Acterna FST-2230 TestPad

A comprehensive solution for testing E1 and Data Communication services

The Acterna FST-2230 TestPad E1 and Data Communications Module provides the user with all the test functions and interfaces needed to provision and maintain digital leased line, CAS, ISDN, DASS2 and Frame Relay services.

Field engineers can verify service performance, and solve physical and service layer problems rapidly and simply using this powerful and multifunctional tool. Network operators can in turn reduce the time and cost of providing business services.

Highlights

- Modular E1 and Data services testing solution for the Acterna TestPad
- Supports physical layer testing over E1 balanced and unbalanced, BRI and Data interfaces. Data interfaces include RS-530, V.36 (RS449), V.35, V.24 (RS232) and X.21/V.11
- Dual receivers enable full link monitoring and timing analysis
- Full emulation and monitoring of primary and subprimary rate services including CAS, ISDN PRA and BRA, DASS2 and Frame Relay
- Large, color touch-screen displays test results clearly with “View” and “Event Log” displays for rapid fault analysis and identification
- Off-line expert analysis of results by ISDN partner

ACTERNA™
The Keepers of Communications

The FST-2230 provides a versatile and effective solution for tackling digital line problems. In a single instrument it supplies everything engineers need to verify service performance and solve physical and service layer problems rapidly.

It saves time by simplifying the work of field service staff. Intuitive Quick Test tools and automated test features speed their work, reducing skill requirements and fixing problems faster to improve productivity and reduce network downtime.

The comprehensive set of interfaces and functions eliminates the need to equip each engineer with separate test instruments for each task and ensures the correct tester is always to hand. As well as reducing capital investment, this also minimizes the cost of ongoing service and calibration.

Testing features are provided for all aspects of E1, BRI and Data circuits operating at speeds from 50 bps up to 2 Mbps. Physical and service layer problems are solved quickly, reducing time spent on troubleshooting and improving productivity. A wide range of business services (ISDN PRA, ISDN BRA, DASS2, CAS and Frame Relay) can be verified and maintained, while faster turn-up of new services helps to grow operator revenues.

The large, clear touch-screen display on the TestPad enables the detailed analysis of results stored to the Event Log on site, eliminating the need for and cost of a separate PC. Its clear and unambiguous "View" of test results provides engineers with an immediate assessment of all link activity and actions to be taken. They can accurately evaluate how the network is handling traffic so that appropriate adjustments can be made. If problems are indicated, operators can identify these immediately and determine their source. This helps to save time and boost customer confidence.

Unattended use, with off-line "Expert" analysis, streamlines long-term monitoring and maximizes staff productivity by reducing time spent on site and allowing results to be examined at base. Users can select any error condition or alarm to trigger the event detector, then review the "Event Log" while the test continues or after the test is complete. They can print logs and test results on site using an optional external printer or save them for later reference.

Practicality is another feature of the FST-2230. Its low weight maximizes usability and its rugged construction minimizes repair bills and downtime. Dual PCMCIA slots provide for additional storage space and support easy installation of future upgrades.

Within the packages, four options are provided as standard. These are Voice Frequency, Frequency Offset and Synthesizer, CAS and VT-100.

2M application
The 2M application supports physical layer testing on E1 links and can be used in Monitor, Terminate, or Drop and Insert modes. Signal level measurements indicate whether digital pulse level problems are the root cause of reported alarms and errors. BER testing can be performed with a wide range of user-selectable patterns over E1 and channelized E1 links. The module can be set to autodetect the incoming framing type and BER pattern.

Results analysis to ITU-T G.821, G.826, and M.2100 are simultaneously performed as applicable to the test being carried out. Round-trip delay can be measured on all interfaces allowing assessment of the likely impact of transmission delays on data transmission performance.

Dual receivers enable in-service monitoring of both directions of a link simultaneously, speeding problem diagnosis. The receiver inputs can be compared to assess whether clock instability is the source of synchronization problems. Comprehensive timing-analysis is performed, including maximum relative time interval error (MRTIE).

Data application
The Data application enables physical layer testing over both synchronous and asynchronous interfaces at data rates from 50 bps to 2.048 Mbps. Interfaces supported include X.21/V.11, V.24 (RS232), V.35, V.36 (RS449) and EIA530 in full DTE and DCE, Monitor and Emulation modes.

Multiplexer application
The Multiplexer application enables multiplexers and demultiplexers to be tested using the combination of E1 and Data interfaces. Using the multiplexer wrap feature, two BER tests are completed simultaneously, one from the 2M side and one from the Data side, eliminating the need to perform two independent sequential tests.

BRI application
BRI application permits both BERT and ISDN testing[1] over the basic rate interface. The option supports NT and TE emulation on the S/T interface and NT1 emulation on the U interface. The BERT option allows physical layer verification of the basic rate interface confirming connectivity to a TE, NT or network switch. The ISDN option enables the user to monitor the ISDN link and record D channel signaling, establish calls using the D channel, and send and receive voice, DTMF or BERT patterns in a B channel to test transmission quality.

Frequency Offset and Synthesizer option
During 2 Mbps testing the Frequency Offset and Synthesizer option enables the transmit timing to be offset by up to ±40960 Hz. When Data testing, the option enables a user-defined data rate between 50 bps and 2.048 kbps to be entered.

VF option
The VF option enables assessment of a circuit's PCM signal performance to be made. A PCM tone encoded to either A or μ Law of variable level and frequency can be generated and inserted into any selected timeslot. The return path can then be monitored for any distortion. When in-service, voice channels can be dropped to the loudspeaker to assess live voice quality. This function can be performed rapidly by using the VF "View" to select each applicable channel in turn.

[1] ISDN BRA testing requires BRI hardware and ISDN options.

VT-100 option

The VT-100 Terminal Emulator option enables the module to emulate a VT-100 terminal using the supplied RS-232 interconnection cable. In this mode, it is possible to locally access network components or performance monitoring devices and configure or obtain performance information from them.

CAS option

The CAS option provides the instrument with two additional major test applications, PBX emulation and in-service monitoring. In monitor mode the activity on the link is monitored through the dual receivers, and the status of all 30 channels is displayed on the "View" Results page (see figure 1). Information on DTMF and CAS signaling events are all displayed and recorded while realtime audio for a selected call can be dropped to the internal speaker. In emulation mode the module simulates a PBX and can both place outgoing calls and receive incoming calls.

Frame Relay option

The Frame Relay option provides all the features required for the installation, commissioning and maintenance of Frame Relay services. Emulation and monitoring of links at both primary and subprimary rate over E1 or Data interfaces can be performed. In either mode connection can be made at either the user-network interface (UNI) or network-network interfaces (NNI) with the emulation mode supporting both customer premise and network equipment operation. Each available DLCI can be tested, with frame size, percent loading, and the setting of FECN, BECN and DE bits all user-definable. The status of all available DLCIs are displayed on the "View" Results page, with additional results pages for LMI, link and DLCI statistics (see figure 2).

Additional test modes allow stress testing of the network and end-to-end connectivity to be determined. The Load (Fox) test is designed to prove the capacity of a virtual circuit by confirming a customer's committed information rate (CIR). It can also be used to stress the network, assessing how it will respond to different levels of traffic and determining available bandwidth. The PING test measures end-to-end connectivity through a network by sending a simple IP PING command to a specified device using its IP address. Round-trip delay time (maximum, average, and minimum) is measured during this test.

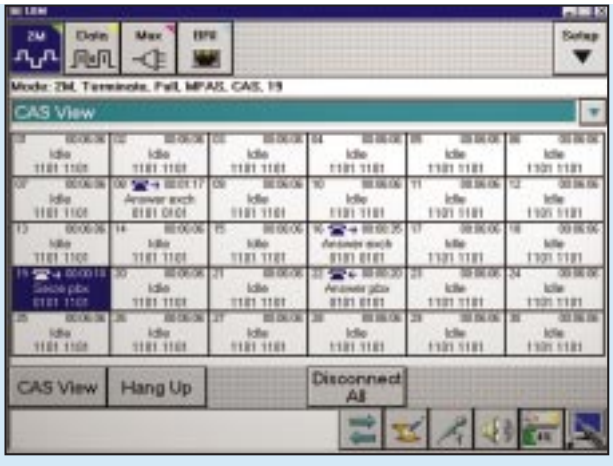


figure 1

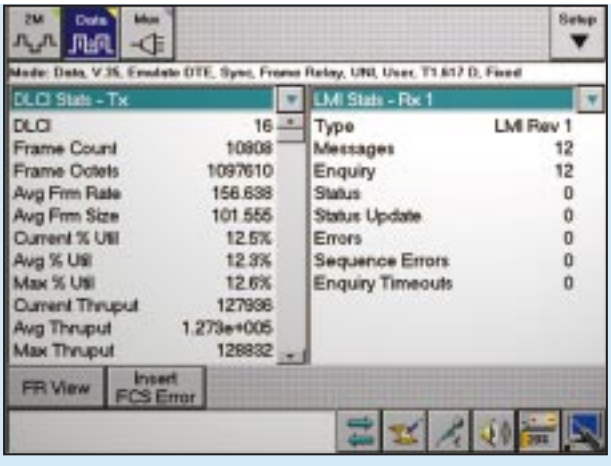


figure 2 DLCI statistics are displayed and recorded. At the same time, LMI signaling is decoded and displayed

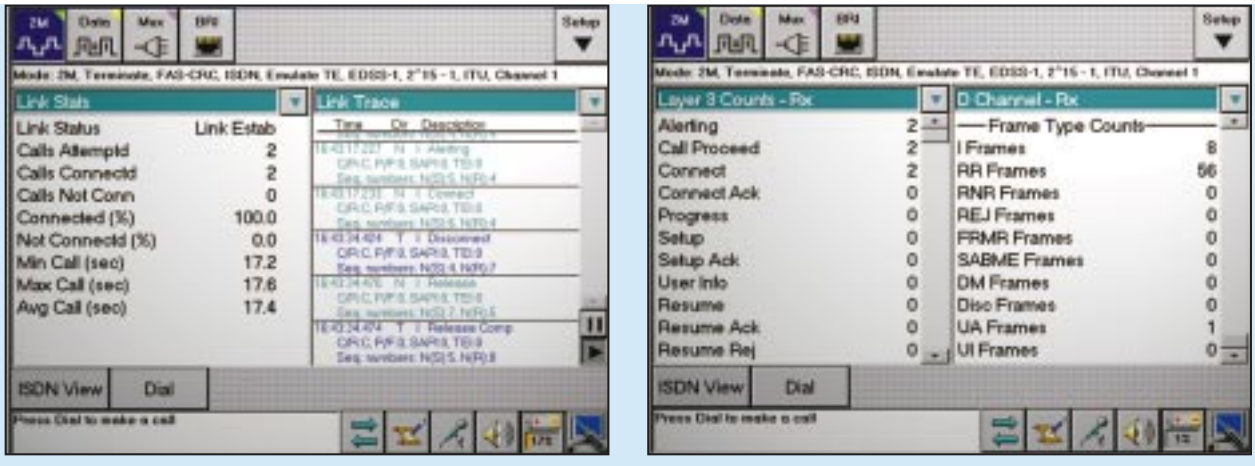
DASS option

The DASS option enables the module to perform both in-service monitoring and emulation of a DASS link in either PBX or ET modes. In emulation mode the option supports up to 30 simultaneous incoming and outgoing calls. Outgoing calls being either voice, 3.1 kHz audio or 64 k data. Voice calls can be made through the built-in speaker microphone or optional handset. Data services can be tested with the recommended BERT patterns. The "View" Results page displays the status of all 30 channels and additional results pages display LAP, link, channel, layer 3 statistics and trace information.

ISDN option

The ISDN option enables the module to perform both in-service monitoring and emulation of ISDN PRA and BRA services. In emulation mode, the module can replace either the network termination (NT) or terminal equipment (TE) and allow qualification of the link, customers' equipment, and network service prior to connection. In monitor mode the module non-intrusively monitors the D-channel traffic present on the link and can route single B channels to the internal speaker.

To make troubleshooting as easy as possible, ISDN traces may be saved in a file format compatible with ISDNpartner for analysis on a PC. Lower skilled technicians benefit from the expert interview and analysis modes, while specialists are supported by the protocol analysis mode, which aids the resolution of even the most complex problems.



In both Emulate and Monitor modes, statistics are presented relating to channel utilizations, number/percentage of calls connected, and other key parameters for satisfactory performance analysis

Technical specifications

Physical characteristics

Overall dimensions	190 x 346 x 57mm (7.5 x 13.6 x 2.3 in)
Module dimensions	184 x 190 x 56 mm (7.25 x 7.5 x 2.2 in)
Max. weight (Module only)	1.01 kg (2.2 lb)
Max. weight (Module with UIM and battery)	2.69 kg (5.9 lb)

Environment

Temperature range	
Operating	0°C to +45°C (32°F to 113°F)
Storage	–20°C to 60°C (–4°F to 140°F)
Humidity	10% to 95% relative humidity, non-condensing

Power requirements

AC adapter	100-240 V, 50-60 Hz to 19 VDC, 2.95 A
Charging time	Maximum of 2 hours from full discharge
Battery type	10.8 V NiMH
Operating time	Typically 2-4 hours on full charge

Display	6-in diagonal graphic LCD color display
Languages	English, German, French, Italian and Spanish

Physical interfaces

G.703 Transmitters

Outputs	2 x balanced Siemens (CF) connectors, Impedance 120 Ω 2 x unbalanced BNC connectors, Impedance 75 Ω
Bit Rate	2,048 kbps, ±5 ppm
Line Coding	AMI or HDB3
Jitter	To ITU-T G.823
Clock Source	Internal, recovered

G.703 Receivers

Inputs	2 x balanced Siemens (CF) connectors, Impedance 120 Ω, Bridge or Monitor 2 x unbalanced BNC Connectors, Impedance 75 Ω, Bridge or Monitor
PMP compensation	20, 23, 26 and 31dB gain
Bit Rate	2,048 kbps
Level measurement	0 to –32 dB
Line Coding	AMI or HDB3
Jitter	To ITU-T G.823

Basic rate port

Interfaces supported	U Interface, S/T Interface
U interface	
– Number of transmitters	1
– Number of receivers	1
– Connector	RJ-45, 2-wire
– Input	135 Ω
– Line Code	2B1Q
S/T interface	
– Number of transmitters	1
– Number of receivers	1
– Connector	RJ-45, 4-wire
– Input	100 Ω or Hi-Z
– Line Code	AMI

Datacom port

Interfaces supported (via adapter cables)	X.21/V.11, V.24 (RS232), V.35, V.36 (RS449), EIA-530E
Data rates (emulate and monitor)	X.21 50 bps to 2,048 kbps V.24 Async 50 bps to 115.2 kbps V.24 Sync/EIA-530E 50 bps to 2,048 kbps V.35 50 bps to 2,048 kbps V.36 50 bps to 2,048 kbps

G.703 LEDs

Current and history	Signal, FAS Sync, MFAS Sync, Pattern Sync, AIS, TS-16 AIS, FAS Distant, MFAS Distant
Current only	CRC-4

Data LEDs

DTE	Mark, Space, DTR, RTS/C, RL, LL
DCE	Mark, Space, DSR, CTS/I, RLSD, TM

BRI LED

Current (physical)	Layer1, NEBE, FEBE, PS1, Seal, Pattern Sync (under the 2M/E1 section)
Current (soft)	Layer 1 Active, NEBE Error, FEBE Error, PS1 Correct, Sealing Current, Pattern Sync, U-Loop Request
History (soft only)	FEBE, NEBE, Pattern Sync, U-Loop Request General (Rx/Tx Mode and 2 Rx Mode)
Framing	MFAS (PCM30), FAS (PCM31), MFAS + CRC (PCM30C), FAS + CRC (PCM31C) or Unframed
BERT Modes	2M, Data, Mux, BRI

Test patterns

PRBS	2^6–1, 2^9–1, 2^{11}–1, 2^{15}–1, 2^{20}–1, 2^{23}–1, QRSS, TTC1
Non-random	All 1s/All 0s, 1:1, 1:3, 1:4, 1:7, 3:1, 7:1, QBF
Program	one 3 to 32 bits two up to 2,048 bytes Auto Detect Mode

Error injection

CRC, Pattern Slip	single
Consecutive FAS	1, 2, 3, 4
Bit, Logic, Code, Line	single, $9.5x10^4$, $1x10^3$, $1.05x10^3$, $1.05x10^6$, $1x10^6$, $9.5x10^7$

Alarms exerciser

Generation of	AIS, TS-16 AIS, REBE, FAS Distant, MFAS Distant

Performance analysis

To	G.821, G.826, M.2100

Interface results

Error Count/Rate for	Bit, Code, FAS, MFAS, CRC, REBE
Indication of	FAS, NFAS, MFAS words Sa6 and C-bit Datalink messages C-bit Delay (ms)

Signal results

Count/Display of	Signal loss seconds, Bit Slips, Rx Level (dB nom), Tx & Rx Freq, Rx Delta ppm
Wander	Max. Positive, Negative, Peak-to-Peak, Max. Peak-to-Peak 15 min. and 24 hours Max. Relative Time Interval Error (MRTIE)

BER results

Indication of	Bit Errors and Bit Error Rate, Block Count, Errored Secs, Error Free Secs, Percentage Error Free Secs, Pattern Slip, Round Trip Delay, Pattern Loss Seconds, Pattern Invert

Received frame information (2M view)

Display of	Timeslot and Channel Number, Rx Byte, Channel Activity, Signaling Bits

Voice frequency (inc VF view)

Display of	Rx Freq (Hz), Rx Level (dBm), Rx Max. and Min. PCM, Rx DC Offset Drop contents of timeslot (Rx 1 and/or 2) to speaker

CAS option

CAS View	Channel No., Time, State, Rx Byte
Link/Channel Statistics	Calls Attempted, Connected/Not Connected and percentage, Percentage Utilization (Per Channel) Min./Ave./Max. Call (sec.)
Link/Channel Trace	Time, Channel, Forward/Backward ABCD, State, Error
Dial Modes	Manual, Program, Phone List

Telephone handset (included)

Connector	RJ-11
Handset modes	internal (hands-free), or external, connects to UIM

BRI option

BERT	B1, B2, B1+B2, D
Indication of	L1 Active, Unstable seconds, Activation failures

ISDN (basic rate) testing

Test modes	TE, NT, NT1TE
Protocols supported	Q.931, EDSS-1, 1TR6, 1TR67, VN3, VN4, TPH 1962, Swissnet 2/3, Televerket, TeleNokia, CorNet-T, TN1R6, Q.Sig, NTT
Test of services (depending on protocol selected)	Speech, Fax G3, Fax G4, Speech BC, Data 56 k, Data 56 k BC, Data 64 k, Data 64 k BC, Tone 3.1 kHz, Audio 3.1 kHz, Audio 3.1 kHz BC, Audio 7 kHz, Audio 7 kHz BC, Graphic, Bild, Bild 3.1 kHz, BTX, BTX 64 kHz, BTX New, Teletex, Videotex, Videotel NFB, Mixed Mode, Remote Control, X21 Uc19, X25 Uc13
Dial modes	Manual, Program, Phone List
Incoming calls	Prompt, Accept, Reject, Accept BERT
TEI	Dynamic or Static

ISDN basic rate results

ISDN view	Channel No, Time, Call Direction, Channel Continuation Indicator
Link/Channel statistics	Calls Attempted, Connected/Not Connected and percentage, Min./Avg./Max. Call (sec.)
Link/Channel trace	Normal, Verbose
Trace capture	Save in ISDNpartner compatible format, Print as text file
D Channel results	
Link statistics	Count of Total and Valid Frames, Direction, Description, Reference Number
Error counts	FCS, Aborted, Short/Long Error, Non Octet Aligned
Frame type counts	I, RR, RNR, REJ, Frame Rejects, SABME, DM, Disc, UA, UI
Layer 3 messages	Count of Layer 3 messages type

ISDN option (primary rate)

Test modes	TE, NT, Monitor
Protocols supported	Q.931, EDSS-1, 1TR6, 1TR67, VN3, VN4, VN6, TPH1856, Swissnet 2/3, CorNet-N, CorNet-NQ, Q.Sig
Test of services (depending on protocol selected)	Speech, Fax G3, Fax G4, Speech BC, Data 56 k, Data 56 k BC, Data 64 k, Data 64 k BC, Tone 3.1 kHz, Audio 3.1 kHz, Audio 3.1 kHz BC, Audio 7 kHz, Audio 7 kHz BC, Graphic, Bild, Bild 3.1 kHz, BTX, BTX 64 kHz, BTX New, Teletex, Videotex, Videotel NFB, VideoConf, Mixed Mode, Remote Control
Dial modes	Manual, Program, Phone List, Sequence, Multi-Call, In/Out
Incoming calls	Prompt, Accept, Reject, Accept BERT

ISDN primary rate results

ISDN view	Channel No, Time, Call Direction, Channel Continuation Indicator
Link/Channel statistics	Calls Attempted, Connected/Not Connected and percentage, Min./Avg./Max. Call (sec.)
Link/Channel trace	Normal, Verbose
Trace capture	Save in ISDNpartner compatible format, Print as text file

D Channel results

Link statistics	Count of Total and Valid Frames, Direction, Description, Reference Number
Error counts	FCS, Aborted, Short/Long Error, Non Octet Aligned
Frame type counts	I, RR, RNR, REJ, Frame Rejects, SABME, DM, Disc, UA, UI
Layer 3 messages	Count of Layer 3 messages types

DASS option

Test modes	PBX, ET, Monitor
Test of services	Voice (Cat1), Voice (Cat2), Voice (Tel), 3.1 kHz, 64 kbps Data
Dial modes	Manual, Program, Phone List
Results	
DASS view	Channel No, Time, Call Direction, Call Type
Link/Channel statistics	Calls Attempted, Connected/Not Connected and percentage, Min./Avg./Max. Call (sec.) LAP Status (Channel)
Link/Channel	Trace Time, Channel, Direction, Description LAP Statistics Count of Total and Valid Frames
Error counts	CRC, Aborted, Short/Long Error, Invalid SAPI, Rx Overruns, Non Octet Aligned, Single Octet Address
Frame type counts	SABMR, UA, UI(C), UI(R)
DASS Layer 3	Count of Layer 3 messages

Frame Relay option

Test modes	Emulate (UNI-U, UNI-N, NNI) and Monitor (UNI, NNI)
Link management types	None, ANSI TI.617 Annex D, ITU Q.933 Annex A, LMI Rev 1, Auto
Timers	T391 Status Poll Time, Max. Rx Response Time, N391 Full Status Poll Cycle (User Timers) T392 Status Poll Time, Tx Response Delay (Network Timers)
Programmable DLCI	0-1,023
Link trace available	Normal, Verbose, Hex
FR view	DLCI List, DLCI Status
Frame Relay Triggers (results shown in Event Log)	Rx Data Rate, FECN, BECN, DE
Long Frame Threshold	4 to 9,999 octets

Load test

Test of CIR (load)	Ramped, Fixed, Burst and Loopback
CIR fixed rate	1 to 10,000 kbps
Frame lengths (max.and min)	4 to 9,999 bytes
Payload (test frame structure)	Sequence, User, Sequence + User
Setting of control bits	FECN, BECN, DE, C/R
Burst characteristics	Tx Time, Idle Time
Ramp characteristics	Data Rate, Step Rate, Step Time
Error Injection	FCS Error

Ping test

Setting of	Source IP address, Destination IP address
Encapsulation	IETF, Ethertype

Results

LMI statistics	Message type, message count, status enquiry message count, status message count, status update message count, errors, sequence number errors, status enquiry, message timeouts, status message timeouts
Link statistics	Frame count, Frame octets, Avg. frame rate, Avg. frame size, Current percent utilization, Avg. percent utilization, Max. percent utilization, Current throughput, Avg. throughput, Max.throughput, FECN frames, BECN frames, DE frames, FCS errored frames, Aborted frames, Rx overrun, No flag duration, Lost frames, Short frames, Long frames, Tx underrun
DLCI statistics	DLCI number, Frame count, Frame octets, Avg. frame rate, Avg. frame size, Current percent utilization, Avg. percent utilization, Max. percent utilization, Current throughput, Avg. throughput, Max. throughput, FECN frames, BECN frames, DE frames, Long frames, Inactive count, Inactive duration.
PING statistics	Tx echo, Lost echo, Min delay, Avg. delay, Max.delay (ms)
Link trace	Time, Direction, Description

Ordering information

Acterna offers four customized packages to meet the specific requirements of key user groups. All packages include the Acterna TestPad User Interface Module (includes color display, kickstand, AC adapter/charger, hanging strap and printer cable) and the FST-2230 Module.

Base package ***2230-P1***

This package includes all the required elements for Physical layer testing E1 and Data telecommunications installations. Includes VF, Frequency Offset, CAS and VT-100 options.

Frame Relay package ***2230-P2***

Building on features included in the Base package, this package includes the Frame Relay option, therefore providing the features required to install and maintain Frame Relay services.

ISDN Expert package ***2230-P3***

Building on the features of the Base package, the ISDN Expert package includes all the features required to install and maintain ISDN services. The package includes the ISDN, BRI hardware and DASS2 options together with ISDNpartner the offline expert analysis software.

Complete package ***2230-P4***

The Complete package combines the features of all available packages, creating a comprehensive testing solution for highly qualified engineers.

For all packages select one mains power lead from the following:

AD-2000-AU	Australian
AD-2000-EU	European
AD-2000-UK	British
AD-2000-US	North American

FST-2230 TestPad Module Options

TTC2230-CAS	CAS Emulation/Monitor
TTC2230-PRI	ISDN Emulation/Monitor
TTC2230-DASS2	DASS Emulation/Monitor
TTC2230-FR	Frame Relay Emulation/Monitor
TTC2230-BRI	ISDN BRI 2B1Q Hardware (BERT Only) Option

Optional accessories (cables)

CB-44390	X.21 DTE/DCE Emulate Cable
CB-44346	X.21 Y-Monitor Cable
CB-44385	V.24/EIA-530 DTE/DCE Emulate Cable
CB-44348	V.24/EIA-530 Y-Monitor Cable
CB-44389	V.35 DTE/DCE Emulate Cable
CB-44341	V.35 Y-Monitor Cable
CB-44388	V.36 DTE/DCE Emulate Cable
CB-44347	V.36 Y-Monitor Cable
CB-30662	BNC to BNC Cable
CB-30687	Siemens (CF) 3 pin to Siemens (CF) 3 pin Cable
CB-30761	Siemens (CF) 3 pin to Bantam Plug Cable
CB-30914	Siemens (CF) 3 pin to Weco Plug Cable
CB-30969	1.6/5.6mm to 1.6/5.6mm Cable BNC (75 Ω) to Siemens (CF)
CB-31066	3 pin (120 Ω) Cable
CB-31868	VT-100 Emulate Cable
CB-31201	BNC (75 Ω) to Bantam Plug Cable BNC Male to 1.6/5.6mm Female
CB-14937	RJ-45 to RJ-45

Optional accessories (other)

TTC2000-PC	PCMCIA Card 4MB (extra storage)
CC-44605	Carrying Case, Large Soft
CC-45158	Carrying Case, Multi-Modules (soft)

For further information on available accessories, please contact your Acterna Sales representative.

Additional application modules available

FST-2109	Copper Analyzer Module
FST-2357	DSL Broadband Services Module
FST-2207	T1/T3 Wireless Module
FST-2209	T1/T3 Module
FST-2310	SONET Services Module
FST-2510	10 Gigabit Services Module
FST-2416	SDH Services Module
BAT-2700	Base Station & Air Interface Test Module

Acterna is the world's largest provider of test and management solutions for optical transport, access and cable networks, and the second largest communications test company overall. Focused entirely on providing equipment, software, systems and services, Acterna helps customers develop, install, manufacture and maintain optical transport, access, cable, data/IP and wireless networks.

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