I²C and SPI Protocol Triggering and Decode for Infiniium 9000 Series Oscilloscopes

Data sheet

This application is available in the following license variations.

- Order N5391B for a user-installed license
- Order Option 007 for a factory-installed license with new 9000 Series oscilloscopes
- Order N5435A Option 006 for a server-based license

Agilent Technologies

Easily debug and test designs that include I²C or SPI protocols using your Infiniium 9000 scope

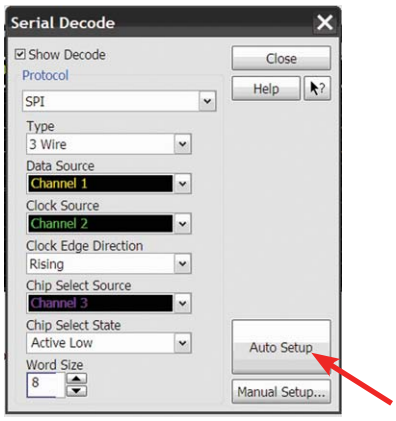
Lower-speed serial bus interfaces such as I²C (inter-integrated circuit) and SPI (serial peripheral interface) are widely used today in electronic designs for chip-to-chip communication. In many designs these serial buses tend to provide content-rich points for debug and test. However, since these protocols transfer bits serially, using a traditional oscilloscope has limitations. Manually converting captured 1's and 0's to protocol requires significant effort, can't be done in real-time, and includes potential for human error. In addition, traditional scope triggers are not sufficient for specifying protocol-level conditions.

Extend your scope capability with I²C and SPI Triggering and Decode application. This application makes it easy to debug and test designs that include I²C or SPI protocols using your Infiniium 9000 scope.

- Set up your scope to show I²C or SPI protocol decode in less than 30 seconds.
- Get access to a rich set of integrated protocol-level triggers.
- Save time and eliminate errors by viewing packets at the protocol level.
- Use time-correlated views to quickly troubleshoot serial protocol problems back to their timing or signal integrity root cause.

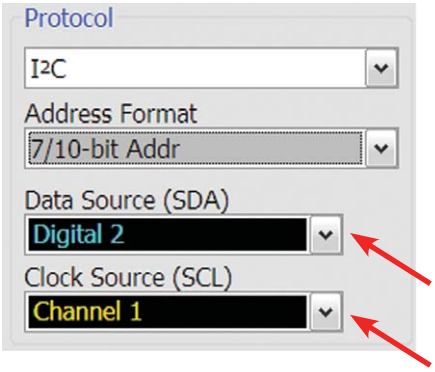
Easy to find

Turn decode on/off via the "Serial Decode" button on the front of the instrument or in the "Setup" menu. View decode embedded on the waveform display or in the protocol viewer listing window. (See pages 4-5).



30 Second SPI or I²C Setup

Configure your oscilloscope to display protocol decode in under 30 seconds. Use "Auto Setup" to automatically configure sample rate, memory depth and threshold and trigger levels.



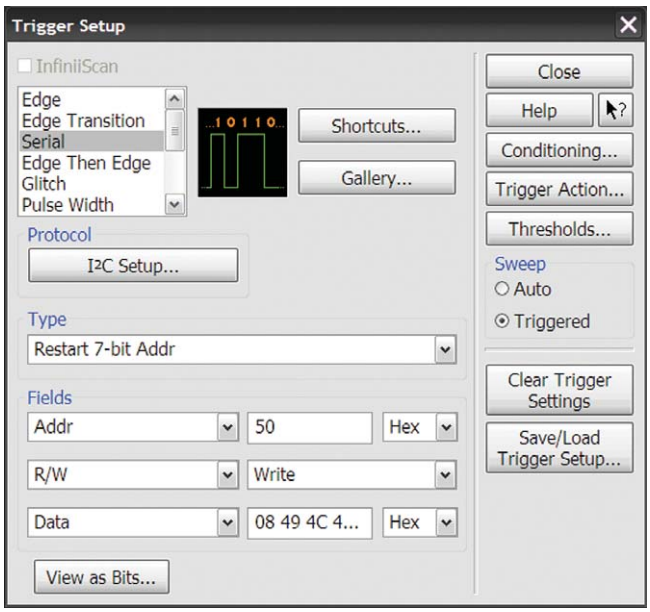
Support for both analog and digital channels

Acquire serial buses using any combination of scope or digital channels. Using digital channels on MSO models preserves analog channels for viewing other time-correlated signals.

I²C and SPI protocol triggering and searching

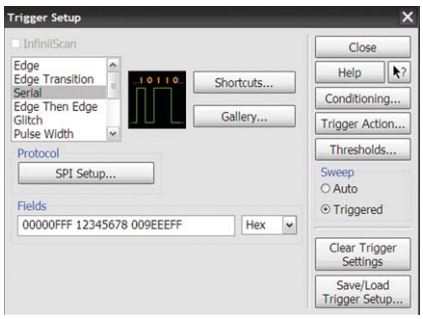
Get access to a rich set of integrated protocol level triggers. The application includes a suite of configurable protocol-level trigger conditions specific to I²C and SPI. When serial triggering is selected, the application enables special real-time triggering hardware inside the scope.

Hardware-based triggering ensures that the scope never misses a trigger event when armed. This hardware takes signals acquired using either scope or digital channels and reconstructs protocol frames. It then inspects these protocol frames against specified protocol-level trigger conditions and triggers when the condition is met.



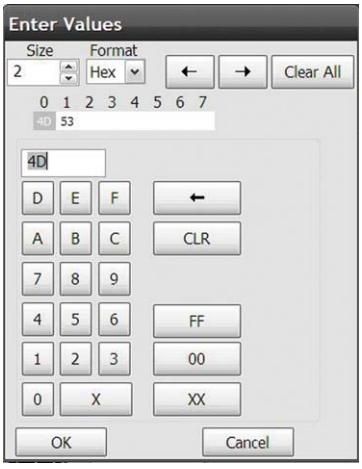
I²C Trigger Setup

Choose a combination of address, read/write, address acknowledge and data values for I²C triggers.



SPI Trigger Setup

Quickly access protocol triggering via the scope's trigger menu. Specify SPI trigger in HEX, binary, or decimal up to 200 bits.



Payload editor

Use the payload editor to specify data values word by word. Operators give additional triggering flexibility.

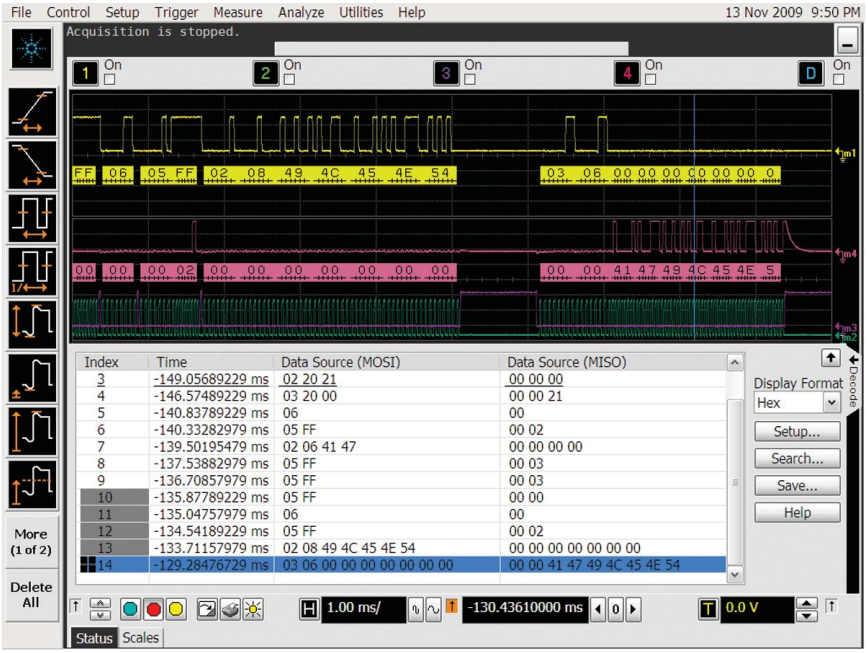
Post-acquisition searching

Search acquired protocol listing using a menu that is identical to the trigger menu.

Quickly find occurrences

Quickly move to next occurrence of a specified event. Jump to the next or previous occurrence of the specified event.

SPI protocol decode



SPI protocol decode with precise time-correlation between waveforms and listing

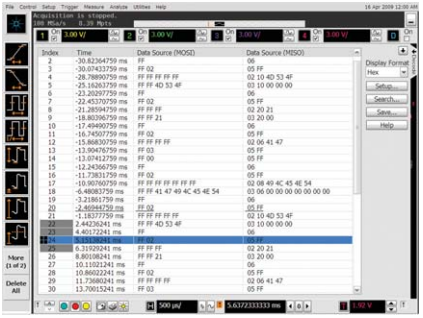
Agilent's SPI protocol viewer includes correlation between the waveforms and the selected packet. The selected packet, highlighted blue row in the listing, is time-correlated with the blue line in the waveform display. Move the blue tracking marker in time through waveforms and the blue bar will automatically track in the packets window. Or, scroll through the packet viewer and highlight a specific packet. The time-correlation tracking marker will move to the associated point in the waveform.

Support for 2, 3, and 4-Wire SPI

The application supports 2-, 3-, and 4-wire SPI. Use digital channels on MSO models to preserve analog channels for simultaneously viewing other signals.

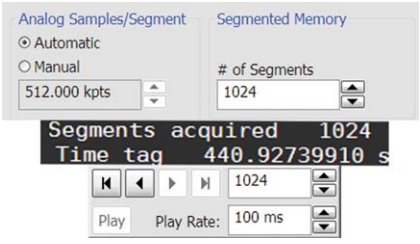
SPI decode embedded in waveform area

Utilize the oscilloscope waveform area to display decode information. For SPI, minor ticks indicate clock transitions and major ticks show the beginning and end of each word in the serial packet.



Full screen SPI listing

Fill the entire display with compact protocol information using the full screen listing. The protocol viewer window shows the index number, time stamp value, and data content for each serial packet in the list. Scroll though all decoded serial packets to find events of interest or errors in the transmission. Data in the listing window can be saved to a .csv or .txt file for off-line analysis or documentation.

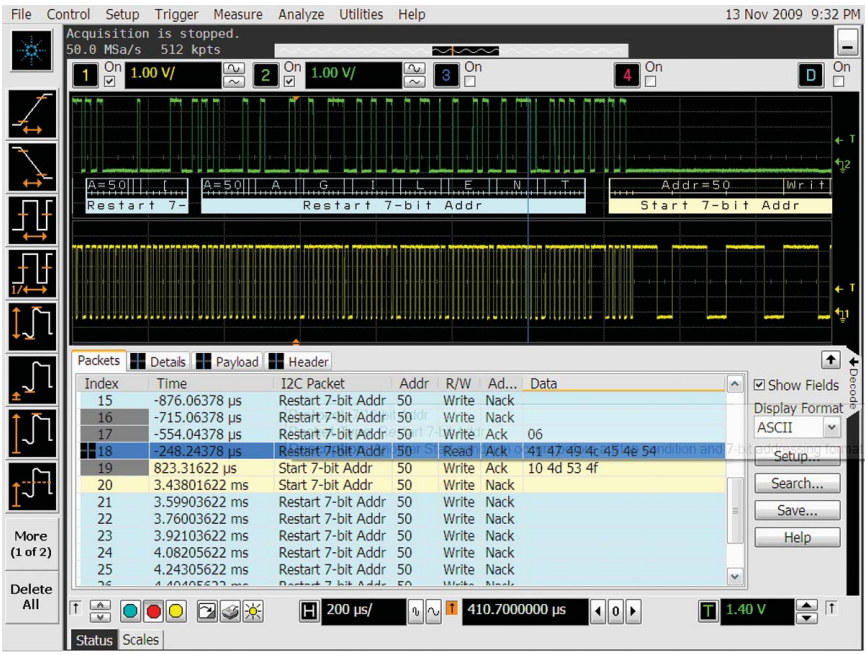


Long Time Captures using Segmented Memory

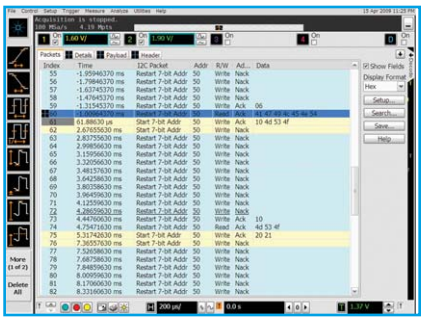
Capture seconds to days of serial protocol. The scope fills memory as each acquisition sees its trigger condition.

Segmented memory uses time tags to track time between segment acquisitions.

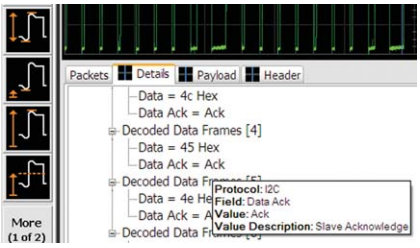
I²C protocol decode



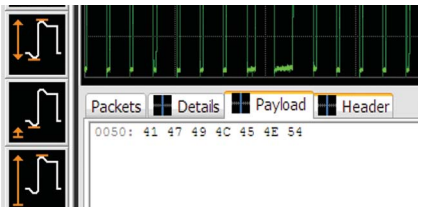
Quickly move between physical and I²C protocol layer information using the time-correlated tracing marker. Display protocol content using embedded decode in the waveform area, Or, see protocol events in a compact listing format using the industry's first scope based multi-tab protocol viewer. For I²C minor tick marks indicate clock transitions. Major tick marks indicate sections of the serial packet such as address, acknowledge, and data.



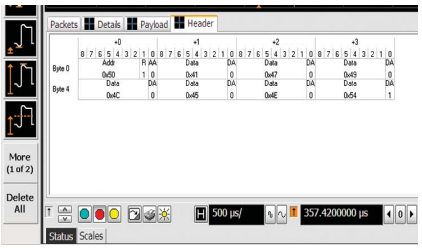
Fill the entire display with compact protocol information. The protocol viewer shows index number, time stamp, and data content for each serial packet. Listing content can be saved to a .csv or .txt file for off-line analysis or documentation. Use search capability to quick navigate through an acquisition.



Details tab breaks the packets into easy-to-read textual fields. Hovering shows additional detail.



Payload tab shows data carried by the packet in byte-by-byte HEX and ASCI.



Header tab shows packets in a data book format. Hovering at any field reveals additional detail.

I^2C specifications and characteristics

I^2C source (clock and data)	Analog channels 1, 2, 3, or 4 MSO models can additionally use digital channels D0 to D15 any waveform memory
Max clock/data rate	Any waveform memory up to 3.4 Mbps (automatic)
Auto Setup	Automatically configures scope settings for proper I^2C decode and protocol triggering
Triggering	Start and re-start 7-bit address Start and re-start 8-bit address Start and re-start 10-bit address Start and re-start 11-bit address Specify value for 3 fields choosing between the following Read or write Address (value in HEX or binary) Address acknowledge Data (up to 20 bytes (specify in HEX, binary, ASCII, or decimal) Operators include: = on 8-bit word boundaries.

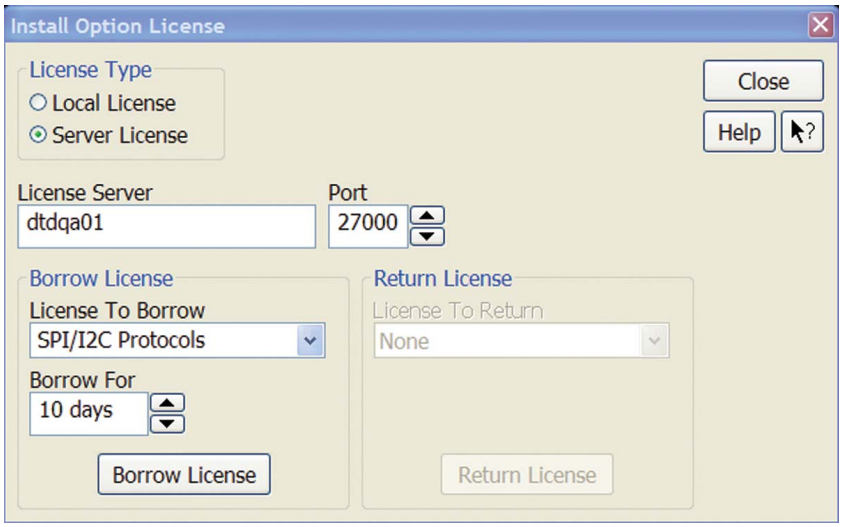
SPI specifications and characteristics

SPI protocols supported	2-wire SPI signals: data source and clock source 3-wire SPI signals: data source, clock source, and chip select source 4-wire SPI signals: data source (MOSI), clock source, chip select source, data source (MISO)
SPI source (all signals)	Analog channels 1, 2, 3, or 4 MSO models can additionally use digital channels D0 to D15
Max clock/data rate	Up to 50 Mbps (automatic)
Autoset	Automatically configures scope settings for proper SPI decode and protocol triggering
Decode word size	User-selectable from 4 to 32 bits
Decode bit order	User-selectable LSB or MSB
Triggering	Data length up to 200 bits Number of words * word size < 200 bits Number of words selectable up to 50 Word size selectable from 4 to 32 bits Data operators include: =, OR

Ordering information

This application is compatible with all 9000 Series oscilloscope models.

Software applications	Factory-installed node-locked license for new scope purchases	User-installed node-locked license	Server-based license (N5435A option)
I²C/SPI triggering and decode	007	N5391B	006



Sharing the application across multiple instruments? Server-based licensing allows users to borrow an application license for a specified period of time.

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Product specifications and descriptions in this document subject to change without notice.

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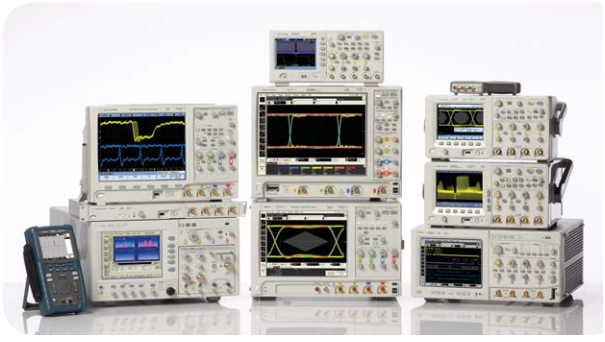

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