Keysight N8837A
USB-PD Protocol Triggering and Decode for Infiniium Series Oscilloscopes

Data Sheet

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Unlocking Measurement Insights

Easily Debug and Test Designs That Include USB-PD Protocols

Introduction of the USB Type-C connector also introduced the enhanced capabilities of USB-PD. The CC line in the Type-C connector is a single-ended, BMC encoded, 4b/5b signal used for Power Delivery (PD) negotiation. USB-PD is responsible for negotiating power levels, device type, connector orientation, charging infrastructure, and other capabilities like ALT mode.

Serial buses such as the USB-PD CC line are widely used today in electronic designs. In many designs, these serial buses provide 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. In addition, traditional scope triggers are not sufficient for specifying protocol-level conditions.

Now you can extend your oscilloscope's capability with the N8837A USB-PD protocol triggering and decode application. This application makes it easy to debug and test designs that include USB-PD protocols using your Infiniium oscilloscope.

– Set up your scope to show USB-PD protocol decode in less than 30 seconds.
– 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.
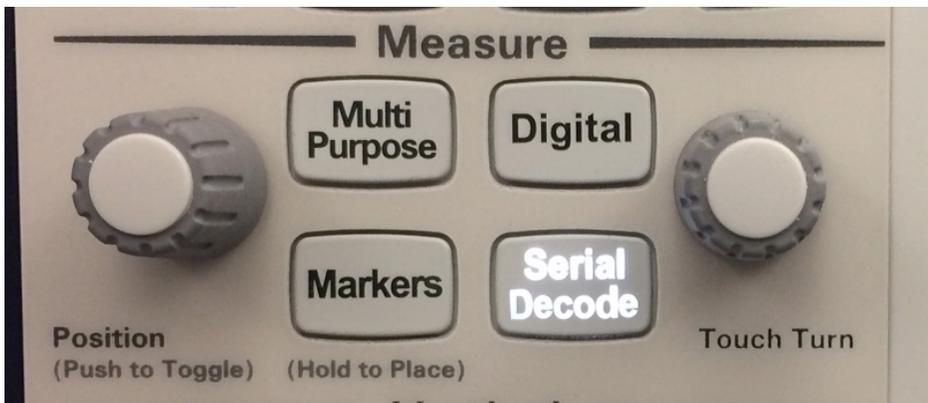
Easy to find

Figure 1. Turn decode on/off in the "Setup" menu. View decode embedded on the waveform display of in the protocol viewer listing window.
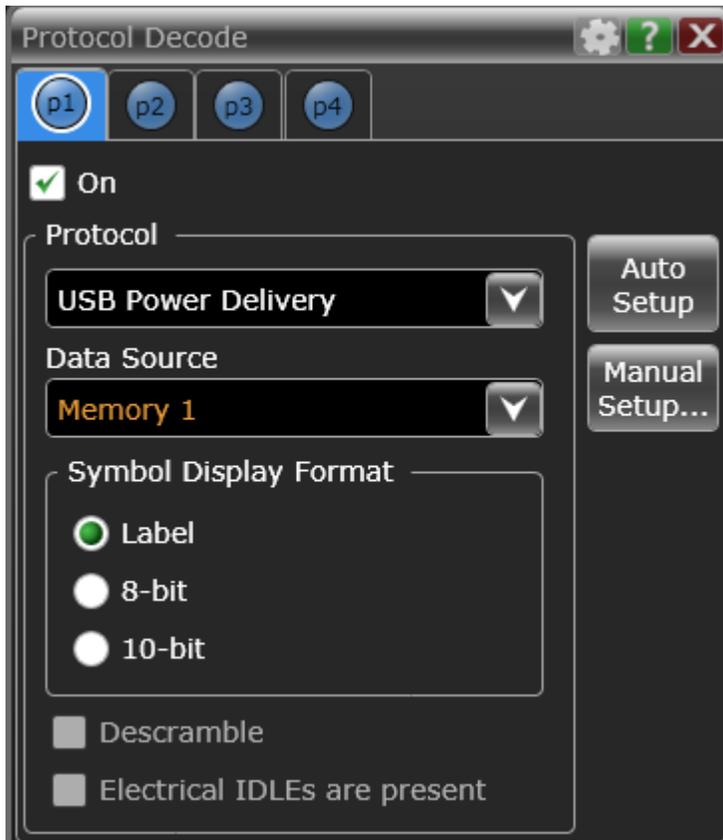
30-second USB-PD setup

Figure 2. Configure your oscilloscope to display protocol decode in less than 30 seconds. Use "Auto Setup" to automatically configure sample rate, memory depth and threshold and trigger levels.

USB-PD protocol triggering and searching

Get access to a rich set of integrated protocol level triggers. The application includes a suite of configurable protocol-level trigger conditions specific to USB-PD. When serial triggering is selected, the application enables special real-time triggering hardware inside the Infiniium S-Series oscilloscope.

Hardware-based triggering on S-Series oscilloscopes ensures that the scope never misses a trigger event when armed. This hardware takes signals acquired using either scope or digital channels and reconstructs protocol frames. It then inspects these protocol frames against specified protocol-level trigger conditions and triggers when the condition is met.
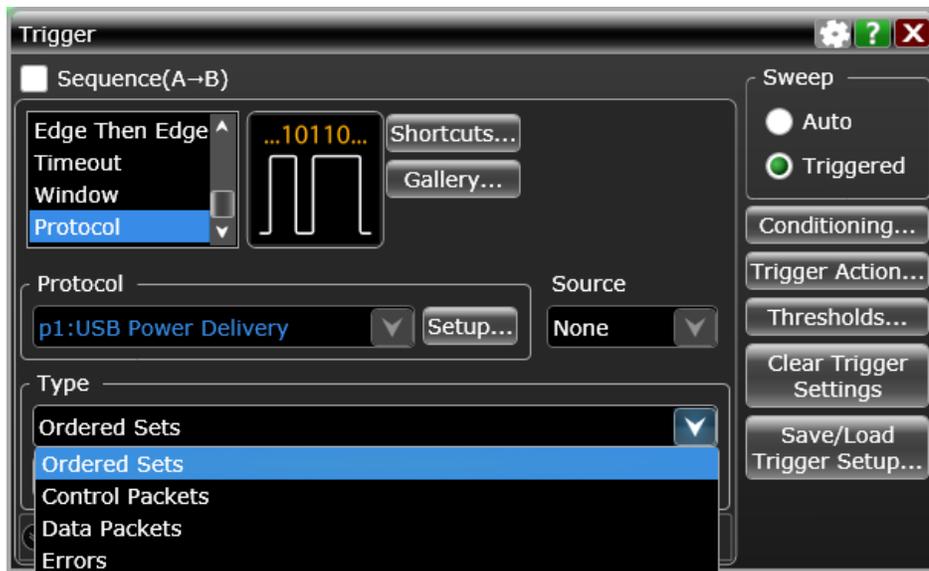
USB-PD trigger setup

Figure 3. Choose to trigger on ordered sets, control packets, data packets, or protocol errors.
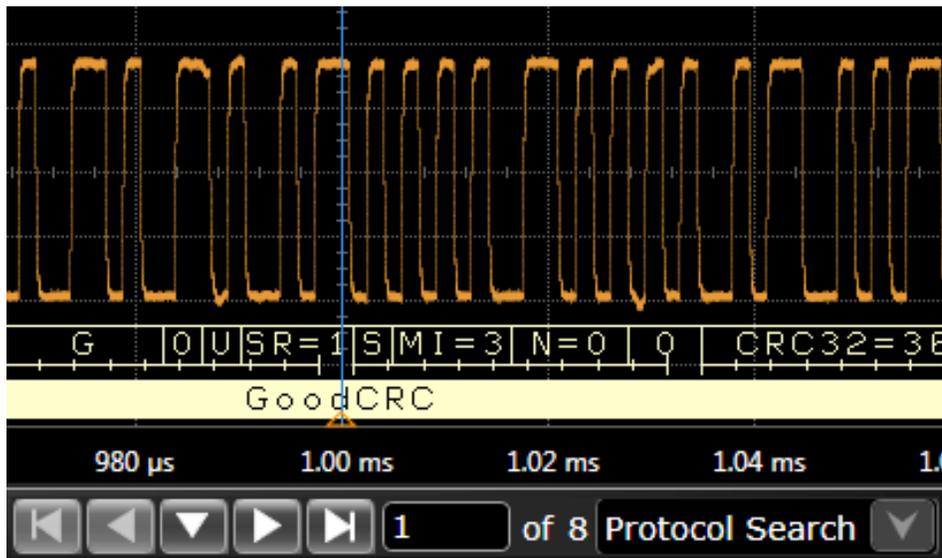
Quickly find occurrences

Figure 4. Quickly move to next occurrence of a specified event. Jump to the next or previous occurrence of the specified event.

Figure 5. Header tab shows packets in a data book format.

Figure 6. Details tab breaks the packets into easy-to-read textual fields.

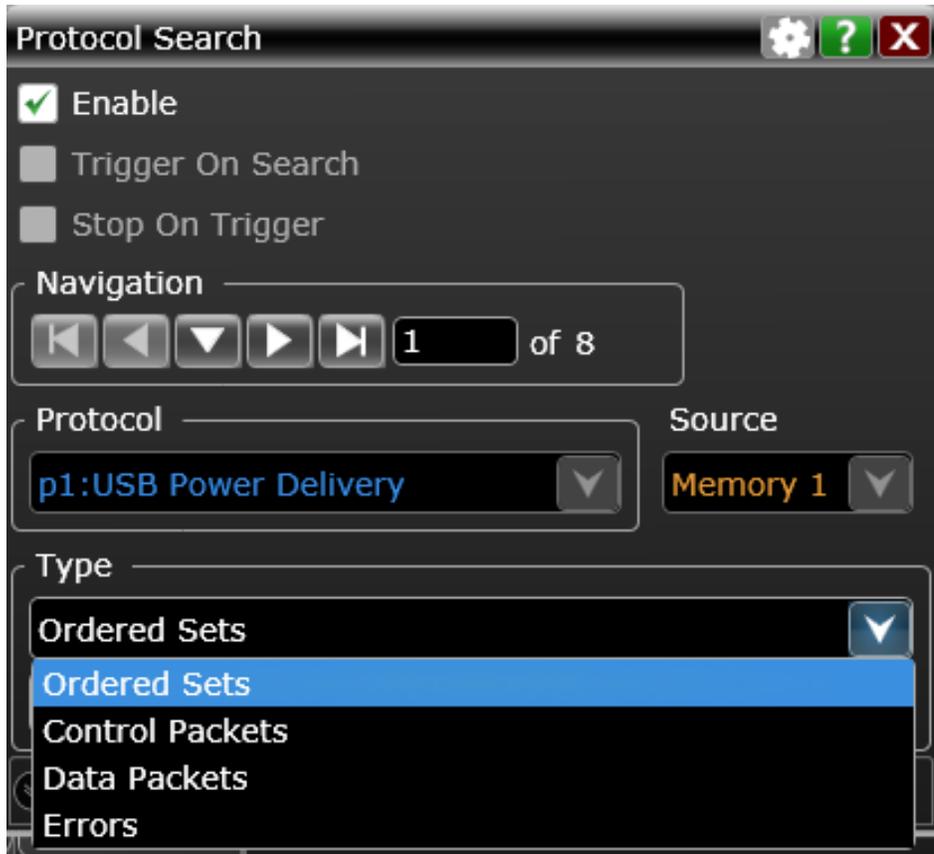## Post-acquisition searching

Figure 7. Search acquired protocol listing using a menu that is identical to the trigger menu.

USB-PD protocol decode

The Keysight Technologies, Inc. USB-PD protocol viewer includes correlation between the waveforms and the selected packet. The selected packet (highlighted blue row in the listing) is time-correlated with the blue vertical line in the waveform display. Move the blue tracking marker in time through waveforms, and the blue bar will automatically track in the packets window. Or you can scroll through the packet viewer and highlight a specific packet. The time-correlation tracking marker will move to the associated point in the waveform.
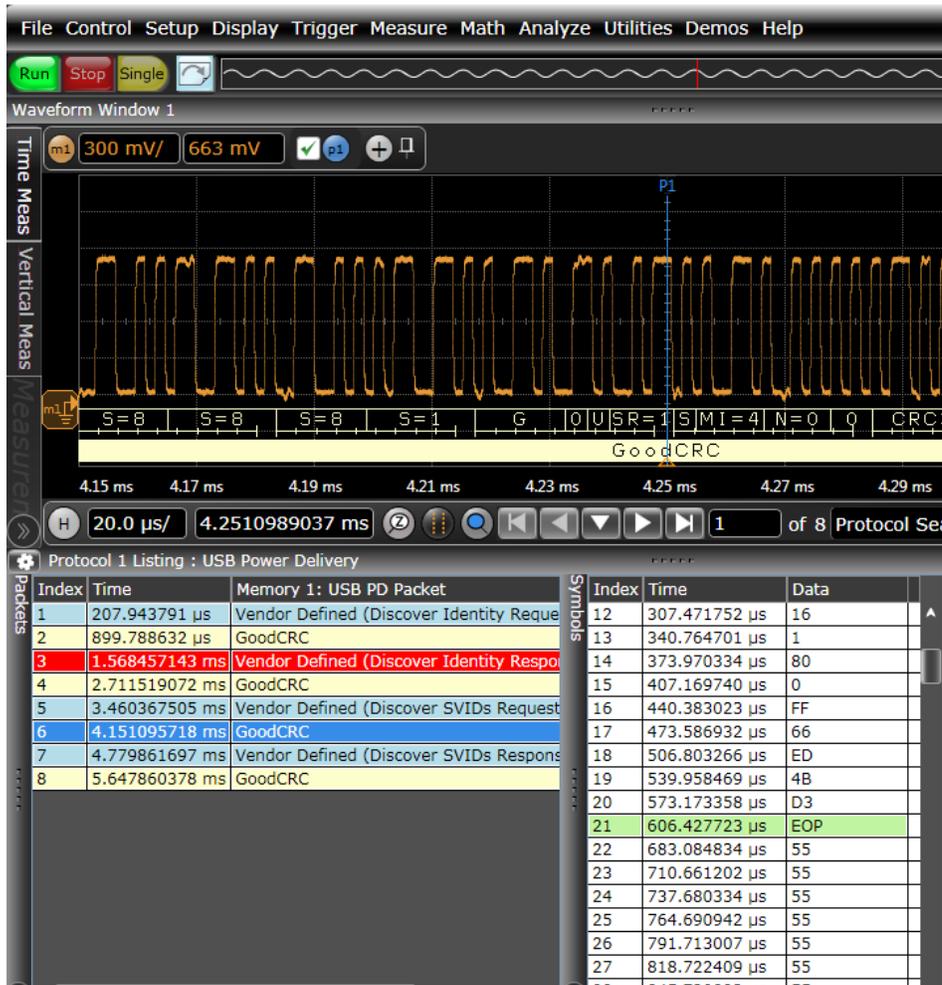

Figure 8. USB-PD protocol decode with precise time-correlation between waveforms and listing.

Fill the entire display with compact protocol information using the full-screen listing. The protocol viewer window shows the index number, time stamp value, and data content for each serial packet in the list. Scroll through all decoded serial packets to find events of interest or errors in the transmission. Data in the listing window can be saved as .csv or .txt file for offline analysis or documentation. Error packets are shown in red to help with debug.
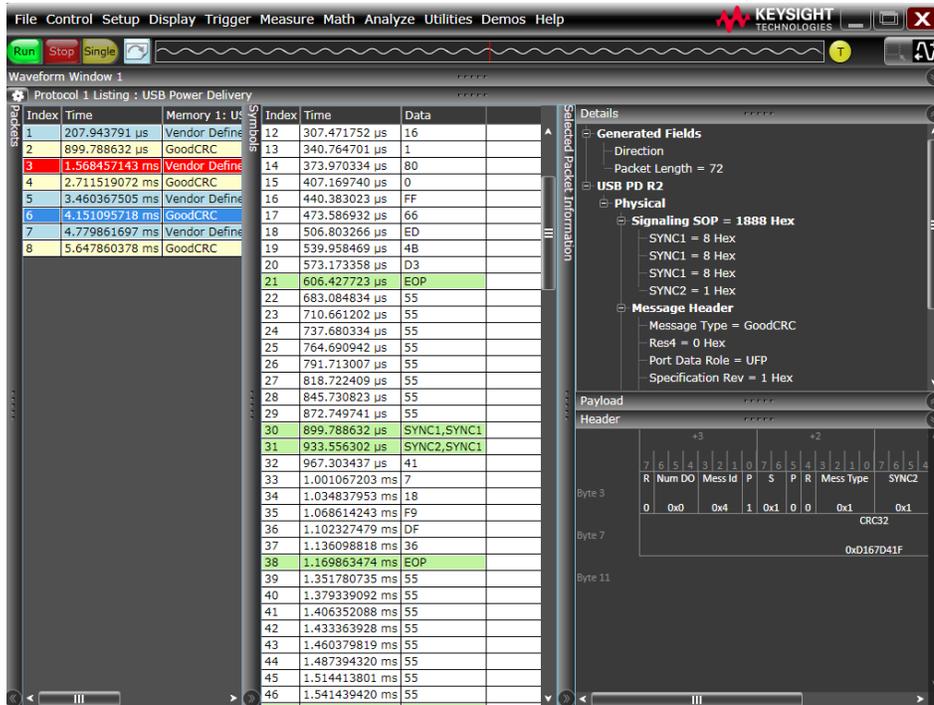

Figure 9. Full screen USB-PD listing.
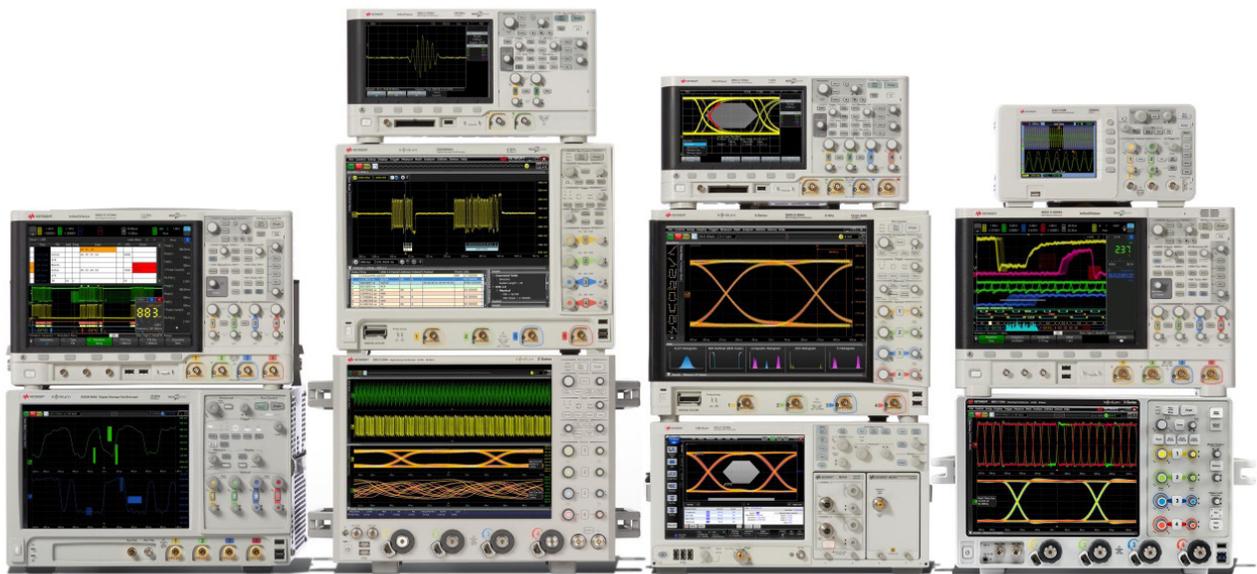
USB-PD specifications and characteristics
  – CC line source: Analog channels 1, 2, 3, and 4
  – Probing: Single-ended
  – Auto setup: Automatically configures scope settings for proper USB-PD protocol triggering and decode

Ordering Information

Application	License type		Infiniium V-Series and Z-Series	Infiniium S- Series	Infiniium 90000A Series	Infiniium 90000 X-Series	Infiniium 9000 Series
USB-PD protocol triggering and decode	Fixed	Factory-installed	N8837A-1FP	N8837A-1FP	DSO90000-091	N8837A-1FP	N8837A-1FP
		User-installed	N8837A-1FP	N8837A-1FP	N8837A-1FP	N8837A-1FP	N8837A-1FP
	Floating	Transportable	N8837A-1TP	N8837A-1TP	N8837A-1TP	N8837A-1TP	N8837A-1TP
		Server-based	N5435A-096				

Related Literature

Publication title	Publication number
Infiniium S-Series High-Definition Oscilloscopes - Data Sheet	5991-3904EN

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www.axiestandard.org

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