



Acterna FIREBERD 8000

Take testing to the next level

Since the introduction of the FIREBERD 1500 in 1983, the FIREBERD legacy continues with more than 30,000 FIREBERD mainframes in the field today with over 20 years of industry experience in physical layer testing.

The newest evolution of the FIREBERD family, the FIREBERD 8000 (FB-8000), is designed to meet the needs of users installing and maintaining data communications circuits and network elements. The FB-8000 provides test functionality for a wide variety of technologies, including RS-232/V.24, EIA-530, V.35/306, RS-449/V.36, X.21, MIL-188C, MIL-188-114, and conditioned diphas. Supported applications of the FB-8000 include verifying end-to-end circuit continuity and throughput, emulating datacomm network elements (DTE/DCE), and verifying Quality of Service (QoS).

Building on the success of the Acterna TestPad platform, the addition of the FB-8000 allows users to easily migrate from datacomm to OC-192/48 and Ethernet technologies, support battery operation, and enjoy the size of a handheld tester all in one instrument.

Highlights

- Datacomm interfaces in one test module for ANSI and ETSI standards.
- Native datacomm interfaces for EIA-530, RS-449 (422 and 423), RS-232, X.21, V.35, and V.36 serial interfaces.
- Government standards support for MIL-188C and MIL-188-114.
- Interface module slot for conditioned diphas and expandability to new technologies.
- Synchronous/Asynchronous and DTE/DCE modes of operation.
- A full suite of BER patterns with data-rate support up to 18 Mbps.
- 'Virtual breakout box' functionality allowing complete flow-control troubleshooting, with user-controllable signaling leads (CTS, RTS, DTR, RLSD, and DSR).
- Native test connectors for 15-, 25-, and 37-pin datacomm interfaces mean no need for custom adapter cables.

Take testing to the next level with a single platform for new and legacy requirements

Traffic Generation

The FIREBERD 8000 contains all the common BER patterns, including the patterns found in the Acterna FIREBERD 6000A and T-BERD product lines. This enables the FB-8000 to run an end-to-end test in conjunction with a FB-6000A, FB-6000, FB-6000M, MC-6000, or FB-4000.

DTE/DCE Emulation

The software-selectable user interface of the FB-8000 enables users to emulate DTE or DCE network elements for both Synchronous and Asynchronous modes of operation. This allows the user to test head-to-head with any device under test and sectionalize problems within the network.

Internal, Recovered, and External Clock Capability

As with the FB-6000A, the FB-8000 provides various modes of timing. The Recovered Clock option operates with DTE/DCE interfaces at rates up to 10Mbps and allows the FB-8000 to recover timing (and proceed with data analysis) by extracting a clock from the receiver data. This option provides a powerful method of differentiating timing problems from transmission problems.

In addition, the FB-8000 allows for the use of an external clock and an internal clock to source and analyze at data rates up to 18 Mbps.

“Virtual Breakout Box” Functionality

Easy-to-interpret LEDs on the FB-8000 provide the user with information regarding the state of the signaling and data leads of the circuit under test, much like a breakout box. In addition, user-controllable signaling leads (CTS, RTS, RLSD, DTR, DSR, RI, TM, RL, and LL) are available. The combination of LEDs and signal lead manipulation allows for complete flow-control troubleshooting.

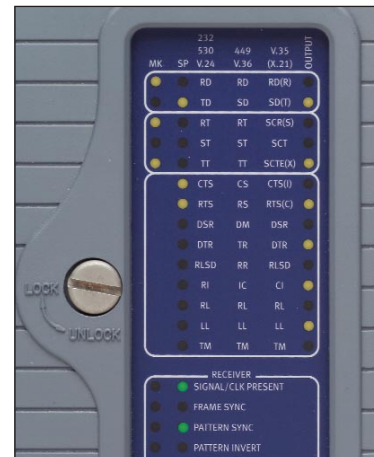


Figure 3. Front panel LEDs monitor signaling and data leads of the circuit under test.

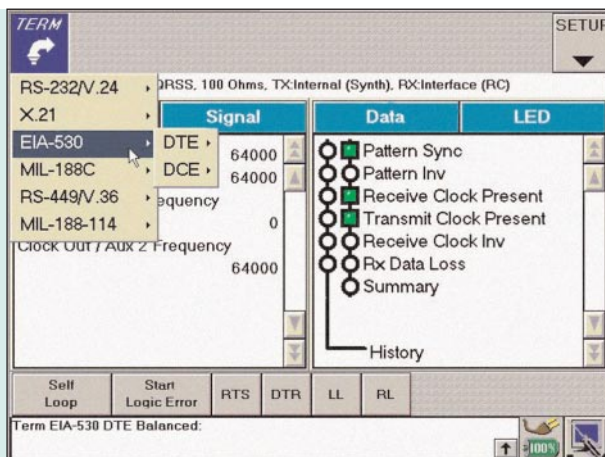


Figure 1. Emulate DTE or DCE networks.

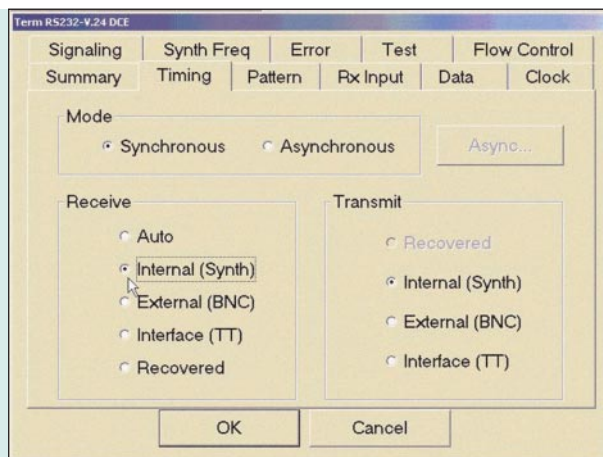


Figure 2. Various clock options.

Test Interface Modularity

Like its predecessors, the FB-8000 includes a field-upgradable module slot (Figure 4) to support conditioned diphase and future technologies. Therefore, users can purchase datacomm and conditioned diphase test functionality and enjoy the flexibility of field upgrading the FB-8000 with new Acterna option slot test modules easily and efficiently.

Remote Operation and Results Storage

Removable storage media can be connected through a PC card interface on the FB-8000, facilitating the storage of test results for external reporting and analysis. Results can also be configured to print at the end of a test, periodically during the test, or at any occurrence of an error. Customized printouts are also available showing only the results that you specify, in order to detect hard-to-find bit error rate (BER) problems quickly and interpret test results easily.

Easy-to-Use Graphical User Interface

The easy-to-use graphical user interface (GUI) helps users with limited test experience to verify performance parameters and ensure that services meet desired quality metrics. The GUI also helps to enable advanced applications such as measuring Round Trip Delay, support high data rates for stress testing, and verify flow control problems.

The application-driven icons of the user interface, combined with easy setup buttons, allow technicians to easily navigate through setup and testing. The FB-8000 has retained the overall “flow” of the FB-6000A, thus enabling FB-6000A users to operate the FB-8000 with minimal additional training.

Battery Operation

In keeping with the portable requirements of today’s users, the FB-8000 can be battery operated to maximize its portability, particularly in environments where AC power is unavailable or unreliable.

Durability

The FB-8000 was built with ruggedness in mind. The platform meets all of the key MIL-PRF 28800 F standards for operation and storage in harsh environments and is backed by Acterna’s standard three-year warranty.



Figure 4. Module slot facilitates field upgrades for future technologies.

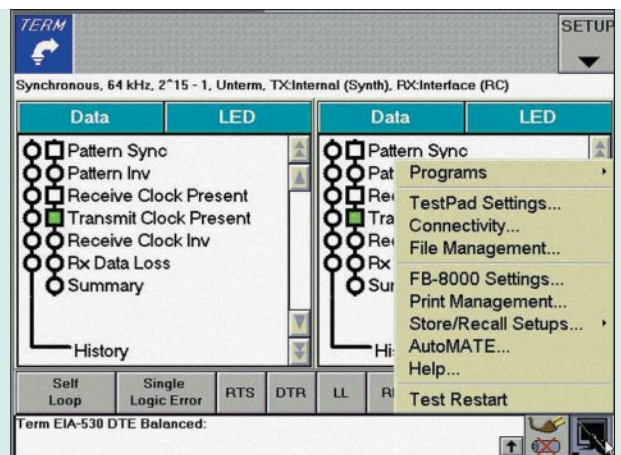


Figure 5. Easy-to-Use Graphical User Interface (GUI).

Applications

Verifying End-to-End Connectivity

Using two FB-8000s, you can quickly isolate any problem to a specific direction by analyzing the performance of an entire digital link in both directions. With a variety of supported interfaces, the FB-8000 allows for the performance of multiplexer or loopback testing on sections of the link to quickly verify operation or to isolate a problem. The FB-8000 can be connected at access points in the network to verify channel routing, cable integrity, and communication across radio or satellite links. Full duplex end-to-end testing also enables excellent analysis of all circuits and equipment within the network. Testing can also be performed with loopback testing using built-in remote and local loopback modes.

Timing Analysis

In Synchronous mode of operation, if a receiving device's data is not synchronized to the clock signal, it may misinterpret bits, causing a bit error. The FB-8000 provides all of the standard clocking options, allowing users to rapidly diagnose network timing problems. Also, its recovered clock capability allows users to differentiate timing problems from transmission problems by using different clock modes.

Another source of problems includes propagation delay of signals, commonly leading to inverted clock situations. The FB-8000 automatically alerts the user of inverted clocks that lead to the improper sampling of data. In addition, the FB-8000 allows the user to quickly invert clock and data signals to verify correct operation.

Users can operate the FB-8000 with circuits supporting data rates up to 18 Mbps, allowing for network element verification of high-speed datacomm signals and components.

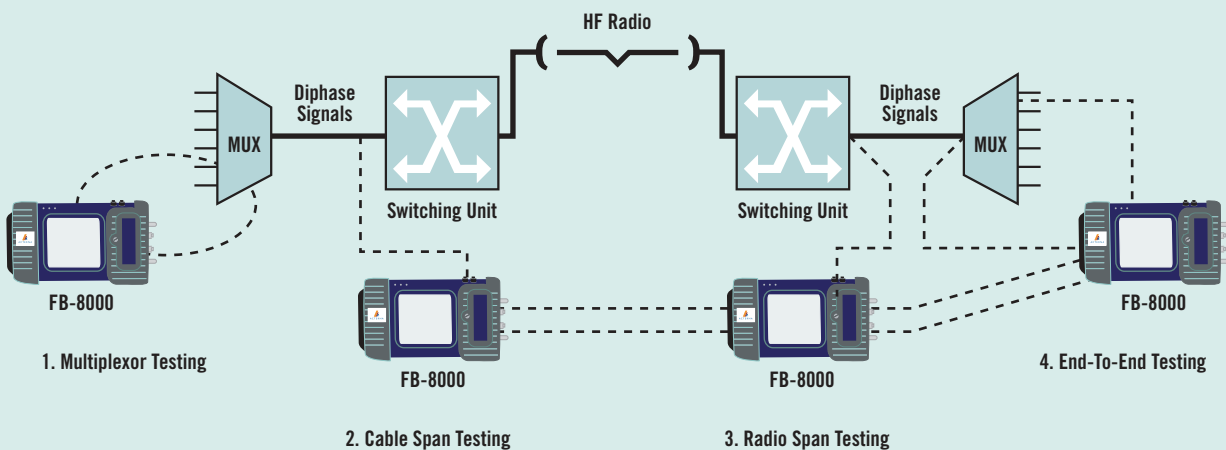


Diagram 1. Verifying End-to-End Connectivity

DTE and DCE Emulation

At the physical interface, the interaction between the DTE and DCE is comparable to a telephone conversation. The connection between the DTE and DCE uses transmit and receive lines and separate control signal lines. Using the FB-8000, technicians can replace a network element (either DTE or DCE) to verify that proper interaction is taking place between elements. Through the use of “virtual breakout box” functionality and user-controllable signaling leads, technicians can verify the proper operation of the DTE or DCE under test.

Quality of Service Testing

Circuits must be qualified before service handoff to the end user. The FB-8000’s results analysis, including Round Trip Delay, G.821, and Pattern Slips, allows technicians to quickly verify that circuits are performing according to specified metrics before they are brought into service.

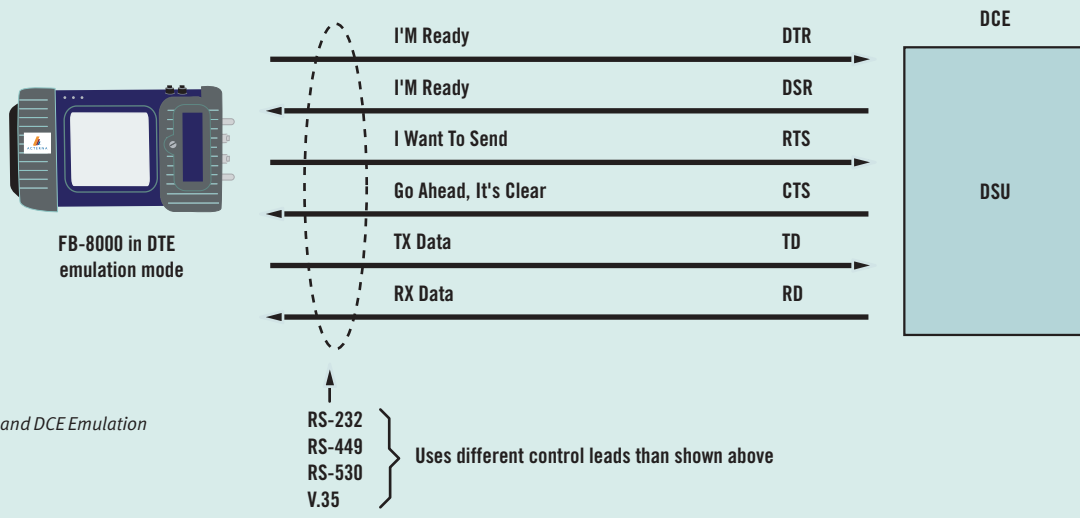
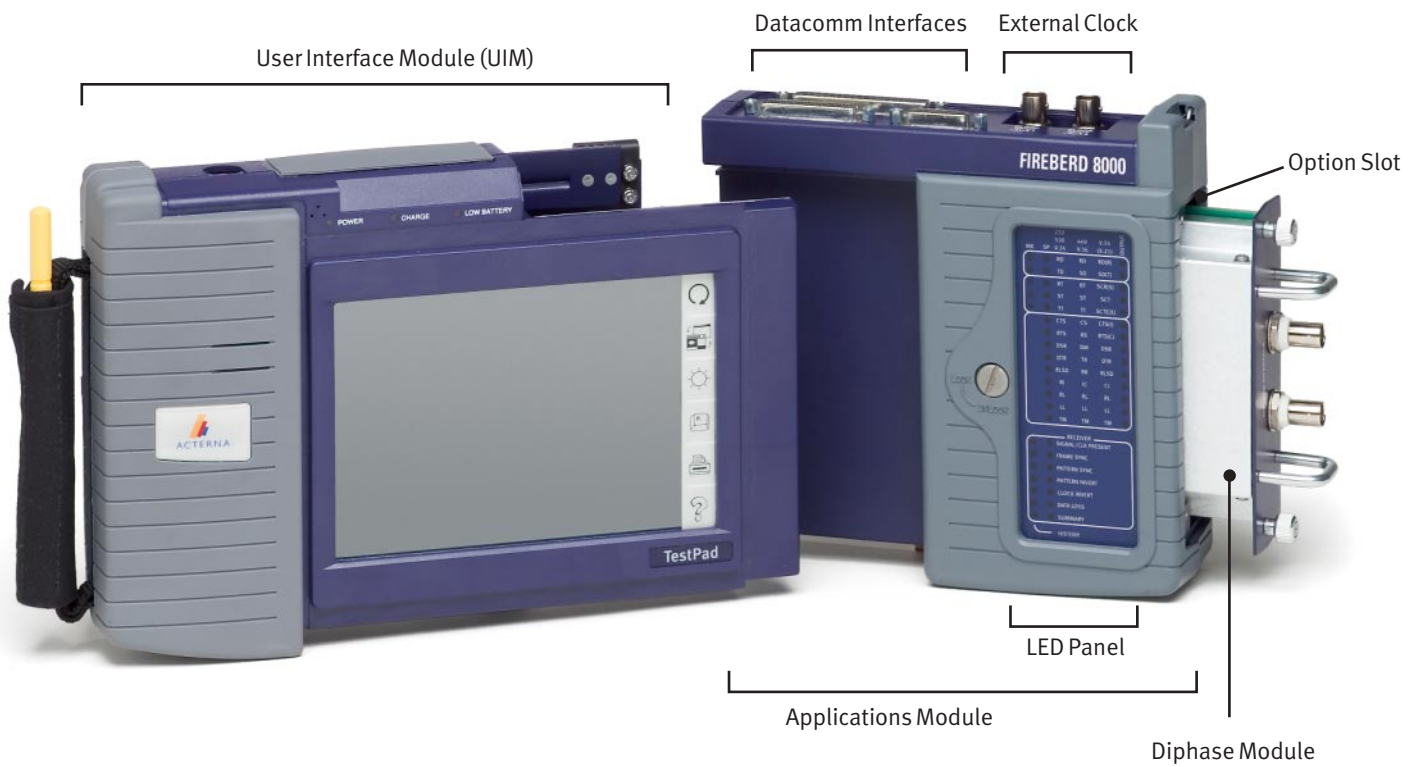


Diagram 2. DTE and DCE Emulation

Physical Characteristics



Specifications

User Interface (Part # 2000-V6)

Mechanical specifications

Dimensions	6.7 x 11.5 x 2.2 in (with handstrap)
Weight	3.75 lbs
Speaker and Microphone	Built in
PCMCIA slot	2 Type II CardBus Slots (also supports 1 Type II Slot)
AC adapter	100-220 at 60Hz or 200-240 at 50 Hz VAC to 19VDC, 2.95 Amps
Battery	10.8 VDC Nickel-Metal-Hydrate (NiNH)
Calibration Interval	None
LCD	Graphic color display (Touchscreen), 6.2 inch diagonal viewable area
Resolution	640x480 pixels
LEDs	Power, Charging, Low Battery
Operating	32° (0C) to 113° (45°)*
Storage	-4F (-20°) to 140° (60°)

* Note: The upper operating temperature limit is 122F (50C) while not charging the battery.

FB8000 Applications Module

Mechanical specifications

Dimensions	7.5 x 13.5 x 2.2 in
Weight	1.70 lbs
Menu language	English
Calibration Interval	every 3 years

Environmental specifications

Temperature

Operational temperature range	32°F (0°C) to 122°F (50°C)
Storage temperature range	-40°F to 75°C

Safety

- UL
- CSA
- TUV

FCC class A

Front Panel LEDs

Datacomm

- MARK, SPACE, OUTPUT
- RS-232/V.24/EIA-530: RD, TD, RT, ST, TT, CTS, RTS, DSR, DTR, RLSD, RI, RL, LL, TM
- RS-449/V.36: RD, SD, RT, ST, TT, CS, RS, DM, TR, RR, IC, RL, LL, TM
- V.35: RD, SD, SCR, SCT, SCTE, CTS, RTS, DSR, DTR, RLSD, CI, RL, LL, TM, RI
- X.21: R, T, S, X, I, C

Receiver

- CURRENT, HISTORY, SIGNAL PRESENT, CLOCK PRESENT, FRAME SYNC, PATTERN SYNC, PATTERN INVERT, CLOCK INVERT, DATA LOSS, SUMMARY

Interfaces

Datacomm

X.21

- 15-pin D-type connector
- Emulate DTE or DCE with X or S timing
- Receiver input termination: unterminated or 78/100/124 Ω

Data rates:

- 5 bps to 18 Mbps synchronous with X, cable length dependent with S
- 5 bps to 128 kbps asynchronous
- 5 bps to 520 kbps recovered

Supported signaling leads: C and I

RS-232/V.24

- 25-pin D-type connector
- Emulate DTE or DCE with TT or ST timing

Data rates:

- 5 bps to 128 kbps synchronous
- 5 bps to 128 kbps asynchronous
- 5 bps to 128 kbps recovered

Supported signaling leads: CTS, RTS, DSR, DTR, RLSD, RI

EIA-530

- 25-pin D-type connector
- Emulate DTE or DCE with TT or ST timing

Signal formats and input terminations:

- Balanced: un-terminated or 78/100/124 Ω terminated

Unbalanced

Data rates:

- Balanced
- 5 bps to 18 Mbps synchronous
- 5 bps to 128 kbps asynchronous
- 5 bps to 520 kbps recovered

Unbalanced

- 5 bps to 128 kbps synchronous
- 5 bps to 128 kbps asynchronous
- 5 bps to 128 kbps recovered

Supported signaling leads: RTS, CTS, DSR, DTR, RLSD, LL, RL, TM

MIL-STD-188c

- 25-pin D-type connector
- Emulate DTE or DCE with TT or ST timing

Signal formats and input terminations:

- Unbalanced

Data rates:

- 5 bps to 64 kbps synchronous
- 5 bps to 64 kbps asynchronous
- 5 bps to 64 kbps recovered

Supported signaling leads: RTS, CTS, DSR, DTR, RLSD, LL, RL, TM, RI

RS-449/V.36 and MIL-188-114

- 37-pin and 25-pin D-type connectors
- Emulate DTE or DCE with TT or ST timing

Signal formats and input terminations:

- RS-422 and MIL-188-114 Balanced: un-terminated or 78/100/124 Ω terminated

- RS-423 and MIL-188-114 Unbalanced

Data rates:

- RS-422/Balanced
- 5 bps to 18 Mbps synchronous
- 5 bps to 128 kbps asynchronous
- 5 bps to 520 kbps recovered
- RS-423/Unbalanced
- 5 bps to 128 kbps synchronous

- 5 bps to 128 kbps asynchronous

- 5 bps to 128 kbps recovered

- Supported signaling leads: RS, CS, DM, TR, RR, LL, RL, TM, IC

V.35

- 34-pin Winchester using an adapter cable to 25-pin D-type connector

- Emulate DTE or DTC with TT (306) or ST timing

- Receiver input termination: 124 Ω

Data rates:

- 5 bps to 15 Mbps synchronous
- Note: Due to propagation delay (cable length dependencies), the user may have to invert their clock.

- 5 bps to 128 kbps asynchronous

- 5 bps to 520 kbps recovered

- Supported signaling leads: RTS, CTS, DSR, DTR, RLSD, RL, LL, TM, CI

Conditioned Diphase

- 2 BNC connectors: 1 TX and 1 RX (via plug-in Interface module)

Receiver:

- Selectable-input termination: 58 Ω, 135 Ω, or bridge (>2000 Ω)

- Single-ended operation: 58 Ω

- Differential operation: 135 Ω or bridge

- Automatic compensation up to 30 dB of cable loss

- Valid signal indication: signal valid if

- > +/- 90 mV and < +/- 150 ppm of the selected frequency

Transmitter:

- Single-ended operation: 58 Ω

- Differential operation: 135 Ω

- Transmit timing selectable from internal synthesizer or recovered from receiver interface

Data rates

- 1.2, 2.4, 4.8, 9.6, 16, 32, 64, 72, 128, 144, 256, 288, 512, 576, 1024, 1152, 1536, 2048, 2304, 4096, 4608 KHz

Clock and data encoding:

- Diphase (Manchester)

- Conditioned Diphase

Key Functionality

BER test patterns

- Mark (All Ones), Space (All Zeros), 1:1., 63, 511, 2047, 2047R (Reverse), 2047RI (Reversed and Inverted), 2^15-1*, 2^20-1*, 2^23-1*, QRSS, Programmable (1,2,3), QBF1 (FOX), QBF (2,3), Long User (1,2,3), Delay, All Zeros, 1:3, 1:4, 1:7, 3:1, 7:1

*Note: Both ANSI and ITU variations of these patterns are supported.

Transmit clock sources

- Internal from synthesizer
- Recovered from test interface (with the Recovered Clock option)

- External BNC

Internal clock synthesizer:

- 5 Hz to 18 MHz, +/- 1 Hz resolution.
- 1 ppm accuracy, 1 ppm per year aging

Error insertion

- Bit error(s): single and rate (1E-3 through 1E-6)

Signaling lead control

- Emulate DTE: RTS, DTR, (LL), (RL)
- Emulate DCE: RLSd (RR), DSR (DM), CTS, RI

Self loop

- All test interfaces will loop transmit to receive for the purpose of validating the instrument and the selected test interface.

Asynchronous operation

- Parity selection: odd, even, and none
- Data bits: 5, 6, 7, or 8 bits
- Stop bits: 1, 1.5, or 2 bits
- In-band flow control
- Out-of-band flow control

Remote Operation

- The unit will support remote GUI operation through an Internet browser or VNC viewer.

Key Results

Logic Category

- Delay, Pattern Losses, Pattern Slips, Bit Errors, Bit Error Rate, Interval BER, Total Blocks, Block Errors, Block Error Rate, Int Block Error Rate, Character Errors (Async only)

Signal category

- Transmitter Clock, Frequency, Receiver Clock Frequency, Clock in Frequency, Clock out frequency

Data category

- Receiver Clock Loss, Data Loss, Pattern Sync Loss, Transmitter Clock Losses

6.821

- Err Secs, % Err Sec, Error Free Secs, % Error Free Secs, Sev Err Sec, % Sev Err Sec, Deg Min, % Deg Min, Avail Secs, % Avail Secs, Unavail Secs, Cons Sev Err Sec, Errored Non-SES, BER Non-SES

Time category

- Date, Time, Elapsed Seconds, Elapsed Time, Error Analysis Seconds, Test Seconds (sync only) Error-free Error Analysis Seconds, Errored Error Analysis Seconds, Pattern Loss Seconds,

Ordering Information

Applications Module – FIREBERD 8000

- FB-8000
FIREBERD Applications Module
Includes RS-232/V.24, RS-449/V.36, V.35/306,
EIA-530 X.21, MIL-188C, MIL-188-114
- FB-8000-Diphase
Includes conditioned diphase interface module
- FB-8000-CLK
Includes Clock Recovery option

User Interface

2000-V6
Acterna FST-2000 TestPad User Interface Module (UIM)

Additional application modules available

FST-2510A TestPad	High Speed Optical Analyzer
FST-2310 TestPad	SONET Services Module
FST-2207 TestPad	T1/T3 Wireless Module
FST-2209 TestPad	T1/T3 Services Module
BAT-2700 TestPad	Base Station and Air Interface Test Module
FST-2802 TestPad	Gigabit Ethernet Module



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