FIREBERD 8000
Take testing to the next level

Key Features

- Datacomm interfaces in one test module for ANSI and ETSI standards.
- Government standards support for MIL-188C and MIL-188-114.
- Interface module slot for conditioned diphase 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 usercontrollable 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.

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 diphase. 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 JDSU 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.
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 JDSU 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-60000M, 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.
**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 JDSU 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 JDSU’s standard three-year warranty.
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.
Physical Characteristics

- User Interface Module (UIM)
- Datacomm Interfaces
- External Clock
- Option Slot
- LED Panel
- Applications Module
- Diphasem Module
Specifications

User Interface (Part # 2000-V6)

Mechanical specifications

- Dimensions: 6.7 x 11.5 x 2.2 in (with handstrap)
- Weight: 3.25 lbs
- Speaker and Microphone: Built-in
- PCMCIA slot: 2 Type II CardBus Slots
  (also supports 1 Type III Slot)
- AC adapter: 100-220 at 60Hz or 200-240 at 50 Hz
- Battery: 10.8 VDC Nickel-Metal-Hydride (NiMH)
- Calibration Interval: None
- LCD: Graphic color display (Touchscreen), 6.2 inch diagonal viewable area
- Resolution: 640x480 pixels
- LEDs: Power, Charging, Low Battery
- Operating: 32F (OC) to 113F (45C)*
- Storage: -4F (-20C) to 140F (60C)

Environmental specifications

Temperature

- Operational temperature range: 32F (0ºC) to 113F (45C)*
- Storage temperature range: -40F (-40C) to 167F (75C)

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, DSR, RL, MM, TM
- RS-449/V.36: RD, SD, ST, CTS, RTS, DSR, DTR, RLSD, CI, 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
- EIA-530
  - 25-pin D-type connector
- RS-232/V.24
  - 25-pin D-type connector
- RS-449/V.36
  - 25-pin D-type connector
- RS-242 and EIA-188-114 Balanced
  - 5 bps to 15 Mbps synchronous
  - 5 bps to 128 kbps asynchronous
  - 5 bps to 520 kbps recovered
  - Supported signaling leads: CTS, RTS, DSR, DTR, RLSD, RL, LL, TM
- EIA-530 Balanced
  - 5 bps to 5200 kbps recovered
  - Supported signaling leads: CTS, RTS, DSR, DTR, RLSD, RL, LL, TM

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 terminated
  - RS-423 and MIL-188-114 Unbalanced

Conditioned Diphase

- 2 BNC connectors: 1 TX and 1 RX
  (via plug-in Interface module)
- Receiver:
  - Selectable-input termination: 58, 135, or bridge (>2000)
  - Single-ended operation: 58 Ω
  - Differential operation: 135 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
- Clock and data encoding:
  - Diphase (Manchester)
  - Conditioned Diphase

Continued7
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*, Q8S, Programmable (1,2,3), Q8F1 (FOX), Q8F (2,3), Long User (1,2,3), Delay, All Zeros, 1:3, 1:4, 1:7, 3:3, 7:7
*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:**
- 50 Hz to 18MHz, +/- 1 Hz resolution, 1 ppm accuracy, 1 ppm per year aging
- 5 Hz to 50 Hz, +/- 1 Hz resolution, 20 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: RLS (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**

- 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 in Clock, Clock out frequency

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

**G.821**
- Err Secs, % Err Sec, Error Free Secs, % Error Free Secs, Err Sec, % Err Sec, Deg Min, % Deg Min, Avail Secs, % Avail Secs, Unavail Secs, Cons 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
  - FB-8000-Diphase
    - Includes conditioned diphase interface module
  - FB-8000-CLK
    - Includes Clock Recovery option

**User Interface**
- 2000-V6
  - JDSU 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

Test & Measurement Regional Sales

<table>
<thead>
<tr>
<th>NORTH AMERICA</th>
<th>LATIN AMERICA</th>
<th>ASIA PACIFIC</th>
<th>EMEA</th>
<th>WEBSITE: <a href="http://www.jdsu.com">www.jdsu.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>TEL: 1 866 228 3762</td>
<td>TEL: +55 11 5503 3800</td>
<td>TEL: +852 2892 0990</td>
<td>TEL: +49 7121 86 2222</td>
<td></td>
</tr>
<tr>
<td>FAX: +1 301 353 9216</td>
<td>FAX: +55 11 5505 1598</td>
<td>FAX: +852 2892 0770</td>
<td>FAX: +49 7121 86 1222</td>
<td></td>
</tr>
</tbody>
</table>

All statements, technical information and recommendations related to the products herein are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. The user assumes all risks and liability whatsoever in connection with the use of a product or its application. JDSU reserves the right to change at any time without notice the design, specifications, function, fit or form of its products described herein, including withdrawal at any time of a product offered for sale herein. JDSU makes no representations that the products herein are free from any intellectual property claims of others. Please contact JDSU for more information. JDSU and the JDSU logo are trademarks of JDS Uniphase Corporation. Other trademarks are the property of their respective holders. ©2005 JDS Uniphase Corporation. All rights reserved. 10143208 500 1005 F8000.DS.ACC.TM.AE