Bus Doctor™ USB Analyzer
Protocol, Timing and Statistical Analysis for Consumer Electronics and Computing Design and Test

The USB Pod turns the Bus Doctor into a full-featured protocol analyzer with the depth, ease-of-use, protocol decoding, and statistics needed by software and systems testers. It supports Low, Full and High speeds (USB 1.1 and 2.0) and has a special Chirp mode for viewing the chirp handshaking activity. It also provides the features needed by hardware engineers including multi-level triggering, filtering, state configuration and timing analysis of USB transfers.

Figure 1: Bus Doctor USB Protocol Analyzer (not to scale)
USB 1.1 & 2.0 Displays

It provides displays at the command level, state level, and signal level, and decodes the Bulk Storage, UFI and ATAPI protocol classes, with additional class decodings under development. At the Transaction level, the USB analyzer provides a big-picture view for testers who are trouble-shooting system level or application level issues. The State display provides word-level access details for users who need to monitor USB software, device drivers or firmware. For hardware engineers, the Timing Waveform display provides for analysis of USB signal activity. It includes LEDs to display current capture speed and detected errors, and is able to tap into a USB bus without adding cables to the system.
USB 1.1 & 2.0 Capturing
The USB analyzer provides 4 predefined capture configurations:

1. Timing Mode (Store all transitions)
2. State Mode - Packet Transfers (Default)
3. State Mode - Chirp Only
4. State Mode - Chirp and Packet Transfers

Custom State Modes can also be created.
USB Custom States for the Bus Doctor Analyzer

The custom capture feature allows you to specify how the protocol analyzer captures the bus trace. You may define up to eight state terms using the Define Terms menus below. For each term you may adjust the setup and hold times relative to the edge for the sample.

The following screen contains the options for Defining Terms at a High Level:
The Signal-Level Terms Menu allows the user to modify any or all of the bits (channels/signals) of which a Trigger term consists. This menu is useful when the user wants to detect a single signal or modify a term which was created by the High-Level Terms.
USB 1.1 & 2.0 Triggering
The USB Analyzer provides high-level trigger configurations for most common trigger scenarios. The high-level triggers provide drop-down boxes that enable the user to select specific commands, addresses, endpoints, etc from a list without memorizing codes or positions. Users can also create and save custom triggers.
USB Custom Triggers for Bus Doctor Analyzer

The Bus Doctor Protocol Analyzer custom trigger sequencer is the industry's premier system because of its combination of power and ease of set up. You may define your custom trigger using up to 12 levels, including two counters and two timers. You may turn filtering on or off for each level. Establish the if-then-else-else... relationships of the trigger sequencer simply by a few mouse clicks. Custom triggers may be saved and used later.
For each level, you may easily define the event by using the following screen which contains the options for your protocol at a High Level:

The Signal-Level Terms Menu allows the user to modify any or all of the bits (channels/signals) of which a Trigger term consists. This menu is useful when the user wants to detect a single signal or modify a term which was created by the High-Level Terms.
**USB 1.1 & 2.0 Trace Filtering**
The USB Analyzer provides commonly used high-level filter configurations. Many of the high-level filters provide drop-down boxes for configuration options. Users can also create and save custom filters.
USB Custom Filters for the Bus Doctor Analyzer

The Bus Doctor Protocol Analyzer custom filter feature gives you powerful options to control the traffic you capture to ease your analysis or just to maximize your buffer usage. The Edit Filter menu consists of two sections - Pause, and Continue. The pause section has 3 pause counters, each capable of counting an OR of two terms. The counters can each count up to 65535 occurrences of the OR’ed terms, before pausing the capture. Once paused, the capture is stopped until a Continue term is found. The Continue terms are logically OR’ed, and all pause counters are reset whenever a continue term is found. If a bus event satisfies both a Pause term and a Continue term simultaneously, the Continue has top priority.
You may easily define each term by using the following screen which contains the options for your protocol at a High Level:

The Signal-Level Terms Menu allows you to modify any or all of the bits (channels/signals) that a term consists of. This menu is useful when you want to select a single signal or modify a term which was created by the High-Level Terms.
USB 1.1 & 2.0 Statistics
The Real-Time Monitor is pre-configured for certain common statistical measurements, but can be easily reconfigured by the user for almost any type of measurement desired.

![Real Time Statistics]

Protocols, Standards, & Speed

Protocols & Standards:
USB 1.1 & 2.0
Bulk Commands
ATAPI Commands

Speeds:
1.5Mb/sec (Low-speed)
12Mb/sec (Full-speed)
480Mb/sec (High-speed)