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LeCroy

PCI EXPRESS®
PROTOCOL SOLUTIONS FOR TESTING AND VERIFICATION

PE*Tracer*™ Gen2 Summit Analyzer
PE*Tracer* EML Analyzer
PE*Trainer*™ EML Exerciser
PE*Tracer* ML Analyzer
PE*Trainer* ML Exerciser



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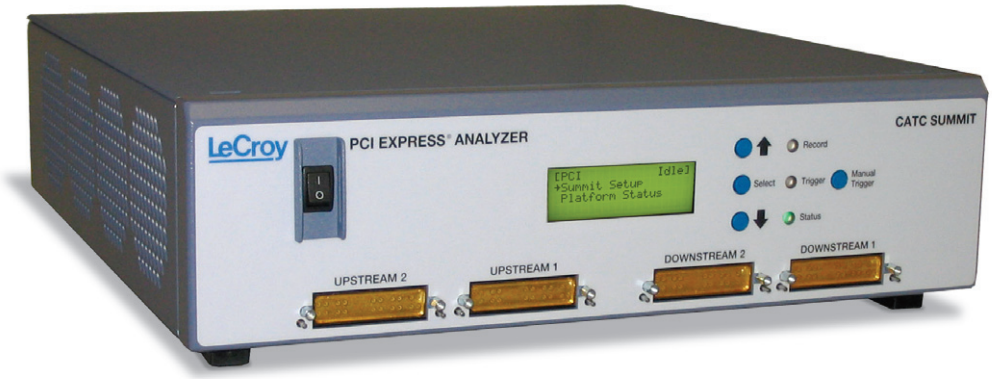
LeCroy, a worldwide leader in serial data test solutions, creates advanced instruments that drive product innovation by quickly measuring, analyzing, and verifying complex electronic signals. With systems available for both physical and protocol layer testing, LeCroy offers a complete solution to meet the high demands of PCI Express devices and their application.

The PCI Express Solutions

All PCI Express systems use the CATC™ architecture as their foundation for stable and reliable measurements. With a wide range of hardware platforms, field upgradeable firmware, and the ability to link analyzers together for high bandwidth applications, the CATC platforms can evolve as your protocol analysis needs change. The PCI Express solutions include both protocol analyzers and exercisers, and support lane widths from single lane to x16 and data rates of 2.5 Gb/s to 5 Gb/s.

Analyzers for Every Lane Width

The PE*Tracer* Gen2 Summit Analyzer is built on the CATC Summit platform, LeCroy's fourth generation architecture and our highest performance platform. It provides full bidirectional support of x16, x8, x4, x2, and x1 at data rates up to 5 Gb/s. With 8 GB of trace memory, it offers enough capacity for analyzing and recording extensive PCI Express data streams. It employs high-impedance, non-intrusive probing technology to ensure minimal system intrusion.



Supporting lane widths up to x16 at 2.5 Gb/s, the PE*Tracer* EML Analyzer uses the CATC 100K platform and has 8 GB of trace memory.

For lane widths of x1 to x4, the PE*Tracer* ML analyzer uses the CATC 10K platform and has 2 GB of trace memory.

Exercisers for Every Lane Width

The PCI Express exercisers assist you with generating PCI Express transactions, observing behavior, and performing both stress testing and compliance testing. The PE*Trainer* EML exerciser is the first exerciser on the market that supports up to x16 lane widths. It provides extensive root complex or end point emulation capabilities. Also available is the PE*Trainer* ML exerciser for up to x8 lane widths.

As a complete solution, the PE*Tracer*/*Trainer*™ systems give you the unique ability to record (capture) live traffic, modify the traffic, and then playback the exact data stream, or "script," using the exerciser. This saves time in setting up exerciser operations and provides an easy way to reproduce problems reported in the field.

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PE*Tracer*/*Trainer* ML System on the CATC 10K Platform



PE*Tracer*/*Trainer* EML System on the CATC 100K Platform

Powerful Display Views Allow for Easy Analysis of Protocol Traffic

LeCroy's analysis tools give you a variety of powerful tools for analyzing and displaying traffic. The application interface makes it easy for you to view all elements of a command, even if they are spread over several different physical links—helping you understand traffic flow and ensure devices are behaving correctly at the protocol level.

Unfiltered PCI Express traffic contains tens of thousands of packets, which can make it extremely difficult for you to analyze and discover errors within the data. Within the CATC Trace™ application, you can preserve the detail, but also have an easy way to view the traffic hierarchically.

For instance, you can:

- Isolate the view to the Link Transaction level by clicking on the Link icon. This narrows down the display to the transaction layer and data link layer of the protocol. The data link layer packets (DLLP) and transaction layer packets (TLP) are shown along with associated information such as packet number, direction of flow, header, flow control status, time stamp, data, ACK/NAK, and other packet level information.
- Decode down to the packet level by selecting the Pkt icon, Link icon, Split icon, ORD icon, or DLLP icon. This presents the packet information and shows the detail information of the devices involved, device IDs, types of commands, and performance data.

Although the CATC Trace display is ideal for showing traffic at the logical level, it is often necessary to drill down to the byte level and see traffic across multiple lanes on a common timescale. The Link Tracker application display provides this view, and allows you to see the low level primitives and 32-bit data structures in hex, scrambled hex, or decoded with the field names displayed. It shows a time slice at DWORD level resolution (13 ns), and chronologically displays all channels synchronized to a common clock. This is helpful for analyzing propagation delay or state changes between upstream and downstream links.

Within each of these displays, Tooltips pop up to provide you with detailed descriptions of the field, including information about the PCI Express specification. At the higher layers, valuable performance metrics are calculated for each operation such as the number of packets in a sequence or the throughput (bus utilization) both upstream and downstream from a specific event. This helps you identify possible problems at the lower levels.

Optional Probes for Advanced Analysis

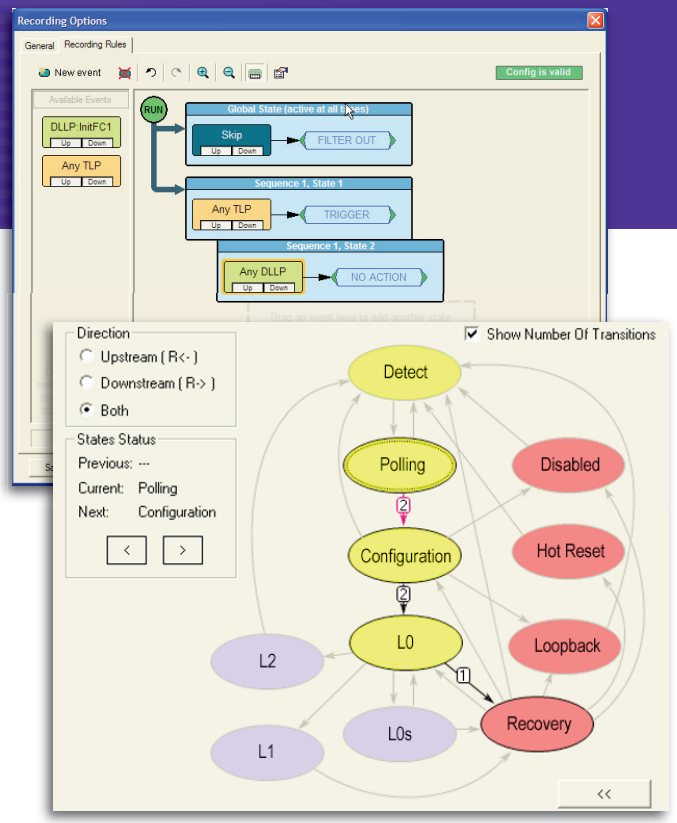
Analysis: The Slot Interposer Probe gives you a non-intrusive tap to capture the signals between a motherboard and an add-in card. The Mid-Bus Probe allows you to capture inter-chip signaling on a PCI Express board.

Bus Exercising: LeCroy offers an add-in card for end point emulation and a host emulation platform with x16 slot. Both probing options also provide traffic capture for simultaneous analyzer operations.

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Powerful Triggering and Filtering

As the protocol evolves and moves from prototypes to system level testing, triggering becomes more important since problems from linking devices are increasingly intermittent. The trigger display provides the ability to select simple triggers on typical events, like out of band signals, PCI Express operations, errors, link conditions, TLP Headers, DLLP Messages, Breakout Board Data, or Payload Data. Triggers can be set up on almost any sequence of events possible; it supports up to 32 levels or sequential states, with four events or actions per level. It also allows you to isolate the important part of the traffic stream, and when you open the trace, it jumps right to that portion.



LTSSM View

The intuitive CATC Trace display decodes and displays PCI Express packets with color-coded fields.

Indicates data rate (Gen1 or Gen2)

Automatically decodes TLP, DLLP's, and primitive packets.

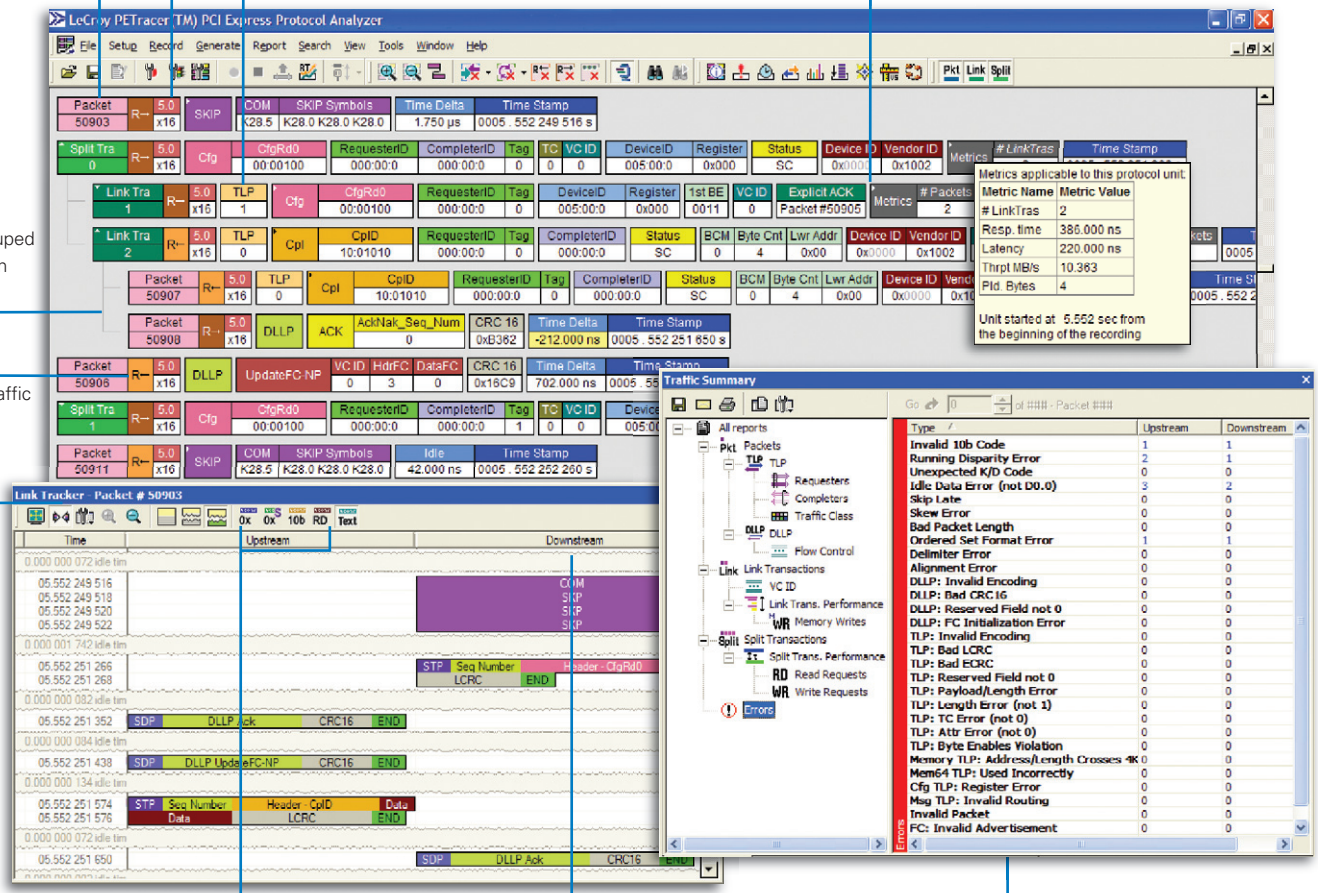
Expands to show flow control information

FC-NP	VC ID	HdrFC	DataFC
	0	2	Infinite

Packets grouped and shown in logical order.

Shows traffic direction.

The CATC Trace and Link Tracker displays can be synchronized.

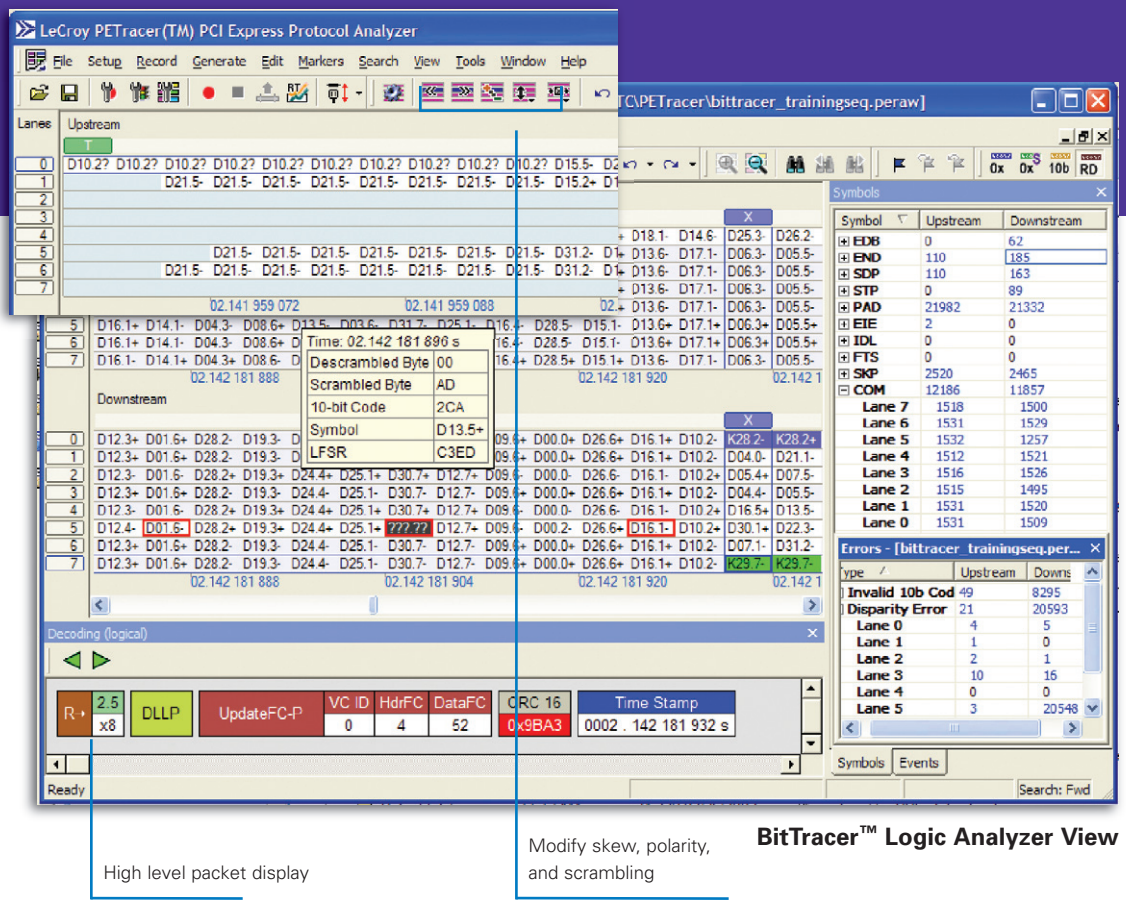


Displays data in 8b, 10b, scrambled values, symbol with running disparity or field names.

View by direction

Displays protocol errors

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BitTracer™ Logic Analyzer View

Comprehensive Traffic Reports and Summaries

Our PCI Express solutions are more than just data recorders. The real value is in the analysis of the data. The application presents real time statistics, including link utilization, data payload throughput, and data packet count. It also generates detailed reports that provide statistics on the occurrence of errors and packets, and counts events for the link transactions and split transactions in the trace. You can evaluate these metrics at a glance or use them to navigate through the recording. The traffic summary can be printed or saved to text with a single keystroke.

Search Results Quickly

The advanced search features in the search tool help you quickly find what you want. By using the Quick Search, you can select fields right from the drop down menu, such as Go To Trigger or Event, or directly to a specific marker or time stamp in the trace. The Go To feature provides a simple way to search for PCI Express specific items within the trace, such as packets or specific link transactions. The advanced Find lets you search on specific PCI Express parameters such as the TLP Type—Memory Write (32 bit). Using the Find dialog, you can chose your selection criteria and create a new trace file that represents only the data you seek.

Advanced Exerciser for PCI Express Traffic Generation

LeCroy's PE*Trainer* EML and PE*Trainer* ML exercisers are capable of generating and responding to all types of PCI Express transactions. The powerful scripting language allows for the creation of TLPs, DLLPs, and Ordered Sets. ACK's and NAK's can be automatically generated under your control, or inject CRC or symbol errors, and violate flow control credits and other types of errors. You can create test scripts by exporting traffic from a trace file captured with a PE*Tracer.* The exported script can then be modified to generate different test cases, insert errors or create loop tests. The point and click capability of the script editor makes modifying or creating scripts from scratch simple. The powerful scripting language allows for a link training script to be created with just 3 simple commands.

BitTracer Logic Display

The BitTracer option provides a physical layer traffic view, similar to a logic analyzer, combining the advantages of a protocol analyzer with those of a logic analyzer.

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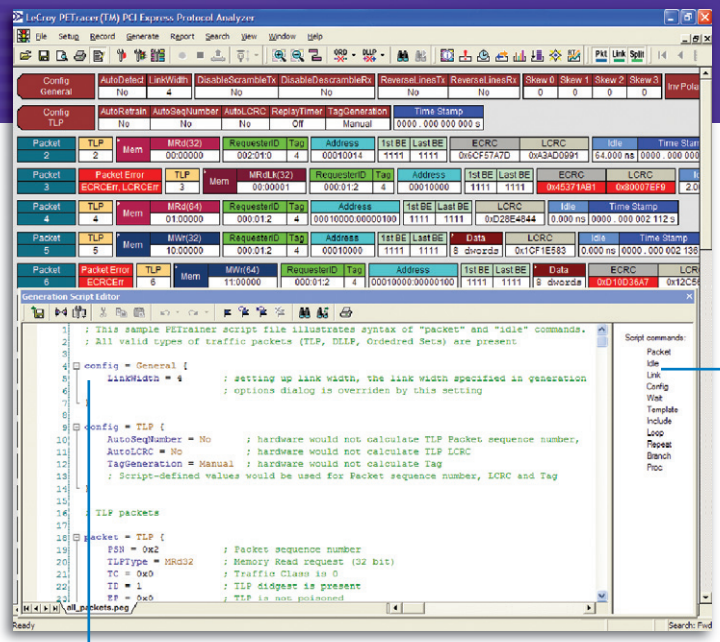
Compliance Testing

LeCroy offers an integrated and automated compliance testing system. Used together, the PE*Trainer* generates traffic to test the DUT and the PE*Tracer* captures the ensuing exchange of communication. Programs invoked within PE*Tracer* using its powerful Verification Scripting Engine (VSE) review the captured trace and compare what happened against the protocol's specifications. The automated system will report back with a pass or fail. After the tests are complete, a double-click on a test name within the application dialog will bring up the PE*Tracer* application and show the captured trace so problems can be analyzed. Tests be run repeatedly, and test logs may be automatically saved. You may create your own VSE scripts for evaluating captured traces. Provided tests include those for the link and transaction layers.

A Comprehensive Solution

LeCroy's PCI Express solutions provide you with advanced features necessary to ease the development and deployment of PCI Express devices and their applications. Combined with powerful PE*Tracer* analyzers and PE*Trainer* exercisers, the application interface makes it easy to understand what occurred in the data stream. At every level, you have the ability to drill deeper into the data, to get additional information about the traffic or even the protocol itself.

Let LeCroy's Serial Data Solutions peel back the layers of PCI Express to solve your test and verification challenges.



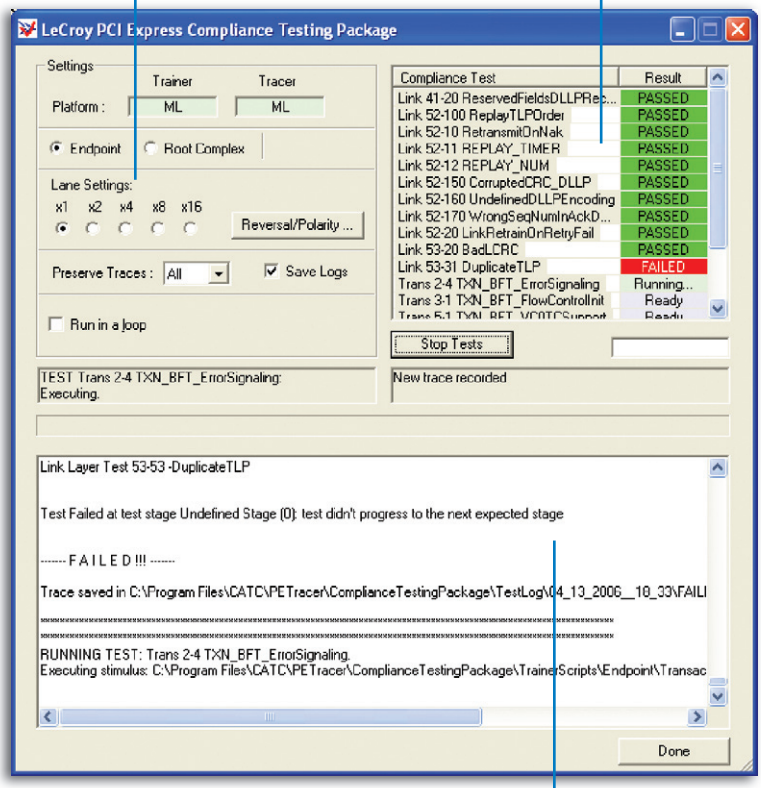
Script commands list values for all the parameters currently defined in the command.

All the commands and parameters are highlighted in blue and all predefined values and command modifiers are highlighted in brown.

PE*Trainer* Traffic Generation

Easily set test parameters

Name of tests with status report



Compliance Testing

Test log

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Specifications

CATC Summit Platform

PE*Tracer* Gen2 Summit

Host Requirements	Windows 2000 or greater; Intel Pentium II processor or greater; USB Port or 10/100 Ethernet
Recording Memory Size	8 GB for trace capture, timing, and control information
Power Requirements	100–240 VAC, 47–63 Hz (universal input), 480 W maximum
Connectors	AC power, external trigger (TRIG IN/OUT, BNC), USB host computer connection, breakout board data output, Ethernet
Recording	Lights when recording
Status	Lights during power up of platform; Blinks if self-test fails
Triggered	Lights when analyzer is triggered
Power	On/Off
Manual Trigger	Forces a trigger event when pressed
Dimensions	15.9" x 15.2" x 3.8" (40.4 x 38.6 x 9.6 cm)
Net Weight	18 lbs. (8.2 kg)

CATC 100K Platform

PE*Tracer*/*Trainer* EML

Host Requirements	Windows 2000 or greater; Intel Pentium II processor or greater; USB port
Recording Memory Size	4 GB for trace capture, timing, and control information
Power Requirements	90–254 VAC, 47–63 Hz (universal input), 200 W maximum
Connectors	AC power, external trigger (TRIG IN/OUT, BNC), USB host computer connection, breakout board data output connection
Power (PWR)	Lights when power is on
Status (STATUS)	Lights during power up of platform; Blinks if self-test fails
Triggered	Lights when triggering an event
Slot 1 Status	Lights when analyzer in slot 1 is recording
Slot 2 Status	Lights when analyzer in slot 2 is recording
Power	On/Off
Manual Trigger	Forces a trigger event when pressed
Dimensions	11.5" x 5.75" x 16.25" (29.2 x 14.6 x 41.3 cm)
Net Weight	9.5 lbs. (4.3 kg)

CATC 10K Platform

PE*Tracer*/*Trainer* ML

Host Requirements	Windows 2000 or greater; Intel Pentium II processor or greater; USB port
Recording Memory Size	2 GB for trace capture, timing, and control information
Power Requirements	90–254 VAC, 47–63 Hz (universal input), 150 W maximum
Connectors	AC power, external trigger (TRIG IN/OUT, BNC), USB host computer connection, breakout board data output connection
Power (PWR)	Lights when power is on
Status (STATUS)	Lights during power up of platform; Blinks if self-test fails
Manual Trigger Switch	Forces a trigger event when pressed
Dimensions	12.2" x 12.2" x 3.5" (31.1 x 31.1 x 8.9 cm)
Net Weight	7.5 lbs. (3.4 kg)

Environmental Specifications

Common to All Platforms

Temperature: Operating	32 °F to 131 °F (0 °C to 55 °C)
Temperature: Non-Operating	-4 °F to 176 °F (-20 °C to 80 °C)
Humidity: Operating	10% to 90% RH (non-condensing)

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Features and Benefits – Ordering Information

FEATURES	BENEFITS
Powerful and Intuitive CATC Trace	Faster interpretation and debug of PCI Express traffic.
Extensive Decoding	Understand the protocol with accurate, decoding of TLPs (Transaction Layer Packets), DLLPs (Data Link Layer Packets), and all Primitives.
Advanced Triggering/Filtering	Find errors fast by isolating important traffic, specific errors, or data patterns. Understand transactions by removing non-essential fields from the trace.
Intelligent Reporting	Quickly identify and track error rates, abnormal link or timing conditions, display configuration space, and protocol specification details.
Dword to Transaction Level Viewer	See and understand Symbol, Packet, Link, and Split Transaction protocol levels.
Monitoring and Link Utilization	Troubleshoot throughput, link utilization, and bandwidth issues.
BitTracer™ Option(1)	Records the bytes as they come across the link. Allows debugging of PHY layer problems. Gives protocol analyzer the best of both worlds; a logic analyzer format and decoded protocol analyzer format.
Auto Sense Link	Analyzes all traffic negotiation between two devices of different lane widths.
Lane Swizzling(1)	Accommodates specialized or unique board layouts for midbus connections.
Bifurcated Lane Support(1)	Supports multilink operations where ports are bifurcated into narrower links.
Deep Buffer Recording Capacity	Capture long recording sessions for analysis and problem solving.
CRC Checking	Know that info being displayed is accurate.
High-speed USB Port	No complicated setup required.
Downloadable Trace Viewer	Share and annotate trace recordings within a development team.
13 Month Warranty	Protect your investment.

(1) PE*Tracer* Gen2 Summit Systems only.

Ordering Information

Product Description	Product Code
PE*Tracer* Analyzers	
PCI Express PE*Tracer* ML x1 Analyzer System	PE001AAE-X
PCI Express PE*Tracer* ML x4 Analyzer System	PE002AAC-X
PCI Express PE*Tracer* ML x8 Analyzer System	PE003AAC-X
PCI Express PE*Tracer* EML x8 Analyzer System	PE009AAB-X
PCI Express PE*Tracer* EML x16 Analyzer System	PE008AAB-X
PCI Express PE*Tracer* Gen2 Summit x16 Analyzer System	PE015AAA-X
PCI Express PE*Tracer* Gen2 Summit x8 Analyzer System	PE022AAA-X
PCI Express PE*Tracer* Gen1 Summit x16 Analyzer System	PE024AAA-X
PCI Express PE*Tracer* Gen1 Summit x8 Analyzer System	PE025AAA-X
PE*Trainer* Exercisers	
PCI Express PE*Trainer* ML x1 Exerciser System (ML Host Emulation Platform)	PE001AGA-X
PCI Express PE*Trainer* ML x1 Exerciser System (ML Device Emulation Card)	PE001AGB-X
PCI Express PE*Trainer* ML x4 Exerciser System (ML Host Emulation Platform)	PE002AGB-X
PCI Express PE*Trainer* ML x4 Exerciser System (ML Device Emulation Card)	PE002AGC-X
PCI Express PE*Trainer* EML x8 Exerciser System (EML Host Emulation Platform)	PE009AGB-X

Product Description	Product Code
PE*Trainer* Exercisers (cont'd)	
PCI Express PE*Trainer* EML x8 Exerciser System (EML x16 Device Emulation Card)	PE009AGC-X
PCI Express PE*Trainer* EML x16 Exerciser System (EML Host Emulation Platform)	PE008AGB-X
PCI Express PE*Trainer* EML x16 Exerciser System (EML x16 Device Emulation Card)	PE008AGC-X
PCI Express LinkUP	PE024AGA-X
PCI Express Accessories	
PCI Express PE*Tracer* ML x8 Slot Interposer Gen1	800-0110-00
PCI Express PE*Tracer* EML x16 Slot Interposer Gen1	PE001UIA-X
PCI Express ExpressCard Interposer Gen1	PE006UIA-X
PCI Express AMC Interposer Card Gen1	PE007UIA-X
Mid-Bus Probes and Accessories	
Gen1	
Mid-Bus Probe Pod Gen1	PE001UAA-X
Multi-Lead Mid-Bus Cable Gen1	PE006ACA-X
Gen2	
x8 Mid-Bus Probe Pod Gen2	PE015ACA-X
x16 Slot Interposer Gen2 (Active)	PE028UIA-X
x16 Slot Interposer Gen2 (Passive)	PE008UIA-X

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