

# U4611A/B USB 2.0/3.0 Protocol Analyzer

## Data Sheet

*Agilent's U4611A/B USB Protocol Analyzer offers a new level of usability with industry leading memory buffer, the most comprehensive triggering system, and real-time data analysis of up to 18 GB.*

*Protocol Analyzers from Agilent are the right tool for locating intermittent problems in complex SuperSpeed USB systems.*

- Isolate specific events with advanced triggering
- Optimize buffer and display operations with advanced pre/post filtering
- High speed trace processes 1 GB of trace data per second
- Up to 18 GB trace buffer with the U4611B
- Analyze USB 2.0 and 3.0 SuperSpeed simultaneously
- Intuitive GUI, with one click to easily see the details



**Agilent Technologies**

# Overview

For today's USB developers and integrators, ensuring that their design is compatible with the ever growing number of USB devices is a difficult task. Traditionally, those needing to capture large amounts of traffic have been faced with limited trace buffers, long waits to view the data, slow searches, and slow saving. The Agilent U4611A/B USB Protocol Analyzer overcomes these limitations with its ability to provide an instant display of the captured data, even at the full available trace capture depth of 18 GB. Trace data is transferred to the host computer by either Hardware Accelerated Gigabit Ethernet (up to 70MB/s) or PCI Express (up to 550MB/s) making full depth data available for analysis with little or no waiting. For example, a histogram of the full 18 GB trace can be obtained in 15 seconds. Pre-indexed and compressed trace data is displayed and can be analyzed with multiple processors.

Typical USB systems may contain a wide range of devices operating at widely different speeds ranging from seconds to milliseconds. Human

interface devices such as keyboards and mice operate at the low end of this speed scale while memory devices operate at the highest speeds. This speed range requires a deep trace memory so that the full spectrum of the system under test is available for analysis.

The high speed trace capture and display capabilities of the U4611A/B Protocol Analyzer is the product of a total system development process that encompasses all elements of USB testing, starting with the analyzer's memory and extending to the communication link to the computer hosting the application.

The Agilent U4611A/B also features easy triggering with the Agilent USB SuperSpeed Protocol Analysis software. In addition, pre/post-filtering, textual search and sequence search, and many different displays of the captured traffic to bring specific points of interest into focus with this GUI.

## Configuration Options

- The U4611A is designed for specialized, limited testing requirements. These applications are ideally suited to a smaller buffer size (2,4, or 9 GB) and choice of speeds (2.0, 3.0, or both).
- The U4611B supports an 18-GB trace buffer to meet the needs of developing the highest performance products. The powerful U4611B breaks free of past analyzer limitation and lets users spend more time on development.

Additional test equipment such as Agilent logic analyzers and mixed signal oscilloscopes expand the view of the total system under test by means of the U4611A/B trigger capabilities. For example, the U4611A/B analyzer can be instructed to capture USB data at a specific point in the operation of the DUT by either the logic analyzer or oscilloscope, giving the user the ability to link system operation across many phases of the DUT operation. As shown in Figure 1, LEDs provide indicators to give the user confidence that the analyzer and DUT are set up and functioning correctly.

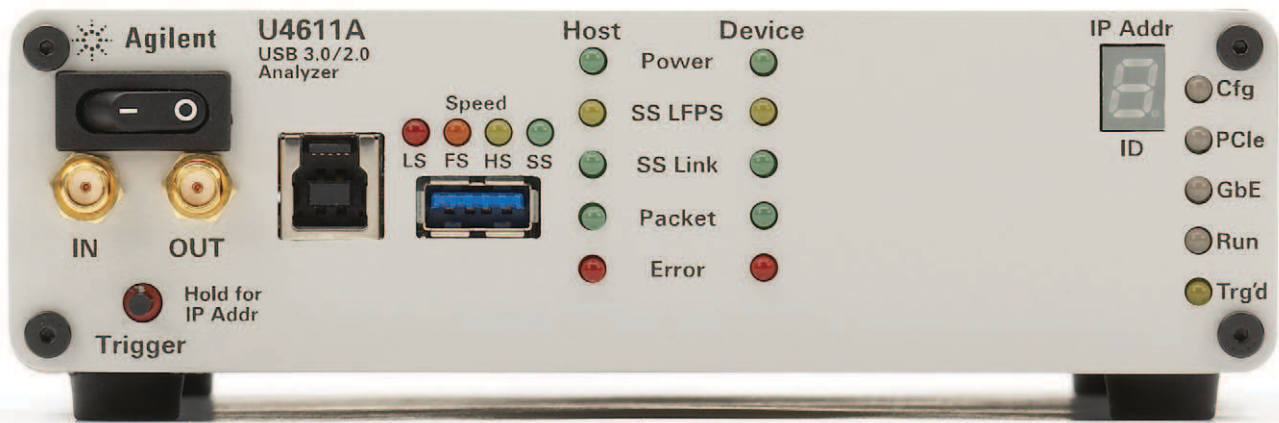


Figure 1. U4611A/B Front Panel

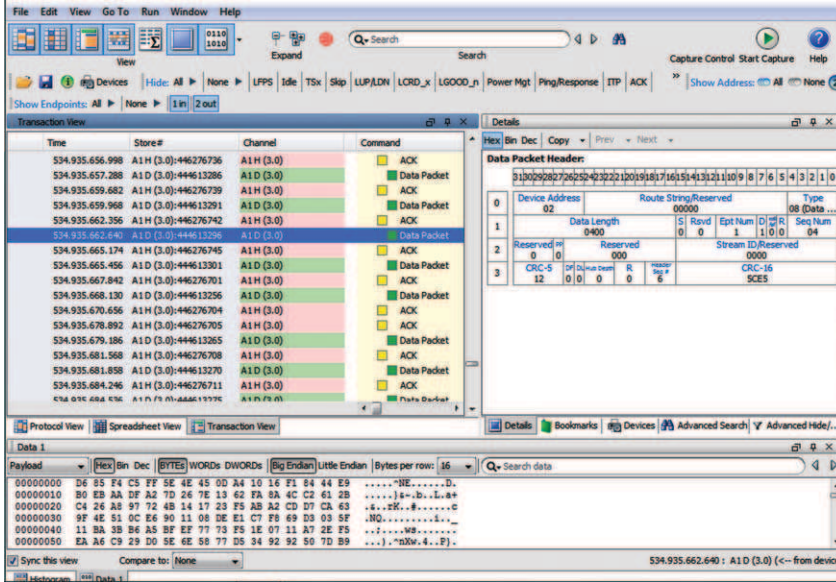


Figure 2: The USB transaction view of the Agilent USB SuperSpeed analyzer system illustrates the operation of the system under test with three easily understood views. The highlighted row in the transaction view window is presented in the details screen. The data window contains the details of the payload, enhancing troubleshooting.

### Powerful application software

The U4611A/B is supplied with Agilent USB SuperSpeed Protocol Analysis software. An intuitive user interface allows the user to configure the analyzer's acquisition and triggering functions to perform the analysis of the SuperSpeed USB bus. This enhanced usability coupled with the high speed data capture and display technology results in increased project throughput and reduced time to market. Product testing is quickly configured and data analysis is enhanced.

The Agilent USB SuperSpeed USB Protocol Analysis software, with its multiple levels of abstraction, provides clear instant insight into the system under test.

### Advanced software automates test.

- Multiple buffer segments, enabling controlled captures during a single run, greatly enhancing the effectiveness of a test run.
- Multistate triggering creates complex if-then decision making in the runtime capture to control data capture triggering, counting, and timing.
- Multiple trigger sequences enable simultaneous execution of multiple test scenarios.

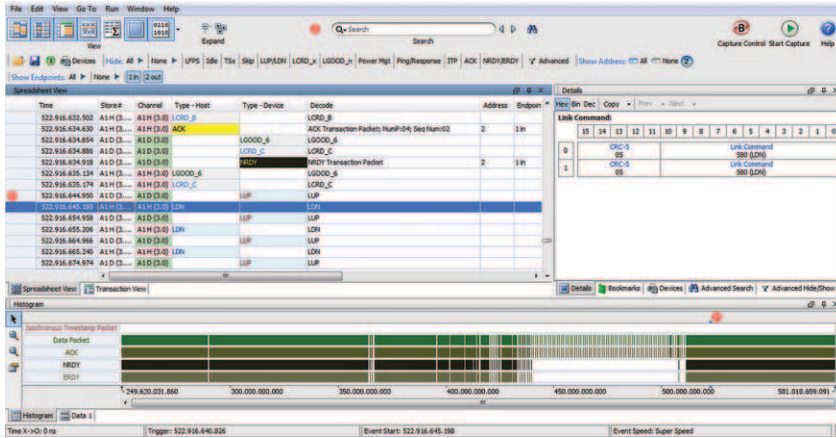


Figure 3: The histogram view provides an overview of the operation of the system under test. The red target symbol is the location of the trigger event.

The USB transaction view of the Agilent USB SuperSpeed analyzer system presents the operation of the system under test with three easily understood views, as shown in Figure 2.

The histogram view, shown in Figure 3, provides an overview of the operation of the system under test. The red target symbol is the location of the trigger event.

Powerful triggering brings events of interest into focus for detailed analysis. In addition to the ability to trigger on USB data, the analyzer can be triggered by an external instrument or command an external instrument to be triggered on a specific USB event. This greatly expands problem solving as events in the overall system under test are easily linked to specific events captured in the USB protocol analyzer. Figure 4 is an example of the trigger setup menu.

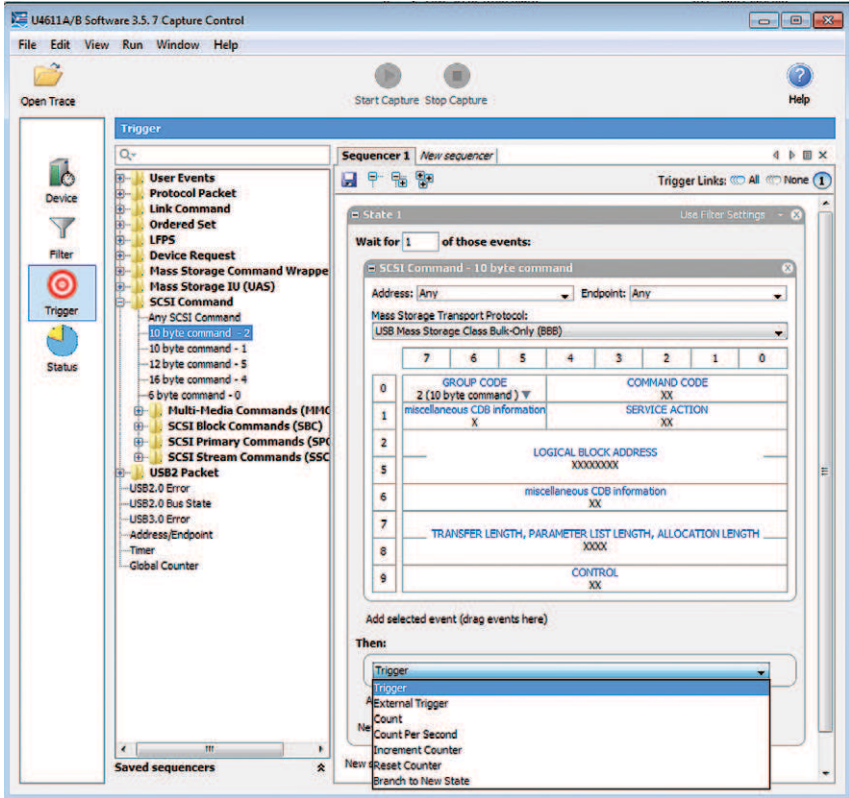


Figure 4. The U4611A/B trigger menu.

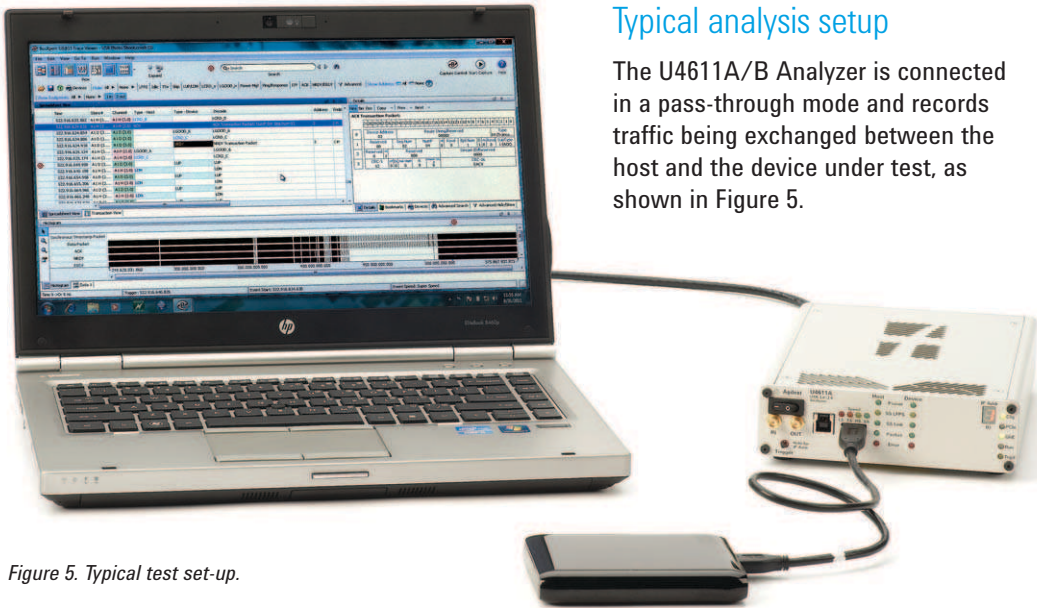


Figure 5. Typical test set-up.

### Typical analysis setup

The U4611A/B Analyzer is connected in a pass-through mode and records traffic being exchanged between the host and the device under test, as shown in Figure 5.

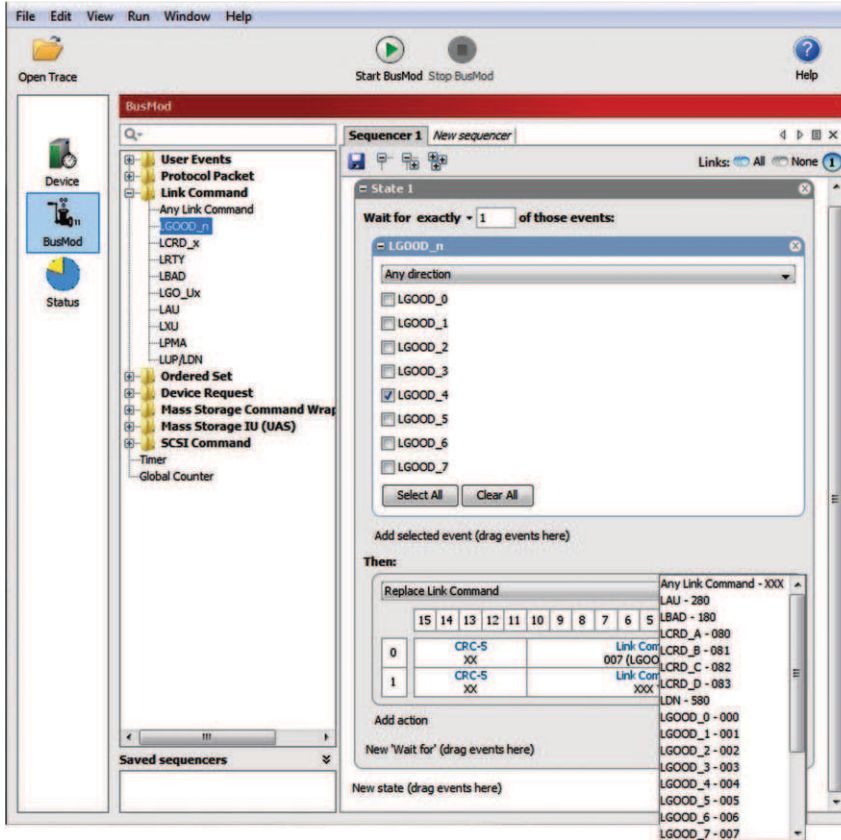


Figure 6. U4612A Jammer GUI

## Increase project confidence with the U4612A Jammer

The addition of the Agilent U4612A Jammer provides a complete validation test solution of the USB 3.0 system. The U4612A Jammer has the ability to inject a variety of errors into live data so that real time error handling, system recovery, and duplication of issues can be tested. Used in conjunction with the U4611A/B Protocol Analyzer, it is easy to verify the system under test's ability to respond to and recover from errors.

The U4612A Jammer can be used to create random and defined line errors such as CRC or 8b10b encoding errors, and modifies link commands, protocol packets, packet data, and ordered sets.

The jammer is controlled with the Agilent USB SuperSpeed Protocol Analysis software provided with the U4611A/B USB 3.0 USB Protocol Analyzer, shown in Figure 6. The Jammer's GUI enables easy definition of frames, random or interval error generation, and creation of logical branching and arguments.

The U4612A USB Jammer and U4611A/B USB Protocol Analyzer connected in pass-through mode between a USB host and device is shown in Figure 7. The Jammer injects programmed errors on the link while the analyzer non-intrusively records any traffic exchanged between the host and the device.

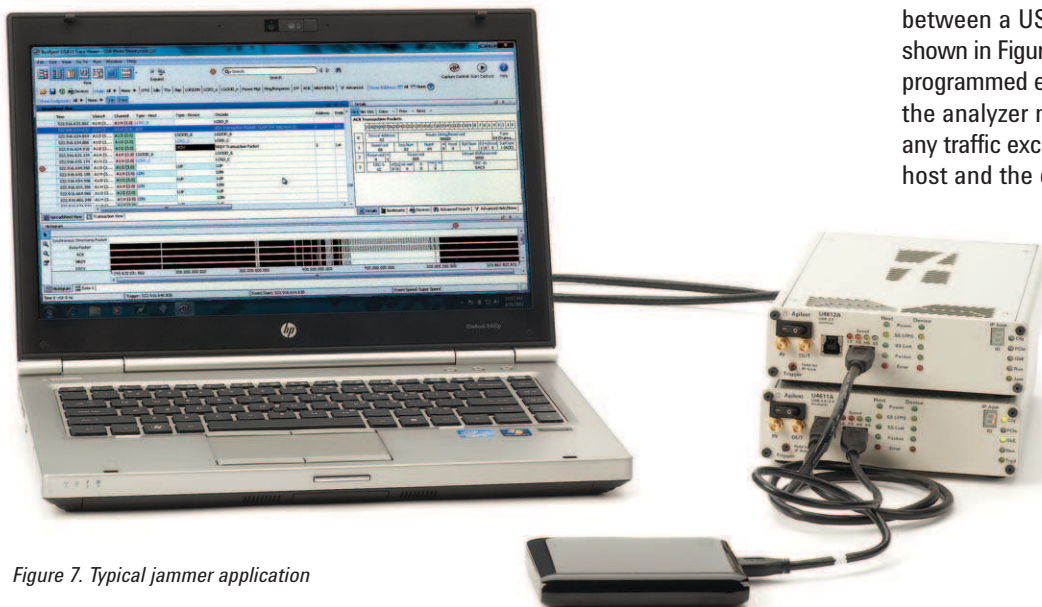


Figure 7. Typical jammer application

# System Requirements

To take full advantage of the U4611A/B's high speed trace processing technology the host computer must be able to receive the deep trace record with minimum delay. Therefore, a high-speed interface to the instrument is required.

Recommended Configuration	
Operating system	Windows XP, Vista, Server 2003/2008, Win7 32 bit or Win7 64 bit platforms
	Linux versions: Fedora 12, and RedHat/CentOS 5.4 or later, Ubuntu 9.10, or SUSE
Processor	2.8 GHz or greater dual-core
Memory	3GB or greater of 1.3 Ghz FSB memory
Graphics	Capable of supporting 1920x1200 or greater
Interface	PCIe x4 (550 MB/s) recommended or Express Card Slot (70 MB/s)
Free disk space for installation	100MB

# Specifications

Protocol(s) supported	USB 1.0, 2.0, and 3.0. Note: USB 1.0 and 2.0 support supplied as standard with the product. Optional software license required for 3.0 operation
Power:	19Vdc 90 watts maximum
Agilent U4611A-1PS Power Supply	Input: 50/60 Hz, 100 to 240 Vac $\pm$ 10% Output: 19Vdc, 4.47 A

Triggering	
Trigger Input	Input impedance: ~1K ohm
	Trigger level: Rising or falling edge ~1.5 V
	Maximum input: 5.5V
Trigger Output	Source impedance: 50 ohms
	Modes: Pulse High, Pulse Low, and Toggle.

## Environmental and Safety

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment.

Temperature	Operating: 20 to 30° C	
	Non-operating: -40 to +70° C	
Humidity (non-condensing)	Operating: 50% to 80% at 30° C	
	Non-operating: 90% for 12 hours at 65° C	
Altitude	2000 m (6500 feet)	
Electromagnetic Compatibility	IEC 61326-1:2005 / EN 61326-1:2006	
	CISPR 11 / EN 55011	Group 1 class A
	IEC 61000-4-2 / N 61000-4-2	4 kV CD, 8 kV AD
	IEC61000-4-3 / EN 61000-4-3	3 V/m, 80-1000MHz & 1.4-2 GHz, 1 V/m 2-2.7 GHz
	IEC61000-4-4 / EN 61000-4-4	0.5k V signal, 1 kV power lines
	IEC61000-4-5 / EN 61000-4-5	0.5k V line-line, 1 kV line-ground
	IEC61000-4-6 / EN 61000-4-6	3 V, 0.15-80 MHz
	IEC61000-4-11 / EN 61000-4-11	0% for 1/0.5 (0 degree, 180 degree) cycle 0% for 250/300 cycles 70% for 25/30 cycles
	Canada: ICES-001:2004	
	Australia/new Zealand; AS/NZS CISPR 11:2004	
Safety	IEC 61010-1:2001 / EN 61010-1:2001	
	Canada: CAN/CSA C22.2. No 61010-1-04	
	USA: ANSI/UL 61010-1:2004	

Instrument		
Dimensions	cm	Inches
Width	15.24	6.0
Height	4.45	1.75
Depth	22.9	9.0
Weight	Kg	lb
Instrument only	1.36	3.0
Shipping	2.95	6.5

# Ordering Information

Instrument Hardware	Description
U4611A USB 2.0/3.0 Analyzer	Analyzer with up to 2.26 GB memory
U4611B USB 2.0/3.0 Analyzer	Analyzer with up to 18 GB memory
<b>Speed Options (select one)</b>	
U4611A-600	USB 1.0/2.0 speed only supplied as standard
U4611A-601	USB 3.0 speed only
U4611A-602	Both USB 1.0/2.0 and USB 3.0 speeds
<b>Memory Options (U4611A only)</b>	
U4611A-M04	Increase U4611A Capture memory to 4.5 GB
U4611A-M09	Increase U4611A Capture memory to 9 GB
<b>Software Capability (select one)</b>	
U4611A-800 Basic software	Software license for basic analyzer features 1 buffer segment 1 trigger state 1 trigger sequence
U4611A-801 Advanced software	Software license for advanced software features Up to 256 buffer segments Up to 26 trigger states Up to 4 trigger sequences
<b>Host Connection Accessories*</b>	
U4601A PCIe XpressCard for laptops*	XpressCard for laptop based systems
U4602A PCIe XpressCard for desktops*	PCIe XpressCard for desktop based systems
U4603A PCIe X4 cable, 2m long	
U4604A PCIe X4 cable, 3m long	
<b>Optional Jammer</b>	
U4612A USB Jammer	See U4612A data sheet 5990-9002EN for details

\*Choose one for either desktop or laptop based systems

## Related literature

Publication title	Publication type	Publication number
USB Design and Test – A Better Way	Brochure	5990-4640EN
U7243A USB 3.0 Software for the Infiniium Series Oscilloscopes	Data Sheet	5990-4115EN
U4612A USB 3.0 Jammer	Data Sheet	5990-9002EN



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