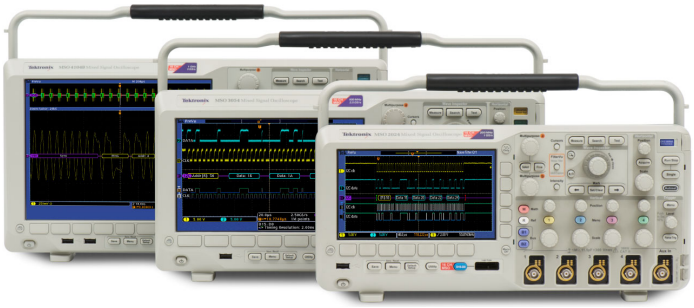
Serial Triggering and Analysis Application Modules

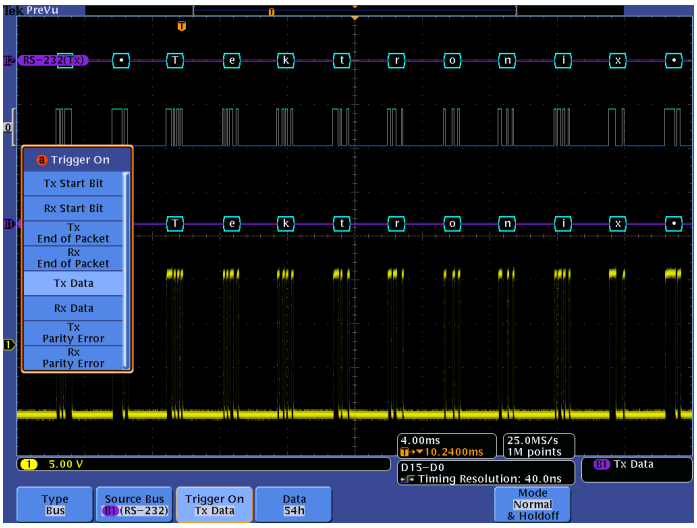
AERO • AUDIO • AUTO • AUTOMAX • COMP • EMBD • FLEX Datasheet



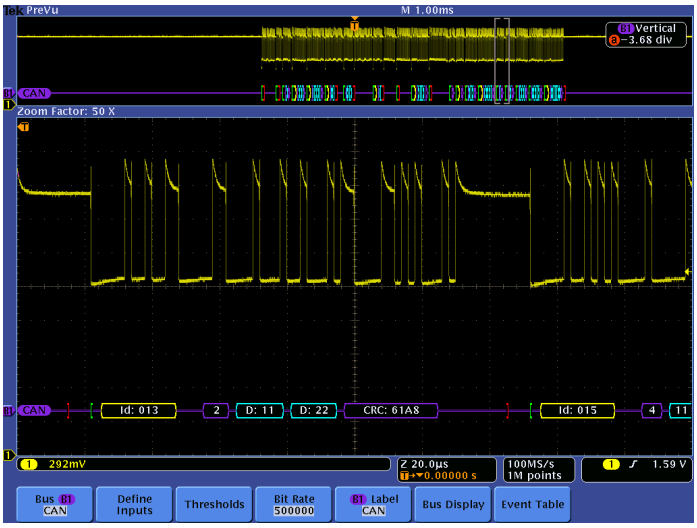
Features & Benefits

- Automated Serial Triggering, Decode, and Search options for I²C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and I²S/LJ/RJ/TDM.
- Trigger on all the critical elements of a serial bus such as address, data, etc.
- Decode all the critical elements of each message. No more counting 1s and 0s!
- Search through long acquisitions using user-defined criteria to find specific messages.
- Event table shows decoded serial bus activity in a tabular, time-stamped format for quick summary of system activity.
- Export Event table data to .csv format.

Tektronix®



Triggering on a specific transmit data packet going across an RS-232 bus. A complete set of triggers, including triggers for specific serial packet content, ensures you quickly capture your event of interest.



Color-coded display of a CAN bus, showing Start, DLC, Data, CRC, and Stop components of the serial signal.

Serial Triggering and Analysis Application Modules

On a serial bus, a single signal often includes address, control, data, and clock information. This can make isolating events of interest difficult. The Serial Application modules for the MDO/MSO/DPO4000B, MDO3000, and MSO/DPO2000B Series transform the oscilloscopes into a robust tool for debugging serial buses with automatic trigger, decode, and search for I²C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and I²S/LJ/RJ/TDM.

Serial Triggering

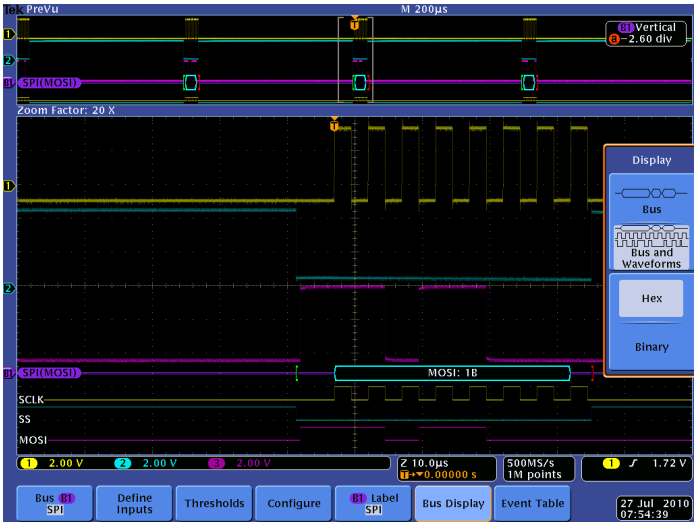
Trigger on packet content such as start of packet, specific addresses, specific data content, unique identifiers, etc. on popular serial interfaces such as I²C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and I²S/LJ/RJ/TDM.

Bus Display

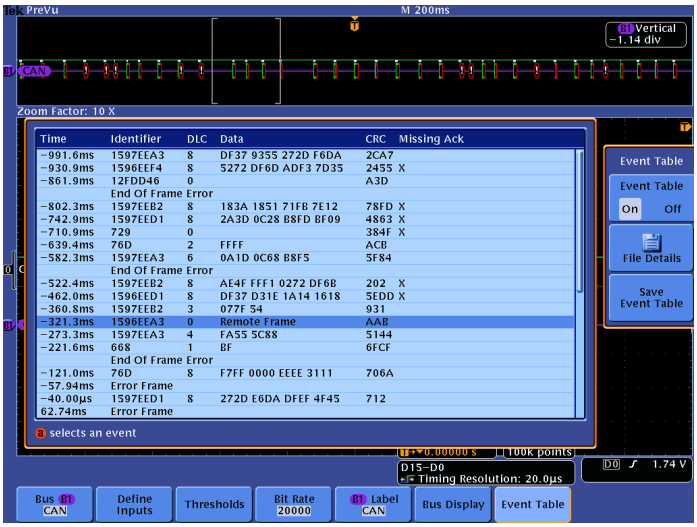
Provides a higher-level, combined view of the individual signals (clock, data, chip enable, etc.) that make up your bus, making it easy to identify where packets begin and end and identifying subpacket components such as address, data, identifier, CRC, etc.

Bus Decoding

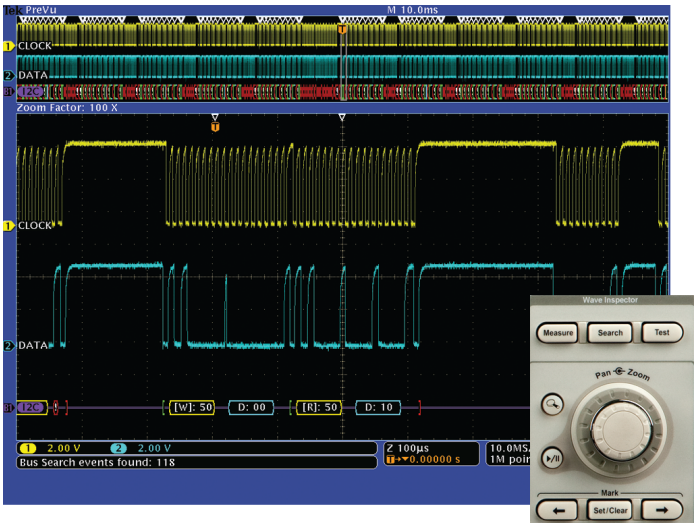
Tired of having to visually inspect the waveform to count clocks, determine if each bit is a 1 or a 0, combine bits into bytes, and determine the hex value? Let the oscilloscope with a Serial Application module do it for you! Once you've set up a bus, the oscilloscope will decode each packet on the bus, and display the value in hex, binary, decimal (LIN, MIL-STD-1553, and FlexRay only), signed decimal (I²S/LJ/RJ/TDM only), or ASCII (RS-232/422/485/UART only) in the bus waveform.



Simultaneously display the bus and digital waveforms. Digital waveforms show how the bus translates the individual signals based on the threshold settings (useful for making analog channels look like just 1s and 0s).



Event table showing decoded Identifier, DLC, DATA, and CRC for every CAN packet in a long acquisition.



Search – I²C decode showing results from a Wave Inspector® search for Address value 50. Wave Inspector® controls provide unprecedented efficiency in viewing and navigating waveform data.

Event Table

In addition to seeing decoded packet data on the bus waveform itself, you can view all captured packets in a tabular view much like you would see in a software listing. Packets are time stamped and listed consecutively with columns for each component (Address, Data, etc.).

Search

Serial triggering is very useful for isolating the event of interest, but once you've captured it and need to analyze the surrounding data, what do you do? In the past, users had to manually scroll through the waveform counting and converting bits and looking for what caused the event. With a Serial Application module, you can enable the oscilloscope to automatically search through the acquired data for user-defined criteria including serial packet content. Each occurrence is highlighted by a search mark. Rapid navigation between marks is as simple as pressing the **Previous** (←) and **Next** (→) buttons on the oscilloscope front panel.

Characteristics

I²C Characteristics

Bus Setup Options

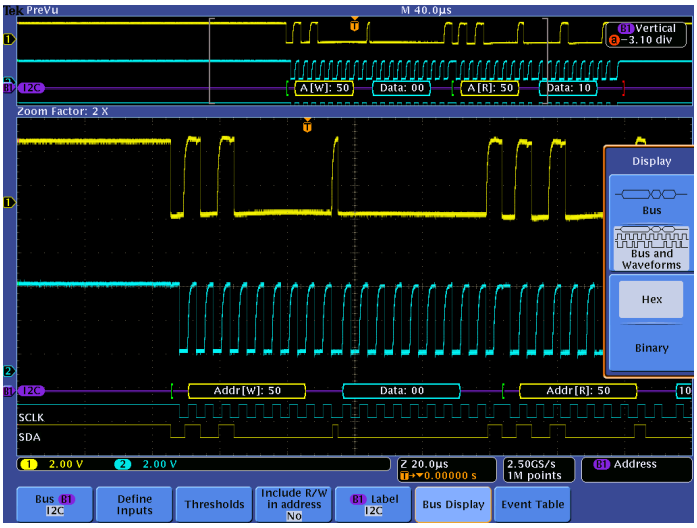
Characteristic	Description
Sources (Clock and Data)	Analog channels 1-4 Digital channels D0-D15
Thresholds	Per-channel thresholds
Recommended Probing	Single Ended
Include R/W in Address	Yes or No
Decode Formats Available	Hex Binary
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

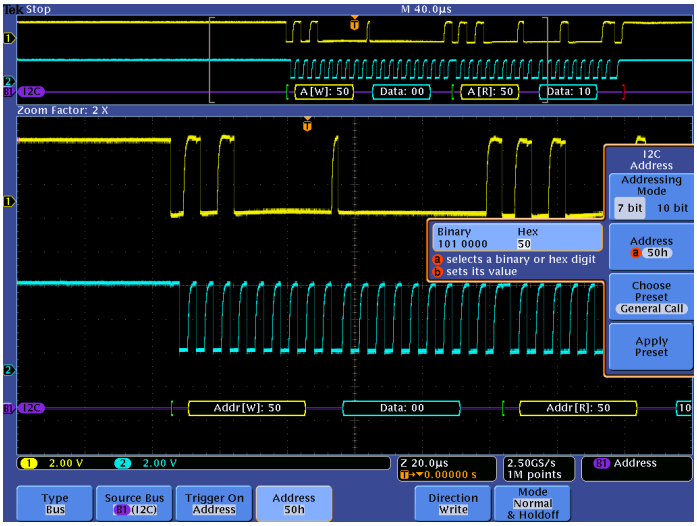
Characteristic	Description
Trigger and/or Search On	Start Stop Repeated Start Missing Ack Address (7 or 10 bit) with R/W Selection Data (number of bytes 1-5) Address and Data

Bus Decode

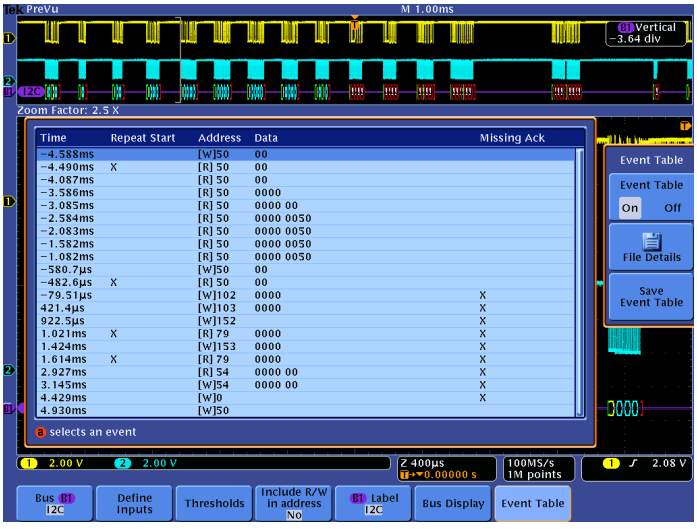
Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (for automated decoding of bus)
Decode Display	Start (green bracket) Address (yellow box) Missing Ack (red ! symbol) Data (cyan box) Stop (red bracket)



I²C bus setup, showing selection of bus display modes.



Triggering on a specific address value on the I²C bus.



Event table for I²C bus with all captured packets time stamped and in a tabular view.

SPI Characteristics

Bus Setup Options

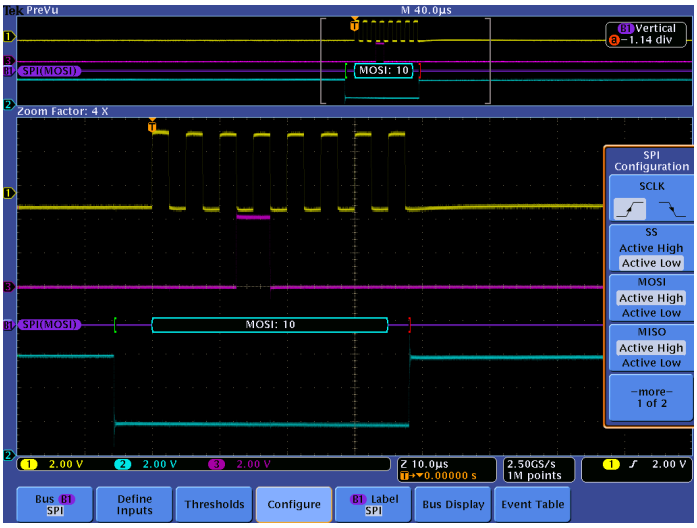
Characteristic	Description
Sources (Clock, Slave Select, MOSI, and MISO)	Analog channels 1-4 Digital channels D0-D15
Thresholds	Per-channel thresholds
Recommended Probing	Single Ended
Decode Configuration	
Framing	Idle Time (2-wire SPI) Slave Select (3-wire or 4-wire SPI)
Clock	Rising or Falling Edge
Slave Select	Active High or Active Low
MOSI	Active High or Active Low
MISO	Active High or Active Low
Word Size	4-32 bits
Bit Order	Most Significant (MS) First Least Significant (LS) First
Decode Formats Available	Hex Binary
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

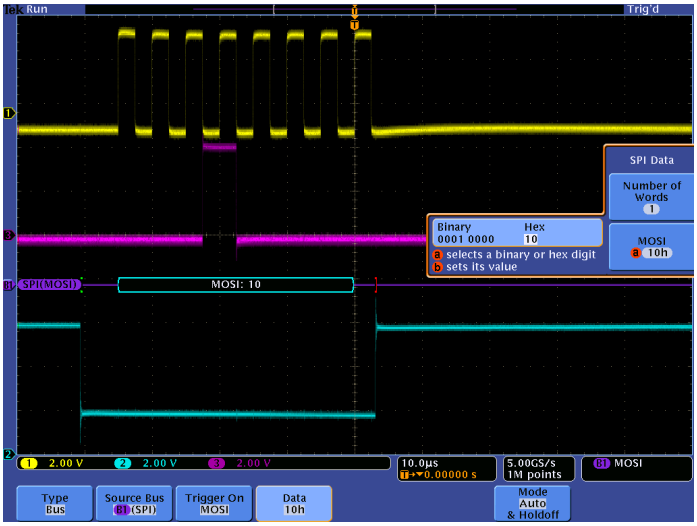
Characteristic	Description
Trigger and/or Search On	SS Active Start of Frame MOSI MISO MOSI and MISO Data: maximum of 128 bits (up to four 32-bit words or 32 four-bit words)

Bus Decode

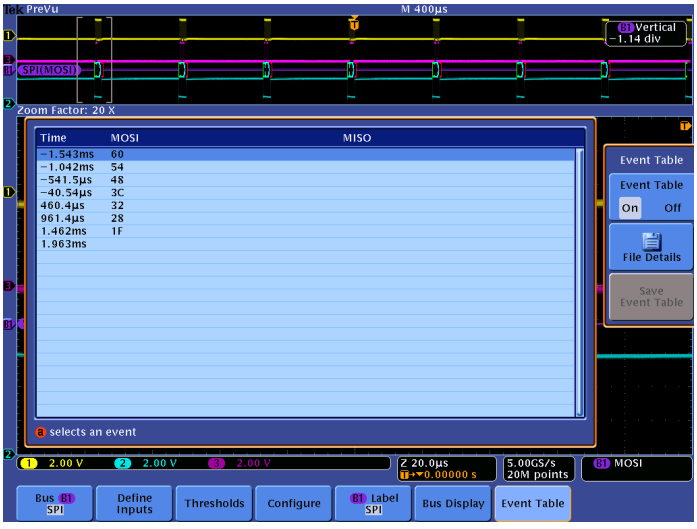
Characteristic	Description
Maximum Clock/Data Rate	Up to 50 Mb/s (for automated decoding of bus)
Decode Display	Start (green bracket) Data (cyan box) Stop (red bracket)



SPI bus setup, showing configuration options for bus sources.



Triggering on a specific MOSI data value on the SPI bus.



Event table for SPI bus with all captured packets time stamped and in a tabular view.

RS-232/UART/RS-422/RS-485 Characteristics

Bus Setup Options

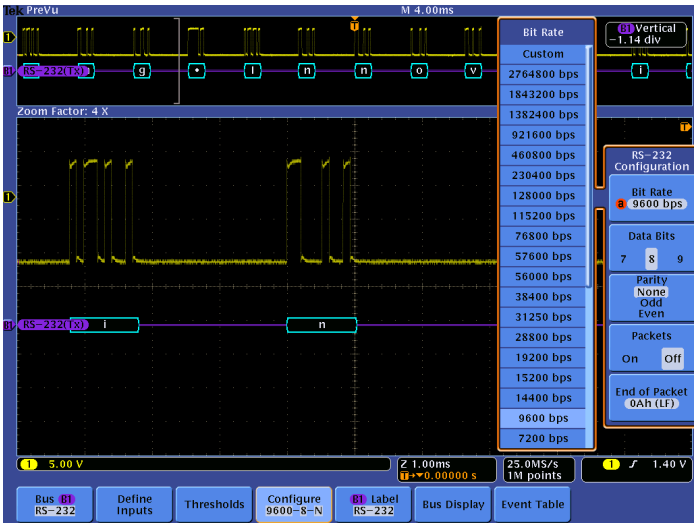
Characteristic	Description
RS-232/UART Sources (Transmit and Receive)	Analog channels 1-4 Digital channels D0-D15
RS-422/RS-485 Sources (Transmit and Receive)	Analog channels 1-4
Thresholds	Per-channel thresholds
Recommended Probing	
RS-232/UART	Single Ended
RS-422/RS-485	Differential
Polarity	Normal (RS-232) Inverted (UART, RS-422/RS-485)
Decode Configuration	
Bit rate	
Pre-defined list of rates	50 b/s - 2.8 Mb/s
Custom	50 b/s - 10 Mb/s
Data bits	7, 8, or 9
Parity	None, Odd, or Even
Packets	On or Off
End of packet	00h (NUL) 0Ah (LF) 0Dh (CR) 20h (SP) FFh
Decode Formats Available	Hex Binary ASCII
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

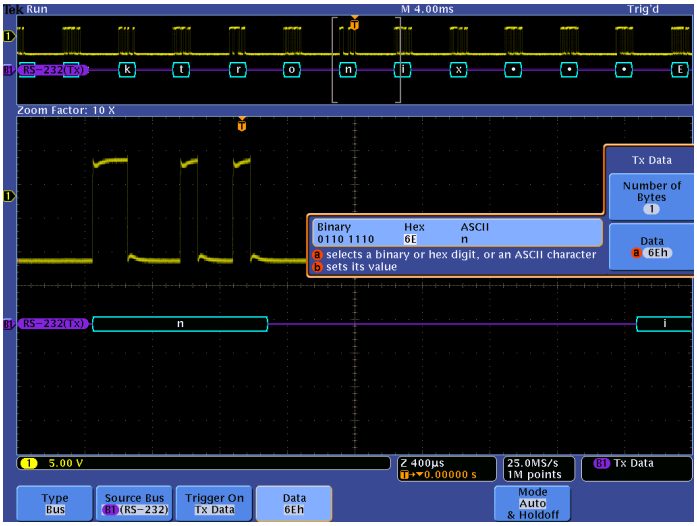
Characteristic	Description
Trigger and/or Search On	Tx Start Bit Rx Start Bit Tx End of Packet Rx End of Packet Tx Data (number of bytes 1-10) Rx Data (number of bytes 1-10) Tx Parity Error Rx Parity Error

Bus Decode

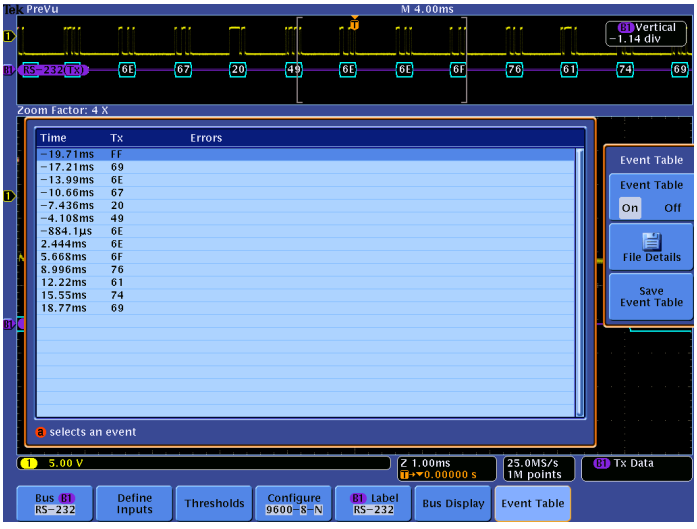
Characteristic	Description
Maximum Bit Rate	Up to 10 Mb/s (for automated decoding of bus)
Decode Display	Data (cyan box) Errors (red box) - Parity - Framing



RS-232 bus setup, showing bit rate options for RS-232 bus.



Triggering on a specific Tx data value on the RS-232 bus.



Event table for RS-232 bus with all captured packets time stamped and in a tabular view.

CAN Characteristics

Bus Setup Options

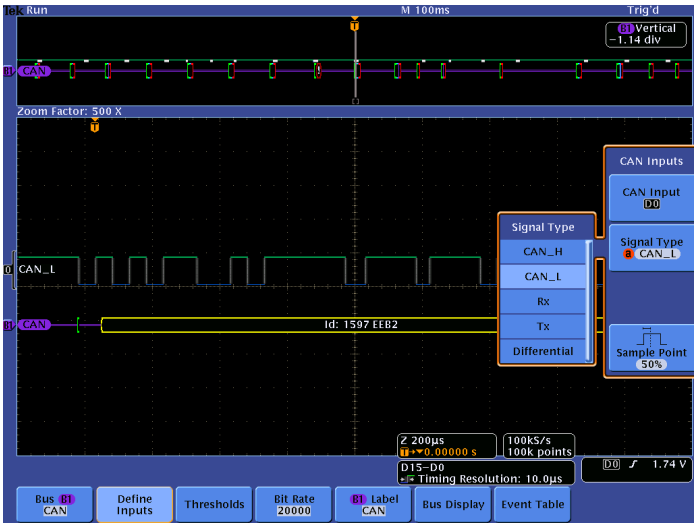
Characteristic	Description
Source for CAN_H, CAN_L, Rx, or Tx Probing	Analog channels 1-4 Digital channels D0-D15
Source for Differential Probing	Analog channels 1-4
Thresholds	Per-channel thresholds
Recommended Probing	
CAN_H, CAN_L, Rx, Tx	Single Ended
Differential	Differential
Bit Rate	
Pre-defined list of rates	10 Kb/s - 1 Mb/s
Custom	10 Kb/s - 1 Mb/s
Sample Point	Position at 5% to 95% within bit period or unit interval
Decode Formats Available	Hex Binary
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

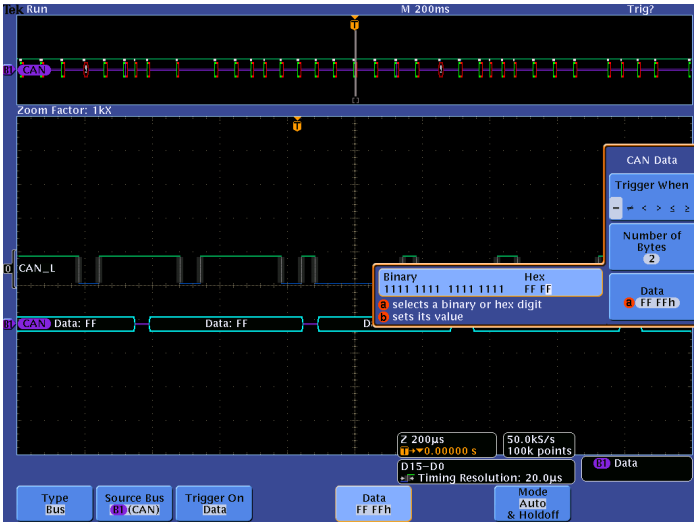
Characteristic	Description
Trigger and/or Search On	Start of Frame Type of Frame (Data, Remote, Error, Overload) Identifier (Standard or Extended) Data (number of bytes 1-8, trigger or search when =, ≠, <, >, ≤, ≥) Identifier and Data End of Frame Missing Ack Bit Stuffing Error

Bus Decode

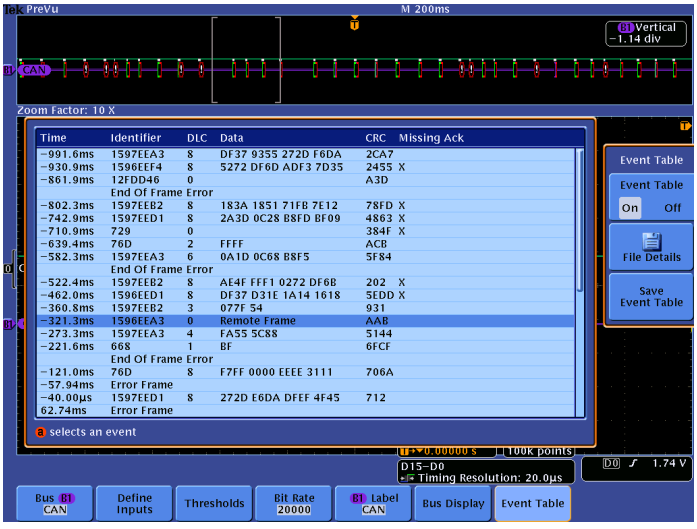
Characteristic	Description
Maximum Bit Rate	Up to 1 Mb/s (for automated decoding of bus)
Decode Display	Start (green bracket) Identifier (yellow box) DLC, CRC (purple box) Missing Ack (red ! symbol) Data (cyan box) Stop (red bracket) Errors (red box) - End of Frame - Bit Stuffing



CAN bus setup, showing signal type options for CAN bus.



Triggering on a specific data value on the CAN bus.



Event table for CAN bus with all captured packets time stamped and in a tabular view.

LIN Characteristics

Bus Setup Options

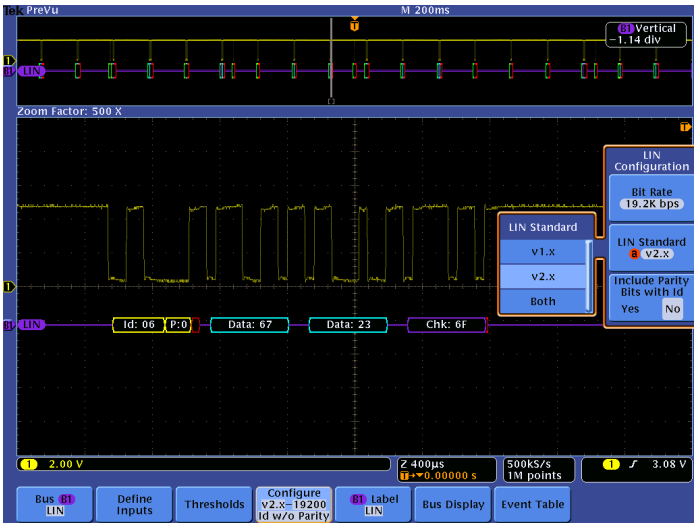
Characteristic	Description
Source	Analog channels 1-4 Digital channels D0-D15
Thresholds	Per-channel thresholds
Recommended Probing	Single Ended
Sample Point	Position at 10% to 90% within bit period or unit interval
Decode Configuration	
Polarity	Normal or Inverted
Bit rate	
Pre-defined list of rates	1.2 kb/s - 19.2 kb/s
Custom	800 b/s - 100 kb/s
LIN standard	v1.x, v2.x, or Both
Include parity bits with ID	Yes or No
Decode Formats Available	Mixed: ID and Parity are shown in Hex, Data and Checksum are shown in Binary Hex: all fields Binary: all fields
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

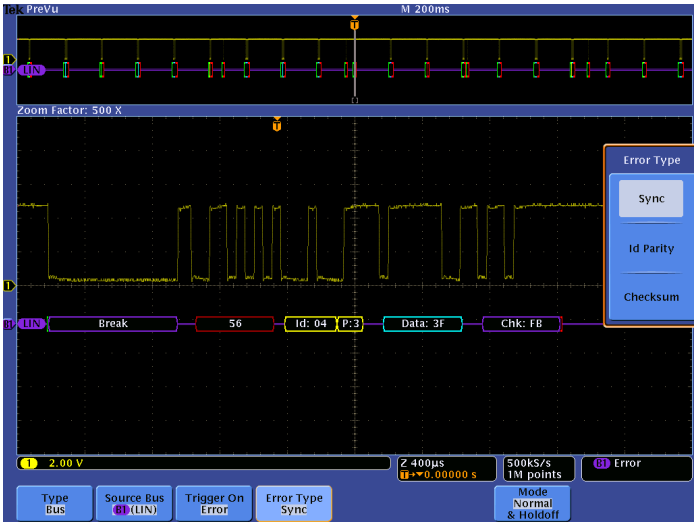
Characteristic	Description
Trigger and/or Search On	Sync Identifier Data (number of bytes 1-8; trigger or search when =, ≠, <, >, ≤, ≥, inside range, outside range) Identifier and Data Wakeup Frame Sleep Frame Error (Sync, ID Parity, Checksum)

Bus Decode

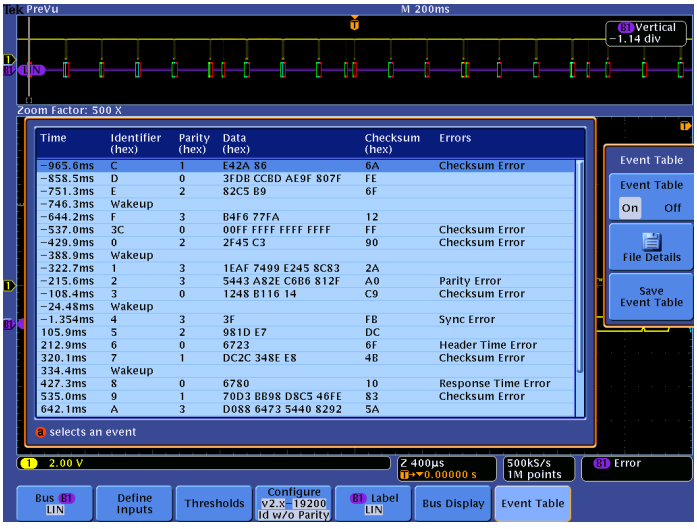
Characteristic	Description
Maximum Bit Rate	Up to 1 Mb/s, by LIN definition up to 20 kb/s (for automated decoding of bus)
Decode Display	Start (green bracket) Sync, Break (purple box) Identifier, Parity (yellow box) Data (cyan box) Checksum, Wakeup (purple box) End of frame (red bracket) Errors (red box) - Sync - Parity - Checksum - Header Time - Response Time - Frame Time - Response and Frame Time



LIN bus setup, showing source configuration options for LIN bus.



Triggering on a Sync Error on the LIN bus.



Event table for LIN bus with all captured packets time stamped and in a tabular view.

FlexRay Characteristics

Bus Setup Options

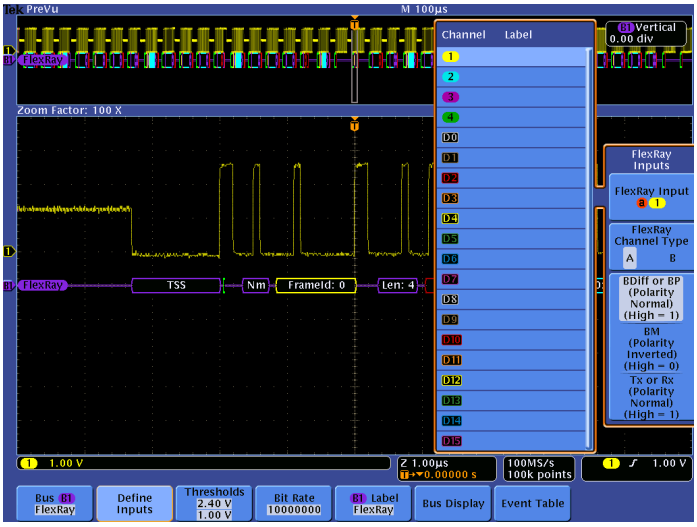
Characteristic	Description
Source for Single-ended Probing	Analog channels 1-4 Digital channels D0-D15
Source for Differential Probing	Analog channels 1-4
Thresholds	High and Low thresholds per channel
Recommended Probing	Single Ended or Differential
Decode Configuration	
Bit rate	2.5 Mb/s, 5 Mb/s, 10 Mb/s, or Custom (1 Mb/s - 100 Mb/s)
Channel type	A or B
Polarity	BDiff or BP, BM, Tx or Rx
Decode Formats Available	Mixed: Identifier, Payload Length and Cycle Count are shown in Decimal, Data and CRCs are shown in Hex. Hex: all fields Binary: all fields
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Decode

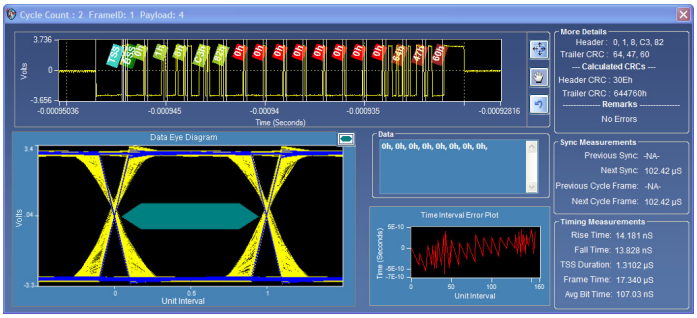
Characteristic	Description
Maximum Bit Rate	Up to 10 Mb/s (for automated decoding of bus)
Decode Display	TSS (purple box) Start (green bracket) Frame ID (yellow box) Payload Length (purple box) Headers (purple box) - Null - Normal - Sync - Payload - Startup - Unknown - Null Sync - Payload Sync - Null Startup - Payload Startup - CRC Cycle Count (yellow box) Data (cyan box) CRC, DTS, CID (purple box) Stop (red bracket) - TSS - Header CRC - Trailer CRC - Null Frame - Sync Frame - Startup Frame - BSS - FSS

Bus Trigger and Search Options

Characteristic	Description
Trigger and/or Search On	Start of Frame Indicator Bits (Normal, Null, Payload, Sync, Startup) Identifier (trigger when =, ≠, <, >, ≤, ≥, inside range, outside range) Cycle Count (trigger when =, ≠, <, >, ≤, ≥, inside range, outside range) Header Fields (Indicator Bits, Identifier, Payload Length, Header CRC, and Cycle Count) Data (number of bits 1-16; byte offset 'don't care' – 253; trigger when =, ≠, <, >, ≤, ≥, inside range, outside range) Identifier and Data End of Frame (Static, Dynamic (DTS), All) Error (Header CRC, Trailer CRC, Null Frame (static or dynamic), Sync Frame, Startup Frame)



FlexRay bus setup, showing input options for FlexRay bus.



PC-based, eye-diagram analysis software builds an eye-diagram from the entire acquisition and plots it against TP1 mask called out by the FlexRay standard.

I²S/LJ/RJ/TDM Characteristics

Bus Setup Options

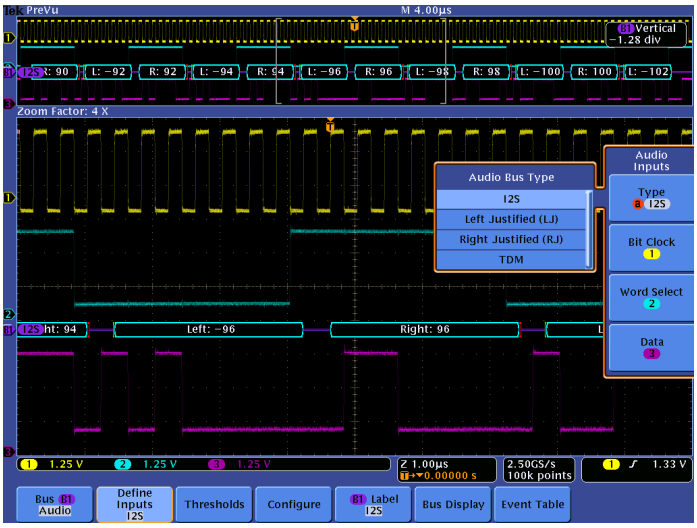
Characteristic	Description
Sources (Clock, Word, Data)	Analog channels 1-4 Digital channels D0-D15
Thresholds	Per-channel thresholds
Recommended Probing	Single Ended
Decode Configuration	
Word size	4-32 bits
Clock	Rising or falling edge
Word Select polarity	Normal or Inverted
Data High	1 or 0
Bit order	Most Significant (MS) First Least Significant (LS) First
Decode Formats Available	Signed Decimal Hex Binary
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

Characteristic	Description
Trigger and/or Search On	Word Select Frame Sync Data (select either word, left word, or right word; trigger or search when =, ≠, <, >, ≤, ≥, inside range, outside range)

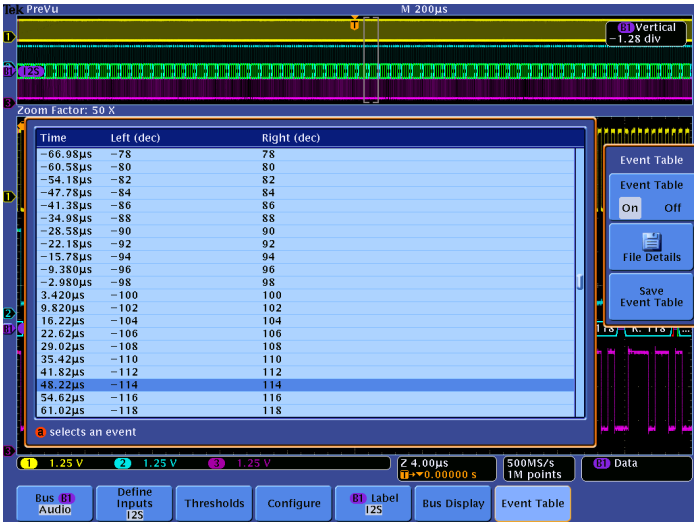
Bus Decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 12.5 Mb/s (for automated decoding of I²S/LJ/RJ bus) Up to 25 Mb/s (for automated decoding of TDM bus)
Decode Display	Start (green bracket) Data (cyan box) Stop (red bracket)



I²S bus setup, showing input configuration options for I²S bus.

Triggering on a specific data value on the I²S bus.



Event table for I²S bus with all captured packets time stamped and in a tabular view.

MIL-STD-1553 Characteristics

Bus Setup Options

Characteristic	Description
Source	Analog channels 1-4 Reference waveforms 1-4 Math waveform
Thresholds	High and Low threshold per source
Recommended Probing	Differential or Single Ended (only one single-ended signal required)
Decode Configuration	
Polarity	Normal or Inverted
Bit rate	1 Mb/s per the standard
Response Time	2µs – 100µs
Decode Formats Available	Mixed1: Hex (data), Decimal (addresses and count), Binary (bits) Mixed2: ASCII (data), Decimal (addresses and count), Binary (bits) Block Hex Hex and Binary Binary
Display Modes	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view

Bus Trigger and Search Options

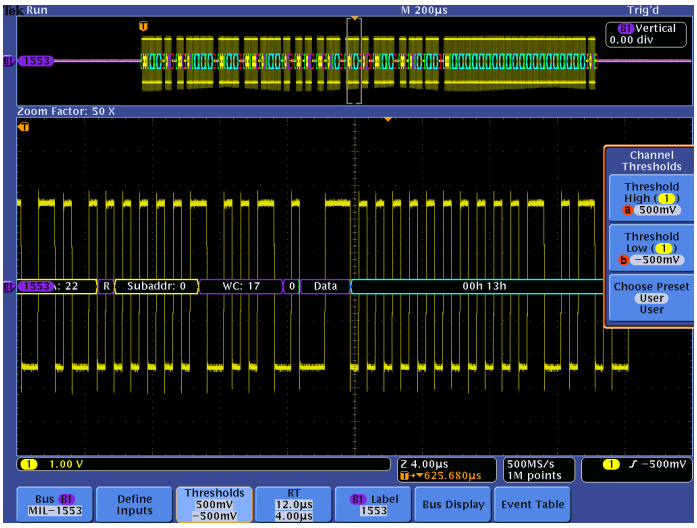
Characteristic	Description
Trigger and/or Search On	Sync Word Type*2 (Command, Status, Data) Command Word*2 (set RT Address (=, ≠, <, >, ≤, ≥, inside range, outside range), T/R, Sub-address/Mode, Data Word Count/Mode Code, and Parity individually) Status Word*2 (set RT Address (=, ≠, <, >, ≤, ≥, inside range, outside range), Message Error, Instrumentation, Service Request Bit, Broadcast Command Received, Busy, Subsystem Flag, Dynamic Bus Control Acceptance (DBCA), Terminal Flag, and Parity individually) Data Word (user-specified 16-bit data value) Error (Sync, Parity, Manchester, Non-contiguous data) Idle Time (minimum time selectable from 4 µs to 100 µs; maximum time selectable from 12 µs to 100 µs; trigger on < minimum, > maximum, inside range, outside range)

Bus Decode

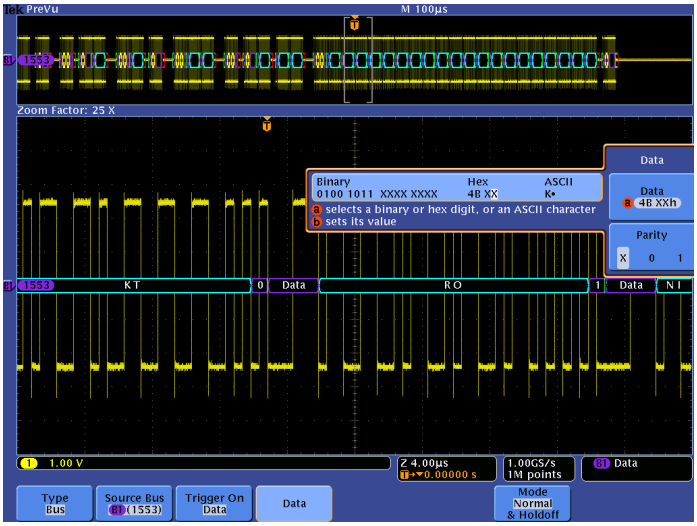
Characteristic	Description
Maximum Clock/Data Rate	Up to 1 Mb/s (for automated decoding of bus)
Decode Display	Start (green bracket) Sync*3 (purple box) with Word Type identified Address (yellow box) R/T (purple box) Word Count (purple box) Status Bits (purple box) Data (cyan box) Parity (purple box) Stop (red bracket) Errors (red box)

*2 Trigger selection of Command Word will trigger on Command and ambiguous Command/Status words. Trigger selection of Status Word will trigger on Status and ambiguous Command/Status words.

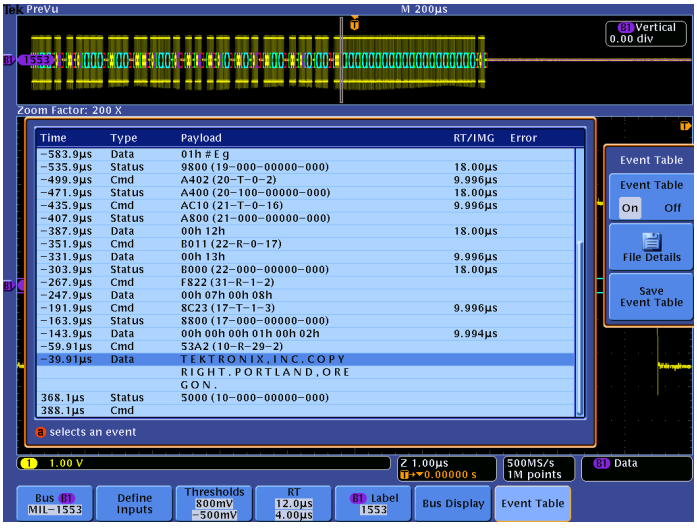
*3 Ambiguous Command and Status words will be labeled with C/S and a generic bit decode will be displayed.



MIL-STD-1553 bus setup, showing threshold entry fields.



Triggering on a specific data value on the MIL-STD-1553 bus.



Event table for MIL-STD-1553 bus with all captured packets time stamped and in a tabular view.

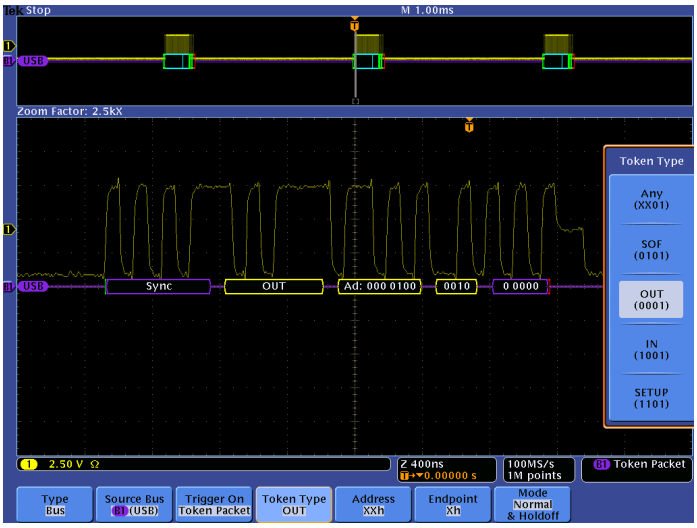
DPO4USB

Bus Setup Options

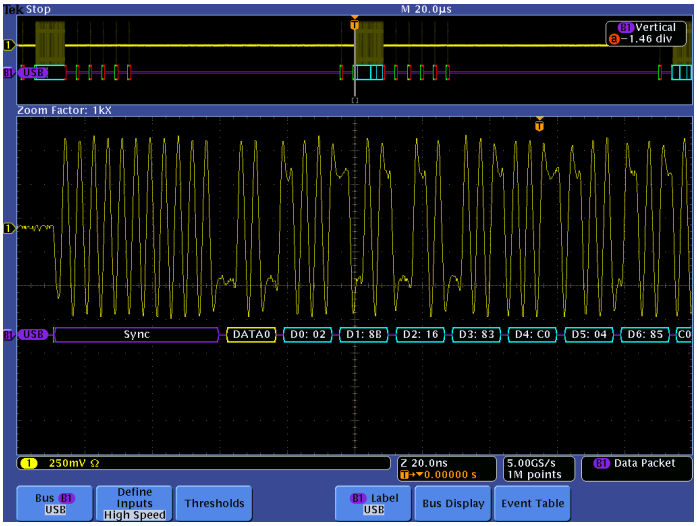
Characteristic	Description
USB 2.0 Compatibility	Low-speed and Full-speed: All MDO/MSO/DPO4000 Series models High-speed: Models with 1 GHz analog channel bandwidth
Sources	Single-ended: Analog channels 1-4 Digital channels D0-D15 Differential: Analog channels 1-4 Math channel Reference channels 1-4
Recommended Probing	Low-speed and Full-speed: Single-ended or differential High-speed: Differential
Thresholds Presets	Low-speed and Full-speed: Single-ended (D+: 1.4 V; D–: –1.4 V), differential (High: 1.4 V; Low: –1.4 V) High-speed: Differential (High: 100 mV; Low: –100 mV)
Decode Formats Available	Mixed1: Frame and Address are shown in Decimal, Data shown in Hex Mixed2: Frame and Address are shown in Decimal, Data shown in ASCII Hex: all fields Binary: all fields
Display Modes	
Bus	Bus only
Bus and waveforms	Simultaneous display of bus and logic waveforms
Event table	Decoded packet data in a tabular view

Bus Decode

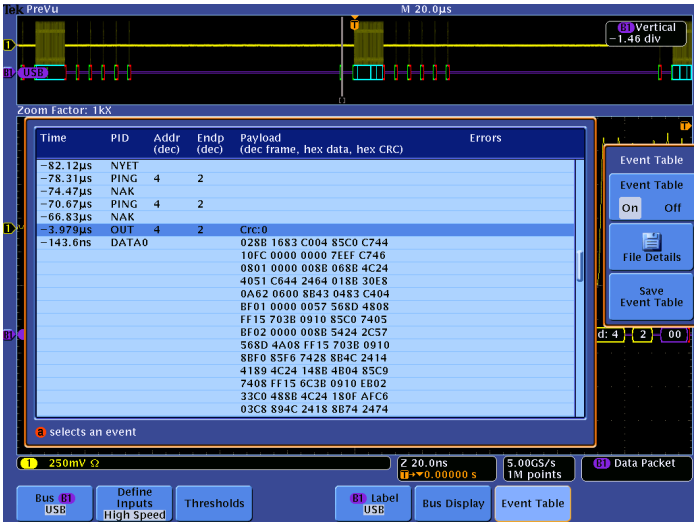
Characteristic	Description
USB 2.0 Data Rates	Low-speed: 1.5 Mb/s Full-speed: 12 Mb/s High-speed: 480 Mb/s
Decode Display	Start (green bar) PID (yellow packet) Data (cyan packet) CRC (purple packet) Stop (red bar)



Triggering on a specific PID on an USB FS bus.



High-speed USB decoded display, automatically displaying bus content.



USB decoded Event table showing all packet information with time-stamp information.

Bus Trigger Options

Characteristic	Description
Trigger and/or Search On	Low-speed: Trigger/Search on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet – Any token type, SOF, OUT, IN, SETUP; Address can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular value, or inside or outside of a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet – Any data type, DATA0, DATA1; Data can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Handshake Packet – Any handshake type, ACK, NAK, STALL. Special Packet – Any special type, Reserved. Error – PID Check, CRC5, CRC16, Bit Stuffing.
	Full-speed: Trigger/Search on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet – Any token type, SOF, OUT, IN, SETUP; Address can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular value, or inside or outside of a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet – Any data type, DATA0, DATA1; Data can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Handshake Packet – Any handshake type, ACK, NAK, STALL. Special Packet – Any special type, PRE, Reserved. Error – PID Check, CRC5, CRC16, Bit Stuffing.
	High-speed: Trigger/Search on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet – Any token type, SOF, OUT, IN, SETUP; Address can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular value, or inside or outside of a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet – Any data type, DATA0, DATA1, DATA2, MDATA; Data can be further specified to trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Handshake Packet – Any handshake type, ACK, NAK, STALL, NYET. Special Packet – Any special type, ERR, SPLIT, PING, Reserved. SPLIT packet components that can be specified include: Hub Address Start/Complete – Don't Care, Start (SSPLIT), Complete (CSPLIT) Port Address Start and End bits – Don't Care, Control/Bulk/Interrupt (Full-speed Device, Low-speed Device), Isochronous (Data is Middle, Data is End, Data is Start, Data is All) Endpoint Type – Don't Care, Control, Isochronous, Bulk, Interrupt Error – PID Check, CRC5, CRC16.

DPO4ENET Ethernet Triggering and Analysis Test Characteristics

Bus Setup Options

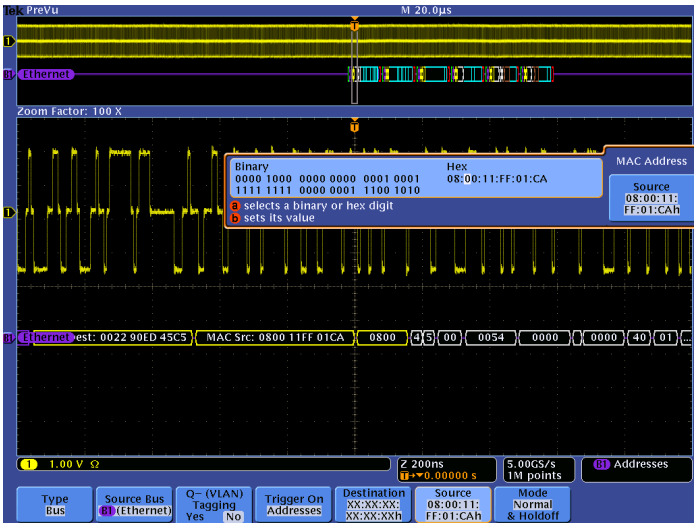
Option	Description
Ethernet Compatibility	10BASE-T, 100BASE-TX
Sources	Single-ended: Analog channels 1-4 Differential: Analog channels 1-4 Math channel Reference channels 1-4
Recommended Probing	10BASE-T: Single-ended or differential 100BASE-TX: Differential
Thresholds Presets	10BASE-T: Single-ended (D+ 1.25 V; D– 1.25 V); Differential (High 1.25 V; Low –1.25 V) 100BASE-TX: Single-ended (D+ 500 mV; D– 500 mV); Differential (High 500 mV; Low –500 mV)
Decode Formats Available	Mixed1: Data is shown in Hex, all other fields are shown in either Decimal or Hex Mixed2: Data is shown in ASCII, all other fields are shown in either Decimal or Hex Hex: all fields Binary: all fields

Bus Decode

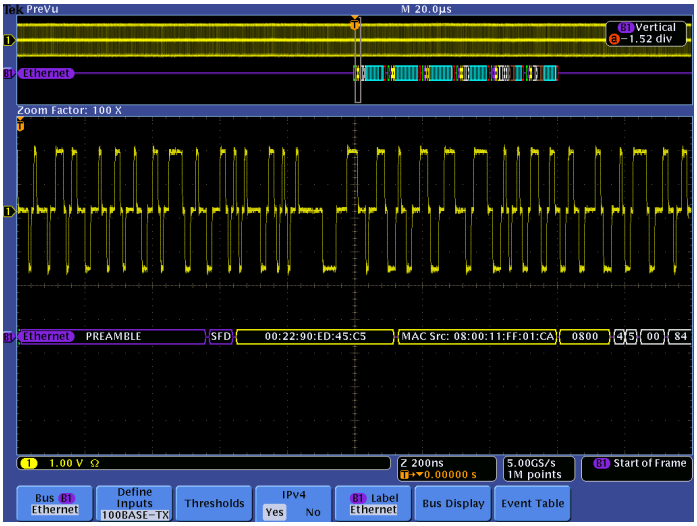
Characteristic	Description
Ethernet Data Rates	10BASE-T: 10 Mb/s 100BASE-TX: 100 Mb/s
Decode Display	Start (green bar) MAC Address (yellow packet) Data (cyan packet) IPv4 Header (white packet) TCP Header (brown packet) CRC (purple packet) Stop (red bar) Error (red packet)
Internet Protocol Support	IPv4
Transport Layer Protcol Support	TCP

Display Modes

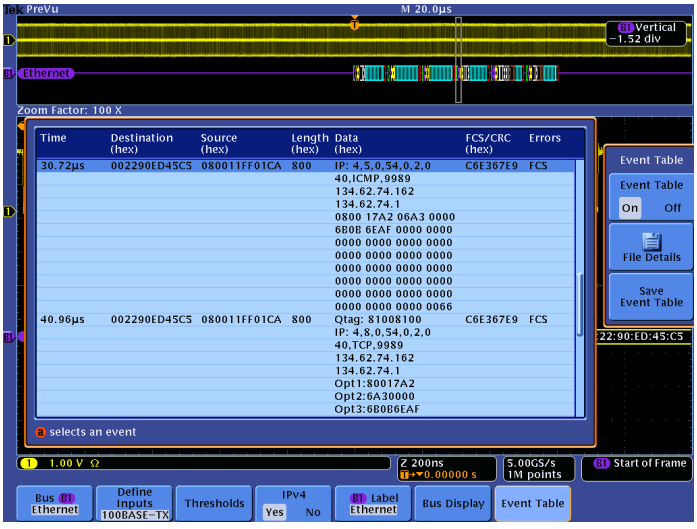
Mode	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view



DPO4ENET triggering on a specific 10BASE-T MAC source address.



Color-coded DPO4ENET display of 100BASE-TX.



DPO4ENET 100BASE-TX decoded Event Table showing all packet information.

Bus Trigger Options

Option	Description
Trigger and/or Search On	**10BASE-T:** Start Frame Delimiter MAC Addresses: Trigger on Source and Destination 48-bit address values MAC Q-tag Control Information: Trigger on Q-tag 32-bit value MAC Length/Type: Trigger on ≤, <, =, >, ≥, ≠ a particular 16-bit value, or inside or outside of a range MAC Client Data: Trigger on ≤, <, =, >, ≥, ≠ a particular 16-bit value, or inside or outside of a range. Selectable number of bytes to trigger on from 1-16. Byte offset options of Don't Care, 0-1499 IP Header: Trigger on IP header 8-bit value, Source Address, Destination Address TCP Header: Trigger on Destination Port, Source Port, Sequence Number, and Ack Number TCP/IPv4 Client Data: Trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Selectable number of bytes to trigger on from 1-16. Byte offset options of Don't Care, 0-1499 End of Packet FCS (CRC) Error **100BASE-TX:** Start Frame Delimiter MAC Addresses: Trigger on Source and Destination 48-bit address values MAC Q-tag Control Information: Trigger on Q-tag 32-bit value MAC Length/Type: Trigger on ≤, <, =, >, ≥, ≠ a particular 16-bit value, or inside or outside of a range MAC Client Data: Trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Selectable number of bytes to trigger on from 1-16. Byte offset options of Don't Care, 0-1499 IP Header: Trigger on IP header 8-bit value, Source Address, Destination Address TCP Header: Trigger on Destination Port, Source Port, Sequence Number, and Ack Number TCP/IPv4 Client Data: Trigger on ≤, <, =, >, ≥, ≠ a particular data value, or inside or outside of a range. Selectable number of bytes to trigger on from 1-16. Byte offset options of Don't Care, 0-1499 End of Packet FCS (CRC) Error Idle

Ordering Information

All modules enable triggering on packet-level information as well as analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information.

	Current Products			Discontinued Products			
Serial Bus	**MDO/MSO/DPO 4000B Series Module**	**MDO3000 Series Module**	**MSO/DPO2000B Series Module**	**MDO4000 Series Module**	**MSO/DPO4000 Series Module*4**	**MSO/DPO3000 Series Module**	**MSO/DPO2000 Series Module**
I²C, SPI*5	DPO4EMBD	MDO3EMBD	DPO2EMBD	DPO4EMBD	DPO4EMBD	DPO3EMBD	DPO2EMBD
RS-232 / 422 / 485 / UART	DPO4COMP	MDO3COMP	DPO2COMP	DPO4COMP	DPO4COMP	DPO3COMP	DPO2COMP
CAN, LIN	DPO4AUTO	MDO3AUTO	DPO2AUTO	DPO4AUTO	DPO4AUTO	DPO3AUTO	DPO2AUTO
FlexRay	–	MDO3FLEX	–	–	–	DPO3FLEX	–
CAN, LIN, FlexRay	DPO4AUTOMAX*6	–	–	DPO4AUTOMAX*6	DPO4AUTOMAX*6	–	–
I²S/LJ/RJ/TDM*7	DPO4AUDIO	MDO3AUDIO	–	DPO4AUDIO	DPO4AUDIO	DPO3AUDIO	–
MIL-STD-1553	DPO4AERO	MDO3AERO	–	DPO4AERO	DPO4AERO	DPO3AERO	–
USB*8	DPO4USB	MDO3USB	–	DPO4USB	DPO4USB	DPO3USB	–
Ethernet*9	DPO4ENET	–	–	DPO4ENET	–	–	–

*4For DPO4000 (non-B) Series with serial numbers lower than C020000, contact Tektronix for a serial triggering hardware update to enable 2-wire SPI, RS-232/422/485/UART parity error, LIN, FlexRay, and I²S/LJ/RJ/TDM triggers.

*5 SPI support is limited to 2-wire SPI only on models that have only 2 analog channels and no digital channels.

*6 DPO4AUTOMAX includes a PC-based software package for FlexRay eye diagram analysis.

*7 Not available on models that have only 2 analog channels and no digital channels.

*8 USB LS/FS triggering and decode available on all models in all indicated product families. HS decode available only on 1 GHz models. HS triggering only available on 1 GHz models in MDO/MSO/DPO4000B and MDO4000 Series.

*9 100BASE-TX requires ≥ 350 MHz model.

Recommended Probes

Please refer to www.tek.com/probes for further information on the recommended models of probes and any necessary probe adapters.

CE

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USA 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

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For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit **www.tektronix.com**

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