

# Keysight Technologies

## RS232/UART Protocol Triggering and Decode for Infiniium 90000 Series Oscilloscopes

Data Sheet



This application is available in the following license variations.

- Order N5462A 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

## Easily debug and test designs that include RS-232/UART using your Infiniium 90000 scope

Lower-speed serial bus interfaces such as RS-232 and other UART (universal asynchronous 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.

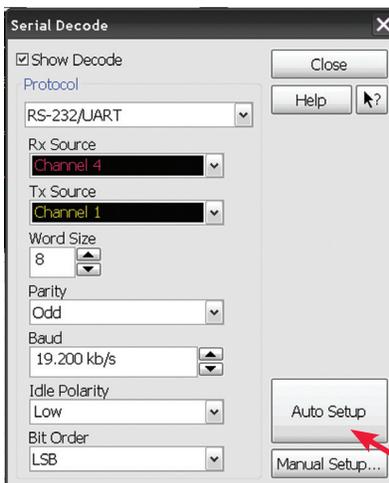
Extend your scope capability with the Keysight Technologies, Inc. RS-232/UART Triggering and Decode application. This application makes it easy to debug and test designs that include RS-232/UART protocols using your Infiniium 90000 scope.

- Set up your scope to show RS-232/UART protocol decode in less than 30 seconds.
- Get access to a rich set of software-based 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.

Setup	Trigger	Measure	Analyze	Util
1	Channel 1...		Ctrl+1	
2	Channel 2...		Ctrl+2	
3	Channel 3...		Ctrl+3	
4	Channel 4...		Ctrl+4	
	Probes...		Alt+P	
	Serial Decode...		Alt+S	
	Serial Search...			

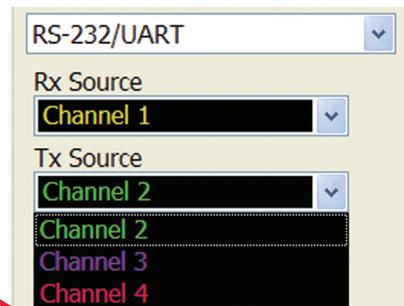
### Easy to find

Turn decode on/off 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.



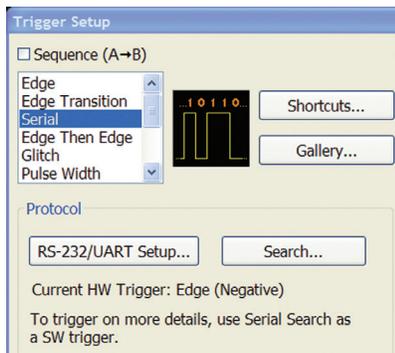
### Support for any analog channels

Acquire serial buses using any combination of scope channels.

# RS-232/UART setup and triggering

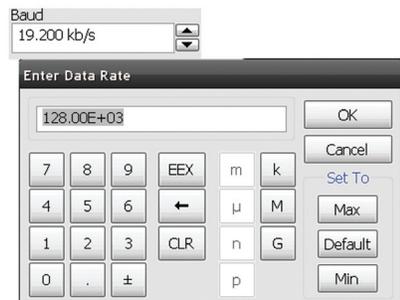
Get access to a rich set of integrated protocol level triggers. The application includes a suite of configurable protocol-level trigger conditions specific to RS-232/UART. The application uses software-based search triggering when serial triggering is selected.

With software-based protocol triggering, the oscilloscope takes signals acquired using either scope or digital channels and reconstructs protocol frames after each acquisition. It then inspects these protocol frames against specified protocol-level trigger conditions and triggers when the condition is met.



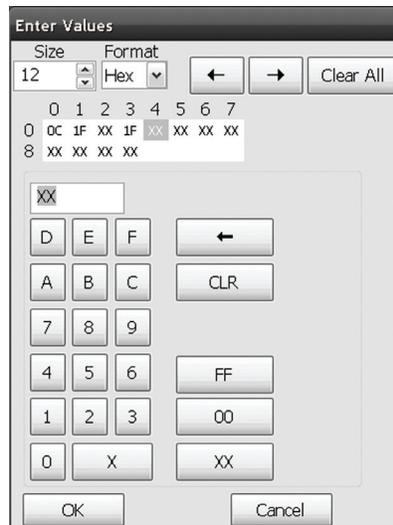
## RS-232 Trigger Setup

Quickly access protocol triggering via the scope's trigger menu. Choose Tx or Rx and 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

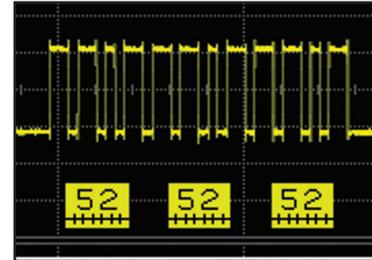
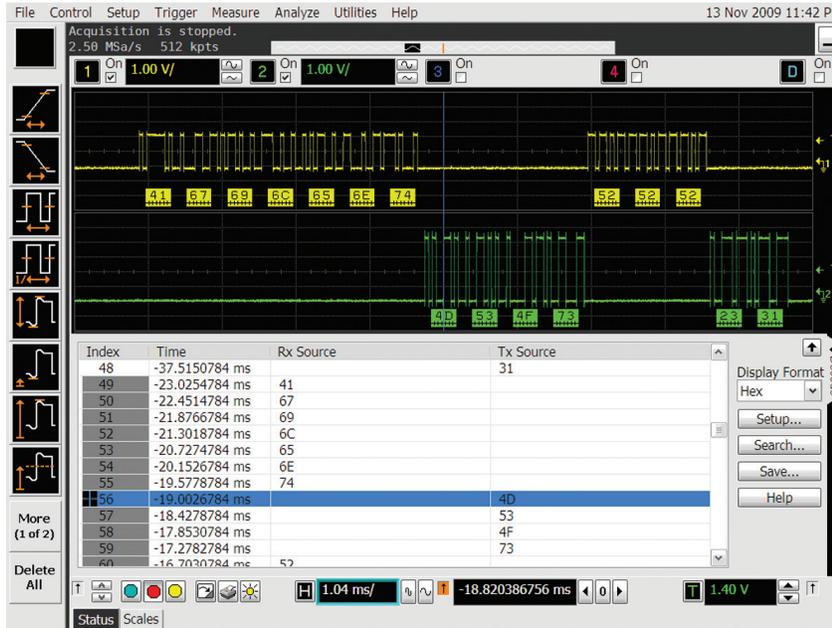
Choose trigger length between one to 27 words and use the payload editor to specify data values word by word.



## Set trigger

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

# RS-232/UART protocol decode and searching

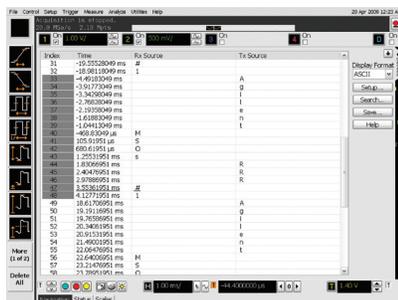


**RS-232 decode embedded in waveform area**

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.

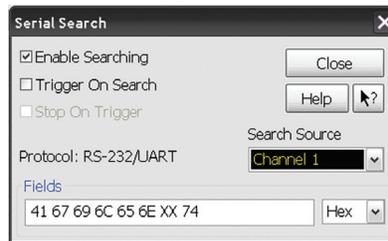
## RS-232 protocol decode with precise time-correlation between waveforms and listing

Keysight'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.



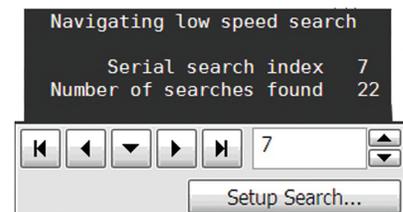
## Full screen RS-232 listing

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 through 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.

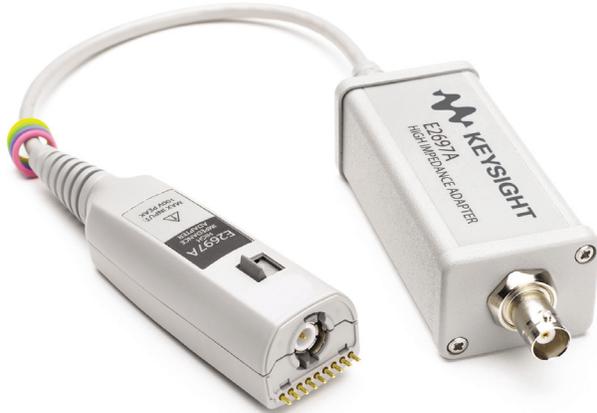
# RS-232/UART protocol decode



Use spare analog channels to simultaneously view other signals time-correlated with RS-232/UART decode.



View decode in listing window in HEX, decimal, binary or ASCII.



E2697A High impedance adapters let you make RS-232/UART measurements with passive probes with 1 MΩ impedance.

### RS-232/UART specifications and characteristics

UART protocols supported	RS-232 RS-422 up to 10 Mbps, differential probing recommended. RS-485 up to 10 Mbps, 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. The Infiniium 90000 Series requires E2697A hi-pod adapters for probes with 1 M $\Omega$ impedance.
Tx and Rx source	Analog channels 1, 2, 3, or 4 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 (software-based)	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 Enter trigger in HEX, binary, decimal or ASCII

## Ordering information

This application is compatible with all 90000 Series oscilloscope models.

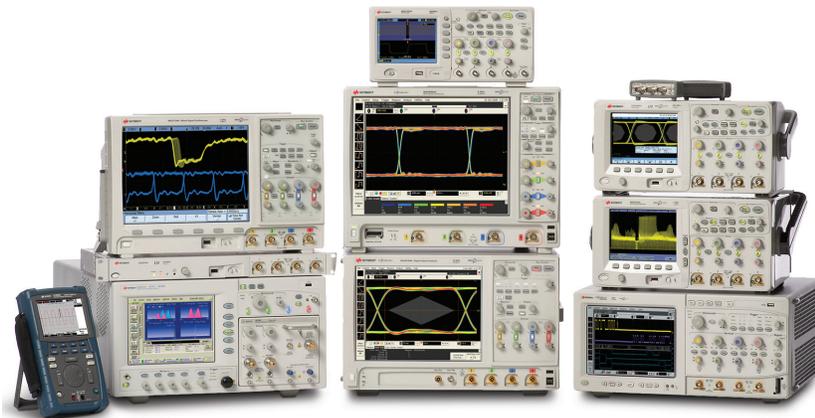
Software applications	Factory-installed node-locked license for new scope purchases	User-installed node-locked license	Server-based license (N5435A option)
RS-232/UART triggering and decode	001	N5462A	031



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

## Related literature

Publication title	Publication type	Publication number
<i>Infiniium 90000 Series Oscilloscopes</i>	Data Sheet	5989-7819EN



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