LeCroy

USB 1.x/2.0 Trigger and Decode

The comprehensive triggering, intuitive decode and easy to navigate table display enable a powerful tool set to quickly debug a USB device or system.

Key Features

- **True Hardware Protocol Triggering for efficient debug**

- **Trigger on USB Packet (Token, Data, Handshake, User-Defined) with complete setup flexibility**

- **Trigger on any of three "OR'ed" Packets**

- **Transaction Triggering**

- **Comprehensive Protocol Error and Bus Event Triggering**

- **Decodes Low-speed (1.5 Mb/s), Full-speed (12 Mb/s) and High-speed (480 Mb/s) USB bus speeds**

- **Correlate analog waveforms with protocol decode on one screen**

- **Decode information expands as the timebase is adjusted or zoomed**

- **Convenient table display with quick "Zoom to byte" capability**

- **Quick search capability for specific message packets**

The USB 1.x/2.0 trigger and decoder is the ideal tool for powerful system level protocol debug as well as problem solving for signal quality issues. The trigger provides for a wide variety of powerful trigger features, including TransactionPacket, OR'ed Packet, and comprehensive Bus Event and Protocol Error triggering. The USB 1.x/2.0 decode simplifies observation of bus traffic for more efficient debug.

The Most Comprehensive USB Triggering

Full support is provided for triggering on any type of Packet, even User-Defined Packets, with complete flexibility for address, endpoint, split type, hub, port, etc. Trigger on specific Data payloads in specific locations. OR any three Packets in a single trigger condition. Create a USB Transaction trigger with any allowed combination of Token, Data, Handshake, and User-Defined packets. Advanced capability like this is usually only found in a dedicated protocol analyzer!

The Most Intuitive Decode

USB 1.x/2.0 decode uses color-coded overlays on various sections of the protocol for an easy-to-understand visual display. Depending on the time base or the amount of zoom, the decode information is condensed or expanded to better assist in understanding events during short or long acquisitions.

The Single Tool Enhances Productivity

The USB 1.x/2.0 decode solution concentrates all your information in one place. Viewing the application layer of USB signals on top of the physical layer provides a unique view that bus analyzers cannot. Apply measurements to debug physical layer issues that may not be apparent in a protocol view.

Complete Compliance and Debug

For complete testing, use with QPHY-USB for automated compliance testing according to the USB-IF USB 2.0 Electrical Test Specification.

Convenient Table Display Summarizes Results

Turn your oscilloscope into a protocol analyzer with the table display of protocol information. Custom configure the table to display the information you want, and export table data into an Excel file. Touch the message in the table and automatically zoom for detail. In all cases, the table never obscures your waveform.

Identify the USB signal type, timestamp, Device address and Endpoint using the Table display. Quickly identify items of interest, such as a glitch following an End of Packet (EOP).
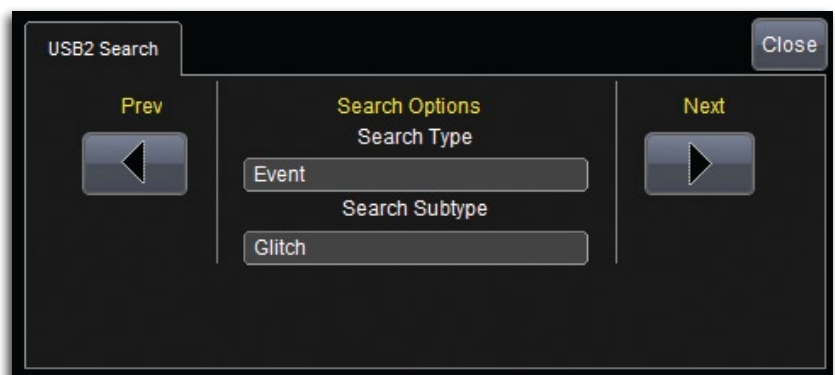
Search and Zoom

The powerful search engine of the USB 1.x/2.0 decode package can quickly find an Event, Packet, Transaction, or Protocol Error. Search through a long record of decoded data by entering any of the 45 available search criteria by entering a value or simply finding the next occurrence.

Search through a long record to find any of the 45 search criteria, such as a glitch that is frequently occurring after each EOP.

Search on:	
Events:	
Any	Suspend
Idle	Keep Alive
Resume	Glitch
Reset	Unknown
Packet:	
Any	ACK
Token Out	NAK
Token In	Stall
Setup	Nyet
SOF	Preamble
Data0	ERR
Data1	Split
Data2	Unknown Packet
MData	

Transactions:	
Any	Trans SSplit Out
Trans In	Trans SSplit Setup
Trans Out	Trans CSplit In
Trans Setup	Trans CSPlit Out
Trans Ping	Trans CSplit Setup
Trans SSplit In	
Protocol Error:	
CRC5 Error	
CRC16 Error	
Bit Stuff Error	
PID and Check Mismatch Error	
Packet Length Error	

LeCroy USB 1.0, 1.1, 2.0 Decode	
Definition	
Protocol Setup	Selection for USB Low, Full, or High Speeds (1.x and 2.0). Selection for source channels (USB 2.0 High-speed limited to Ch1 source). Supports Single (differential probe) or dual (two single-ended probes) input(s) for decoder. Trigger requires a single input (differential probe) for USB2.0 (High) and two inputs for USB1.x/2.0 (Low-, Full-speed)
Decode Capability	
Format	USB2 Link and Data Layer Protocol Decode (Hexadecimal or Binary)
Decode Setup	Selection for USB Low, Full, or High Speeds (1.x and 2.0). Selection for source inputs. Choose to Decode address values including/not including the R/W bit in address value
Decode Input	Any analog Channel, Memory or Math trace
# of Decode Waveforms	Up to 4 buses may be decoded at one time. In addition, zooms can be displayed (with decoded information)
Location	Overlaid on USB physical layer waveform, on Grid
Visual Aid	Color Coding for FRAME, START/ReSTART bit, ADDR, R/W, DATA, ACK, and STOP bit Decode information is intelligently annotated based on timebase setting
Trigger Capability	
Format	Hexadecimal or Binary
Trigger Setup	Trigger on Packet Type (Any, Token, Data, Handshake, or User-Defined), Protocol Error, Transaction, or Bus Event
Any Packet Setup	Trigger on ANY SYNCH pattern
Token Packet Setup	Trigger on ANY Token Packet. Select PREAMBLE/ERR Token Packet. Select SOF Token Packet with specific Frame Number. Select OUT, IN, SETUP, or PING Token Packet with a specific Address and Endpoint, or "don't care." Select SPLIT Special Token Packet with a specific SPLIT TYPE, HUB ADDR, PORT, S(speed/start), E(nd), and ET (for SPLIT type). Select USER-DEFINED. Trigger on any of three Token Packets of any type and trigger on them with an "OR" condition
Data Packet Setup	Trigger on ANY Data Packet. Trigger on DATA0, DATA1, DATA2, or MDATA Data packet, with allowance for setting a 16-byte payload value with a condition of = or <> and locatable anywhere in a 1024 byte data packet. Trigger on any of three Data Packets of any type (with a common PAYLOAD data definition, as above). Trigger on DATA0, DATA1, DATA2, MDATA or ANY Data Packet Payload Length up to 1024 bytes, with a payload length condition of = or <>.
Handshake Packet Setup	Trigger on ANY Handshake Packet Trigger on a specific ACK, NAK, NYET, STALL or ERR Handshake Packet
Protocol Error Triggering	Trigger on any ORed combination of PID/Check Error, CRC5 Error, CRC16 Error, Frame Length Error, Bad Data Toggle Error, or PID0 Error
Bus Event Triggering	Trigger on any ORed combination of Reset, Resume, Suspend, or Chirp
Transaction Packet Setup	Trigger on any USB Transaction - combine any allowable set of Token, Data, Handshake or User-Defined Packet together in a Transaction, and trigger when that set is detected
Primitive Triggering	
Trigger Input	Any analog channel
Trigger Design	Internal to oscilloscope, settable like any other oscilloscope true hardware protocol trigger
Search Capability	
Pattern Search	Search by: **Events:** any, Idle, Resume, Reset, Suspend, KeepAlive, Glitch, Unknown **Packet:** any, Token Out, Token In, Setup, SOF, Data0, Data1, Data2, Mdata, ACK, NAK, Stall, Nyet, Preamble, ERR, Split, Ping, Unknown Packet **Transaction:** any, Trans In, Trans Out, Trans Setup, Trans Ping, Trans SSplit In, Trans SSplit Out, Trans SSplit Setup, Trans CSplit In, Trans CSplit Out, Trans CSplit Setup **Protocol Error:** CRC5 Error, CRC16 Error, Bit Stuff Error, PID and Check Mismatch Error, Packet Length Error
Other	
Compatible With…	TD (Trigger & Decode) Option fully compatible with WaveRunner® 6 Zi Series. D (Decode) Option fully compatible with WaveSurfer® Xs/Xs-A/Xs-B Series; WaveRunner® Xi/Xi-A, 6000 Series; WavePro® 7 Zi/Zi-A, 7000 Series; WaveMaster® 8 Zi/Zi-A, 8000 Series. Bandwidth of oscilloscope must be equal to bit rate with a minimum oscilloscope sample rate of 4x the bit rate

Product Description	Product Code
USB 1.x/2.0 Trigger and Decode Options	
USB 1.x/2.0 Trigger/Decode Option for WaveRunner 6 Zi	WR6Zi-USB2bus TD
USB 1.x/2.0 Decode Option for WaveSurfer Xs/Xs-A	WSXs-USB2bus D
USB 1.x/2.0 Decode Option for WaveRunner Xi/Xi-A	WRXi-USB2bus D
USB 1.x/2.0 Decode Option for WavePro 7 Zi	WPZi-USB2bus D
USB 1.x/2.0 Decode Option for WaveMaster 8 Zi-A	WM8Zi-USB2bus D

Additional Products

Decode Annotation and Protocol Analyzer Synchronization Software Option for WaveRunner 6 Zi	WR6Zi-ProtoSync
Decode Annotation and Protocol Analyzer Synchronization Software Option for WaveRunner Xi/Xi-A	WRXi-ProtoSync
Decode Annotation and Protocol Analyzer Synchronization Software Option for WavePro 7 Zi/Zi-A	WPZi-ProtoSync
Decode Annotation and Protocol Analyzer Synchronization Software Option for WaveMaster 8 Zi/Zi-A	WM8Zi-ProtoSync
QualiPHY Enabled USB 2.0 Software Option	QPHY-USB*
USB 2.0 Compliance Test Fixture	TF-USB-B

*TF-USB-B required.

Recommended Accessories

500 MHz, 1.0 pF, 1 MΩ Active Differential Probe	ZD500
1 GHz, 1.0 pF, 1 MΩ Active Differential Probe	ZD1000
1.5 GHz, 1.0 pF, 1 MΩ Active Differential Probe	ZD1500
WaveLink ProLink Platform/Cable Assembly (4 – 6 GHz)	WL-PLink
WaveLink ProBus Platform/Cable Assembly (4 GHz)	WL-PBus
WaveLink 4 GHz 2.5 V_{p-p} Differential Amplifier Small Tip Module	D410*
WaveLink 4 GHz 5 V_{p-p} Differential Amplifier Small Tip Module	D420*
WaveLink 6 GHz 2.5 V_{p-p} Differential Amplifier Small Tip Module	D610*
WaveLink 6 GHz, 5 V_{p-p} Differential Amplifier Small Tip Module	D620*

*For a complete probe, order a WL-PLink or WL-PBus Platform/Cable Assembly with the Probe Tip Module.

Customer Service

LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranteed for one year.

This warranty includes:

• No charge for return shipping
• Long-term 7-year support
• Upgrade to latest software at no charge

LeCroy

1-800-5-LeCroy
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Local sales offices are located throughout the world. Visit our website to find the most convenient location.

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