Acterna FST-2209 TestPad T1/T3 Services Module

From climate-controlled vaults to weather-beaten rooftops, field technicians need to travel lightly and quickly to keep data and voice networks operating. The Acterna FST-2209 TestPad T1/T3 Services Module (formerly known as the T1/T3 Service Module 2209) is a powerful, handheld instrument that delivers a full range of troubleshooting capabilities. Quick, intuitive, and weighing only five pounds, the FST-2209 Module provides comprehensive FT1, DS1, DS3, and ISDN PRI testing resources. It is the solution that providers demand when maintaining existing voice and data network systems and installing new revenue producing services.

Highlights

– **Easy-to-use touch screen and graphical user interface (GUI) simplifies and expedites testing**

– **Modular Acterna TestPad architecture enables up-to-date support for established and emerging technologies in a single platform**

– **Engineered with rugged construction, lightweight design, and battery powered operation ideal for use in the field**

– **Dual PCMCIA slots support easy installation of future upgrades and bring added testing functionality and versatility**

– **Automated testing features minimize training costs and testing complexity**

– **All-in-one solution for high-speed testing TDM services when combined with DS1, DS3, ISDN PRI, and voice features**

The Acterna FST-2209 Module provides a full range of signal, alarm, and timing test functions to ensure proper performance at the physical level of T1 and T3 network connections. It also offers the ability to place, receive and monitor voice calls on PCM-based and ISDN PRI trunks. With the automated T1 BER testing in the new TestMATE option of the FST-2209, both experienced and novice technicians can install and maintain T1 networks quickly and accurately.

The functions of the FST-2209 include:
– DS1 signal analysis and BER testing with standard and advanced stress patterns including 55 octet and T1-DALY
– Dual DS1 receivers for in-service monitoring and drop-and-insert testing
– DS3 BER testing analysis with patterns for both M13 and C-bit framing
– DS1 channel drop from a DS3 signal for testing or monitoring
– Monitoring, placement, or receipt of calls over T1 voice trunks and analysis signaling bits
– Transmission and measurement of tones on individual PCM channels
– ISDN PRI call placement and receipt, backup D-Channel and NFAS testing, and layer 3 (Q.931) results
– VT100 emulation for equipment configuration and results monitoring

The FST-2209 is designed to simplify testing of today's complex networks. Programmed with highly integrated applications for in-service and out-of-service testing, the instrument tests at both the pipeline and service levels to ensure that the network is performing as advertised.

Applications

– Isolate and troubleshoot physical layer problems associated with data or other advanced services without taking channels out of service
– Verify proper network routings and signal delays to ensure all fractional T1 channel signals are terminated properly and with the correct timing
– Monitor network voice quality and signaling
– Test the ability of a PBX/switch to handle incoming calls
– Verify or troubleshoot ISDN PRI service by placing and receiving calls and analyzing decodes
– Qualify DS3 circuits with an array of BER testing patterns
– Analyze DS1 tributaries at DS3 access points
– Sectionalize repeated T1 and HDSL circuits with embedded 16-bit smart repeater and HDSL loopcodes

DS1 physical layer testing

Whether provisioning or trouble-shooting T1 service, the first step is to verify proper circuit operation through-out the network by testing the physical layer. Typical requirements include BER testing and signal, alarm, and timing tests to ensure proper performance of T1 network connections.

BER testing is typically conducted from the customer premises at an NIU or HTU-R. To identify and sectionalize circuit problems from network equipment faults, the FST-2209 monitors and performs BER testing in both directions of a circuit simultaneously. The use of standard or user-programmable loop codes to loopback network equipment allows technicians to further sectionalize network troubles. In addition to commonly used BER patterns such as QRSS, the test instrument also offers several industry-recommended, advanced stress patterns, including 55 octet and T1-DALY to ensure network performance.
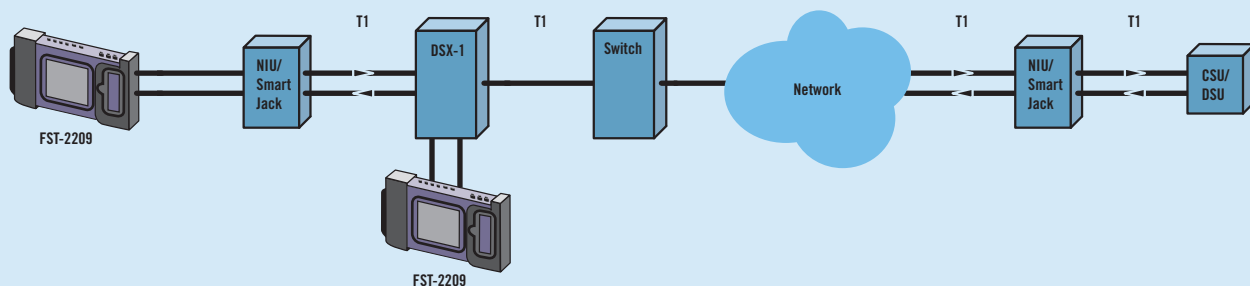
Simultaneously monitor and test in both directions on a circuit

With its advanced timing analysis, technicians using the FST-2209 can pinpoint signal delays, timing slips, and mismatches between the switch and remote equipment.

Fractional T1 channel testing
Qualification of fractional T1 service requires the verification of network routings and signal delays to ensure that all channel signals are terminated properly and with the correct timing. In rural locations or on the outer reaches of the service area, it is often critical to isolate single-circuit faults without disrupting the entire line.

VF channel access and PCM TIMS
When problems with voice service arise, the ability to measure the quality of voice transmissions on the network circuit quickly and effectively is essential. By monitoring data or signaling bits, the FST-2209 can check and verify individual channels without disrupting network traffic. Transmitting and measuring tones on an individual PCM channel utilizing the test instrument's in-service channel access affects only the channel under test – providing a further level of performance analysis without impacting other revenue generating channels. The FST-2209 provides TIMS measurements that include:
– Level
– Frequency
– Signal-to-noise ratio
– Noise (C-message and C-notch filters)
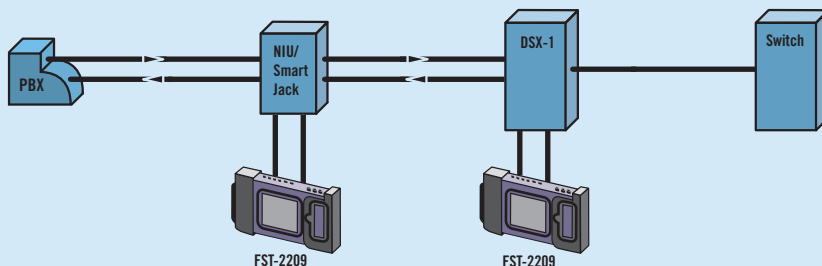
The FST-2209 quickly and effectively measures the quality of voice transmission on the network circuit

Signaling testing

After the physical layer has been tested when provisioning or troubleshooting T1 voice trunks, it is also necessary to test the transmission and signaling performance of the circuit. This testing verifies the ability of a switch or PBX to handle incoming calls and ensures switch-to-switch communications. By placing, receiving, or monitoring voice calls, connectivity can be verified. The FST-2209 captures and displays digits, signaling events, and signaling bits to provide a more detailed level of analysis.

The test instrument also displays physical layer results simultaneously, so comprehensive testing of the voice trunk can be completed in a matter of minutes. It provides signaling and voice results such as:
– DP, DTMF, MF digit recognition
– Interevent/digit delay measurements
– Event/digit duration measurements
– Speaker/microphone or handset functionality for checking voice integrity
– Signaling (ABCD) bits
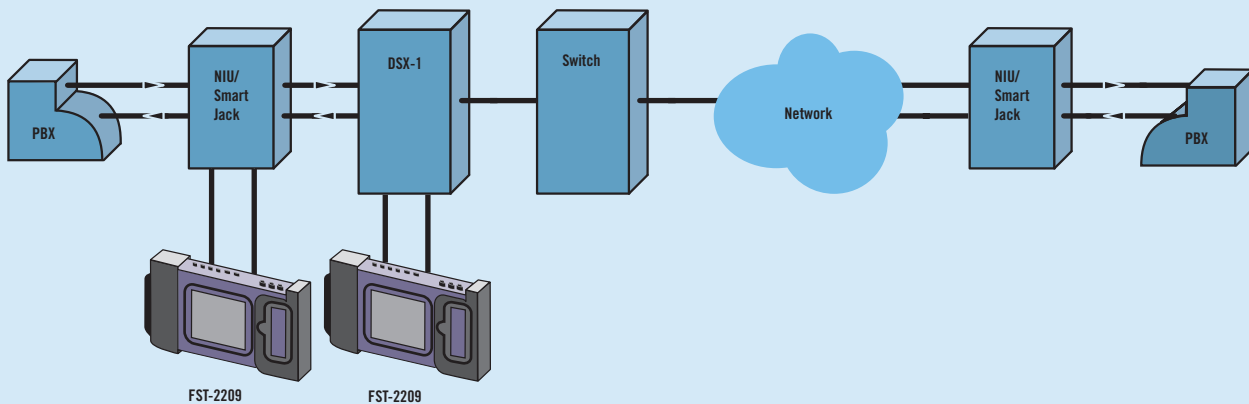
*Monitor network voice quality and signaling*

DS3 testing

The first step in provisioning DS3 circuits is qualifying the physical layer. The FST-2209 gives technicians the ability to qualify DS3 circuits with an array of BER testing patterns for both M13 and C-bit framing and supports the verification of frame synchronization on the circuit.

For more comprehensive and flexible testing, it is often also necessary to insert test patterns or tones on single, multiple, or all DS1 channels within the DS3 circuit. The FST-2209 DS3 BER testing measurements include:
– DS3 FEAC loopback codes
– Advanced stress patterns
– Signal level and frequency
– Insertion of logic and frame errors

A final level of analysis is provided by dropping DS1 channels from the DS3 signal for testing or monitoring of the individual channels.
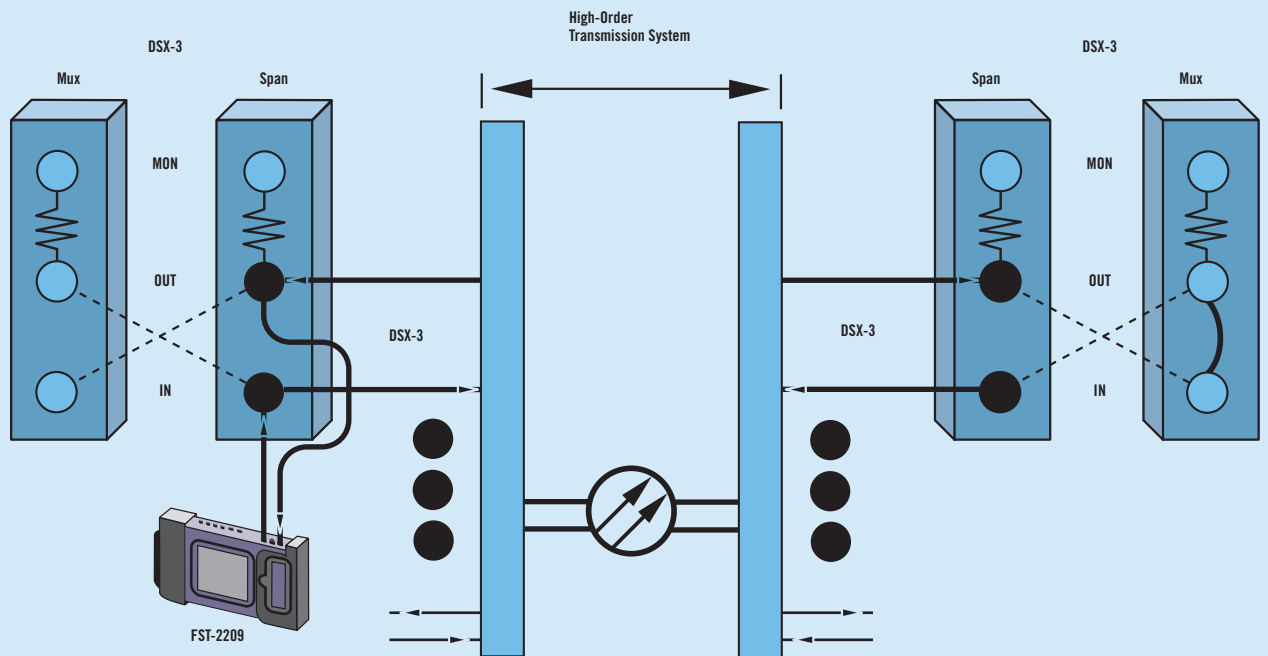

With the FST-2209 module, you can qualify DS3 circuits with a host of BER testing patterns

ISDN PRI testing

After verifying the physical layer, testing during the provisioning of ISDN service is typically performed at the customer premises by emulating a TE device, such as a PBX, to place and receive voice and data calls. Call status results and progress reports provide an additional level of detail to ensure calls are successfully established. The reports are also useful for troubleshooting calls that are not established.

When multiple PRI lines are in use at the same location, it is often necessary to perform backup D-channel and NFAS testing. By providing the user with simultaneous results for physical layer (T1), layer 2 (LAPD), and layer 3 (Q.931) as well as plain text decodes, the FST-2209 provides an efficient means to verify or troubleshoot the ISDN PRI service. It can:

– Test multiple call types including voice, 56 K, 64 K, Nx56 K, Nx64 K, and H0 to verify correct switch translations for both inbound and outbound calls
– Test data services (calls) using BER testing patterns
– Place and receive calls
– Receive call status results that provide a summary of calls
– Receive English decodes of layer 3 cause codes
– Receive full layer 3 (Q.931) decodes, with the ability to print
– Place and receive calls on either T1 (secondary or primary) for NFAS configurations
– Switch from standby D-channel to in-service D-channel for verification of D-channel backup operation in NFAS configurations
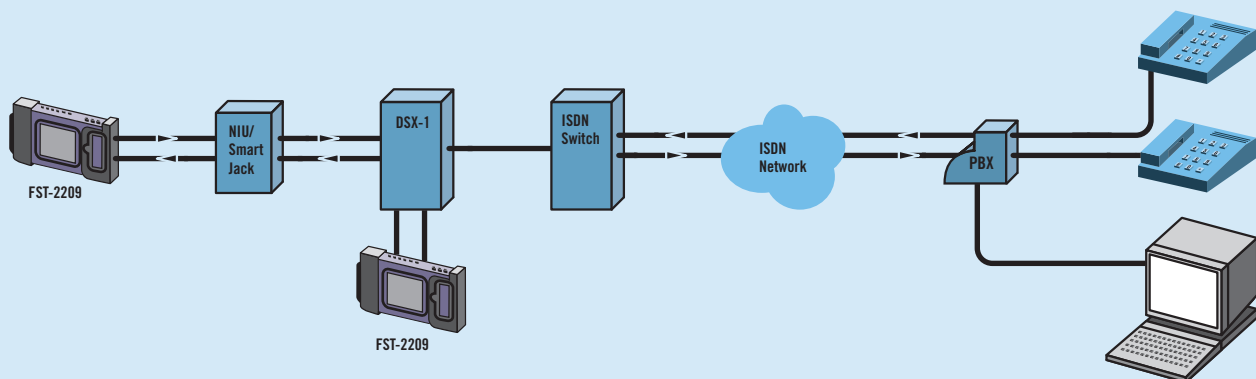
Verify or troubleshoot your customer's ISDN PRI service using the FST-2209 module's ISDN testing capabilities

Technical specifications

Physical characteristics

Overall dimensions	7.5 x 11.5 x 2.25 in (19 x 29.2 x 5.7 cm)
Weight	4.25 lb (1.93 kg), with battery

Environment

Temperature range

Operating	32 to 122°F (0 to 50°C)
Storage	−40 to 167°F (−40 to 75°C)
Humidity	10 to 90% relative humidity, noncondensing

Power requirements

AC adapter	100 to 220 at 60 Hz or 200 to 240 at 50 Hz VAC to 19 VDC, 2.37 AMPS
Charging time	Maximum of 2 hours from full discharge
Battery	10.8 V NiMH
Operating time	Typically 3 hours on a full charge (DS1 operation only) Typically 2 hours on a full charge (DS3 operation only)

Display

6-inch diagonal graphic LCD color display

Input and output connectors

Bantam (4) and RS-232 (printer operation)

Input impedance

Bridge	≥ 1000 Ω
Term	100 Ω_±5%
DSX-MON	100 Ω_±5%

Receive level

Bridge or Term	+6 to −35 dBdsx
DSX-MON	+6 to −24 dBdsx (of resistive loss)

Transmit

Output	Isolated T1 pulse is 3.0 V peak ±0.6 V at 0 dBdsx (conforms with ANSI T1.102-1993 and ITU-T G.703-1998)
LBO level	Line build out (LBO) of 7.5, 15.0 and 22.5 dB measured in a 3 kHZ ±1 kHz band centered at 772 kHz
LBO tolerance	±2 dB at 7.5, 15.0, and 22.5 dB

Transmit timing sources

Internal clock, recovered clock

Line codes	AMI, B8ZS
	DS3 Options
Input and output connectors	WECO 560A
Impedance	75 Ω, nominal unbalanced to ground

Receiver (single) frequency

44.736 Mbps ±300 ppm

Level (from output or monitor jack)

High	Accepts nominal 1.2 Vp, 0 ft of cable from high source
DSX	Accepts nominal 0.6 Vp, 450 ft of cable from high source
Low	Accepts nominal 0.3 Vp, 900 ft of cable from high source

Transmitter (single) frequency

44.736 Mbps ±20 ppm

Line build out (LBO)

High	Nominal 1.2 Vp signal meets ANSI specification T1.102-1993 and ITU-T G.703 when subjected to 450 feet of cable loss
DSX	Nominal 0.61 Vp signal meets ANSI specification T1.102-1993 and ITU-T G.703
Low	Nominal 0.31 Vp
Line code	B3ZS

Ordering information

User interface module

Part number	Description
2000V-3	FST-2000 TestPad with color display (includes kickstand, AC adapter/ changer, hanging strap, and printer cable)

Application modules

TB2209-DS1	DS1 Communications Analyzer
TB2209-DS3	DS1/DS3 Communications Analyzer

Additional application modules available

FST-2109	Copper Analyzer Module
FST-2207	T1/T3 Wireless Module
FST-2357	DSL Broadband Services Module
FST-2230	E1 Data Communications Module
FST-2310	SONET Services Module
FST-2416	SDH Services Module
FST-2510A	High Speed Optical Analyzer
BAT-2700	Base Station and Air Interface Test Module
FST-2802	Gigabit Ethernet Services Module

Analyzer options

TB2209-ASP	Advanced Stress Patterns
TB2209-FT1	Fractional T1
TB2209-TIM	VF PCM TIMS
TB2209-SIG	Signaling
TB2209-PRI	Primary Rate ISDN
TB2209-ILE	Intelligent Line Equipment
TB2209-VT100	VT100 Emulation
TB2209-EXPERT	TestMATE
TB2209-HDLC	Fractional HDLC Option

Optional accessories

AC-31705	External battery charger
AC-31905	Cigarette lighter adapter/charger
BA-014081	Replacement battery
CC-44581	Carrying case/tilt stand (includes adjustable strap)
CC-44605	Carrying case, large soft
CC-45158	Carrying case, multimode (soft)

Package descriptions

2209-P1	Field Service Package (Includes 2209 DS3, ASP, FT1, TIM, SIG, PRI, and VT100 options)
2209-P2	DS3/DS1 Package (Includes 2209 DS3, ASP, FT1, TIM, and SIG options)
2209-P3	DS1 Package (Includes 2209, DS1, ASP, FT1, TIM, and SIG options)

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