Tektronix

Serial Triggering and Analysis Application Modules

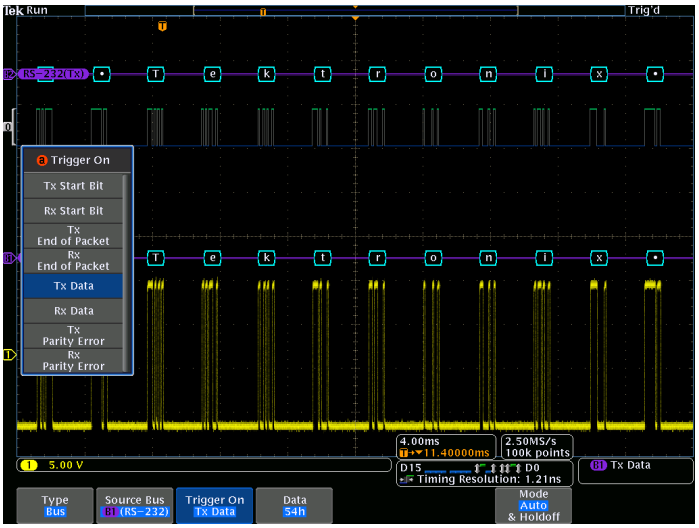
AERO • AUDIO • AUTO • AUTOMAX • COMP • EMBD • FLEX • USB • ENET Datasheet

Key features

- Automated Serial Triggering, Decode, and Search options for I²C, SPI, CAN, CAN FD, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, I²S/LJ/ RJ/T DM, USB, and Ethernet.
- 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. Search mark table provides a tabular view of the events found during an automated search.
- Export Search Mark table data to .csv file.
- 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 file.

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 MDO4000C, MDO3000, and MSO/DPO2000B Series transform the oscilloscope into a robust tool for debugging serial buses with automatic trigger, decode, and search for I²C, SPI, CAN, CAN FD, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, I²S/LJ/RJ/TDM, USB2, and Ethernet.



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.

Serial triggering

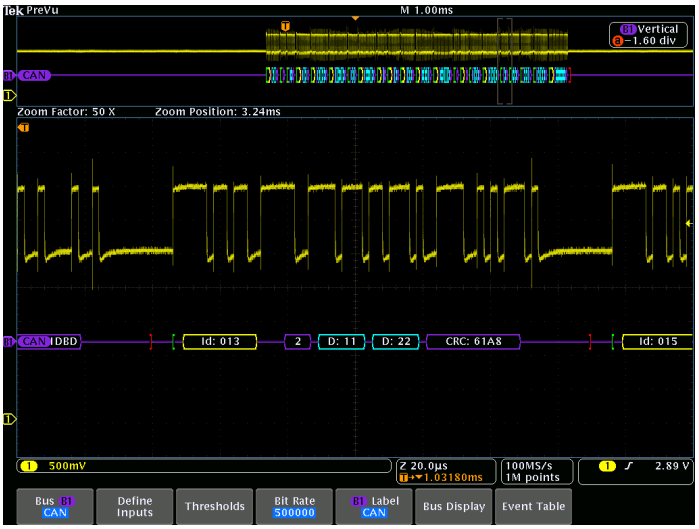
Trigger on packet content such as start of packet, specific addresses, specific data content, unique identifiers, etc. on popular serial interfaces such as I²C, SPI, CAN, CAN FD, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and I²S/LJ/RJ/TDM, USB2, and Ethernet.

Bus display

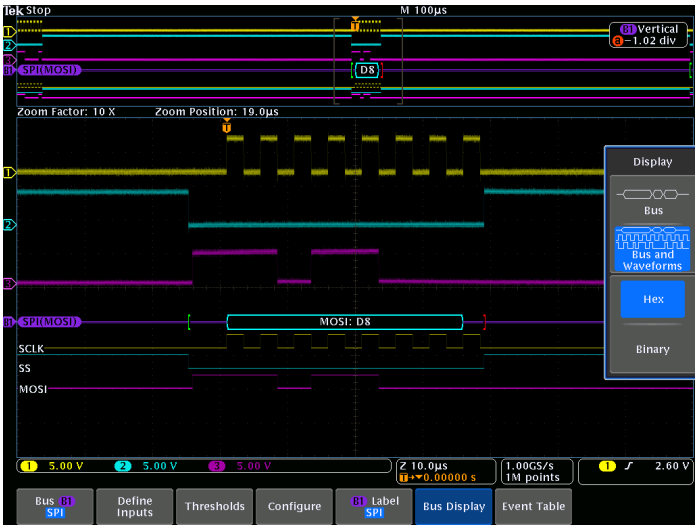
Provides a higher-level, combined view of the individual signals (clock, data, chip enable, etc.) that make up your bus, making it easy to identify where packets begin and end and identifying sub-packet components such as address, data, identifier, CRC, etc.

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, USB and Ethernet only), signed decimal (I^2S/LJ/RJ/TDM only), or ASCII (RS-232/422/485/UART, USB and Ethernet only) in the bus waveform.



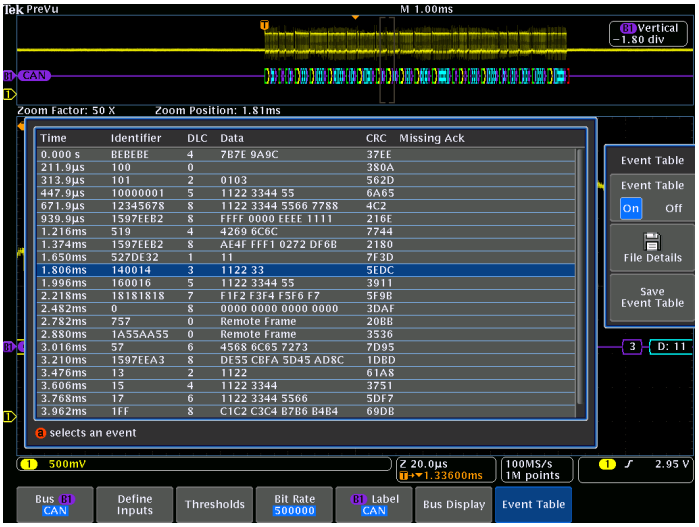
Color-coded display of a CAN bus, showing Start, DLC, Data, CRC, and Stop components of the serial signal.



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

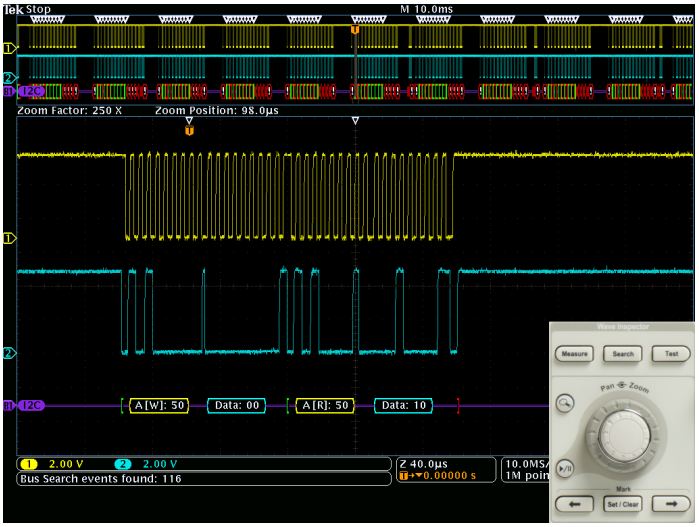
In addition to seeing decoded packet data on the bus waveform itself, you can view all captured packets in a tabular view much like you would see in a software listing. Packets are time stamped and listed consecutively with columns for each component (Address, Data, etc.).



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

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. The Search Mark table provides a tabular view of all events found during an automated search. The search mark data can be exported to a .csv file.



Search – I^2C decode showing results from a Wave Inspector® search for Address value 50. Wave Inspector® controls provide unprecedented efficiency in viewing and navigating waveform data.

Specifications

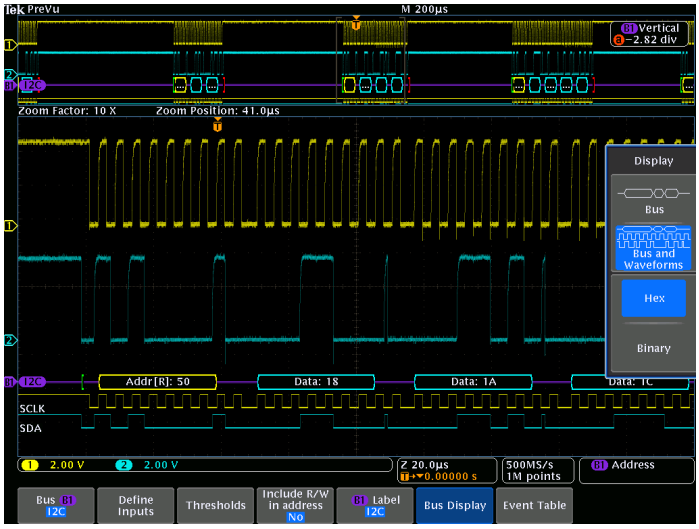
I²C Characteristics

Bus setup options

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

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

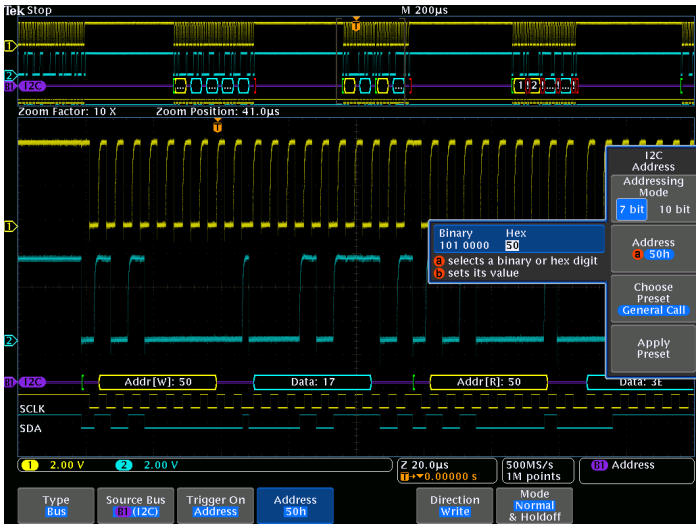


I²C bus setup, showing selection of bus display modes.

I²C Characteristics

Bus trigger and search options

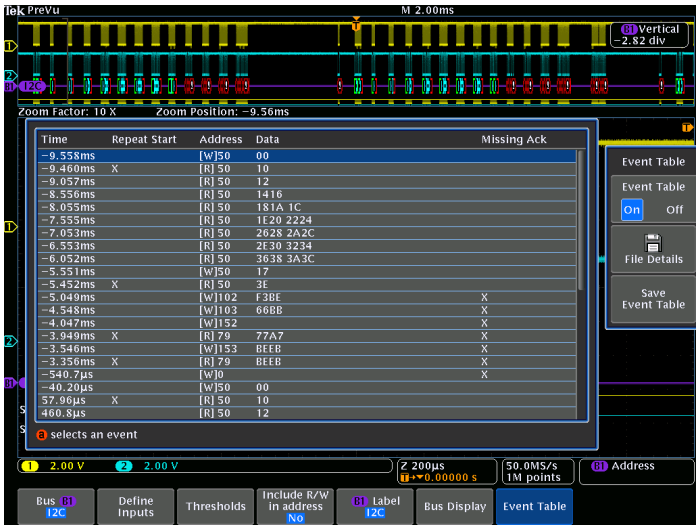
Characteristic	Description
Trigger and/or Search On	Start Stop Repeated Start Missing Ack Address (7 or 10 bit) with R/W Selection Data (number of bytes 1-5) Address and Data



Triggering on a specific address value on the I²C bus.

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)



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

SPI Characteristics

Bus setup options

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

Paramater	Description
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
Bit order	Most Significant (MS) First Least Significant (LS) First

Decode formats available
Hex, Binary

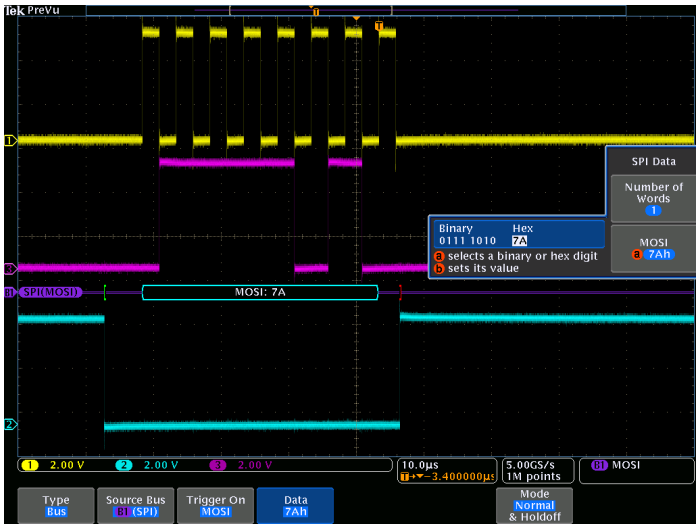
Display mode

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

SPI Characteristics

Bus trigger and search options

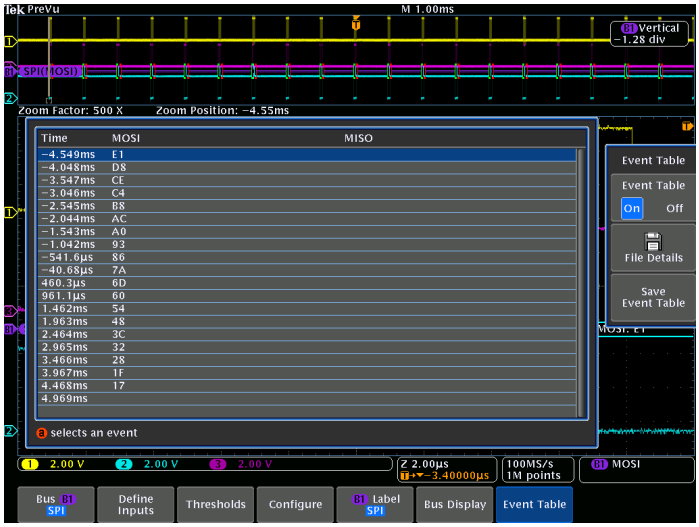
Characteristic	Description
Trigger and/or Search On	SS Active Start of Frame MOSI MISO MOSI and MISO Data: maximum of 128 bits (up to four 32-bit words or 32 four-bit words)



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

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)



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

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

BusSetupOptions-spectable2

Bus setup options

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	RS-422/RS-485 Inverted (UART, RS-422/RS-485)

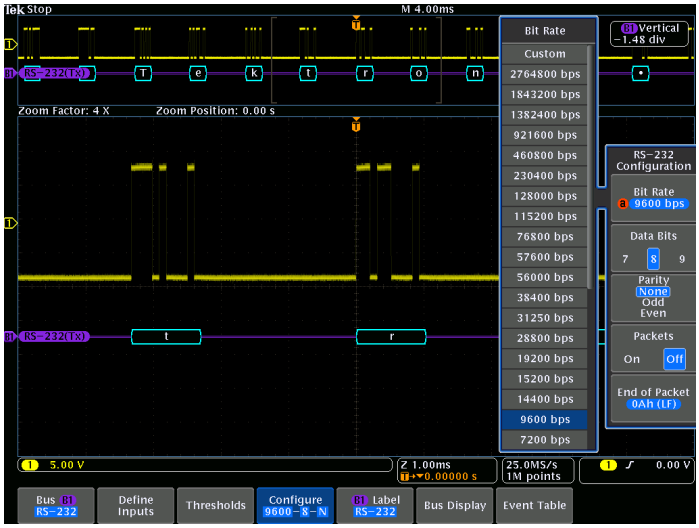
Decode configuration

Paramater	Description
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

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

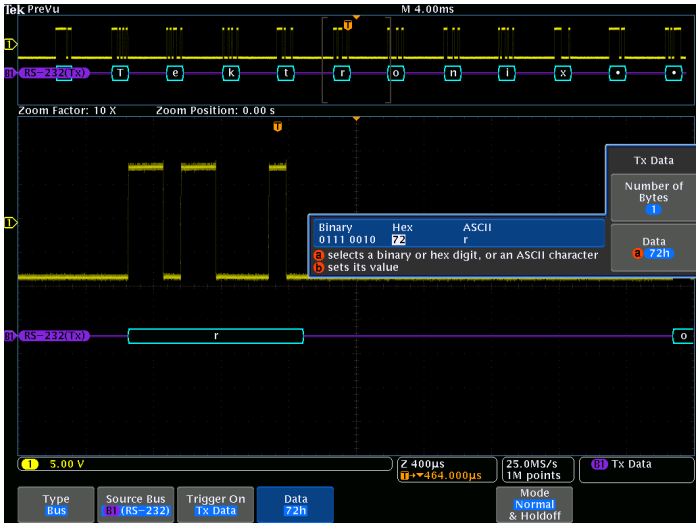


RS-232 bus setup, showing bit rate options for RS-232 bus.

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

Bus trigger and search options

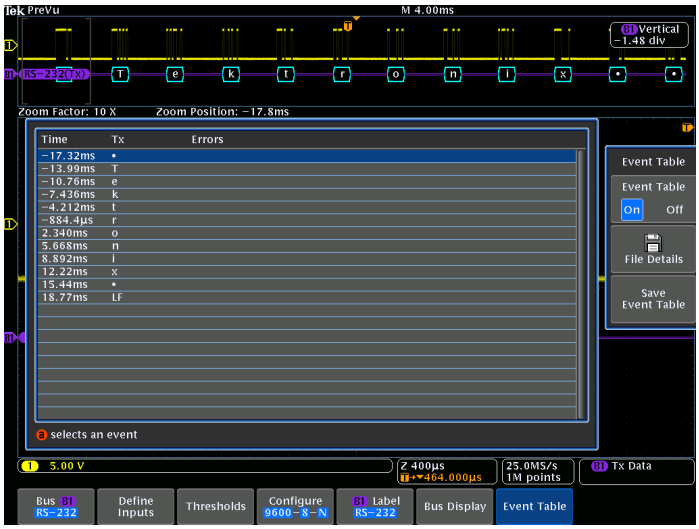
Characteristic	Description
Trigger and/or Search On	Tx Start Bit Rx Start Bit Tx End of Packet Rx End of Packet Tx Data (number of bytes 1-10) Rx Data (number of bytes 1-10) Tx Parity Error Rx Parity Error



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

Bus decode

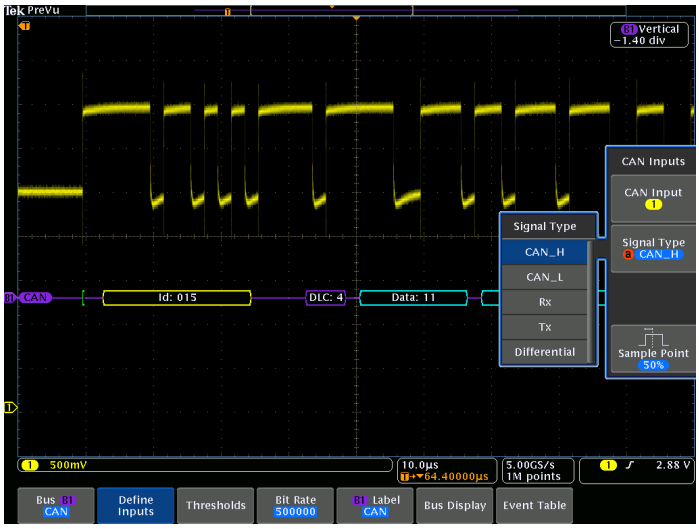
Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (for automated decoding of bus)
Decode display	Data (cyan box) Errors (red box) - Parity - Framing



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

CAN, CAN FD (ISO and non-ISO) Characteristics

Bus setup options



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

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

TDP1500 differential probe

CAN_H, CAN_L, Rx, Tx: Single ended

Differential: Differential

Bit Rate

Parameter	Description
Standard: pre-defined list of rates and Custom	10 Kb/s - 1 Mb/s
FD: Pre-defined and custom	1 Mb/s - 10 Mb/s (7 M/bs MDO3K)

Sample Point

Position at 15% to 95% within bit period or unit interval

Decode formats available

Hex, Binary

Display modes

Parameter	Description
Bus	Bus only
Bus and waveforms	Simultaneous display of bus and logic waveforms
Event table	Decoded packet data in a tabular view

CAN, CAN FD (ISO and non-ISO) Characteristics

Bus trigger and search options

Characteristic	Description
Trigger and/or Search On [1]	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 FD BRS Bit FD ESI Bit Form Error Any Error

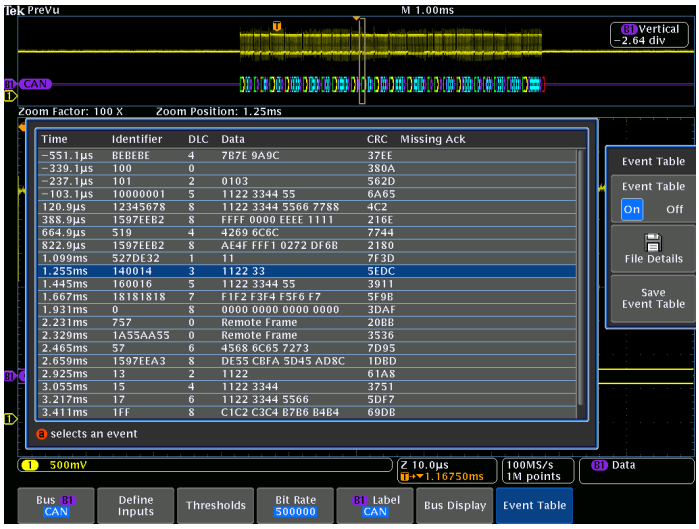
Triggering on a specific data value on the CAN bus.

[1] FD BRS Bit, FD ESI Bit, Form Error and Any Error are available only when CAN FD is selected as BUS

CAN, CAN FD (ISO and non-ISO) Characteristics

Bus decode

Characteristic	Description
Decode display	Start (green bracket) Address (yellow box) DLC, CRC (purple box) Missing Ack (red ! symbol) Data (cyan box) Stop (red bracket) Bit stuffing errors (red box)



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

LIN Characteristics

Bus setup options

Source

Analog channels 1-4

Digital channels D0-D15

Thresholds

Per-channel thresholds

Recommended probing

Single ended

Decode Configuration

Parameter	Description
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

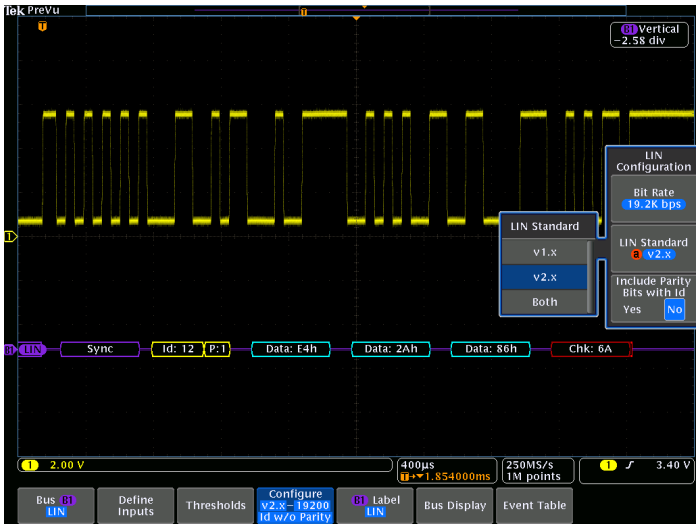
LIN Characteristics

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

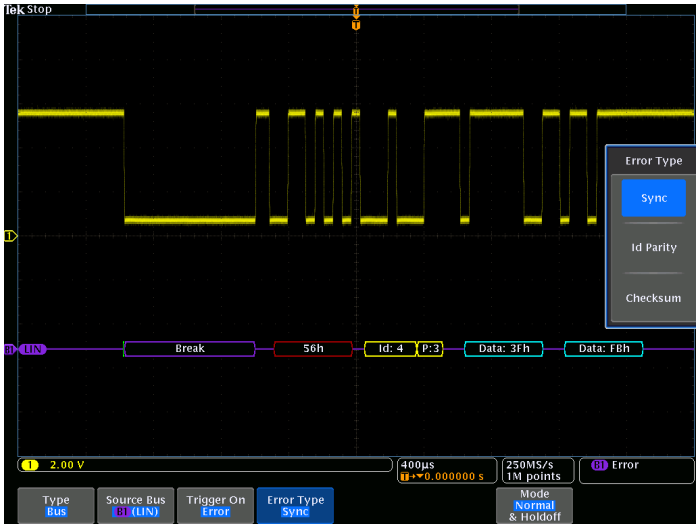
Mode	Description
Bus	Bus only
Bus and waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view



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

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)

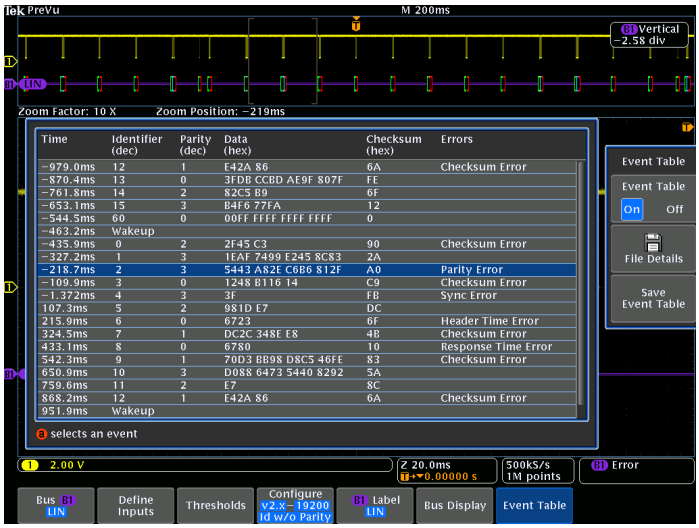


Triggering on a Sync Error on the LIN bus.

LIN Characteristics

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



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

FlexRay Characteristics

Bus setup options

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

Parameter	Description
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

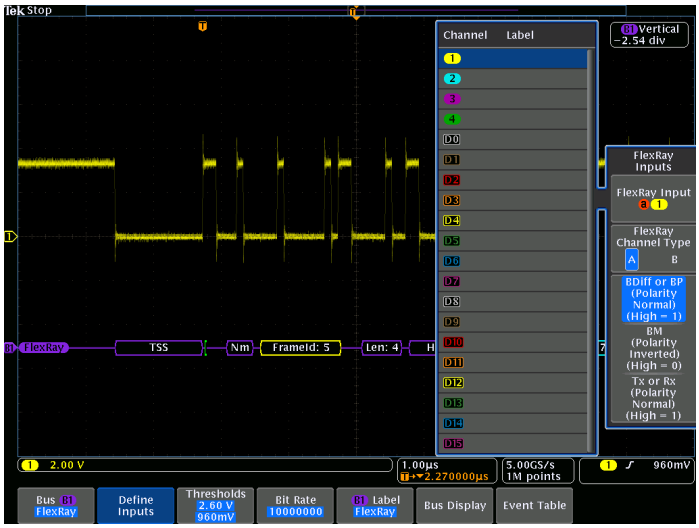
FlexRay Characteristics

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

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



FlexRay bus setup, showing input options for FlexRay bus.

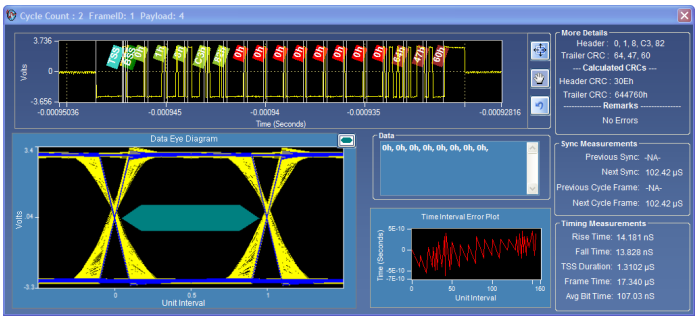
Bus trigger and search options

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 Characteristics

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



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, available with MDO4000C instruments.

I²S/LJ/RJ/TDM Characteristics

Bus setup options

Sources (Clock, Word, Data)
Analog channels 1-4
Digital channels D0-D15

Thresholds
Per-channel thresholds

Recommended probing
Single ended

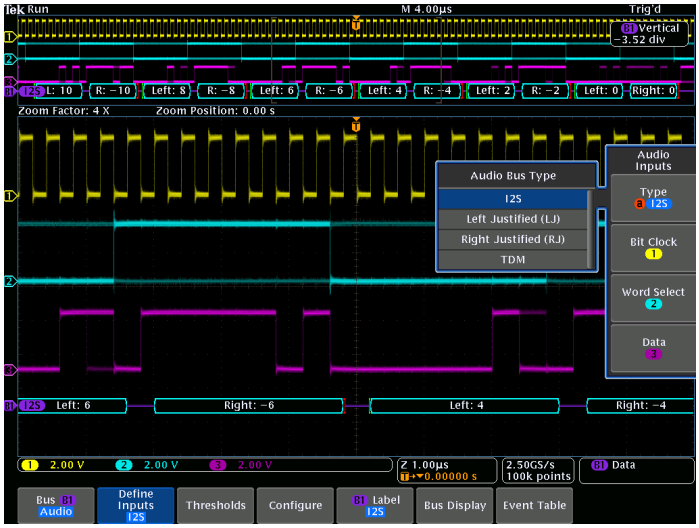
Decode Configuration

Parameter	Description
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

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

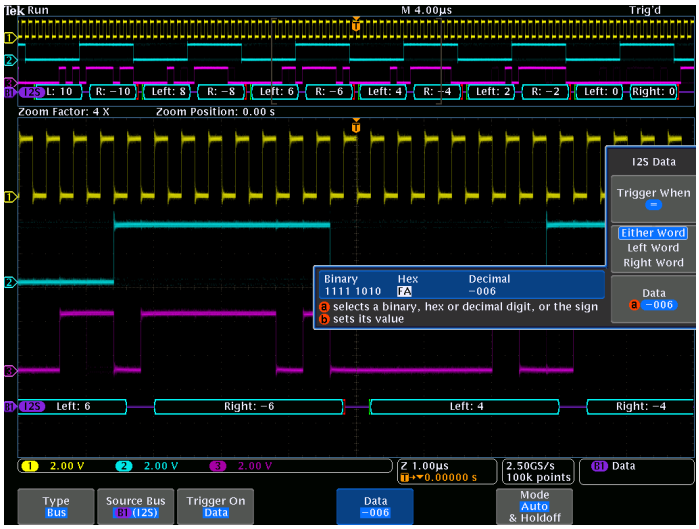


I²S bus setup, showing input configuration options for I²S bus.

I²S/LJ/RJ/TDM Characteristics

Bus trigger and search options

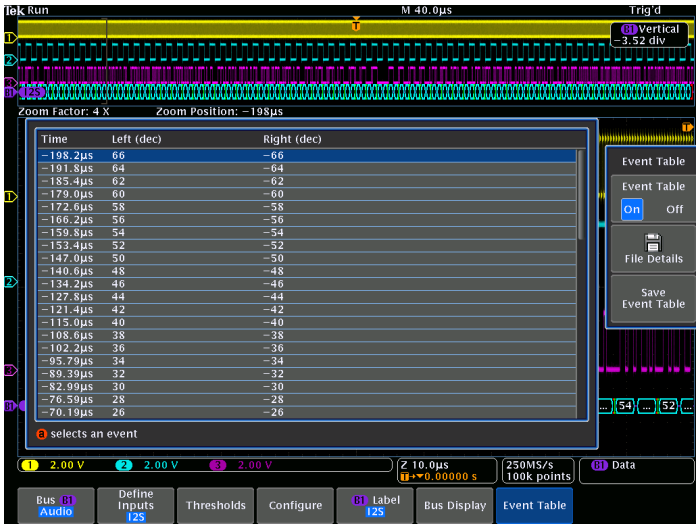
Characteristic	Description
Trigger and/or Search On	Word Select Frame Sync Data (select either word, left word, or right word; trigger or search when =, ≠,<,>, ≤, ≥, inside range, outside range)



Triggering on a specific data value on the I²S bus.

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



Start (green bracket) Data (cyan box) Stop (red bracket).

MIL-STD-1553 Characteristics

Bus setup options

Sources

Analog channels 1-4

Reference waveforms 1-4

Math waveform

Thresholds

High and low threshold per source

Recommended probing

Single ended or differential (only one single-ended signal required)

Decode Configuration

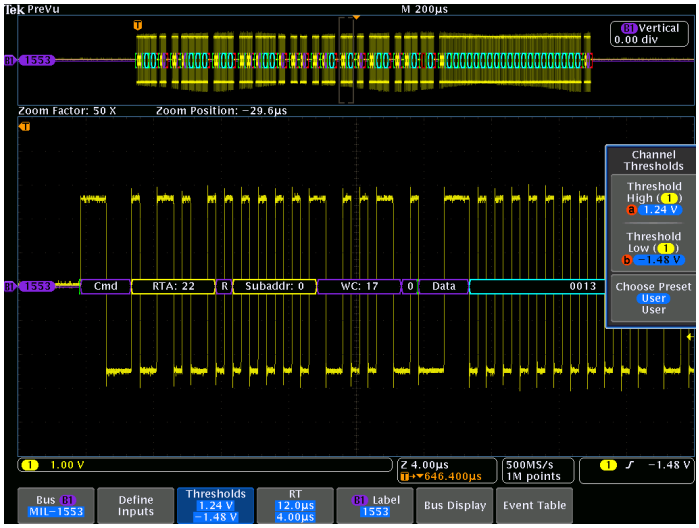
Parameter	Description
Bit rate	1 Mb/s per the standard
Response Time	2 µs – 100 µs
Polarity	Normal or Inverted

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

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

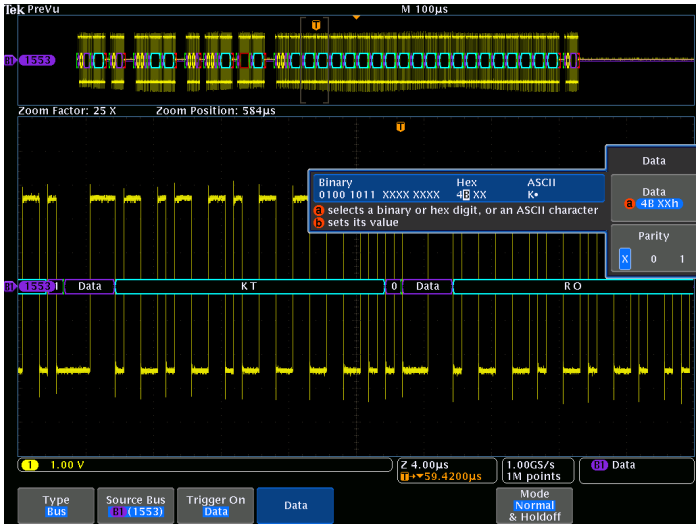


MIL-STD-1553 bus setup, showing threshold entry fields.

MIL-STD-1553 Characteristics

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)

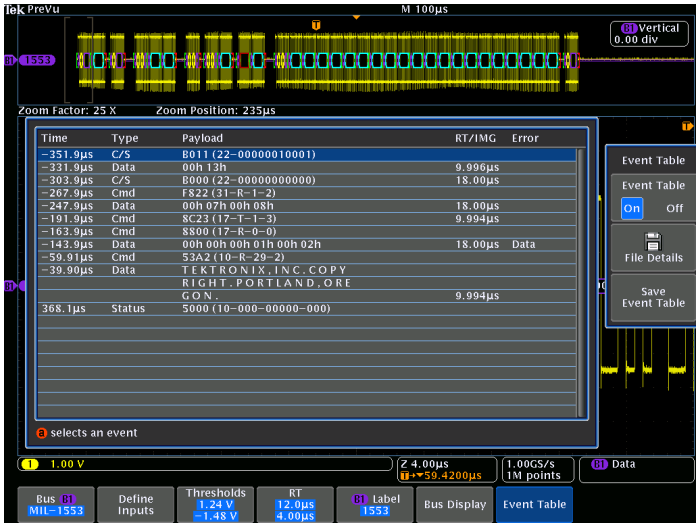


Triggering on a specific data value on the MIL-STD-1553 bus.

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.

MIL-STD-1553 Characteristics

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)



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

USB Characteristics

Bus setup options	USB 2.0 Compatibility
	Low-speed and Full-speed: All MDO4000C or MDO3000 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 presents	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) High-speed: Differential (High: 100 mV; Low: -100 mV)

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

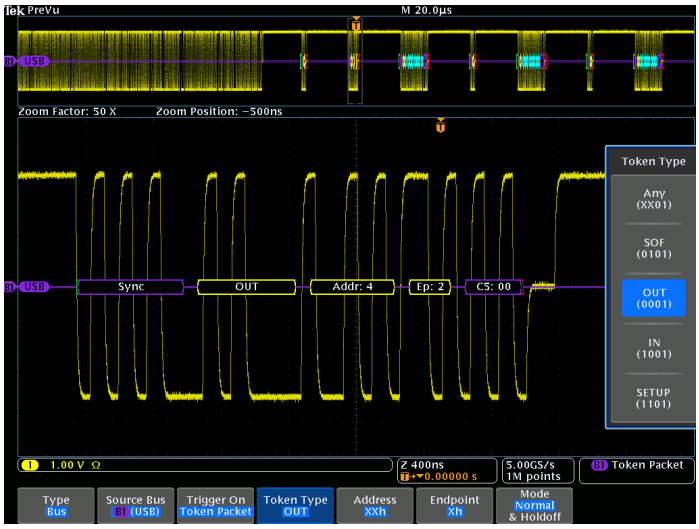
USB Characteristics

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

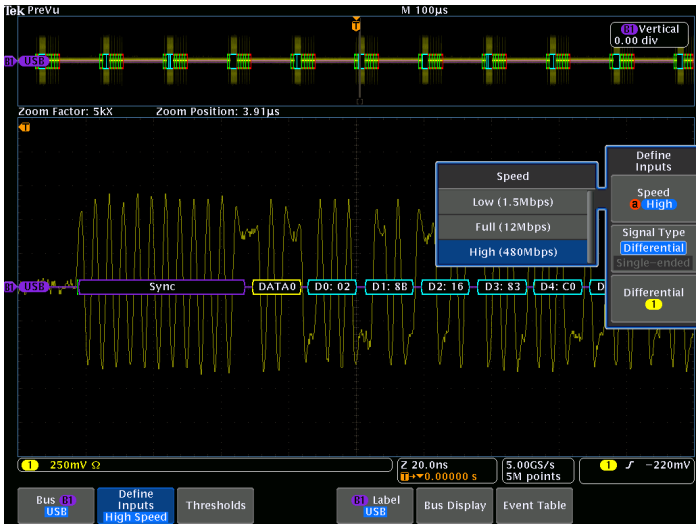
Mode	Description
Bus	Bus only
Bus and waveforms	Simultaneous display of bus and logic waveforms
Event Table	Decoded packet data in a tabular view



Triggering on a specific PID on a USB FS bus.

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 bracket) PID (yellow box) Data (cyan box) CRC (purple box) Stop (red bracket)



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

USB Characteristics

Bus trigger and search 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

Ethernet Characteristics

Bus setup options

Ethernet compatibility 10BASE-T, 100BASE-TX On MDO4000C Series only

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 presents

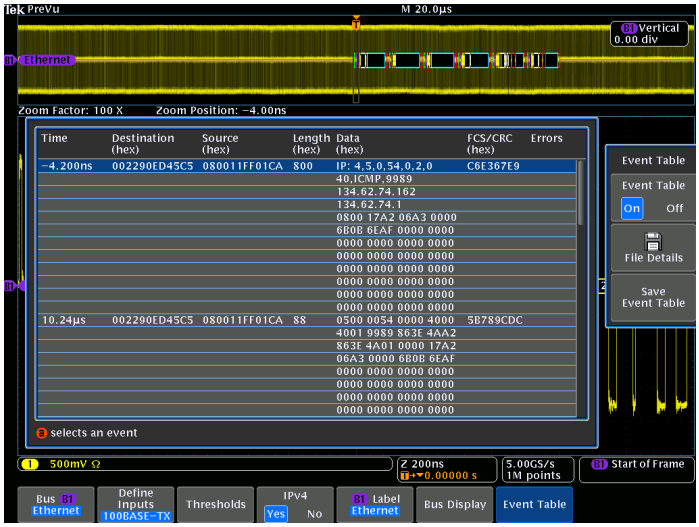
10BASE-T: Single-ended (D+: 1.25 V; D-: 1.25 V); Differential (High: 1.25 V; Low: -1.25 V) 100BASE-TX: Single-ended (D+: 500 mV; D-: 500 mV); Differential (High: 500 mV; Low: -500 mV)

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

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

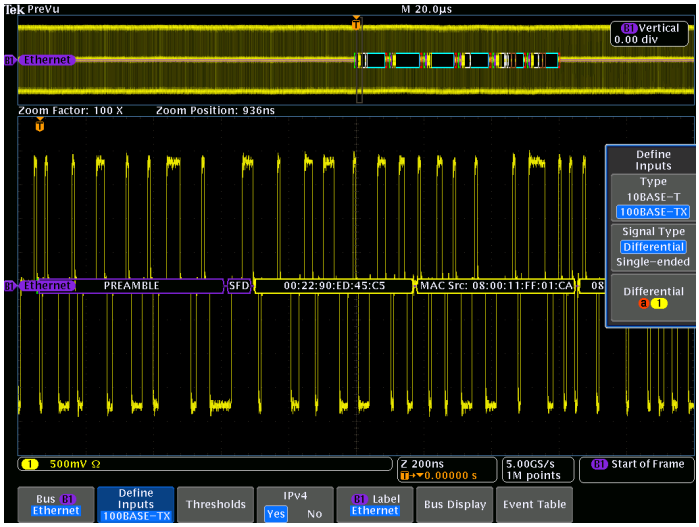


DPO4ENET 100BASE-TX decoded Event Table showing all packet information.

Ethernet Characteristics

Bus decode

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

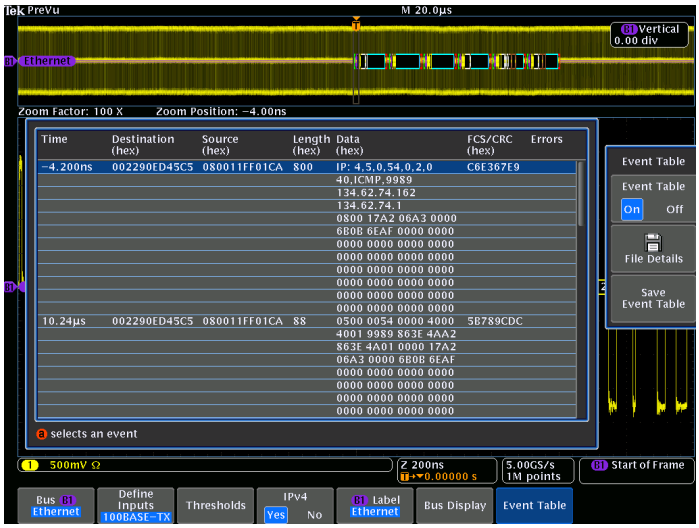


Color-coded DPO4ENET display of 100BASE-TX.

Ethernet Characteristics

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



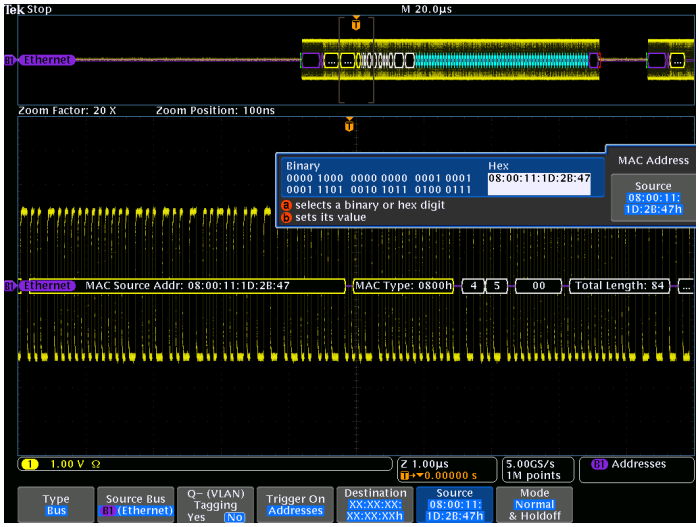
DPO4ENET 100BASE-TX decoded Event Table showing all packet information.

Ethernet Characteristics

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

Ethernet Characteristics



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

Ordering information

Current/discontinued products

Current products

Serial Bus	MDO4000C Series Module	MDO3000 Series Module	MSO/DPO2000B Series Module
I^2C, SPI [4]	DPO4EMBD	MDO3EMBD	DPO2EMBD
RS-232 / 422 / 485 / UART	DPO4COMP	MDO3COMP	DPO2COMP
CAN/CAN FD, LIN	DPO4AUTO	MDO3AUTO	DPO2AUTO
FlexRay	--	MDO3FLEX	--
CAN/CAN FD, LIN, FlexRay	DPO4AUTOMAX [5]	--	--
I^2S/LJ/RJ/TDM [6]	DPO4AUDIO	MDO3AUDIO	--
MIL-STD-1553	DPO4AERO	MDO3AERO	--
USB [7]	DPO4USB	MDO3USB	--
Ethernet [8]	DPO4ENET	--	--

Discontinued products

Serial Bus	MSO/DPO4000B and MDO4000/B Series Module	MSO/DPO4000 Series Module	MSO/DPO3000 Series Module	MSO/DPO2000 Series Module
I^2C, SPI [4]	DPO4EMBD	DPO4EMBD	DPO3EMBD	DPO2EMBD
RS-232 / 422 / 485 / UART	DPO4COMP	DPO4COMP	DPO3COMP	DPO2COMP
CAN, LIN	DPO4AUTO	DPO4AUTO	DPO3AUTO	DPO2AUTO
FlexRay	--	--	DPO3FLEX	--
CAN, LIN, FlexRay	DPO4AUTOMAX [5]	DPO4AUTOMAX [5]	--	--
I^2S/LJ/RJ/TDM [6]	DPO4AUDIO	DPO4AUDIO	DPO3AUDIO	--
MIL-STD-1553	DPO4AERO	DPO4AERO	DPO3AERO	--
USB [7]	DPO4USB	DPO4USB	--	--
Ethernet [8]	DPO4ENET	--	--	--

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

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

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

7 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 MSO/DPO4000B and MDO4000/B/C Series.

8 100BASE-TX requires ≥ 350 MHz model.

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