Keysight N8851A

100GBASE-KR/CR 64b/66b Solution with Link Training Decode Software

KEYSIGHT
TECHNOLOGIES

Introduction

64b/66b encoding is a principal line code that is used in data networking and transmission. 64b/66b encoding is the principal encoding scheme behind the 100GBASE-KR/CR (x1/x4) technology as it achieves DC balance across a serial stream. The 64b/66b encoding also has less overhead than the 8b/10b encoding scheme.

Keysight Technologies, Inc. N8851A Infiniium protocol viewer software for 100GBASE-KR/CR Ethernet is the only 64b/66b protocol decoder technology available on a real time oscilloscope, providing time-correlated views of physical layer and transaction layer errors.

You get packet-level decode for 100GBASE-KR/CR 64b/66b and link training decode Ethernet 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 simultaneously on up to four lanes of serial data streams. This capability allows you to test, debug and characterize your designs to the logic and link layer. The N8851A Infiniium protocol decoder software is designed to work with 100GBASE-KR/CR Ethernet technologies. It also comes with the unique ability to identify PRBS signal lengths to verify the correct signals are being passed though the DUT.

Table of Contents

Features

The N8851A Infiniium protocol decoder software offers several features to simplify the validation of your 100GBASE-KR/CR 64b/66b designs:

- Setup wizard for quick setup, configuration and test
- Packet-level decode of primitives as well as link and transaction layers
- Serial data analysis with 64b/66b bit streams
- Differential Manchester Encoding (DME) capability for link training decode
- Training Frame Decode
- Serial data analysis with PRBS detect
- Decode of scrambled and unscrambled symbols
- Quad-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 primitive 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 N8851A Infiniium 100GBASE-KR/CR 64b/66b protocol decoder software, you can use the same oscilloscope you use for everyday debugging and signal quality testing to perform protocol-level viewing. The software automatically decodes symbols, packets and primitives 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 100GBASE-KR/CR communication links are determining if link failures or instability is due to electrical problems or logic-level problems. The N8851A Infiniium 100GBASE-KR/CR 64b/66b protocol decoder and link training software allows you to analyze the root cause of these issues with a single piece of test equipment.

Easy Measurement Setup

The N8851A Infiniium 100GBASE-KR/CR 64b/66b protocol decoder and link training 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.

The N8851A is compatible with numerous clock recovery algorithms including first and second order PLL, constant, and explicit clock recovery. The N8851A is also compatible with Infiniium's Serial Data Equalization software, making it possible to decode signals even on equalized data.

To further simplify the decoding setup process, the N8851A includes an AUTO SETUP (see figure 2) button that will automatically setup the entire decoding setup. This includes clock recovery, memory depth, thresholds, and data rate. Users can also select the appropriate lane (0-3) that the oscilloscope is connected too. This will ensure that the proper polynomial bit pattern is selected for decode. After the AUTO SETUP is complete, the setup can be adjusted using the manual setup button (see figure 3).
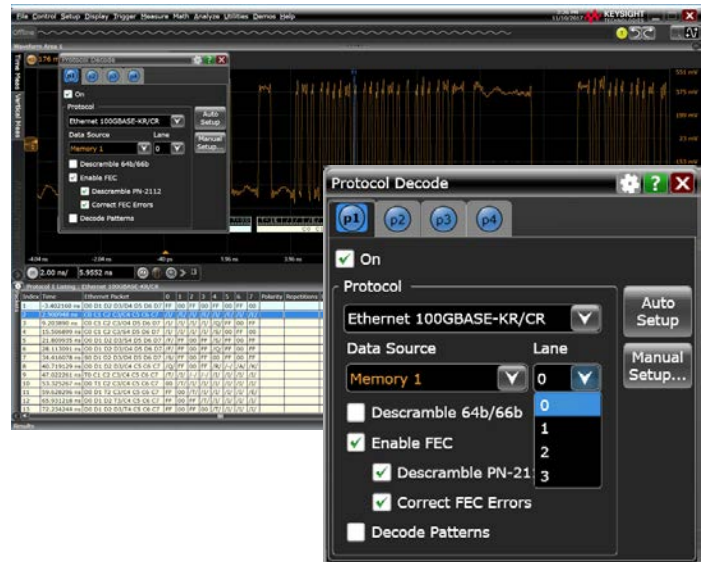

Figure 2. The 64b/66b and link training setup menu includes an "Auto Setup" tab, which enables you to begin decoding 100GBASE-KR/CR signals in less than 30 seconds.
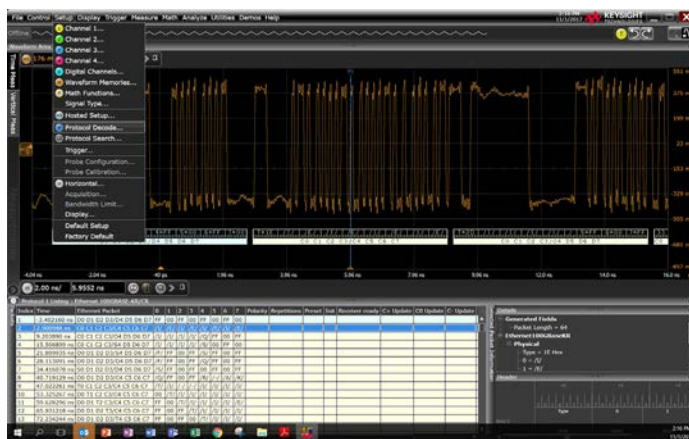

Figure 1. The 64b/66b setup is conveniently located in the "Setup" tab of the Infiniium 90000 and 90000 X-Series oscilloscopes.

Figure 3. Customize your decoding setting using the manual tab. Image above shows the manual menu option.

Synchronized Analog and Digital Display

The N8851A 100GBASE-KR/CR 64b/66b and link training decode software provides the ability to perform 64b/66b bit and link training based packet decoding via a Keysight exclusive 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.

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

The unique packet-waveform correlation marker "blue line" 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.

The expandable decode list provides an extendable indexed view of packet decode for users who are more accustomed to logic decoder "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 5.

Figure 4. The 64b/66b includes a viewing pane and alignment marker, making it easy to identify problems in the system.
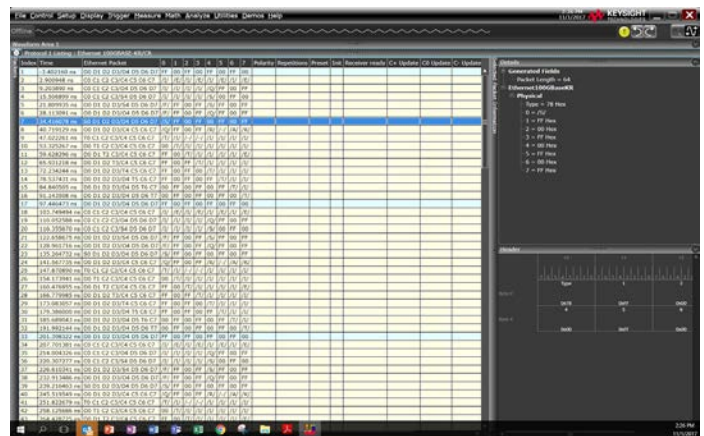

Figure 5. Maximize the window pane to see the full details of your design.

Comprehensive Search Capabilities

The N8851A 64b/66b Ethernet 100GBASE–KR/CR protocol software includes a powerful serial search tool which allows you to search for a pattern that is a primitive, control symbol or packet.

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.

– Errors
  – Any error
  – Unknown Control Sequence
  – Unknown Block Type
  – Invalid Ordered Set
  – Invalid FEC Block
  – Invalid 64b/66b Preamble

– 64b/66b blocks
  – Numerous blocks as specified by the 100GBASE–KR/CR specification
  – Example: D0 D1 D2 D3/D4 D5 D6 D7

– Pattern Detection
  – PRBS7
  – PRBS15
  – Square Wave
  – Compliance Pattern
  – Many more

– Differential Manchester encoding (DME) decode capability

– Training Frame decode includes (Link Training)
  – Frame Marker
  – Control Channel A - Coefficient update
  – Control Channel B - Status Report
  – Training Pattern

Figure 6. Training sequence of 100GBASE–KR/CR ethernet.
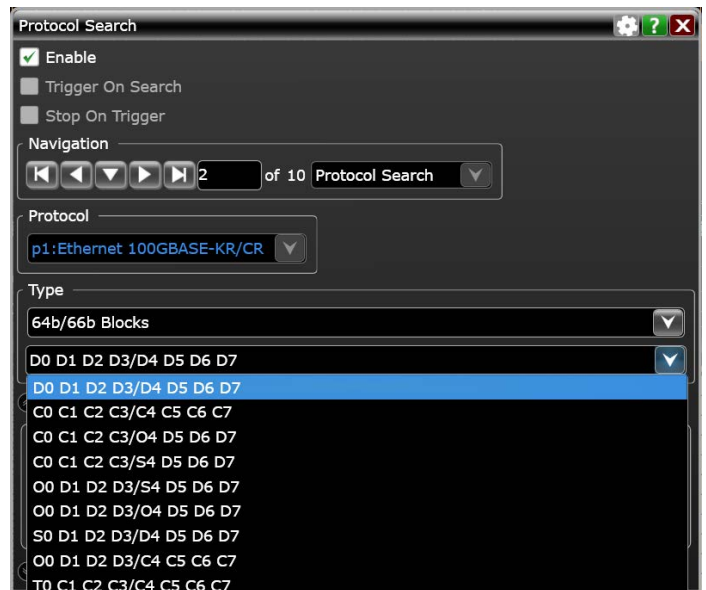

Figure 7. Search for specific blocks related to 64b/66b.

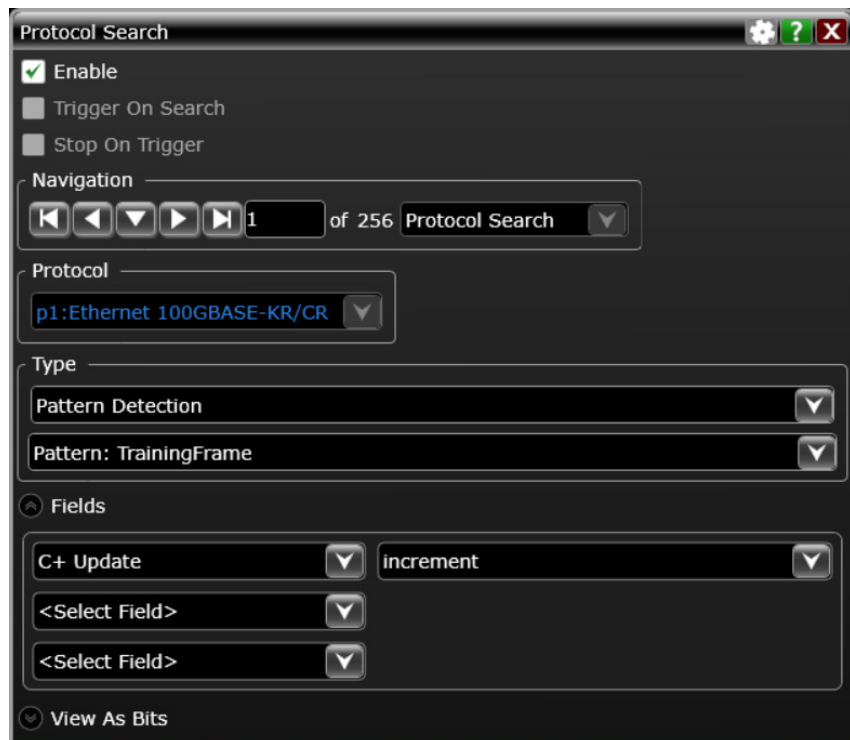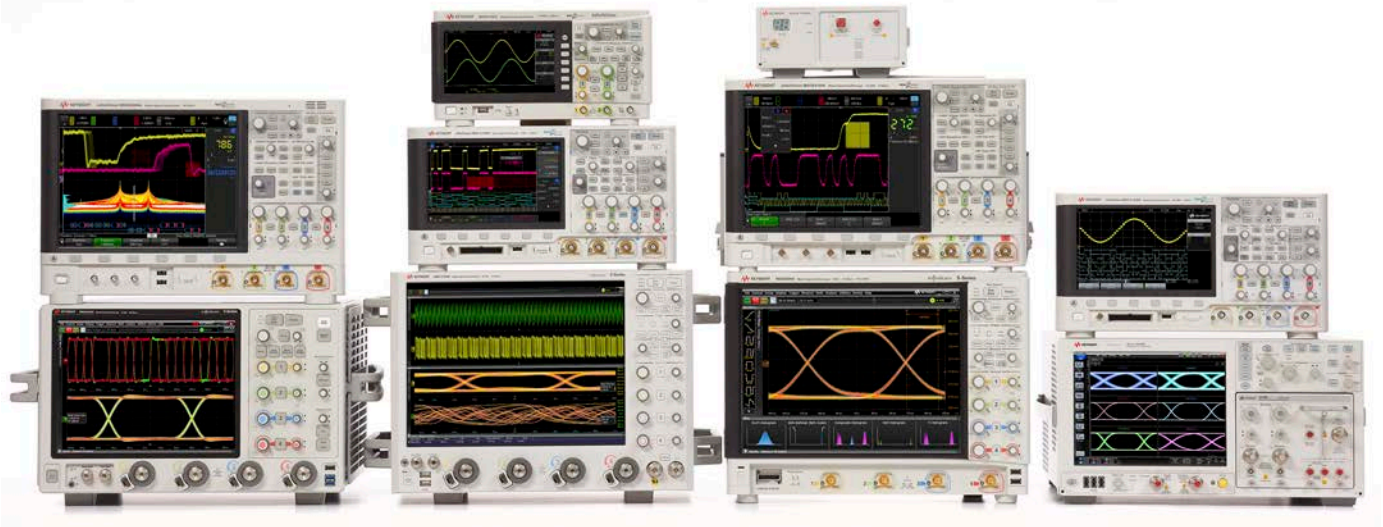# Comprehensive Search Capabilities (Continued)

Figure 8. Search for specific Coefficient Update and Status Report in the Training Frame.

Oscilloscope Compatibility

The N8851A Infiniium protocol decoder software is compatible with Keysight V and Z Series oscilloscopes with operating software revision 6.20 or higher (Windows 7).

	Software revision	Compatible
V Series	6.20 or later	Yes
Z Series	6.20 or later	Yes

Keysight Oscilloscopes

Multiple form factors from 20 MHz to > 90 GHz | Industry leading specs | Powerful applications

Download your next insight

Keysight software is downloadable expertise. From first simulation through first customer shipment, we deliver the tools your team needs to accelerate from data to information to actionable insight.

– Electronic design automation (EDA) software
– Application software
– Programming environments
– Productivity software

Learn more at
www.keysight.com/find/software

Start with a 30-day free trial.
www.keysight.com/find/free_trials

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.
From Hewlett-Packard to Agilent to Keysight.

myKeysight

myKeysight
www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

http://www.keysight.com/find/emt_product_registration
Register your products to get up-to-date product information and find warranty information.

KEYSIGHT SERVICES
Accelerate Technology Adoption.
Lower costs.

Keysight Services
www.keysight.com/find/service
Keysight Services can help from acquisition to renewal across your instrument's lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.

Keysight Channel Partners
www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/N8851A

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

Americas
Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific
Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East
Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

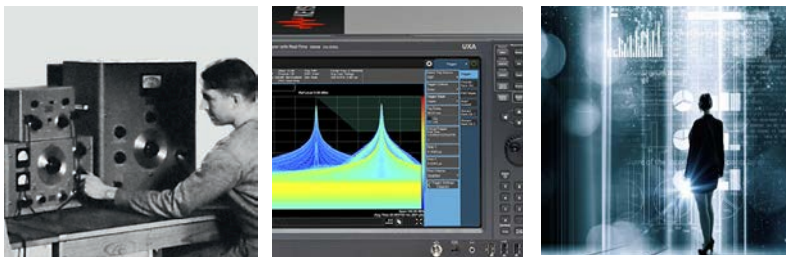For other unlisted countries:
www.keysight.com/find/contactus
(BP-9-7-17)

DEKRA Certified
ISO9001 Quality Management System

www.keysight.com/go/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2015
Quality Management System

KEYSIGHT
TECHNOLOGIES