Protocol Knowledgeable

GTX-B

Bit Error Rate Test System

Fibre Channel • Gigabit Ethernet

NEW!

Gigabit-Rate Physical Layer Verification System

- **Test at single- and double-rate Fibre Channel and Gigabit Ethernet speeds**

- **Verify data integrity in networks, subsystems, and components**

- **Test through multiplexers, repeaters, hubs, re-timing and bypass circuits**

- **Simple setup to test using industry standard data patterns**

- **User-defined tests with legal or illegal data patterns**

Verifying data integrity is key to insuring the performance and reliability of Gigabit-rate networks and systems. A major source of data errors is the network physical layer: cables, connectors, transceivers and associated intervening electronics. Testing these network elements with normal traffic can be a time-consuming process. Most errors are data pattern dependent. Only if errors occur more than several times a second will users notice anything more than a slight reduction in system performance. Even worse, a few data errors on the link today may be the precursor to a major system failure in the near future.

The GTX Bit Error Rate Test System speeds the data integrity testing process by sending industry-standard worst-case data patterns through network devices. These data patterns are designed to stress the physical layer of the system, with patterns specifically developed to check frequency response, data dependencies and network interface memory components. With bit-by-bit comparison, any difference between the transmitted and received data is detected, counted and captured for additional analysis. Unique data patterns can be created to meet special test requirements.

The GTX System is protocol knowledgeable for Gigabit Ethernet and Fibre Channel. The unit recognizes data modifications allowed by devices on the link and does not report them as errors.
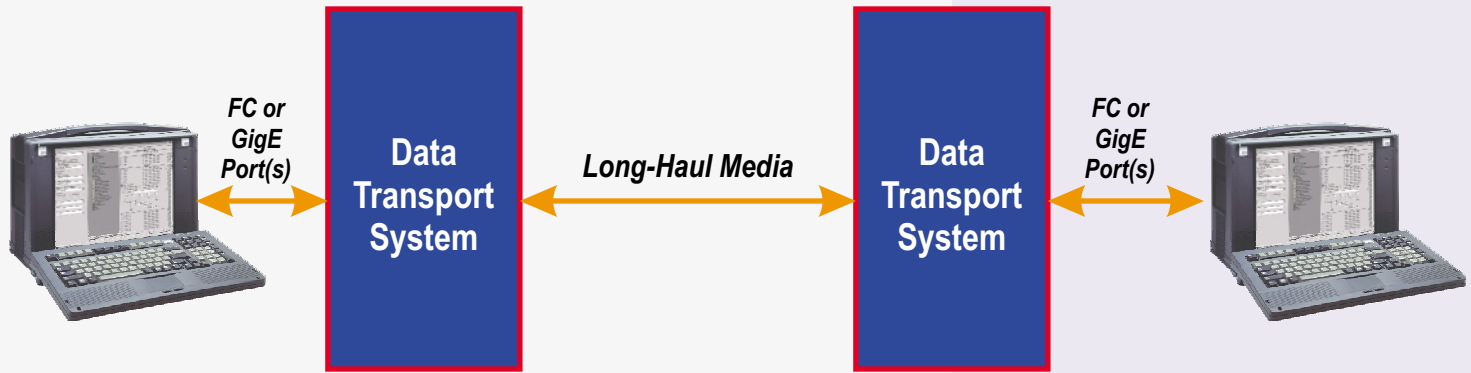
The portable GTX System is perfect for field use. The GTX has interchangeable GBICs and supports both opti-cal and copper (Fibre Channel only) networks. Just attach the GTX System to the link, open one of the pre-defined instrument configurations and begin the test. Two systems can be used together for testing long data links, if looping data back to one point is not possible.

The GTX System will greatly reduce manufacturing test times: Test hubs, host bus adapters, Fibre Channel RAIDs, and other active or passive devices. Stress all of the components in the data path. Eliminate the hours of test time looking for a data-dependent error which happen only rarely in a normal traffic stream.

FC or GigE Port(s) — **Data Transport System** — Long-Haul Media — **Data Transport System** — FC or GigE Port(s)

## Testing Local, Metro, and Wide Area Networks

Many network backbones carry native or embedded Fibre Channel and Gigabit Ethernet traffic. While these networks may use custom transport protocols or complex wavelength domain multiplex processes for transport, they have one thing in common. Though the data may be re-timed, re-clocked, delayed or modified during transport, the transport system accepts and delivers traffic compliant with the Fibre Channel and Gigabit Ethernet specifications. From the view of a Fibre Channel or Gigabit Ethernet device, these systems are nothing more than a long cable with delays and possibly modifications to the protocol primitive words.

The primary source of data integrity errors in these networks is the accumulated effect of analog signal jitter and noise. While jitter and noise may inject errors into a data stream, systems are normally robust and will either correct the error, ask for the data to be resent or reset and start over. If the error rate is low, these processes happen automatically and are not reported to the network administrator for further action.

Even though these networks allow error rates on the order of 1 bit in 10^{12}, any error during data transmission indicates a problem in some component of the network. Detecting errors and fixing the component problems insure that the network will continue to perform reliably.

The GTX Bit Error Rate Test System allows a technician to stress the data transport system at installation and as part of a preventive maintenance program. Just connect the GTX to a Fibre Channel or Gigabit Ethernet port, run the industry-standard test patterns and watch for errors. If errors are detected at the system level, use the GTX to test individual cables and components to isolate the failing device.
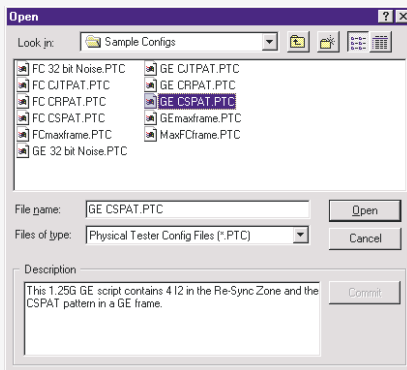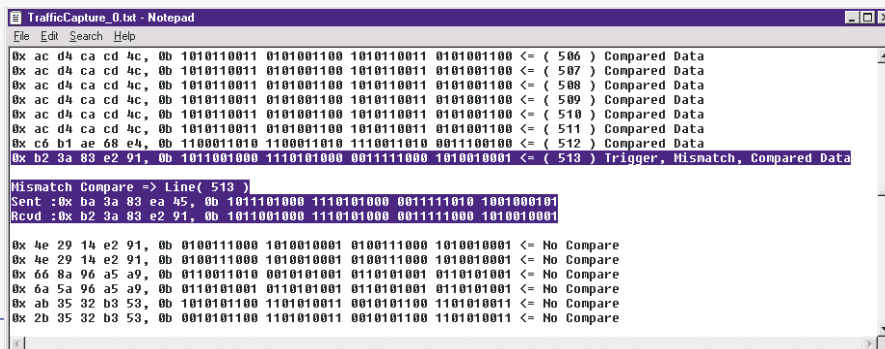

GTX Bit Error Rate Test System provides a range of ready-to-use industry standard test pattern configurations.

Start the instrument and watch for errors on the link.
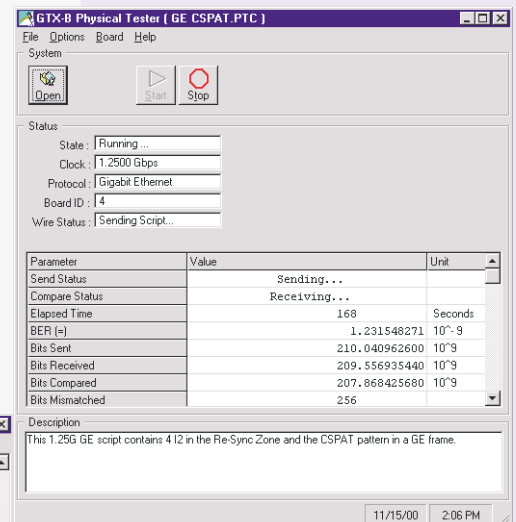
Traffic and errors are captured in a buffer for further analysis. The contents of the buffer, including both the sent and received bit values, are automatically saved to a text file.

Testing Active Devices: A Fibre Channel RAID

Testing the physical layer, re-timing and bypass circuitry in a Fibre Channel device is a challenge. One test strategy is to generate normal traffic, with a computer and host bus adapter, for an extended period of time. Use Operating System tools or a protocol analyze to detect errors such as a frame with an incorrect CRC. This strategy is time consuming, finding data-dependent errors in normal traffic may require hours of test time.

The GTX Bit Error Rate Test System provides the functions required to streamline this process. The GTX can stress the device under test in several ways. The device can be exercised with data generated at the maximum rate. The physical layer can be stressed with data to check for pattern sensitivities and noise. Memory associated with data re-timers can be exercised for bit sensitiv-

ity. The power supply and distribution can be checked with patterns that toggle bits on the link and in memory at the maximum rate. The operation of error correction devices can be tested by sending illegal characters.

For example, all of the circuitry in a Fibre Channel RAID system can be tested with a GTX System. A RAID consists of Fibre Channel connection ports with bypass circuitry and disk drives with pass-through capability. Testing is as simple as connecting the GTX System and pressing start. If the device under test is a JBOD (just a bunch of disks) rather than a RAID, a hub may be required at the GTX connection. The hub allows the JBOD to perform loop initialization before testing begins.

Use the clock output signal to trigger an oscilloscope for detailed eye pattern analysis of the analog waveforms on the data link.

High-speed oscilloscope

RAID

Disk Drive 1

Disk Drive 2

Disk Drive 3

Disk Drive n

Bypass Port
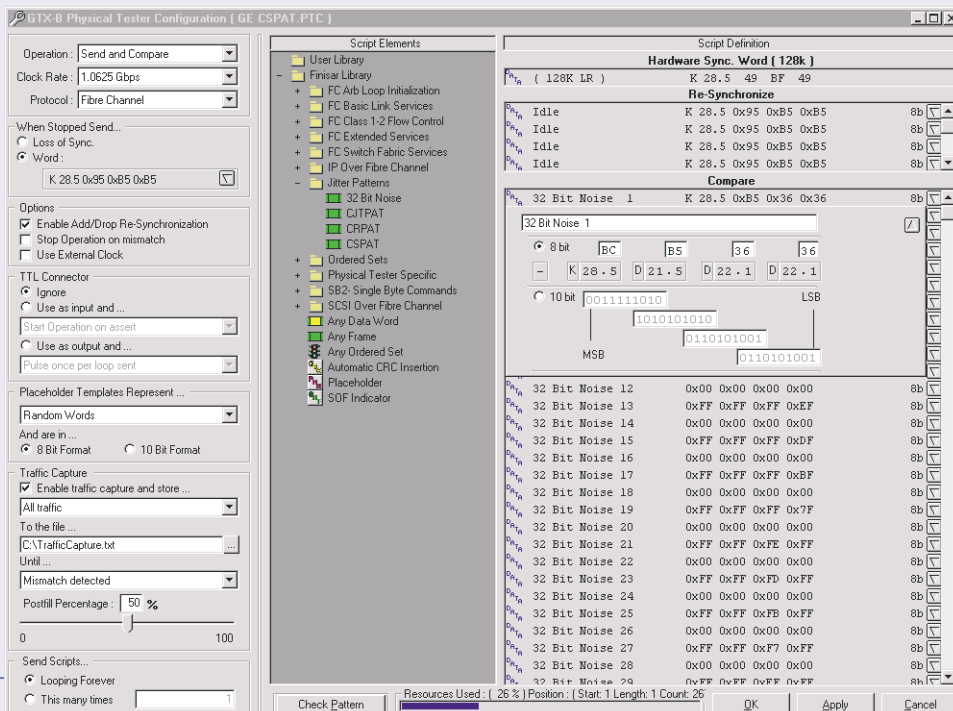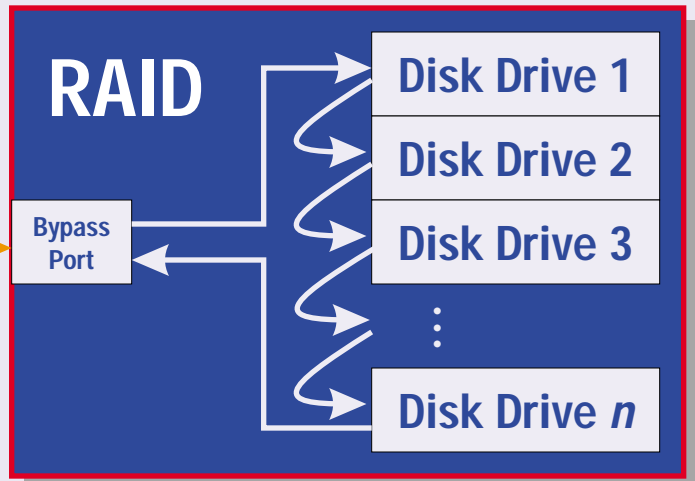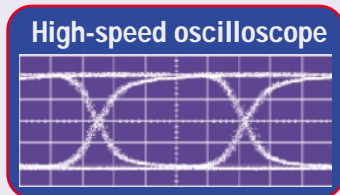
Use standard test patterns, or edit them as either 8- or 10-bit characters to create new tests.

Create changing patterns with placeholder templates which insert incrementing or walking data words each time the pattern is sent. The system will automatically create a correct CRC.

GTX-B Bit Error Rate Tester

Specifications

Data Rates

- 1.0625 Gbit/sec
- 1.2500 Gbit/sec
- 2.1250 Gbit/sec
- 2.5000 Gbit/sec
- Frequency is ±100 PPM

Link Connections

Duplex GigaBit Interface Converter (GBIC) module. Options include DB9, HSSDC, 850nm SC multi-mode, 1310nm SC single-mode. For other options call factory.

Operating Modes

- Send and Compare for BERT
- Send Only for PLL recovery and error testing
- Compare Only when two GTX-Bs are testing a long link with one at either end

Automatic Re-Synchronization

Re-synchronization corrects for bit slippage or re-timer circuits that add or drop fill words between data packets. Disable re-synchronization for bit-by-bit pattern comparison.

Data Patterns

Library contains Fibre Channel and Gigabit Ethernet compatible CJTPAT, CRPAT, CSPAT, MemTest plus primitives, data packet start and end characters, and real-time CRC calculator.

User-defined patterns to 40K bits long may include any legal or illegal 10- or 8-bit values. Dynamic quad-byte placeholders support: Random Words, Incrementing Bytes, Incrementing Words, Walking One, Walking Zero.

Patterns may be sent from 1 to 4 million times or continuously.
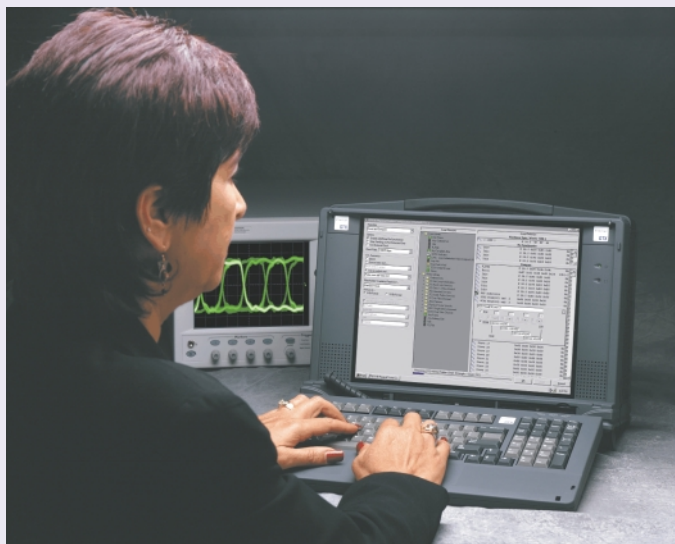
Error Capture

Capture 4K bytes of 10-bit data in a buffer for further analysis. Stop capture at error condition at the end of the test. Buffer is automatically transferred to a text file containing sent and received characters.

Measurement Log

Test result parameters and statistics are saved to a file at intervals of 1-999 seconds. The latest 999 result-records are retained.

Trigger In/Out

BNC connector (TTL): as input to start data generation or stop compare; as output to pulse out once per loop sent.

Clock/20 In

SMA connector: 50Ω, 1 Vpp, AC coupled. 53.1, 62.5, 106, or 125 MHz ±1%.

Clock/20 Out

SMA connector: 50Ω, 1.5 Vpp, AC coupled.

Eye Diagram Support

Connect the clock/20 output signal to a high-speed oscilloscope as the trigger input, and use a high-bandwidth probe for the displayed signal input.

Scripted Control and Remote Operation

Tests may be executed using script commands. Remote control software allows the GTX products to be operated over a network or modem. These capabilities are optional, contact Finisar for details..

System Configurations

The GTX Bit Error Rate Test Systems are available fully-configured in a range of rugged portable, desk, or server computers with the NT operating system. It is also available as a PCI card module. Up to 16 GTX-B modules, each operating independently, may reside in one PC. Two units may be paired for send and remote compare.

GTX 2 and 1 Gbit/sec Fibre Channel Instrumentation Systems may be configured with GTX-A Protocol Analyzers, GTX-J Error Injection, GTX-G Data Generator, and GTX-B BERT modules. Contact Finisar for configuration information.

Specifications, configurations, and availability subject to change without notice.

For a demonstration of the capabilities of Finisar instrumentation, call Finisar or your local sales representative.