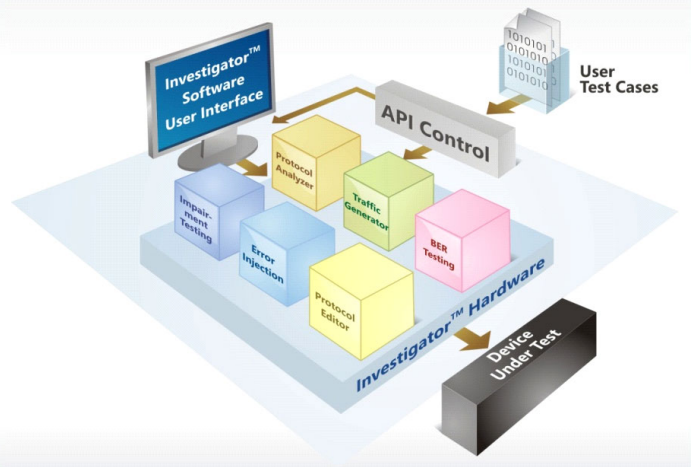
Protocol Analyzer

TPI4000 Series Data Sheet



Features & Benefits

- Multiple Protocols and Test Functions in a Single Instrument
- User-customizable and Configurable Protocol Database
- Simultaneous Analysis, Generation, and Statistics
- True 100% Line Rate Traffic Capture and Optional Traffic Generation
- Time-correlated Views and Triggers across Every Port and Protocol
- “Drag and Drop” Ease of Use for Triggering and Filtering
- Bit-level Control of Generated Traffic
- Actual Statistics (Total Population, not Sampling)

Applications

- Protocol Compliance
- Stress Testing
- Communication Compatibility
- Performance Optimization
- Interoperability Testing

Tektronix®

One Instrument – Multiple Functions

The TPI4000 Series provides multiple test functionality within a single piece of hardware making it the most versatile serial tester on the market.

A single TPI4000 protocol analyzer can handle:

- Protocol Analysis: Guaranteed 100% full line rate capture
- Multiple Protocols: Support for Ethernet, Fibre Channel, Serial RapidIO, Serial FDPD, Avionics Full-duplex Switched Ethernet (AFDX), and others including custom protocols
- Traffic Generation: Test your device with good and bad protocol data
- Impairment Testing: Introduce extreme delay conditions into your system to see
- Bit Error Rate Testing: Detect errors that exceed 10^{-12}
- API Interface: Allows for test automation
- Custom Protocol Editor: Add custom protocols to the protocol database

One Instrument – Multiple Protocols

The TPI4000 Series supports the highest number of protocols including:

- Ethernet
- FCoE
- CPRI
- AFDX
- SATA
- Custom 8B/10B
- Time Triggered Ethernet (TTE)
- Fibre Channel
- Serial RapidIO
- Serial RPDP
- SAS
- FICON
- Custom 64B/66B

Meet Your Performance Requirements

At speeds up to 10 Gb/s, test at full line rate to ensure your design hits its performance requirements.

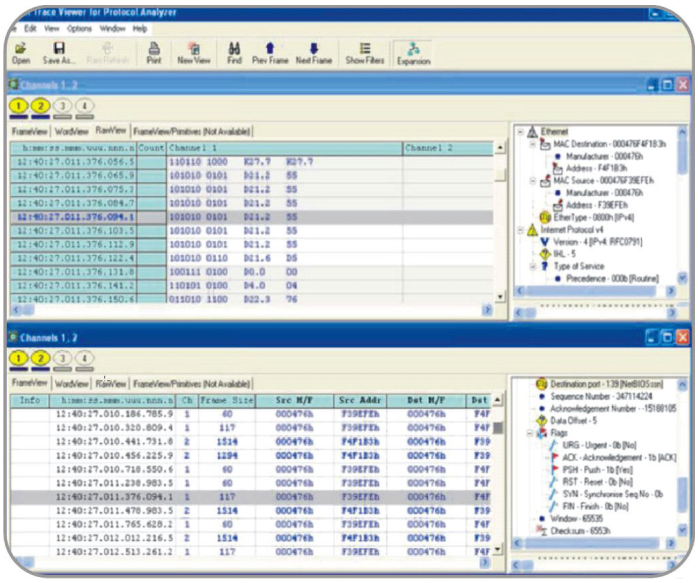
The Ultimate High-speed Serial Test and Debug Platform

Reduce Time to Market with Faster Analysis and Debug

The nature of serial debug is that you may have problems that show up only after days or weeks of testing. These types of problems are hard to simulate or capture. However, with the TPI4000 Series' advanced debugging functions, including state-of-the-art triggering and filtering, you can find even the most obscure problems fast. To achieve this, the software uses a number of advanced features:

- Alarms: Build and save custom trigger, filter, and capture configurations for later use or as part of a formal test procedure
- Advanced Triggering: Start capturing data only when specific conditions are met
- Powerful Triggering: Sift through trace data fast, and filter out all conditions except the ones you are looking for
- Search: Find any data pattern within any frame and maintain a library of predefined search patterns
- Bookmarks: Set bookmarks for easy reference in later debugging

Further speed debug by sharing trace files using the free Trace Viewer software.



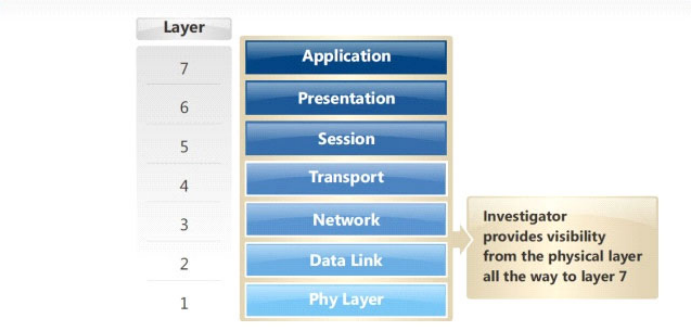
Interpret Data Quickly Using Multiple Display Formats

View your data in the most convenient fashion. This facilitates interpreting and reading the data quickly.

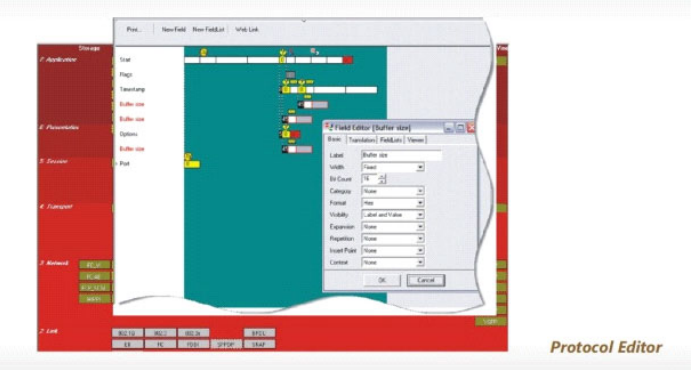
- Raw, 8B/10B, Hexadecimal, and Frame views
- Detailed decode of each frame down to individual bit level
- Highly configurable trace display with color-coded channel data
- Independent or merged channel views
- Multilayer post-capture filtering on all fields
- Save/Print/Export trace segments or entire captures with comments

Gain Insight with Hardware Layer Visibility

All TPI4000 protocol analyzers feature visibility down to the hardware level – never miss a bit. This provides unparalleled insight into both your hardware and software operation, significantly reducing error debug time.



Protocol Stack Diagram



Protocol Editor

Increase Reliability with Compliance and Interoperability Testing

Ensure your device complies with current standards by generating real traffic and observing the response. The TPI4000 Series complies with the latest specifications and standards through a program of regular participation with the standards' bodies.

Custom/Proprietary Protocol Testing

The Protocol Editor is an easy-to-use, powerful means of updating or adding protocols to the protocol database.

The Protocol Editor uses a GUI to correctly display the translated data from the link. Once it is saved in the protocol database, the new or revised protocol is available for decoding and searching within the Trace Viewer. It is also available in the protocol analyzer as trigger and filter definitions.

For Every Application

Network Lab Interoperability Testing

Interoperability is critical in a data center or other networking environment. The problem of specification interpretation comes into play where different networking equipment vendors have a different interpretation of a particular protocol specification. In a networking lab environment, the TPI4000 Series provides insight into serial links, even before the link comes up, so you can verify all devices are working properly. If a device does misbehave, the TPI4000 Series' powerful triggering and filtering capabilities can easily identify the offender so it can be fixed before going into product.

Not only does specification interpretation cause problems, but problems also happen in error recovery or unanticipated out-of-specification conditions. These conditions can be simulated using controlled negative testing. With controlled negative testing, errors and delays are introduced into the line to verify proper recovery of devices on the network. This is important to insure against costly failures in the field.

Embedded Systems Testing

Embedded system interface testing can involve chip-to-chip, board-to-board, and box-to-box testing, depending upon the application.

The TPI4000 Series is uniquely suited to handle embedded system interface validation and verification by providing the most comprehensive support of protocols, speeds, and connection types. Serial interfaces are tested at full line rate, with full reporting down to the physical hardware layer. In addition, your design can be fully characterized through negative testing.

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Military/Aerospace Communications

All of the functions of the TPI4000 Series are made available through an Application Programming Interface (API). The 'C' compatible interface allows 3rd party applications to be created on top of the TPI4000 Series' platform that can be used for test automation, production testing, or conformance testing.

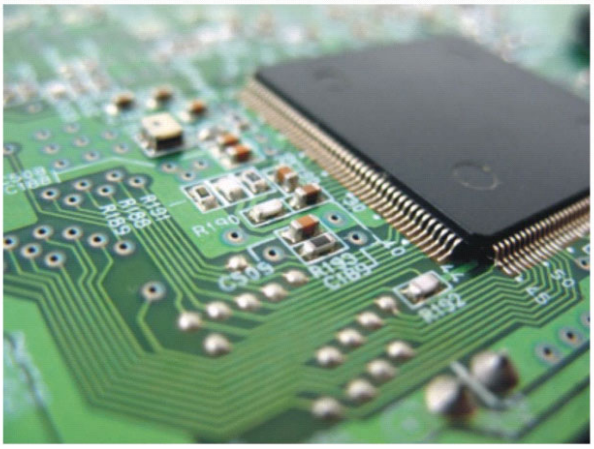
The API can also be accessed from a UNIX platform using remote procedure calls enabling the integration of Unix-based platforms into the TPI4000 Series solution.

Post Silicon Applications

The TPI4000 Series is a perfect solution for doing post silicon serial interface validation. With its wide selection of protocols supported, as well as doing mixed protocol testing in a time-correlated fashion, chip designers can both verify the interfaces and characterize chip performance at the same time.

One of the most difficult issues to overcome is simply connecting to the chip's test setup. The TPI4000 Series provides a variety of connectivity options to handle most test environments.

Removable Hard Disk for Securing Data



Post Silicon design diagram

Field Testing of Deployed Networks

The small self-contained form factor of the TPI4202 is perfect for field test applications. In addition, trace data captured in the field can be easily e-mailed to engineering offices for analysis with the free Trace Viewer software.

A Connection and Chassis for Every Environment

A Variety of Connector Types are Available

The ports on every TPI4000 protocol analyzer have been standardized to accommodate the widest range of connections using the SFP (Small Form-factor Pluggable) transceiver specification.

SFP standardization allows the TPI4000 Series to support a wide range of both copper and electrical connections. Other connection types such as SMA connectors are also available.

A Chassis to Fit Your Needs

The TPI4202 is a self-contained rugged unit that is suitable for both the lab and the field. With a built-in PC, keyboard, and display, the TPI4202 provides laboratory performance in a go-anywhere chassis that supports 2- to 8-port configurations.

Complete Protocol Analysis

Each of the TPI4000 protocol analyzers captures and displays 100% of link data, even at full line rates. Views of primitives, as well as frame delimiter, frame header, and payload data are also provided. The Protocol Database Editor allows the user to define additional decoding of protocols to further enhance the existing functions. Deep, bit-level triggering and pre- and post-filtering capabilities ensure that relevant data can be extracted from multi-gigabit data streams.

Data Capture

Capture 100% of data at full line rate and in raw 10-bit format, and stop with “buffer full” or “buffer wrap” options. Captured traces can be viewed on any Windows PC using a stand-alone viewer. The hardware compression algorithm makes efficient use of trace memory resources. Network topology can be displayed through analysis of captured traces.

Triggering

- Multilevel triggering
- Trigger on multiple consecutive events on, or across, all channels
- Select from a list of predefined trigger events
- State machine “loop sequence” triggering
- Re-arm trigger if condition is not met
- Independent channel triggers

Upper Layer Protocol (ULP) Support

- iSCSI, IP, TCP, and UDP protocol suites provided as standard
- Supports sequential and direct access devices
- Automatic decodes for iSCSI, IP, TCP, and UDP and many other upper-layer protocols
- Add new and proprietary protocols using the Protocol Editor application

Search Facilities

- Find next and previous frames
- Go to and create bookmarks
- Search for source or destination address
- Search for any data within a frame
- Library of predefined search items
- Find trigger events

Data Display Formats

- Raw, 8B/10B, Hexadecimal, and Frame views
- Detailed decode of each frame down to individual bit level
- Highly configurable trace display with color-coded channel data
- Independent or merged channel views

Alarm Feature

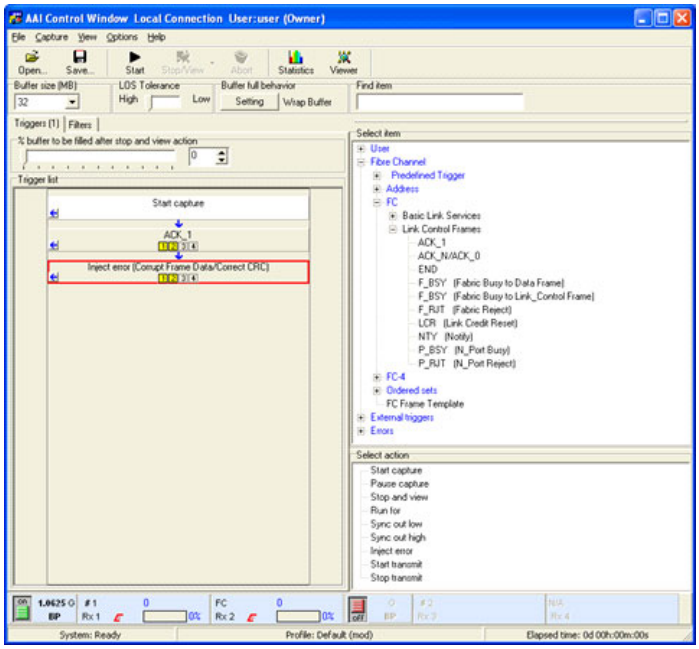
- User-definable alarms for link utilization, frames, and bytes
- Ability to set high and low limits
- Ability to set alarms on all statistical data

Performance Statistics

A real-time statistics module provides bookmarks, search, and tabular or graphical displays of link captures to offer unrivalled flexibility, power, and ease of use in high-speed data capture, decode, and analysis.

Test Configuration Library

Build and save custom trigger, filter, and capture configurations to server.



Traffic Generator

Generate protocol-specific traffic with complete control over timing and content of data. The Traffic Generator's ability to maintain full line rate traffic, even across multiple links, allows device performance to be measured and operation under stress to be characterized.

- Output any traffic load scenario up to full line rate traffic
- Simulate protocol, data, and CRC errors
- Control inter-frame and inter-burst packet gaps
- Test buffer limits by manipulating flow control fields
- Stress multiple links simultaneously with no performance loss
- Monitor statistics in real time

Impairment Tester

Simulate the delay caused by long cable runs without the inconvenience and cost of testing with multiple lengths of cable. Using the Impairment Tester allows the effects of latency on application performance and flow control to be measured.

- Simulate cable length and delays
- Determine the amount of delay
- Select criteria to identify errors
- Check for delays to the millisecond
- Report bit-level diagnostic details
- Supports sequential and direct access devices

Error Injector

Use the TPI4000 Series' Error Injector to test the recovery of systems and line failures for communications using Fibre Channel and Ethernet, including AFDX, iSCSI, IP, IPv6, TCP, and other Ethernet-based protocols.

- Replace data on the link with user-defined data in real time
- Corrupt values or remove events from the link to replace data and simulate slow device response times
- Recalculate and insert CRC values automatically where applicable
- Integrate proprietary protocols into error injection
- Generate custom test patterns for custom applications with the TPI4000 Series' Protocol Database Editor and application software

Bit Error Rate Tester

Send both framed and unframed bit error rate test patterns through the link under test to test its ability to reliably transport data between the transmitter and receiver. Standard and user-defined test patterns are supported.

- Generate multi-speed, multi-application, and custom patterns
- Support up to 8 ports of testing
- Verify and validate lowest-level connectivity, down to 10^{-12}
- Generate different forms of IEEE patterns and jitter such as CRPAT, CJTPAT, CSPAT, and Incrementing

Protocol Editor

The Protocol Editor allows the protocol analyzer's standard database to be expanded to support user-defined protocols. Once part of the database, a user-defined protocol can be used as a filter or can trigger scenarios, in addition to being fully decoded in the Trace Viewer. Other features, such as post-capture filtering, are fully available as if the protocol was part of the standard TPI4000 protocol analyzer's database.

API Library

The TPI4000 Series' API Library is a 'C' API that provides the user with programmatic control over all the TPI4000 tools. Using the API Library, the user can write custom applications that function over the platform or create code for test automation.

Characteristics

TPI4202 Characteristics

General

Characteristic	Description
Maximum Number of Interface Cards	2

Interface Card Options – Voyager600 / Voyager800 / Voyager1000 Characteristics

General

Characteristic	Description
Number of Ports	
Voyager600	4 Full-duplex SFP+
Voyager800	4 Full-duplex SFP+
Voyager1000	2 Full-duplex SFP+
Physical Interface	Optical- or copper-based on SFP
Line Rate	
Voyager600	Up to 6.25 Gb/s; 8B/10B encoded
Voyager800	Up to 8.5 Gb/s; 8B/10B encoded
Voyager1000	Around 10 Gb/s; 64B/66B encoded
Memory Size	
Voyager600	1 GB per port
Voyager800	1 GB per port
Voyager1000	2 GB per port
External Triggering	1 external trigger in 1 external trigger out
Time Stamp Resolution	10 ns

Protocol Solutions

General

Characteristic	Description
Traffic Capture	Each analyzer captures bi-directional traffic between two devices; or from up to 2 SPAN ports, or from 2 passive tap inputs
Dual Channel	Trigger on sequence of events in any Rx channel, in any analyzer
Sequencer	32 states per sequencer
Resources	32 counters and timers per sequencer
Pattern Matchers	Eight 32-byte pattern matchers (primitives or frames) with associated local occur
Combinations	“OR” conditions between pattern matchers
Internal Cross Triggering	Cross-module arm in/out for inclusion in sequencer events coming from another analyzer
Filters	Hardware filter conditions can be defined individually at each sequence level
Error Detection	Disparity, Code Violation, CRC Error, Loss of Sync
Frame Slicing	Store user-specified number of words beginning at SOF

Protocol Options

Option	Supported Protocols	Line Rates
AFDX (Opt. AFDX-1G-PP)	AFDX, ARINC644	—
Serial FPDP (Opt. SFPD-6G-PP)	VITA17.1	1.0625, 2.125, and 2.5 Gb/s 3.125, 4.25, 5.0, and 6.25 Gb/s
CPRI (Opt. CPRI-6G-PP)	CPRI	1.2288, 2.4576, 3.072, 4.9152, and 6.144 Gb/s
Gigabit Ethernet (Opt. ET-1G-PP)	—	10, 100, and 1000 Mb/s
10G Ethernet (Opt. ET-10G-PP)	SCSI, FCoE, TCP/IP and IPv6	9.95328 and 10.3125 Gb/s
1G Fibre Channel (Opt. FC-1G-PP)	FCP-SCSI, FC-AE-ASM, and FICON	1.0625 Gb/s
2G Fibre Channel (Opt. FC-2G-PP)	FCP-SCSI, FC-AE-ASM, and FICON	1.0625 and 2.215 Gb/s
4G Fibre Channel (Opt. FC-4G-PP)	FCP-SCSI, FC-AE-ASM, and FICON	1.0625, 2.215, and 4.25 Gb/s
8G Fibre Channel (Opt. FC-8G-PP)	FCP-SCSI, FC-AE-ASM, and FICON	1.0625, 2.215, 4.25, and 8.5 Gb/s
10G Fibre Channel (Opt. FC-10G-PP)	FCP-SCSI, FC-AE-ASM, and FICON	10.51875 Gb/s
3G Serial Attached SCSI (Opt. SAS-3G-PP)	SSP, SMP, STP	1.5 and 3.0 Gb/s
6G Serial Attached SCSI (Opt. SAS-6G-PP)	SSP, SMP, STP	1.5, 3.0, and 6.0 Gb/s
3G Serial ATA (Opt. SATA-3G-PP)	—	1.5 and 3.0 Gb/s
6G Serial ATA (Opt. SATA-6G-PP)	—	1.5, 3.0, and 6.0 Gb/s
3G Serial RapidIO (Opt. SRIO-3G1-PP)	Single lane of SRIO	1.25, 2.5, and 3.125 Gb/s
6G Serial RapidIO (Opt. SRIO-6G1-PP)	Single lane of SRIO	1.25, 2.5, 3.125, and 6.25 Gb/s

General

Display

Characteristic	Description
Display Type	17.3 in. LCD HD Display
Display Resolution	1920 × 1080

Computer System and Peripherals

Characteristic	Description
Operating System	Windows XP SP3
PC System Memory	3 GB
Hard Disk Drive	500 GB
CD/DVD Drive	R/W DVD
USB Ports	Four USB 2.0 High-speed Host Ports
LAN Ports	Two RJ-45 Connectors, supports 10/100/1000 Mb/s
Video Ports	One DVI Connector

Power

Characteristic	Description
Power Source Voltage	100 to 240 V AC ±10%
Power Source Frequency	50/60 Hz
Power Consumption	600 W maximum

Physical Characteristics

Dimension	mm	in.
Height	424	16.7
Width	333	13.1
Depth	173	6.8
Weight	**kg**	**lb.**
Net	10.5	23
Shipping	15	33

Environmental

Characteristic	Description
Temperature	
Operating	+5 °C to +45 °C derated 1.0 °C per 300 meters above 1,500 meters altitude
Nonoperating	–20 °C to +60 °C without disk media installed in disk drives
Humidity	
Operating	5% to 95% relative humidity (% RH) at up to +30 °C
Nonoperating	5% to 45% RH above +30 °C up to +40 °C noncondensing, and as limited by a maximum wet-bulb temperature of +29 °C
Altitude	
Operating	5% to 95% RH (Relative Humidity) at up to +30 °C
Nonoperating	5% to 45% RH above +30 °C up to +40 °C, noncondensing, and as limited by a maximum wet-bulb temperature of +29 °C
Regulatory	
Electromagnetic Compatibility	EU Council Directive 2004/108/EC
Certifications	UL61010-1:2004, Second Edition; CSA61010-1:2004, EN61010-1:2001; IEC 61010-1:2001

Ordering Information

TPI4202

Portable Chassis; supports up to 8 ports

Instrument Options

Interface Card Options

Option	Description
Voyager600	Multifunction Interface Card with 4 full-duplex SFP connectors. Supports copper and optical Media Kits for line rates up to 6.25 Gb/s; 8B/10B encoding
Voyager800	Multifunction Interface Card with 4 full-duplex SFP connectors. Supports copper and optical Media Kits for line rates up to 8.5 Gb/s; 8B/10B encoding
Voyager1000*[1]	Multifunction Interface Card with 2 full-duplex SFP+ connectors. Supports copper and optical Media Kits for line rates around 10 Gb/s; 64B/66B encoding

*[1] This option is not available in all countries.

Protocol Support Options

Option	Description
AFDX-1G-PP	AFDX Protocol Analyzer and Performance Statistics; Supports AFDX and ARINC644; Licensed per port pair
SFPDP-6G-PP	Serial FPDP Protocol Analyzer and Performance Statistics; Supports VITA 17.1 with link rates of 1.0625, 2.125, and 2.5 Gb/s. Also supports 3.125, 4.25, 5.0, and 6.25 Gb/s; Licensed per port pair
CPRI-6G-PP	6G CPRI Protocol Analyzer and Performance Statistics; Supports CPRI line rates of 1.2288, 2.4576, 3.072, 4.9152, and 6.144 Gb/s; Licensed per port pair
ET-1G-PP	Gigabit Ethernet Protocol Analyzer and Performance Statistics; Supports Ethernet line rates of 10, 100, and 1000 Mb/s; Licensed per port pair
ET-10G-PP	10G Ethernet Protocol Analyzer and Performance Statistics; Supports Ethernet line rates of 9.95328 and 10.3125 Gb/s; Includes support for iSCSI, FCoE, TCP/IP, and IPv6 protocols; Licensed per port pair
FC-1G-PP	1G Fibre Channel Protocol Analyzer and Performance Statistics; Supports Fibre Channel line rate of 1.0625 Gb/s only; Includes support for FCP-SCSI, FC-AE-ASM, and FICON protocols; Licensed per port pair
FC-2G-PP	2G Fibre Channel Protocol Analyzer and Performance Statistics; Supports Fibre Channel line rates of 1.0625 and 2.125 Gb/s; Includes support for FCP-SCSI, FC-AE-ASM, and FICON protocols; Licensed per port pair
FC-4G-PP	4G Fibre Channel Protocol Analyzer and Performance Statistics; Supports Fibre Channel line rates of 1.0625, 2.125 and 4.25 Gb/s; Includes support for FCP-SCSI, FC-AE-ASM, and FICON protocols; Licensed per port pair
FC-8G-PP	8G Fibre Channel Protocol Analyzer and Performance Statistics; Supports Fibre Channel line rates of 1.0625, 2.125, 4.25, and 8.5 Gb/s; Includes support for FCP-SCSI, FC-AE-ASM, and FICON protocols; Licensed per port pair
FC-10G-PP	10G Fibre Channel Protocol Analyzer and Performance Statistics; Supports Fibre Channel line rate of 10.51875 Gb/s; Includes support for FCP-SCSI, FC-AE-ASM, and FICON protocols; Licensed per port pair
SAS-3G-PP	3G Serial Attached SCSI Protocol Analyzer and Performance Statistics; Supports SAS line rates of 1.5 and 3.0 Gb/s; Includes support for SSP, SMP, and STP protocols; Licensed per port pair
SAS-6G-PP	6G Serial Attached SCSI Protocol Analyzer and Performance Statistics; Supports SAS line rates of 1.5, 3.0, and 6.0 Gb/s; Includes support for SSP, SMP, and STP protocols; Licensed per port pair
SATA-3G-PP	3G Serial ATA Protocol Analyzer and Performance Statistics; Supports SATA line rates of 1.5 and 3.0 Gb/s; Licensed per port pair
SATA-6G-PP	6G Serial ATA Protocol Analyzer and Performance Statistics; Supports SATA line rates of 1.5, 3.0, and 6.0 Gb/s; Licensed per port pair
SRIO-3G1-PP	3G Serial RapidIO (1X Mode) Protocol Analyzer; Supports Serial RapidIO on a single lane at rates of 1.25, 2,5, and 3.125 Gb/s; Licensed per port pair
SRIO-6G1-PP	6G Serial RapidIO (1X Mode) Protocol Analyzer; Supports Serial RapidIO on a single lane at rates of 1.25, 2,5, 3.125, 5.0, and 6.25 Gb/s; Licensed per port pair

Application Support Options

Option	Description
API-APP	Library API; C Library providing programmatic control over all TPI4000 tools; Licensed per system
BERT-6G-APP	6G Bit Error Rate Tester; Generate pseudo-random and user-defined data patterns on 8B/10B link; Enables BERT at line rates of 1.0625, 1.25, 1.5, 2.125, 2.5, 3.0, 3.125, 4.25, 5.0, 6.0, and 6.25 Gb/s; Licensed per port pair
BERT-10G-APP	10G Bit Error Rate Tester; Generate pseudo-random and user-defined data patterns on 64B/66B encoded links; Enables BERT at line rates of around 10 Gb/s; Licensed per port pair
IMPT-6G-APP	6G Impairment Tester; Simulates long cable lengths and high-latency devices at licensed line rates up to 6.25 Gb/s; Available for Fibre Channel and Ethernet only; Licensed per interface card
IMPT-10G-APP	10G Impairment Tester; Simulates long cable lengths and high-latency devices at licensed line rates around 10 Gb/s; Available for Fibre Channel and Ethernet only; Licensed per interface card
EINJ-4G-APP	4G Error Injector; Simulate error conditions to exercise error handling; Supports line rates up to 4.25 Gb/s; Available for Fibre Channel and Gigabit Ethernet only; Licensed per interface card
PE-APP	Protocol Editor; Add user-defined protocols to protocol database; Once added, supports decode, triggering, and filtering; Licensed per system
TGEN-APP	Traffic Generator; Generate valid and invalid traffic to full line rate; Available for Fibre Channel, Gigabit Ethernet, and 10G Ethernet; Licensed per interface card

Media Kit Options

Option	Description
MK-8GLC0850	LC 850 nm 50u Multi Mode Optical Media Kit (8.5 Gb/s)
MK-8GLC0862	LC 850 nm 62.5u Multi Mode Optical Media Kit (8.5 Gb/s)
MK-8GLC1309	LC 1310 nm 0.9u Single Mode Optical Media Kit (8.5 Gb/s)
MK-10GLC0850	LC 850 nm 50u Multi Mode Optical Media Kit (10 Gb/s)
MK-10GLC0862	LC 850 nm 62.5u Multi Mode Optical Media Kit (10 Gb/s)
MK-10GLC1309	LC 1310 nm Single Mode Optical Media Kit (10 Gb/s)
MK-6GSFPSMA	Includes 2 SFP to SMA cables (0.5 m)
MK-1GRJ45	RJ-45 Copper Media Kit (10/100/1000 Mb/s)
MK-SFPSATA	SFP to SATA Media Kit (2) (0.5M)

Power Cord Options

Option	Description
A0	North America
A1	Universal Euro
A2	United Kingdom
A3	Australia
A4	240 V, North America
A5	Switzerland
A6	Japan
A10	China
A11	India
A12	Brazil
A99	No power cord or AC adapter

Language Options

Option	Description
L0	English

Maintenance Support Options

Option	Description
ASM1	1-year Support; System software updates and protocol database updates; 1-year Hardware Warranty; Technical Support – Support of system functions, verification including standard equipment operation and configuration
ASM3	3-year Support; System software updates and protocol database updates; 3-year Hardware Warranty; Technical Support – Support of system functions, verification including standard equipment operation and configuration
ASM5	5-year Support; System software updates and protocol database updates; 5-year Hardware Warranty; Technical Support – Support of system functions, verification including standard equipment operation and configuration

TPI4000 Series Upgrades

You can add additional Voyager interface cards, protocol packages, or software applications to your existing TPI4000 protocol analyzer by ordering the appropriate upgrade kit. Please contact your local account manager for further details.

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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