting TestPad on the Results Display of the receiving TestPad.

BER testing on unswitched (layer 1) networks

If you are testing on an unswitched network, when you perform an end-to-end test, you can transmit BER patterns in the bit stream to determine the ratio of erroneous bits to the total bits received.

To perform BER test on an unswitched network

1. If your TestPad has two ports, select the port for the profile; otherwise, proceed to step 2.
2. Using the application buttons, select one of the following applications:
   - **MON > 1G Fibre Channel > Layer 1 BERT**
   - **TERM > 1G Fibre Channel > Layer 1 BERT**
   - **THRU > 1G Fibre Channel > Layer 1 BERT** (dual port units only)
   - **MON > 2G Fibre Channel > Layer 1 BERT**
   - **THRU > 2G Fibre Channel > Layer 1 BERT** (dual port units only)
   - **TERM > 2G Fibre Channel > Layer 1 BERT**
3. Select **SETUP > BERT**, and then select one of the following patterns:

To…	Select…
– Test random jitter at a BER of 10^{-12} – Test asymmetry of transition times	**HFPAT**
– Test low frequency random jitter – Test PLL tracking errors	**LFPAT**
Test random and deterministic jitter (combined)	**MFPAT**
Emulate a worst case scenario for deterministic jitter	**RDPAT**
Stress timing margins in the received eye by exposing the data sampling circuits to large systematic phase jumps	**JTPAT**

To…	Select…
Emulate a worse case scenario for power supply noise within network transceivers	**SNPAT**

4 *Optional*. If you want to insert bit errors or code violations into the bit stream, select the Error tab, and then do the following:

To…	Select…
Setup the TestPad to allow you to insert BIT errors into the bit stream	**BIT**. – If you want the TestPad to beep each time it receives a bit error (or errors), under Beep On Error, select **ON**. – If you want to insert a rate of bit errors, select **Rate**, and then select the rate.
Setup the TestPad to allow you to insert code violations into the bit stream	**Code Violations**. – If you want the TestPad to beep each time it receives a code violation (or violations), under Beep On Error, select **ON**. – If you want to insert a rate of code violations, select **Rate**, and then select the rate.

5 Select **OK** to return to the main window.
   – If you want to perform a BER test from a second port, select the second port, and then repeat step 2 through step 5 for the second port.

6 For each active port, establish connectivity (see “Establishing connectivity” on page 185).

7 If you are performing the BERT in single port THRU mode (using the **MON** application button), for each active port on the far end TestPad, select **Connect RX to TX**.

8 For each active port, start the traffic using the **Start BERT Pattern** button.

9 For each active port, verify that the Pattern Sync LED is illuminated in the LED result category.

10 *Optional*. To insert bit errors or code violations into the bit stream, for each active port, select the **Bit Error** or **CV Error** button.

11 Verify the Error Stats: Bit Errors and Bit Error Rate results for each active port on a Results Display.

BER testing on switched (layer 2) networks

If you are testing on a switched Fibre Channel network, when you perform an end-to-end test you can transmit BER patterns in the frame payload to determine the ratio of erroneous bits to the total bits received.

To transmit a BER pattern on a switched network

1 If your TestPad has two ports, select a port for the test; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   - **MON > 1G Fibre Channel > Layer 2 Traffic**
   - **THRU > 1G Fibre Channel > Layer 2 Traffic** (dual port units only)
   - **TERM > 1G Fibre Channel > Layer 2 Traffic**
   - **MON > 2G Fibre Channel > Layer 2 Traffic**
   - **THRU > 2G Fibre Channel > Layer 2 Traffic** (dual port units only)
   - **TERM > 2G Fibre Channel > Layer 2 Traffic**

3 Select **SETUP > Rx Profiles**, and then define the receive profile for the traffic you want to BERT (see “Defining receive profiles” on page 192).

4 Select the **Tx Profiles** tab, and then do the following:

   a Under Payload, select **Bert Pattern**, and then select **2^23-1**, **Inv 2^23-1**, **2^31-1**, **Inv 2^31-1, ALL ONES, ALL ZEROS**, or **USER DEFINED**.

   b If you selected USER DEFINED, type the user defined BER pattern using a 4 byte hexadecimal format.

5 *Optional*. If you want to insert a framed bit error into the traffic, select the Error tab, and then do the following:

   a Select **Framed Bit**.

   b If you want the TestPad to beep each time it receives a framed bit (or bits), under Beep On Error, select **ON**.

   c If you want to insert a rate of framed bits, select **Rate**, and then select the error rate.

6 Select **OK** to return to the main window.

7 *Optional.* If you want to transmit a BER pattern from the second port, select the second port, and then repeat step 2 through step 6.

8 Establish connectivity (see "Establishing connectivity" on page 185).

9 For each active port, select **Start Traffic** to transmit the pattern over the circuit.

10 For each active port, verify that the FRAME LED is illuminated.

11 *Optional*. To insert one or more framed bits into the traffic, for each active port, select the **Framed Bit Error** button.

12 For each active port, verify the Error Stats: Bit Errors and Bit Error Rate results on a Results Display.

> **NOTE:**
>
> When performing a BERT on a switched (layer 2) network, Bit Errors and Bit Error Rate results may indicate one or more physical layer (layer 1) bit errors.

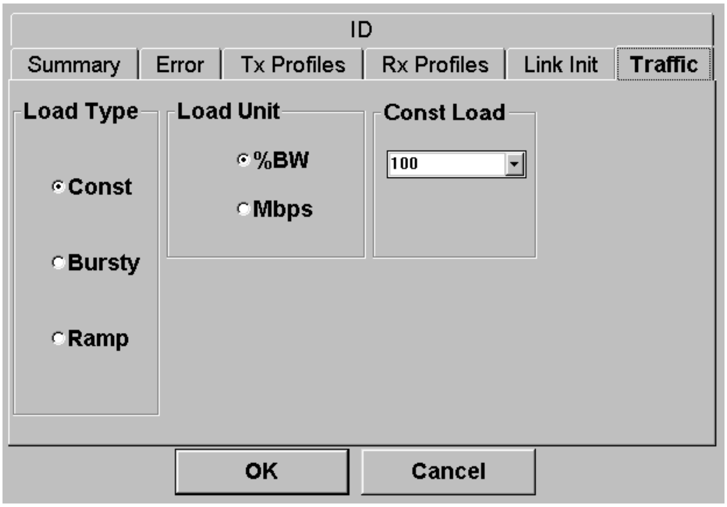
Measuring service disruption time

When you perform an end-to-end test, you can measure the service disruption time resulting from a switch in service to a protect line.

To measure service disruption time

1 Setup and configure an end-to-end test (see "End-to-end testing" on page 197).

2 On the far end FST-2802, select **SETUP > Traffic**.



3 When measuring service disruption time, we recommend transmitting a constant load at 100 percent by specifying the following parameters:

a Load Type: **Const**

b Load Unit: **%BW**

c Const Load: **100**

4 Select **OK** to return to the main window.

5 Turn the laser on by selecting the **Laser OFF** button.

The Laser OFF button changes to Laser ON.

6 Select **Start Traffic** to transmit traffic over the circuit.

7 On the near end FST-2802, clear the service disruption time by selecting the **Reset Svc Disruption** action button.

8 Initiate the switch to the protect line.

9 *Optional*. If you want to measure service disruption time from a second port, select the second port, and then repeat step 2 through step 8.

10 Verify the Link Stats: Svc Disruption (ms) result for each active port on a Results Display.

Transmitting patterns

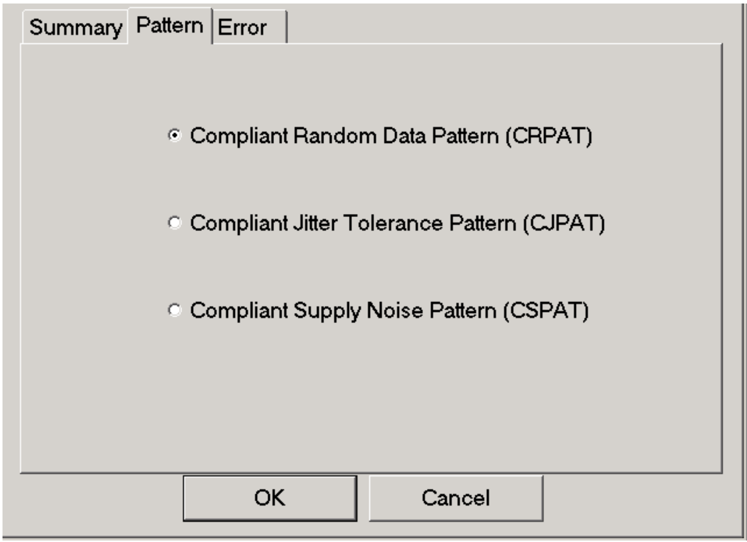
Using the FST-2802, you can stress the jitter and noise characteristics of Fibre Channel components and systems by transmitting continuous random test patterns (CRPAT), continuous jitter test patterns (CJPAT), and the compliant supply noise pattern (CSPAT). To transmit a pattern, you select the pattern on the Pattern tab, and then you establish connectivity to a Fibre Channel link. Finally, you transmit the pattern over the link.

> **NOTE:**
>
> These patterns are designed to test physical layer networks. By definition, these framed patterns populate the Fibre Channel header with invalid address information; therefore, these frames will not traverse a layer 2, switched network. You must run pattern tests using an end-to-end configuration at all times.

To transmit a pattern

1. If your TestPad has two ports, select a port for the test; otherwise, proceed to step 2.
2. On the application button bar, select one of the following applications:
   - **TERM > 1G Fiber Channel > Layer 2 Patterns**
   - **TERM > 2G Fiber Channel > Layer 2 Patterns**
3. Select **SETUP > Summary** to display the setup tabs, and then select **Pattern**.

The Pattern tab appears.



4 Select a pattern:

To…	Select…
Emulate a worst case scenario for deterministic jitter by transmitting packets with a broad spectral content	**CRPAT**
Stress the timing margins in the received eye by exposing the data sampling circuits to large systematic phase jumps.	**CJPAT**
Emulate a worse case scenario for power supply noise within network transceivers.	**CSPAT**

5 Select **OK** to return to the main window.

6 Establish connectivity (see “Establishing connectivity” on page 185).

7 Turn the laser on by selecting the **Laser OFF** button.

The Laser OFF button changes to Laser ON.

8 Select **Start Pattern** to transmit the pattern over the circuit.

9 *Optional*. If you want to transmit patterns from a second port, select the port, and then repeat step 2 through step 8.

10 For each active port, verify results on the Results Display of the TestPad. At a minimum, verify the following Pattern Stats results:
   – Transmitted Frames
   – Received Frames
   – FCS Errored Frames

Loopback testing

Loopback testing allows you to generate and transmit Fibre Channel traffic from one TestPad, and then loop the traffic back through a second TestPad (see Figure 17 on page 102) or a hard loopback on the far end of a circuit (see Figure 18 on page 103).

Using the Line Loopback feature

You can manually perform a line loopback using two TestPads by selecting the LLB button on the far end TestPad to loop frames back to the originating TestPad.

To manually perform a line loopback

1. If your TestPad has two ports, select the port for the loopback test; otherwise, proceed to step 2.
2. Establish connectivity (see “Establishing connectivity” on page 185).

3 Do one of the following:
   – If you are performing the loopback on a point-to-point, unswitched (layer 1) network, proceed to step 4.
   – If you are performing the loopback on a switched (layer 2) network, on the transmitting TestPad, configure the traffic port (see step 3 through step 6 of "End-to-end testing" on page 197).

NOTE:

If you want to filter the traffic looped back to the near end TestPad, the parameters you specify in the transmit profile for the near end TestPad must match the parameters specified in the receive profile for the far end TestPad.

For example, if you want to loop back frames for a specific Routing Control code, the same Routing Control code must be specified in both profiles.

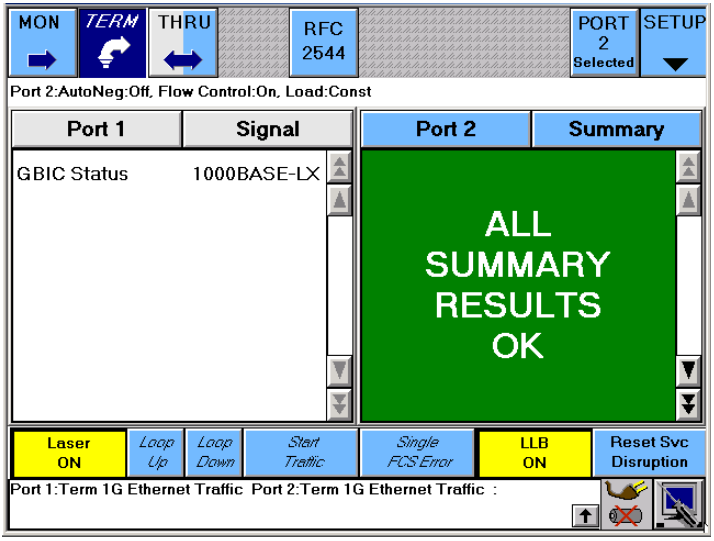
If you want to loop back all frames, select **Don't Care** for each of the receive profile parameters.

4 On the far end TestPad, turn the laser on by selecting **Laser OFF**.

   The Laser OFF button changes to Laser ON.

5 On the far end TestPad, select **LLB OFF** to put the TestPad into loopback mode.

The LLB OFF button changes to LLB ON.



6 On the transmitting TestPad, select **Start Traffic** to transmit traffic over the circuit to the TestPad on the far end.

7 *Optional*. If you want to perform a line loopback from a second port, select the second port, and then repeat step 2 through step 6.

8 For each active port, verify results on the Results Display of the transmitting TestPad. At a minimum, verify the following results:

– Link Stats: Total Util%, Avg, Total Util %, Cur, and Total Util % Peak.

– Error Stats: All results are 0.

Using the Automatic Loopback feature

You can perform an automatic loopback on an unswitched network by selecting the Loop Up button on the traffic generating TestPad. A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the far end TestPad is in loopback mode. The destination ID in the loopback profile for the first TestPad is also automatically populated with the source ID of the TestPad on the far end.

When you configure TestPads for an automatic loopback test, you can optionally specify text identifiers for each TestPad (for example, “Joe’s 2802” and “Sam’s 2802”). When the TestPads send confirmation messages to each other indicating the status of the loopback, the message will identify each TestPad using the text identifier.

> **NOTE:**
>
> After you establish the loop, you can change the source ID specified for the traffic in the far end TestPad’s loopback profile. This will not bring down the loop.

To perform an automatic loopback

1. If your TestPad has two ports, select the port for the loopback test; otherwise, proceed to step 2.
2. Establish connectivity (see “Establishing connectivity” on page 185).
3. On the far end TestPad, select **SETUP > Summary**, and then do the following:
   – Select the **Tx Profiles** tab.
   – Under Settings, in Profiles, select **Loop Profile**.
   – In Source ID, type the source ID for the traffic looped back to the traffic generating TestPad.

> **NOTE:**
>
> If you want to filter the traffic looped back to the near end TestPad, the parameters you specify in the transmit profile for the near end TestPad must match the parameters specified in the receive profile for the far end TestPad.
>
> For example, if you want to loop back frames for a specific Routing Control code, the same Routing Control code must be specified in both profiles.
>
> If you want to loop back all frames, select **Don’t Care** for each of the receive profile parameters.

4. *Optional*. If you want to provide an identifier in the confirmation messages sent between TestPads, for each TestPad, do the following:

   a Select **SETUP > Summary** to display the setup tabs.

   b Select **ID** to display the ID tab, and then select **Edit** to display a keypad.

   c Using up to ten characters, type the identifier for the TestPad, and then select **OK** to store the identifier and return to the ID tab.

   d Select **OK** to return to the main window.

5. On the traffic generating TestPad, select **Loop Up** to put the receiving TestPad on the far end into loopback mode.

   A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the far end TestPad is in loopback mode. The destination ID field of the loopback profile is automatically updated with the source ID of the far end TestPad.

6. On the traffic generating TestPad, turn the laser on by selecting **Laser OFF**.

   The Laser OFF button changes to Laser ON.

7. On the traffic generating TestPad, select **Start Traffic** to transmit traffic over the circuit to the TestPad on the far end.

8. *Optional*. If you want to perform a loopback from a second port, select the port, and then repeat step 2 through step 7.

9. Verify results for each active port on the Results Display of the traffic generating TestPad. At a minimum, verify the following results:

   – Link Stats: Total Util%, Avg, Total Util %, Cur, and Total Util % Peak.

   – Error Stats: All results are 0.

10. When the test is complete, for each active port, select **Loop Down** to take the receiving port on the far end TestPad out of loopback mode.

    A confirmation message from the TestPad on the far end appears in the message display of the first TestPad informing you that the port on the far end TestPad is out of loopback mode.

Inserting a CRC error

You can insert a CRC error when you perform end-to-end and loop-back tests.

NOTE:

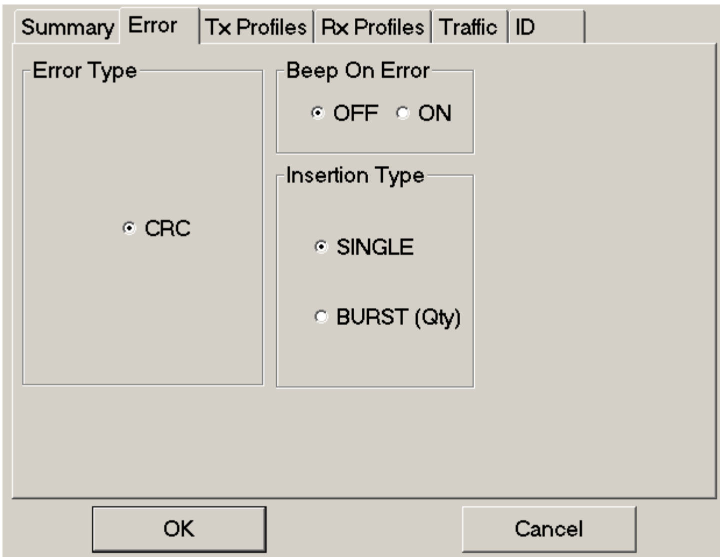
If you insert a CRC error on an unswitched point-to-point network using two FST-2802s, and you want to receive the CRC back at the originating TestPad, put the TestPad on the far end of the circuit in THRU mode. See "Monitoring Fibre Channel traffic in single port THRU mode" on page 215 for information on THRU mode.

To insert a CRC error

1 If your TestPad has two ports, select the port for the error insertion; otherwise, proceed to step 2.

2 Using the application buttons, select one of the following applications:
   - **TERM > 1G Fibre Channel > Layer 2 Traffic**
   - **TERM > 2G Fibre Channel > Layer 2 Traffic**

3 Select **SETUP > Summary** to display the setup tabs, and then select **Error.**



4 To specify the error parameters, do the following:

To…	Do this…
Specify that the TestPad should beep whenever a CRC error occurs	Under Beep on Error, select **ON**.
Insert a single CRC error	Select **SINGLE**.
Insert a burst of CRC errors	Select **BURST**. A BURST (Qty) field appears. – Select the arrow to the right of the BURST (Qty) field to display a keypad. – Using the keypad, type the number of CRC errors to insert in the burst.

5 Select **OK** to store the error parameters and return to the main window.

6 Turn the laser on by selecting **Laser OFF**.

The Laser OFF button changes to Laser ON.

7 Select **Start Traffic** to transmit traffic over the circuit.

8 Select the **CRC Errors** action button to insert the error or burst of errors.

9 *Optional*. If you want to insert errors from a second port, select the port, and then repeat step 3 through step 8.

The error is inserted into the traffic and is handled as follows:

– For end-to-end applications, the error is transmitted to the TestPad on the far end of the circuit.

– For loopback applications, the error is typically looped back to the TestPad. Consult your network element documentation to determine if the network element drops errored traffic.

Measuring round trip delay

When you perform loopback tests, you can measure round trip delay by transmitting an Acterna payload with frames of a pre-defined length (28, 76, 512, 1024, 1536, or 2076 bytes). The Acterna payload carries frames with time stamps, enabling the FST-2802 to calculate the round drip delay.

> **NOTE:**
>
> When you measure round trip delay, you must implement a loop-back on the far end of the circuit, and then transmit and receive an Acterna payload with test frames from a FST-2802 on the near end of the circuit. If you do not use a loopback, the test results will be invalid.

To measure round trip delay

1. Setup and configure a loopback test (see “Loopback testing” on page 207).
2. Select **SETUP > Tx Profiles**, and then do the following:
   - Under Payload, select **Acterna.** The Acterna payload transmits frames with a time stamp and sequence number. You must select an Acterna payload to measure round trip delay.
   - In **Length**, select a pre-defined frame length (**28**, **76**, **512**, **1024**, **1536**, or **2076** bytes).
3. Select **OK** to return to the main window.
4. Turn the laser on by selecting **Laser OFF**.

   The Laser OFF button changes to Laser ON.
5. Select **Start Traffic** to transmit traffic over the circuit.
6. *Optional*. If you want to measure round trip delay from the second port, select Port 2, and then repeat step 2 through step 5.
7. Verify results for each active port on the Results Display of the transmitting TestPad. At a minimum, verify the following Link Stats results:
   - Delay, Max (us)
   - Delay, Min (us)
   - Delay, Avg (us)

In-service testing

Using the FST-2802, you can monitor Fibre Channel traffic when the network is in service. To perform in-service tests, you simply connect the TestPad to a network device on the circuit, and then monitor the Fibre Channel traffic on the circuit.

Monitoring traffic using a splitter

You can monitor Fibre Channel traffic on a circuit by connecting the TestPad to a splitter (see Figure 13 on page 97).

To monitor Fibre Channel traffic using a splitter

1. If your TestPad has two ports, select a port for the test; otherwise, proceed to step 2.
2. On the application button bar, select one of the following applications:
   - **MON > 1G Fibre Channel > Layer 1 BERT**
   - **MON > 1G Fibre Channel > Layer 2 Traffic**
   - **MON > 2G Fibre Channel > Layer 1 BERT**
   - **MON > 2G Fibre Channel > Layer 2 Traffic**
3. *Optional*. If you want to monitor traffic from the second port, select the second port.
4. Using the correct cable for the splitter, connect one end of the cable to the RX jack of the TestPad, and the other end to the TX jack of the splitter.
   - If you are monitoring traffic on a second port, repeat this step for the second port.
5. Verify the Error Stats results for each active port.

Monitoring Fibre Channel traffic in single port THRU mode

You can monitor Fibre Channel traffic on a circuit in THRU mode (see Figure 14 on page 98).

To monitor Fibre Channel traffic in single port THRU mode

1. On the application button bar, select one of the following applications:
   – **MON > 1G Fibre Channel > Layer 1 BERT**
   – **MON > 1G Fibre Channel > Layer 2 Traffic**
   – **MON > 2G Fibre Channel > Layer 1 BERT**
   – **MON > 2G Fibre Channel > Layer 2 Traffic**
2. If you want to loop the frames received through to the transmitter (instead of transmitting idle frames), select the **Connect RX to TX** button.
3. Using the correct cable for the switch, connect one end of the cable to the TX jack of the TestPad, and the other end to the RX jack of the switch.
4. Using the correct cable for the network access element, connect one end of the cable to the RX jack of the TestPad, and the other end to the TX jack of the network access element.
5. Select **Laser OFF** to turn the laser on. The Laser OFF button changes to Laser ON.
6. Verify the Error Stats results on the Results Display.

Monitoring Fibre Channel traffic in dual port THRU mode

If you have a dual port configuration, you can monitor full duplex Fibre Channel traffic from both directions in THRU mode (see Figure 14 on page 98). When you monitor traffic in dual port THRU mode, the TestPad routes all traffic received on Port 1 to the transmit jack on Port 2, and all traffic received on Port 2 to the transmit jack on Port 1.

To monitor Fibre Channel traffic in dual port THRU mode

1. Using the correct cable for the switch, connect one end of the cable to the Port 1 TX jack of the TestPad, and the other end to the RX jack of the switch.
2. Using the correct cable for the network access element, connect one end of the cable to the Port 1 RX jack of the TestPad, and the other end to the TX jack of the network access element.

3 Using the correct cable for the switch, connect one end of the cable to the Port 2 TX jack of the TestPad, and the other end to the RX jack of the switch.

4 Using the correct cable for the network access element, connect one end of the cable to the Port 2 RX jack of the TestPad, and the other end to the TX jack of the network access element.

5 For each port, do the following:

   a Select the port.

   b On the application button bar, select **THRU > 1G Fibre Channel > Layer 2 Traffic**, or **THRU > 2G Fibre Channel > Layer 2 Traffic**.

6 Select **Laser OFF** to turn the laser on for both ports. The Laser OFF button changes to Laser ON.

7 Verify the Error Stats results for each active port.

NOTE:

When you select a MON (monitor) or TERM (terminate) application after testing in THRU mode, the TestPad will automatically configure both ports for the test you selected (using the default test parameters), and the port selection buttons will be enabled allowing you to control each port independently.

Test Results

7

This chapter describes test results for the FST-2802. Topics discussed in this chapter are as follows:

– “About test results” on page 220
– “Summary results” on page 220
– “LED results” on page 222
– “Signal results” on page 223
– “Time results” on page 224
– “AutoNeg Status results” on page 224
– “Link Stats results” on page 227
– “Link Counts results” on page 228
– “Filter Stats results” on page 231
– “Filter Counts results” on page 232
– “Error Stats results” on page 234
– “Pattern Stats results” on page 237
– “Ping Stats results” on page 237
– “L1 Bert Stats results” on page 238
– “L2 Bert Stats results” on page 239
– “Custom results” on page 240

About test results

After you connect the TestPad, results for the configured test automatically accumulate. The result categories available depend on their applicability to the test you configured. For example, if you configured a port for an unframed BERT test, the Summary, LED, Signal, Time, Error Stats, and L1 BERT Stats categories are available for the port. Ping Stats, Pattern Stats, L2 BERT Stats categories are not available because they are not applicable when performing an unframed BERT test.

To view the results for your test, select a port and category in each result pane.

Summary results

The Summary category automatically displays error results that are non-zero, key results that are out-of-specification, or key informational results. This allows quick access to the results without having to search each category.

If an errored or out of specification result appears, the pane has a red background. If only informational results appear, the pane has a white background. If all Summary results are within the recommended specifications, no alarms are present, and no informational results apply, the ALL SUMMARY RESULTS OK message appears in the result pane with a green background (see Figure 34).

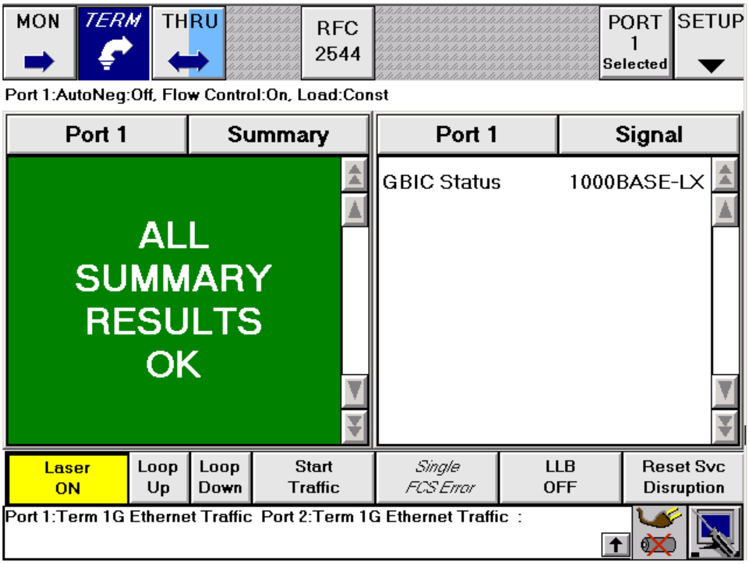


Figure 34 All Summary Results OK display

When errors are detected, the summary result window lists each error that occurred, and the result pane is red (see Figure 35).

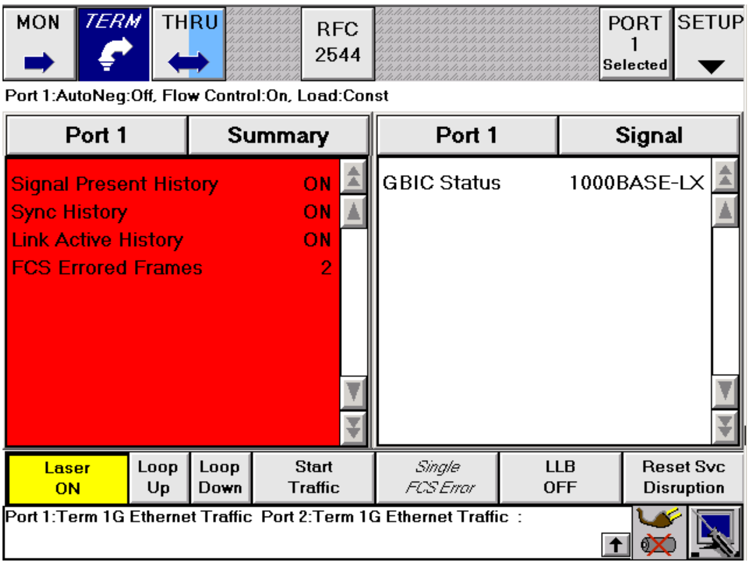


Figure 35 Summary results

LED results

The TestPad offers two types of LED results:

– Current and historical status and alarm LED results, displayed on the LED display panel.

– LED test results displayed in the Results Display of the user interface for the LED result category.

About status and alarm LEDs

Current and historical Status and Alarm LEDs are provided on the LED display panel. The inside column of LEDs indicate the current condition or state of the link; the outside column of LEDs indicate the historical condition of the link.

Status LEDs

The inside green LEDs for SIGNAL, SYNC, LINK ACTIVE, and FRAME illuminate sequentially when the TestPad detects a signal, obtains synchronization, recognizes a link is active, and then detects frames. If a signal, synchronization, link or frame detection is lost, the green Status LED extinguishes, and the red Alarm LED in the history column illuminates indicating an error condition has occurred.

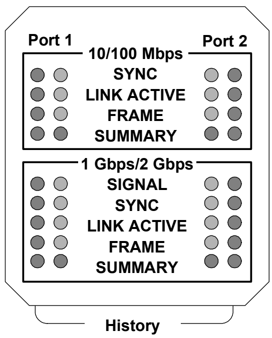


Figure 36 Dual port LED display panel

Alarm LEDs

The red Alarm LEDs illuminate when an error condition, such as a loss of a signal or synchronization occurs. For the SIGNAL, SYNC, LINK ACTIVE, and FRAME categories, the red LED illuminates in the outside (History) column.

For the SUMMARY category, the red LED illuminates in the inside column whenever a summary error occurs. To view summary errors on a results pane, select the Summary results category.

LED results category

You can also view LED results by selecting the LED results category. Table 14 describes the LED results.

Table 14 LED results

LED	When illuminated, indicates:
Frame Detect	The TestPad has detected frames.
Link Active	The link is active.
L1 Patt Sync	The data contained on the incoming bit stream is synchronized with a BERT pattern.
L2 Patt Sync	The data contained inside the frame payload is synchronized with a BERT pattern.
Signal Present	A signal is present (1G and 2G tests only).
Sync Acquired	Synchronization has been acquired.
Pause Frame Detect*	The TestPad has detected valid pause frames. * Only available when testing Ethernet.
VLAN Frame Detect	The TestPad has detected VLAN Ethernet frames as defined in IEEE 802.p/q. This LED only appears for TestPads with the VLAN Tagging option.

Signal results

The Signal results category displays the GBIC Status result, which displays one of the following:

- If a supported GBIC is in the GBIC port, the type of Gigabit Interface Converter (GBIC) the TestPad detects is displayed.
- If a GBIC which is not supported by the TestPad is in the GBIC port, the result indicates that the GBIC is not supported.
- If no GBIC is detected, the result indicates that there is no GBIC.

To view the GBIC Status result, use the Result Group button to set the port for the GBIC, and then set the result category to Signal.

NOTE:

The Signal results category is only available for 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel tests.

Time results

The Time category lists the current time, date, and the amount of time that has elapsed since the last test restart. Table 15 describes Time results. To view time results, set the result category to Time.

Table 15 Time results

Test Result	Description
Date	The current day and month.
Elapsed Time	The elapsed time in hours, minutes, and seconds since the last test restart on the port.
Time	The current time of day in hours, minutes, and sec-onds.

AutoNeg Status results

The AutoNeg Status category displays results associated with the auto-negotiation of capabilities between two Ethernet devices. Table 16 describes 1G AutoNeg Status results; Table 17 describes 10/100 AutoNeg Status results. To view AutoNeg Status results, set the result category to AutoNeg Status.

NOTE:

AutoNeg Status results only appear when auto-negotiation is turned ON on the TestPad.

Table 16 1G AutoNeg Status results

Test Result	Description
FDX Capable	Indicates that the Ethernet link partner is full duplex capable.
HDX Capable	Indicates that the Ethernet link partner if half duplex capable.
Link Adv Status	Indicates that the FST-2802 has received a valid auto-negotiation capability advertisement from the Ethernet link partner and sent an acknowledge-ment.
Link Config ACK	Indicates that the Ethernet link partner has acknowl-edged the receipt of a valid auto-negotiation capa-bility advertisement from the FST-2802.
Pause Capable	Indicates the flow control capabilities of the Ethernet link partner. Those capabilities are: – TX Only: The Ethernet link partner will transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth momentarily, however it will not reduce its transmitted bandwidth if it receives PAUSE frames. – RX Only: The Ethernet link partner will reduce its transmit-ted bandwidth momentarily if it receives PAUSE frames but it will not transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth. – TX and RX: The Ethernet link partner will transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth momentarily and it will reduce its transmitted bandwidth momentarily if it receives PAUSE frames – Neither TX and RX: The Ethernet link partner will not transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth and it will not reduce its transmitted bandwidth if it receives PAUSE frames.

Table 16 1G AutoNeg Status results (Continued)

Test Result	Description
Remote Fault	If supported by the Ethernet link partner, indicates a reason for auto-negotiation failure. If auto-negotiation succeeded, the result will read “NO”.

Table 17 describes 10/100 AutoNeg Status results.

Table 17 10/100 AutoNeg Status results

Test Result	Description
100Base-TX FDX	Indicates whether the Ethernet link partner is full duplex capable at 100Base-TX (YES or NO).
100Base-TX HDX	Indicates whether the Ethernet link partner is half duplex capable at 100Base-TX (YES or NO).
10Base-T FDX	Indicates whether the Ethernet link partner is full duplex capable at 10Base-TX (YES or NO).
10Base-T HDX	Indicates whether the Ethernet link partner is half duplex capable at 10Base-TX (YES or NO).
Duplex	Indicates the negotiated duplex setting for the link (half or full).
Link Adv Status	Indicates that the FST-2802 has received a valid auto-negotiation capability advertisement from the Ethernet link partner and sent an acknowledgement.
Link Config ACK	Indicates that the Ethernet link partner has acknowledged the receipt of a valid auto-negotiation capability advertisement from the FST-2802.
Remote Fault	If supported by the Ethernet link partner, indicates a reason for auto-negotiation failure. If auto-negotiation succeeded, the result will read “NO”.
Speed (Mbps)	Indicates the negotiated speed setting for the link (10 or 100 Mbps).

Link Stats results

The Link Stats category lists link statistics such as the average frame rate, peak frame rate, and the maximum, minimum, and average round trip delay measurements. Table 18 describes Link Stats results. To view Link Stats results, set the result category to Link Stats.

Table 18 Link Stats results

Test Result	Description
Delay, Avg (us)	The average round trip delay calculated in micro-seconds. You must originate an Acterna payload to measure round trip delay. A unit in loopback mode will display invalid results because it is not originating the traffic.
Delay, Max (us)	The maximum round trip delay calculated in micro-seconds. You must originate an Acterna payload to measure round trip delay. A unit in loopback mode will display invalid results because it is not originating the traffic.
Delay, Min (us)	The minimum round trip delay calculated in micro-seconds. You must originate an Acterna payload to measure round trip delay. A unit in loopback mode will display invalid results because it is not originating the traffic.
Frame Rate, Avg	The average rate of received frames, expressed in frames per second. The average is calculated over the time period elapsed since the last test restart.
Frame Rate, Cur	The current rate of received frames, expressed in frames per second. This measurement is an average taken over the prior second of test time.
Frame Rate, Min	The minimum rate of received frames over a one second period, expressed in frames per second.
Frame Rate, Peak	The maximum rate of received frames over a one second period, expressed in frames per second.
Frame Size, Avg	The average frame size of frames received since frame detection.
Frame Size, Max	The maximum frame size of frames received since frame detection.

Table 18 Link Stats results (Continued)

Test Result	Description
Frame Size, Min	The minimum frame size of frames received since frame detection.
Rx Mbps, Cur	The current bandwidth utilized by the received traffic expressed in megabits per second. This measurement is an average taken over the prior second of test time.
Svc Disruption (ms)	The service disruption time (maximum inter-frame gap) when service switches to a protect line calculated in milli-seconds.
Total Util %, Avg	The average bandwidth utilized by the received traffic, expressed as a percentage of the line rate of available bandwidth since the last test restart. The average is calculated over the time period elapsed since the last test restart.
Total Util %, Cur	The current bandwidth utilized by the received traffic expressed as a percentage of the line rate of available bandwidth. This measurement is an average taken over the prior second of test time.
Total Util %, Peak	The peak bandwidth utilized by the received traffic since the last test restart expressed as a percentage of the line rate of available bandwidth.
Tx Mbps, Cur	The current bandwidth utilized by the transmitted traffic expressed in megabits per second. This measurement is an average taken over the prior second of test time.

Link Counts results

The Link Counts category lists link counts such as the number of received frames, number of transmitted frames, and number of unicast, multicast, or broadcast frames. The Received Frames result includes errored frames; all other results count valid frames only.

To view Link Counts results, set the result category to Link Counts.

Table 19 Link Counts results

Test Result	Description
>1023 Byte Frames	A count of Ethernet frames with a length greater than 1023 bytes.
>2140 Byte Frames	A count of Fibre Channel frames with a length greater than 2140 bytes.
1024-2140 Byte Frames	A count of Fibre Channel frames with lengths between 1024 and 2140 bytes, inclusive.
128-252 Byte Frames	A count of Fibre Channel frames with lengths between 128 and 252 bytes, inclusive.
128-255 Byte Frames	A count of Ethernet frames with lengths between 128 and 255 bytes, inclusive.
256-508 Byte Frames	A count of Fibre Channel frames with lengths between 256 and 508 bytes, inclusive.
256-511 Byte Frames	A count of Ethernet frames with lengths between 256 and 511 bytes, inclusive.
28-64 Byte Frames	A count of Fibre Channel frames with lengths between 28 and 64 bytes, inclusive.
512-1020 Byte Frames	A count of Fibre Channel frames with lengths between 512 and 1020 bytes, inclusive.
512-1023 Byte Frames	A count of Ethernet frames with lengths between 512 and 1023 bytes, inclusive.
64 Byte Frames	A count of Ethernet frames with a length of 64 bytes.
65-127 Byte Frames	A count of Ethernet frames with lengths between 65 and 127 bytes, inclusive.
68-124 Byte Frames	A count of Fibre Channel frames with lengths between 68 and 124 bytes, inclusive.
Broadcast Frames	The number of Ethernet broadcast frames received since the last test restart.

Table 19 Link Counts results (Continued)

Test Result	Description
Multicast Frames	The number of Ethernet multicast frames received since the last test restart.
PAUSE Frames	A count of PAUSE frames received from a remote Ethernet device. PAUSE frames are utilized for flow control and alert the transmitting device that it must reduce the outgoing frame rate or risk a receiver overflow on the far end, resulting in dropped traffic.
Received Frames	A count of frames received since the last test restart, including errored frames.
Rx Acterna Frames	A count of received Acterna frames, excluding errored frames.
Rx Collisions	A count of the number of times the TestPad has received a jam signal while it was not transmitting frames. Result only appears for half-duplex 10/100 Ethernet tests.
Transmitted Frames	A count of frames transmitted since the last test restart. This result does not appear when testing in Monitor mode.
Tx Collisions	A count of the number of times the TestPad has transmitted a frame, and then received a jam signal in the time slot for the frame. Result only appears for half-duplex 10/100 Ethernet tests.
Tx Defers	A count of the number of times the transmitter prepared to send traffic, and then was forced to defer based on link activity. Result only appears for half-duplex 10/100 Ethernet tests.
Tx Late Collisions	A count of the number of times the TestPad has transmitted a frame, and then experiences a collision more than 64 byte times after the transmission begins. Result only appears for half-duplex 10/100 Ethernet tests.

Table 19 Link Counts results (Continued)

Test Result	Description
Unicast Frames	The number of Ethernet unicast frames received since the last test restart.
VLAN Frames	A count of VLAN frames as defined in IEEE 802.p/q. This result only appears for TestPads with the VLAN Tagging option.

Filter Stats results

The Filter Stats category lists link statistics for filtered traffic such as the average frame rate, peak frame rate, and the maximum, minimum, and average round trip delay measurements. Table 20 describes Filter Stats results. To view Filter Stats results, set the result category to Filter Stats.

Table 20 Filter Stats results

Test Result	Description
Frame Rate, Avg	The average rate of filtered frames, expressed in frames per second. The average is calculated over the time period elapsed since the last test restart.
Frame Rate, Cur	The current rate of filtered frames, expressed in frames per second. This measurement is an average taken over the prior second of test time.
Frame Rate, Min	The minimum rate of filtered frames over a one second period, expressed in frames per second.
Frame Rate, Peak	The maximum rate of filtered frames over a one second period, expressed in frames per second.
Frame Size, Max	The maximum frame size of filtered frames received since frame detection.
Frame Size, Min	The minimum frame size of filtered frames received since frame detection.
Delay, Avg	The average round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.

Table 20 Filter Stats results (Continued)

Test Result	Description
Delay, Max	The maximum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
Delay, Min	The minimum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
Util %, Avg	The average bandwidth utilized by the filtered traffic, expressed as a percentage of the line rate of available bandwidth since the last test restart. The average is calculated over the time period elapsed since the last test restart.
Util %, Cur	The current bandwidth utilized by the filtered traffic expressed as a percentage of the line rate of available bandwidth. This measurement is an average taken over the prior second of test time.
Util %, Peak	The peak bandwidth utilized by the filtered traffic since the last test restart expressed as a percentage of the line rate of available bandwidth.

Filter Counts results

The Filter Counts results category displays counts for filtered traffic such as the number of received frames, and the number of received frames with an Acterna payload. Table 21 describes Filter Counts results. To view Filter Counts results, set the result category to Filter Counts.

Table 21 Filter Counts results

Test Result	Description
>1023 Byte Frames	A count of filtered Ethernet frames with a length greater than 1023 bytes.
>2140 Byte Frames	A count of filtered Fibre Channel frames with a length greater than 2140 bytes.

Table 21 Filter Counts results (Continued)

Test Result	Description
1024-2140 Byte Frames	A count of filtered Fibre Channel frames with lengths between 1024 and 2140 bytes, inclusive.
128-252 Byte Frames	A count of filtered Fibre Channel frames with lengths between 128 and 252 bytes, inclusive.
128-255 Byte Frames	A count of filtered Ethernet frames with lengths between 128 and 255 bytes, inclusive.
256-508 Byte Frames	A count of filtered Fibre Channel frames with lengths between 256 and 508 bytes, inclusive.
256-511 Byte Frames	A count of filtered Ethernet frames with lengths between 256 and 511 bytes, inclusive.
28-64 Byte Frames	A count of filtered Fibre Channel frames with lengths between 28 and 64 bytes, inclusive.
512-1020 Byte Frames	A count of filtered Fibre Channel frames with lengths between 512 and 1020 bytes, inclusive.
512-1023 Byte Frames	A count of filtered Ethernet frames with lengths between 512 and 1023 bytes, inclusive.
64 Byte Frames	A count of filtered Ethernet frames with a length of 64 bytes.
65-127 Byte Frames	A count of filtered Ethernet frames with lengths between 65 and 127 bytes, inclusive.
68-124 Byte Frames	A count of filtered Fibre Channel frames with lengths between 68 and 124 bytes, inclusive.
Broadcast Frames	The number of filtered Ethernet broadcast frames received since the last test restart.
Multicast Frames	The number of filtered Ethernet multicast frames received since the last test restart.

Table 21 Filter Counts results (Continued)

Test Result	Description
Rx Acterna Frames	A count of filtered frames with an Acterna payload, excluding errored frames.
Unicast Frames	The number of filtered Ethernet unicast frames received since the last test restart.
Valid Rx Frames	A count of filtered frames received since the last test restart, including errored frames.
VLAN Frames	A count of filtered VLAN frames as defined in IEEE 802.p/q. This result only appears for TestPads with the VLAN Tagging option.

Error Stats results

The Error Stats category lists error statistics such as the number of symbol errors, FCS errored frames, and runts. Table 22 describes Error Stats results. To view Error Stats results, set the result category to Error Stats.

Table 22 Error Stats results

Test Result	Description
Code Violation Rate	The rate of frames with code violations, expressed in frames per second. This measurement is an average taken over the prior second of test time.
Code Violations	A count of each invalid 10-bit code word in the bit stream.
Code Violation Secs	A count of the number of seconds during which code violations occurred.
CRC Errored Frames	A count of Fibre Channel frames containing Cyclic Redundancy Check (CRC) errors.
Errored Frames	A summed count of FCS Errored Frames (Ethernet), CRC Errored Frames (Fibre Channel), Runts, Jabbers, Undersized Frames, and Oversized Frames.

Table 22 Error Stats results (Continued)

Test Result	Description
FCS Errored Frames*	A count of Ethernet frames containing Frame Check Sequence (FCS) errors. When receiving Ethernet jumbo frames containing FCS errors, the FCS error count does not increment. Instead, these frames are counted as Jabbers. * For Ethernet ping applications, the FCS Errored Frames result is the only result displayed in the Error Stats category. The other Error Stats results are not applicable.
Fibre Runts	A count of received Fibre Channel frames that have a byte value less than the minimum 28 byte frame length containing CRC errors.
Fibre Jabbers	A count of received Fibre Channel frames that have a byte value greater than the maximum 2140 frame length and an errored CRC.
Frame Loss Ratio	The ratio of frames lost to the number of frames expected.
Jabbers	A count of received Ethernet frames that have a byte value greater than the maximum 1518 frame length (or 1522 bytes for VLAN tagged frames) and an errored FCS.
Lost Frames	A count of lost Acterna test frames. For example, if the TestPad detects sequence numbers: 1, 2, 3, 6, 7, 8, (frames 4 and 5 were not detected), the lost frame count is incremented by two (frames 4 and 5 are lost). If the TestPad then detects sequence numbers 9, 10, 14, 15, 16 (frames 11, 12, and 13 are missing), the lost frame count is incremented by three, resulting in a total count of five lost frames. **NOTE:** If the TestPad receives errored frames containing errors in the sequence number field, the Lost Frames count will be incorrect.

Table 22 Error Stats results (Continued)

Test Result	Description
Out of Seq Frames	A count of each instance where the TestPad detects out of sequence Acterna test frames. For example, if the TestPad detects sequence numbers: 1, 2, 3, 6, 7, 8, (frame 6 is detected immediately following frame 3), the out of sequence count is incremented by one, resulting in a count of one instance of out of sequence frames. If the TestPad then detects sequence numbers 9, 10, 14, 15, 16 (frame 14 is detected immediately following frame 10), the out of sequence number is incremented again by one, resulting in a total count of two instances of out of sequence frames.
Oversized Frames	A count of frames over the maximum 1518 byte (Ethernet) or 2140 byte (Fibre Channel) frame length with no FCS or CRC errors. **NOTE:** If the TestPad is set up to transmit jumbo Ethernet frames, frames exceeding 1518 bytes (or 1522 bytes for VLAN tagged frames) are not considered oversized.
Runts	A count of Ethernet frames under the minimum 64 byte frame length containing Frame Check Sequence (FCS) errors.
Symbol Errors	A count of invalid 10-bit code words received on the physical layer. This result will not increment more than one time per frame.
Undersized Frames	A count of frames under the minimum 64 byte (Ethernet) or 24 byte (Fibre Channel) frame length with no FCS or CRC errors.

Pattern Stats results

The Pattern Stats category displays results associated with the transmission of patterns over a circuit. Table 23 describes Pattern Stats results. To view Pattern Stats results, transmit a pattern over a circuit, and then set the result category to Pattern Stats.

Table 23 Pattern Stats results

Test Result	Description
Received Frames	The number of valid and errored frames received since the link was established.
Transmitted Frames	The number of frames transmitted since the link was established.

Ping Stats results

The Ping Stats category displays results associated with the transmission of Ethernet Ping packets. Table 24 describes Ping Stats results. To view Ping Stats results transmit a ping packet (or packets) over a circuit, and then set the result category to Ping Stats.

Table 24 Ping Stats results

Test Result	Description
Lost Pings	Count of Ping requests sent by the FST-2802 for which replies were not received within 3 seconds.
Ping Requests Rx	Count of the Ping requests received by the FST-2802 (in other words, requests sent to the FST-2802's IP address) from another Layer 3 device on the network.
Ping Requests Tx	Count of the ping requests sent from the FST-2802.
Ping Responses Rx	Count of the replies received in response to the ping requests sent by the FST-2802.

Table 24 Ping Stats results (Continued)

Test Result	Description
Ping Responses Tx	Count of the Ping replies sent by the FST-2802 in response to the ping requests sent to the FST-2802. Each time a ping request is received, the FST-2802 replies and this counter is incremented by one.
Delay, Avg (ms)	The round trip delay for all pings sent and successfully received by the FST-2802 since the last test restart. Calculated in milliseconds.
Delay (ms)	The round trip delay for the last ping sent and successfully received by the FST-2802. Calculated in milliseconds.
Delay, Max (ms)	The maximum round trip delay for the pings sent and successfully received by the FST-2802. Calculated in milliseconds.
Delay, Min (ms)	The minimum round trip delay for the pings sent and successfully received by the FST-2802. Calculated in milliseconds.

L1 Bert Stats results

The L1 Bert Stats category displays results associated with the transmission of BER patterns on a layer 1 (unswitched) network. Table 25 describes L1 Bert Stats results. To view L1 Bert Stats results, transmit a BER pattern over a layer 1 network, and then set a result category to L1 Bert Stats.

Table 25 L1 Bert Stats results

Test Result	Description
BIT Error Rate	The ratio of pattern bit errors to received pattern bits since initially acquiring pattern synchronization.
BIT Errored Seconds	The number of seconds during which one or more pattern bit errors occurred since initial pattern synchronization.

Table 25 L1 Bert Stats results (Continued)

Test Result	Description
BIT Errors	A count of the number of received bits in a recognized pattern that do not match the expected value.
Total Bits Received	The total number of bits received since initial pattern synchronization.

L2 Bert Stats results

The L2 Bert Stats category displays results associated with the transmission of BER patterns on a layer 2 (switched) network. Table 26 describes L2 Bert Stats results. To view L2 Bert Stats results, transmit traffic with a BER pattern in the payload over a layer 2 network, and then set a result category to L2 Bert Stats.

Table 26 L2 Bert Stats results

Test Result	Description
BIT Error Rate	The ratio of pattern bit errors to received pattern bits since initially acquiring frame synchronization. **NOTE:** This ratio is determined using only the bits in the payload of the frame.
BIT Errored Seconds	The number of seconds during which one or more pattern bit errors occurred since initial frame synchronization.
BIT Errors	A count of the number of received bits in a recognized pattern that do not match the expected value since initially acquiring frame synchronization.
Total Bits Received	The total number of bits received since initial frame synchronization.

Custom results

In addition to the standard result categories provided on the TestPad, you can define your own Custom result category with test results from a variety of categories. This allows you to quickly review key results without navigating through each individual category.

To view results for the Custom category

– On a result pane, set the result group to **Custom Port 1** or **Custom Port 2**.

The Custom Results category appears, listing the results you selected when you defined the category (see "Defining the Custom result category" on page 45).

Troubleshooting

8

This chapter describes how to identify and correct problems related to the FST-2802. Topics discussed in this chapter are as follows:

– “About troubleshooting” on page 242
– “Resolving problems” on page 242

About troubleshooting

You may experience problems while using the FST-2802. Many of these problems are easily remedied. If you experience significant problems with the FST-2802, contact the Technical Assistance Center (see “Technical assistance” on page xxiii).

Resolving problems

The following section describes common problems that you may encounter while using the FST-2802. Before getting technical assistance, verify that you have exhausted all possibilities.

Installing and setting up

The unit will not power up.

- Check the power source and restart the unit.
- Verify that the unit is locked between the UIM and the FST-2802. The unit will not power up if the TestPad is not properly assembled. See “Connecting and swapping application modules” on page 28.
- Verify that you are connecting the FST-2802 application module to a Version 6 UIM.

Operating the TestPad

Test results do not print.

- Verify that the printer cable is properly connected to the TestPad. Refer to “Connecting a printer” on page 49 for instructions on connecting a printer to the TestPad.
- If you are printing to a serial printer, verify that the printer is configured properly. See “Configuring a serial printer” on page 50.
- Verify that the printer is turned on and that it is loaded with paper.

Performing tests

Test results are inconsistent.

The primary reason for inconsistent test results is improper hookup of the test connectors.

– Verify that the TestPad is connected properly for the test. Refer to "Step 2: Connecting the TestPad for testing" on page 96 for information about test connections.

– Verify that the TestPad is configured properly for the test you are performing.

I cannot perform a loopback test using a hard loopback at the far end of the network.

– If you are testing on switched Ethernet network, you must use two TestPads as end stations on a circuit. For a detailed explanation of Ethernet switching, refer to "Ethernet switching" on page 115.

– If you are testing on an unswitched Ethernet network, you can use a hard loopback at the far end of the circuit.

Specifications

A

This appendix describes the TestPad's specifications. Topics discussed in this appendix are as follows:

– "Physical specifications" on page 246

– "Environmental specifications" on page 246

– "Power specifications" on page 247

– "Electrical specifications" on page 247

– "GBIC specifications" on page 248

Physical specifications

The physical characteristics for the TestPad are described in Table 27.

Table 27 Physical specifications

Item	Description
Height	7.2 inches (18.3 cm)
Width	13.6 inches (34.5 cm)
Depth	2.2 inches (5.6 cm)
Weight	5.5 lbs with battery (2.5 kg)

Environmental specifications

The environmental characteristics for the TestPad are described in Table 28.

Table 28 Environmental specifications

Item	Description
Temperature Operating Storage	 32° F to 113° F (0° C to +40° C) -4° F to 158° F (-20° C to +70° C)
Humidity	5% to 85% relative humidity, non-condensing
Shock/drop height	40 inches onto concrete

Power specifications

The power characteristics for the TestPad are described in Table 29.

Table 29 Power specifications

Item	Description
Battery	Rechargeable10.8V Nickel-Metal Hydride (NiMH)
Operating time	Single port configuration: – Typically provides a minimum of 1 hour of operation. Dual port configuration: – Typically provides a minimum of 40 minutes of operation.
Recharging period	Minimum of 1.5 hours
AC adapter	19VDC, 2.95 amps / 100-240 VAC, 50-60 Hz

Electrical specifications

The FST-2802 10/100 Base-TX interface conforms to IEEE 802.3 electrical requirements. The electrical specifications for the 10 Mb/s interface are described in Table 30; the electrical specifications for the 100 Mb/s interfaces are described in Table 31.

Table 30 10 Mb/s interface electrical specifications

Specification	Description
Cable	Cat-5 (or better) 100 Ohm STP cable, ≤100 meters.
Twisted pair differential	
Output voltage	2.2 MIN Vpk, 2.5 TYP Vpk, 2.8 MAX Vpk
Input squelch threshold	.310 MIN Vpk, .540 MAX Vpk
Input voltage range	3.3V MAX
Output jitter	±5.5 ns pk-pk MAX

Table 30 10 Mb/s interface electrical specifications

Specification	Description
Input jitter	±13.5 ns pk-pk MAX

Table 31 100 Mb/s interface electrical specifications

Specification	Description
Cable	Cat-5 (or better) 100 Ohm STP cable, ≤100 meters.
Twisted pair differential Output voltage Input squelch threshold Input voltage range	 .950 MIN Vpk, 1.000 TYP Vpk, 1.050 MAX Vpk .166 MIN Vpk, .500 MAX Vpk 3.3V MAX
Output jitter	±.7 ns pk-pk MAX
Input jitter	±3.0 ns pk-pk MAX

GBIC specifications

Each of the optional SX and LX GBICs offered by Acterna complies with the Revision 5.5 GBIC specification. The copper and long-haul GBICs comply with the Revision 5.4 GBIC specification. Please refer to your GBIC manufacturer's site for detailed specifications.

For a complete list of GBICs offered by Acterna, see "GBIC accessories" on page 9.

Remote Control Commands

B

This appendix describes remote control operation and lists each of the available remote control commands. This guide also provides preparation, setup, and syntax instructions for the FST-2802 remote operation. Topics discussed in this appendix are as follows:

– “About the remote control function” on page 250
– “Characteristics of remote control commands” on page 250
– “Configuration commands” on page 251
– “Result commands” on page 269
– “Event commands” on page 285
– “Miscellaneous commands” on page 287

About the remote control function

You can connect to the TestPad via modem dial-in or dial-out, Ethernet, USB, and serial connections. Figure 37 illustrates a typical connection between a device and a TestPad.

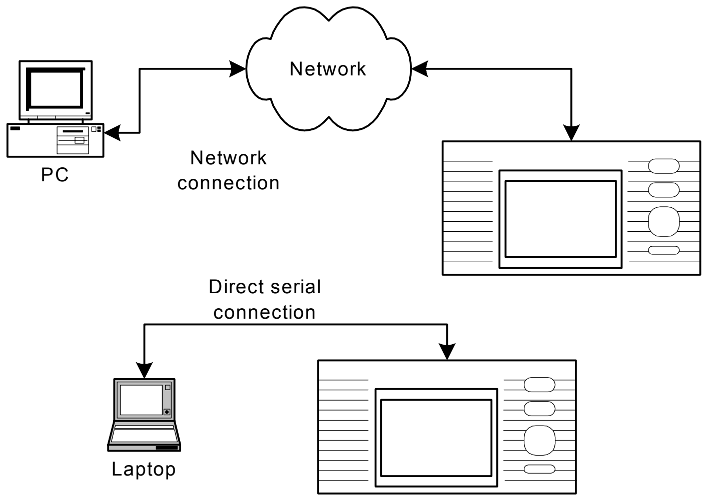


Figure 37 PC to TestPad connection

For details on establishing connections to the FST-2802 for remote control operation, see Chapter 3 “Serial and Network Connections”.

Characteristics of remote control commands

You type remote control commands into a terminal emulation application, such as HyperTerminal. When typing commands:

– Use lower-case characters
– Press Backspace to erase the last character entered
– Type commands in the same sequence as you would perform them when using the TestPad.
– Be sure to specify the port_ID for each command. For single port units, the port_ID is always `port_1`. For dual port units, you must specify `port_1` or `port_2`.

The availability of a command depends on your current test configuration. For example, the commands for a 1G pattern test are not available if you are performing a 10/100 ping test.

Configuration commands

Use configuration commands to set or query the parameters of the test configuration for a port. These parameters can be a test type or a specific value.

This section describes the command syntax for each type of configuration command.

config

Displays or modifies a configuration parameter.

Syntax

```
config:<cfg_id?><port_id>
```

Displays the value of `cfg_id` for the port specified.

```
config:<cfg_id><port_id> [value]
```

Changes the value of `cfg_id` to `value` on the port specified.

Remark

If you do not specify `value`, the FST-2802 displays the current value for the parameter.

Example

The following command sets the 1G pattern to CRPAT on port 1.

```
config:ethernet_pattern port_1 crpat
```

Table 32 lists system configuration identifiers and values.

Table 32 System configuration identifiers and values

Configuration ID	Meaning	Configuration Values
`error_burst_quantity`	Sets the number of burst frames.	`1 to 32767`
`error_insert_type`	Sets the type of FCS error to insert.	`single_insert`, `quantity_burst_insert`
`error_type`	Sets the type of error to insert.	`ethernet_fcs`
`ether_fibre_bert_traffic`	Starts transmission of layer 1 BERT patterns.	
`ether_fibre_l1_bert_pattern`	Sets the layer 1 BERT pattern to the value specified.	Accepts one of the following BERT patterns: – `hfpat` – `lfpat` – `mfpat` – `rdpat` – `jtpat` – `snpat`
`ether_fibre_l2_bert_tx_eql_rx`	Sets the transmitted BERT pattern to the pattern specified in the receive profile.	`on`, `off`
`ether_fibre_rx_l2_bert_patt`	Sets the BERT pattern for the receive profile to the value specified.	Accepts one of the following BERT patterns: – `2_23_1` – `2_23_1_inv` – `2_31_1` – `2_31_1_inv` – `all_ones` – `all_zeros` – `User_Define`
`ether_fibre_rx_l2_user_patt`	Sets the user defined BERT pattern for the transmit profile. Valid only when `ether_fibre_rx_l2_bert_patt` is set to `User Define`.	Accepts a hexadecimal value from 0 to FFFFFFFFFF, for example, e57f.

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ether_fibre_tx_l2_bert_p att	Sets the BERT pattern for the transmit profile to the value specified.	Accepts one of the following BERT patterns: – 2_23_1 – 2_23_1_inv – 2_31_1 – 2_31_1_inv – all_ones – all_zeros – User_Define
ether_fibre_tx_l2_user_p att	Sets the user defined BERT pattern for the transmit profile. Valid only when ether_fibre_tx_l2_ber t_patt is set to User Define.	Accepts a hexadecimal value from 0 to FFFFFFFFFF, for example, e57f.
ethernet_auto_negotiatio n	Enables auto negotiation.	on, off
ethernet_auto_negotiatio n_100basetx_fdx	Advertises Ethernet 100BaseTx full-duplex capable.	yes, no
ethernet_auto_negotiatio n_100basetx_hdx	Advertises Ethernet 100BaseTx half-duplex capable.	yes, no
ethernet_auto_negotiatio n_10baset_fdx	Advertises Ethernet 10BaseT full-duplex capable.	yes, no
ethernet_auto_negotiatio n_10baset_hdx	Advertise Ethernet 10BaseT half-duplex capable.	yes, no
ethernet_auto_negotiatio n_1g_fdx	Advertises Ethernet 1000 Base X full-duplex capable.	yes, no
ethernet_auto_negotiatio n_1g_hdx	Advertises Ethernet 1000 Base X half-duplex capable.	yes, no
ethernet_auto_negotiatio n_1g_pause	Advertises Ethernet 1000 Base X pause capable.	neither, both, tx_only, rx_only
ethernet_burst_frame_siz e	Sets the size of burst frames.	fixed, random

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_burst_load	Sets traffic load to bursty.	
ethernet_burst_numbers	Sets the number of burst frames. Valid only when ethernet_burst_type is set to FIXED.	Accepts a number from 1 to 65535.
ethernet_burst_size	Sets burst size. If you type "user", you must also enter the user-defined burst size using the ethernet_burst_user_size configuration ID.	16, 64, 256, 1024, user
ethernet_burst_type	Specifies finite number (fixed) or a continuous burst of frames.	fixed, continuous
ethernet_burst_user_size	Sets user-defined burst size. Valid only when ethernet_burst_size is set to user.	Accepts a number from 1 to 16500000.
ethernet_connect_rx_to_tx	Tells the TestPad to loop the frames received through to the transmitter (instead of transmitting idle frames) when monitoring 1G traffic in single port THRU mode.	on, off
ethernet_const_load	Sets constant traffic load in percentage of bandwidth utilization.	Accepts a number from 1 to 100.
ethernet_duplex	Sets duplex to half or full.	half, full
ethernet_flow_control	Enables or disables flow control.	on, off
ethernet_llb	Turns line loopback feature on or off.	on, off
ethernet_load	Sets the Ethernet traffic load type.	burst, constant, ramp
ethernet_loop_down	Issues loop down command.	on, off
ethernet_loop_up	Issues loop up command.	on, off

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
`ethernet_pattern`	Sets the Ethernet pattern.	`crpat`, `cjpat`, `cspat`
`ethernet_payload`	Sets the Ethernet transmit frame payload type. If you specify `bert`, you must also specify the pattern for the payload using the `ether_fibre_tx_l2_bert_patt` command.	`acterna`, `bert`
`ethernet_ping`	Turns ping packet transmission on or off.	`on`, `off`
`ethernet_ping_address`	Specifies the IP address of the device you are verifying connectivity to.	Accepts an IP address, for example: `128.118.200.4`.
`ethernet_ping_dont_fragment`	Specifies whether ping packets may be fragmented.	`off`, `on`
`ethernet_ping_frame_type`	Sets the Ethernet frame type for transmitted ping packets.	`ethernet_type_2`, `802_3_with_llc`, `802_3_with_llc_and_snap`
`ethernet_ping_gateway`	Sets the IP address for the router through which ping traffic will be sent if the destination for the traffic is outside of the local subnet.	Accepts an IP address, for example: `128.118.200.4`.

`ethernet_ping_jumbo_length`	Sets the frame length for jumbo ping packets.	Accepts a number from `1493` to `9982` depending on the frame type specified:
		DIX:
		`1501 - 9982`
		802.3 w/LLC:
		`1497 - 9979`
		802.3 w/LLC and SNAP:
		`1493 - 9974`

`ethernet_ping_length`	Specifies the length type for ping packets.	`user`, `jumbo`

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_ping_packet_count	Sets the number of ping packets to transmit. Valid only when ethernet_ping_traffic_type is set to multiple.	Accepts a number from 1 to 1024.
ethernet_ping_source_address	Sets the IP address for the FST-2802.	Accepts an IP address, for example: 128.118.200.4
ethernet_ping_subnet_mask	Sets the subnet mask address for the ping traffic.	Accepts an IP address, for example: 128.118.200.4
ethernet_ping_tagging	Sets the VLAN tagged status for ping traffic.	nontagged, tagged
ethernet_ping_time_to_live	Sets the time after which a fragmented ping request or response can be dropped by any device on a circuit.	Accepts a number from 0 to 255.
ethernet_ping_traffic_type	Sets the ping traffic type.	single, multiple, continuous
ethernet_ping_type_of_service	Sets the type of service code for transmitted ping packets.	Accepts up to 8 zeros or ones, for example: 10001000.
ethernet_ping_user_length	Sets the frame length for user-defined ping packets.	Accepts a number from 38 to 1500, depending on the frame type specified: **DIX:** 46 - 1500 **802.3 w/LLC:** 43 - 1497 **802.3 w/LLC and SNAP:** 38 - 1492
ethernet_ping_user_priority	Sets the VLAN user priority for each ping packet transmitted. Valid only when ethernet_ping_tagging is set to tagged.	0, 1, 2, 3, 4, 5, 6, 7

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_ping_vland_id	Sets the VLAN ID for each ping packet transmitted. Valid only when ethernet_ping_tagging is set to tagged.	Accepts a value from 0 to 4095.
ethernet_ramp_load_step	Sets the load increment (as a percentage of bandwidth) for ramped traffic.	Accepts a number from 1 to 50.
ethernet_ramp_num_drop_frames	Sets the threshold for dropped frames. Valid only when ethernet_ramp_stop_on_dropped_frames is on.	Accepts a number from 1 to 1000000.
ethernet_ramp_num_err_frames	Sets the threshold for error frames. Valid only when ethernet_ramp_stop_err_frames is on.	Accepts a number from 1 to 1000000.
ethernet_ramp_num_pause_frames	Sets the threshold for pause frames. Valid only when ethernet_ramp_stop_on_pause_frames is on.	Accepts a number from 1 to 1000000.
ethernet_ramp_state	Starts or stops ramp traffic.	on, off
ethernet_ramp_stop_drop_frames	Set dropped frames as a criterion to stop ramp mode.	on, off
ethernet_ramp_stop_err_frames	Set error frames as a criterion to stop ramp mode.	on, off
ethernet_ramp_stop_pause_frames	Set pause frames as a criterion to stop ramp mode.	on, off
ethernet_ramp_time_step	Sets the time increment for ramped traffic.	Accepts a number from 0.1 to 10.0.
ethernet_rx_profile	Sets the Ethernet receive profile.	rx_profile_1, rx_profile_2, rx_profile_3, rx_profile_4

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values

`ethernet_rx_profile_1`	Sets the frame characteristics for the traffic filtered using receive profile 1. You must specify a value for each of the ten profile settings, even if they are not applicable. The string of values must be enclosed in quotes.
	
	For example, if you issue a command to set up the receive profile to filter for untagged frames, the string of values might look like this:
	
	`"unicast, 00404D000001, yes, 00404D000002, 802_3. 0800, 64, untagged, na, na"`
		Accepts a string of 10 comma delimited values, enclosed in quotes:
		DA Type:
		`unicast`, `multicast`, `broadcast`, `dont_care`
		Dest Address:
		`000000000000` to `ffffffffffff`, `na`
		SA:
		`yes`, `dont_care`
		Source Address:
		`000000000000` to `ffffffffffff`, `na`
		Frame Type:
		`ethernet_type_2`, `802_3`, `dont_care`
		Protocol:
		`0000` to `ffff`, `na`
		Data Length:
		`64` to `1550`, `na`
		Tagging:
		`tagged`, `untagged`, `dont_care`
		VLAN ID:
		`0` to `4095`, `na`
		User Priority:
		`0` to `7`, `na`

`ethernet_rx_profile_2`	Sets the frame characteristics for the traffic filtered using receive profile 2.	See the description and values for "ethernet_rx_profile_1" on page 258.
`ethernet_rx_profile_3`	Sets the frame characteristics for the traffic filtered using receive profile 3.	See the description and values for "ethernet_rx_profile_1" on page 258.
`ethernet_rx_profile_4`	Sets the frame characteristics for the traffic filtered using receive profile 4.	See the description and values for "ethernet_rx_profile_1" on page 258.

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
`ethernet_rx_profile_ip_addr`	Specifies that the receive profile should filter traffic for a specific IP address.	Accepts an IP address, for example: `128.118.200.4`
`ethernet_sa`	Queries the FST-2802 for the factory-assigned source MAC address. FST-2802 displays ID.	N/A
`ethernet_speed`	Sets speed to 10 Mbps or 100 Mbps. Valid only when `ethernet_auto_negotiation` is set to `off`.	`10`, `100`
`ethernet_traffic`	Starts and stops traffic.	`on`, `off`
`ethernet_tx_profile`	Selects the Ethernet profile you want to use when you transmit traffic.	`tx_profile_1`, `tx_profile_2`, `tx_profile_3`, `tx_profile_loop`

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_tx_profile_1	Sets the frame characteristics for the traffic transmitted using transmit profile 1. You must specify a value for each of the ten profile settings, even if they are not applicable. The string of values must be enclosed in quotes. For example, if you issue a command to set up the transmit profile to send untagged 64 byte 802.3 frames to destination address 00404D000001, the string of values would look like this: `"unicast, 00404D000001, 802_3, 0800, untagged, na, na, 64, na, na"`	Accepts a string of 10 comma delimited values, enclosed in quotes: **DA Type:** unicast, multicast, broadcast **DA:** 000000000000 to ffffffffffff, na **Frame Type:** ethernet_type_2, 802_3 **Protocol:** 0000 to ffff, na **Tagging:** tagged, untagged **VLAN ID:** 0 to 4095, na **User Priority:** 0 to 7, na **Length:** 64, 128, 256, 512, 1024, 1280, 1518, user, jumbo **User Length:** 64 to 1522, na **Jumbo Length:** 1519 to 10000, na
ethernet_tx_profile_2	See the description for "ethernet_tx_profile_1" on page 260.	See the values for "ethernet_tx_profile_1" on page 260.
ethernet_tx_profile_3	See the description for "ethernet_tx_profile_1" on page 260.	See the values for "ethernet_tx_profile_1" on page 260.

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_tx_profile_loop	Sets the frame characteristics for the traffic looped back to the FST-2802 using the profile. You must specify a value for each of the ten profile settings, even if they are not applicable. The string of values must be enclosed in quotes. For example, if you issue a command to set up the loop back profile to loop back untagged 64 byte 802.3 frames from destination address 00404D000001, the values would look like this: "unicast, 00404D000001, 802_3, 0800, untagged, na, na, 64, na, na" **NOTE:** When you perform an automatic loopback using the Loop Up button on the traffic originating FST-2802, the destination address for the loopback profile is populated automatically with the source address of the Test-Pad on the far end.	Accepts 10 comma delimited values, enclosed in quotes: **DA Type:** unicast, multicast, broadcast **DA:** na **Frame Type:** ethernet_type_2, 802_3 **Protocol:** 0000 to ffff, na **Tagging:** tagged, untagged **VLAN ID:** 0 to 4095, na **User Priority:** 0 to 7, na **Length:** 64, 128, 256, 512, 1024, 1280, 1518, user, jumbo **User Length:** 64 to 1522, na **Jumbo Length:** 1519 to 10000, na
ethernet_tx_sa_type	Sets the transmitted source address type to the factory assigned source address (tx_source_address) or the user assigned source address (tx_user_define_sa).	tx_source_address, tx_user_define_sa

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
ethernet_unit_text_id	Sets the user defined text ID for each port on the FST-2802. You must type the text id in quotes. For example, if you want to identify a port on the FST-2802 as TP Port 1, you must type “TP Port 1”.	Accepts a quoted string of up to ten characters.
ethernet_user_tx_sa	Sets the transmitted user-assigned source address.	000000000000 to ffffffffffff
fibre_auto_llb	Turns line loopback feature on or off.	on, off
fibre_burst_frame_size	Sets the size of burst frames.	fixed, random
fibre_burst_load	Sets traffic load to bursty.	
fibre_burst_numbers	Sets the number of burst frames. Valid only when fibre_burst_type is set to FIXED.	Accepts a number from 1 to 65535.
fibre_burst_size	Sets burst size. If you type “user”, you must also enter the user-defined burst size using the fibre_burst_user_size configuration ID.	16, 64, 256, 1024, user
fibre_burst_type	Specifies finite number (fixed) or a continuous burst of frames.	fixed, continuous
fibre_burst_user_size	Sets user-defined burst size. Valid only when fibre_burst_size is set to user.	Accepts a number from 1 to 16500000.
fibre_const_load	Sets constant traffic load in percentage of bandwidth utilization.	Accepts a number from 1 to 100.
fibre_load	Sets the Fibre Channel traffic load type.	burst, constant, ramp

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
fibre_loop_down	Issues loop down command.	on, off
fibre_loop_up	Issues loop up command.	on, off
fibre_pattern	Sets the Fibre Channel pattern.	rpat, jpat, spat
fibre_payload	Sets Fibre Channel transmit frame payload type. If you specify bert, you must also specify the pattern for the payload using the ether_fibre_tx_l2_bert_patt command.	acterna, bert
fibre_ramp_load_step	Sets the load increment (as a percentage of bandwidth) for ramped traffic.	Accepts a number from 1 to 50.
fibre_ramp_number_dropped_frames	Sets the threshold for dropped frames. Valid only when fibre_ramp_stop_on_dropped_frames is on.	Accepts a number from 1 to 1000000.
fibre_ramp_number_errored_frames	Sets the threshold for error frames. Valid only when fibre_ramp_stop_err_frames is on.	Accepts a number from 1 to 1000000.
fibre_ramp_state	Starts or stops ramp traffic.	on, off
fibre_ramp_stop_on_dropped_frames	Set dropped frames as a criterion to stop ramp mode.	on, off
fibre_ramp_stop_on_errored_frames	Set error frames as a criterion to stop ramp mode.	on, off
fibre_ramp_time_step	Sets the time increment for ramped traffic.	Accepts a number from 0.1 to 10.0.
fibre_rx_profile	Sets the Fibre Channel receive profile.	rx_profile_1, rx_profile_2, rx_profile_3, rx_profile_4

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values

`fibre_rx_profile_1`	Sets the frame characteristics for the traffic filtered using receive profile 1. You must specify a value for each of the ten profile settings, even if they are not applicable. The string of values must be enclosed in quotes.
	
	For example, if you issue a command to set up the receive profile to filter for frames originating from port 00012F, the string of values might look like this:
	
	`"dont_care, na, yes, 01012F, dont_care, na, dont_care, na, dont_care, na"`
		Accepts a string of 10 comma delimited values, enclosed in quotes:
		Routing Filter:
		`yes`, `dont_care`
		Routing Ctrl:
		`00` to `ff`, `na`
		Des ID Filter:
		`yes`, `dont_care`
		Destination ID:
		`010000` to `efefff`, `na`
		Src ID Filter:
		`yes`, `dont_care`
		Source ID:
		`010000` to `efefff`, `na`
		Data Filter:
		`yes`, `dont_care`
		Data Type:
		`00` to `ff`, `na`
		Seq Filter:
		`yes`, `dont_care`
		Sequence Cnt:
		`00` to `ff`, `na`

`fibre_rx_profile_2`	See the description for "`fibre_rx_profile_1`" on page 264	See the description for "`fibre_rx_profile_1`" on page 264
`fibre_rx_profile_3`	See the description for "`fibre_rx_profile_1`" on page 264	See the description for "`fibre_rx_profile_1`" on page 264
`fibre_rx_profile_4`	See the description for "`fibre_rx_profile_1`" on page 264	See the description for "`fibre_rx_profile_1`" on page 264
`fibre_traffic`	Starts and stops traffic.	`on`, `off`

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
`fibre_tx_profile`	Selects the Fibre Channel profile you want to use when you transmit traffic.	`tx_profile_1`, `tx_profile_2`, `tx_profile_3`, `tx_profile_loop`

`fibre_tx_profile_1`	Sets the frame characteristics for the traffic transmitted using transmit profile 1. You must specify a value for each of the seven profile settings, even if they are not applicable. The string of values must be enclosed in quotes.
	
	For example, if you issue a command to set up the transmit profile to send 512 byte frames from sequence ID `4F`, source ID `00012F`, to destination ID `00043D`, the string of values would look like this:
	
	`"4f, 00043D, 00012F, na, na, 512, na"`
		Accepts a string of seven comma delimited values, enclosed in quotes:
		Sequence ID:
		`00 to ff`
		Destination ID:
		`010000` to `efefff`, `na`
		Source ID:
		`01000` to `efefff`, `na`
		Originator ID:
		`0000` to `ffff`, `na`
		Responder ID:
		`0000` to `ffff`, `na`
		Length*:
		`28`, `32`, `512`, `1024`, `2076`, `user`
		User Length*:
		`28` or 76 to `2076`, `na`
		***NOTE:** The minimum frame size for an Acterna payload is 76 bytes; the minimum frame size for a BERT payload is 28 bytes.

`fibre_tx_profile_2`	See the description for “`fibre_tx_profile_1`” on page 265.	See the description for “`fibre_tx_profile_1`” on page 265.
`fibre_tx_profile_3`	See the description for “`fibre_tx_profile_1`” on page 265.	See the description for “`fibre_tx_profile_1`” on page 265.
`fibre_tx_profile_loop`	See the description for “`fibre_tx_profile_1`” on page 265.	See the description for “`fibre_tx_profile_1`” on page 265.

Table 32 System configuration identifiers and values (Continued)

Configuration ID	Meaning	Configuration Values
`fibre_unit_text_id`	Sets the user defined text ID for each port on the FST-2802. You must type the text id in quotes. For example, if you want to identify a port on the FST-2802 as TP Port 1, you must type "TP Port 1".	Accepts a quoted string of up to ten characters.
`laser_enable`	Turns the laser on the FST-2802 on or off.	`off`, `on`

config:all

Lists the values of all applicable configurations for the port specified.

Syntax `config:all? <port_id> [-all]`

Remark The `-all` parameter returns all the configuration and associated values regardless of their applicability to the current test.

config:value

Lists all of the possible currently applicable values for a configuration on the port specified.

Syntax `config:value? <port_id><cfg_id> [-all]`

Remark The `-all` parameter returns a list of all possible values for the configuration identifier, regardless of applicability to the current test.

config:id

Lists all of the possible currently applicable configuration identifier values on the port specified.

Syntax `config:id? <port_id> [-all]`

Remark The `-all` parameter returns the list of all possible configurations, regardless of applicability.

config:test

Sets the type of test you want to perform.

Syntax

```
config:test <test_type>
```

Example The following command is equivalent to selecting **Term > 1G Ethernet > Layer 2 Traffic** on the TestPad:

```
config:test term_ethernet_1g
```

Table 33 lists the possible values for <test_type>.

Table 33 Test configuration values

Configuration value
dualthru_ethernet_10_100
dualthru_ethernet_1g
dualthru_fibre_chan_1g
dualthru_fibre_chan_2g
thru_ethernet_10_100
thru_ethernet_10_100_ip
thru_ethernet_1g
thru_ethernet_1g_ip
thru_ethernet_unfrm_1g_bert
thru_fibre_chan_1g
thru_fibre_chan_1g_pattern
thru_fibre_chan_2g
thru_fibre_chan_2g_pattern
thru_fibre_unfrm_1g_bert
thru_fibre_unfrm_2g_bert
term_ethernet_10_100
term_ethernet_10_100_ping
term_ethernet_1g
term_ethernet_1g_pattern
term_ethernet_1g_ping
term_ethernet_unfrm_1g_bert
term_fibre_chan_1g
term_fibre_chan_1g_pattern
term_fibre_chan_2g
term_fibre_chan_2g_pattern
term_fibre_unfrm_1g_bert
term_fibre_unfrm_2g_bert

Result commands

Use result commands to query the test set for the current value of a results field. After you issue a result command, the test set responds with the current value of the result. If the result is unavailable or not applicable to the current test, the message appears, `UNAVAILABLE` or `N/A` respectively.

result

Displays the result of a field for the port specified.

Syntax

```
result:<res_id?> <port_id>
```

Example

The following command displays the current result of the Delay, Avg (us) field on port 1.

```
result:ethernet_delay_avg? port_1
```

result:all

Lists all test results generated by a test on the port specified.

Syntax

```
result:all? <port_id> [-all]
```

Remark

The `-all` parameter returns all results regardless of their applicability to the current test.

result:id

Lists all test result fields for the specified port.

Syntax

```
result:id? <port_id>
```

result:summary

Lists the results that are currently available in the Summary category for the port specified.

Syntax `result:summary? <port_id>`

Remark If the FST-2802 does not detect any errors on the port specified, the message `All Summary Results OK` appears.

LED result field IDs

Table 34 lists the LED result field identifiers.

Table 34 LED result field identifiers

Field Identifier	Description
`ether_fibre_l1_patt_sync`	For layer 1 tests, indicates the data contained on the incoming bit stream is synchronized with a BERT pattern.
`ether_fibre_l2_patt_sync`	For layer 2 tests, indicates the data contained inside the frame payload is synchronized with a BERT pattern.
`ether_fibre_l1_patt_sync_history` `ether_fibre_l2_patt_sync_history`	Indicates the TestPad could not achieve pattern synchronization (when performing layer 1 or layer 2 BERT testing) at some point in the past.

`ethernet_10_100_link_active`
`ethernet_1G_link_active`
`fibre_link_active`
	Indicates whether a link is active.

`ethernet_10_100_lnk_act_hist`
`ethernet_1G_link_active_history`
`fibre_link_active_history`
	Indicates the link was lost at some point in the past.

`ethernet_10_100_sync_history`
`ethernet_1G_sync_history`
`fibre_word_sync_history`
`ether_fibre_l1_bert_word_sync_history`
	Indicates synchronization was lost at some point in the past.

`ethernet_10_100_sync`
`ethernet_1G_sync`
`fibre_word_sync`
`ether_fibre_l1_bert_word_sync`
	Indicates whether synchronization has been achieved.

Table 34 LED result field identifiers (Continued)

Field Identifier	Description

`ethernet_signal_history`
`fibre_signal_history`
`ether_fibre_l1_bert_signal_history`
	Indicates a 1G or 2G signal was lost at some point in the past.

`ethernet_signal_present`
`fibre_signal_present`
`ether_fibre_l1_bert_signal_present`
	Indicates whether a 1G or 2G signal is present.

`ethernet_sw_frm_detect_history` `fibre_sw_frm_detect_history`	Indicates the TestPad did not detect frames at some point in the past.
`ethernet_sw_frm_detect` `fibre_sw_frm_detect`	Indicates whether the TestPad has detected frames.
`ethernet_sw_vlan_frm_detect`	Indicates whether the TestPad has detected VLAN tagged frames as defined in IEEE 802.p/q. This result is only available to Test-Pads with the VLAN Tagging option.
`ethernet_sw_vlan_frm_detect_hist`	Indicates the TestPad could not detect VLAN tagged frames at some point in the past. This result is only available to TestPads with the VLAN Tagging option.

Signal result field IDs

Table 35 lists the Signal result field identifiers. The Signal result field identifiers are only available for 1G and 2G tests.

Table 35 Signal result field identifiers

Field Identifier	Description
`ethernet_gbic_module`	Informs you of the type of Gigabit Interface Converter (GBIC) the TestPad detects in each GBIC port, and indicates whether detected GBICs are not supported, or if there is no GBIC detected.
`fibre_gbic_module`	See “`ethernet_gbic_module`” on page 271.

Link Stats result field IDs

Table 36 lists the Link Stats field identifiers.

Table 36 Link Stats result field identifiers

Field Identifier	Description
ethernet_delay_avg	The average round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
ethernet_delay_max	The maximum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
ethernet_delay_min	The minimum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
ethernet_frm_rate_avg fibre_frm_rate_avg	The average rate of received frames, expressed in frames per second. The average is calculated over the time period elapsed since the last test restart.
ethernet_frm_rate_cur fibre_frm_rate_cur	The current rate of received frames, expressed in frames per second. This measurement is an average taken over the prior second of test time.
ethernet_frm_rate_min fibre_frm_rate_min	The minimum rate of received frames over a one second period, expressed in frames per second.
ethernet_frm_rate_peak fibre_frm_rate_peak	The maximum rate of received frames over a one second period, expressed in frames per second.
ethernet_frm_size_max fibre_frm_size_max	The minimum frame size of frames received since frame detection.
ethernet_frm_size_min fibre_frm_size_min	The maximum frame size of frames received since frame detection.
ethernet_rx_mbps_tot_util_cur	The current bandwidth utilized by the received traffic expressed in megabits per second. This measurement is an average taken over the prior second of test time.
ethernet_service_disruption_time	The service disruption time (maximum inter-frame gap) when service switches to a protect line calculated in milli-seconds.
ethernet_test_secs	The number of seconds since the last test restart.

Table 36 Link Stats result field identifiers (Continued)

Field Identifier	Description
`ethernet_tot_util_avg` `fibre_tot_util_avg`	The average bandwidth utilized by the received traffic, expressed as a percentage of the line rate of available bandwidth since the last test restart. The average is calculated over the time period elapsed since the last test restart.
`ethernet_tot_util_cur` `fibre_tot_util_cur`	The current bandwidth utilized by the received traffic expressed as a percentage of the entire 1 Gbps or 2 Gbps of available bandwidth. This measurement is an average taken over the prior second of test time.
`ethernet_tot_util_peak` `fibre_tot_util_peak`	The peak bandwidth utilized by the received traffic since the last test restart expressed as a percentage of the line rate of available band-width.
`ethernet_tx_mbps_tot_util_cur` `fibre_tx_bits_tot_util_cur`	The current bandwidth utilized by the transmit-ted traffic expressed in megabits per second (Ethernet), or bits per second (Fibre Channel). This measurement is an average taken over the prior second of test time.

Link Counts result field IDs

Table 37 describe the Link Counts result field identifiers.

Table 37 Link Counts result field identifiers

Field Identifier	Description
`ethernet_10_100_rx_collision_cnt`	For 10/100 half duplex tests, a count of the number of times the TestPad has received a jam signal while it was not transmitting frames.
`ethernet_10_100_tx_collision_cnt`	For 10/100 half duplex tests, a count of the number of times the TestPad has transmitted a frame, and then received a jam signal in the time slot for the frame.

Table 37 Link Counts result field identifiers (Continued)

Field Identifier	Description
`ethernet_10_100_tx_late_collision_cnt`	A count of the number of times the TestPad has transmitted a frame, and then experiences a collision more than 64 byte times after the transmission begins. Result only appears for half-duplex 10/100 tests.
`ethernet_broadcast_frm_cnt`	The number of broadcast frames received since the last test restart.
`ethernet_frm_1024_to_1518_count`	A count of frames with frame lengths ranging from 1024 bytes to 1518 bytes.
`ethernet_frm_128_to_255_count`	A count of frames with frame lengths ranging from 128 bytes to 255 bytes.
`ethernet_frm_256_to_511_count`	A count of frames with frame lengths ranging from 256 bytes to 511 bytes.
`ethernet_frm_512_to_1023_count`	A count of frames with frame lengths ranging from 512 bytes to 1023 bytes.
`ethernet_frm_64_count`	A count of 64 byte long frames.
`ethernet_frm_65_to_127_count`	A count of frames with frame lengths ranging from 65 bytes to 127 bytes.
`ethernet_multicast_frm_cnt`	The number of multicast frames received since the last test restart.
`ethernet_pause_frm_cnt`	The number of pause frames received from a remote Ethernet device since the last test restart.
`ethernet_rx_acterna_frm`	The number of frames with an Acterna payload received since the last test restart.
`ethernet_rx_atp_frames`	A count of received frames with Acterna test packets (ATP).
`ethernet_rx_frm_cnt` `fibre_rx_frm_cnt`	The number of frames received since the last test restart.
`ethernet_tx_10_100_defer_cnt`	For 10/100 half duplex tests, a count of the number of times the transmitter prepared to send traffic, and then was forced to defer based on link activity.

Table 37 Link Counts result field identifiers (Continued)

Field Identifier	Description
`ethernet_tx_frm_cnt` `fibre_tx_frm_cnt`	The number of frames transmitted since the last test restart.
`ethernet_unicast_frm_cnt`	The number of unicast frames received since the last test restart.
`ethernet_vlan_tagged_frm_cnt`	A count of received VLAN frames as defined in IEEE 802.p/q.
`fibre_frm_1024_to_2140_count`	A count of frames with frame lengths ranging from 1024 bytes to 2140 bytes.
`fibre_frm_128_to_252_count`	A count of frames with frame lengths ranging from 128 bytes to 252 bytes.
`fibre_frm_256_to_508_count`	A count of frames with frame lengths ranging from 256 bytes to 508 bytes.
`fibre_frm_28_to_64_count`	A count of frames with frame lengths ranging from 28 bytes to 64 bytes.
`fibre_frm_512_to_1020_count`	A count of frames with frame lengths ranging from 512 bytes to 1020 bytes.
`fibre_frm_68_to_124_count`	A count of frames with frame lengths ranging from 68 bytes to 124 bytes.

Filter Stats result field IDs

Table 38 describes the Filter Stats result field identifiers.

Table 38 Filter Stats result field identifiers

Field Identifier	Description
`ethernet_masked_delay_avg`	The average round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
`ethernet_masked_delay_max`	The maximum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.

Table 38 Filter Stats result field identifiers (Continued)

Field Identifier	Description
`ethernet_masked_delay_min`	The minimum round trip delay calculated in microseconds. You must transmit an Acterna payload to calculate round trip delay.
`ethernet_masked_frm_rate_avg` `fibre_masked_frm_rate_avg`	The average rate of filtered frames, expressed in frames per second. The average is calculated over the time period elapsed since the last test restart.
`ethernet_masked_frm_rate_cur` `fibre_masked_frm_rate_cur`	The current rate of filtered frames, expressed in frames per second. This measurement is an average taken over the prior second of test time.
`ethernet_masked_frm_rate_min` `fibre_masked_frm_rate_min`	The minimum rate of filtered frames over a one second period, expressed in frames per second.
`ethernet_masked_frm_rate_peak` `fibre_masked_frm_rate_peak`	The maximum rate of filtered frames over a one second period, expressed in frames per second.
`ethernet_masked_frm_size_max` `fibre_masked_frm_size_max`	The maximum frame size of filtered frames received since frame detection.
`ethernet_masked_frm_size_min` `fibre_masked_frm_size_min`	The minimum frame size of filtered frames received since frame detection.
`ethernet_masked_util_avg` `fibre_masked_util_avg`	The average bandwidth utilized by the filtered traffic, expressed as a percentage of the line rate of available bandwidth since the last test restart. The average is calculated over the time period elapsed since the last test restart.
`ethernet_masked_util_cur` `fibre_masked_util_cur`	The current bandwidth utilized by the filtered traffic expressed as a percentage of the line rate of available bandwidth. This measurement is an average taken over the prior second of test time.
`ethernet_masked_util_peak` `fibre_masked_util_peak`	The peak bandwidth utilized by the filtered traffic since the last test restart expressed as a percentage of the line rate of available bandwidth.
`ethernet_rx_mbps_masked_util_cur`	The current bandwidth utilized by the filtered traffic expressed in megabits per second. This measurement is an average taken over the prior second of test time.

Filter Counts result field IDs

Table 39 describes the Filter Counts result field identifiers.

Table 39 Filter Counts field identifiers

Field Identifier	Description
ethernet_masked_bcast_frm_cnt	A count of filtered multicast frames received since the last test restart.
ethernet_masked_frm_1024_to_1518	A count of filtered frames with frame lengths ranging from 1024 bytes to 1518 bytes.
ethernet_masked_frm_128_to_255	A count of filtered frames with frame lengths ranging from 128 bytes to 255 bytes.
ethernet_masked_frm_256_to_511	A count of filtered frames with frame lengths ranging from 256 bytes to 511 bytes.
ethernet_masked_frm_512_to_1023	A count of filtered frames with frame lengths ranging from 512 bytes to 1023 bytes.
ethernet_masked_frm_64_count	A count of 64 byte long filtered frames.
ethernet_masked_frm_65_to_127	A count of filtered frames with frame lengths ranging from 65 bytes to 127 bytes.
ethernet_masked_frm_cnt fibre_masked_frm_cnt	A count of the total number of filtered frames received since frame detection.
ethernet_masked_mcast_frm_cnt	A count of filtered broadcast frames received since the last test restart.
ethernet_masked_rx_acterna_frm	A count of filtered frames with Acterna test payload.
ethernet_masked_rx_atp_frames	A count of filtered frames with Acterna test packets (ATP).
ethernet_masked_unicast_frm_cnt	A count of filtered unicast frames received since the last test restart.
ethernet_masked_vlan_frm_cnt	A count of filtered VLAN frames as defined in IEEE 802.p/q.
fibre_masked_frm_1024_to_2140_count	A count of filtered frames with frame lengths ranging from 1024 bytes to 2140 bytes.
fibre_masked_frm_128_to_252_count	A count of filtered frames with frame lengths ranging from 128 bytes to 252 bytes.

Table 39 Filter Counts field identifiers (Continued)

Field Identifier	Description
`fibre_masked_frm_256_to_508_count`	A count of filtered frames with frame lengths ranging from 256 bytes to 508 bytes.
`fibre_masked_frm_28_to_64_count`	A count of filtered frames with frame lengths ranging from 28 bytes to 64 bytes.
`fibre_masked_frm_512_to_1020_count`	A count of filtered frames with frame lengths ranging from 512 bytes to 1020 bytes.
`fibre_masked_frm_68_to_124_count`	A count of filtered frames with frame lengths ranging from 68 bytes to 124 bytes.

Error Stats result field IDs

Table 40 describes the Error Stats result field identifiers.

Table 40 Error Stats result field identifiers

Field Identifier	Description
`ether_fibre_code_violation_rate`	The ratio of frames with code violations tot he number of frames expected.
`ether_fibre_code_violation_secs`	A count of the number of seconds during which code violations occurred.
`ether_fibre_code_violations`	A count of each invalid 10-bit code word in the bit stream.
`ethernet_errored_frm`	A summed count of FCS Errored Frames, Runts, Jabbers, Undersized Frames, and Oversized Frames.
`ethernet_fcs_err_frm`	A count of frames containing Frame Check Sequence (FCS) errors.
`ethernet_jabber`	A count of received frames that have a byte value greater than the maximum frame length of 1518 bytes (or 1522 bytes for VLAN tagged frames) and an errored FCS.

Table 40 Error Stats result field identifiers (Continued)

Field Identifier	Description
ethernet_lost_frm fibre_lost_frm	A count of lost Acterna test frames. For example, if the TestPad detects sequence numbers: 1, 2, 3, 6, 7, 8, (frames 4 and 5 were not detected), the lost frame count is incremented by two (frames 4 and 5 are lost). If the TestPad then detects sequence numbers 9, 10, 14, 15, 16 (frames 11, 12, and 13 are missing), the lost frame count is incremented by three, resulting in a total count of five lost frames. **NOTE:** If the TestPad receives errored frames containing errors in the sequence number field, the Lost Frames count will be incorrect.
ethernet_oos_frame_count fibre_oos_frame_count	A count of each instance where the TestPad detects out of sequence Acterna test frames. For example, if the TestPad detects sequence numbers: 1, 2, 3, 6, 7, 8, (frame 6 is detected immediately following frame 3), the out of sequence count is incremented by one, resulting in a count of one instance of out of sequence frames. If the TestPad then detects sequence numbers 9, 10, 14, 15, 16 (frame 14 is detected immediately following frame 10), the out of sequence number is incremented again by one, resulting in a total count of two instances of out of sequence frames.
ethernet_oversized_frm	A count of frames over the maximum 1518 byte frame length (1522 for VLAN tagged frames).
ethernet_runt	A count of frames under the required 64 byte frame length containing FCS errors.
ethernet_symbol_error	A count of invalid 10-bit code words received on the physical layer. This result will not increment more than one time per frame.
ethernet_undersized_frm	A count of frames under the minimum 64 byte frame length.
fibre_errored_frm	A summed count of CRC Errored Frames, Runts, Jabbers, Undersized Frames, and Oversized Frames.
fibre_crc_frm	A count of frames containing Cyclic Redundancy Check (CRC) errors.

Table 40 Error Stats result field identifiers (Continued)

Field Identifier	Description
fibre_jabber	A count of received frames that have a byte value greater than the maximum frame length of 2140 bytes with an errored FCS.
fibre_oversized_frm	A count of frames over the maximum 2140 byte frame length.
fibre_runt	A count of frames under the required 28 byte frame length containing CRC errors.
fibre_symbol_error	A count of invalid 10-bit code words received on the physical layer. This result will not increment more than one time per frame.
fibre_undersized_frm	A count of frames under the minimum 28 byte frame length.

AutoNeg Status result field IDs

Table 41 describes the AutoNeg Status result field identifiers.

Table 41 AutoNeg Status result field identifiers

Field Identifier	Description
ethernet_10_100_dplx_detect	Indicates the negotiated duplex setting for the link (half or full).
ethernet_10_100_link_ad_stat	Indicates that the FST-2802 has received a valid auto-negotiation capability advertisement from the far end Ethernet device and sent an acknowledgement.
ethernet_10_100_link_config_ack	Indicates that the far end Ethernet device has acknowledged the receipt of a valid auto-negotiation capability advertisement from the FST-2802.
ethernet_10_100_remote_fault ethernet_1G_remote_fault	If supported by the far end Ethernet device, indicates a reason for auto-negotiation failure. If auto-negotiation succeeded, the result will read “NO”.
ethernet_10_100_speed_detect	Indicates the negotiated speed setting for the link (10 or 100 Mbps).

Table 41 AutoNeg Status result field identifiers (Continued)

Field Identifier	Description

`ethernet_100_fdx`
`ethernet_10_fdx`
`ethernet_1G_fdx`
	Indicates that the far end Ethernet device is full duplex capable.

`ethernet_100_hdx`
`ethernet_10_hdx`
`ethernet_1G_hdx`
	Indicates that the far end Ethernet device is half duplex capable.

`ethernet_1G_link_ad_status`	Indicates that the FST-2802 has received a valid auto-negotiation capability advertisement from the far end Ethernet device and sent an acknowledgement.
`ethernet_1G_link_config_ack`	Indicates that the far end Ethernet device has acknowledged the receipt of a valid auto-negotiation capability advertisement from the FST-2802.

Table 41 AutoNeg Status result field identifiers (Continued)

Field Identifier	Description
`ethernet_1G_pause_capable`	Indicates the flow control capabilities of the far end Ethernet device. Those capabilities are: – TX Only: The far end Ethernet device will transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth, however it will not reduce its transmitted bandwidth if it receives PAUSE frames. – RX Only: The far end Ethernet device will reduce its transmitted bandwidth if it receives PAUSE frames but it will not transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth. – TX and RX: The far end Ethernet device will transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth and it will reduce its transmitted bandwidth if it receives PAUSE frames – Neither TX and RX: The far end Ethernet device will not transmit PAUSE frames to alert the FST-2802 to reduce the transmitted bandwidth and it will not reduce its transmitted bandwidth if it receives PAUSE frames.

Pattern Stats result field IDs

Table 42 describes the Pattern Stats result field identifiers.

Table 42 Pattern Stats field identifiers

Field Identifier	Description
`ethernet_rx_frm_cnt`	The number of valid and errored Ethernet frames received since the link was established.
`ethernet_tx_frm_cnt`	The number of Ethernet frames transmitted since the link was established.

Table 42 Pattern Stats field identifiers (Continued)

Field Identifier	Description
`fibre_rx_frm_cnt`	The number of valid and errored Fibre Channel frames received since the link was established.
`fibre_tx_frm_cnt`	The number of Fibre Channel frames transmitted since the link was established.

Ping Stats result field IDs

Table 43 describes the Ping Stats result field identifiers.

Table 43 Ping Stats field identifiers

Field Identifier	Description
`ethernet_ping_lost_pings`	Count of Ping requests sent by the FST-2802 for which replies were not received within 3 seconds.
`ethernet_ping_rt_delay`	The round trip delay for the last ping sent and successfully received by theFST-2802. Calculated in microseconds.
`ethernet_ping_rt_delay_avg`	The round trip delay for all pings sent and successfully received by the FST-2802 since the last test restart. Calculated in microseconds.
`ethernet_ping_rt_delay_max`	The maximum round trip delay for pings sent and successfully received by the FST-2802. Calculated in microseconds.
`ethernet_ping_rt_delay_min`	The minimum round trip delay for pings sent and successfully received by the FST-2802. Calculated in microseconds.
`ethernet_ping_rx_requests`	Count of the Ping requests received by the FST-2802 (in other words, requests sent to the FST-2802's IP address) from another Layer 3 device on the network.
`ethernet_ping_rx_responses`	Count of the responses received to ping requests sent by the FST-2802.
`ethernet_ping_tx_requests`	Count of the ping requests sent from the FST-2802.

Table 43 Ping Stats field identifiers (Continued)

Field Identifier	Description
ethernet_ping_tx_responses	Count of the Ping responses sent by the FST-2802 as replies to ping requests. Each time a ping request is received, the FST-2802 responds and this counter is incremented by one.

L1 Bert Stats result field IDs

Table 44 describes the L1 Bert Stats result field identifiers.

Table 44 L1 Bert Stats results

Field Identifier	Description
ether_fibre_l1_ber	The ratio of pattern bit errors to received pattern bits since initially acquiring pattern synchronization.
ether_fibre_l1_bit_error_seconds	The number of seconds during which one or more pattern bit errors occurred since initial pattern synchronization.
ether_fibre_l1_bit_errors	A count of the number of received bits in a recognized pattern that do not match the expected value.
ether_fibre_l1_total_bits	The total number of bits received since initial pattern synchronization.

L2 Bert Stats result field IDs

Table 45 describes the L2 Bert Stats result field identifiers.

Table 45 L2 Bert Stats results

Field Identifier	Description
ether_fibre_l2_ber	The ratio of pattern bit errors to received pattern bits since initially acquiring frame synchronization. **NOTE:** This ratio is determined using only the bits in the payload of the frame.

Table 45 L2 Bert Stats results (Continued)

Field Identifier	Description
ether_fibre_l2_bit_error_seconds	The number of seconds during which one or more pattern bit errors occurred since initial frame synchronization.
ether_fibre_l2_bit_errors	A count of the number of received bits in a recognized pattern that do not match the expected value since initially acquiring frame synchronization.
ether_fibre_l2_total_bits	The total number of bits received since initial frame synchronization.

Event commands

Use event commands to either initiate an event or query for an event or series of events. Examples of initiated events are inserting an error or restarting a test.

event

Initiates or displays an event (specified by event and value) on the port specified.

Syntax

```
event:<event_id><port_id> [event_arg]
```

Initiates event_id with the associated argument on the port specified. Table 46 lists the available event IDs and associated arguments for this syntax.

```
event:<event_id>? <port_id>
```

Lists all events for the event_id on the port specified.

```
event:all? <port_id>
```

Lists all events on the port specified.

```
event:clear <port_id>
```

Clears the event storage on the port specified.

```
event:id? <port_id>
```

Returns the event ids for the port specified.

```
event:value? <port_id><event_id>
```

Returns the event values for the port specified.

Example The following command restarts a test on port 1:

```
event:test_restart port_1
```

Remark Not all `events` require a `value`.

Event commands

Table 46 lists parameters for event change command identifiers and arguments.

Table 46 Event change command identifiers and arguments

Event Identifier	Description	Event Argument
`error_insert`	inserts an error	none
`novram_clear`	Clears NOVRAM	none
`test_restart`	Causes a test restart	none
`ethernet_reset_svc_disruption`	Resets the service disruption test.	none

Table 47 lists event responses to the `event:all?` or event:<event_id> command.

Table 47 Event responses

Response	Description
`ethernet_link_status_change` `fibre_link_status_change`	Indicates whether the status of the link has changed.
`ethernet_loop_response` `fibre_loop_response`	Provides the response from the far end FST-2802 when looping up or down.

Table 47 Event responses (Continued)

Response	Description
`ethernet_loop_timeout` `fibre_loop_timeout`	Indicates your attempt to loop up or down has timed out with no response.
`ethernet_optical_gbic` `fibre_optical_gbic`	Indicates a GBIC has been inserted or removed from the FST-2802.
`ethernet_ping_done`	Indicates a ping was successful.
`ethernet_ping_fail`	Indicates a ping has failed.
`ethernet_ramp_abort` `fibre_ramp_abort`	Indicates a ramp was aborted.
`ethernet_ramp_stopped` `fibre_ramp_stopped`	Indicates a ramp is complete.

Miscellaneous commands

Use miscellaneous commands to perform a variety of functions with the FST-2802.

hello

Lists the identification, revisions, and installed options of the FST-2802. The output corresponds with the information on the “Revisions and Options” screen on the test set.

Syntax `hello`

help

Lists the syntax and a brief description of each command.

Syntax `help` or `?`

Example The following appears for the print command:

`print:results [-save]-  Returns a printout of the results`

id

Displays the identification of the FST-2802.

Syntax `id?`

options

Lists the configuring options installed on the TestPad. The output corresponds with information on the “Revisions and Options” screen.

Syntax `options?`

print

Prints TestPad information.

Syntax `print:controls [-save]`

Lists the current configuration of the TestPad.

`print:results [-save]`

Lists the current results of the TestPad.

Remark Use the `-save` option to save the output in the print queue.

rev

Lists the revisions of software and hardware installed on the FST-2802.

Syntax `rev?`

Customer Services

C

This chapter describes the customer services available through Acterna. Topics discussed in this appendix are as follows:

– “About our services” on page 290
– “Customer care” on page 290
– “Global services and solutions” on page 295

About our services

Acterna offers an unmatched portfolio of services to deploy, support and innovate purchased equipment through its Customer Care and Global Services and Solutions organizations. Customer Care is standard with every product sale and consists of business hours technical assistance, in-warranty repair, calibration, and upgrade services. Global Services and Solutions provides professional services to optimize product capabilities and maximize efficiencies, including field engineering and deployment, technical training, product support, consulting and custom software development. Together these organizations supply the services necessary successfully utilize purchased equipment.

Customer care

Customer Care is accompanied with the sale of every Acterna product. Customer Care services include:

– Needs Analysis on Products and Services
– Comprehensive Product and Service Literature
– Pre-Sales Consulting
– Technical Assistance (Business Hours)
– Instrument Repair (Under Warranty Repair and Calibration Services)
– Immediate Return Authorizations

Contact a Customer Care representative through your local distributor or by accessing www.acterna.com for information on upgrades, calibration, warranty policies or any of Global Services and Solutions offerings. Representatives also provide assistance with product repairs and returns.

Technical assistance (business hours)

Expert business hours technical support, including help with product configuration, circuit qualification, and complete network trouble sectionalization is provided with your product (see “Technical assis-

tance” on page xxiii). For around-the-clock support, 7x24 technical assistance may be purchased through Global Services and Solutions FleetCare program (see “Product support” on page 297).

Instrument repair

Our service centers provide repair, calibration and upgrade services for under warranty equipment. Acterna understands the impact of equipment down time on operations and is staffed to ensure a quick turnaround. Available services include the following:

Product Repair — All equipment returned for service is tested to the same rigorous standards as newly manufactured equipment. This ensures products meet all published specifications, including any applicable product updates.

Calibration — Acterna’s calibration methods are ISO 9001 approved and based on NIST standards.

Factory Upgrades — Any unit returned for a hardware feature enhancement will also receive applicable product updates and will be thoroughly tested, ensuring peak performance of the complete feature set.

Additional repair, calibration and upgrade services are available for purchase through Global Services and Solutions (see “Product support” on page 297).

Equipment return instructions

Please contact your local Customer Care location via telephone or web site for Return or Reference Authorization to accompany your equipment. For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner’s name, address, and telephone number.
- The serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, contact Acterna Customer Care.)
- A detailed description of the problem or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.

– The return authorization (RA) number (US customers), or reference number (European Customers).

If possible, return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit; when needed, appropriate packing materials can be obtained by contacting Acterna Customer Care. Acterna is not liable for any damage that may occur during shipping. The customer should clearly mark the Acterna-issued RA or reference number on the outside of the package and ship it prepaid and insured to Acterna.

Warranty information

The warranties described herein shall apply to all commercially available Acterna products. Any additional or different warranties shall apply only if agreed to by Acterna in writing. These warranties are not transferable without the express written consent of Acterna.

Hardware Warranty — Acterna warrants that Hardware Product sold to customer shall, under normal use and service, be free from defects in materials and workmanship. Information regarding the specific warranty period for this product can be obtained by contacting your local Acterna Customer Service Representative, or at our web site www.acterna.com. If installation services have been ordered, the warranty period shall begin on the earlier of (1) completion of installation, or (2) thirty (30) days after shipment to Customer. If Installation Services have not been ordered, the warranty period shall begin upon shipment to Customer. Hereafter these periods of time shall be collectively referred to as the “Initial Warranty Period.”

Acterna’s obligation and customer’s sole remedy under this Hardware Warranty is limited to the repair or replacement, at Acterna’s option, of the defective product. Acterna shall have no obligation to remedy any such defect if it can be shown: (a) that the Product was altered, repaired, or reworked by any party other than Acterna without Acterna’s written consent; (b) that such defects were the result of customer’s improper storage, mishandling, abuse, or misuse of Product; (c) that such defects were the result of customer’s use of Product in conjunction with equipment electronically or mechanically incompatible or of an inferior quality; or (d) that the defect was the result of damage by fire, explosion, power failure, or any act of nature.

Acterna performed repairs shall be warranted from defective material and workmanship for a period of ninety (90) days, or until the end of the Initial Warranty Period, whichever is longer. Risk of loss or damage to Product returned to Acterna for repair or replacement shall be borne by customer until delivery to Acterna. Upon delivery of such product, Acterna shall assume the risk of loss or damage until that time that the product being repaired or replaced is returned and delivered to customer. Customer shall pay all transportation costs for equipment or software shipped to Acterna for repair or replacement. Acterna shall pay all transportation costs associated with returning repaired or replaced product to customer.

Software Warranty — Acterna warrants that Software Products licensed to Customer shall, under normal use and service, and for a period of ninety (90) days from the date of shipment of the Software to Licensee (the “Warranty Period”), perform in all material respects in accordance with the published specifications for such Software as established by Acterna. However, Acterna does not warrant that the Software will operate uninterrupted or error free, operate in the combination with other software, meet Customer’s requirements, or that its use will be uninterrupted.

Acterna’s obligation and Customer’s sole and exclusive remedy under this Software Warranty is limited to, at Acterna’s option, either (i) correcting the material errors reported to Acterna in writing by Customer during the Warranty Period and which Acterna is able to reproduce, (ii) replacing such defective Software, provided that Acterna received written notice of such defect within the Warranty Period, or (iii) provided that Acterna received written notice of such defect within the Warranty Period, terminating the License and, upon return to Acterna of the Software, Documentation and all other materials provided by Acterna under the applicable License, providing Customer with a refund of all charges paid with respect thereto. Acterna shall have no warranty obligations hereunder if (a) the Software is altered or modified or is merged with other software by Customer or any third party or (b) all or any part of the Software is installed on any computer equipment other than the Designated Server or used with any operating system for which the Software is not designed. Acterna’s obligation and Customer’s sole and exclusive remedy under this Software Warranty is limited to, at Acterna’s option, either (i) correcting the material errors reported to Acterna in writing by Customer during the Warranty Period and which Acterna is able to reproduce, (ii) replacing such defective Software, provided that Acterna received written notice of such defect within the Warranty Period, or (iii) provided that Acterna received written notice of such defect within the Warranty Period, terminating the License and, upon return to Acterna of the Software, Documentation and all other materials provided by Acterna under the applicable License, providing Customer with a refund of all charges paid with respect thereto. Acterna shall have no warranty obligations hereunder if (a) the Software is altered or modified or is merged with other software by Customer or any third party or (b) all or any part of the Software is installed on any computer equipment other than the Designated Server or used with any operating system for which the Software is not designed. Customer acknowledges that the Software Products provided by Acterna hereunder may contain third party software not produced by Acterna (a "Third Party Supplier Product"). To the extent that the rights Acterna grants to Customer consist of use of Third Party Supplier Products obtained and provided under a GNU General Public License ("General Public Software"), the following notice is required and shall govern the use of such General Public License Software: (1) this program is free software; you can distribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version. This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the IMPLIED WARRANTY OF MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details. If you would like to receive further details concerning the use of such General Public License Software or would like to receive a copy of the GNU General Public License, please make a written request to Acterna, 12410 Milestone Center Drive, Germantown, Maryland 20876-4023 or write to the Free Software Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.

Services Warranty — Acterna warrants that the Services provided by Acterna, if any, shall be performed promptly, diligently and in a professional manner in accordance with the commercial standards of the industry. Acterna shall not, however, be responsible for any delays that are not due to Acterna’s fault or negligence or that could not have reasonably been foreseen or provided against.

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Global services and solutions

Global Services and Solutions markets a broad portfolio of services to enable customers to aggressively build their competitive advantage within the markets they serve. Global Services and Solutions innovative offerings respond to our customers' dynamic needs:

- System deployment and field engineering services
- Technical training
- Product support
- Consulting
- Custom software development
- Integrated service programs

Additional information can also be found on our web site under Services.

System deployment and field engineering

Acterna offers a range of support services for our centralized test systems, designed around the needs of the customer's network. Field engineering and deployment services provide a variety of options for implementing the test system into the network.

Deployment — Thorough deployment process covers the initial site survey through hardware and software installation, allowing rapid integration of systems product into customers' environment without the use of their own resources. Deployment includes survey, configuration, installation of hardware and software, site planning, cabling, acceptance testing, staging, certification and system documentation.

Basic Service for Systems — In today's fast-paced world of communications, network operators are deploying increasingly complex communications test and management systems. Acterna's Basic Service for Systems is designed to provide the system experts, support and methodologies to facilitate the integration of systems products into customers' environments. Basic Service for Systems encompasses system deployment, training, software upgrades, technical assistance and repair. This service is subject to availability, please visit www.acterna.com or contact Customer Care for additional information.

Training

Acterna delivers training in instructor-led or alternative learning formats that are flexible, convenient, and timely. Our training solutions portfolio consists of network-specific test and management tools for optical transport, cable, access, data, and wireless environments.

Instructor-led training

Public courses (Acterna sites)

Public courses help participants quickly acquire fundamental skills or broaden their communications knowledge with advanced instruction. Our courses deliver the ideal mix of theory and practice.

On-site training (Customer site)

Acterna provides practical, customized instruction at the customer's designated site. Whether your goal is to shorten turn-up times or increase operation-wide efficiency, on-site training can be a cost-effective way to train from one to 10 participants. Prior to training, the instructor contacts the customer to ensure the course content is aligned with the organization's training needs. We conduct step-by-step reviews of current technologies and products to help both new and experienced technicians translate theory into practical, hands-on expertise.

When scheduling an on-site course, please note that Acterna requires a minimum commitment of two consecutive days of training. Courses that are only one day in duration may either be paired with another course for a minimum total of two training days, or presented on two consecutive days to different groups of participants.

Alternative learning

Courseware licensing program and train-the-trainer

Recommended for customers with internal training departments, Acterna's Courseware Licensing Program is a fast, affordable alternative that allows our customers to train their own staff using Acterna's courseware. Each course provides comprehensive instructor and participant materials to ensure consistent content delivery for the length of the agreement. A critical part of Courseware Licensing is the Train-the-Trainer program, which prepares the organization's own instructors to deliver Acterna training courses. Courseware Licensing is sold in increments of one, two, or three years.

Computer-based training (CBT)

By blending learning with technology, Acterna's CBT program provides our customers with a cost-effective way to learn technology fundamentals and product applications. Topics include ATM, Frame Relay, ISDN, LAN Basics, Fiber Optics, and more. CBTs are designed to complement both public and on-site training; they can serve to prepare students for classroom Acterna courses or be used after instructor-led training to reinforce learning. In addition to our pre-packaged CBTs, Acterna custom-develops CBTs to meet your organization's training needs.

To enroll in a course or for more information on the variety of Acterna training programs available, call 1-800-638-2049 or visit www.acterna.com and complete the Training Requirement Form.

Product support

To continue repair, maintenance and upgrades after a product's warranty expires, Acterna offers a variety of product support plans.

FleetCare — Designed for customers with ten or more Acterna products, FleetCare extends each product's initial factory warranty to include repair parts, labor and one-way shipping. FleetCare allows customers to upgrade the base package with a variety of options, including Calibration Plans, Calibration Plan with Manager, Loaners, 7x24 Technical Assistance and Software Enhancement Agreements.

Software Enhancement Agreements — In response to new developments in technology, Acterna continually upgrades and revises the software that drives many of its products. Software Enhancement Agreements automatically ships the latest software revisions, releases and upgrades to ensure products are operating at the most technologically advanced level.

Product Maintenance Agreements — Yearly repair and calibration maintenance agreements simplify billing and help ensure equipment is always operating at optimum levels. Product maintenance agreements can be used to extend a current warranty or provide protection for out-of-warranty units.

Repair Pricing Options — For out-of-warranty repairs, Acterna offers two additional pricing options: time and material pricing and flat rate pricing. Under time and material pricing, customers are billed for the actual cost of the repair, making this a cost-effective method for minor repairs. Under flat rate pricing, customers pay a fixed service charge to repair unit failures (excluding damage or abuse).

Consulting services

To quickly improve our customer’s efficiency and productivity, Acterna offers personalized consulting programs designed to meet specific client needs. Our consulting staff will work as part of your team, providing a valuable blend of subject matter proficiency, an in-depth test and measurement systems perspective, and trusted telecommunications industry vision.

Methods and Procedure Development — Acterna's Methods and Procedure Development services include consulting with your staff and assessing your network plant’s current test and turn-up procedures. After evaluating the skill level of your workforce in specific technologies and procedures, an Acterna team of experts identifies potential areas of improvement and makes appropriate recommendations in a formal implementation plan. Depending on your staff 's level of expertise, test procedures can be written to any level of detail, from general methods and procedures to detailed “button-by-button" test and network equipment-specific procedures. In addition, Acterna’s experts offer hands-on training for your field technicians and can resolve specific problems at the central office. Acterna develops test plans and procedures for Service Providers, End-users and Manufacturers of Network Equipment.

Test Automation — With Acterna's Test Automation Development, a team of experts can develop customized automated and remote testing solutions so that you can keep your network functioning at peak levels. After consulting with you, the Acterna team can determine which of Acterna's test and analysis equipment and automation platforms can best streamline your testing processes, data analysis, and test result storage methods. The consulting team can develop and integrate automated testing applications on customers' currently installed computer platforms that match existing methods and procedures. An Acterna team of consultants can assist customers throughout every stage of the development and implementation of automated and remote testing solutions. Services range from developing automated scripts to integrating customized software applications to developing drivers to automated manufacturing tests.

On-site Test and Measurement Service — Acterna On-site Test and Measurement Service provides testing expertise to expedite the implementation, turn-up, and provisioning of network services. Applying their knowledge to your specific network requirements, Acterna's network consultants can quickly verify transmission systems' implementation, assess a fiber plant's suitability for advanced services, future-proof your system. Because incomplete testing often results in crippling losses of revenue, carriers and providers must operate their networks with a very low margin of error. Difficulties in ensuring network performance are further compounded when technicians must employ unfamiliar yet critical test and measurement processes. But with Acterna's dedicated, highly skilled team of professionals providing communications test and measurement solutions, your staff can concentrate on performing value-added services that will maximize your profitability.

Integrated service programs

Service Dollars (North America only) — To deliver the highest level of support with your product purchase, Acterna offers Service Dollars. Services Dollars can be purchased at anytime, for each Acterna instrument. If purchased at the same time as your product, Service Dollars are discounted 20 percent. This is a significant savings, as Service Dollars can be used towards the purchase of any of Global Services and Solutions offerings. Service Dollars are also flexible in the fact that they can be purchased at anytime and then used later towards the specific service that best fits your support needs.

Glossary

Symbols/Numerics

802.11b — IEEE standard for wireless LANs. You can establish wireless LAN connections to the TestPad using an 802.11 PCMCIA card.

802.3 — The IEEE specification for Ethernet. 802.3 also specifies a frame type that places the frame length in the Length/Type field of the Ethernet header, as opposed to the DIX Type II frame type which utilizes the Length/Type field to identify the payload Ethertype.

A

ADM — Add-drop multiplexer.

ATP — Acterna test packet. A test packet that contains a time stamp and sequence number for measuring round trip delay and counting out-of-sequence frames. To transmit ATPs from an FST-2802, you select an Acterna payload on the Tx Profiles tab when you configure a test.

C

CJPAT — Continuous jitter test pattern.

Controls — Synonym for test configuration. Appears on the TestPad user interface.

CRC — Cyclic redundancy check. *See also* FCS.

CRPAT — Continuous random test pattern.

CSPAT — Compliant supply noise test pattern.

D

DA — Destination address.

DB-9 — Standard 9-pin RS-232 serial port or connector. The Y cable supplied with the TestPad provides a DB-9 connector.

DB-25 — 25-pin RS-232 serial port or connector.

DHCP — Dynamic Host Configuration Protocol. A communications protocol that assigns IP addresses dynamically as needed. Also supports static IP address assignment.

DIX — Digital, Intel, and Xerox. Ethernet Type II frame format.

DTE — Data Terminal Equipment. Port that serves as the data transmission source, data transmission destination, or both, for the purpose of sending or receiving data. The USB/Serial port of the TestPad is configured as a DTE port.

E

Ethernet — A LAN protocol. Using the FST-2802, you can test and verify Ethernet network elements and services. If you purchase the Networking option, you can establish Ethernet connections from the TestPad to an Ethernet network or a laptop or PC using an Ethernet PCMCIA card and an Ethernet LAN or crossover cable. After you establish an Ethernet connection, you can run the Remote GUI, use FTP to transfer files, issue remote control commands, and launch the Web browser.

Ethernet link partner — The nearest Ethernet device on a link. The FST-2802 auto-negotiates its capabilities with this device when you initialize a link.

F

FCS — Frame check sequence. A value calculated by an originating device and inserted into an Ethernet frame. The receiving device performs the same calculation, and compares its FCS value with the FCS value in the frame. If the values don’t match (suggesting the frame is errored), an FCS error is declared. Switching devices will discard the frame.

FDX — Full duplex.

FTP — File transfer protocol. Protocol used on LANs and the Internet to transfer files. If you purchase the Networking option, you can transfer files to and from the TestPad using FTP.

G

GBIC — Gigabit Interface Converter. An Ethernet or Fibre Channel module that provides a media conversion from a standard, defined Ethernet or Fibre Channel interface to the desired media such as single-mode or multi-mode fiber. The FST-2802 provides a GBIC jack for 1G Ethernet, 1G Fibre Channel, and 2G Fibre Channel testing.

GUI — Graphical User Interface. Layout of commands in a user-friendly environment. *See also* UI (user interface).

H

HDX — Half duplex.

Histogram — Print output of specific results in a bar graph format.

I

ICMP — Internet Control Message Protocol. Protocol which provides basic control messages such as Echo Requests and Echo Replies for IP packet processing. When you ping a layer 3 or IP device using the FST-2802, the FST-2802 displays key ICMP messages in the message display of the user interface.

IP — Internet Protocol. Protocol specifying the format and address scheme of packets transmitted over the Internet. Typically used with TCP.

ISP — Internet service provider. A vendor who provides access to the Internet and the World Wide Web.

ITU — International Telecommunications Union based in Geneva, Switzerland.

J

jabber — An Ethernet frame that exceeds the IEEE 802.3 maximum length of 1518 bytes (or 1522 bytes with a VLAN tag) and contains an errored FCS, or a Fibre Channel frame that exceeds the maximum length of 2140 bytes with an errored CRC.

jumbo frame — An Ethernet frame that exceeds the IEEE 802.3 maximum length of 1518 bytes (or 1522 bytes with a VLAN tag), or a Fibre Channel frame that exceeds 2140 bytes. You can transmit jumbo frames using the FST-2802.

L

LCD — Liquid crystal display.

LED — Light emitting diode.

LLC — Logical link control. Three bytes carried in 802.3 frames which specify the memory buffer the data frame is placed in. When you transmit pings using the FST-2802, you can transmit 802.3 frames with LLC, or 802.3 frames with LLC and SubNetwork Access Protocol (SNAP).

M

MDI — Medium dependent interface.

MDI-X — Medium dependent interface crossover.

Msg — Message.

MSPP — MSPP. Multi-service provisioning platform. Typically next generation SONET multiplexors capable of aggregating multiple access technologies such as Ethernet, TDM, and ATM onto a SONET ring.

N

NiMH — Nickel-Metal Hydride. The TestPad is equipped with a rechargeable Nickel-Metal Hydride battery.

P

PCMCIA — Personal Computer Memory Card International Association. The PCMCIA standardizes credit-card size packages for memory and input/output for computers, laptops, palmtops, and more.

Ping — Program which sends an ICMP echo request packet to an IP address and awaits a reply. Ping requests are typically used to test connectivity. You can transmit and respond to ping packets using the FST-2802.

Print event trigger — An event, such as a change in test results or a test restart, which prompts the TestPad to generate print output.

Print mode — The means of generating print output on the TestPad. You can manually generate output, schedule the TestPad to generate output at timed intervals, or schedule the TestPad to generate output when a test ends.

Print type — The type of information provided in print output.

R

RFC 2544 — Document titled *Benchmarking Methodology for Network Interconnect Devices*, published by the Internet Engineering Task Force. RFC 2544 defines a series of tests that can be used to measure the performance characteristics of data networking devices. Using the FST-2802, you can run an automated script which prompts you for key parameters for each of the RFC 2544 recommended tests.

RJ-11 — Modular telephone jack, typically used for telephones, modems, and fax machines.

RJ-45 — Jack on the FST-2802 used for 10/100 Ethernet testing.

RS-232 — Set of standards specifying electrical, functional and mechanical interfaces used for communicating between computers, terminals and modems.

runt — An Ethernet frame that is shorter than the IEEE 802.3 minimum frame length of 64 bytes and contains an errored FCS, or a Fibre Channel frame that is shorter than the minimum 28 byte frame length containing an errored CRC.

Rx — Receive.

S

SA — Source address.

Secs — Seconds.

Service disruption time — The time between Ethernet or Fibre Channel frames (maximum inter-frame gap) when service switches to a protect line. The Svc Disruption (ms) result in the Link Stats category displays the service disruption time.

SFD — Start of frame delimiter. Part of an Ethernet frame preamble that indicates that the destination address frame is about to begin.

SMTP — Simple mail transfer protocol. You must connect to an SMTP server to send e-mail from the TestPad.

SNAP — SubNetwork Access Protocol. Protocol used in 802.3 frames which specifies a vendor code and an Ethertype. When you transmit pings using the FST-2802, you can transmit 802.3 frames with with logical link control (LLC) and SNAP.

T

Tcl/Tk — Scripting language which enables you to write your own test scripts for the TestPad.

TCP — Transmission Control Protocol. Protocol enabling two hosts to establish a connection and exchange streams of data.

Term — See Terminate

Terminate — An application where the test set is terminating the circuit. In these applications, the test set sends and receives traffic.

Thru — An application where the test set is used in series with a network circuit to monitor the traffic on that circuit.

ToS — Type of service. When you configure the FST-2802 to transmit pings, you can optionally specify the type of service using the Advanced button on the PING tab.

TTL — Time to live. Time after which a fragmented ping request or response can be deleted by any device on a circuit. When you configure the FST-2802 to transmit pings, you can optionally specify the TTL value in seconds using the Advanced button on the PING tab.

Tx — Transmit

U

UIM — User interface module.

USB — Universal Serial Bus. A bus designed to handle a broad range of devices, such as keyboards, mouses, printers, modems, and hubs. The Y cable supplied with the TestPad provides a USB connector.

V

VNC — Virtual Network Computing. A thin client system that enables you to run applications on a VNC server from any other computer connected to the Internet. Using VNC, you can run the TestPad from a remote workstation, and you can run remote applications from the TestPad.

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