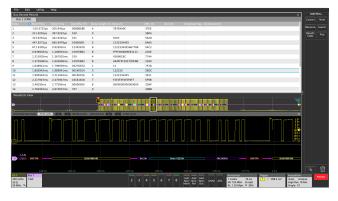
# **Tektronix**<sup>®</sup>

# Serial Triggering and Analysis

3 Series MDO, 4/5/6 Series MSO Applications Datasheet



On a serial bus, a single signal often includes address, control, data, and clock information. This can make isolating events of interest difficult. Optional serial applications transform the oscilloscope into a robust tool for debugging serial buses with automatic decode and analysis for I<sup>2</sup>C, SPI, CAN, CAN FD, LIN, FlexRay, 100BASE-T1, SENT, RS-232/422/485, UART, USB 2.0 (LS, FS, HS), Ethernet, I3C, SPMI, Spacewire, 8b10b, NRZ, MIL-STD-1553, ARINC'429, I<sup>2</sup>S, LJ, RJ, PSI5, DPHY, CPHY, 1-WIRE, and TDM.

# Key features

- Automated Serial Decode and Analysis Options for I<sup>2</sup>C, SPI, I3C <sup>1</sup>, CAN, CAN FD, LIN, FlexRay, SENT<sup>1</sup>, RS-232/422/485, UART, USB 2.0, Ethernet<sup>1</sup>, SPMI<sup>1</sup>, MIL-STD-1553, ARINC<sup>\*</sup>429, I<sup>2</sup>S, LJ, RJ, PSI5, DPHY, CPHY, 1-WIRE, and 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 with user-defined criteria to find specific messages
- Event Table shows decoded serial bus activity in a tabular, timestamped format for quick summary of system activity

# Serial Triggering and Analysis Applications

The serial applications support automatic trigger and decode for I<sup>2</sup>C, SPI, CAN, CAN FD, LIN, FlexRay, 100BASE-T1, SENT, RS-232/422/485, UART, USB 2.0 (LS, FS, HS), Ethernet, I3C, SPMI, Spacewire, 8b10b, NRZ, MIL-STD-1553, ARINC`429, I<sup>2</sup>S, LJ, RJ, PSI5 and TDM buses, making it easier to locate, analyze, and debug events 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 I<sup>2</sup>C, SPI, CAN, CAN FD, LIN, FlexRay, SENT, RS-232/422/485, UART, USB 2.0, Ethernet, SPMI, MIL-STD-1553, ARINC`429, I<sup>2</sup>S, LJ, RJ, PSI5 and TDM.

#### Bus display

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

#### 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 do it for you! Once you've set up a bus, the oscilloscope decodes each packet on the bus, and displays the value in hex, binary, ASCII, or decimal (certain buses only) in the bus waveform.

#### **Results 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, and so on).

#### Wave Inspector<sup>®</sup> 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, 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  $\leftarrow$  and  $\rightarrow$ arrow buttons on the oscilloscope front panel or the Search badge. The 3 Series MDO uses the arrows in the Search badge to navigate.

<sup>&</sup>lt;sup>1</sup> Not available for 3 Series MDO.

# I<sup>2</sup>C characteristics

# Table 1: Bus setup options

Characteristic	Description
I <sup>2</sup> C Sources	Analog channels
(Clock and Data)	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Include R/W in Address	Yes or No
Address/Data Formats	Hex
Available	Binary

# Table 4: Bus decode

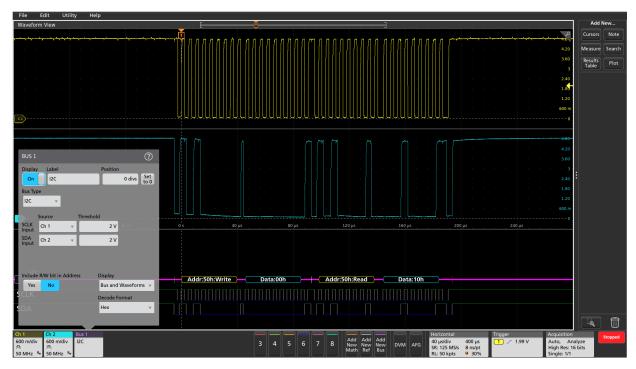
Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (automatic selection)
Decode Display	Start (green bar)
	Address (yellow packet)
	Data (cyan packet)
	Missing Ack (! symbol in red box)
	Stop (red bar)

# Table 2: Display modes

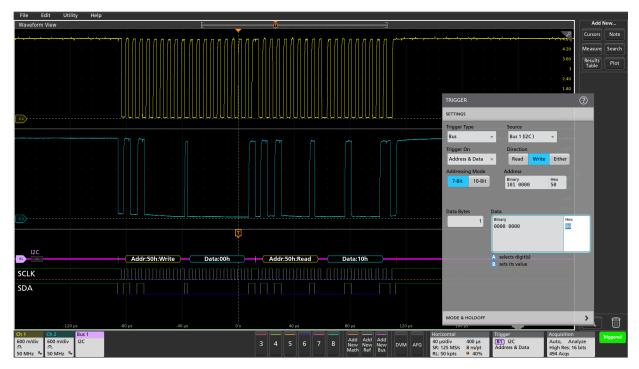
Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 3: Bus trigger and search options

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



Color-coded I<sup>2</sup>C bus display, using hexadecimal display format.



Triggering on a specific address value on the  $l^2C$  bus.

#### **SPI characteristics**

# Table 5: Bus setup options

Characteristic	Description
SPI Sources	Analog channels
(Clock, Data, and Slave Select)	Digital channels
Slave Selecty	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Decode Configuration:	Slave Select (2 wire SDI), Idle Time (2 wire
Framing	Slave Select (3-wire SPI), Idle Time (2-wire SPI)
Clock	Rising or Falling Edge
Slave Select	Active High or Active Low
Data	Active High or Active Low
Word Size	4 - 32 bits
Bit Order	Most Significant (MS) First, Least Significant (LS) First
Formats Available	Hex
	Binary

#### Table 6: Display modes

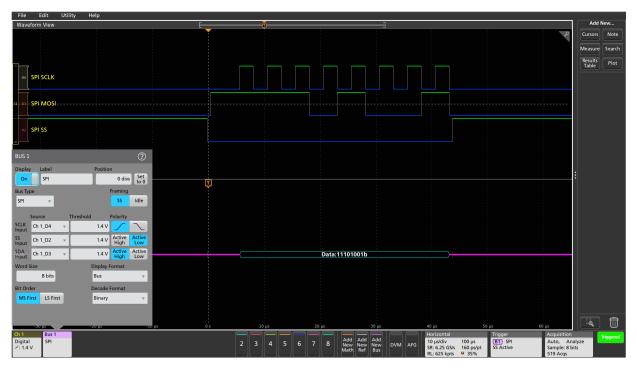
Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

#### Table 7: Bus trigger and search options

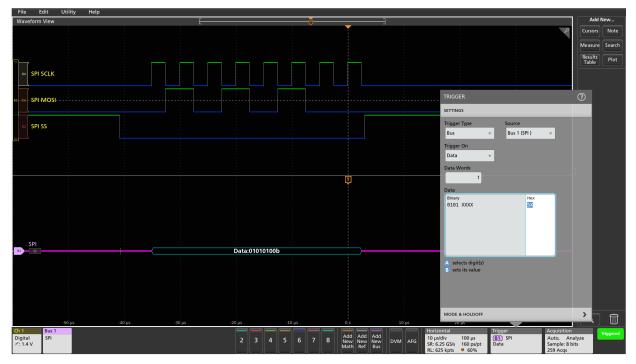
Characteristic	Description
Trigger and/or Search	SS Active (3-wire SPI)
<b>V</b> 11	Start of Frame (2-wire SPI)
	Data (1-16 bytes)

#### Table 8: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (automatic selection)
Decode Display	Start (green bar)
	Data (cyan packet)
	Stop (red bar)



SPI bus, captured with digital channels, showing binary display format of the color-coded SPI bus decoding.



Triggering on a specific data value on the SPI bus.

# I3C characteristics<sup>1</sup> (Version 1.0)

# Table 9: Bus setup options

Characteristic	Description
I3C Sources	Analog channels
(Clock and Data)	Digital channels
	Active Math channels
	Active Reference channels
Thresholds	Per-channel thresholds
Speed	High Speed (480 Mb/s)
	Full Speed (12 Mb/s)
	Low Speed (1.5 Mb/s)
Recommended Probing	Single-ended
Formats Available	Hex
	Binary
	Mixed Hex

#### Table 11: Bus search options

Characteristic	Description
Search On	Start
	Repeated Start
	Address
	Data
	I3C SDR Direct Message
	I3C SDR Broadcast Message
	I3C DDR Message
	Errors
	Hot-Join
	Direct Message End
	Stop
	HDR Restart
	HDR Exit

#### Table 12: Bus decode

# Table 10: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

Characteristic	Description
Maximum Clock/Data Rate	Up to 12.5 Mb/s (automatic selection)
Decode Display	Start (green bar)
	Address (yellow packet)
	Commands (cyan packet)
	Data (cyan packet)
	Parity (purple packet)
	Stop (red bar)



The Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the I3C bus.



Searching on a specific data pattern on the I3C bus and automatically searching on Sync.

#### RS-232, RS-422, RS-485, UART characteristics

# Table 13: Bus setup options

Characteristic	Description
Sources, RS-232, UART	Analog channels
	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Sources, RS-422, RS-485	Analog channels
K3-400	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Polarity	Normal (RS-232)
	Inverted (UART, RS-422, RS-485)
Parity	None
	Odd
	Even
Recommended Probing, RS-232, UART	Single-ended
Recommended Probing, RS-422, RS-485	Differential
Number of Bits	7 - 9
Formats Available	Hex
	Binary
	ASCII
	Packet View

# Table 14: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms

Table continued...

Characteristic	Description
Results Table	Decoded packet data in a tabular view

# Table 15: Bus trigger and search options

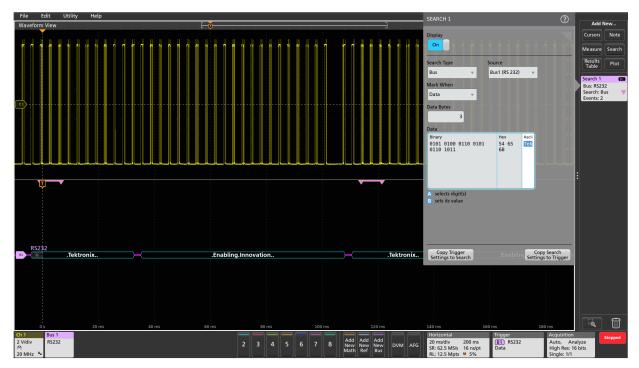
Characteristic	Description
Trigger and/or Search	Start
On	End of Packet
	Data (1 - 10 bytes)
	Parity Error

#### Table 16: Bus decode

Characteristic	Description
Maximum Clock/Data	Up to 15 Mb/s
Rate	For 3 Series MDO: Up to 10 Mb/s
Bit Rate Selection	300 b/s
	1,200 b/s
	2,400 b/s
	9,600 b/s
	19,200 b/s
	38,400 b/s
	115,200 b/s
	921,600 b/s
	Custom (All but 3 Series MDO: 50 b/s - 15 Mb/s
	Custom (for 3 Series MDO): 50 b/s - 10 Mb/s
Decode Display	Start (green packet)
	Data (cyan packet)
	Parity (purple packet)
	Parity Error (red packet)



RS-232 bus setup and ASCII display, showing assignment of source signal, digital threshold, and polarity.



RS-232 bus shown in Packet View format, with the Wave Inspector search automatically searching for the data string "Tek".

#### CAN characteristics (Version 2.0)

# Table 17: Bus setup options

Characteristic	Description
Source for CAN_H, CAN_L, Rx, or Tx	Analog channels
(single-ended probing)	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Source for Diff	Analog channels
(differential probing)	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds	Per-channel thresholds
Recommended Probing:	Single-ended
CAN_H, CAN_L, Rx, Tx	Differential
Diff	
Bit Rate Selection:	10 kb/s - 1 Mb/s
Predefined list of rates	TO KD/S - T MD/S
Custom	All but 3 Series MDO: 1 kb/s - 1 Mb/s
ousion	3 Series MDO: 10 kb/s - 1 Mb/s
Sample Point	All but 3 Series MDO: 0% - 100% of bit period of unit interval
	3 Series MDO: 5% - 95% of bit period of unit interval
Formats Available	Mixed Hex
	Hex
	Binary
	Symbolic (.dbc) <sup>1</sup>

# Table 18: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Table continued	

Characteristic	Description
Results Table	Decoded packet data in a tabular view

#### Table 19: Bus trigger and search options

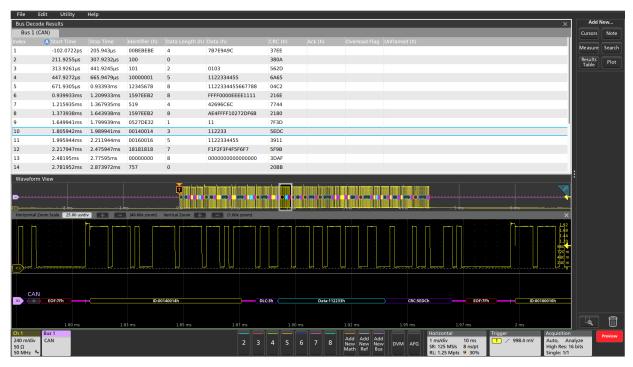
Characteristic	Description
Trigger and/or Search	Start of Frame
On	Type of Frame (Data, Remote, Error, Overload)
	Identifier (Standard or Extended)
	Data (number of bytes 1-8, trigger or search when =, $\neq$ , <, <, >, ≥)
	Identifier and Data
	EOF
	Missing Ack
	Bit Stuff Error

#### Table 20: Symbolic bus search options

Characteristic	Description
Message	As defined by the .dbc file <sup>1</sup>
Message and Signal	As defined by the .dbc file <sup>1</sup>

#### Table 21: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 1 Mb/s (automatic selection)
Decode Display	Start of Frame (green bar)
	Identifier (yellow packet)
	Data Length Control (purple packet)
	Data (cyan packet)
	CRC (purple packet)
	End of Frame (red bar)
	Errors (red packet)



Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the CAN bus.



Triggering on a specific extended Identifier value on the CAN bus.

#### CAN FD (ISO and non-ISO) characteristics

# Table 22: Bus setup options

Characteristic	Description
Source for CAN_H, CAN_L, Rx, or Tx (single-ended probing)	Analog channels Digital channels Active Math channels <sup>1</sup> Active Reference channels <sup>1</sup>
Source for Diff (differential probing) Thresholds Recommended Probing: CAN_H, CAN_L, Rx, or Tx Diff	Analog channels Active Math channels <sup>1</sup> Active Reference channels <sup>1</sup> Per-channel thresholds Single -ended Differential
Version	ISO non-ISO
SD Bit Rate Selection: Predefined list of rates Custom	10 kb/s - 1 Mb/s All but 3 Series MDO: 50 kb/s - 10 Mb/s 3 Series MDO: 10 kb/s - 1 Mb/s
FD Bit Rate Selection: Predefined list of rates Custom Sample Point	All but 3 Series MDO: 1 Mb/s - 16 Mb/s 3 Series MDO: 1 Mb/s - 7 Mb/s All but 3 Series MDO: 500 kb/s - 16 Mb/s 3 Series MDO: 500 kb/s - 7 Mb/s All but 3 Series MDO: 55% - 95% of bit period of unit interval
Formats Available	of unit interval 3 Series MDO: 15% - 95% of bit period of unit interval Mixed Hex Hex Binary

Characteristic	Description
	Symbolic (.dbc) <sup>1</sup>

#### Table 23: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 24: Bus trigger and search options

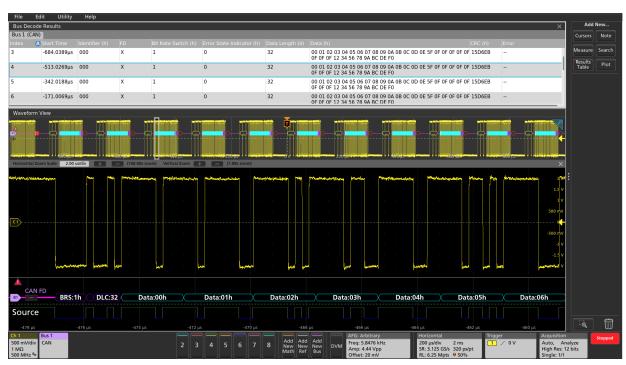
Characteristic	Description
Trigger and/or Search	Start of Frame
On	Type of Frame (Data, Remote, Error, Overload)
	FD Bits (Bit Rate Switch bit, Error State Indicator bit)
	Identifier (Standard or Extended)
	Data (1-8 bytes, trigger or search when =, $\neq$ , <, <, >, $\geq$ )
	Identifier and Data
	End of Frame
	Error (Missing Ack, Bit Stuffing Error, FD Form Error, Any Error)

# Table 25: Symbolic bus search options

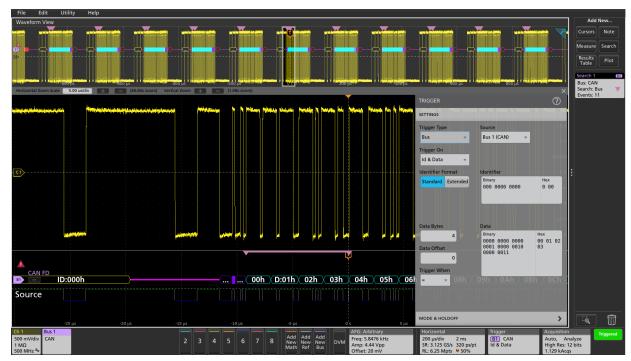
Characteristic	Description
Message	As defined by the .dbc file <sup>1</sup>
Message and Signal	As defined by the .dbc file <sup>1</sup>

#### Table 26: Bus decode

Characteristic	Description
Decode Display	Start of Frame (green bar)
	Identifier (yellow packet)
	Data Length Control (purple packet)
	Data (cyan packet)
	CRC (purple packet)
	End of Frame (red bar)
	Errors (red packet)



Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the CAN FD bus.



Triggering on a specific Identifier value and data pattern on the CAN FD bus and automatically searching on the same data pattern.

#### LIN characteristics (Version 2.0)

# Table 27: Bus setup options

Characteristic	Description
LIN Source	Analog channels
	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Polarity	Normal
	Inverted
Bit Rate Selection:	
Predefined list of rates	1.2 kb/s - 19.2 kb/s
Custom	All but 3 Series MDO: 1 kb/s - 100 kb/s
	3 Series MDO: 800 b/s - 100 kb/s
Sample Point	All but 3 Series MDO: 0% - 100% of bit period of unit interval
	3 Series MDO: 10% - 90% of bit period of unit interval
LIN Standard	V 1.x
	V 2.x
	Both
Include Parity Bits with	
ID	Yes
	No
Formats Available	Hex
	Binary
	Mixed

# Table 28: Display modes

Characteristic	Description
Bus	Bus only
Table continued	

Characteristic	Description
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 29: Bus trigger and search options

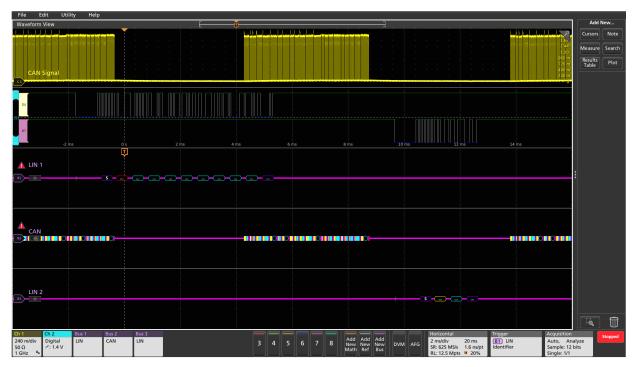
Characteristic	Description
Trigger and/or Search On	Sync
On	Identifier
	Data (number of bytes 1-8, trigger or search when =, ≠, <, ≤, >, ≥, Inside Range, Outside Range)
	ID and Data
	Wakeup Frame
	Sleep Frame
	Error (Sync, ID Parity, Checksum)

#### Table 30: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 100 kb/s, by LIN definition up to 20 kb/s (for automated decoding of bus)
Decode Display	Start of Frame (green bar)
	Sync
	Identifier (yellow packet)
	Data (cyan packet)
	CRC (purple packet)
	Errors (red packet)

File Ec	dit Utility	Help							
Bus Decode	e Results						>	K Add	New
Bus 1 (L	IN)							Cursors	Note
Index	A Start Time								
1	-107.4613ms	-100.3323ms	3C 00	8	O FF FF FF FF FF FF FF	80	Checksum: Checksum, calculated 07h	Measure	e Search
2	-760.8545µs	3.411407ms	00 10	2	F 45 C3	90	Checksum: Checksum, calculated 2Fh	Results Table	Plot
3	105.8623ms	112.936ms	01 11	1	E AF 74 99 E2 45 8C 83	2A			
4	133.1646ms	133.428ms							
5	212.5379ms	219.6142ms	02 11	5	4 43 A8 2E C6 B6 81 2F	A0	Identifier: Parity		
6	319.2824ms	324.6193ms	03 00	1	2 48 B1 16 14	C9	Checksum: Checksum, calculated FFh		
7	425.9819ms	429.0045ms	04 11	3	F	FB	Sync: Invalid sync field		
8	532.6003ms	536.7754ms	05 10	9	8 1D E7	DC			
9	639.3519ms	643.5739ms	06 00	6	7 23	6F			
10	746.0544ms	751.3855ms	07 01	D	C 2C 34 8E E8	4B	Checksum: Checksum, calculated 04h		
Horizontal Zo	-100 ms om Scale 1.00 ms/di	v + -	100 r (100.00x zoom) Vertical 2		200 ms-	300 ms	400 ms 500 ms 600 ms 700 ms	×	
╕┯━									
<u>-</u> ₽+									
81 - + -	15 ms	106 ms	<b>Sync</b> b	<b>D:1Eh</b>	D:AFh Data:	74h Data:99h			
	Bus 1				1 3 4	5 6 7	8         Add         Add         Add         Add         Add         Add         Acquisiti           New         New </td <td>Analyze 12 bits</td> <td>Preview</td>	Analyze 12 bits	Preview

Protocol Decode Results Table provides a time-stamped, tabular view of all captured LIN packets.



Display of multiple LIN and CAN buses, showing timing between the buses.

#### FlexRay characteristics (Version 2.0)

# Table 31: Bus setup options

Characteristic	Description
Source for Differential Probing (Bdiff)	Analog channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Source for Single- ended Probing (BP,	Analog channels
BM)	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Source for Single- ended Probing (Tx,	Analog channels
Rx)	Digital channels
	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds:	High and Low thresholds
Bdiff	High and Low thresholds
BP, BM (analog channels)	Single threshold
BP, BM (digital	Single threshold
channels)	
Tx, Rx	
Recommended Probing:	Differential
Bdiff, BP, BM	Single-ended
Tx, Rx	
Channel Type	A
	В
Bit Rate Selection:	
Predefined list of rates	2.5 Mb/s, 5 Mb/s, 10 Mb/s 1 Mb/s - 10 Mb/s
Custom	1 NUN - 10 NUN 5
Formats Available	Hex
	Binary

Characteristic	Description
	Mixed Hex (Decimal: ID, Len, and Count; Hex: Data and CRCs)

#### Table 32: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

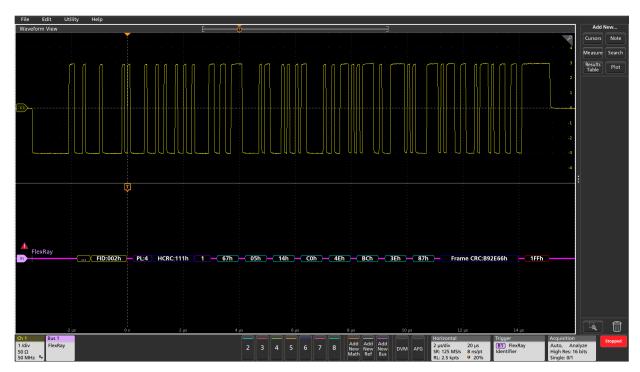
# Table 33: Bus trigger and search options

Characteristic	Description
Trigger and/or Search	Start of Frame
	Indicator Bits (Normal, Payload, Null, Sync, Startup)
	Cycle Count (when =, $\neq$ , <, ≤, >, ≥)
	Header Fields (Indicator Bits, Identifier, Payload Length, Header CRC, and Cycle Count)
	Identifier (when =, $\neq$ , <, ≤, >, ≥)
	Data (when =, ≠, <, >, ≤, ≥)
	Identifier and Data
	End Of Frame (Static, Dynamic)
	Error (Header CRC, Trailer CRC, NULL Frame in Static, NULL Frame in Dynamic, Sync Frame in Dynamic, Start Frame No Sync)

#### Table 34: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (for automated decoding of bus)
Table continued	

Characteristic	Description
Decode Display	TTS (purple box)
	Start (green bracket)
	Frame ID (yellow box)
	Payload Length (purple box)
	Headers (purple box)
	Cycle Count (yellow box)
	Data (cyan box)
	CRC, DTS, CID (purple box)
	Stop (red bracket)



Decoded FlexRay bus, with the acquisition triggered on a specified identifier value.



Decoded FlexRay bus, with all data values in a specific range marked with pink brackets.

## SENT Characteristics<sup>1</sup>

# Table 35: Bus setup options

Characteristic	Description
SENT source	Analog channels
	Digital channels
	Active Math channels
	Active Reference channels
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Polarity	Normal
	Inverted
Clock Tick	1 µs - 300 µs
Tick Tolerance	1% - 30%
Fast Data Channels	1 or 2
Data Nibbles	3, 4, or 6 nibbles
(1 Fast Data Channel)	
Channel Widths (C1/C2)	12/12, 14/10, or 16/8 bits
(2 Fast Data Channels)	
Pause Pulse	Yes
	No
Slow Channel	None
	Enhanced w/ 4-bit ID
	Enhanced w/ 8-bit ID
	Short
Formats Available	Mixed Hex
	Binary
	Hex
	Mixed Decimal

Table	36:	Display	modes
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Characteristic	Description
Bus	Bus only
Table continued	

Characteristic	Description
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 37: Bus trigger options

Characteristic	Description
Trigger On	Start of Packet
	Fast Channel(s) (Status/Communication, Data)
	Slow Channel (Message ID, Data)
	CRC Error (Fast channel, Slow channel)

# Table 38: Bus search options

Characteristic	Description
Search On	Start of Packet
	Fast Channel(s) (Status/Communication, Data)
	Slow Channel (Message ID, Data)
	Pause Pulse (Number of Ticks)
	Error (Frame Length, Fast channel CRC, Slow channel CRC)

# Table 39: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Up to 10 Mb/s (for automated decoding of bus)
Decode Display	Sync (green packet)
	Fast Channel Status (purple packet)
	Slow Channel Message ID (yellow packet)
	Data (cyan packet)
	CRC (purple packet)
	Pause (purple packet)
	Errors (red packet)

File	Edit Utility	Help									
Bus Deco	de Results								×	Add N	ew
Bus 1 (SE	NT)									Cursors	Note
Index	A Start Time	Status	Chan 1 (h)	Chan 2 (h)	CRC (h)			S Data (h	) S CI		
44	-13.23838ms	01 00	B5E	4F5	В					Measure	Search
45	-12.38638ms	01 00	2B2	4C9	5					🗭 a la a constante de la const	Plot
46	-11.53438ms	10 00	978	1A2	3					Of h 0.003b) - Of h 0.003b) - Of h 0.003b) - Of h 0.003b + - Of h 0.003b + - Of h 0.003b - Of h 0.00	
47	-10.68238ms	11 00	0EC	7FE	2						
48	-9.830377ms	10 00	694	4B2	3					-40'ms -30'ms -20 <mark>'ms -10'ms 0's</mark> 10'ms 20'ms 30'ms 40'ms	
49	-8.978379ms	01 00	B66	3BF	3	07		075	01	Horizontal Zoom Scale 2.50 ms/div 📑 🧰 (4.00x zoom) Vertical Zoom 🖶 📼 (1.00x zoom) X	
50	-8.126378ms	10 00	95D	A54	С	Sta	rt			Q.04V	
51	-7.274379ms	10 00	OBE	F4A	D					2.04 V	
52	-6.422379ms	10 00	E48	083	0						
53	-5.570378ms	10 00	41A	DCB	F					a na an	
54	-4.718377ms	10 00	5D8	FD7	F						
55	-3.866378ms	11 00	1F7	0E5	2						
56	-3.014378ms	00 00	3C1	3BC	0						
57	-2.162378ms	00 00	F08	3D5	5					a state in the second department of the second s	
58	-1.310377ms	00 00	A97	4A9	F						
59	-458.378µs	00 00	F06	DFB	6						
60	393.6206µs	00 00	27F	C72	С						
61	1.245621ms	01 00	532	FB3	A					-680 mV	
62	2.097622ms	01 00	B5E	4F5	В						
63	2.949623ms	01 00	2B2	4C9	5						
64	3.801621ms	10 00	978	1A2	3						
65	4.653623ms	11 00	0EC	7FE	2						
66	5.505623ms	10 00	694	4B2	3						
67	6.357621ms	01 00	B66	3BF	3	07		075	01		
68	7.209623ms	10 00	95D	A54	С	Sta	rt			SENT	
69	8.061621ms	10 00	OBE	F4A	D						
70	8.913622ms	10 00	E48	083	0					Data:075h 01h ID:07h Data:075h	
71	9.765623ms	10 00	41A	DCB	F						
72	10.61762ms	10 00	5D8	FD7	F						
73	11.46962ms	11 00	1F7	0E5	2						
74	12.32162ms	00 00	3C1	3BC	0						fi
				_						-17.5 ms -15 ms -12.5 ms -10 ms -7.5 ms -5 ms -2.5 ms 0 s 2.5 ms	U
Ch 1 340 mV/div 1 MΩ 500 MHz <sup>B</sup> *					2 3	4	5	6 7	8	Add Add Add Add New	itopped

Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the SENT bus.



Triggering on a specific Fast Channel Status and data pattern on the SENT bus and automatically searching on the same data pattern.

#### **MIL-STD-1553 characteristics**

# Table 40: Bus setup options

Characteristic	Description
MIL-STD-1553 Source	Analog channels
	Active Math channels
	Active Reference channels
Polarity	Normal
	Inverted
Thresholds	Single-ended: Per-channel thresholds
	Differential: High and low thresholds
Recommended Probing	Single-ended or differential
Bit Rate	1 Mb/s per the standard
Response Time	2 µs-100 µs
Formats Available	Mixed Hex
	Mixed ASCII
	Hex
	Binary

# Table 41: Display modes

Characteristic	Description
Bus	Bus only
Results Table	Decoded packet data in a tabular view

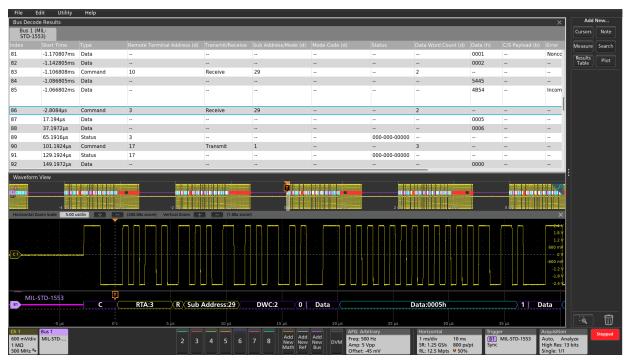
# Table 42: Bus trigger and search options

Characteristic	Description
Trigger and/or Search On	Sync Command (Transmit/Receive Bit, Parity, Subaddress / Mode, Word Count / Mode Count, and RT Address =, ≠, <, ≤, >, ≥, Inside Range, Outside Range) Status (Parity,

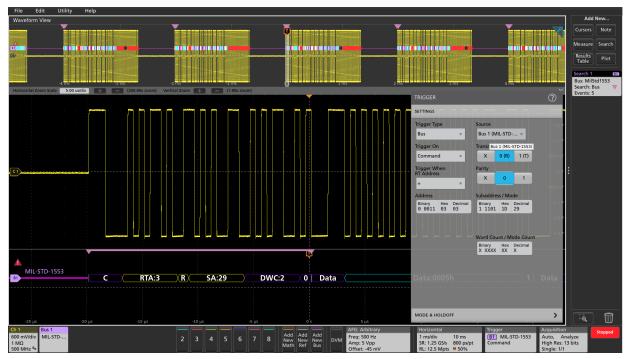
Characteristic	Description
	Bit 9 - Message Error,
	Bit 10 - Instrumentation,
	Bit 11 - Service Request,
	Bit 15 - Broadcast Command Received,
	Bit 16 - Busy,
	Bit 17 - Subsystem Flag,
	Bit 18 - Dynamic Bus Control Acceptance,
	Bit 19 - Terminal Flag,
	and Data =, ≠, <, ≤, >, ≥,
	Inside Range, Outside Range)
	Data (Parity, and Data =, $\neq$ , <, ≤, >, ≥,
	Inside Range, Outside Range)
	Time (RT / IMG) (> Maximum, < Minimum, Inside range, Outside Range)
	Error (Parity Error, Sync Error, Manchester Error (trigger only), Non-contiguous Data)

#### Table 43: Bus decode

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



Protocol Decode Results Table provides a time-stamped, tabular view of all captured MIL-STD-1553 packets.



Triggering on a specific command pattern on the MIL-STD-1553 bus and automatically searching on the same pattern.

#### ARINC 429 characteristics (ARINC Specs 429 PART 1-17)

# Table 44: Bus setup options

Characteristic	Description
ARINC 429 Source	Analog channels
	Active Math channels
	Active Reference channels
Signal Type	Differential
Polarity	Normal
	Inverted
Thresholds	High and low thresholds
Recommended Probing	Differential
Bit Rate Selection:	12.5 kb/s, 100 kb/s
Predefined list of rates	10 kb/s - 1 Mb/s
Custom	
Data Format	Data (19 bits)
	SDI+Data (21 bits)
	SDI+Data+SSM (23 bits)
Formats Available	Mixed Hex
	Hex
	Binary

# Table 46: Bus trigger and search options

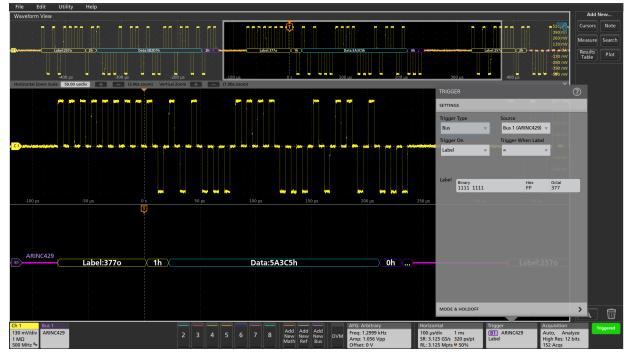
Characteristic	Description
Trigger and/or Search	Word Start
	Label (when =, ≠, <, ≤, >, ≥, Inside Range, Outside Range)
	Data (when =, ≠, <, ≤, >, ≥, Inside Range, Outside Range)
	Label and Data (Label value and Data =, ≠, <, ≤, >, ≥, Inside Range, Outside Range)
	Word End
	Error (Any Error, Parity Error, Word Error, Gap Error)

#### Table 47: Bus decode

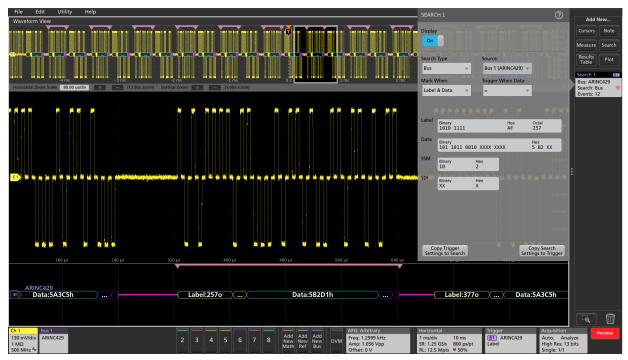
Characteristic	Description
Decode Display	Start (green bracket)
	Label (yellow box)
	Source Destination Identifier (yellow box)
	Data (cyan box)
	Sign/Status Matrix (purple box)
	Parity (purple box)
	Stop (red bracket)
	Error (red box)

# Table 45: Display modes

Characteristic	Description
Bus	Bus only
Results Table	Decoded packet data in a tabular view



Decoded ARINC 429 bus, with the acquisition triggered on a specified label value.



Decoded ARINC 429 bus, with all data values in a specific range marked with pink brackets.

#### Audio characteristics

# Table 48: Bus setup options

Characteristic	Description
Audio Sources (Bit	Analog channels
Clock, Word Select, Data)	Digital channels
,	Active Math channels <sup>1</sup>
	Active Reference channels <sup>1</sup>
Thresholds	Per-channel thresholds
Bit Clock Polarity	Rising Edge
	Falling Edge
Word Select Polarity	Normal
	Invert
Data Polarity	Active High
	Active Low
Word Size	4 - 32 bits
Formats Available	Hex
	Binary
	Signed Decimal

Characteristic	Description
Results Table	Decoded packet data in a tabular view

#### Table 50: Bus trigger and search options

Characteristic	Description
	Word Select (I <sup>2</sup> S, LJ, RJ only)
On	Frame Sync (TDM only)
	Data (when =, ≠, <, >, ≤, ≥, Inside Range, Outside Range; Left, Right, or Either Word)

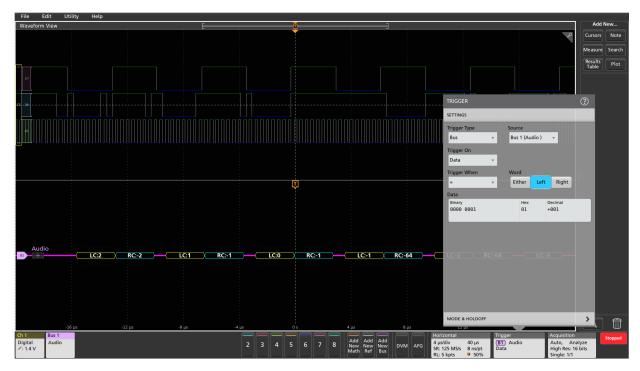
#### Table 51: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	All but 3 Series MDO: Up to 10 Mb/s (for automated decoding of bus)
	3 Series MDO: Up to 12.5 Mb/s (for automated decoding of I2S/LJ/RJ bus)
	3 Series MDO: Up to 25 Mb/s (for automated decoding of TDM bus)
Decode Display	Left Channel Data (I <sup>2</sup> S, LJ, RJ) (yellow box)
	Right Channel Data (I <sup>2</sup> S, LJ, RJ) (cyan box)
	Channel 1 Data (TDM) (yellow box)
	Channel 2 - N Data (TDM) (cyan box)

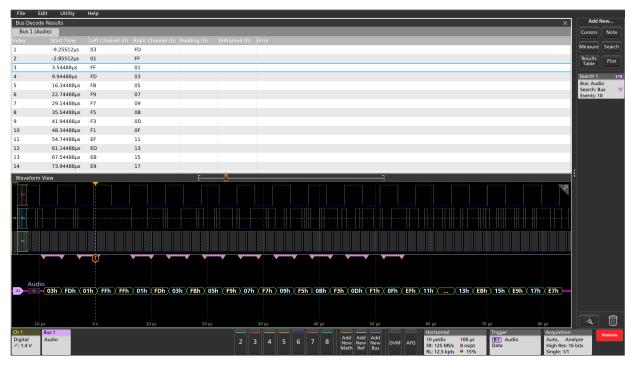
#### Table 49: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms

Table continued...



Decoded I<sup>2</sup>S bus, with data values displayed in signed decimal format, and the MSO triggered on a specific data value.



Decoded I<sup>2</sup>S bus, with data values displayed in hex and Results Table format, and the Wave Inspector automatic search marking all occurrences of the data values equal to 0X hex.

#### USB 2.0 Characteristics (Version 2.0)

# Table 52: Bus setup options

Characteristic	Description
USB 2.0 Source(s)	Analog channels
	Digital channels (single-ended)
	Active Math channels
	Active Reference channels
Thresholds	Per-channel thresholds
Speed	High Speed (480 Mb/s)
	Full Speed (12 Mb/s)
	Low Speed (1.5 Mb/s)
Recommended Probing, LS and FS	Single-ended
Recommended Probing, HS	Differential
Formats Available	Mixed Hex
	Hex
	Binary
	Mixed ASCII

# Table 53: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 54: Bus trigger options

Characteristic	Description
Trigger On	Sync
	Reset
	Suspend
	Resume
	End of Packet
	Token (address) Packet
	Data Packet

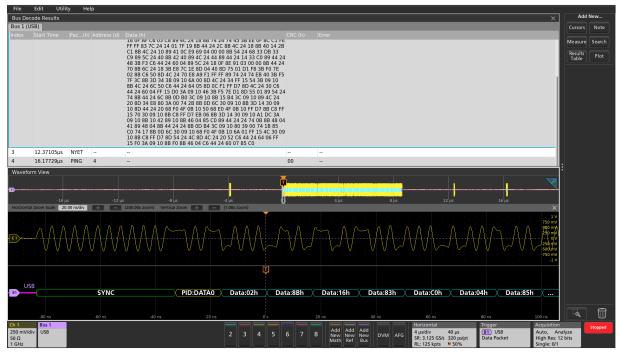
Characteristic	Description
	Handshake Packet: ACK, NAK, STALL, NYET (HS only)
	Special Packet: PRE (FS only), ERR, SPLIT, PING, Reserved
	Error: PID check, CRC5 or CRC16, Bit stuffing (LS and FS only)

# Table 55: Bus Search options

Characteristic	Description
Search On	Sync
	Reset
	Suspend
	Resume
	End of Packet
	Token (address) Packet
	Data Packet
	Handshake Packet: ACK, NAK, STALL, NYET (HS only)
	Special Packet: PRE (FS only), ERR, SPLIT, PING, Reserved
	Error: PID check, CRC5 or CRC16, Bit stuffing (LS and FS only)

#### Table 56: Bus decode

Characteristic	Description
Decode Display	Start of packet (green bar)
	Sync (green packet)
	PID (yellow packet)
	Token (address) (yellow packet)
	Data (cyan packet)
	CRC (purple packet)
	Error (red packet)
	End of packet (red bar)



Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the USB bus.



Triggering on a specific data pattern on the USB 2.0 bus and automatically searching on Sync.

#### Ethernet characteristics<sup>1</sup>

#### Table 57: Bus setup options

Characteristic	Description
Ethernet Source(s)	Analog channels
	Active Math channels
	Active Reference channels
Thresholds	Per-channel thresholds
Speed	10BASE-T
	100BASE-TX
Recommended Probing	Differential
Formats Available	Mixed Hex
	Hex
	Binary
	Mixed ASCII

# Table 58: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 59: Bus trigger options

Characteristic	Description
Trigger On	Start Frame Delimiter
	MAC Addresses
	Q-Tag Control Information
	MAC Length/Type
	IPv4 Header
	TCP Header
	MAC Data
	TCP-IPv4 Client Data

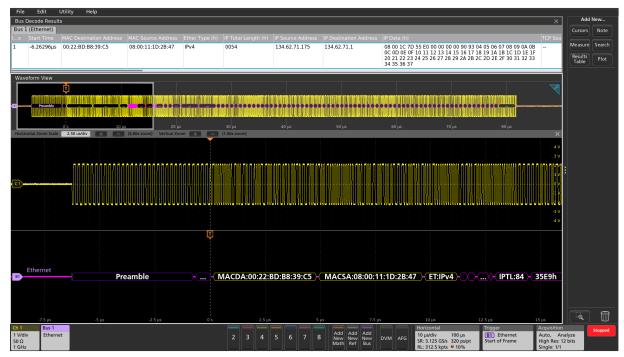
Characteristic	Description
	Idle
	End of Packet
	Frame Check Sequence (CRC) Error

# Table 60: Bus search options

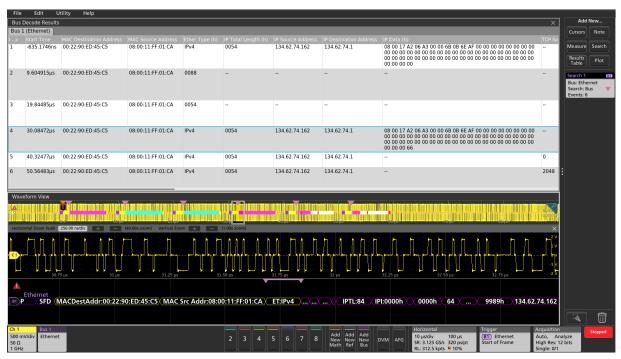
Characteristic	Description
Search On	Start Frame Delimiter
	MAC Addresses
	Q-Tag Control Information
	MAC Length/Type
	IPv4 Header
	TCP Header
	MAC Data
	TCP-IPv4 Client Data
	ldle
	End of Packet
	Frame Check Sequence (CRC) Error

#### Table 61: Bus decode

Description
Start of Packet (green bar)
Preamble (purple packet)
SFD (purple packet)
Address (yellow packet)
EtherType (yellow packet)
IP packet (purple packet)
Data (cyan packet)
IPv4 packet (pink packet)
TCP packet (white packet)
Frame Check Sequence (yellow packet)
Error (red packet)
End of packet (red bar)



Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the 10BASE-T Ethernet bus



Triggering and automatically searching on the 100BASE-TX Ethernet bus.

# SPMI characteristics<sup>1</sup> (Version 2.0)

# Table 62: Bus setup options

Characteristic	Description
SPMI Sources (Clock and Data)	Analog channels Digital channels Active Math channels
	Active Reference channels
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Formats Available	Mixed Hex
	Hex
	Binary

# Table 63: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

# Table 64: Bus trigger options

Characteristic	Description
Trigger On	Sequence Start Condition (SSC)
	Reset
	Sleep
	Shutdown
	Wakeup
	Authenticate
	Master Read
	Master Write
	Register Read
	Register Write
	Extended Register Read

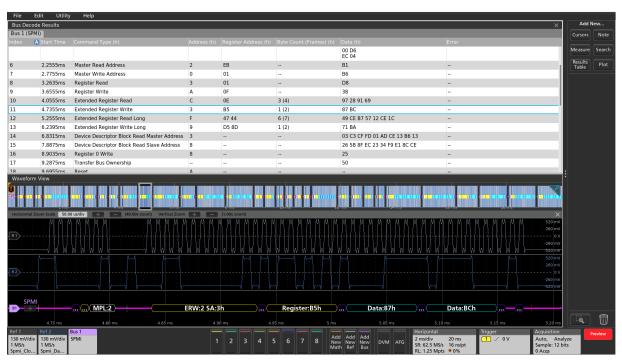
Characteristic	Description
	Extended Register Write
	Extended Register Read Long
	Extended Register Write Long
	Device Descriptor Block Master Read
	Device Descriptor Block Slave Read
	Register 0 Write
	Transfer Bus Ownership
	Parity Error

# Table 65: Bus search options

Characteristic	Description
Search On	Sequence Start Condition (SSC)
	Reset
	Sleep
	Shutdown
	Wakeup
	Authenticate
	Master Read
	Master Write
	Register Read
	Register Write
	Extended Register Read
	Extended Register Write
	Extended Register Read Long
	Extended Register Write Long
	Device Descriptor Block Master Read
	Device Descriptor Block Slave Read
	Register 0 Write
	Transfer Bus Ownership
	Parity Error

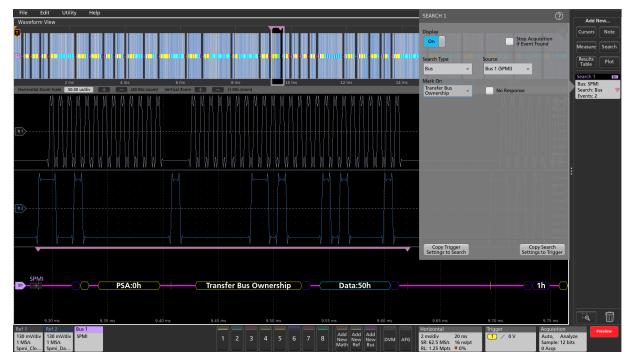
#### Table 66: Bus decode

Characteristic	Description
Decode Display	Arbitration Start (yellow bar)
	Connect Bit (purple packet)
	Master ID (purple packet)
	Alert Bit (yellow packet)
	Slave Request Bit (yellow packet)
	Master Priority Level (gray packet)
	SSC (green bar)
	Command Frame, including Byte Count <sup>2</sup> (yellow packet)
	Address (yellow packet)
	Data (cyan packet)
	Parity (purple packet)
	Ack/Nack (purple packet)
	Parity error (red packet)
	End of packet (red bar)



Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the SPMI bus.

<sup>&</sup>lt;sup>2</sup> The actual decimal Byte Count is displayed in Mixed Hex format, but the raw value is shown in Binary and Hex formats.



Automatically searching the SPMI bus for the Transfer Bus Ownership command

#### SpaceWire characteristics

# Table 67: Bus setup options

Characteristic	Description
SpaceWire Sources	Analog Channels
(Strobe and Data)	Digital Channels
	Active Math Channels
	Active Reference Channels
Thresholds	Per-Channel Thresholds
Recommended Probing	Differential
Address/Data Formats	Hex
Available	Binary

#### Table 68: Display modes

Characteristic	Description
Bus	Bus Only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

#### Table 69: Bus search options

Characteristic	Description
Search On	Synchronization
	Control Code
	Control Character
	Data
	Errors

# Table 70: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	2 Mbits/sec to 200 Mbits/sec
Decode Display	Null
	Control Character
	Control Code
	FCT
	Time-Code
	Parity
	Data-Control Flag
	Data
	End Of Packet
	Error End Of Packet
	Escape Sequence
	Escape Error
	Start FCT
	Start NULL

File	Edit	Applications	Utility	Help					SEARCH 1	?	— 🗆 X
Wave	orm View									Ű	Add New
	- <b>Q</b>								Display		Cursors Note
									On	Stop Acquisition if Event Found	Measure Search
A											
									Search type	Source	Table Plot
*									Bus 🔻	Bus 1 (SpaceWire) 🔻	Search 1
Horizo	0's	cale 2.00 us/div	100 µs	200 µs — (50.00x zoom) Vertical Zoom -	300 µs	400 µs	500 µs	600 µs	Mark On	800 µs 900 µs <sup>14</sup>	Bus: SpaceWire
Honzo	rtal 20011 Se	care 2.00 us/ulv	T	(Secon 20011) Verdeal 20011	(2.40X 20011)				Control Code 🛛 🔻		Search: Bus V Events: 1
									Control Code Type		
									Time Code 🛛 👻	208.333 r	
R 1									Time Code		v
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									XX XXXX XX	-625 (	6V
											nV
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											V
						Martin and Andrews					
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											ia 🗍
2.64		2								Tologo (Alexandriate	
500 mV	/div 500 i	mV/div SpaceWir	e				Add Add	Add	100 µs/div 1 ms	<ol> <li>✓ 0 V Auto,</li> </ol>	Analyze
104.536	i1 104.	5361				4 5 6 ,	' 8 New New Math Ref	New DVM AFG Bus		Sample: 12	2 bits 18 lun 2019
Ref 1 500 mV 104.536 spacew	i1 104.	mV/div SpaceWir	e		1 2 3	4 5 6 7		New DVM AFG	Horizontal 100 µs/div 1 ms SR: 1.25 GS/s 800 ps/pt RL: 1.25 Mpts 9 5.9%	Trigger Acquisitio	n Analyze Au

Searching on a specific data pattern on the SpaceWire bus and automatically searching on Sync.

Bus Decode Results         Entropy           Bus 1 (SpaceWre)	Cu Me	easure !	w Note
Index         Start Time         Control Character (h)         Control Code (h)         Data (h)         Error           7         177.9241µs         CETECT ECT ECT	Me	easure !	Note
7 177.9241µs FCT FCT FCT FCT	Re		
FCT FCT FCT	Re		
			Search
		esults	
FCT FCT		able	Plot
8 213.2803µs 89 C4 CD 17 D8 D9 32			
9 258.1069µs EOP			
10 260.001µs FCT FCT FCT			
11 <u>267.5773µs</u> 5A.72.86			
12 287.1495µs EOP			
13 289,0436µs FCT FCT			
14 294.0945µs 97.71			
15 307.353µs EOP			
16 3092471µs FCT FCT FCT FCT			
Waveform Vew			
	$\nabla$		
	N		
	-1 V		
	00 µs -2 V		
Horizontal Zoom Scale 2.00 us/div + G8.00x zoom) Vertical Zoom + - (2.40x zoom)	×		
	625 mV 208.833 mV		
	-208.333 mV		
	-625 mV		
	-1.041667 V		
	625 mV		
	208.333 mV		
R 2 > k + + + + + k + + + + + + + + + +	-208.333 mV		
	-625 mV		
196 ys 188 ys 190 ys 192 ys 194 ys 196 ys 196 ys 200 ys 200 ys 202 ys 204 ys	-1.041667 V		
	· · · · · ·		
SpareMire			
B) FCT:4h Oh FCT:4h	[:4h		
			-
		à,	
	Acquisition		luto
Stot m/M/m         Sot m/M/m         Sot conv.k/m         Sot conv.k/m	Auto, Analyze		
	Sample: 12 bits 1.847 kAcqs	18 Ju 3:25:	in 2019 :53 AM

The Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the SpaceWire bus.

# Automotive Ethernet (100BASE-T1) characteristics (Version BRR V3.2)

# Table 71: Bus setup options

Characteristic	Description
Ethernet Source(s)	Analog Channels
	Active Math Channels
	Active Reference Channels
Thresholds	Per-channel Thresholds
Speed	100 Mbits/sec
Recommended Probing	Differential
Formats Available	Mixed Hex
	Hex
	Binary
	Mixed ASCII

# Table 72: Display modes

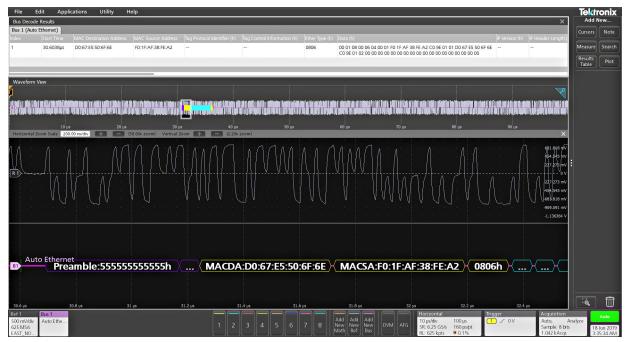
Characteristic	Description
Bus	Bus Only
Results Table	Decoded packet data in a tabular view

#### Table 73: Bus search options

Characteristic	Description					
Search On	Start of Frame					
	Start of Frame Delimiter					
	MAC Addresses					
	Q-Tag Control Information					
	MAC Length/Type					
	IPv4 Header					
	TCP Header					
	MAC Data					
	TCP-IPv4 Client Data					
	End of Packet					
	Frame Check Sequence (CRC) Error					

# Table 74: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	100 Mbits/sec
Decode Display	Start of Packet (green bar)
	Preamble (purple packet)
	SFD (purple packet)
	Address (yellow packet)
	EtherType (yellow packet)
	IP packet (purple packet)
	Data (cyan packet)
	IPv4 packet (pink packet)
	TCP packet (white packet)
	Frame Check Sequence (yellow packet)
	Error (red packet)
	End of packet (red bar)



The Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the Automotive Ethernet (100BASE-T1) bus.



Searching on a specific data pattern on the Automotive Ethernet (100BASE-T1) bus and automatically searching on Start of Frame.

#### 8b10b Characteristics (Line encoding)

# Table 75: Bus setup options

Characteristic	Description
8b10b Sources	Analog Channels
(Strobe and Data)	Digital Channels
	Active Math Channels
	Active Reference Channels
Thresholds	Per-Channel Thresholds
Recommended Probing	Differential
Formats Available	Hex
	Binary
	Symbolic

Characteristic	Description
Decode Display	Control Symbol (yellow packet)
	Data Symbol (cyan packet)
Error Handling	Invalid Symbols
	Running Disparity (6 bit and 4 bit)

# Table 76: Display modes

Characteristic	Description
Bus	Bus Only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view

#### Table 77: Bus search options

Characteristic	Description				
Search On	Symbols [Format:8bit,10bit&symbol]				
	Errors				

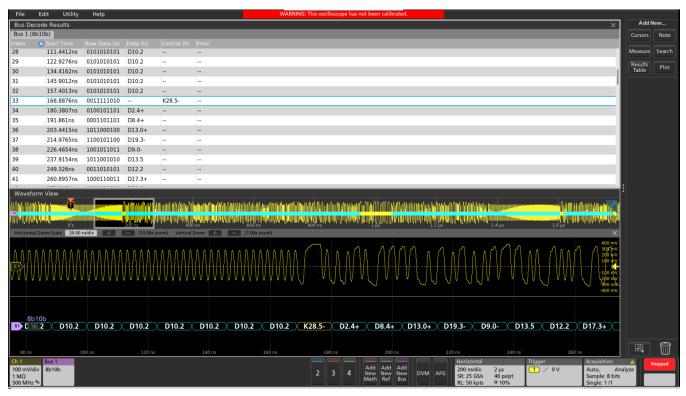
## Table 78: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	1 Tbits/sec
Table continued	•

Table continued...

File	Edit Utility	Help				WARN	ING: This oscillos	cope has no	ot been calibra	ted.	SEARCH 1			?		
Bus De	ecode Results														Add	New
Bus 1 (	8b10b)										Display				Cursors	Note
Index	Start Time	Raw Data (b)		Control (h)	Error						On			Act on Event		
28	111.4412ns	0101010101	D10.2												Measur	e Search
29	122.9276ns	0101010101	D10.2								Search Type		Source		Results	Plot
30	134.4162ns	0101010101	D10.2								Bus	v	Bus 1 (8b10b)	Y	Table	
31	145.9012ns	0101010101	D10.2											_	Search 1	61
32	157.4013ns	0101010101	D10.2								Mark On	-	Format		Bus: 8b	
33	168.8876ns	0011111010		K28.5-							Symbols	T.	8-Bit 10-Bi	t Symbol	Search: Events:	
34	180.3807ns	0100101101	D2.4+								Value					
35	191.861ns	0001101101	D8.4+								K28.5-					
36	203.4415ns	1011000100	D13.0+								K28.5-					
37	214.9765ns	1100101100	D19.3-													
38	226.4654ns	1001011011	D9.0-													
39	237.9154ns	1011001010	D13.5													
40	249.326ns	0011010101	D12.2													
41	260.8957ns	1000110011	D17.3+													
Mayof	orm View			1											1	
wave						and an and a cost			A4 - 0 (1 - 01 0 - 0 - 0		Les managements					
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<b>MANAMAN</b>	II. I. J. Longer (1990)	IIIIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIII	<mark>.</mark>	n finite of a first stand of the				Linuwinin 1	UNIV H UNHINAM	Wilding of the						
	0's tal Zoom Scale 20.00		200 ns	400	Zoom + -	000115	800 ns		1 µs	1.	2'µs					
Honzon	tai zoom scale 20.00	nydiv ege	(10.00x 2	oom) vertical	200m +	(1.00x 200m)										
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$\Lambda \Lambda \Lambda$	AAAAAAA	AAAAA	LAAAAA	AAAAA	.8888888	\AAAAAAA	V ( – VA –	A A E	A LUA							
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							0 0		N.	0						
							· · ·									
											Copy Trigge	or		Conv Search		
8	b10b										Copy Trigge Settings to Set	arch		Copy Search Settings to Trigger		
B1		D10.2	D10.2	D10.2	D10.2 D	10.2 D10.2	K28.5-	D2.4+	D8.4+	D13.0+	D19.3- X D9	9.0- X	D13.5 X D	12.2 X D17.3+ X		
															i o	
80 ns		100 ns	120 ns		140 ns	160 ns	180 n	s	200 ns		220 ns	240		260 ns		
Ch 1 100 mV/	div 8b10b								Add Add A	Add	Horizontal 200 ns/div	2 µs	Trigger	Acquisition V Auto,	Analyze	Stopped
1 MΩ							2 3	4	New New N		AFG SR: 25 GS/s	40 ps/pt		Sample: 8 bi		
500 MH	Z <sup>B</sup> w										RL: 50 kpts	<b>¥</b> 10%		Single: 1 /1		

Searching on a specific data symbol in symbol format on a 8b10b bus



The Protocol Decode results table provides time-stamped, tabular view of all captured packets on a 8b10b bus

#### NRZ Characteristics (Line encoding)

# Table 79: Bus setup options

Characteristic	Description					
NRZ Source(s)	Analog Channels					
	Digital Channels					
	Active Math Channels					
	Active Reference Channels					
Thresholds	Per-channel Thresholds					
Recommended Probing	Differential					
Bit Order	MSB First					
	LSB First					
Polarity	Normal					
	Invert					
Formats Available	Hex					
	Binary					

# Table 80: Display modes

Characteristic	Description
Bus	Bus Only
Bus and Waveforms	Simultaneous display of bus and digital waveforms.
Table continued	•

Table continued...

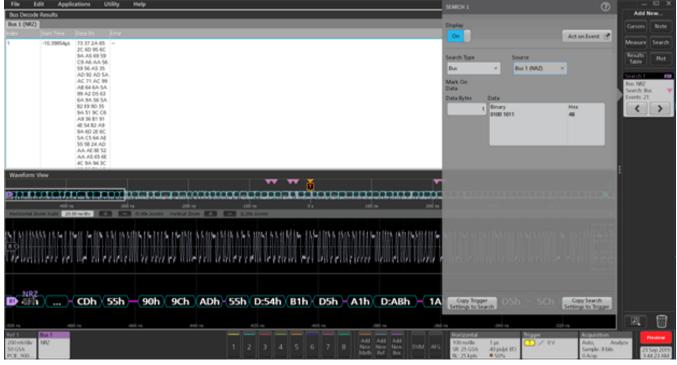
Characteristic	Description
Results Table	Decoded packet data in a tabular view

#### Table 81: Bus search options

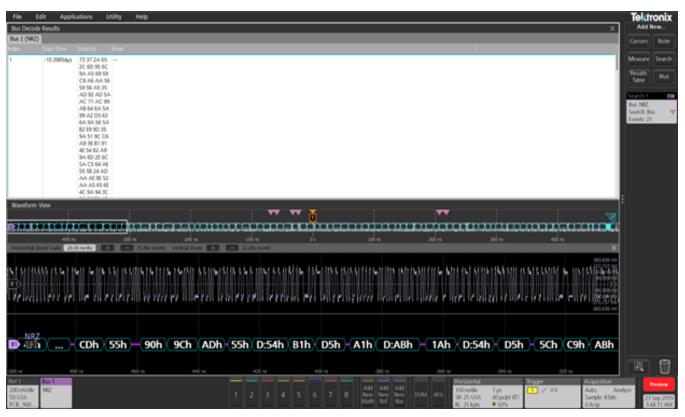
Characteristic	Description	
Search On	Data Bytes [Maximum 5]	

#### Table 82: Bus decode

Characteristic	Description	
Maximum Clock/Data Rate	1Gbits/sec	
Decode Display	Data (cyan packet)	



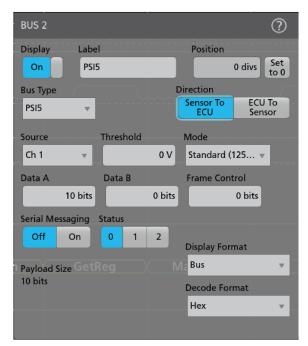
Searching on a specific data symbol in symbol format in the NRZ bus



The Protocol Decode results table provides time-stamped, tabular view of all captured packets on the NRZ bus

#### PSI5 characteristics (Version 2.1)

PSI5 Sensor to ECU configuration



PSI5 ECU to Sensor configuration

BUS 2			?
Display Label		Position	0 divs Set to 0
Bus Type PSI5 🔻		Direction Sensor To ECU	ECU To Sensor
Source Thresh		Sync Bit Peri	
Ch 2 🔻	0 V		60 µs
Sync Mode Data Fo Pulse Tooth Width Gap Nibble			
		Display Forr	nat
n X GetReg		Bus Decode Forr Hex	▼ /load:01h mat ▼

#### Table 83: Bus setup options

Characteris tic	Description	
PSI5 Sources	Analog channels Digital channels Active Math channels Active Reference channels	
Thresholds	Per-channel thresholds	
Recommend ed Probing	Sensor to ECU	Current probe with minimum current rating of less than 50mA - TCP2020, TCP202A
	ECU to Sensor	Differential Voltage probe - TDP1000, TDP1500, and TAP1500
Direction	ECU to Sensor Sensor to ECU	
Direction - Sensor to ECU	Mode	Slow (83.3 kbps) Standard (125 kbps) Fast (189 kbps)
	Data A	10 - 24 bits
	Data B	0 - 12 bits
	Frame Control	0 - 4 bits
	Status	0 - 3 bits
Direction - ECU to	Sync Bit Period	1 us to 300 us
Sensor	Sync Mode	Pulse Width Tooth Gap
	Data Format	Nibble Byte
Decode Format	Hex Binary Mixed Hex	

# Table 84: Display modes

Characteristic	Description	
Bus	Bus only	
Bus and Waveforms	Simultaneous displays bus and digital waveforms	
Results Table	Decoded packet data in a tabular view	

# Table 85: Bus search options

Characteristic	Description	
Mark On	Direction -	Start [Start of packet]
	Sensor to ECU	Status
		Data [Region B and Region A]
		Block ID
		Sensor Status [5 different status]
		Errors [Parity CRC and any]
	Direction - ECU	Start [Start of packet]
	to Sensor	Status
		Data [4 or 8 bits]
		Function Code
		Sensor Address
		Register Address
		CRC Error



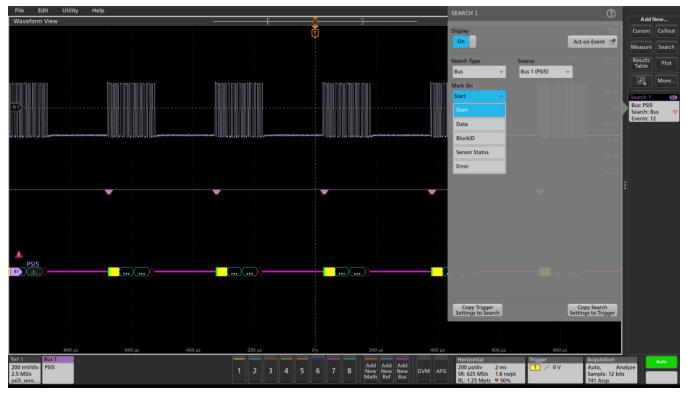
**Note:** Bus Search option is depend on the direction in Bus Configuration.

#### Table 86: Bus decode

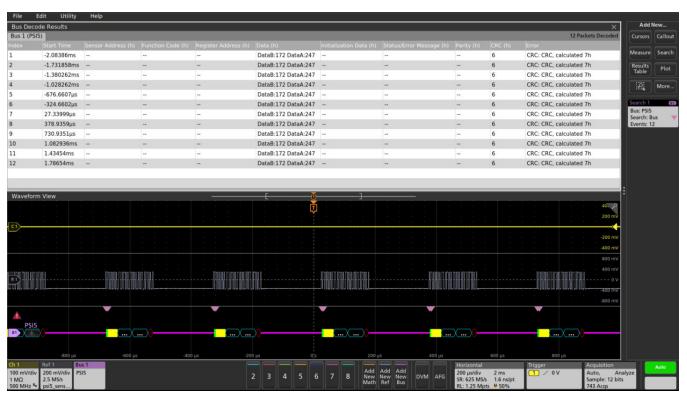
Characteristic	Description	
Decode Display	Direction - Sensor to ECU Packets	Message Field (Yellow Field)
		Status (Yellow Field)
		Frame Control (Yellow Field)
		Data B (Cyan Field)
		Data A (Cyan Field)
		Parity or CRC (Purple Field)

Table continued...

Characteristic	Description	
	Direction - ECU to Sensor Packets	Sensor Address (Yellow Field)
		Function Code (Yellow Field)
		Register Address (Yellow Field)
		Data (Cyan Field)
		CRC (Purple Field)
Error Type		Parity
		CRC
		Response Code (Sensor to ECU)



#### PSI5 Search configuration

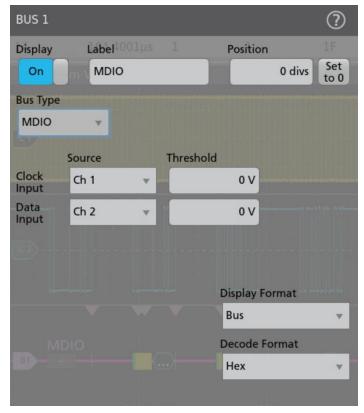


PSI5 Results table

#### **MDIO Characteristics**

#### Table 87: Bus setup options

Characteristic	Description
MDIO Sources (Clock, Data)	Analog channels
	Digital channels
	Active Math channels
	Active Reference channels
Thresholds	Pre-channel thresholds
Recommended Probing	Single-ended
Formats Available	Hex
	Binary
	Mixed Hex



Bus configuration

#### Table 88: Bus search options

Characteristic	Description
Search On	Start Packet
	OpCode
	Physical Address
	Register Address
	Data
	Error: Any, OpCode Error, Device Type Error



Search configuration

# Table 89: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Result Table	Decoded packet data in tabular view

#### Table 90: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	Maximum frequency of up to 2.5 MHz
Decode Display	Start Packet (Green)
	Clause (Green)
	OpCode (Yellow)
	Physical Address (Yellow)
	Register Address (Yellow)
	Device Type (Yellow)
	Data/Address (Cyan)
	Error: Any, OpCode Error,
	Device Type Error (Red)



#### SVID characteristics (Version 1.9)

# Table 91: Bus setup options

Characteristic	Description
SVID Sources (Clock, Data, Alert)	Analog channels
	Digital channels
	Active Math channels
	Active Reference channels
Thresholds	Pre-channel thresholds
Recommended Probing	Single-ended
Formats Available	Hex
	Binary
	Mixed Hex

BUS 1					?
Display	1µ Label			Position	
On	SVID			-2.06 divs	Set to 0
Bus Type	•				
SVID					
ann Staile	Source		Threshold		
Clock Input	Ref 1		50	0 mV	
Data Input	Ref 2	Ŧ	50	0 mV	
Alert Input	Ref 3	v		0 V	
			D	isplay Format	
			E	Bus	v
			D	ecode Format	
∕Start√			h V M	Hex	v
(Second C)	SHIGH A				

Bus configuration

#### Table 92: Bus search options

Characteristic	Description
Search On	Start
	Slave Address
	Command
	Payload: Master, Slave, Either
	Errors: Any, Missing Ack, Parity
	End

Display	510.Pa	ckets Decode
On	Act	on Event 🛃
earch Type	Sla source ty: Incorrect Parity	
Bus	Bus 1 (SVID)	
	Slave Hancy: incorrect Parity	
Aark On		
Start •		
Start		
c)		
Slave Address		
Command		
Payload		
rayload	Slave Parity: Incorrect Parity	

Search configuration

# Table 93: Display modes

Characteristic	Description
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Result Table	Decoded packet data in tabular view

#### Table 94: Bus decode

Description
Maximum frequency of 26.25 MHz
Start (Green)
Slave Address (Yellow)
Command (Yellow)
Master Payload (Cyan)
Master Parity (Purple)
End (Purple)
Turnaround (Purple)
Ack (Purple)
Slave Payload (Cyan)
Slave Parity (Purple)



# e-USB2 (Version 2.0)

# Table 95: Bus setup options

Characteristic	Description
Source(s)	Analog channels
	Digital channels(single-ended)
	Active Math channels
	Active Reference channels
Thresholds	Pre-channel thresholds
Speeds	Speed High Speed (480 Mb/s)
	Full Speed (12 Mb/s)
	Low Speed (1.5 Mb/s)
Recommended Probing, HS, LS, and FS	Single-ended [Active Single Ended TAP1500]
Formats Available	Mixed Hex
	Hex
	Binary
	Mixed ASCII

BUS 1			?
Display On	Label		Position 0 divs Set to 0
Bus Type		Speed	Mode
eUSB	Ψ.	Low (1.5 🔻	Native Repeater
	Source	Threshold	
D+ Input	Ch 1	·	ov
D- Input	Ch 2		ov
B1			
			Display Format
			Bus 🔻
			Decode Format
			Mixed Hex 🔍

#### Table 96: Bus search options

Characteristic	Description
Search On	Characteristic Description
	Search On Sync
	Reset
	Suspend
	Resume/Wake
	Connect
	Control Message
	Port Reset
	Port Configuration
	Device Chirp
	Host Chirp
	End of Packet
	Token (address) Packet
	Data Packet
	Handshake Packet: ACK, NAK, STALL, NYET (HS only)
	Special Packet: PRE (FS only), ERR, SPLIT, PING
	Reserved
	Error: PID check, CRC5 or CRC16, Bit stuffing (LS and FS only)

Bus configuration

SEARCH 1			?
Display On		Act on Even	t 🗗
Search Type	Source		-100101
Bus v	Bus 1 (eUSB)	Y	-200
Mark On			-
Control Message 👻			
Sync			400 mV
			300 mV
Handshake Packet			100 mV
Special Packet			📢
Error			-100 mV
Token Packet			-200 mv -300 mV
loken Packet			-400 mV
Data Packet			
Reset	A		-400 mV Mittaniv
Connect			200 mV
			100 mV
Control Message			0.9
Suspend			-200 mil
Device Chirp	$\sim 1 \sim \lambda_{c}$		-300 mV
	104.1 ja		-400 mV
Host Chirp			
Port Reset			
Port Configuration			
Resume/Wake	68h	Copy Sear Settings to Tr	ch igger
End of Packet		Jetungs to II	igger

Search configuration

# Table 97: Bus decode

Characteristic	Description
Decode Display	Start of packet (green bar)
	Sync (green packet)
	PID (yellow packet)
	Token (address) (yellow packet)
	Data (cyan packet)

Characteristic	Description
	CRC (purple packet)
	Error (red packet)
	End of packet (red bar)
	Control Message (Yellow packet)
	Zeros (Blue packet)
	Ack (Purple packet)
	Port Reset (Red Bar)
	Port Configuration(Green Bar)
	Connect (Green Bar)
	Resume/Wake(Green Bar)
	Device Chirp(Green Bar)
	Host Chirp (Green Bar)
	End Of reset(Red Bar)

## Table 98: Results & other features

Characteristic	Description
Table view	View more than 10000* points
* Depends on the Model	
Save	Save Result table as CSV
Sessions	Save sessions of your protocol setup
Simultaneous Buses	Load multiple Buses
* Depends on the Model	simultaneously*
Upcoming Future addition	Timing Measurements for Protocols
Search Table	Displays the Search hits along with Delta time difference between hits

#### 3 Series MDO, 4/5/6 Series MSO Serial Triggering and Analysis Applications Datasheet

Bus Deco	ode Results											×	Add	New
Bus 1 (eUS REPEA	B-HOST- TER) Bus	2 (eUSB- IPHERA									96 Pack	ets Decoded	Cursors	Callout
Index	A Start Time											CR	Measure	Search
1	-99.08332µs	DATA0									18 01 66 58 E6 17 A2 0A 60	D 7F 8A F	Describes	
2	-98.67706µs	DATA0									18 01 66 58 E6 17 A2 0A 60	D7F8AF	Results Table	Plot
3	-98.27081µs	DATA0					-				18 01 66 58 E6 17 A2 0A 60	07F8A F		
4	-97.86456µs	DATA0									18 01 66 58 E6 17 A2 0A 60	D7F8A F		More
5	-97.45831µs	DATA0							-		18 01 66 58 E6 17 A2 0A 60	07F8A F		
6	-97.05206µs	DATA0									18 01 66 58 E6 17 A2 0A 60	D7F8A F		
7	-96.6458µs	DATA0					-				18 01 66 58 E6 17 A2 0A 60	07F8A F		
8	-96.23956µs	DATA0									18 01 66 58 E6 17 A2 0A 60	D7F8A F		
9	-95.8333µs	DATA0									18 01 66 58 E6 17 A2 0A 60	07F8A F		
10	-95.42707µs	DATA0									18 01 66 58 E6 17 A2 0A 6E	07F8A F		
11	-94.84372µs			-			-		-			-		
12	-85.92705µs											-		
13	171.2468µs	DATA0							-		18 01 66 58 E6 17 A2 0A 60	D 7F 8A F		
B II Horizontal 2	Zoom Scale 7.00	III III 224 ps us/div + - (	32.00x zoom) V	44ULps	672 ssi (1.00x zoor		ибра ни	1.120 rHJ	+ III 1,344 ms	III III.568 ms	II 1.79 Illus			
<u> </u>	IUISJ&RASTST B-HOST-REPEA	NER				SYNC PID:DA Data:1	TA0 8h		 					
	686 µs			700 µs	707 µs		-) 14 μs	-OIII <sub>1 µs</sub>	γ <sub>28 μs</sub>	735 µs	742 µs			
B2 +	B-PERPIPHERA				me/Wake									
1 MΩ	v 200 mV/div 1 MΩ 500 MHz <sup>B</sup>	1 MΩ	iv 200 mV/div 1 MΩ 500 MHz <sup>B</sup> w	Bus 2 eUSB				Add New Math Re		Horizontal 224 µs/div 2.24 m SR: 3.125 GS/s 320 ps RL: 7 Mpts 9 10%	/pt 1 / 0 V	Acquisition Manual, An Sample: 12 bit: 0 Acqs	alyze 02	Preview Apr 2020 28:08 AM

Results table with decoded waveform

#### Manchester Characteristics (Line encoding)

# Table 99: Bus setup options

Characteristic	Description
Manchester Sources	Analog channels Digital channels(single-ended) Active Math channels Active Reference channels
Bus Setup: Threshold Idle Bits Transition For '0' Tolerance	BUS 1 On Manchester O divs Set to 0 Bus Type Transition For '0 Data Rate Manchester I25 kb/s Source Threshold V Packet View Idle Bits 1.2 bits I edge Tolerance 10% Display Format Bus v Decode Format Hex v
Recommended Probing	Differential/Single ended
Formats Available	Hex Binary
Packet View	BUS 1       Image: Constraint of the second se

# Table 100: Bus search options

Characteristic	Description
Search On	Characteristic Description
	Search On Sync
	Reset
	Suspend
	Resume/Wake
	Connect
	Control Message
	Port Reset
	Port Configuration
	Device Chirp
	Host Chirp
	End of Packet
	Token (address) Packet
	Data Packet
	Handshake Packet: ACK, NAK, STALL, NYET (HS only)
	Special Packet: PRE (FS only), ERR, SPLIT, PING
	Reserved
	Error: PID check, CRC5 or CRC16, Bit stuffing (LS and FS only)

# Table 101: Display modes

Characteristic	Description
Bus	Bus Only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Results Table	Decoded packet data in a tabular view with columns containing:
	Sync Pattern
	Packet Header
	Packet Data
	Packet Trailer
	Error

# Table 102: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	1Gbps
Decode Display	Control Field (yellow packet)
	Payload Field (cyan packet)
Error Handling	Parity
	Manchester
Search On	When Packet View is ON
	Sync Bits
	Header
	Data
	Trailer
	Errors
	When Packet View is OFF
	Data
	Errors

# Table 103: Bus search options

Character istic	Description	
Search On	Sync Bits	Mark On
(Packet	Header	Sync Bits 🔹 🔻
View ON)	Data	
	Trailer	Sync Bits
	Errors	Header
		Data
		Trailer
		Errors
Table contin		

Table continued...

Character istic	Description	
Search On	Data	Mark On
(Packet View	Errors	Data 👻
OFF)		[ Data
		Errors Lata

# Table 104: Results & other features

Characteristic	Description
Table view	View more than 10000* points
* Depends on the Model	
Save	Save Result table as CSV
Results Table	Sessions
Simultaneous Buses	Load multiple Buses
* Depends on the Model	simultaneously*
Upcoming Future addition	Timing Measurements for Protocols
Search Table	Displays the Search hits along with Delta time difference between hits

#### DPHY(DSI2.0/CSI2.0) Characteristics (Version 2.0)

# Table 105: Bus setup options

	Description
DPHY Sources	Analog channels
	Math channels
	Active Reference channels
Salient Features	Decode capability in for CSI/DSI protocols.
	Decode capability for Escape mode.
	Decode capability for High speed burst mode.
	Decode capability for 8b9b line encoding in LPDT and HS mode.
	Search capability for SoT/EoT
	Search capability for long and short packets
	Search capability for Escape mode
	Search capability for Errors like ECC, CRC, and Any
Bus Setup	BUS 1 Display Label Position On DPHY Odivs Set Odivs
Recommended	Clock – Single Ended/Differential
Probing	Data – Single Ended
	Single ended probe: No. of probes: 3 (D+ and D- by default)
	Differential probe: No. of probes: Not supported
8b9b encoding mode	Select line encoding in LPDT and HS mode.
Formats Available	Hex
	Binary

# Table 106: Display modes

Characteristic	Description
Bus	Bus Only
Bus and Waveforms	Simultaneous display of bus and digital waveforms
Result Table	Decoded packet data in a tabular view with columns containing:
	Mode
	Data Type
	Virtual Identifier
	ECC
	Data
	CRC
	End
	Error

## Table 107: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	2.5 Gbps
Decode Display	Control Field (yellow)
	ECC/CRC (Green)
	Pixel Fields (Red,Green,Blue,Yellow)
	Data Symbol (cyan)
	Raw Fields (Cyan)
Error Handling	ECC
	CRC
	SOT Sync

# Table 108: Bus search options

Characteristic	Description
Search On (CSI/DSI)	SoT – It searches SoT of each transmission in HS mode
	EoT – It searches EoT of each transmission in HS mode.
	Data – Data search (HS/LP)
	Scrambling – Search for scrambling mode command
	Compression – Search for Compression mode command.
	**Packets – Searches for Short and long packets
	Escape – Search for Escape entry mode
	STOP – Search for Escape mode exit
	Errors – Search for CRC and ECC errors.
	**Can select from the list of standard packet names

2	SEARCH 1											
Display			64 Packets Decoded									
	On							Act on Event 🛛 🛃				•
												_
0	plete packet(2); Unfra Search Type	-		Sourc	e	-		-	_			
	Bus 🔻			Bus	1 (DI	PHY)			•			
ľ	/lark On											
	SoT 🔻											
	SoT											
	ЕоТ											
	Data	hed										
	Scrambling											
	Compression											
	Packets											
	BusTurnAround											
	Escape											mV
	Escape											mV mV
	Stop											mV 0 V
	Errors											
												mV
												mV 0 V
												mV
												mV mV
												mV
												0 V I

Bus search options

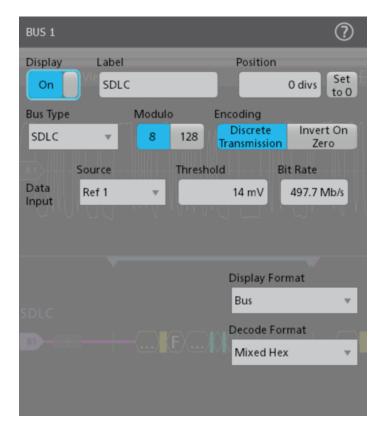
# Table 109: Result & other features

Characteristic	Description			
Table view	View more than 10000* points			
* Depends on the Model				
Save	Save Result table as CSV			
Sessions	Save sessions of your protocol setup			
Simultaneous Buses	Load multiple Buses simultaneously*			
* Depends on the Model	Sinulaneously			
Upcoming Future addition	Timing Measurements for Protocols			
Search Table	Displays the Search hits along with Delta time difference between hits			

#### SDLC Characteristics (Version GA27-3093-3)

## Table 110: Bus setup options

Characteristic	Description
SDLC Source(s)	Analog channels
	Digital channels
	Active Math channels
	Active Reference channels
Thresholds	Pre-channel thresholds
Recommended Probing	Differential
Modulo	8 [8-bit Control Word]
	128 [16-bit Control Word]
Encoding	Discrete Transmission [NRZ] Invert On Zero [Inverted NRZi]
Formats Available	Hex
	Binary
	Mixed Hex



#### Table 111: Display modes

Characteristic	Description
Bus	Bus Only
Result Table	Decoded packet data in a tabular view

#### Table 112: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	1 Gbits/sec
Decode Display	Start (green vertical line)
	Address (yellow field)
	Frame Type (yellow field)
	Code (yellow field)
	Ns(yellow field) [Sequence number sent]
	Nr(yellow field) [Sequence number received]
	Poll/Final (yellow field)
	Data(cyan field)
	FCS(purple field)
	Abort (red vertical line)
Error handling	FCS [ Frame Check Sequence Errors]

#### Table 113: Bus search options

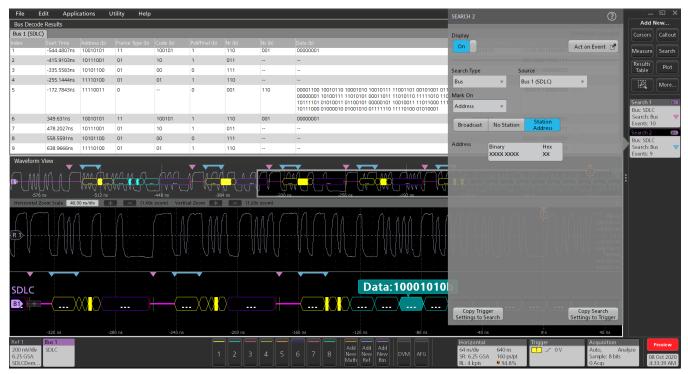
Characteristic	Description
Search On	Start [Searches for Start event]
	Data [Searches for Payload Data]
	Abort [Searches for Abort]
	Address
	Broadcast [Broadcast Packets]
	No Station [Packets not pertaining to secondary]
	Station [Valid Station Address]
	Unnumbered
	Commands [Searches for Primary Commands]
	Responses [Searches for Secondary Responses]
	Both Information [Searches for information frames]
	Supervisory [Searches for different receiver status]
	Receive Frame Ready
	Receive Frame Not Ready
	Reject frame
	Errors
	FCS [Searches for Frame Check Sequence errorrs]
	Out of Numeric Order [Searches for this frame]
	Stop



#### 3 Series MDO, 4/5/6 Series MSO Serial Triggering and Analysis Applications Datasheet



The Protocol Decode Results Table provides a time-stamped, tabular view of all captured packets on the SDLC bus.



Searching on a station address on the SDLC bus.

#### **CPHY Characteristics (Version 2.0)**

# Table 114: Bus setup options

Characteristic	Description
CPHY Sources	Analog channels
	Digital channels
	Math channels
	Active reference channels
Salient Features	Decode capability in for CSI/DSI protocols. Decode capability for Escape mode.
	Decode capability for High speed burst mode.
	Decode capability for Word/Symbol Mode.
	Decode capability in single ended and differential mode
	Search capability for SoT/EoT
	Search capability for long and short packets Search capability for Escape mode
	Search capability for CRC Errors
	Search capability on Pixel value and Pixel number in CSI/DSI packet search
Sub Type	CSI
	DSI
	Word (16 Bit data word decode)
	Symbol (Symbol level decode of cphy data)
Signal Type	Single Ended: No. of probes: 3
	Differential: No. of probes: 5
	Minimum BW of probe: As minimum bitrate of HS is set to 4 Mbps, almost all probe should work. But considering the general CPHY HS speed is about 1 GHz and speed can vary depending on customer, the probe need to based on what speed the end customer want to test.
Formats Available	Hex
	Binary
	Mixed Hex
Bit Rate	Specifies the data rate in High Speed Mode

# Table 115: Display modes

Characteristic	Description
Bus	Bus Only
Result Table	Decoded packet data in a tabular view with columns containing:
	Mode Data Type
	Virtual Identifier
	PHCCRC
	Data CRC
	Symbols
	End
	Error

# Table 116: Bus decode

Characteristic	Description
Maximum Clock/Data Rate	10 Gbps
Decode Display	Control Field (yellow) ECC/CRC (Green)
	Pixel Fields (Red, Green, Blue, Yellow)
	Data Symbol (cyan) Raw Fields (Cyan)
	Word and Symbol Decode (cyan)
Error Handling	PHCRC
	CRC
	SOT Sync
Sub type	CSI (CSI packet decode)
	DSI (DSI packet decode in HS/LP)
	Word (16 bit word decode)
	Symbol Decode

#### Table 117: Bus search options

Characteristic	Description
Search On (CSI/DSI)	SoT – Searches SoT of each transmission in HS mode
	EoT – Searches EoT of each transmission in HS mode.
	Data – Data search (HS/LP)
	Scrambling – Search for scrambling mode command
	Compression – Search for Compression mode command.

Characteristic	Description				
	**Packets – Searches for Short and long packets				
	Escape – Search for Escape entry mode				
	Errors – Search for CRC and PHCRC errors.				
	**Can select from the list of standard packet names				
Word / Symbols Decode	Search for Words/Symbols respectively				

не Virtual Identifier (b) 44405	LP-01 LP-00 LPDT Command LP-11 LP-01 LP-00 	Data Type (b)  001000 	ECC (b)  00000001	X 142 Packets Decoded Data (b) 	Waveform View	Add Cursors
944µs            11µs            23µs         00           17µs            49µys         10           95ns	LP-01 LP-00 LPDT Command LP-11 LP-01 LP-00 	  001000		Data (b) 		Cursors
944µs            11µs            23µs         00           17µs            49µys         10           95ns	LP-01 LP-00 LPDT Command LP-11 LP-01 LP-00 	  001000				
11μs 23μs 00 17μs 49μs 10 10 95ns	LP-00 LPDT Command LP-11 LP-01 LP-00 	001000				
23µs 00 17µs 49µs 10 10 95ns	LPDT Command LP-11 LP-01 LP-00		00000001			Measure
17µs 49µs 10 10 95ns				00001111 00001111	88133-HS	Results Table
95ns					B8TB3-LP	
	1 P-11   P-01   P-00	101101 101101		Pixel A:10101000 Pixel B	-123.072 μs -92.304 μs -61.536 μs -30.768 μs <b>0</b> s 30.768 μs 61.536 μs 92.304 μs 123.072 μs	0
4ns 01 01	LI TI LI FUT LEFOU				Horizontal Zoom Scale 100.00 ns/div + (307.68x zoom) Vertical Zoom + (1.00x zoom) X	
		100100 100100		Blue0:10100010 Green0: Green1:01100001 Red1:	····· δ00 mV	
2µs	LP-11 LP-01 LP-00				400 mV	
4µs 10 10		100000 100000		Blue0:1110 Green0:0001		
Зµs	LP-11				-200 mV	
6µs	LP-10				· · · · · · · · · · · · · · · · · · ·	
8µs	LP-00					
μs	LP-01				· · · · · · · · · · · · · · · · · · ·	
1µs	LP-00					
3µs 00	LPDT Command	001000	0000001	00001111 00001111		
Зµs	LP-11 LP-01 LP-00				💳	
μs 10 10		101101 101101		Pixel A:10101000 Pixel B	• • • • • • • • • • • • • • • • • • •	
2µs	LP-11 LP-01 LP-00				· · · · · · · · · · · · · · · · · · ·	
7µs 01 01		100100 100100		Blue0:10100010 Green0:		
	LP-11 LP-01 LP-00			-	600 mV	
9µs 10.10		100000 100000		Blue0:1110 Green0:0001		
	LP-11				C	
7µs	LP-10					
9µs	LP-00			-		
	LP-01					
				-	Data Type:100100b	
	LPDT Command	001000	00000001	00001111 00001111		
	LP-11 LP-01 LP-00			-		
				Pixel A:10101000 Pixel B		
					B8133-LP	
2µs 01 01		100100 100100		Blue0:10100010 Green0:	-200 ns -100 ns 01s 100 ns 200 ns 300 ns 400 ns 500 ns 600 ns 700 ns	
	ising	Pick         Pick         Pick         Pick           Sigs         Pick         Pick         Pick	Figs          LP-10            Bys          LP-00            Bys          LP-00            Bys         0         LP-00            Bys         0         LP-01            Bys         0         LP-11 LP-01 LP-00            Bys         0         LP-11 LP-01 LP-00            Bys         10.10          101101101101           Bys         0.10          100100.00000           Bys         0.10          100000.100000           Bys         10.1          100000.100000           Bys         10.1          100000.100000           Bys         10.1          100000.100000           Bys         10.1             Bys         10.1             Bys          LP-11            Bys          LP-00            Bys         10.10          1011011011           Bys         10.10          101101101101	App         P-10             Bys          P-00             Bys          P-00             Bys          P-00             Bys          P-00             Bys         0         P-00             Bys         0         P-01         P-01            Bys         0         P-01         P-01             Bys         1010         -         1011010110             Bys         1010         -         10101000              Bys         1010         -         10010000               Bys         1010         -         10010000               Bys         1010         -         P-111P-011P-00               Bys         1010         P-1           - <t< td=""><td>Rigs        </td><td>Figs        LP-10            Bys       -       LP-00        -          Bys       -       LP-01            Bys       -       LP-01            Bys       -       LP-00            Bys       0       LP-11             Bys       0       LP-11       O-10             Bys       0       LP-11  -</td></t<>	Rigs	Figs        LP-10            Bys       -       LP-00        -          Bys       -       LP-01            Bys       -       LP-01            Bys       -       LP-00            Bys       0       LP-11             Bys       0       LP-11       O-10             Bys       0       LP-11  -

The protocol decode results table provides a time-stamped, tabular view of all captured pixel packets on the CPHY bus

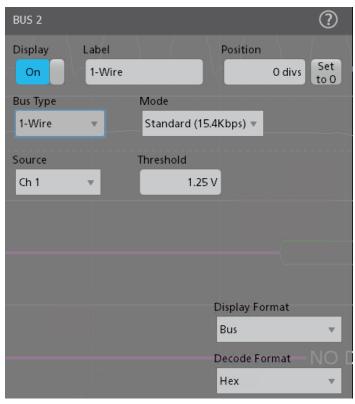


CPHY search results display

#### **ONEWIRE Characteristics**

#### Table 118: Bus setup options

Characteristic	Description
1-WIRE Sources	Analog channels
	Digital Channels
	Active Math channels
	Active Reference channels
Salient Features	Decode capability in for 1-WIRE protocol.
	Decode capability for Standard mode.
	Decode capability for Overdrive mode.
	Search capability for Reset, Presence events
	Search capability for Command, Data
	Search capability for different ROM packets such as Read/Match/Skip/Search ROM and Alarm based on the Standard or Overdrive mode chosen.
	Search capability for CRC Error
Formats Available	Hex
	Binary
	Mixed Hex
Mode	Specifies the mode of operation – Standard (15.4 kbits/s) or Overdrive (125 kbits/s).



#### Bus setup

# Table 119: Display modes

Characteristic	Description
Bus	Bus Only
Result Table	Decoded packet data in a tabular view with columns containing:
	Initialization
	ROM Command
	ROM Code
	CRC
	Command
	Data
	Error

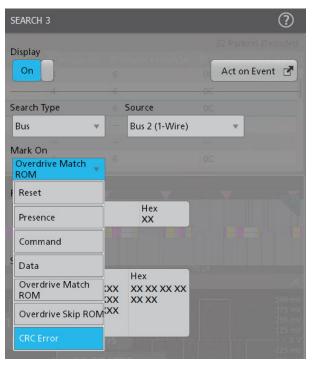
## Table 120: Bus decode

Characteristic	Description
Decode Display	ROM Command/ROM Code/ Command (yellow) CRC (purple) Reset/Presence event (Green) End event (Red)
Error Handling	CRC

#### Table 121: Bus search options

Characteristic	Description
Search On 1-WIRE	Reset – Searches for the Reset event. Reset is the default trigger on condition.
	Presence – Searches for the Presence event.
	Command – Searches for Command.
	Data – Searches for the Data.
	Read ROM – Searches for the Family code and Serial number of Read ROM.
	Match ROM – Searches for the Family code and Serial number of Match ROM.
	Overdrive Match ROM – Searches for the Family code and Serial number of Match ROM.
	Skip ROM – Searches for Skip ROM packet.
	Overdrive Skip ROM – Searches for the Overdrive Skip ROM packet.
	Search ROM – Searches for the ROM code.
	Alarm Search – Searches for the Alarm packet.
	CRC Error specifies the search condition as CRC Error.

SEARCH 1		?
Display On		Act on Event 🕑
Search Type	Source	
Bus 💌	Bus 2 (1-Wire)	
Mark On		) µs
Search ROM 🛛 🔹		×
F Reset		818.18Z mV
Presence	Hex XX XX XX XX XX	636.364 mV
Command	XX XX XX XX XX XX XX	+24,242 ms
Data	~~	Mun Linses
Read ROM		1 190 909 mil
Match ROM		Звілять пу
Skip ROM		127.273 mV
Search ROM		363.636 mV
Alarm Search		0 V
CRC Error		-181.818 mV



Search on 1-WIRE

File E	dit Applic	ations Utility	Help Debug								—	ω×
Bus Decod	Results									×	Add N	lew
Bus 1 (1-Wi	e)									46 Packets Decoded	Cursors	Callout
Index	Start Time	Initialization	ROM Command (h)	ROM Code (h)		CRC (h)	Command (h)	Data (h)	Error			
1	-1.291216ms	Reset:-1.291216ms									Measure	Search
2	-775.2975µs	Presence:-775.2975µs	Search ROM	ROM Code:3400000544	473910				-		Results	Plot
3	15.0041ms	Reset:15.0041ms									Table	
4	15.52066ms	Presence:15.52066ms	Match ROM	Family Code:10 Serial Nu	mber:00000054A739	2C	44					More
5	1.022878s	Reset:1.022878s										
6	1.023387s	Presence:1.023387s	Match ROM	Family Code:10 Serial Nu	mber:00000054A739	2C	BE	2D 00 E8 80 FF FF 18 54 8E			Search 1	80
7	1.060963s	Reset:1.060963s									Bus: 1-Win Search: Bu	
8	1.061473s	Presence:1.061473s	Search ROM	ROM Code:CE0000045CF	FFBD28				-		Events: 15	
9	1.108843s	Reset:1.108843s										
10	1.109358s	Presence:1.109358s	Match ROM	Family Code:28 Serial Nu	mber:0000045CFFBD	73	44		-			
11	2.11666s	Reset:2.11666s				-		-				
12	2.11717s	Presence:2.11717s	Match ROM	Family Code:28 Serial Nu	mber:0000045CFFBD	73	BE	78 01 4B 46 7F FF 08 10 51	-			
13	2.4268125	Reset:2.426812s										
14	2.427328s	Presence:2.427328s	Search ROM	ROM Code:340000054.4	\$73910							
Waveform	view										:	
						, 📩				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
BD							A Code:340000005					
	-40 ms	-30 n		-20 ms				10 ms 20 ms	30 ms	40 ms		
Horizontal Z	oom Scale 400.0		(25.00x zoom) Vert		(1.60x zoom)	410				×		
			an a	and the second second				a sa		· · · · · 6.25 V		
	· · · ·	· · · · · · · · · · · · · · · · · · ·			ון ו ויידאו	יות ורד	<u> </u>	יין (ביורייון אין) א				
										5,V 3.75 2.50 1.25 V		
R 1			. المسا المسا ا	- hand hand hand hand hand hand	L	ـ المسالسيا ـ	السبا ــ لا ــ لا ــ	mall_l_l_l_l_hundle	_ المسال السما إسما السما	_ Honeral H freeward here and here and here and free of by		
										-1.25 V -2.50 V		
	v											
1-W	ire								00000544700			
B1 +		N	latch ROM	Family C	.ode:10h			Serial Numb	er:00000054A739	n		
	15.6 ms	16 ms	16.4 ms	16.8 ms		2 ms	17.6 ms	18 ms	18.4 ms	18.8 ms 19.2 ms		
Ref 1	Bus 1								Horizontal	Trigger Acquisition		Preview
2 V/div	1-Wire						7 8 Ne		o 10 ms/div 100 ms	1 _ 0V Auto, A	nalyze 🛛 💆	
1 MS/s 1-wire_10								ith Ref Bus	SR: 12.5 MS/s 80 ns/pt RL: 1.25 Mpts 9 50%	Sample: 12 bit 0 Acgs		Feb 2021 53:58 AM

The protocol decode results table provides a time-stamped, tabular view of all captured pixel packets on the 1-WIRE bus.

File E	dit Applic	ations Utility	Help Debug							SEARCH 1		?	— 1	Β×
Bus Decode	Results												Add M	lew
Bus 1 (1-Wir	:)									Display		46 Packets Decoded	Cursors	Callout
Index	Start Time	Initialization	ROM Command (h)	ROM Code (h)		CRC (h)	Command (h)	Data (h)		On		Act on Event 📑		
1	-1.291216ms	Reset:-1.291216ms											Measure	Search
2	-775.2975µs	Presence:-775.2975µs	Search ROM	ROM Code:340000054A	73910					Search Type	Source		Results Table	Plot
3	15.0041ms	Reset:15.0041ms								Bus 👻	Bus 1 (1-Wire)	· ·		$\equiv$
4	15.52066ms	Presence:15.52066ms		Family Code:10 Serial Nur	mber:00000054A739		44		_					More
5	1.022878s	Reset:1.022878s								Mark On				
6	1.023387s	Presence:1.023387s	Match ROM	Family Code:10 Serial Nur	mber:00000054A/39	2C	BE	2D 00 E8 80 FF FF 18	54 8E	Match ROM 🛛 🔻			Search 1 Bus: 1-Wir	BD
7	1.060963s	Reset:1.060963s								Family Code			Search: Bu	is 🔍 🔻
8	1.061473s	Presence:1.061473s	Search ROM	ROM Code:CE0000045CF	FBD28					Binary	Hex		Events: 15	
9	1.108843s	Reset:1.108843s				**				XXXX XXXX	XX			
10	1.109358s	Presence:1.109358s	Match ROM	Family Code:28 Serial Nur	mber:0000045CFFBD	73	44							
11	2.11666s	Reset:2.11666s								Serial Number				
12	2.117175	Presence:2.11717s	Match ROM	Family Code:28 Serial Nur	mber:0000045CFFBD	73	BE	78 01 4B 46 7F FF 08	10 51	Binary	Hex			
13	2.4268125	Reset:2.426812s			72040				_	XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXX				
14	2.427328s	Presence:2.427328s	Search ROM	ROM Code:3400000054A	(73910				_	XXXX XXXX XXXX XXXX				
B) Horizontal Zo	-40 ms om Scale 400.0	-30 n 00 us/div + -	s (25.00x zoom) Ver		-10 ms (1.60x zoom)		M Code:34000000	4473910h	20 ms	30 ms	40			
R1												3.75 V 2.56 V 1.25 V 1.25 V 1.25 V 2.50 V 3.75 V		
1-W	ire	(	latch ROM	Family C	ode:10h 📈			Serial N	umbe	Copy Trigger Settings to Search	9n	Copy Search Settings to Trigger		
	15.6 ms	16 ms	16.4 ms	16.8 ms	17	'.2 ms	17.6 ms	18	ms	18.4 ms	18.8 ms	19.2 ms		
Ref 1 2 V/div 1 MS/s 1-wire_10	Bus 1 1-Wire			1	2 3 4	5 6		dd Add Add ew Ref Bus D\		Horizontal 10 ms/div 100 ms SR: 12.5 MS/s 80 ns/pt RL: 1.25 Mpts 950%	Trigger	Acquisition Auto, An Sample: 12 bits 0 Acqs	alyze 10	Preview Feb 2021 55:28 AM

Searching on a MATCH ROM packet with Family Code and Serial Number on the 1-WIRE bus.

# **Ordering information**

# **Protocol Bundles**

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Serial Decode	Description	4 Series MSO	5 Series MSO	6 Series MSO				
4-RL-1	Record length enhancement to 62.5 million sample points	V	*	*				
5-RL-125M	Record length enhancement to 125 million sample points	ecord length enhancement to 125 million sample points *						
6-RL-2	Record length enhancement to 250 million sample points	length enhancement to 250 million sample points						
SRAUDIO	Audio Serial Triggering and Analysis (I2S, LI, RJ, TDM). Enables triggering on packet-level information on serial audio buses	<ul> <li>✓</li> </ul>	~	~				
SRAUTO	Automotive Serial Triggering and Analysis (CAN, CAN FD, LIN, FlexRay). Enables triggering on packet-level information on CAN/CAN FD/LIN/FelxRay	V	V	V				
SRNET	Ethernet Serial Triggering and Analysis (10BASE-T, 100BASE-T). Enables decoding and analysis on Ethernet buses.	~	~	~				
SRI3C	I3C Serial Decoding and Analysis. Enables decoding and searching on packet-level information on MPI I3C	~	<ul> <li></li> </ul>	~				
SRNRZ	NRZ Serial Decoding and Analysis. Supports NRZ with normal and inverted polarity with Bit order (MSB or LSB first)	~	<ul> <li></li> </ul>	~				
SRPM	Power Management Serial Triggering and Analysis. Enables triggering on packet-level information on SPMI buses	~	<ul> <li></li> </ul>	~				
SRUSB2	USB 2.0 Serial Triggering and Analysis (LS, FS, HS). Enables triggering on packet-level information on USB 2.0 buses	~	<ul> <li></li> </ul>	~				
SRMDIO	MDIO Protocol Decoder and Search. Extensive search options.	V	V	V				
SRSVID	SVID Protocol Decider and Search. Supports version rev.1.92. Extensive search options	~	<ul> <li></li> </ul>	~				
SR8B10B	8B10B Serial Decoding and Analysis. Finds and displays parity error if found in 4-bit or 6-bit for the 10-bit symbol in 8b10b	*	~	V				
1 Year License		4-PRO- MILGOV-1Y	5-PRO- MILGOV-1Y	6-PRO- MILGOV-1Y				
Perpetual		4-PRO-MILGOV- PER	5-PRO-MILGOV- PER	6-PRO-MILGOV- PER				

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Serial Decode	Description	4 Series MSO	5 Series MSO	6 Series MSO
4-RL-1	Record length enhancement to 62.5 million sample points	<b>v</b>	×	×
5-RI-125M	Record length enhancement to 125 million sample points	×	~	×
6-RL-2	Record length enhancement to 250 million sample points	×	×	~
SRAERO	Aerospace Serial Triggering and Analysis (MIL-STD-1553, ARINC429). Enables triggering on packet-level information	~	~	~
SRSPACEWIRE	SpaceWire serial analysis. Enables decoding and analysis on SpaceWire buses.	~	~	~
MTM		~	~	<b>v</b>
SRNRZ	NRZ Serial Decoding and Analysis. Supports NRZ with normal and inverted polarity with Bit order (MSB or LSB first)	*	~	~
DJA	Jitter Analysis Package including TIE, Eye diagram, Histogram and other advanced analysis measurements.	~	~	~
1 Year License Perpetual		4-PRO- MILGOV-1Y	5-PRO- MILGOV-1Y	6-PRO- MILGOV-1Y
		4-PRO-MILGOV- PER	5-PRO-MILGOV- PER	6-PRO-MILGOV- PER

# To add to an instrument at purchase

3 Series MDO Option	4 Series MSO Option	5 Series MSO Option	6 Series MSO Option	Description
3-SRAERO	4-SRAERO	5-SRAERO	6-SRAERO	Aerospace Serial Triggering and Analysis (MIL-STD-1553, ARINC 429). Enables triggering on packet-level information on MIL-STD-1553 and ARINC 429 buses 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.
3-SRAUDIO	4-SRAUDIO	5-SRAUDIO	6-SRAUDIO	Audio Serial Triggering and Analysis (I <sup>2</sup> S, LJ, RJ, TDM). Enables triggering on packet-level information on serial audio buses 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.
N/A	N/A	5-SR8B10B	5-SR8B10B	8B10B Serial Decoding and Analysis. Enables decoding and searching the packet-level information on buses with analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Finds and displays parity error if found in 4-bit or 6-bit for the 10-bit symbol in 8b10b.
	Option 3-SRAERO 3-SRAUDIO	OptionOption3-SRAERO4-SRAERO3-SRAUDIO4-SRAUDIO	OptionOption3-SRAERO4-SRAERO3-SRAUDIO4-SRAUDIO3-SRAUDIO5-SRAUDIO	OptionOptionOption3-SRAERO4-SRAERO5-SRAERO6-SRAERO3-SRAUDIO4-SRAUDIO5-SRAUDIO6-SRAUDIO

Serial bus type	3 Series MDO Option	4 Series MSO Option	5 Series MSO Option	6 Series MSO Option	Description
NRZ	N/A	4-SRNRZ	5-SRNRZ	6-SRNRZ	NRZ Serial Decoding and Analysis. Enables decoding and searching the packet-level information on buses with analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Variants like NRZ-I, NRZ-M, NRZ-S, and NRZ-C are not supported currently. Supports only NRZ with normal and inverted polarity with Bit Order (MSB or LSB First).
CAN, CAN FD, LIN, FlexRay	3-SRAUTO	4-SRAUTO	5-SRAUTO	6-SRAUTO	Automotive Serial Triggering and Analysis (CAN, CAN FD, LIN, FlexRay). Enables triggering on packet-level information on CAN/CAN FD/LIN/FlexRay buses 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.
Automotive 100BASE-T1	N/A	N/A	5-SRAUTOEN1	6-SRAUTOEN1	100BASE-T1 Automotive Ethernet serial analysis.
SENT	N/A	4-SRAUTOSEN	5-SRAUTOSEN	6-SRAUTOSEN	Automotive Sensor Serial Triggering and Analysis (SENT). Enables triggering on packet-level information on SENT buses 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.
RS-232/422/485, UART	3-SRCOMP	4-SRCOMP	5-SRCOMP	6-SRCOMP	Computer Serial Triggering and Analysis (RS-232, RS-422, RS-485, UART). Enables triggering on packet-level information on RS-232/422/485 and UART buses 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.
I <sup>2</sup> C, SPI	3-SREMBD	4-SREMBD	5-SREMBD	6-SREMBD	Embedded Serial Triggering and Analysis (I <sup>2</sup> C, SPI). Enables triggering on packet-level information on I <sup>2</sup> C and SPI buses 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.
Ethernet	N/A	4-SRENET	5-SRENET	6-SRENET	Ethernet Serial Triggering and Analysis (10BASE-T, 100BASE-T). Enables triggering on packet-level information on Ethernet buses 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.
13C	N/A	4-SRI3C	5-SRI3C	6-SRI3C	I3C Serial Decoding and Analysis. Enables decoding and searching on packet-level information on MIPI I3C buses with analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information.

Serial bus type	3 Series MDO Option	4 Series MSO Option	5 Series MSO Option	6 Series MSO Option	Description
SPMI	N/A	4-SRPM	5-SRPM	6-SRPM	Power Management Serial Triggering and Analysis (SPMI). Enables triggering on packet-level information on SPMI buses 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.
Spacewire	N/A	4-SRSPACEWIRE	5-SRSPACEWIRE	6-SRSPACEWIRE	Spacewire serial analysis. Enables decoding and analysis on Spacewire buses.
USB 2.0	3-SRUSB2	4-SRUSB2	5-SRUSB2	6-SRUSB2	USB 2.0 Serial Triggering and Analysis (LS, FS, HS). Enables triggering on packet-level information on USB 2.0 buses 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.
Serial options bundle	3-BND	N/A	N/A	N/A	Adds all serial analysis options and the power analysis option available for an instrument.
PSI5	N/A	4-SRPSI5	5-SRPSI5	6-SRPSI5	PSI5 Serial Decoding (v1.3 and 2.1) and analysis. Enables decoding and Search Packet level information with analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information.
MDIO	N/A	4-SRMDIO	5-SRMDIO	6-SRMDIO	MDIO Protocol Decoder and Search, No Hardware Trigger; Node locked
SVID	N/A	4-SRSVID	5-SRSVID	6-SRSVID	SVID Protocol Decoder and Search, No Hardware Trigger; Node locked
e-USB2	N/A	4-SREUSB2	5-SREUSB2	6-SREUSB2	eUSB2 Protocol Decoder and Search; Node locked
DPHY	N/A	N/A	5- SRDPY	6- SRDPY	DPHY CSI/DSI (DSI2.0 /CSI2.0 protocols decoder. Supports HS data transmission burst, and escape mode functionality. Data transmission can be with 8-bit raw data or using 8b9b encoded symbol
MANCHESTER	N/A	4-SRMANCH	5-SRMANCH	6-SRMANCH	Supports Generic Manchester decode. Decode of packets as per packet structure defined. Decode of Errors like Sync, Parity, Manchester
SDLC		4-SRSDLC	5-SRSDLC	6-SRSDLC	SDLC decoder and Search. Extensive search options on captured waveforms like unnumbered , Supervisory, address etc
CPHY 1.2	N/A	N/A	5-SRCPHY	6-SRCPHY	MIPI C-PHY CSI/DSI Protocol Decoder and Search
1-Wire	N/A	4-SRONEWIRE	5-SRONEWIRE	6-SRONEWIRE	1-Wire Protocol Decoder and search

# To upgrade an already purchased instrument

JP3 SRAERO JP3 SRAUDIO JP3 SRAUTO A	SUP4-SRAERO SUP4-SRAERO-FL SUP4-SRAUDIO SUP4-SRAUDIO-FL SUP4-SRAUTO SUP4-SRAUTO-FL N/A	SUP5-SRAERO SUP5-SRAERO-FL SUP5-SRAUDIO SUP5-SRAUDIO-FL SUP5-SRAUTO SUP5-SRAUTO-FL SUP5-SR8B10B	SUP6-SRAERO SUP6-SRAERO-FL SUP6-SRAUDIO SUP6-SRAUDIO-FL SUP6-SRAUTO SUP6-SRAUTO-FL
JP3 SRAUTO	SUP4-SRAUDIO SUP4-SRAUDIO-FL SUP4-SRAUTO SUP4-SRAUTO-FL	SUP5-SRAUDIO SUP5-SRAUDIO-FL SUP5-SRAUTO SUP5-SRAUTO-FL	SUP6-SRAUDIO SUP6-SRAUDIO-FL SUP6-SRAUTO
JP3 SRAUTO	SUP4-SRAUDIO-FL SUP4-SRAUTO SUP4-SRAUTO-FL	SUP5-SRAUDIO-FL SUP5-SRAUTO SUP5-SRAUTO-FL	SUP6-SRAUDIO-FL SUP6-SRAUTO
A	SUP4-SRAUTO SUP4-SRAUTO-FL	SUP5-SRAUTO SUP5-SRAUTO-FL	SUP6-SRAUTO
A	SUP4-SRAUTO-FL	SUP5-SRAUTO-FL	
			SUP6-SRAUTO-FL
	N/A	SUP5-SR8B10B	
Ά			SUP6-SR8B10B
A	1	SUP5-SR8B10B-FL	SUP6-SR8B10B-FL
	SUP4-SRNRZ	SUP5-SRNRZ	SUP6-SRNRZ
	SUP4-SRNRZ-FL	SUP5-SRNRZ-FL	SUP6-SRNRZ-FL
Ά	N/A	SUP5-SRAUTOEN1	SUP6-SRAUTOEN1
		SUP5-SRAUTOEN1-FL	SUP6-SRAUTOEN1-FL
Ά	SUP4-SRAUTOSEN	SUP5-SRAUTOSEN	SUP6-SRAUTOSEN
	SUP4-SRAUTOSEN-FL	SUP5-SRAUTOSEN-FL	SUP6-SRAUTOSEN-FL
JP3 SRCOMP	SUP4-SRCOMP	SUP5-SRCOMP	SUP6-SRCOMP
	SUP4-SRCOMP-FL	SUP5-SRCOMP-FL	SUP6-SRCOMP-FL
JP3 SREMBD	SUP4-SREMBD	SUP5-SREMBD	SUP6-SREMBD
	SUP4-SREMBD-FL	SUP5-SREMBD-FL	SUP6-SREMBD-FL
Ά	SUP4-SRENET	SUP5-SRENET	SUP6-SRENET
	SUP4-SRENET-FL	SUP5-SRENET-FL	SUP6-SRENET-FL
A	SUP4-SRI3C	SUP5-SRI3C	SUP6-SRI3C
	SUP4-SRI3C-FL	SUP5-SRI3C-FL	SUP6-SRI3C-FL
Ά	SUP4-SRPM	SUP5-SRPM	SUP6-SRPM
	SUP4-SRPM-FL	SUP5-SRPM-FL	SUP6-SRPM-FL
Ά	SUP4-SRSPACEWIRE	SUP5-SRSPACEWIRE	SUP6-SRSPACEWIRE
	SUP4-SRSPACEWIRE	SUP5-SRSPACEWIRE-FL	SUP6-SRSPACEWIRE-FL
JP3 SRUSB2	SUP4-SRUSB2	SUP5-SRUSB2	SUP6-SRUSB2
	SUP4-SRUSB2-FL	SUP5-SRUSB2-FL	SUP6-SRUSB2-FL
	N/A	N/A	N/A
	A A A A	SUP4-SREMBD-FL SUP4-SRENET SUP4-SRENET-FL SUP4-SRI3C SUP4-SRI3C-FL SUP4-SRPM SUP4-SRPM-FL SUP4-SRSPACEWIRE P3 SRUSB2 SUP4-SRUSB2 SUP4-SRUSB2 SUP4-SRUSB2-FL B3 DND	SUP4-SREMBD-FLSUP5-SREMBD-FLASUP4-SRENETSUP5-SRENETASUP4-SRENET-FLSUP5-SRENET-FLASUP4-SRI3CSUP5-SRI3CASUP4-SRI3C-FLSUP5-SRI3C-FLASUP4-SRPMSUP5-SRPMASUP4-SRPM-FLSUP5-SRPM-FLASUP4-SRSPACEWIRESUP5-SRSPACEWIREASUP4-SRSPACEWIRESUP5-SRSPACEWIREP3 SRUSB2SUP4-SRUSB2SUP5-SRUSB2SUP4-SRUSB2-FLSUP5-SRUSB2-FL

Table continued...

<sup>&</sup>lt;sup>3</sup> Software is supplied with the instrument firmware. Always download and install the latest version of the firmware. Option documentation is part of the application Help.

<sup>&</sup>lt;sup>4</sup> 3 Series MDO option license names do not have a dash in the option number.

 $<sup>^{5}\;</sup>$  All serial bus and power analysis options that are available for an instrument.

Serial bus <sup>3</sup>	3 Series MDO Node-Lock License <sup>4</sup>	ed 4 Series MSO Node-Locke Floating License	d/ 5 Series MSO Node-Locked/ Floating License	6 Series MSO Node-Locked/ Floating License
PSI5	N/A	SUP4-SRPSI5	SUP5-SRPSI5	SUP6-SRPSI5
		SUP4-SRPSI5-FL	SUP5-SRPSI5-FL	SUP6-SRPSI5-FL
MDIO	N/A	SUP4-SRMDIO	SUP5-SRMDIO	SUP6-SRMDIO
		SUP4-SRMDIO-FL	SUP5-SRMDIO-FL	SUP6-SRMDIO-FL
SVID	N/A	SUP4-SRSVID	SUP5-SRSVID	SUP6-SRSVID
		SUP4-SRSVID-FL	SUP5-SRSVID-FL	SUP6-SRSVID-FL
e-USB2	N/A	SUP4-SREUSB2	SUP5-SREUSB2	SUP6-SREUSB2
		SUP4-SREUSB2-FL	SUP5-SREUSB2-FL	SUP6-SREUSB2-FL
DPHY	N/A	N/A	SUP5-SRDPHY	SUP6-SRDPHY
			SUP5-SRDPHY -FL	SUP6-SRDPHY-FL
MANCHESTER	N/A	SUP4-SRMANCH	SUP5-SRMANCH	SUP6- SRMANCH SUP6-
		SUP4-SRMANCH-FL	SUP5-SRMANCH-FL	SRMANCH -FL
SDLC	N/A	SUP4-SRSDLC	SUP5- SRSDLC	SUP6- SRSDLC
		SUP4- SRSDLC -FL	SUP5- SRSDLC -FL	SUP6- SRSDLC -FL
CPHY 1.2	N/A	SUP5-SRCPHY	SUP6-SRCPHY	MIPI C-PHY CSI/DSI Protocol Decoder and Search
1-Wire	SUP4-SRONEWIRE	SUP5-SRONEWIRE	SUP6-SRONEWIRE	1-Wire Protocol Decoder and search

# **Recommended probes**

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

#### Partner Products Ordering information

**Brief Description of Partner** 

#### To add to an instrument at purchase (Supports Windows Option)

Serial bus type	Minimum Bandwidth	Recommended Probes		6 Series/6B Series MSO Option	Description
PGY-eMMC (Windows Option Only)	2 GHz	Standard probes of MSO5/6 series	PGY-eMMC	PGY-eMMC	eMMC and SD (UHS-I) electrical measurements and Protocol decoding. software conforms to eMMC version 4.41,4.51,5.0, 5.1 specification. Supports Boot, SDR, DDR, HS200 and HS400 mode for electrical measurement and protocol Decode
PGY- SDIO(Windows Option Only)	2 GHz	Standard probes of MSO5/6 series	PGY-I2C	PGY-I2C	I2C Electrical Validation and Protocol decode SW
Table continued			1	1	

<sup>&</sup>lt;sup>3</sup> Software is supplied with the instrument firmware. Always download and install the latest version of the firmware. Option documentation is part of the application Help.

<sup>&</sup>lt;sup>4</sup> 3 Series MDO option license names do not have a dash in the option number.

Serial bus type	Minimum Bandwidth	Recommended Probes	5 Series MSO Option	6 Series/6B Series MSO Option	Description
PGY-QSPI(Windows Option Only)	500 MHz	Standard probes of MSO5/6 series	PGY-SPI	PGY-SPI	Electrical measurements compliance testing and protocol decoding as specified in QSPI specification. Supports Single and Dual Transfer rate (STR/DTR), electrical measurements and compliance testing for Ext SPI, Dual SPI and Quad SPI. Supports Triggering on command index and on S# falling edge. Supports Analog and Digital Channels of Tektronix MSO Series

#### Reference Selling of List of protocols supported on MSO series (please note: Windows only)

Serial bus type	Minimum Bandwidth	Recommended Probes	Ordering	5 Series MSO Option	6 Series/6B Series MSO Option	Description
RFFE	500 MHz	Standard probes of MSO5/6 series	Reference Selling. Contact: contact@prodigytec	PGY-RFFE	PGY-RFFE	RFFE Protocol Trigger & Decode Analysis Software.
			hno.com			PGY-RFFE utilizes the hardware based real-time RFFE protocol aware trigger, protocol analysis of long acquisition record length up to 125MB to provide superior RFFE Protocol Analysis result at press of button.
128	500 MHx and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-I2S	PGY-I2S	I2S Electrical, Audio and Protocol Testing SW
12C	500 MHz and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-I2C	PGY-I2C	I2C Electrical Validation and Protocol decode SW
SPI	500 MHz and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-SPI	PGY-SPI	SPI Electrical Validation and Protocol decode SW
13C	500 MHz and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-I3C	PGY-I3C	I3C Electrical Validation, Protocol trigger and Decode software
JTAG	500 MHz and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-JTAG	PGY-JTAG	JTAG Protocol decode Software
ONFI	4 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-ONFI	PGY-ONFI	ONFI Electrical Timing Analysis Sw
SPMI	500 MHz and above	standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-SPMI	PGY-SPMI	SPMI Protocol Decode Software

Serial bus type	Minimum Bandwidth	Recommended Probes	Ordering	5 Series MSO Option	6 Series/6B Series MSO Option	Description
MPHY	16 GHz and above	Contact Prodigy	Reference Selling. Contact:	PGY-UPRO	PGY-UPRO	MIPI MPHY -UniPro/LLI/UFS Protocol Decode Sw
			contact@prodigytec	PGY-LLI	PGY-LLI	FIOLOCOL DECODE SW
			hno.com	PGY-UFS(needs PGY-UPRO)	PGY-UFS(needs PGY-UPRO)	
USB 2.0	2 GHz	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-USB	PGY-USB	USB 2.0 Protocol Decode Sw
USB-PD	500 MHz and above	Standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-PD	PGY-PD	USB PD (CC) Protocol Analysis Sw
UART	500 MHz and above	Standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-UART	PGY-UART	UART Electrical Validation and Protocol Decode Software
KX/KR	12 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-NEGO	PGY-NEGO	KX/KR DME and Line Training Analysis Sw
100Base-T1	2 GHz and above	Standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-100Base T1	PGY-100Base T1	100 Base-T1 Protocol Decode Sw
SVID	500 MHz and above	Standard probes	Reference Selling. Contact: contact@prodigytec hno.com	PGY-SVID	PGY-SVID	SVID Protocol Decode Sw
USB3 Gen 1	23 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-USB3 Gen1	PGY-USB3 Gen1	USB3 Gen 1 5 Gbps Protocol Decode Sw
USB3 Gen 2	23 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-USB3 Gen1	PGY-USB3 Gen1	USB3 Gen 2 Protocol Decode Sw
8B10B	4 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-8B10B	PGY-8B10B	8B10B Protocol Decode Sw
1000T1-LT	4 GHz and above	Contact Prodigy	Reference Selling. Contact: contact@prodigytec hno.com	PGY-1000T1-LT	PGY-1000T1-LT	1000BaseT1 Line Training Decode Software

Terms and Conditions

Lead time of 2-3 Weeks ARO.



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

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

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