

## FEATURES & BENEFITS

- All digital processing
- Single or multi-wavelength
- Sensor lengths up to 25 km
- High dynamic range
- High sensitivity
- Superior data precision
- Independently Monitored Segments
- Remote Monitoring
- Full-featured API
- Breakthrough Price/Performance

The *OPTIPHASE TDI-7000* is an advanced interferometric Time Domain Multiplexed fiber sensor interrogation product that delivers breakthrough sensitivity and price/performance. The TDM interferometric interrogation approach sensitizes the entire length [up to 25km] of the array. Each fiber segment is separated by partial reflectors, forming an independent channel. The fiber segment or “channel” constitutes the sensor length. This transformational ability produces truly distributed interrogation that has significant advantages over point sensor arrays when used for large area distributed coverage.

### Unique Advantages

Since each sensor/segment/channel is independently monitored, multiple events are detected simultaneously. Further accuracy is achieved due to the low migration of background noise from one segment to the next.

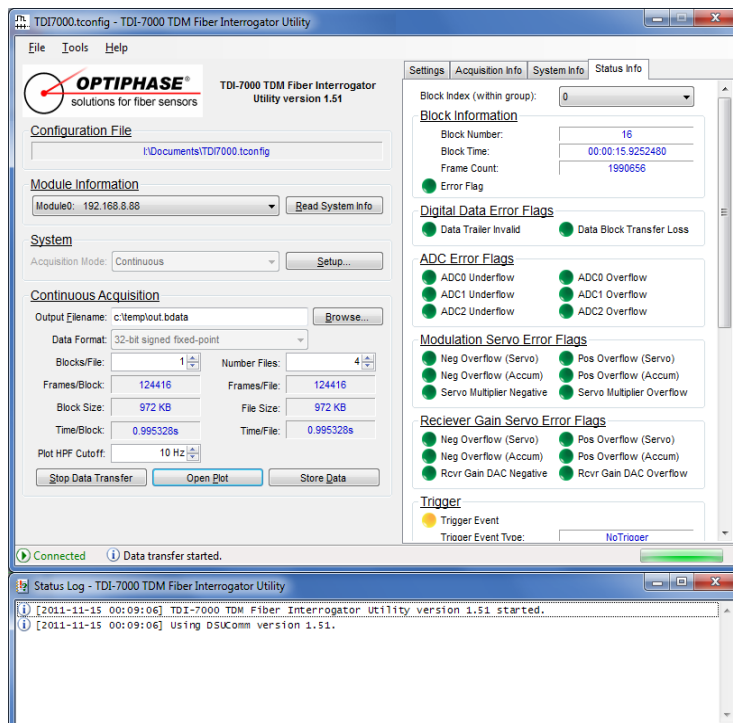


The system provides high sensitivity, a very large dynamic range and a highly linear measure of all sensor physical changes. The linearity and high dynamic range allows the systems integrator to perform reliable post signal processing. This greatly reduces the need for guesswork and broad-based stochastic interpretations when compared to other interrogation techniques that do not produce linear phase measurements or physically separate sensor zones. As a result, physical measurement capabilities are enhanced and superior data interpretation results are achieved and error rates are significantly reduced.

The system provides high sensitivity, a very large dynamic range and a highly linear measure of all sensor physical changes. The linearity and high dynamic range allows the systems integrator to perform reliable post signal processing. This greatly reduces the need for guesswork and broad-based stochastic interpretations when compared to other interrogation techniques that do not produce linear phase measurements or physically separate sensor zones. As a result, physical measurement capabilities are enhanced and superior data interpretation results are achieved and error rates are significantly reduced.

### Operating Principle

TDI-7000 interrogators are designed to conduct high-rate sensing of remote “intrinsic” fiber optic sensor arrays. Compatible arrays have an optical reflector at the start and at the end of each sensor where light transit time between reflectors is greater than 100ns. Interrogation is performed by launching optical pulses into the fiber sensor array and collecting the reflected [time separated] sensor optical return signals which are then processed by the patented Dual-Slope method. This method produces **precisely measured** sensor optical phase changes which correspond to physical changes in the sensor fiber due to sound, motion and temperature changes.



TDI-7000 TDM Fiber Interrogator Utility software – Main Menu

Setup, control and operation of the TDI-7000 is made easy by the supplied Windows-based Utility software. A full-featured API is available for customization and customer developed application enhancements. The API allows for real-time data acquisition, configuration and maintenance.

### Remote Monitoring

Once installed, each system can be accessed remotely by authorized personnel through the TDI-7000 TDM Fiber Interrogator Utility. This powerful function provides the integrator a significant cost-cutting service and support tool. The system may be accessed via an IP addressing based connection. All Setup, Control, Configuration, System State and Data Monitoring functions are accessible.

### Single Wavelength Interrogation

Single wavelength TDM Interrogation is available with an internal ECL laser or externally supplied lasers through a standard front panel FC/PC interface.

### Multi-Wavelength Interrogation

Utilization of a multiple wavelength TDM Interrogation system consists of an Interrogator Module (without laser) and a separate, external Source Module containing multiple lasers. The multiplexing optics for multi-wavelength support is customer supplied.

## SPECIFICATIONS

### GENERAL CHARACTERISTICS

Operational Wavelength	C-band ITU 35 [1549.32 nm]
Optical Source Type	External Cavity Laser, spectral width ~ 5 – 10 KHz
Interrogation Method	Interferometric TDM, Optiphase Dual Slope method
Interrogation controls	Pulse power, dynamic receiver gain, sample rate, number of sensors
Sensor Array Interface	Single <i>Note 1: There is a practical (crosstalk) limit (for IIR configurations) to how many sensors can be on a single fiber (at same wavelength). Array “fan-out” approaches are assumed for high channel counts and dual arrays.</i>
Sensor Array Length	Up to 25 km, assuming sensor return loss $\geq$ 37dB
Sensor Array Type	TDM IIR or FIR, compatible with SMF28 mode profile or customized to specialty fiber profile
Sensor Resolution	Minimum length 20.4 m / Maximum length 1000 m
Interrogator Sensor Count	Up to 256 sensors; <i>Note: Sensor = Channel = Zone</i>
Concurrent event detection	Yes, 1 per zone
Background noise	Constrained to zone of origin

### MEASUREMENT CHARACTERISTICS

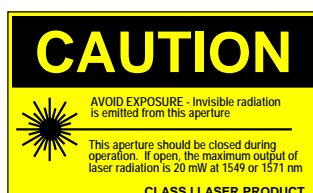
Demodulation Rate: Total measurements per second	2 million samples per second - applies to the interrogator.
Data Interface	Gigabit Ethernet
Data Rate (equivalent to sample rate per sensor)	40 KHz to 270 KHz Range restrictions subject to sensor configuration. Data rate is bounded due to design of modulation technique and overall length of the sensor array. Design changes can bring this down.
Data Format	Data: 32 or 64 bits per angle Diagnostics: ADC out of range, receiver servo gain
Self Noise	40 urad/rt-Hz. Does not include noise caused by telemetry, Coherent Rayleigh or Laser
Linearity	Better than 1%

### INTERFACES

Optical Interfaces	FC/APC, narrow key, E2000 High Power optional
Electronic interfaces	Ethernet for control and I/O, Analog monitor BNC
Ethernet I/F	Gigabit link speed; IP addressing: DHCP and Static IP support
Software Interface	Application program supports full operation. API available for customization, supports .NET enabled languages including C#, C++, Visual Basic, MATLAB and LabVIEW.

### PHYSICAL & ENVIRONMENTAL

Power	85-265 VAC, 47-440 HZ, external DC supply optional
Operating Temperature	0° to 65° C
Non-Operating Temperature	-40° to 70° C , humidity 20% – 80% non-condensing
Dimensions	3U full rack 20" depth
Weight	22 lbs. [10 Kg]
Requirements	Windows PC with GBit Ethernet



**This instrument requires a PC to operate.**

*All trademarks and registrations are copyrights of their respective manufacturers.*

*This product complies with 21CFR1010.2 as a CLASS I device.*

*Protected by U.S. Patent Nos. 5,903,350; 6,556,509; 6,778,720*