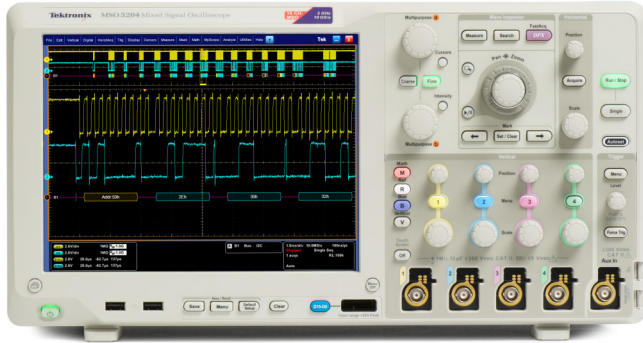


# Serial Triggering and Analysis Applications

MSO5000 and DPO5000 Series options: SR-COMP and SR-EMBD



## Features & Benefits

- Automated Serial Triggering and Decode Options for I<sup>2</sup>C, SPI, and RS-232/422/485/UART\*<sup>1</sup>
- 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!

\*<sup>1</sup> CAN, LIN, and USB support information available in separate data sheets

## Serial Triggering and Analysis Applications

On a serial bus, a single signal often includes address, control, data, and clock information. This can make isolating events of interest difficult. The Serial Applications for the MSO/DPO5000 Series transform the oscilloscopes into a robust tool for debugging serial buses with automatic trigger and decode for I<sup>2</sup>C, SPI, and RS-232/422/485/UART.

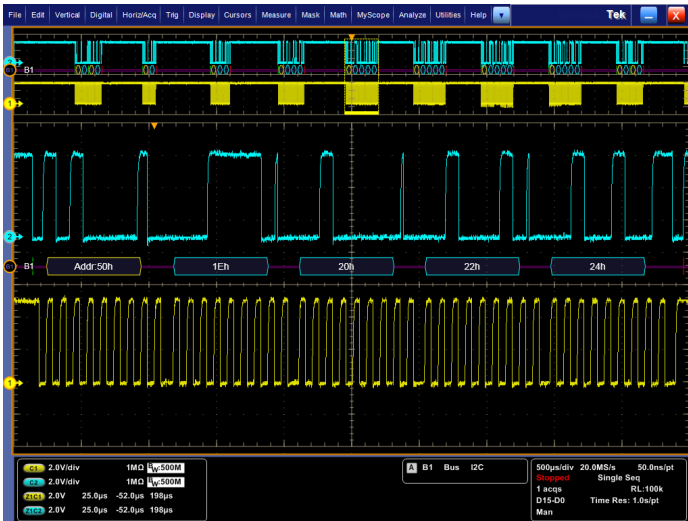
### Serial Triggering



Triggering on a specific address on an I<sup>2</sup>C bus. A complete set of triggers, including triggers for specific address and data packet content, ensures you quickly capture your event of interest.

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, and, RS-232/422/485/UART.

## Bus Display



Color-coded display of I<sup>2</sup>C bus, showing Start, Address, Data, and Stop components of the serial signal.

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

## Bus Decoding

Tired of having to visually inspect the waveform to count clocks, determine if each bit is a 1 or a 0, combine bits into bytes, and determine the hex value? Let the oscilloscope with a serial application do it for you! Once you've set up a bus, the MSO/DPO5000 Series will decode each packet on the bus, and display the value in hex, binary, or ASCII (RS-232/422/485/UART only) in the bus waveform.



Decoded display of SPI bus, automatically displaying bus content in any of several digital formats.

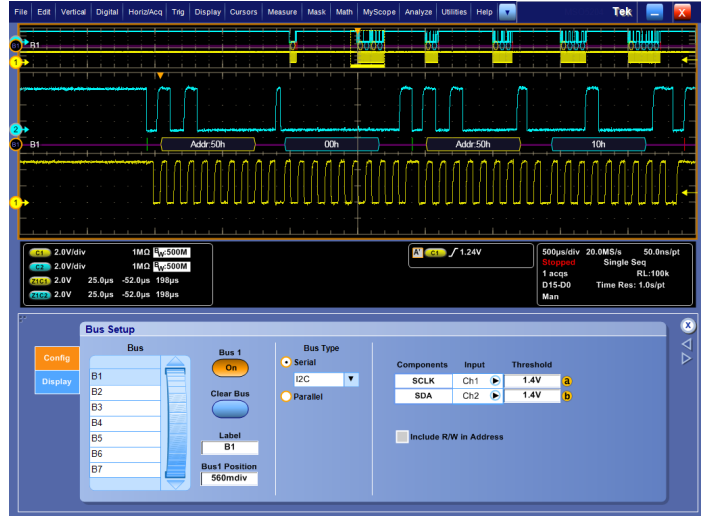
## Characteristics

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

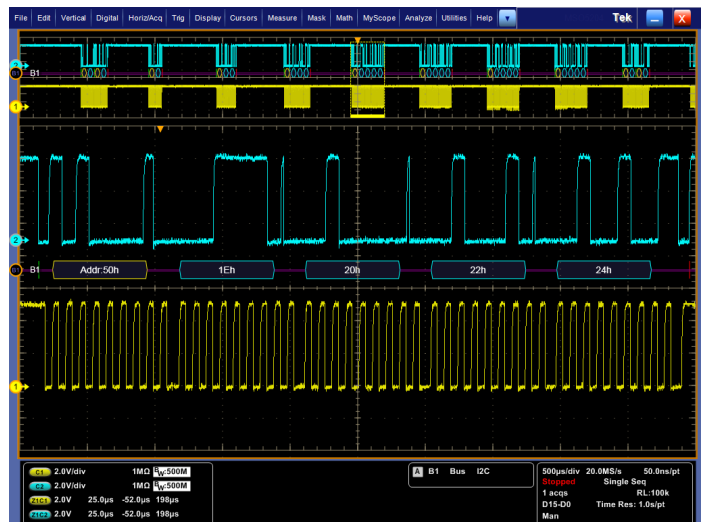
Bus Setup Options	Description
I <sup>2</sup> C Sources (Clock and Data)	Analog channels 1-4 Math channels 1-4 Digital channels D0 – D15 (MSO models only)
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Include R/W in Address	Yes or no
Address / Data Formats Available	Hex Binary
<b>Display Modes:</b>	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms

Bus Trigger Options	Description
Trigger On	Start Stop Repeated Start Missing Ack Address (7 or 10 bit) Data (1 – 5 bytes) Address and Data

Bus Decode Characteristics	Description
Maximum clock / data rate	Up to 10 Mb/s (automatic selection)
Decode Display	Start (green bar) Address (yellow packet) Missing Ack (! symbol) Data (cyan packet) Stop (red bar)



I<sup>2</sup>C bus setup, showing assignment of source signals and digital thresholds.



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



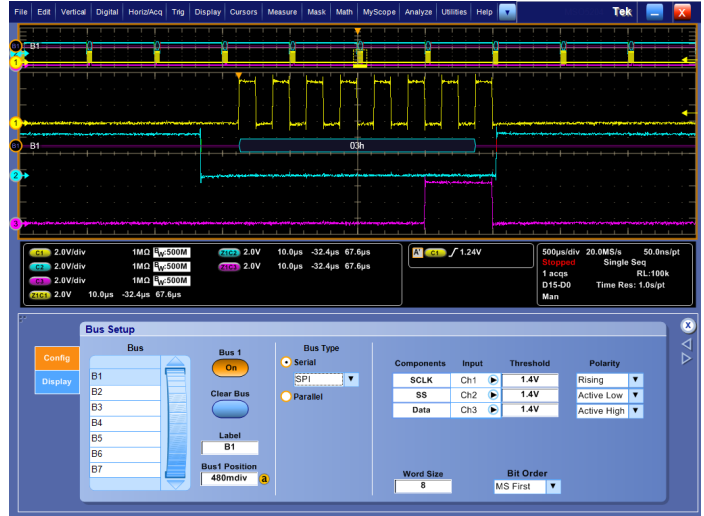
Triggering on a specific address value on the I<sup>2</sup>C bus.

### SPI Characteristics

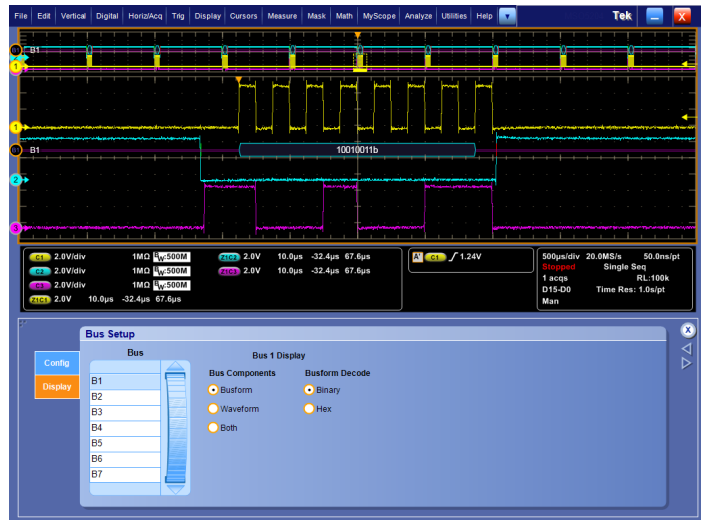
Bus Setup Options	Description
SPI Sources (Clock, Data, and Slave Select)	Analog channels 1-4 Math channels 1-4 Digital channels D0 – D15 (MSO models only)
Thresholds	Per-channel thresholds
Recommended Probing	Single-ended
Number of Bits	2 – 64
Address / Data Formats Available	Hex Binary
<b>Display Modes:</b>	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms

Bus Trigger Options	Description
Trigger On	SS Data (1 – 16 words)

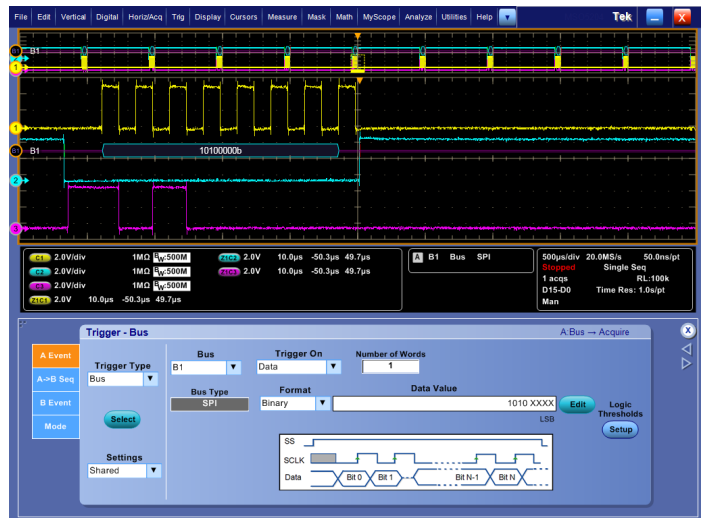
Bus Decode Characteristics	Description
Maximum clock / data rate	Up to 10 Mb/s (automatic selection)
Decode Display	Start (green bar) Data (cyan packet) Stop (red bar)



SPI bus setup, showing assignment of source signals and digital thresholds.



Color-coded SPI bus display, showing binary display format.



Triggering on a specific data value on the SPI bus.

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

Bus Setup Options	Description
<b>Sources:</b>	
RS-232 UART	Analog channels 1-4 Math channels 1-4 Digital channels D0 – D15 (MSO models only)
RS-422, RS-485	Analog channels 1-4 Math channels 1-4
Polarity	Normal (RS-232) Inverted (UART, RS-422/RS-485)
Recommended Probing	RS-232/UART: Single-ended RS-422/RS-485: Differential
Number of bits	7 - 9
Address / Data Formats Available	Hex Binary ASCII Packet View
<b>Display Modes:</b>	
Bus	Bus only
Bus and Waveforms	Simultaneous display of bus and digital waveforms

Bus Trigger Options	Description
Trigger On	Start End of Packet Data (1 – 5 bytes) Parity Error

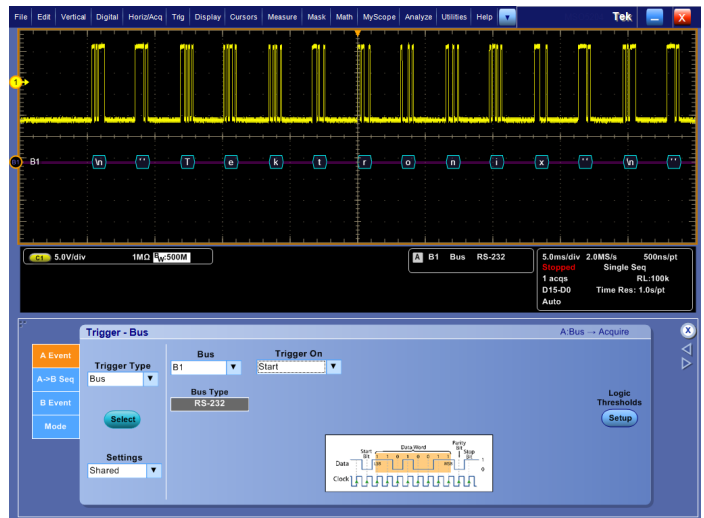
Bus Decode Characteristics	Description
Maximum bit rate	Up to 10 Mb/s (automatic selection)
Bit rate selections	50 b/s, 300 b/s, 1200 b/s, 2,400 b/s, 9,600 b/s, 19,200 b/s, 38,400 b/s, 115,200 b/s, 921,600 b/s, 10,000,000 b/s, Custom (50 b/s – 10 Mb/s)
Decode Display	Start (green bar) Data (cyan packet) Stop (red bar)



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



Color-coded RS-232 bus display, showing ASCII display format.



Triggering on a start of packet on the RS-232 bus.

## Ordering Information

### Optional Applications

Serial Bus	MSO/DPO5000 Series Option*2	Description
I <sup>2</sup> C, SPI	SR-EMBD	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, and packet decoding.
RS-232/422/ 485/UART	SR-COMP	Computer Serial Triggering and Analysis (RS-232/422/485/UART). Enables triggering on packet level information on RS-232/422/485/UART buses as well as analytical tools such as digital views of the signal, bus views, and packet decoding.

\*2 CAN, LIN, and USB options also available.

### Recommended Probes

Please refer to [www.tek.com/probes](http://www.tek.com/probes) for further information on the recommended models of probes and any necessary probe adapters.



Product(s) are manufactured in ISO registered facilities.





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