DATA SHEET

## D9010EKRP 10/100GBASE-KR 64b/66b and Link Training Decode and Trigger Software for Infiniium Oscilloscopes

The D9010EKRP software package for Infiniium oscilloscopes gives you the ability to trigger and decode 10GBASE-KR and 100GBASE-KR 64b/66b and Link Training signals. This package applies to all Infiniium Oscilloscopes.

h	~~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~	G [1]		1 🗆
orm Window 1						<b>W</b> -1		9 5
3 50.0 mV/ 122 mV	<b>00 0</b> >0							_
TSX IIIV								
the first the first	112 1						I & Elite	
	M Wonteres In 100	in the inte	Why has by has we	WM MM M	1 lim has h	may your	MMANA	MM -
A WARNING	The second he	We we have	the half we have	m me my	we we	man har bu	√ 1 V VIV 10	
							1 . 111 1.	
	FFFF0000 R=2	N N Reser	yed=00 hold hol	d C Rese	rved×000	n n n		
<u></u>		11	Pattern: Trainir	ngFrame	the second part of the second second	and the second second		-28.
17.665 µn 47.667		47.670 µs	.47.671 µn 47.673 yr	47.674 µs	47.676 µs	47.677 µs	47.679 µs	47.580 µs
47.665 µs 47.667 1 1.50 ns/ 47.66553		47.670 µs		47,674 µs.	47.676 µs	47.677 µs	47.679 yrs	47.680 yrs
1.50 ns/ 47.66553	09 µs @ ¶ @ K <				47.676 µn	47.677 yr.	47.679 yri	47.580 µs
1.50 ns/ 47.66553 rotocol 1 Listing : Ethernet 1	09 µs 🔞 🦷 💿 🔣 🗨		of 256 Protocol Search		47.676 µs	47.677 µs	47.679 yr.	47.580 µs
1.50 ns/ 47.66553 rotocol 1 Listing : Ethernet 1 Po Re Preset 1	09 µs 🔞 🦷 💿 🔣 🗨	C+ Update C0 Update	of 256 Protocol Search	- stat	47.676 µs erated Fields	47.677 µs	47.679 yr.	47.580 µs
1.50 ns/     47.66553       votocol 1 Listing : Ethernet 1       7 Po Re Preset     1       Normal operation for	09 µs 😨 🖷 💿 🔳 🔳 noogease kry/cr nit Rx ready	C+ Update C0 Update p hold hold	C- Update C+ stat C0 stat C	stat		47.677 pa	47.679 ya	47.580 µs
1.50 ns/ 47.66553 votocol 1 Listing : Ethernet 3     Po Re Preset     Normal operation N     Normal operation N	09 µs P A C A C A C A C A C A C A C A C A C A	C+ Update C0 Update p hold hold p hold hold p hold hold	of 256 Protocol Search  C- Update C+ stat C0 stat C hold not updated not updated not hold	- stat Standored A Genu of updated Stupdated 27 = Ethe	erated Fields acket Length = 64 rmet100GBaseKR	47.677 ps	47.679 ya	47.580 yrs
H     1.50 ns/ 47.66553 rotool 1 Listing : Dhernet 1     Normal operation 1     Normal operation 1     Normal operation 1     Normal operation 1	09 µs (C)	C+ Update C0 Update p hold hold p hold hold p hold hold p hold hold	of 256 Protocol Search  C Update C+ stat. C0 stat. C Indian not updated not updated not bald not updated not up	- stat - Sa Details Science - Sa Details Science - Sa Details Science - Sa Details Provided - Sa Details Prov	erated Fields acket Length = 64 meet 100GBaseKR hysical		47.679 ya	47.580 µs
H 1.50 ns/ 47.66553 rotool 1 Listing Ethernet 1 Normal operation N Normal operation N Normal operation N Normal operation N	DP ps @ @ @	C+ Update C0 Update 9 hold hold 9 hold hold 9 hold hold 9 hold hold 9 hold hold	of 256 Protocol Search	- stat - stat	erated Fields acket Length = 64 Invsical FrameMarker = FFFF 0000		47,679 ya	47.680 µs
N     1.50 ns/     47.66553     rotocol 1 Listing 2 Ethernet 3     Normal operation N	Do gas P C C C C C C C C C C C C C C C C C C	C+ Update CO Update 9 hold hold 9 hold hold 9 hold hold 9 hold hold 9 hold hold 9 hold hold 9 hold hold	of 256 Protocol Search V State Co State	stat tigotated tigot	erated Fields acket Langth = 64 rnet100CBaseKR hysical FrameNarker = 10 Coefficient Update = 10		47.679 ya	47.680 µs
1.50 ns/ 47.66553     votocol 1 Listing 1 Ethernet 3     Perest II     Normal operation 1	09 us 00 ks construction 00 cm construction	C+ Update C0 Update p hold hold p hold hold	of 256 Protocol Search V 250 India cot updated not updated no load not updated not updated no hold no ho	stat stat Selfectored Kupdated K	erated Fields acidet Length = 64 rmet100GBaseKR hysical FrameNarker = 1FFF 0000 Coefficient Update = 80 Reserved = 2 Hex	) Hex 10 Hex	47.679 ya	47.680 µs
H         1.50 ns/         47.66553           rotocol 1 Listing : Ethernet 1         1           Refine Preset         11           Normal operation N         Normal operation N	02 Ja Contract Table 2000 Contract Cont	C+ Update C0 Update 9 hold hold 9 hold hold	of 256 Protocol Search	stat t updated t upd	erated Fields acket Langth = 64 Investoal FrameMacker = 167FF 0000 Coefficient Update = 80 Reserved = 2 Hex Preset = Normal open=	l Hes. 10 Hes tion	47.57 ys.	47.680 µs
1.50 ns/ 47.66553 retorol 1 listing 2 therms 3     Normal operation 6	02 Ja Contract Table 2000 Contract Cont	C+ Update CD Update 9 hold hold 9 hold hold	of 256 Protocol Search V 250 India cot updated not updated no load not updated not updated no hold no ho	stat Construct Const	erated Fields acidet Length = 64 rmet100GBaseKR hysical FrameNarker = 1FFF 0000 Coefficient Update = 80 Reserved = 2 Hex	l Hes. 10 Hes tion	47.679 ya	47.580 µs
1.50 ms/         47.66553           votocol 1 Listing a Ethernet 1         1           Perket         1           Normal operation N         Normal operation N	09 ja 20 in	C+ Update C0 Update 0 hold hold 0 hold hold	of 256 Protocol Search V 20 C Update C+ stat C0 stat C hold exturbate on thu updated in hold exturbates on thu updates	Ext     Second A     Secon	erated Fields scket Langth = 64 rmet100CBaseKR hysical FrameNarkor = FFF 0000 Coefficient Update = 00 Reserved = 2 Hex Preset = Normal operational Init = Normal operational I	) Hex 10 Hex 10	47.679 ya	47.580 µs
1.50 ma/ 1.50 ma/ 1.60 ma/ 10 ma/	00 Ja 20 1 Research Control Carlon Control Carlon Control Carlon	C- Update (C) Update 0 hold hold 0 hold hold hold 0 hold hold hold 0 hold hold hold hold 0 hold hold hold hold hold hold hold hold	of 256 Protocol Search	dat     dat     dat     decaded     d	erated Fields actat Length = 64 met 100GBaseKR bryskal Coefficient Update = 08 Reserved = 2 Hex Freat = Normal operation Freat = Normal operation Reserved = 00 Hex	) Hex 10 Hex 10	47.57 ys.	47.580 µs
1.50 m/l         47,66553           Vettorol, I, Listing, Ethernet, J.         100 kg/ hessis           1.00 kg/ hessis         10           Normal cogration N         Normal cogration N	00 Jas 😧 🕀 <table-cell> 🔍 🔍 🔍 DOCINGER KRUCK DOCINGER KRUCK DOC</table-cell>	C+ Update C0 Update 0 hold hold 0 hold hold hold 0 hold hold hold hold 0 hold hold hold hold hold hold hold hold	of 256 Protocol Search V 20 C Update C+ stat: C0 stat: C hold not vupdated not vupdated not hold not vupdated not vupdat	dat     defate	erated Fields schet Eurgh – 64 met 100GBaseKR hyskal FrameNarkar – FFFF 0000 Coefficient Update = 10 Reserved = 21 Hex Preset = Normal operation Reserved = 20 Hex Reserved = 00 Hex C+ Update = increment	) Hex 10 Hex 10	4257 ya	47.660 µs
1.50 m/l         47.66553           Votocol J, Lisling, Etherret J.         100 m/l           1.00 m/l         100 m/l	00 Ja 20 10 10 10 10 10 10 10 10 10 10 10 10 10	Co- Update (CO Update) 0 hold hold 0 hold hold hold 0 hold hold hold 0 hold hold hold 0 hold hold hold hold hold hold hold hold	of 256 Protocol Search	dat V Details dat V Details december decemb	erated Fields actor Langth = 64 Franct IOGGBaseKR hysical FranctHarkar = FFF 0000 Coefficient Update = n0 Reserved = 2 Hex Preset = Normal operation Reserved = 00 Hex C+ Update = incremen C0 Update = hold	) Hex 10 Hex 10	4359ya	47.680 µs
1.50 mul         42,66553           Vettorol I, Listing: Ethernet L         100 kg Press           1.00 kg Press         10           Normal cogration N         Normal cogration N	09 ja 0 (i)	C- Update (CO Update 0 hold hold 0 increment hold 0 increment hold 0 increment hold	of 256 Protocol Search V 20 C tipotate C+ stat C0 stat C hold not updated not updated no hold n	Contract	erated Fields actor Langth = 64 Franct IOGGBaseKR hysical FranctHarkar = FFF 0000 Coefficient Update = n0 Reserved = 2 Hex Preset = Normal operation Reserved = 00 Hex C+ Update = incremen C0 Update = hold	) Hex 10 Hex 10	4.654 pc	47.660 µs
LSO nu/     47.665533     4000     41.500 nu/     4000     40	00 pp 20 000 000 000 000 000 000 000 000	C Update COUpdate C Update COUpdate C Update COUpdate Node	of 256 Protocol Search V 200 C Update C+ stat CO stat C hold not updated not updated no hold	december	erated Fields actor Length - 64 France 100CEasesKR bysical Frametakar - FIFF 000C Coefficient Update - no Reserved - 2 Hes Reserved - 2 Hes Reserved - 20 Hes C - Update - Incremen C Update - hold C. Update - hold	There 10 Here to t		
LSO nul     LSO nul     LSO nul     LSO nul     LSO nul     LSO nul     Long a themas     Normal operation is	209 jp 200 m 201 m	Ca Updafa Couponna Dada Indd Dada Indd Da	of 256 Protocol Search V 20 C typdate C+ stat C0 stat C hold not updated not updated no hold no ho	Ideal     I	erated Fields actor Length - 64 France 100CEasesKR bysical Frametakar - FIFF 000C Coefficient Update - no Reserved - 2 Hes Reserved - 2 Hes Reserved - 20 Hes C - Update - Incremen C Update - hold C. Update - hold	) Hex 10 Hex 10		47.660 µs
LSO nu/     LSO nu/     LSO nu/     Libiting: Ethernet 2     Normal operation N	09 ps 20 cline virus DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT DOCI	C- Opdate CO Update o Roda Notel o Roda No	of 256 Protocol Search V 20 C Update C+ stat C0 stat C hold not updated not updated no bod not updated not updated no hold not updated	total     t	erated Fields actor Length - 64 France 100CEasesKR bysical Frametakar - FIFF 000C Coefficient Update - no Reserved - 2 Hes Reserved - 2 Hes Reserved - 20 Hes C - Update - Incremen C Update - hold C. Update - hold	 Hers 10 Hex t t		
LSO nu/     LSO nu/     LSO nu/     LSO nu/     LSO nu/     Lobigs 2 themes 2     Normal operation N	200 pp. 200 million 200 millio	C- Update Co Dydate C- Update Co Dydate Sold Nod Nod Nod Nod Nod Nod Nod Nod Nod Nod Nod Nod Nod	of 256 Protocol Search (C) 257 C tipdate C+ stat. (C) stat. (C) add cont updated not updated no do cont updated not updated no do cont updated not updated no do cont updated not updated no hold not not updated no hol	december	erated Fields shot Langh - 64 The Construction Francharker - FIFT 0000 Coefficient Update - 100 Reserved 2 Hax Preset - Normal operator Software - Normal operator Coefficient Update - 100 Coefficient Update - 100 Coe	Hex 10 Hex tom t	- lelelelelelelelele	-1 La la la la
LSO nu/     LSO nu/     LSO nu/     LSO nu/     LSO nu/     Lobigs 2 themes 2     Normal operation N	09 ps 20 cline virus DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT UNIT DOCIMENT DOCI	C Update C Update C Update C Update Data Tead Data T	of 256 Protocol Search V 20 C Update C+ stat C0 stat C hold not updated not updated no bod not updated not updated no hold not updated	Control of Contro	erated Fields actor Length - 64 France 100CEasesKR bysical Frametakar - FIFF 000C Coefficient Update - no Reserved - 2 Hes Reserved - 2 Hes Reserved - 20 Hes C - Update - Incremen C Update - hold C. Update - hold	 Hers 10 Hex t t	- leielalule/alala	



## Table of Contents

Product overview	3
Features	4
Comprehensive Decode Capability	5
Easy Measurement Setup	6
Synchronized Analog and Digital Display	6
Comprehensive Search Capabilities	6
Trigger and Decode Capabilities	7
Ordering Information and Related Literature	8
Required hardware	8
Flexible Software Licensing and KeysightCare Software Support Subscriptions	8
License Terms	8
License Types	8
KeysightCare Software Support Subscriptions	8
Selecting your license	9
Examples	9
Related literature	9

### Product overview

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 10GBase-KR (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.

The D9010EKRP Infiniium protocol viewer software for 10/100GBase-KR Ethernet provides time-correlated views of physical layer and transaction layer errors. You get packet-level decode for 10/100GBASE-KR 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 N8815A Infiniium protocol decoder software is designed to work with 10GBase-KR 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.

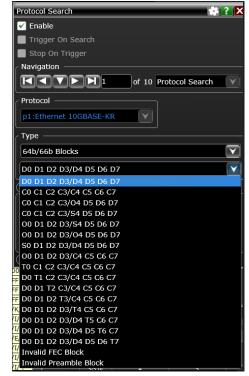


Figure 1. Advanced search capabilities on various 64b/66b blocks

## Features

The N8815A Infiniium protocol decoder software offers several features to simplify the validation of your 10GBASE-KR 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
  - o Channel information
  - Listing index
  - Link primitive type
  - o Control symbols
  - Reserved-bit settings
  - o Data payload popup
  - o CRC
  - o 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
  - o Primitive, control symbol and packet search capability

## **Comprehensive Decode Capability**

With D9010EKRP, 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 10/100GBase-KR communication links are determining if link failures or instability is due to electrical problems or logic-level problems. This package allows you to analyze the root cause of these issues with a single piece of test equipment.

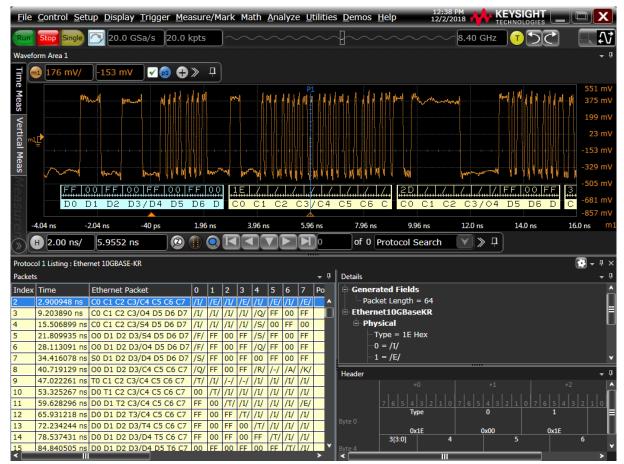


Figure 2. Protocol decoding view with time aligned decode, physical layer view, and packet table with details to the right. The blue line in the middle is referenced below.

## Easy Measurement Setup

D9010EKRP 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.

Numerous clock recovery algorithms including first and second order PLL, constant, and explicit clock recovery are available. D9010EKRP 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, we include an AUTO SETUP button that will automatically setup clock recovery, memory depth, thresholds, and data rate. After the AUTO SETUP is complete, the setup can be adjusted using the manual setup button.

## Synchronized Analog and Digital Display



The N8815A 10GBASE-KR 64b/66b and link training Figure 3: clock recovery setup dialog

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" (see figure 2) 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.

## **Comprehensive Search Capabilities**

The N8815A 64b/66b ethernet 10GBase-KR 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.

## Trigger and Decode Capabilities

Specifications and Characteristics	
Signal sources	Any analog channel Any waveform math Any waveform memory
Auto setup	Automatically configures trigger levels, decode thresholds, sample rate, memory depth, holdoff, and trigger
Decode options	64b/66b scramble/descramble FEC enable/disable PN-2112 scramble/descramble Correct FEC errors Decode patterns
Trigger options (via search)	64b/66b blocks (as defined by specifications) Pattern detection: square waves, PBRS, compliance Errors: unknown control sequence, unknown block type field, invalid ordered set, invalid FEC block, invalid preamble, unknown packet

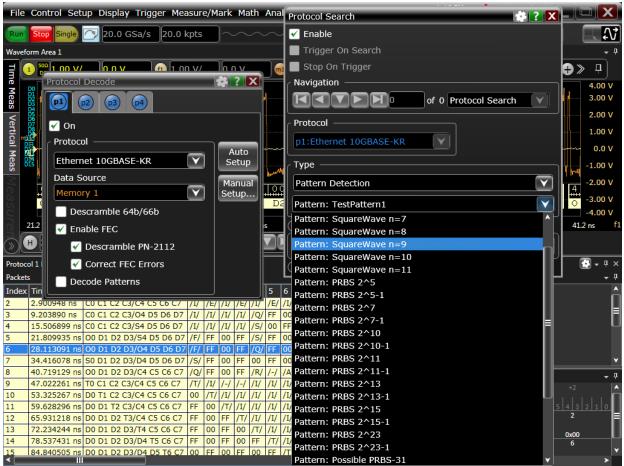


Figure 4: Selecting one of many different pattern detection search options

# Ordering Information and Related Literature Required hardware

The protocol triggering and decode software is compatible with Keysight Infiniium V-Series, Z-Series, and UXR-Series oscilloscopes with operating software revision 6.30 or higher.

#### Flexible Software Licensing and KeysightCare Software Support Subscriptions

Keysight offers a variety of flexible licensing options to fit your needs and budget. Choose your license term, license type, and KeysightCare software support subscription.

#### License Terms

Perpetual – Perpetual licenses can be used indefinitely.

**Time-based** – Time-based licenses can be used through the term of the license only (6, 12, 24, or 36 months).

#### License Types

**Node-locked** – License can be used on one specified instrument/computer.

**Transportable** – License can be used on one instrument/computer at a time but may be transferred to another using Keysight Software Manager (internet connection required).

**USB Portable** – License can be used on one instrument/computer at a time but may be transferred to another using a certified USB dongle (available for additional purchase with Keysight part number E8900-D10).

**Floating (single site)** – Networked instruments/computers can access a license from a server one at a time. Multiple licenses can be purchased for concurrent usage.

#### KeysightCare Software Support Subscriptions

#### KeysightCare Software Support Subscription provides peace of mind amid evolving technologies.

- Ensure your software is always current with the latest enhancements and measurement standards.
- Gain additional insight into your problems with live access to our team of technical experts.
- Stay on schedule with fast turnaround times and priority escalations when you need support.

Perpetual licenses are sold with a 12 (default), 24, 36, or 60-month software support subscription. Support subscriptions can be renewed for a fee after that.

Time-based licenses include a software support subscription through the term of the license.

#### Selecting your license

- **Step 1.** Choose your software product (eg. D9010EKRP).
- Step 2. Choose your license term: perpetual or time-based.
- Step 3. Choose your license type: node-locked, transportable, USB portable, or floating.
- **Step 4.** Depending on the license term, choose your support subscription duration.

#### **Examples**

If you selected:	Your quote will lo	ok like:
D9010EKRP node-	Part Number	Description
locked perpetual license with a	D9010EKRP	10G/100GBASE-KR 64b/66b and Link Training Decode/Trigger Software
12-month support	R-B5P-001-A	Node-locked perpetual license
subscription	R-B6P-001-L	KeysightCare software support subscription, node-locked–12 months
D9010EKRP	Part Number	Description
transportable time- based 6-month	D9010EKRP	10G/100GBASE-KR 64b/66b and Link Training Decode/Trigger Software
license	R-B4P-001-F	6-months, node-locked KeysightCare software support subscription

To configure your product and request a quote:

#### http://www.keysight.com/find/software

Contact your Keysight representative or authorized partner for more information or to place an order:

www.keysight.com/find/contactus

#### **Related literature**

Туре	Description / URL
Brochure	Infiniium S-Series (500 MHz to 8 GHz real time oscilloscope)
Brochure	Infiniium V-Series (8 GHz to 33 GHz real time oscilloscope)
Data Sheet	Infiniium UXR Series (13 GHz to 110 GHz real time oscilloscope)
Brochure	30 Things Only Infiniium Oscilloscopes Can Do

## Learn more at: www.keysight.com

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

