FIREBERD 8000

Take testing to the next level

Key Features

- 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 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

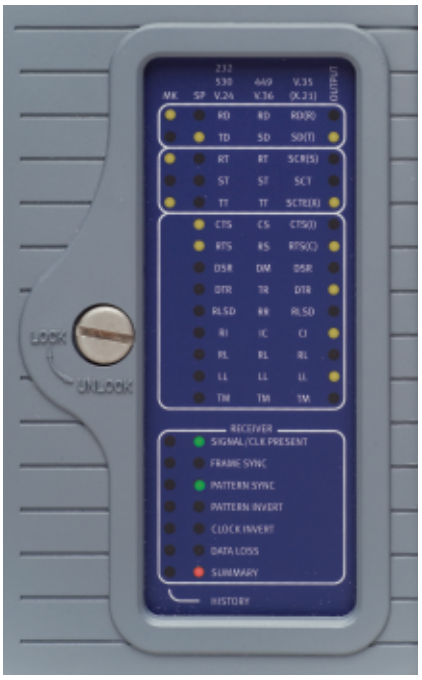

Figure 3. Front panel LEDs monitor signaling and data leads of the circuit under test.

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.

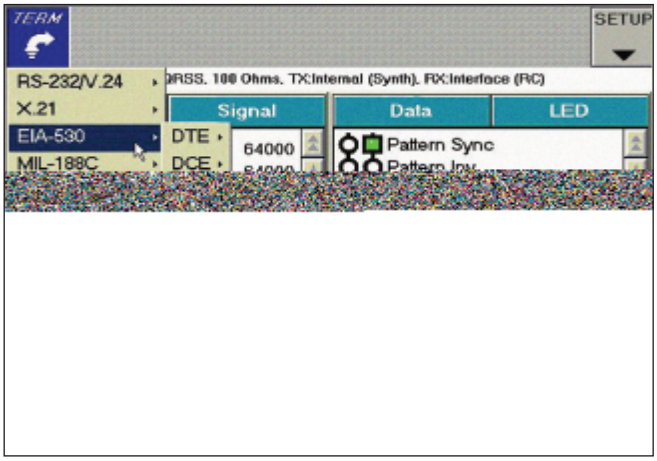

Figure 1. Emulate DTE or DCE networks.

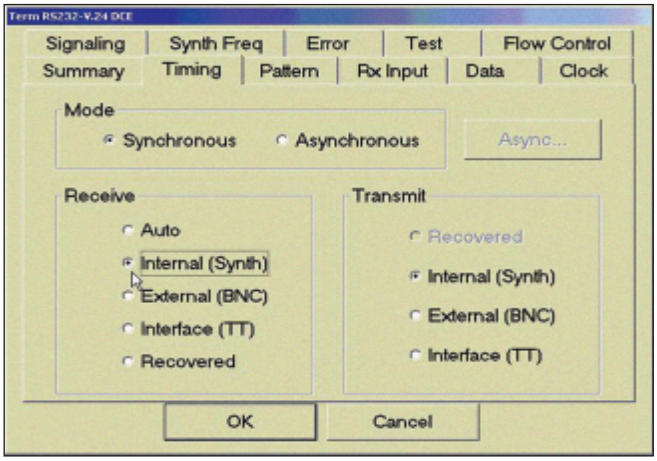

Figure 2. Various clock options.

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.

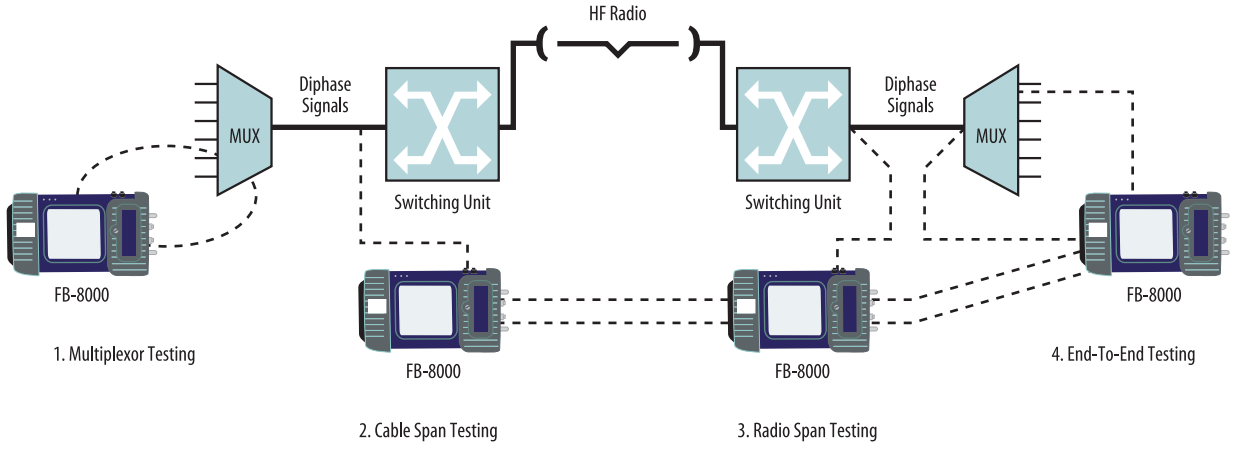

Diagram 1. Verifying End-to-End Connectivity

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.

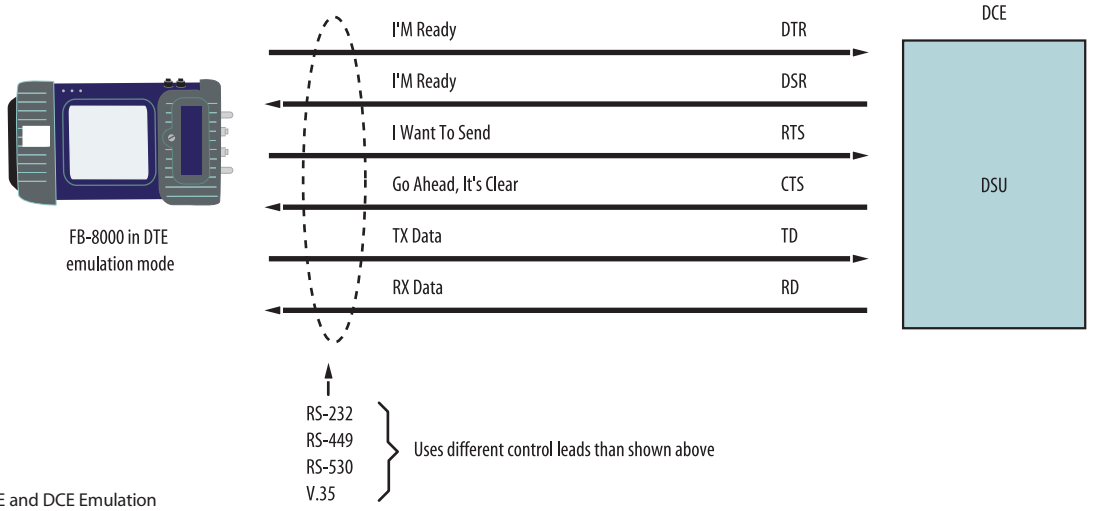

Diagram 2. DTE and DCE Emulation

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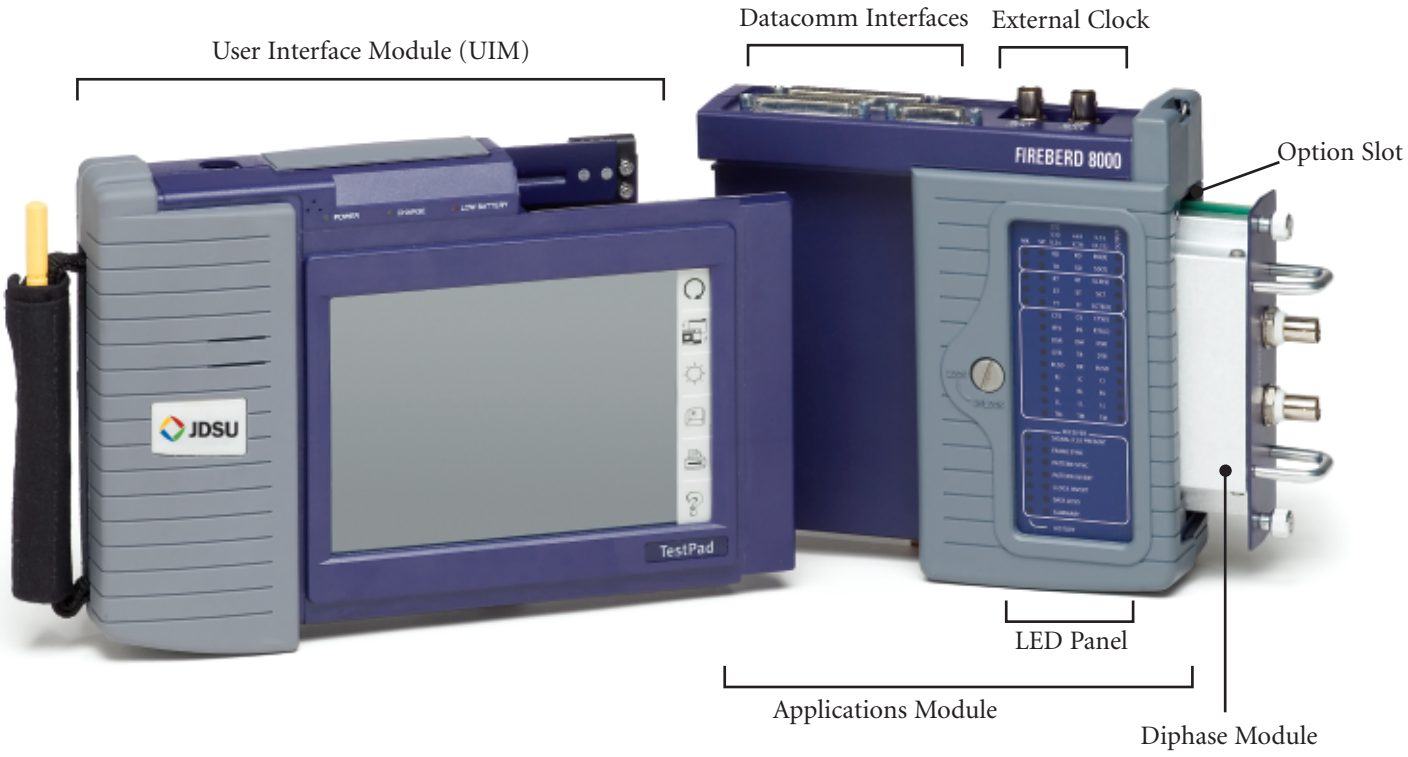
Physical Characteristics



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 III 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-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 (0C) to 113F (45C)*
Storage	-4F (-20C) to 140F (60C)

* 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	-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, 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 10 Mbps 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 andMIL-188-114 Balanced: un-terminated or 78/100/124 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 10 Mbps 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 , 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
- 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:

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: 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

G.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
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

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