RS-232/UART Protocol Triggering and Decode for Infiniium 9000 Series Oscilloscopes

Data sheet

This application is available in the following license variations.

- Order N5462B for a user-installed license
- Order Option 001 for a factory-installed license with new 9000 Series oscilloscopes
- Order N5435A Option 031 for a server-based license

Agilent Technologies

Easily debug and test designs that include RS-232/UART using your Infiniium 9000 scope

Lower-speed serial bus interfaces such as RS-232 and other UART (universal asynchonous receive and transmit) interfaces are widely used today in electronic designs. 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 Agilent's RS-232/UART Triggering and Decode application. This application makes it easy to debug and test designs that include RS-232/UART protocols using your Infiniium 9000 scope.

- Set up your scope to show RS-232/UART 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).
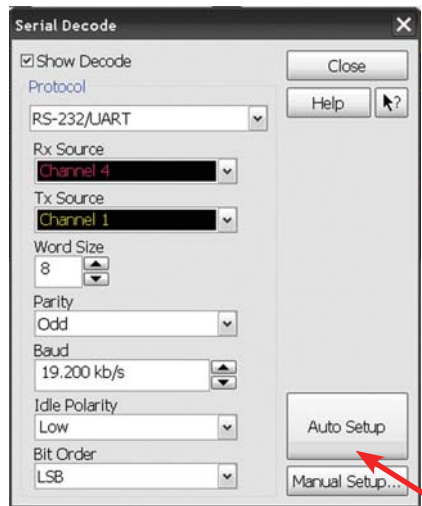
30 Second RS-232/UART Setup

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.
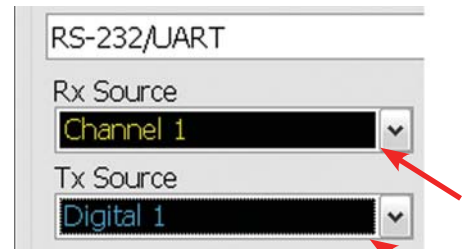
Support for both analog and digital channels

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.

RS-232/UART setup and triggering

Get access to a rich set of integrated protocol level triggers. The application includes a suite of configurable protocol-level trigger conditions specific to RS-232/UART. 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.
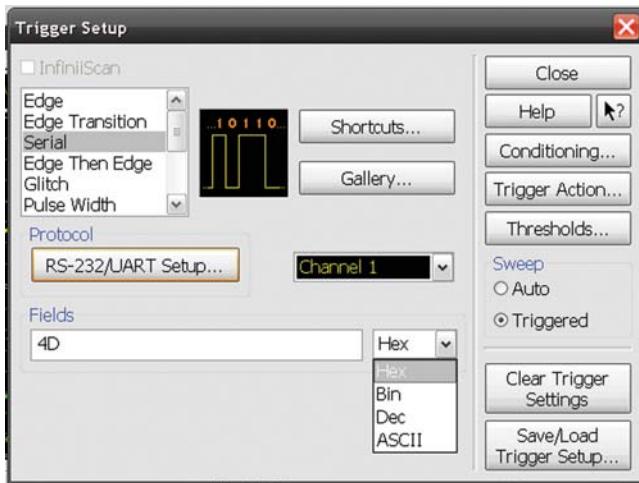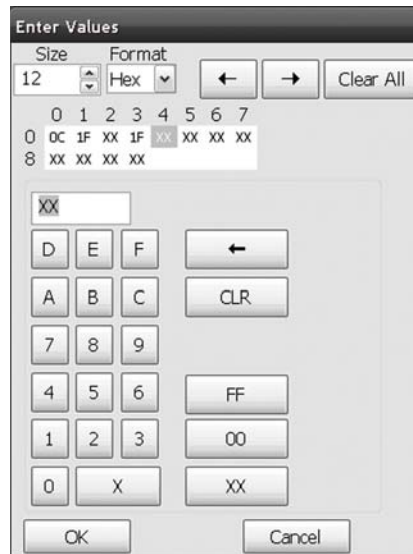
RS-232 Trigger Setup
Quickly access protocol triggering via the scope's trigger menu. Specify RS-232 trigger in HEX, binary decimal, or ASCII up to 27 words.
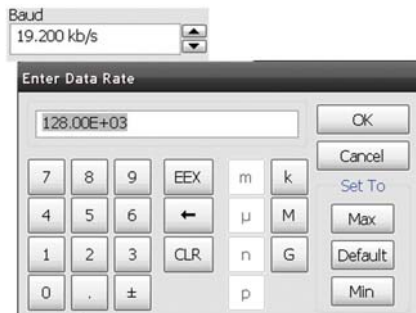
Baud rate settings

Enter any baud rate between 1,200 kb/s and 10 Mb/s, or click on up/down arrows to go to one of many pre-defined common baud rates.
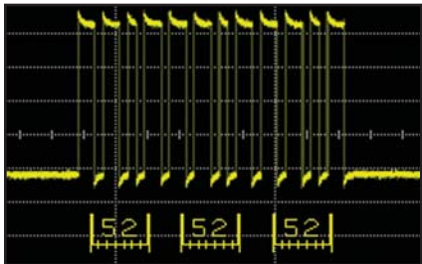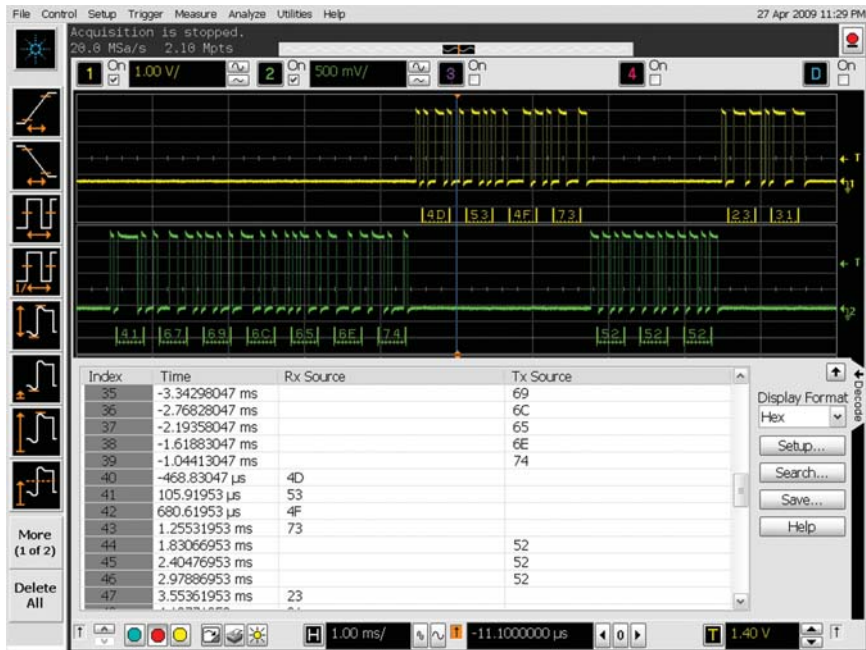
Payload editor

Choose trigger length between one to 27 words and use the payload editor to specify data values word by word.

Set trigger

Enter trigger condition in HEX, binary, decimal or ASCII.

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# RS-232/UART protocol decode and searching

RS-232 decode embedded in waveform area

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

RS-232 protocol decode with precise time-correlation between waveforms and listing

Agilent's 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.
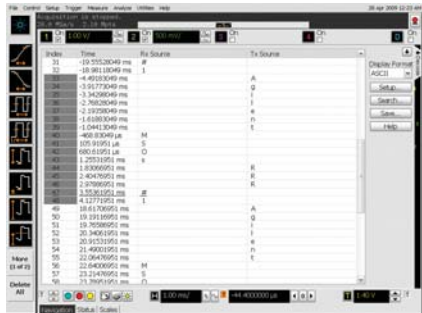

Full screen RS-232 listing

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.
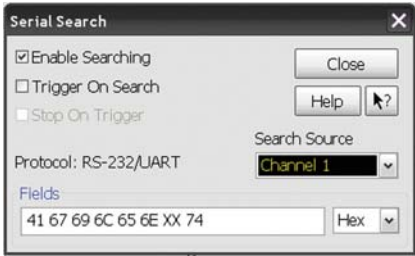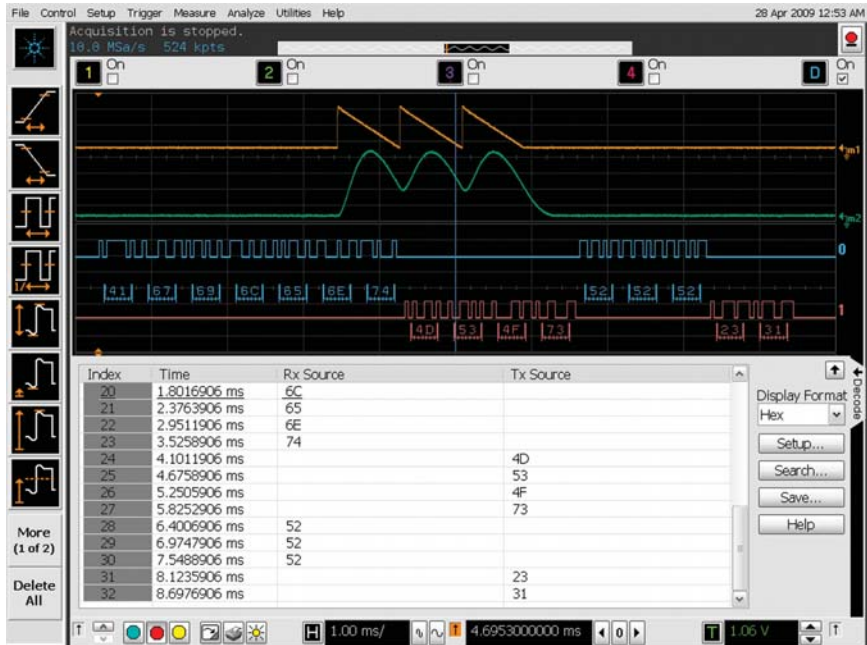
Post-acquisition searching

Search acquired protocol listings using a menu that is identical to the trigger menu.
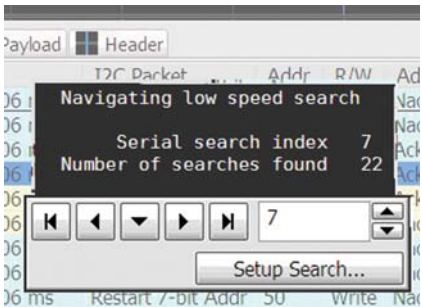
Quickly find occurrences

Quickly move to next occurrence of a specified event.

RS-232/UART protocol decode

Index	Time	Rx Source	Tx Source
20	1.8016906 ms	6C	
21	2.3763906 ms	65	
22	2.9511906 ms	6E	
23	3.5258906 ms	74	
24	4.1011906 ms		4D
25	4.6758906 ms		53
26	5.2505906 ms		4F
27	5.8252906 ms		73
28	6.4006906 ms	52	
29	6.9747906 ms	52	
30	7.5488906 ms	52	
31	8.1235906 ms		23
32	8.6976906 ms		31

Use digital channels on MSO models to preserve analog channels for simultaneously viewing other signals..
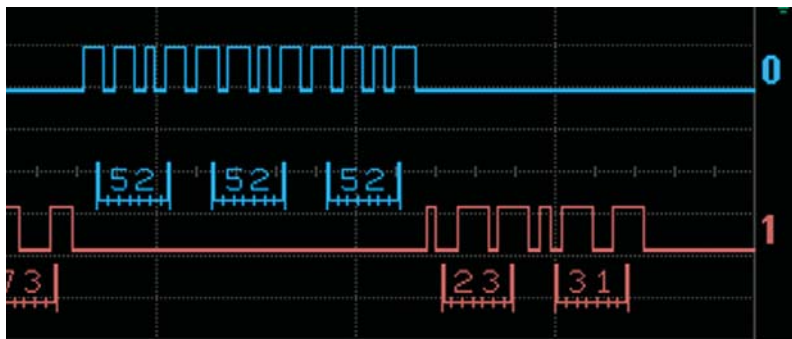
See RS-232 decode next to digital waveforms.

Use digital or analog for RS-232/UART triggering and decode.

RS-232/UART specifications and characteristics

UART protocols supported	RS-232 RS-422 up to 10 Mbp/s, differential probing recommended. RS-485 up to 10 Mbp/s, differential probing recommended. Other UART interfaces which admit to user-specified parameters available in the application. The application relies on probing and trigger/measurement thresholds to properly condition the signal for triggering and decode.
Tx and Rx source	Analog channels 1, 2, 3, or 4 MSO models can additionally use digital channels D0 to D15 Any waveform memory
Auto setup	Automatically configures trigger levels, measurement thresholds, memory depth, sample rate, trigger and holdoff for proper decode and triggering.
Decode word size	User-selectable: 5, 6, 7, 8, or 9 bits Parity: odd, even, none
Decode bit order	User-selectable: LSB or MSB
Supported baud rates	User selectable: 1.2 kb/s up to 10 Mb/s
Idle Polarity	User selectable: low or high
Triggering	User selectable: transmit or receive User selectable data length: 1 to 13 words (each word takes 2 trigger symbols) Word size selectable from 5 to 9 bits Polarity error Enter trigger in HEX, binary, decimal or ASCII Operators include =, not =, >, < and OR on each 8-bit word boundary

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 licenser	Server-based license (N5435A option)
RS-232/UART triggering and decode	001	N5462B	031

Related literature

Publication title	Publication type	Publication number
Infiniium 9000 Series	Data Sheet	5990-3746EN

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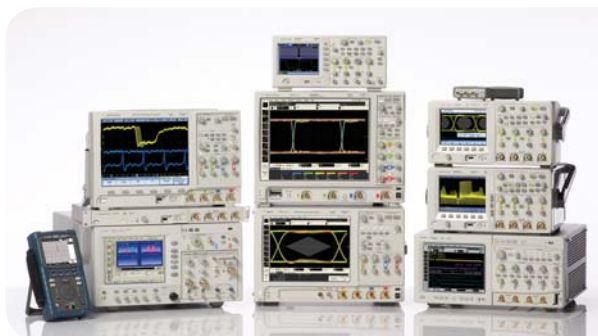
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Revised: October 1, 2008

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Printed in USA, June 1, 2009
5990-3923EN

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