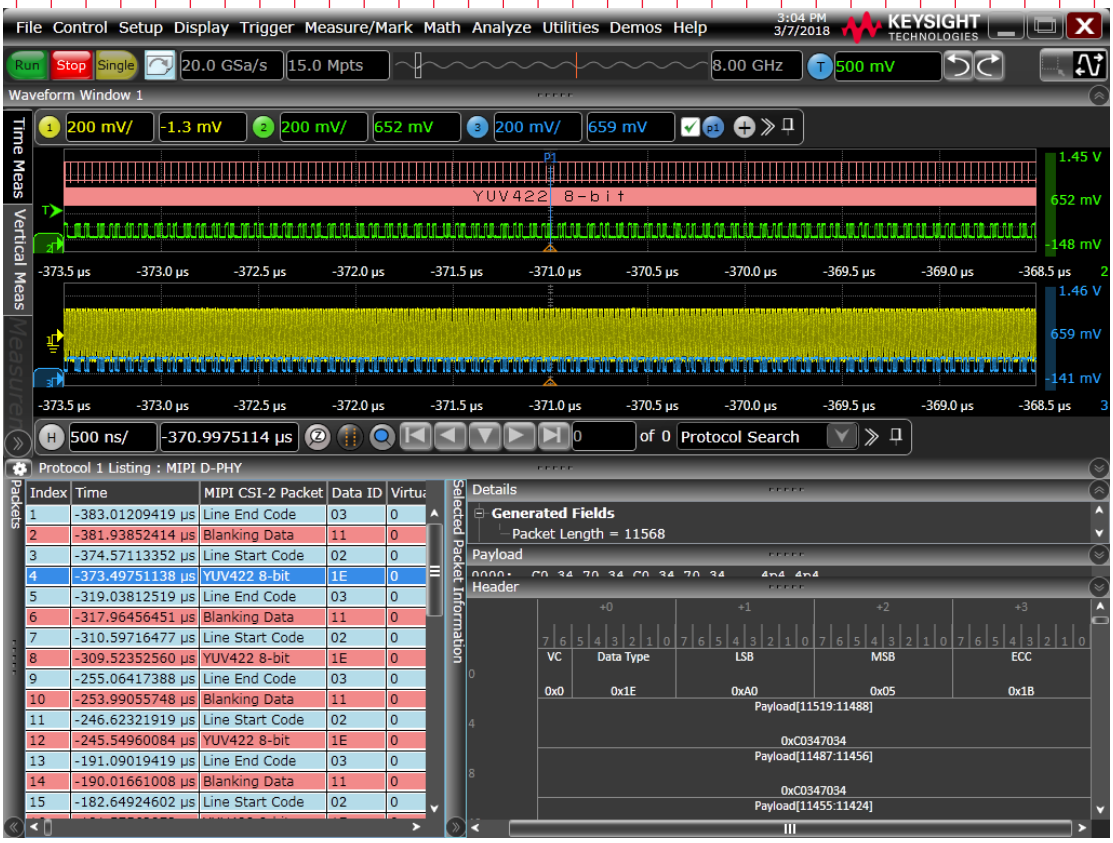
Keysight Technologies
MIPI® D-PHY℠ Protocol Triggering and Decode for Infiniium Series Oscilloscope

Technical Overview



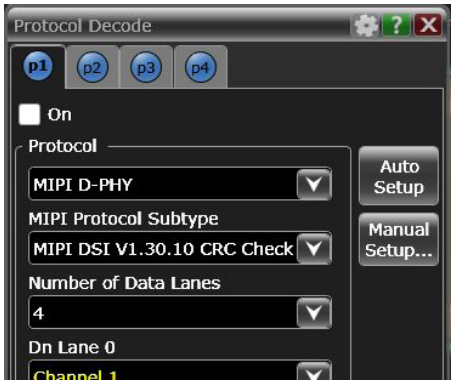
KEYSIGHT TECHNOLOGIES

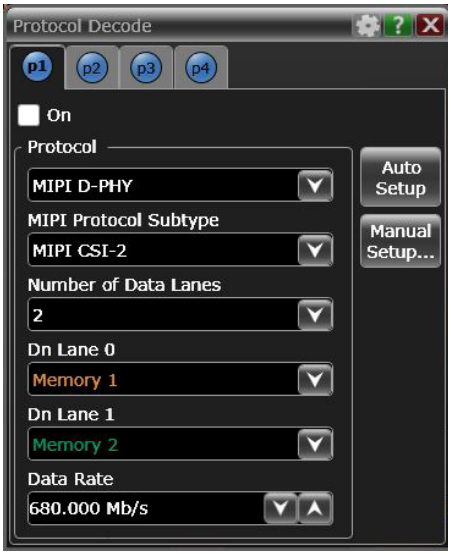
MIPI® D-PHYSM Protocol Using Your Infiniium Oscilloscopes

MIPI serial buses are the backbone for communication in mobile products. The serial bus interface provides content-rich points for debug and test. However, since these protocols transfer bits serially, using a traditional oscilloscope has limitations. Manually converting captured 1's and 0's to protocol requires significant effort, can't be done in real-time, and includes potential for human error. As well, traditional scope triggers are not sufficient for specifying protocol-level conditions.

Extend your scope capability with the Keysight Technologies, Inc. MIPI D-PHY triggering and decode application. This application makes it easy to debug and test designs that include MIPI D-PHY buses using your Infiniium Series oscilloscope.

- Perform MIPI D-PHY multilane protocol decode which includes 1, 2, 3 and 4 lane design implementations
- Set up your scope to show MIPI D-PHY protocol decode in less than 1 minute.
- Get access to a rich set of integrated protocol-level triggers.
- Save time and eliminate errors by viewing packets at the protocol level.
- Use time-correlated views to quickly troubleshoot serial protocol problems back to their timing or signal integrity root cause.





Easy to find

Simply turn decode on/off via the "Serial Decode" button on the front of the instrument or in the "Setup" menu. View decode embedded on the waveform display or in the protocol viewer listing window.

1-Minute D-PHY setup

Configure your oscilloscope to display D-PHY protocol decode in under 1 minute. Use "Auto Setup" to automatically configure sample rate, memory depth and threshold and trigger levels.

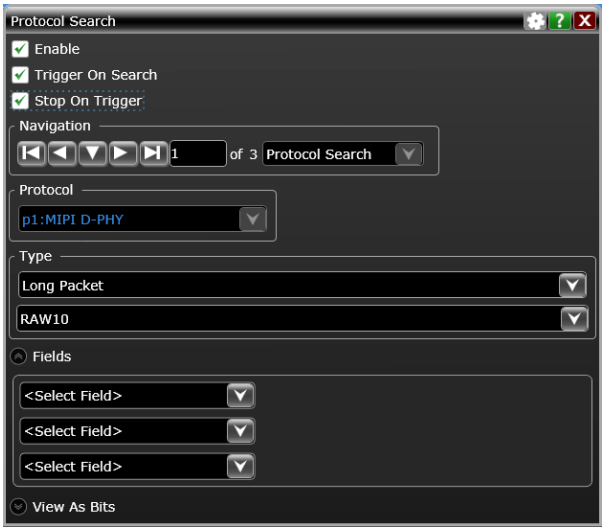
Support for live and saved waveforms

Perform and view decode information on both live and saved waveforms. Decode up to any combination of 4 live or saved waveforms.

D-PHY Setup, Protocol Triggering and Search Capabilities

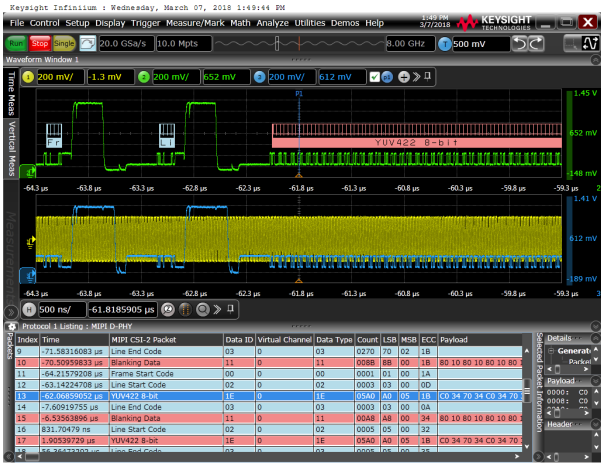
Get access to a rich set of integrated protocol-level triggers. The application includes a suite of configurable protocol-level trigger conditions specific to MIPI D-PHY. When serial triggering is selected, the application uses software-based triggering.

With software-based protocol triggering, the oscilloscope takes signals acquired using either scope or digital channels and reconstructs protocol frames after each acquisition. It then inspects these protocol frames against specified protocol-level trigger conditions and triggers when the condition is met.



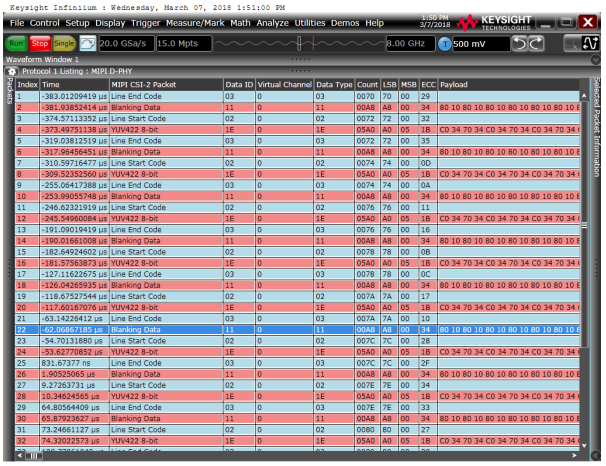
MIPI D-PHY trigger and search setup

Quickly access the software-based trigger via the trigger or search menus. Software-based triggering enables quick setup of data, remote, or error frames.



Time correlation between signal and decoded data

Quickly move between physical and MIPI D-PHY protocol layer information using the time-correlated tracing marker. Display protocol content using embedded decode in the waveform area, Or, see protocol events in a compact listing format. Minor tick marks indicate clock transitions. Major tick marks indicate segments of the serial packet MIPI D-PHY measurements are automatically time-correlated with measurement on other scope channels.

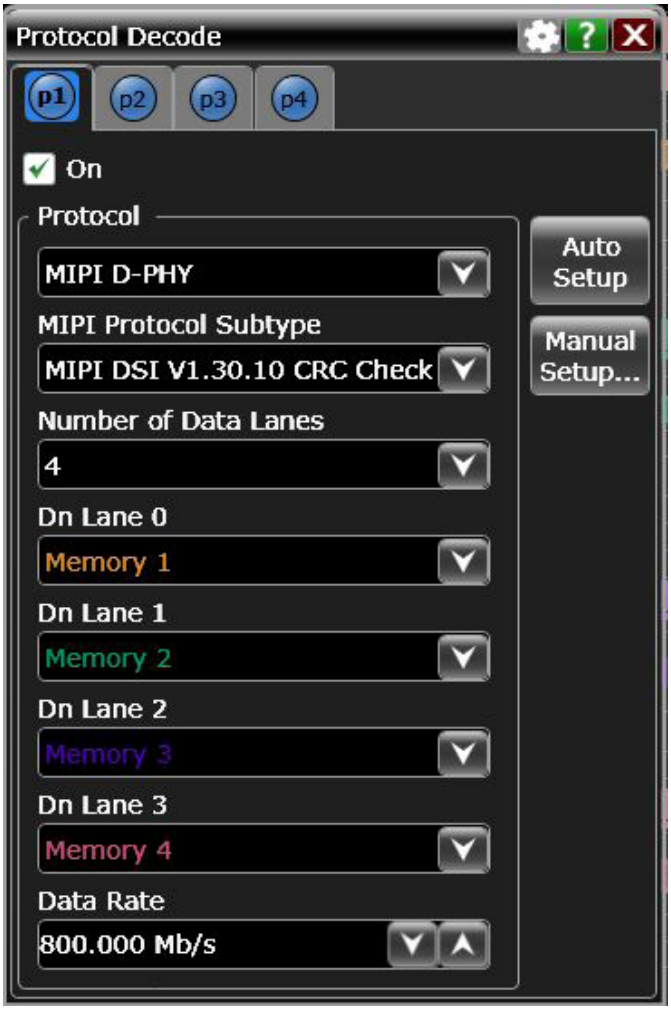


Compact protocol using the full screen listing

The protocol viewer window shows the index number, time stamp value identifier, packet type, and data values for each MIPI D-PHY packet. Data in the listing window can be saved to a .csv or .txt file for off-line.

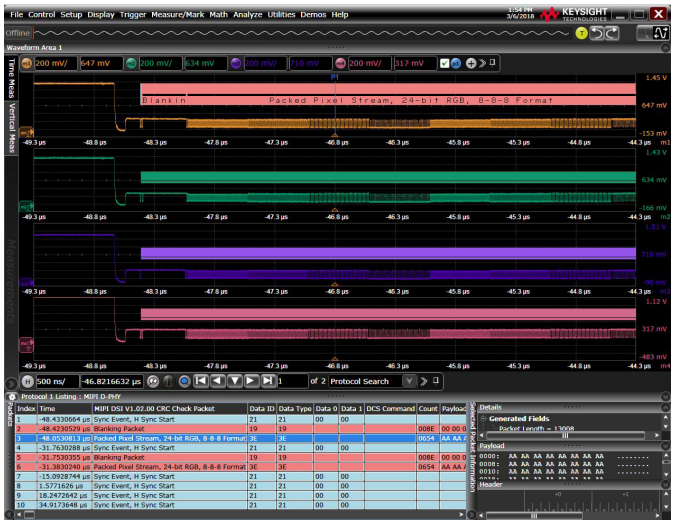
D-PHY Multilane HS Protocol Decode

Keysight MIPI D-PHY protocol decoder software provides multilane decode up to 4 data lanes. User can select number of data lane from 2 to 4 lanes. However, due to oscilloscope's channel limitation, multilane decode will use recovered clock instead of existing clock in D-PHY. Also same reason, multilane decode will support only HS data decoding, not LP data.



MIPI D-PHY Multilane Setup

The MIPI D-PHY setup allows you to select the number of data lanes to decode. Then, specify the Dn waveforms, whether from the scope live channels or saved waveforms as well as the data rate.

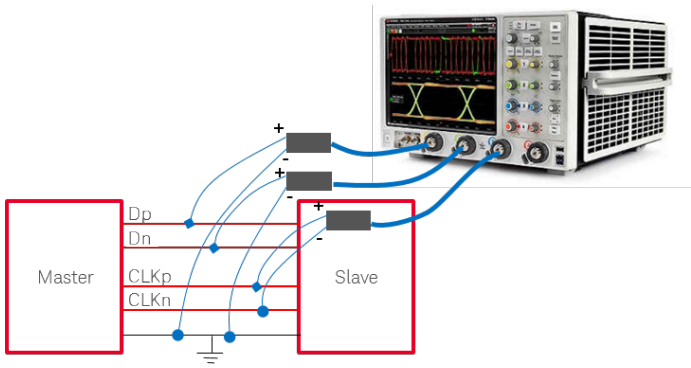
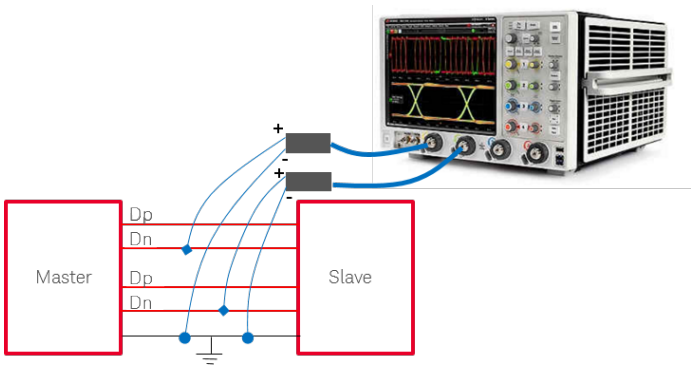


Multilane Packet Decode

The MIPI D-PHY multilane can decode up to 4-lane design implementation. The packet content information can be viewed on the waveform available at the top display as well as the compact listing format at the bottom display. Different color coding to indicate generic and protocol specific packets.

Connection Recommend

Keysight MIPI D-PHY decoder supports both one lane and multilane decoding, based on your DUT configuration, each decoding mode require different connection. Below shows different connection based on number of data lanes.

One data lane	Multilane (2-4)
	
Data Source (Dp) – Selects the Dp (differential positive) low power lane data source. Data Source (Dn) – Selects the Dn (differential negative) low power lane data source. Clock – Selects the high-speed clock source.	Dn Lane 0-3 – Selects the waveform source for the Dn (differential negative) data lane number. Dn is used so the low power signal can be detected. Data Rate – Specifies the data rate. The decode requires a Low Power to High Speed transition. Low power data transmission is not decoded.

For more information, please refer oscilloscope's help file which installed with oscilloscope software.

Performance Characteristics

	Description
D-PHY protocol supported	CSI-2 v1.3
	DSI v1.01, v1.02, v1.30.10
D-PHY source	Analog channels 1, 2, 3, or 4
	Waveform memories
	The application relies on probing and measurement thresholds to properly condition the signal for decode.
Data rate	Up to 4.5 Gb/s
Supporting lane	One data lane with clock (LPDT supports)
	4 data lanes without clock signal (internal clock recovery)
Search/Triggering (software based)	Short Packet
	Long Packet
	Low-Power Data Transmission (one data lane case only)
	Errors
	Any Error
	Bad 16b CRC
	Bad 8b ECC

Recommended Oscilloscopes

The D-PHY protocol decode is compatible with Keysight Infiniium Series oscilloscopes with operating software revision 6.20 or higher. For oscilloscopes with earlier revisions, free upgrade software is available here: www.keysight.com/find/scope-apps-sw.

Data rate	Minimum bandwidth	Minimum channels	Recommended oscilloscopes
Up to 1.5 Gbps	4GHz	3	9000, S-series
Up to 2.5 Gbps	6GHz	3	90000, V-series and Z-series
Up to 4.5 Gbps	12GHz	3	90000, V-series and Z-series

Standard Configuration

9000A and S-Series oscilloscope	Oscilloscope + 4 x Active probes
90000A series oscilloscope	Oscilloscope + 4 x Active probes (recommend using 1169B)
V-Series and Z-Series oscilloscope	Oscilloscope + 4 x Active probes (recommend using 1169B with N5442A)

Ordering Information

This application is compatible with Infiniium Oscilloscope models below.

Application software			9000 Series	S-Series	90000 Series	V-Series	Z-Series
MIPI D-PHY protocol decode software[1]	Fixed	Factory installed	Option 19	N8802B-1FP	Option 19	N8802A-1FP	
		User installed	N8802B-1NL		N8802A-1NL		
	Floating	Transportable	N8802B-1TP			N8802A-1TP	
		Server-based			N5435A-036		

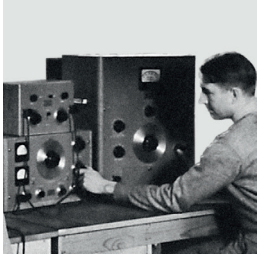
1. Requires Infiniium 6.20 or above.

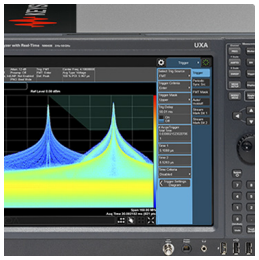
Related Literature

Publication title	Publication type	Publication number
Infiniium S-Series Oscilloscopes	Data sheet	5991-3904EN
Infiniium 9000 Series Oscilloscopes	Data sheet	5990-3746EN
Infiniium V-Series Oscilloscopes	Data sheet	5992-0425EN
Infiniium 90000 Series Oscilloscopes	Data sheet	5989-7819EN
Infiniium Z-Series Oscilloscopes	Data sheet	5991-3868EN

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.

CALIBRATION UP TO 10 YEARS WARRANTY
ASSURANCE PLANS

Keysight Assurance Plans
www.keysight.com/find/AssurancePlans
Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

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.

MIPI® service marks and logo marks are owned by MIPI Alliance, Inc. and any use of such marks by Keysight Technologies is under license. Other service marks and trade names are those of their respective owners.

www.keysight.com/find/N8802A

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

This information is subject to change without notice.
© Keysight Technologies, 2018
Published in USA, March 22, 2018
5992-2864EN
www.keysight.com