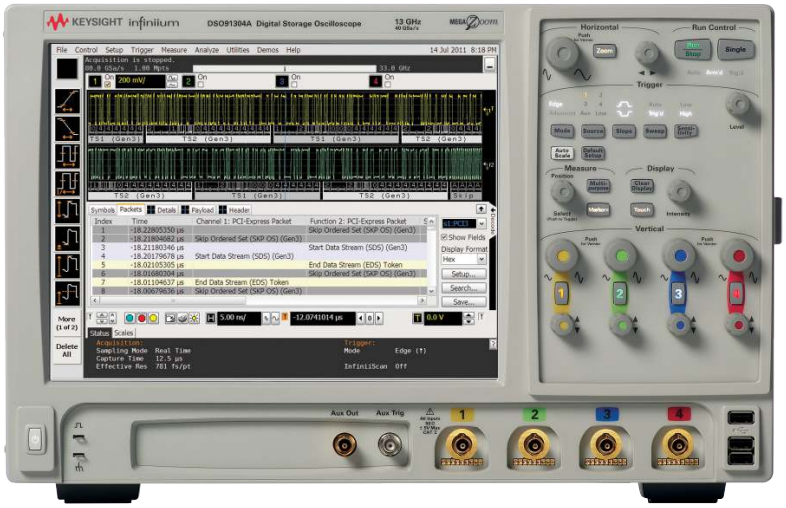
Keysight Technologies
N8816A
PCI Express 3.0 Protocol Viewer Software for Infiniium 90000 Oscilloscopes

Data Sheet



Simplify the validation of your PCI Express® 3.0 with the first full capability protocol viewer built into a digital oscilloscope.

KEYSIGHT TECHNOLOGIES

Introduction

Keysight Technologies, Inc. N8816A Infiniium protocol viewer software for PCI Express 3.0 enhances the industry's first totally integrated oscilloscope-based protocol analyzer technology providing time-correlated views of physical layer and data link layer protocol. You get packet-level decode for PCI Express® signals built into a real-time oscilloscope. This software provides you with a fast, easy way to isolate signal integrity problems from logic-level coding errors on bidirectional serial data streams. This capability allows you to test, debug and characterize your designs to the logic and link layer. The N8816A Infiniium protocol analyzer software has decode options for PCI Express Gen1 and Gen2 and Gen3 decode.

N8816A – Infiniium protocol viewer

PCIe™ Gen1, Gen2 and Gen3

E2688A SDA (prerequisite)

The N8816A Infiniium protocol viewer software is compatible with Keysight 90000 Series Infiniium oscilloscopes.

Features

The N8816A Infiniium protocol viewer software offers several features to simplify the validation of your PCI Express designs:

- Setup wizard for quick setup, configuration and test
- Packet-level decode of ordered sets as well as link and logical physical layers
- Serial data analysis with 128/130 bit streams (Gen3)
- Serial data analysis with 8B/10B symbols (Gen1, Gen2)
- Decode of scrambled and unscrambled symbols
- Bi-directional symbol and packet level decode
- Simultaneous display of packet/ symbol lists and waveform overlay
- Capability to save symbol and packet data lists to .csv and .txt files
- Packet decode details tab provides detailed information on packets
  - Channel information
  - Listing index
  - Link ordered set type
  - Control symbols
  - Reserved-bit settings
  - Data payload popup
  - CRC
  - Packet length
- Payload display shows data payload
- Unique packet-waveform correlation marker "blue line" makes it easy to scroll through waveforms to view synchronized packet and symbol lists
- Comprehensive serial search capabilities
  - Trigger and stop on search
  - Primitive, control symbol and packet search capability

Comprehensive Decode Capability

With the N8816A Infiniium PCI Express 3.0 protocol analyzer software, you can use the same oscilloscope you use for everyday debugging and signal quality testing to perform protocol-level testing. The software automatically decodes symbols, packets and ordered sets and provides informative results. It includes decode of reserved bit settings during training sequences and speed negotiation, greatly simplifying debugging of link training failures.

Some of the difficulties in validating PCI Express communication links are determining if link failures or instability is due to electrical problems or logic-level problems. The N8816A Infiniium PCI Express 3.0 protocol analyzer software allows you to analyze the root cause of these issues with a single piece of test equipment.

Easy Measurement Setup

The N8816A Infiniium PCI Express 3.0 protocol analyzer software uses the Serial Data Wizard to simplify setup of the clock recovery algorithm used to decode the various speeds of serial traffic that it supports. The wizard guides you quickly through the steps required to set up and perform symbol and packet-level decode.

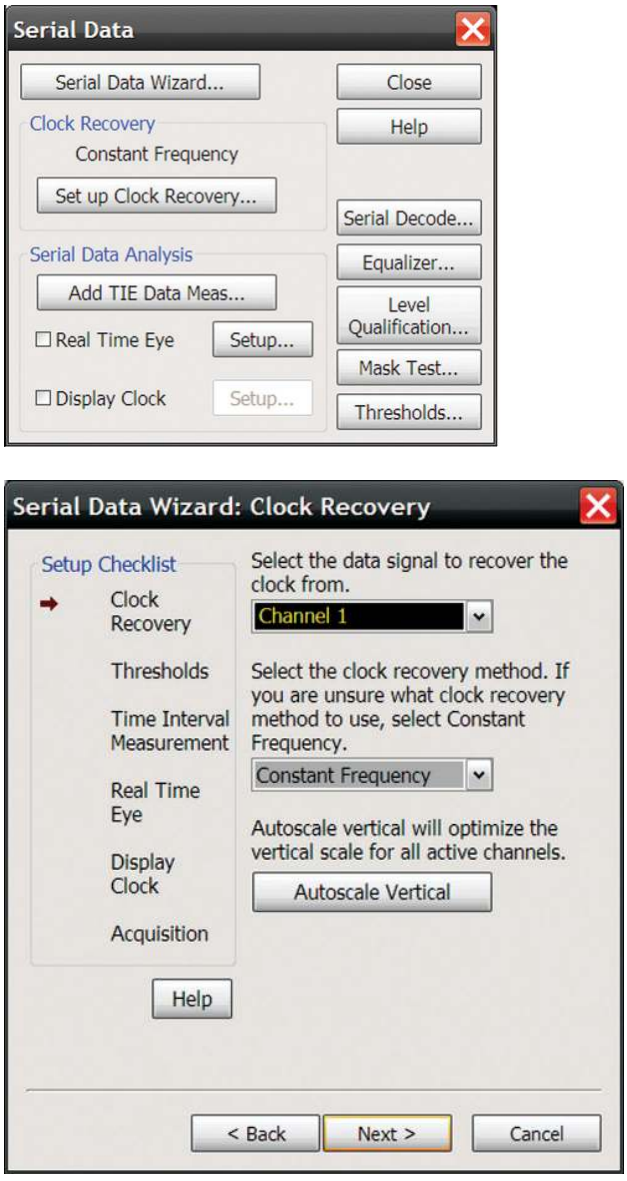


Figure 1. To set up the decode, the wizard asks you to identify the signal source and select the clock recovery algorithm (constant frequency shown. 1st and 2nd order PLLs can also be selected).

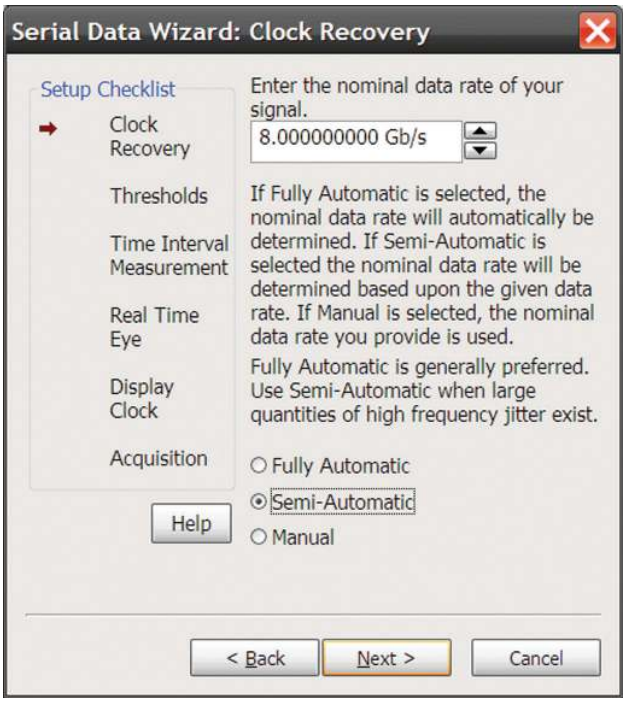


Figure 2. Next, the setup wizard asks you to enter the nominal data rate.

If you use a PLL based clock recovery selection, setting a higher loop bandwidth (ex: 40 Mhz) allows the clock recovery software to sync with the serial data quickly and decode more of the captured data.

Synchronized Analog and Digital Display

The N8816A Infiniium PCI Express 3.0 protocol analyzer software provides the ability to perform 128/130 bit and 8b/10b based packet decoding via a patented (patent pending) technique to capture and display serial data synchronized with the analog view of traffic of a serial data stream. Decode is displayed directly on the analog waveform as well as in the decode list with associated time and index displays.

Figure 3. The packet-level decode below the correlated portion of the PCI Express signal

In conjunction with the decode list, using the multi-grid waveform display you can simultaneously display analog bi-directional waveforms with corresponding decode listings.

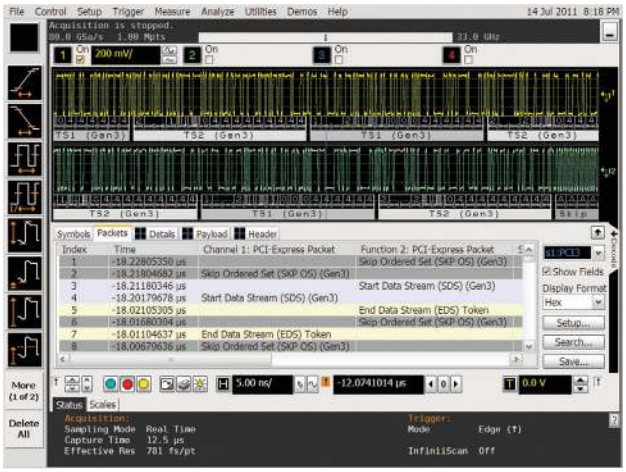


Figure 4. Bi-directional waveform and packet list are displayed simultaneously

The unique packet-waveform correlation marker "blue line" (patent pending) allows for convenient and intuitive correlation of analog and digital domains. You can easily scroll to analog anomalies that are visually distinct, making navigating and checking for errors easy, even for industry-leading record depths.

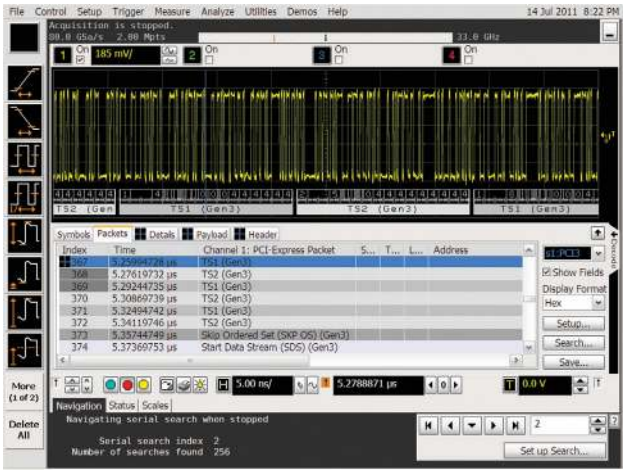


Figure 5. Packet-waveform correlation marker

The expandable decode list provides an extendable indexed view of packet decode for users who are more accustomed to logic analyzer "vertical style" packet decode traffic listings. The list includes color-coded packet types for easier visual searching of traffic patterns as well as a blue highlight that shows the packet that corresponds to the "blue line" in the waveform view. The side bar also shows how much of the waveform display is on the screen by providing a gray background on the index field, as shown in Figure 6.

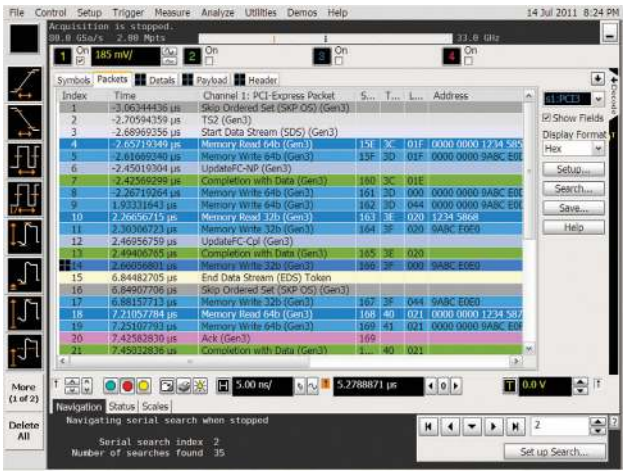


Figure 6. Expandable Decode List with correlation marker (line index 14).

Comprehensive Search Capabilities

The N8816A Infiniium PCI Express 3.0 protocol analyzer software includes a powerful serial search tool which allows you to search for a pattern that is a primitive, control symbol or packet, depending on the version of the PCI Express standard that is selected.

Figure 7. Searching for PCI Express 3.0 ordered sets

The search capability also includes a comprehensive packet search and trigger capability that allows you to specify search conditions like errors or data packets. This allows you to specify desired trigger conditions and makes finding errors or packet types easy by eliminating the need to do manual searches of very long records.

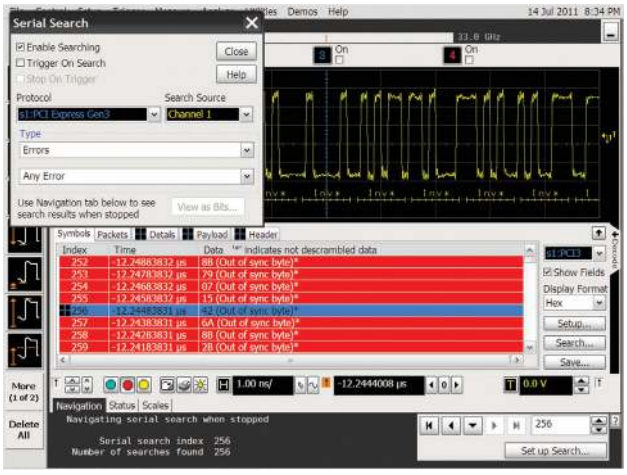


Figure 8. Searching for PCI Express 3.0 errors quickly identifies problems in the data stream.

Save Packet, Symbol and Waveform Data for Further Analysis

The N8816A Infiniium PCI Express 3.0 protocol analyzer software provides save capabilities for the symbol and packet lists in easy-to-export .csv or .txt formats for analysis outside of the scope application. Since the packet decode is performed on the real-time capture of the oscilloscope, the corresponding waveform can also be saved for future analysis in both the oscilloscope and external tools.

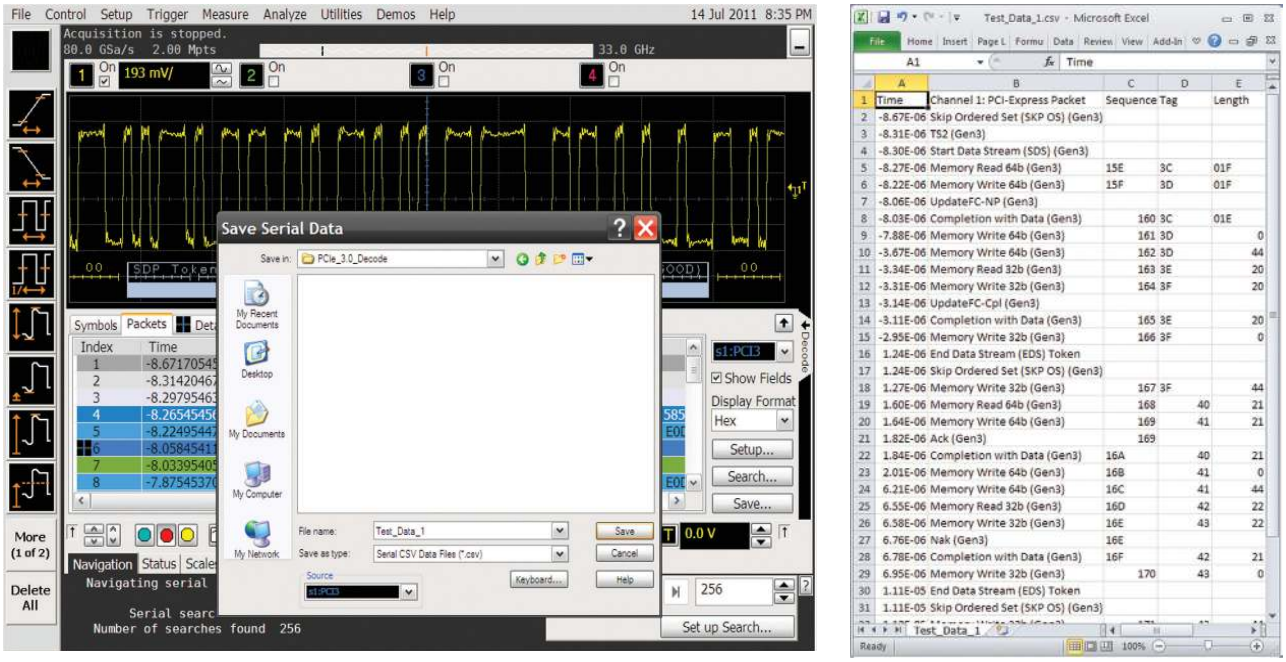


Figure 9. Saving symbol, packet, and waveform data

Oscilloscope Compatibility[1]

The N8816A Infiniium protocol analyzer software is compatible with Keysight 90000 Series oscilloscopes with operating software revision 3.10 or higher (Windows XP Pro). For oscilloscopes with earlier software revisions, free upgrade software is available at:

http://www.keysight.com/find/infiniium_sw_download

Data Rate	Recommended Oscilloscope	Bandwidth
2.5 Gb/s only	DSX91604A	16 GHz
	DSO/DSA/91304A	13 GHz
	DSO/DSA/91204A	12 GHz
	DSO/DSA/90804A	8 GHz
	DSO/DSA/90604A	6 GHz
5.0 Gb/s	DSX91604A	16 GHz
	DSO/DSA/91304A	13 GHz
	DSO/DSA/91204A	12 GHz
8.0 Gb/s	DSX91604A	16 GHz
	DSO/DSA/91304A	13 GHz
	DSO/DSA/91204A	12 GHz

Note:
For DSO/DSA/DSX 90000A Series oscilloscopes, you can choose the oscilloscope bandwidth using the calculation below.

Maximum signal frequency content =
0.5/fastest rise or fall time (10 - 90%)

Scope bandwidth required =
1.4x maximum signal frequency for 3% accuracy measurement

Scope bandwidth required =
1.2x maximum signal frequency for 5% accuracy measurement

Scope bandwidth required =
1.0x maximum signal frequency for 10% accuracy measurement

1. *Ensure that the probe amplifier meets the bandwidth requirement for your signal measurements. Refer to the "Probe accessories" section below to configure the probe head to go with your probe amplifier.*

Ordering Information

To purchase the N8816A Infiniium Protocol Analyzer software for your new or existing 90000 Series oscilloscope, order the following:

For Infiniium 90000 Series Oscilloscope	
Model number	**Description**
DSO/DSA/DSX 90000A	Infiniium 90000 Series scope with software 3.10 or higher
E2688A	Serial data analysis (SDA)
N8816A	N8816A Infiniium protocol analyzer software
1169A InfiniiMax I/II	Probe amplifier (optional if no SMA/SMP direct connection is possible, quantity 2 required to look at bi-directional traffic)
E2677A, E2678A, N5381A	InfiniiMax differential probe heads (solder in and socketed)
N5442A	Precision BNC 50 Ω InfiniiMax III adapter

To order the N8816A PCI Express 3.0 protocol viewer software as an option to the purchase of a new DSOX/DSO 90000 Series oscilloscope use option DSOX90000 opt. 049 or DSO90000A opt. 049

To order a network licensed version of the N8816A PCI Express 3.0 protocol viewer software order N5435A opt. 046

Probe Accessories

InfiniiMax Probe Amplifiers	
Model number	**Description**
1169A	12-GHz InfiniiMax II probe amplifier
1168A	10-GHz InfiniiMax II probe amplifier
1134A	7-GHz differential probe amplifier
N2801A	20-GHz InfiniiMax III probe amplifier
N2800A	16-GHz InfiniiMax III probe amplifier

InfiniiMax Probe Heads	
Model number	**Description**
N5381A InfiniiMax II	12-GHz differential solder-in probe head and accessories
N5382A InfiniiMax II	12-GHz differential browser
N5439A	InfiniiMax III ZIF probe head
N5441A	InfiniiMax III solder-in probe head
N5445A	InfiniiMax III browser head
E2677A InfiniiMax	12-GHz differential solder-in probe head and accessories
E2675A InfiniiMax	6-GHz differential browser probe head and accessories
N5425A InfiniiMax	12-GHz ZIF probe head
N5426A	ZIF tips (x10)
E2678A InfiniiMax	12-GHz differential socketed probe head and accessories

Related Keysight Literature		
Publication title	**Publication type**	**Publication number**
Infiniium Series Oscilloscope Probes, Accessories and Options	Selection Guide	5968-7141EN
Keysight Technologies E2688A, N5384A High-Speed Serial Data Analysis and Clock Recovery Software for Infiniium 90000 Series Oscilloscopes	Data Sheet	5989-0108EN
Keysight Technologies EZJIT and EZJIT Plus Jitter Analysis Software for Infiniium Series Oscilloscopes	Data Sheet	5989-0109EN
Keysight Technologies Infiniium 90000 Series Oscilloscopes and InfiniiMax Series Probe	Data Sheet	5989-7819EN
N5393C PCI Express® 3.0 (Gen3) Electrical Performance Validation and Compliance Software for Infiniium Oscilloscopes	Data Sheet	5989-1240EN
Keysight Technologies Oscilloscope Probes and Accessories	Data Sheet	5989-6162EN
Keysight InfiniiMax III Probing System	Data Sheet	5990-5653EN

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www.pxisa.org
PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

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For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

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