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LeCroy USB Protocol Suite™ User Manual

Manual Version 3.10



Voyager M3™ Analyzer Exerciser System

For Software Version 3.10

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Chapter 1: Overview

The LeCroy Voyager M3™ Analyzer and Exerciser system is a multifunction verification system for USB 2.0 and USB 3.0 development and testing. It is designed to record traffic and graphically present the logical USB transactions and events. It can also generate USB traffic. The system is connected to a laptop or desktop via its USB or Gigabit Ethernet port.



Figure 1.1 Voyager M3 Analyzer Exerciser System

The recommended system requirements are:

Recommended Host PC Configuration

- Intel® Core™ 2 Duo
- USB 2.0 interface
- 1 GB RAM

Supported Operating Systems

- Microsoft® Windows® XP, Windows Vista™ 32, or Windows Vista 64

Please see the Readme file on the installation CD for the latest information on PC requirements and supported operating systems.

USB 2.0 and USB 3.0 Features

The system can monitor traffic between USB 2.0 links using standard high-speed compliant cables.

If configured for USB 3.0 testing, the system supports monitoring between SuperSpeed links using USB 3.0 cables (Figure 1.2)

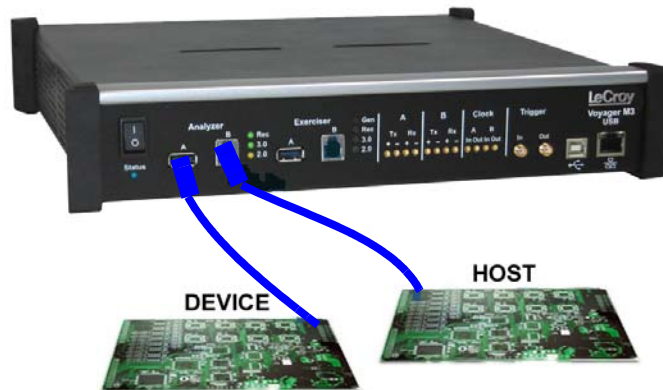


Figure 1.2 Direct Connection using USB 3.0 Cables

or through direct connection via MMCx-to-SMA coaxial cables (Figure 1.3).



Figure 1.3 Direct Connection using SMA Differential Tap

Models

The models available are:

Model	Voyager M3 Advanced USB 2.0 Analyzer USB-T0A2-V01-X	Voyager M3 Advanced USB 2.0 Analyzer with Exerciser USB-TZA2-V01-X	Voyager M3 Pro USB 3.0 Analyzer USB-T0P3-V01-X	Voyager M3 Pro USB 3.0 Analyzer with Exerciser USB-TZP3-V01-X
USB 2.0 / USB 1.1 Recording	x	x	x	x
USB 2.0 OTG Recording	x	x	x	x
USB 3.0 / SuperSpeed Recording			x	x
USB 2.0 Traffic Generation				x
USB 3.0 Traffic Generation				x
Standard Recording Memory	1 GB	1 GB	4 GB	4 GB
Slow-clock and External Clock Option	x (\$)	x (\$)	x (\$)	x (\$)
SMA Differential Tap Option			x (\$)	x (\$)

Note: (\$) means additional cost.

1.1 General Description

The Analyzer is configured and controlled by a portable or desktop PC connected via its USB port. The familiar “CATC Trace™” user interface is an industry standard for documenting the performance of high-speed serial protocols.

The testing tool for the USB protocol provides traffic capture and analysis. Hardware triggering allows capture of real-time events. Hardware filtering allows filtering different packet types in or out of the recording. Filtering allows you to focus recordings on events of interest and to preserve recording memory, for extended recording time.

Recorded data displays in colored graphics in a trace viewer application. This application has advanced search and viewing capabilities that allow you to quickly locate specific data, errors, and other conditions, thereby focusing attention on events of interest.

The system functions with any personal computer having the Microsoft® Windows® XP, Windows Vista™ 32, or Windows Vista 64 operating system and a functional USB interface or Ethernet port.

The system provides on-the-fly detection of, and triggering on, such events as Tokens and Errors. Whether recording manually or with a specified trigger condition, the system continuously records the link data, in a wrap-around fashion, until manually stopped or until the Trigger Event is detected and a specified post-Trigger amount of link data is recorded.

Upon detection of a triggering event, the Analyzer continues to record data up to a point specified by you. Real-time detection of events can be individually enabled or disabled to allow triggering on events as they happen. This includes predefined exception or error conditions and a user-defined set of trigger events. The unit can also be triggered by an externally supplied signal.

The software provides powerful search functions that enable investigation of particular events. In addition to immediate analysis, you can print any part of the data. Use the Save As feature to save the data on disk for later viewing. The program also provides a variety of timing information and data analysis reports.

Please refer to the *Universal Serial Bus Specification* for details on the protocol. The USB specification is available from the USB Implementers Forum (USB-IF) at:

USB Implementers Forum	Tel: +1/503.296.9892
1730 SW Skyline Blvd.	Fax: +1/503.297.1090
Suite 203	Web: http://www.usb.org/
Portland, OR 97221	

1.2 Features

General

- Fully compliant with USB specification revisions.
- Supports the Link Power Management Extension.
- Flexible design with reconfigurable hardware for future enhancements.
- Convenient modular system architecture with field upgradeable firmware and recording engine.
- Supports all USB speeds (5 Gb/s, 480 Mb/s, 12 Mb/s, and 1.5 Mb/s).
- User friendly CATC Trace interface displays bus traffic using color and graphics.
- Trace Viewer available as free non-recording, view-only software.
- Online manual
- Power-on self-diagnostics
- 13 Month warranty and hot-line customer support
- Software upgradable Exerciser function
- Remote control of USB analyzers in a network

Physical Components

- Operated by any desktop or portable Microsoft Windows XP, Windows Vista 32, or Windows Vista 64 computer with USB or Ethernet capability.
- Convenient Plug-and-Play USB installation
- High impedance tap inserts non-intrusively in any branch of a USB system
- 1 GB or 4 GB of physical data recording memory
- USB 2.0 Hi-Speed USB connection to desktop or portable host PC
- Internal wide-range AC power supply
- Expansion port for future enhancements
- SMA connectors and USB 3.0 connectors for SuperSpeed capture and generation
- External clock inputs and outputs

Recording Options

- Versatile triggering: bit-wise value and mask data patterns up to sixteen bytes wide for Setup transactions and data packets (2.0)
- Triggering on new High-speed PIDs and split transaction special tokens (ERR, SPLIT, PING, NYET, DATA2, and MDATA) (2.0)
- CATC Trace displays and enumerates High-speed Micro Frames (2.0)
- Three forms of triggering: Snapshot, Manual and Event
- Transaction sequencer allows triggering on a token qualified by a data pattern and specific handshake or alternately transactions can be filtered (for example, NAK'd transactions). (2.0)
- Advanced triggering with event counting and sequencing (2.0)
- Dedicated trigger for recording input and output used to interface to external test equipment
- Triggering on multiple error conditions: PID bad, bit stuffing bad, CRC bad, end-of-packet bad, babble, loss of activity, frame length violation, time-out or turn-around violation, data toggle violation, Token, Bus Conditions, Data Length, excessive empty frames (2.0)
- Real-time traffic capture filtering and data packet truncation variable up to 256 bytes (2.0)
- Adjustable buffer size from 0.4 MB to 1 GB or 4 GB
- Idle filtering (3.0)
- Simultaneous 2.0 and 3.0 capture

Display Options

- Utilizes the CATC Trace graphical display of bus packets, transactions, split transactions and transfers.
- Numerous packets and transactions can be grouped under a single transfer while quickly decoding all essential information.
- Decoding of split transactions up and down stream of a transaction translator is accomplished with a special hierarchical view.
- Variety of reports summarizes key statistics and conditions of interest, with the ability to jump to the selected item in the trace display.
- Trace Viewer is backward compatible with USB Advisor™, USB Chief™, USB Inspector™, and USB Detective™ trace files. They are converted upon loading
- User-friendly trigger position indicated by different colors of pre- and post-trigger packet color.
- Markers can be set to assist with navigation and time calculations.
- Hide start-of-frame (SOF) packets, as well as any packet or transaction from a device address and endpoint
- Search for a specific PID.
- Detects and alerts you to every potential bus error, protocol violation, and combinations thereof.
- High resolution, accurate time stamping of bus packets, timing measurement and analysis functions
- Extensive search and packet hiding capabilities
- Comprehensive device class decoding, plus user-defined protocol decoding
- Data View (2.0 and 3.0)
- Link Tracker to view symbols of traffic (3.0)
- Spec View to show packets in the same format as the USB 3.0 specification (3.0)
- Quick Timing Markers to immediately show time deltas and bandwidth use

Traffic Generation

- Traffic generation capability (2.0)

Hi-Speed Slow Clock

- Trace and Generate Hi-Speed traffic at fractional (slow) clock rate capability (2.0)

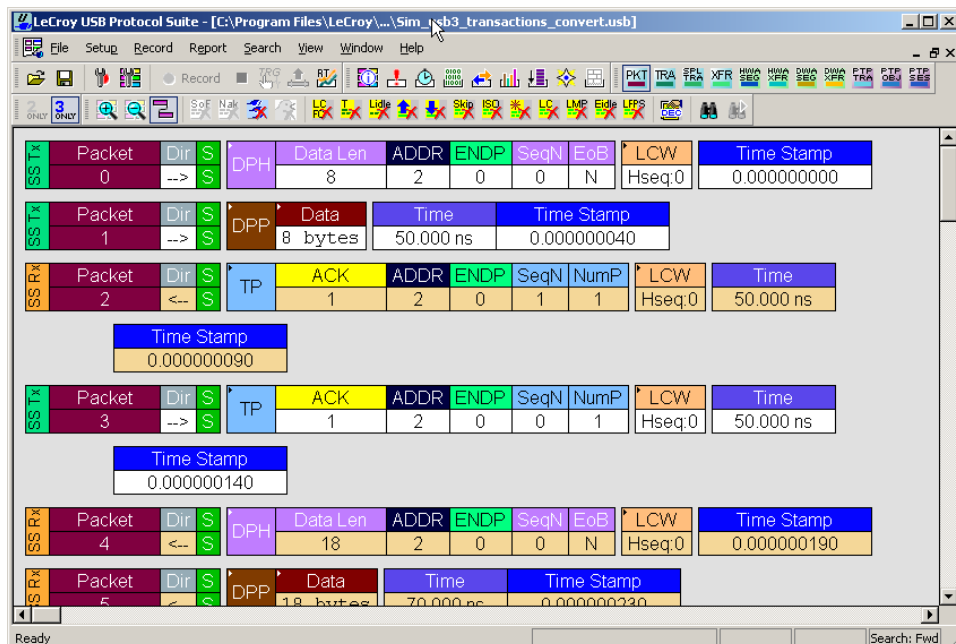
1.3 Graphical Bus Traffic Display

The transaction displays use color and graphics to show the captured transactions in an immediate, understandable and useful format.

Packets are shown on separate rows, with their individual fields both labeled and color-coded. Packets are also numbered (sequentially, as recorded) and time-stamped. Protocol errors are automatically detected and visibly highlighted in red.

The display is customizable, allowing you to control the color scheme and the formatting of field contents. A hide feature allows you to enable the suppression of SOF packets and user-defined packets or fields that might be uninteresting in a given context. Display formats can be named and saved for later use. Pop-up tooltips annotate packet fields with more detailed information about their contents.

The display software operates independently of the hardware, allowing it to function as a stand-alone "trace viewer" that is freely distributed.



1.4 Accurate Time Management

The internal counter/timer circuitry enables a reliable, accurate (2 ns resolution) time stamping of recorded bus traffic. This timing information is displayed in the trace and in measurement and analysis functions. You can add any number of markers to denote specific packets, and further timing measurements can be made from one marker to another or from marker to trigger. All time fields are presented as a time stamp, idle time, bit time, or in a new time delta in either decimal or hexadecimal format.

An essential feature of time management is that idle traffic does not consume the Analyzer memory. Because of this unique technology, accurate timing calculations can be made while still preserving valuable recording memory for important bus traffic.

The highly accurate oscillator has 2.5 ppm accuracy.

1.5 Comprehensive Error Detection and Analysis

The system detects and alerts you to every potential bus error, protocol violation, and combinations thereof. The Analyzer contains circuitry in the BusEngine™ to perform real-time triggering on multiple error conditions, such as PID bad, bit stuffing bad, header or data CRC bad, end-of-packet bad, babble, loss of activity, frame length violation, time-out or turn-around violation and data toggle violation. The Analyzer program highlights all hardware-detected errors and further examines the trace file for additional protocol errors, including wrong packet length, data payload violation, and packet termination not on a byte boundary.

1.6 Real-Time Event Triggering and Capture Filtering (2.0)

No attribute of a bus and protocol Analyzer is more important than its capacity for extracting useful information from a crowded stream of bus traffic. The ability to accurately identify and selectively record transactions of interest is a valuable trait. The system uses a set of “recording resources,” more than a dozen configurable hardware building blocks that can be optimized to perform a particular activity appropriate to the task. A recording resource can independently await an initialization signal, monitor its external environment (external signals or other resources) in search of a particular event, and take a subsequent action (triggering, inclusive or exclusive filtering, and counting). Under control of the user interface, these resources can be selected, configured, and combined to search for complex trigger conditions and selectively capture the associated transactions.

Thus, as well as triggering on basic events, such as specific bus conditions, packet identifiers (PID), and so on (see the Specifications section for a complete list), the system can easily manage the most challenging requirements. For example: “trigger on the fifth occurrence of a SETUP Token device number nine”, or “trigger on a SET INTERFACE request, following a specified eight-byte bulk data pattern match from this scanner, and do not capture any start-of-frame (SOF) packets.”

You can set the size of the recording memory, specify the pre- and post-trigger capture ratio, and truncate large data packets up to 256 bytes.

1.7 Advanced Event Counting and Sequencing

The count and sequence options define rules for data recording sessions. These options configure and control the order of events that have been selected for triggering or filtering.

By utilizing this feature, designers can specify a specific sequence of up to seven events that must occur before the Analyzer triggers and finishes capturing data. This allows designers to pinpoint certain types of events for recording. Without this feature, designers must scroll through potentially megabytes of recorded data to locate a specific sequence or occurrence of a sequence that can take hours to locate before being able to begin analyzing the data of interest.

1.8 BusEngine Technology

The LeCroy BusEngine Technology is at the heart of the Analyzer. The BusEngine core uses state-of-the-art Electrically Programmable Logic Device (EPLD) technology and incorporates both a real-time recording engine and configurable building blocks that implement data/state/error detection, triggering, capture filtering, external signal monitoring, and event counting and sequencing. Like the flash-memory-based firmware that controls its operation, all BusEngine logic is fully field upgradeable, using configuration files.

1.9 Flexible 3.0 Calibration

Each link can be calibrated with respect to received equalization and gain.

Chapter 2: General Description

2.1 System Components/Packing List

These system components are on the packing list:

- Voyager M3 Analyzer Exerciser System
- AC power cable
- USB cables (five)
- Installation CD-ROM, including documentation
- Micro to Standard USB adapter
- Mini to Standard USB adapter
- Quick Start Guide

Product documentation is on the Installation CD-ROM.

2.2 PC Requirements

Please refer to the [USBProtocolSuite_Readme.html](#) file on the installation CD for the most current PC and operating system requirements.

2.3 Analyzer

The Analyzer is shown in the figure.

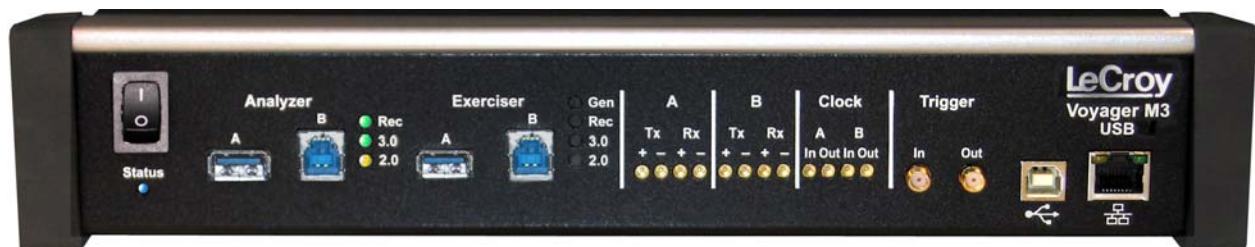


Figure 2.1 Front

Note: The rear has only a power connector.

The Analyzer has the following features:

Power Switch (0/1)

Status LED (blue if system successfully initializes
red if hardware failure
green while initializing)

Analyzer Ports A (downstream) and B (upstream)**Analyzer LEDs**

- Rec** - Recording (red if recording enabled)
- 3.0** - USB 3.0 (green if traffic detected)
- 2.0** - USB 2.0 (yellow for Low and Full Speed)
(green for Hi Speed)

Exerciser Ports A (downstream) and B (upstream)**Exerciser LEDs**

- Gen** - Generating (green if generating enabled)
- Rec** - Recording (red if recording enabled)
- 3.0** - USB 3.0 (green if traffic detected)
- 2.0** - USB 2.0 (yellow for Low and Full Speed)
(green for Hi Speed)

A (downstream) - MMCx plug connectors for interfacing

B (upstream) with USB 3.0 signals

Tx + - Transmit pair

Rx + - Receive pair

Clock A (downstream) - MMCx plug connectors for interfacing

Clock B (upstream) with external clock source or sink

In - Connects to an external reference clock.

Out - Provides reference clock output.

Trigger

In - SMA external trigger input.

Out - SMA external trigger output.

USB - Type B connector for connection to host computer

ETHERNET - Gigabit Ethernet connector for connection to host computer

Note: The rear panel has only a power connector.

Warning: Do not open the Voyager M3 enclosure. No operator serviceable parts are inside. Refer servicing to LeCroy customer care.



2.4 Specifications

The Analyzer has the following specifications.

Power Requirements

90 to 254 VAC, 47 to 63 Hz (universal input), 100 W maximum

Environmental Conditions

Operating Temperature	0 to 55 °C (32 to 131 °F)
Storage Range	-20 to 80 °C (-4 to 176 °F)
Operating Humidity	10 to 90%, non-condensing
Operating Altitude	Up to 6560 feet (2000 meters)

Probing Characteristics

Connection	High Speed USB Connectors Standard cables MMCx connectors for USB 3.0
------------	---

Switches

Power	On/off
-------	--------

Recording Memory Size

1 GB or 4 GB for traffic data capture, timing, state and other data.

Host Compatibility

Works with any PC equipped with a functioning USB port and running the Microsoft® Windows® XP, Windows Vista™ 32, or Windows Vista 64 operating system.

Required Setup

Microsoft Internet Explorer, Version 5 or newer.

Hardware

Processor: For optimum performance, use processors of the Intel® Core 2 Duo or other compatible processors with clock speed of 2 GHz or higher.

Memory: Minimum is 512 MB of RAM. For best performance, use physical RAM at least as large as the size of the recording buffer, up to 3 GB.

Hard Disk: 25 MB of free hard disk space is required for the installation. Additional disk space is needed for operation of applications and storing recorded data in files, each of which can be as much as 2 GB. Hard disks with fast access times are recommended.

Display: Resolution of 1024 x 768 with at least 24-bit color depth is minimum.

Connectivity: For Hi-Speed uploads, a USB 2.0 interface is recommended (USB 1.1 is minimum). This is not required if the application is used only to view pre-recorded traces. Alternatively, Ethernet can be used on a DHCP network.

Chapter 3: Installation

The Analyzer software installs on a Microsoft® Windows® XP, Windows Vista™ 32, or Windows Vista 64 personal computer system.

3.1 Installing the Analyzer Software on the PC

Note: You must install the software before connecting the Analyzer to the host machine for the first time.

Install the software on the PC administering the Analyzer:

Step 1 Insert the Installation CD into the CD drive of the PC that administers the Analyzer.

Step 2 Follow the on-screen installation instructions to install the application on the PC hard disk.

3.2 Setting Up the Analyzer - USB Connection

To set up the Analyzer using a USB connection:

Step 1 Connect the AC power cord to the rear of the Analyzer and to a 100-volt to 240-volt, 50-Hz to 60-Hz, 100-W power outlet.

Note: The Analyzer is capable of supporting supply voltages between 100 volts and 240 volts, 50 z or 60 Hz, thus supporting all supply voltages around the world.

Step 2 Connect the USB port to a USB port on the PC using the LONG (6-foot/2-meter) USB cable.

Step 3 Insert the Installation CD.

Step 4 Turn on the power switch.

Note: At power-on, the Analyzer initializes itself in approximately ten seconds and performs an exhaustive self-diagnostic that lasts about five seconds. If the diagnostics fail, call LeCroy Customer Support for assistance.

Step 5 Click **Next** after you see the Add New Hardware Wizard window.

Step 6 Follow the Microsoft® Windows® on-screen Plug-and-Play instructions for the automatic installation of the Analyzer as a USB device on your analyzing PC (the required USB files are included on the Installation CD)

Step 7 Click **Finish** when you see the message that says “Windows has finished installing the software that your new hardware requires” and the file **VoyagerM3.inf** has been installed in your PC.

Step 8 Check Analyzer setup in the “Application Startup” section (See “Application Startup” on page 17).

Warning! Do not change from USB to Ethernet, or back, without power cycling analyzer.

3.3 Setting Up the Analyzer - Ethernet Connection

To set up the Analyzer using an Ethernet connection:

Step 1 Connect the provided AC power cord to the rear of the Voyager M3 and to a 100-volt to 240-volt, 50-Hz to 60-Hz, 100-W power outlet.

Note: The Analyzer is capable of supporting supply voltages between 100 volts and 240 volts, 50 z or 60 Hz, thus supporting all supply voltages around the world.

Step 2 Insert the Installation CD.

Step 3 To use a DHCP network, make sure that the PC is connected to a DHCP network, then connect the Ethernet port on the Analyzer to a DHCP network.

Note: If the DHCP network uses a Firewall, you must set the Firewall to allow the Analyzer device on the network.

Note: Direct connection from the Ethernet port on the PC to the Ethernet port on the Analyzer is supported in this release. See “IP Settings” on page 19.

Step 4 Turn on the power switch.

Note: At power-on, the Analyzer initializes itself in approximately ten seconds and performs an exhaustive self-diagnostic that lasts about five seconds. If the diagnostics fail, call LeCroy.

Step 5 Complete Analyzer setup in the “Application Startup” section (See “Application Startup” on page 17).

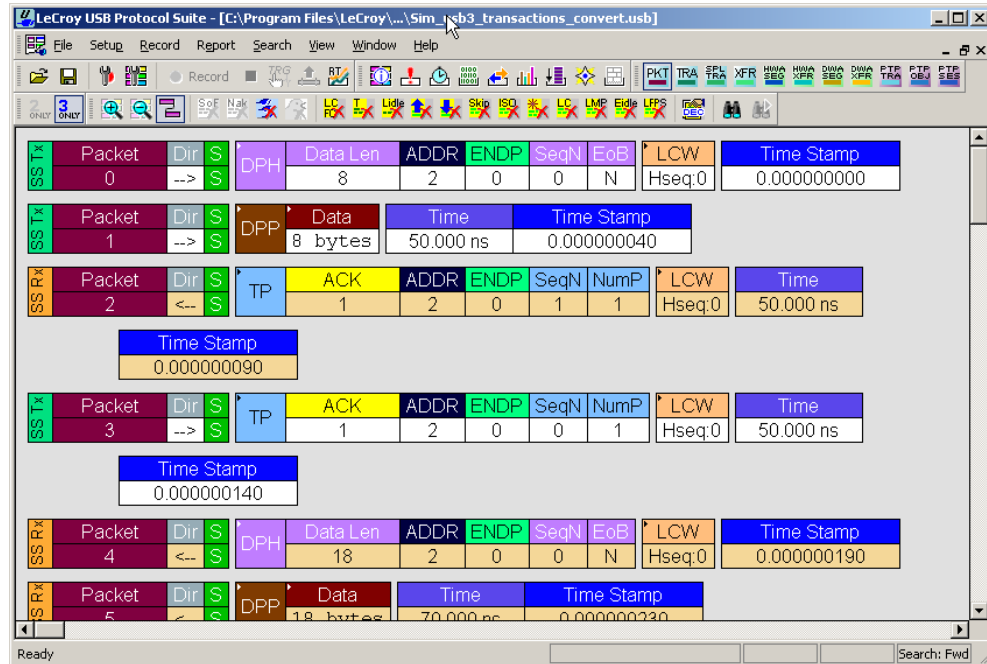
Warning! Do not change from USB to Ethernet, or back, without power cycling analyzer.

3.4 Application Startup

To start the application, launch the LeCroy USB Protocol Suite program from the Start Menu:

Start > Programs > LeCroy > USB Protocol Suite > USB Protocol Suite.

to open the main window.



You can use the software with or without the system connected to the host. Without the Analyzer, the program functions as a trace viewer to view, analyze, and print trace files.

Confirm Proper Hardware Installation and USB or Ethernet Connection

USB Connection

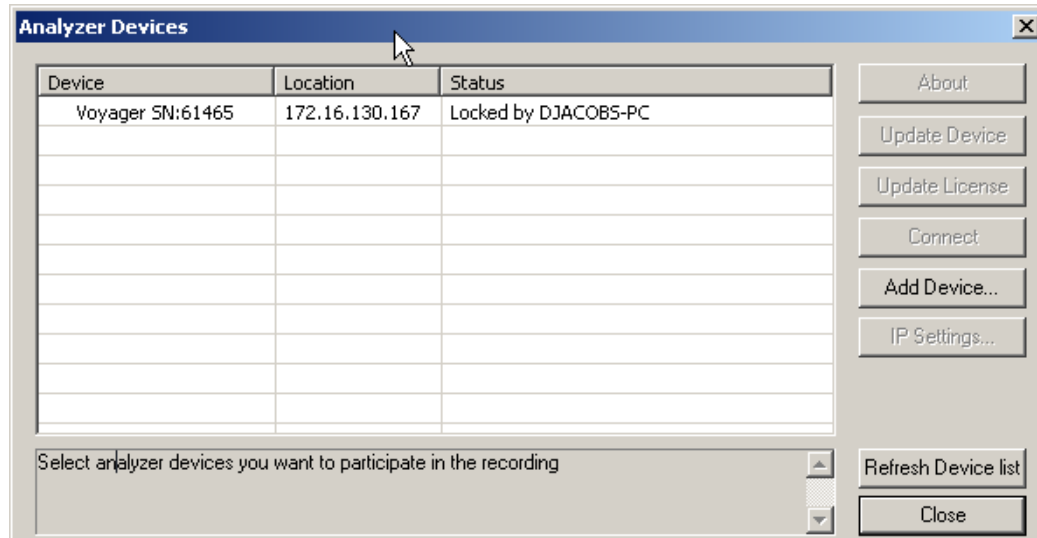
For USB connection, after you open the USB Protocol Suite application, confirm proper installation and USB connection by selecting **About** from the Help menu to view the Software Version, Firmware Version, BusEngine™ Version, and Unit Serial Number in the About window.

Ethernet Connection

For Ethernet connection, after you open the USB Protocol Suite application, confirm proper installation and Ethernet connection using the Analyzer Devices dialog and the About window.

Analyzer Devices

To display the available Analyzer Devices, select **Setup > All Connected Devices** to display the Analyzer Devices dialog.



The dialog displays the Device, Location, and Status.

You can click:

- **About** to display device information (see “Software, Firmware, and BusEngine Revisions” on page 197).
- **Update Device** (see “Manual Updates to Firmware, BusEngine, and Serdes BusEngine” on page 202)
- **Update License** (see “Updating the Software License” on page 204)
- **Connect** to display the Connection Properties dialog, in which you can set the system to:
 - Automatically connect to the device.
 - Ask to connect to the device.
 - Take no action.
- **Add Device** to display the Add Ethernet Attached Device dialog, in which you can enter an IP Address.
- **IP Settings** to use a DHCP or Static IP address.

To refresh the list of devices, click **Refresh Device List**.

Before starting recording, select the Analyzer you want to participate in recording.

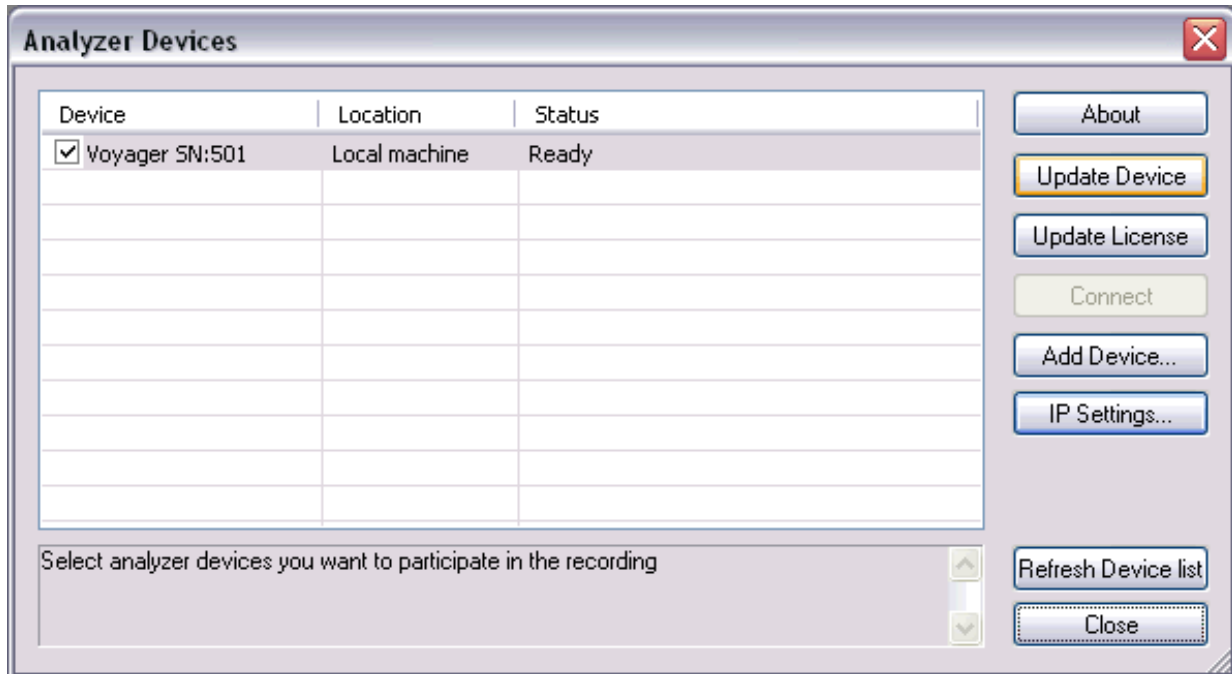
IP Settings

If you are connected to a device, you can change the IP settings:

- **DHCP** automatically assigns an IP address. DHCP is the default.
- **Static IP** prompts you to enter a specific IP address.

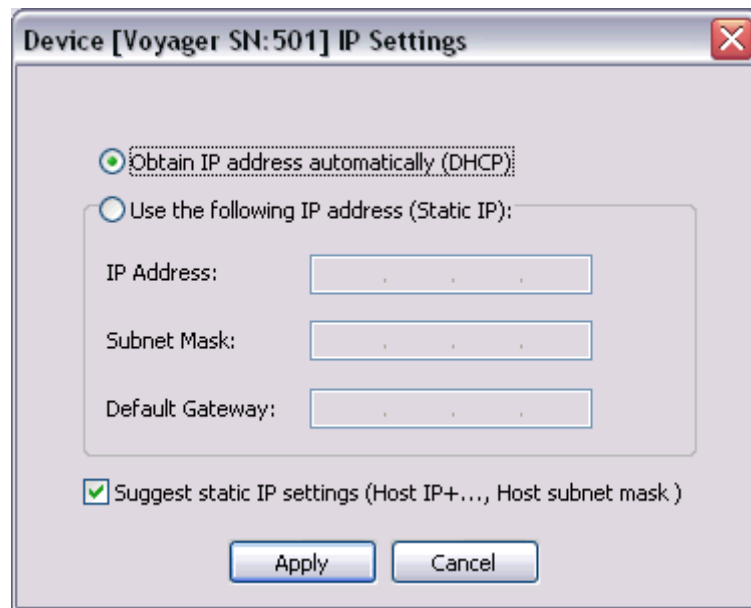
To change from DHCP to Static IP while connected to a device:

Step 1 Select **Setup > All Connected Devices** from the menu bar to display the Analyzer Devices dialog.



Note: If you are not connected to a device, the IP Settings command is grayed out.

Step 2 Select the device to use in the recording, then click the **IP Settings** button to display the Device IP Settings dialog.



Two radio buttons are available:

- Obtain IP address automatically (DHCP) [default]
- Use the following IP Address (Static IP)

Step 3 To change to Static IP, click the **Static IP** radio button.

Enter the **IP Address**.

Enter the **Subnet Mask**.

Enter the **Default Gateway**.

Device [Voyager SN:501] IP Settings

Obtain IP address automatically (DHCP)

Use the following IP address (Static IP):

IP Address: 0 . 1 . 0 . 5

Subnet Mask: 255 . 255 . 255 . 255

Default Gateway: 0 . 0 . 0 . 0

Suggest static IP settings (Host IP+..., Host subnet mask)

Apply Cancel

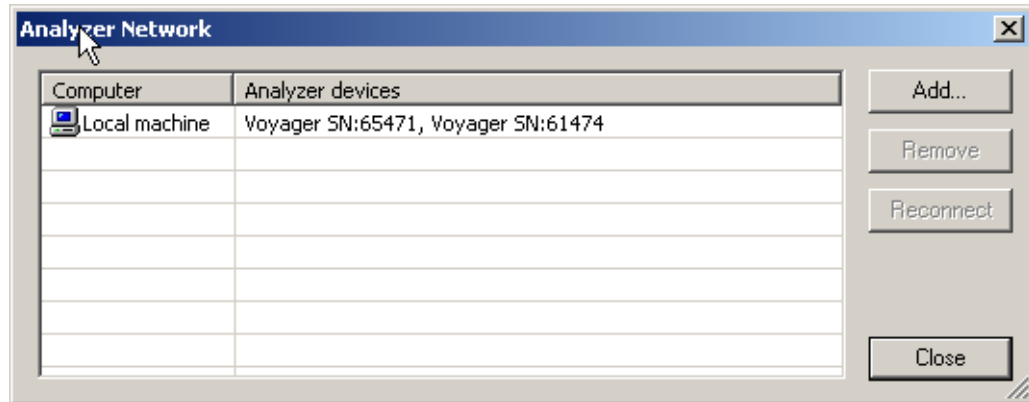
Click **Apply** to get a success message and return to the Analyzer Devices dialog.

Note: You can let the system **Suggest static IP settings** (IP address and subnet mask).

Step 4 Click **Close** to close the dialog and use the device with a Static IP address.

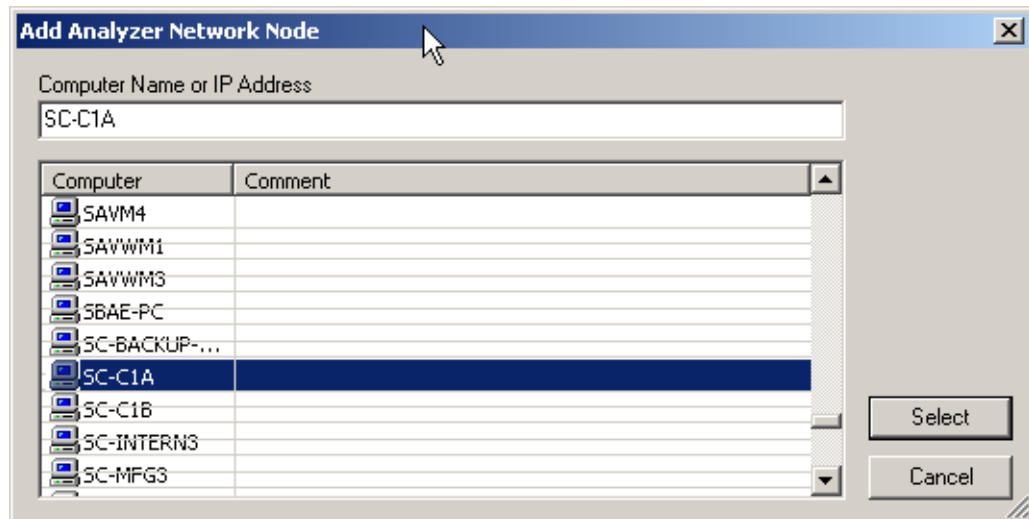
Analyzer Network

For Ethernet, to display the computers and analyzers on the local network, select **Setup > Analyzer Network** to display the Analyzer Network dialog.



The dialog displays the Computers on the network and the Analyzer devices connected to the computers.

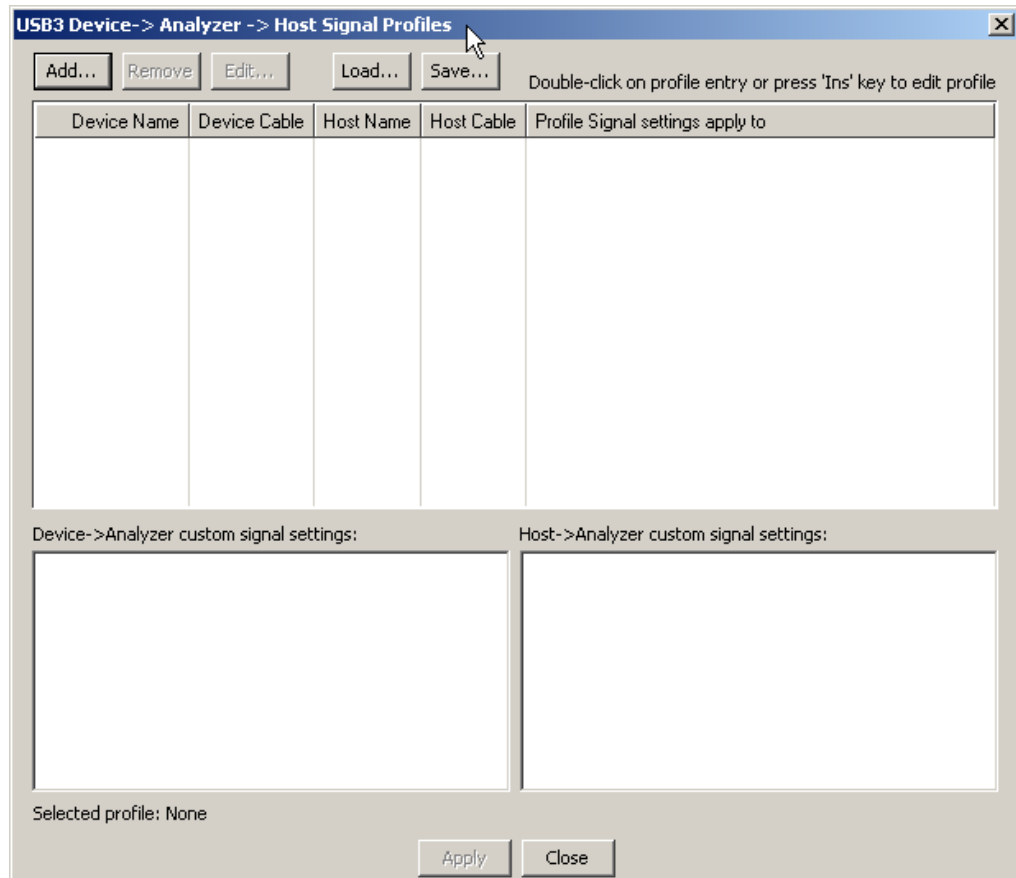
You can click **Add** to display the Add Analyzer Network Node dialog, in which you can select a Computer on the network



You can also **Remove** a selected computer or **Reconnect** a selected computer.

USB 3.0 Device/Host Signal Parameters

For USB, to add, remove, edit, load (from a comma-delimited **.csv** file), or save (as a comma-delimited **.csv** file) USB 3.0 devices and to calibrate USB 3.0 connections, select **Setup > USB 3.0 Device/Host Signal Parameters** to display the USB3 Device -> Analyzer -> Host Signal Profiles dialog.



The dialog lists the Device Name, Device Cable, Host Name, Host Cable, and to what the Profile Signal Settings apply. It also shows Device-to-Analyzer and Host-to-Analyzer custom signal settings.

To add a device, click **Add** to display the USB3 Device -> Analyzer -> Host Signal Parameter Profiles dialog.

The dialog allows you to **Set Device “Current”** or **Read from Analyzer**.

The dialog allows you to **Set Host “Current”** or **Apply to Analyzer**.

You can enter Device to Analyzer Signal Settings:

- Device Name
- Device Cable ID
- Input Signal Equalization (ISE) Settings: short, medium and long time constant (Current, Off, Minimum, Moderate, or Maximum)
- Pre-Emphasis Settings: short and long time level (0 to 15) and short and long time decay (0-7)
- Output Power Level: Current or 213 mV to 1294 mV

You can enter Host to Analyzer Signal Settings:

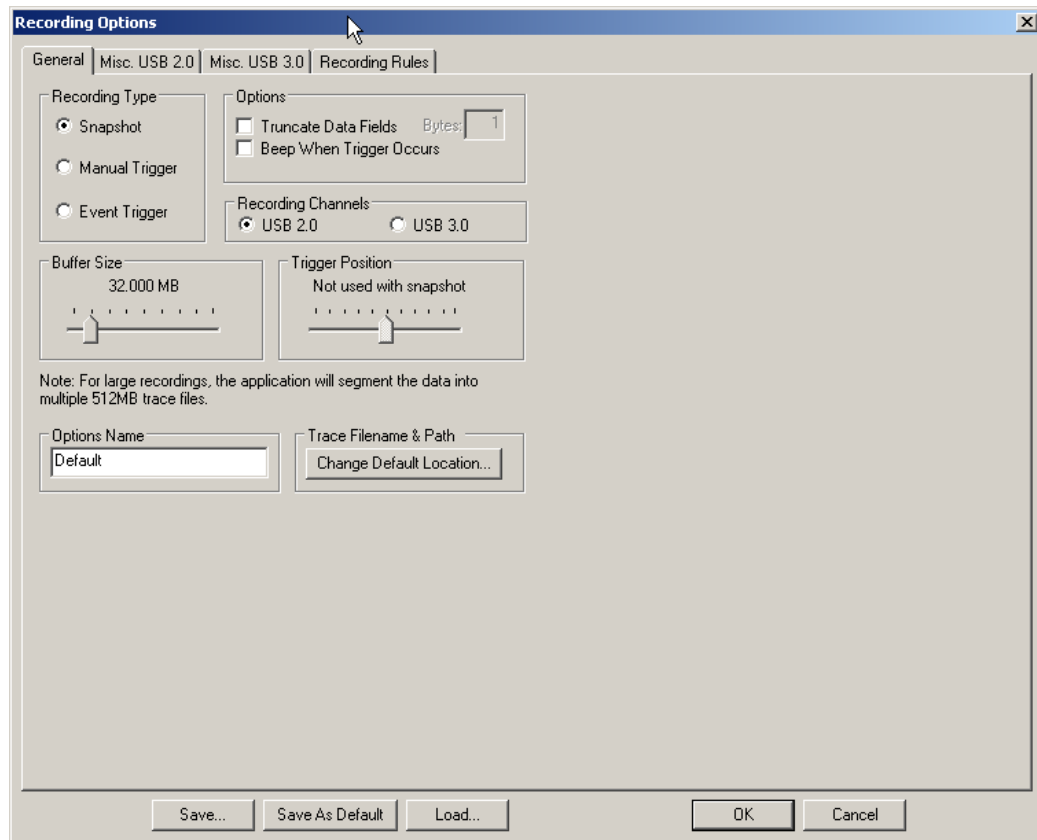
- Host Name
- Host Cable ID
- Input Signal Equalization (ISE) Settings: short, medium and long time constant (Current, Off, Minimum, Moderate, or Maximum)
- Pre-Emphasis Settings: short and long time level (0 to 15) and short and long time decay (0-7)
- Output Power Level: Current or 213 mV to 1294 mV

You can also **Load the default settings** or **Load the last applied settings**.

3.5 Your First USB Recording

After installing and launching the software, you can test the system by performing the following steps:

- Step 1** Connect a USB cable to each of the two connectors on the Analyzer module, then connect the other ends to the USB device under test and USB host system.
- Step 2** Select **Recording Options** under **Setup** on the Menu Bar.
- Step 3** Select the **General** tab to display the following dialog box showing factory default settings such as Snapshot and 4 MB buffer size. For the first recording, you can leave these settings unchanged.



Note: Items not supported on Voyager M3 are greyed out.


Step 4 Click **OK** to activate the recording options you selected.

Step 5 Turn on the USB devices that are to be tested and cause them to generate USB traffic.

Step 6 Click  **Record** on the Tool Bar.

The system starts to record the USB traffic immediately. After 4 MB of traffic are recorded, the Analyzer uploads the data and displays the packets in the trace window.


Step 7 To terminate recording before the snapshot automatically completes,

click  on the Tool Bar.

When the recording session is finished, the traffic is uploaded from the Analyzer to the hard drive on your PC as a file named **data.usb** or the name you assigned as the default filename. While the file is being uploaded, you should see a brown progress bar at the bottom of the screen. When the bar disappears, it indicates that the data has been uploaded to disk.

Step 8 To save a current recording for future reference, select **Save As** under **File** on the Menu Bar.

OR

Click  on the Tool Bar to display the standard **Save As** screen. Give the recording a unique name and save it to the appropriate directory.

Chapter 4: Software Overview

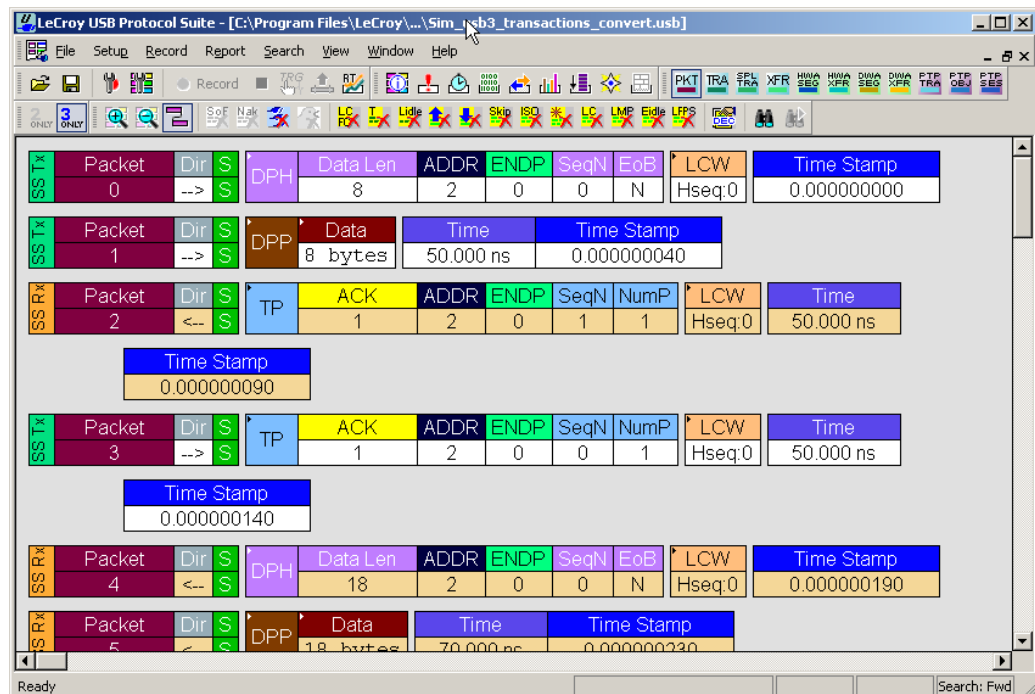
The Trace Viewer is an application that may be used with or without the Analyzer box. When used without an Analyzer box, the program functions in a Trace Viewer mode to view, analyze, and print captured protocol traffic. The software also allows you to view trace files created by the LeCroy USB Chief™, USB Advisor™, USB Detective™, USB Inspector™, and USB Tracer™/Trainer™. Opening a file created with either of these Analyzers displays a screen asking if you want to convert the old file to the new format under the name **<filename>_convert.usb**.

When the program is used with the Analyzer attached to the computer, you can monitor and analyze the activity of your USB branch from either of the USB ports on the front of the Analyzer.

4.1 Starting the Program

To start the USB Protocol Suite program:

Step 1 Select **Start > Programs > LeCroy > USB Protocol Suite > USB Protocol Suite**.



4.2 Tooltips

Tooltips provide useful information about cells in the trace and buttons in the application. To display a tooltip, position the mouse pointer over an item.

4.3 The Main Display Windows

Some of the Main Display window options are familiar Microsoft options.

Menu	Function
File	
<u>N</u> ew .utg file.	Creates a new, empty traffic generation file. Available only if a trace file (.usb) is open. To edit a .utg file, click Edit as Text in the toolbar.
<u>O</u> pen	Opens a file.
<u>C</u> lose	Closes the current file.
Sa <u>v</u> e <u>A</u> s	Saves all or a range of packets from the current file.
<u>P</u> rint	Prints part or all of the current traffic data file.
Print <u>P</u> review	Produces an on-screen preview before printing.
<u>P</u> rint Setup	Sets the options for the current or new printer.
<u>E</u> dit as Text	Opens the Script Editor. Available only when a traffic generation file (.utg) is open.
<u>E</u> dit Comment	Creates or edits the Trace file comment field. See “Edit Comment” on page 70.
Check Syntax of . <u>u</u> tg file	Reads open .utg file and checks syntax for errors. Available only when a traffic generation file (.utg) is open.
Export>> Packets to Text (Packet View Format) Packets to .CSV (Comma Separated Values for Excel, etc.) Format) Packets to Host Traffic Generator Text File (.utg) Packets to Device Emulation Traffic Generation Text File (.utg) Data	<p>Saves all or part of a trace to a text file or generator file.</p> <p>Saves trace as text file in Packet View Format.</p> <p>Saves trace as a comma-separated-values text file for use with Microsoft® Excel.</p> <p>Saves trace as script file that can be used by a Generator to generate a trace.</p> <p>Exports packets to Device Emulation files. This option does not export transactions.</p> <p>Exports Transfer data as text or binary file. Note: Export is supported only for USB 2.0 traffic.</p>
Merge Trace Files	Merges two simultaneously recorded files into a single file. (This command does not work if the files were recorded at different times).
<u>I</u> mport	Imports data from a .vcd file to a BusEngine™ data file. If you have exported simulations to a defined .csv format, you can import data from the .csv file to a BusEngine™ data file. To use this feature, you must contact support for information on how to export to a specific-format .csv file and then import the file.
<u>C</u> ompare Endpoint Data	Allows you to select two endpoints of different directions with the same address and verify that the data OUT/IN is identical to the data IN/OUT from the other endpoint. Used when running echo-types of tests for data integrity. Available only when a trace file (.usb) is open. (2.0 only)
<u>E</u> xit	Exits the program.

Menu	Function
Setup	
<u>D</u> isplay Options	Provides display options such as color, formats, and filters. See “Display Options” on page 87.
<u>R</u> ecording Options	Provides setup options for recording, triggering events and filtering. See “Recording Options” on page 147.
<u>U</u> ppdate Device	Updates the BusEngine™ and Firmware manually. See “Manual Updates to Firmware, BusEngine, and Serdes BusEngine” on page 202.
Analyzer <u>N</u> etwork	Opens a dialog box for browsing to local and networked analyzers. Within the dialog, click Add to browse. The dialog lists PCs that are on the LAN. If a PC has an analyzer attached to it, and if DCOM permissions have been set on the selected PC, clicking Select establishes a connection. See “Analyzer Network” on page 22.
All Connected <u>D</u> evelopers	Opens a dialog box with a list of analyzers connected to the host PC. Lets you select an analyzer and update the BusEngine, Firmware, and licensing information. See “Analyzer Devices” on page 18.
USB 3.0 Device/ Host <u>S</u> ignal parameters	Adds, removes, edits, loads, and saves USB 3.0 devices and lists the device name, device cable, host name, host cable, and to what the Profile Signal Settings apply. Used to calibrate 3.0 connections. Also shows custom device-to-analyzer and host-to-analyzer signal settings. See “USB 3.0 Device/Host Signal Parameters” on page 23.
Record	
<u>S</u> tart	Causes the Analyzer to begin recording USB activity.
<u>S</u> top	Causes the Analyzer to stop recording.
<u>U</u> ppload Again	Allows you to upload a different portion of the captured trace if the previous upload was only partially uploaded.
Reset SuperSpeed Capture Engine	For USB 3.0 traffic capture, in some cases the analyzer might not correctly lock onto the 5-Gbps signals on power up, or it may unlock after a long period of usage. To issue a soft reset to the SuperSpeed capture engine, select this command. Note: After performing the reset, you must retrain the link on your devices.
Generate (see “Traffic Generation (2.0)” on page 173)	
<u>S</u> tart/Stop	Starts traffic generation. Once traffic generation has begun, the Start command becomes Stop and lets you stop traffic generation.
IntelliFrame Generation Mode	Sets the mode of generation to IntelliFrame. Use before Start. (2.0 only)
<u>B</u> itstream Generation Mode	Sets the mode of generation to bitstream. Use before Start. (2.0 only)
<u>R</u> epeat Mode	Allows you to repeat once, a specified number of times, or an infinite number of times using the Generation Repeat Mode window. (2.0 only)

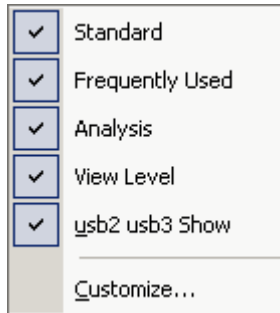
Menu	Function
Report	
<u>F</u> ile Information	Displays information about the recording such as the number of packets and triggering setup. See “File Information” on page 118.
<u>E</u> rror Summary	Summarizes the errors throughout the recording. Allows for fast navigation to packet with errors.. See “Error Summary” on page 119.
Timing <u>C</u> alculations	Calculates timing between two packets and bus utilization. See “Timing Calculations” on page 120.
Data View	Shows packet information. See “Data View” on page 140.
<u>T</u> raffic Summary	Summarizes the numbers and types of errors, packets, transactions, split transactions, and transfers that occurred in the open trace. See “Traffic Summary” on page 121.
<u>B</u> us Utilization	Displays graphs of packet length, bus usage, and bus usage by device. See “Bus Utilization” on page 122.
Link Tracker	Opens a window for displaying a detailed chronological view of traffic. The window provides view and navigation options. See “Link Tracker (3.0)” on page 134.
Spec View	Shows packet header information and other items, in a view that matches the USB 3.0 specification. See “Spec View (3.0)” on page 139.
Search (see “Searching Traces” on page 71)	
Go to <u>T</u> rigger	Positions the display to show the first packet that follows the trigger event.
Go to <u>P</u> acket/ Transaction/Transfer	Positions the display to the packet/transaction/transfer number selected in the Go to <u>P</u> acket/Transaction/Transfer menu.
Go to <u>M</u> arker »	Positions the display to the selected marked packet.
<u>G</u> o to USB2.0»	Positions the display to the selected event, condition, value, or type.
<u>G</u> o to USB3.0»	Positions the display to the selected event, condition, value, or type.
<u>F</u> ind	Allows complex searches on multiple criteria. See “Find” on page 82.
Find <u>N</u> ext	Repeats the previous Find operation.
<u>S</u> earch Direction	Allows the search direction to be changed from Forward to Backward or vice versa.

Menu	Function
View	
Toolbars	Displays list of available toolbars. See "Resetting the Toolbar" on page 38.
Analyzer Network Chat Bar	Opens a dialog that allows users to conduct chat sessions over an IP LAN. In order to send and receive electronic text messages, each user must be working with a PC that is on an IP LAN and also attached to an analyzer.
Status Bar	Switches display of the Status Bar on or off. See "Status Bar" on page 39.
Real-time Statistics	Allows you to view traffic statistics as they occur. See "Real Time Monitoring" on page 129.
Zoom In	Increases the size of the displayed elements.
Zoom Out	Decreases the size of the displayed elements.
Wrap	Wraps displayed packets within the window.
Show USB 2 Traffic Only	Displays only USB 2.0 traffic.
Show USB 3 Traffic Only	Displays only USB 3.0 traffic.
Hiding USB 2 Traffic	Hides: <ul style="list-style-type: none"> • SOF's: Start of Frames • NAK's: NAK'ed Transactions • Devices: Packets belonging to specified devices by address and endpoint • Chirps: Chirp-K and Chirp-J Bus conditions (these are recorded only)
Hiding USB 3 Traffic	Hides: <ul style="list-style-type: none"> • Link Commands (Flow Control) • Link Training Sequences (TS1, TS2, TSEQ) • Logical Idle Packets • Upstream Packets • Downstream Packets • Skip Sequences • ISO Time Stamp Packets • Inter-Packet Symbols • Link Commands (Other than Flow Control) • LMP Packets • Electrical Idles • LFPS Packets
Apply Decoding Scripts	Decoding scripts set the values of the display and recording options for optimum views of trace information from specific vendors or classes of data. This menu option allows you to select the vendor or class of data for the request recipients and endpoints listed in the Request Recipients and Endpoints menu. You can keep the settings across recordings. See "Decode Requests" on page 97.

Menu	Function
<u>P</u> acket Level	Displays Packets.
<u>T</u> ransaction Level	Displays Transactions.
<u>S</u> plit Transaction Level	Displays Split Transactions.
<u>T</u> ransfer Level	Displays Transfers.
HWA Segment Level	Displays Host Wire Adapter Segments
HWA Transfer Level	Displays Host Wire Adapter Transfers
DWA Segment Level	Displays Device Wire Adapter Segments
DWA Transfer Level	Displays Device Wire Adapter Transfers
PTP Transaction Level	Displays PTP Transactions
PTP Object Transfer Level	Displays PTP Objects
PTP Session Level	Displays PTP Sessions
<u>R</u> efresh <u>D</u> ecoding	Forces the software to re-decode transactions and transfers. Useful if you have applied a decoding mapping which helps fully decode a sequence of transfers, as is the case with Mass Storage decoding.
Window	
<u>N</u> ew Window	Switches display of the Tool Bar on or off.
<u>C</u> ascade	Displays all open windows in an overlapping arrangement.
Tile <u>H</u> orizontal	Displays all open windows in a above-below arrangement.
Tile <u>V</u> ertical	Displays all open windows in a side-by-side arrangement.
<u>A</u> rrange Icons	Arranges minimized windows at the bottom of the display.
Windows ...	Displays a list of open windows.
Help	
<u>H</u> elp	Displays online help. You can also select F1.
<u>U</u> ppdate License	Opens a dialog box for updating your LeCroy license. See "Updating the Software License" on page 204.
<u>D</u> isplay License Information	Displays information related to licensing. See "License Information" on page 203.
<u>R</u> egister Product Online	Register at the LeCroy website. See "Registering Online" on page 204.
Check for Updates	Use the Internet to analyze your system for licensed updates. You can set the system to automatically check for updates at application startup in the LeCroy USB Protocol Suite Software Update window. See "Software Updates" on page 198.
<u>A</u> bout	Displays version information about the Voyager M3 and the USB Protocol Suite. See "Software, Firmware, and BusEngine Revisions" on page 197.

4.4 View Options

You can hide, display or reset toolbars by selecting **View > Tool bars** from the menu bar.



Tool Bar



The Tool Bar provides quick and convenient access to the most popular program functions. Tool tips briefly describe the functionality of each icon and menu item as the mouse arrow is moved over the icon/item.

Files and Searches



Open file



Find (see “Find” on page 82)



Save As



Find Next

Zoom and Wrap



Zoom In



Zoom Out



Wrap

Miscellaneous












Display Realtime Statistics.
See “Real Time Monitoring” on page 129





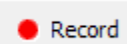





Assign High Level Decodes.
See “Decode Requests” on page 97.









Reports

	File Information Report See “File Information” on page 118.		Error Report See “Error Summary” on page 119.
	Timing and Bus Usage Calculations See “Timing Calculations” on page 120.		Traffic Summary See “Traffic Summary” on page 121.
	Data View See “Data View” on page 140.		Bus Utilization See “Bus Utilization” on page 122.
	Link Tracker See “Link Tracker (3.0)” on page 134.		Spec View See “Spec View (3.0)” on page 139.
	Open the Navigator bar See “Using the Trace Navigator” on page 141.		

Recording and Traffic Generation (see “Traffic Generation (2.0)” on page 173)

	Manual Trigger		Start or Stop Traffic Generation (available if you have the Traffic Generation module).
	Repeat Upload		Bitstream and Intelliframe modes
	Start Recording		Set up Recording Options
	Stop Recording		Set up Display Options
	<input type="text" value="Run once"/>		Repeat Mode. This button becomes active when a traffic generation file (*.utg) is open.

Display/Hide (see “Reading a Trace” on page 45)

	Display Packets See “Trace View Features” on page 45.		Display Device Wire Adapter Segments See “Switch to Device Wire Adapter Segment View” on page 65.
	Display Transactions See “Switch to Transactions View” on page 57.		Display Device Wire Adapter Transfers See “Switch to Device Wire Adapter Transfer View” on page 65.
	Display Split Transactions See “Switch to Split Transaction View” on page 61.		Display PTP Transactions See “Switch to PTP Transactions” on page 66.
	Display Transfers See “Switch to Transfer View” on page 61.		Display PTP Objects See “Switch to PTP Object Transfers” on page 66.



Display Host Wire Adapter Segments
See “Switch to Host Wire Adapter Segment View” on page 64.



Display PTP Sessions
See “Switch to PTP Sessions” on page 67.



Display Host Wire Adapter Transfers
See “Switch to Host Wire Adapter Transfer View” on page 65.

USB 2.0 and USB 3.0



Display USB 2.0 traffic only.



Display USB 3.0 traffic only.

USB 2.0 Display/Hide



Hide SOFs.



Hide Devices



Hide NAK’ed transactions.



Hide Chirps

USB 3.0 Display/Hide



Hide Link Commands (Flow Control).



Hide ISO Time Stamp Packets.



Hide Link Training Sequences (TS1, TS2, TSEQ).



Hide Inter-Packet Symbols (unexpected packets).



Hide Logical Idle Packets.



Hide Link Commands (other than Flow Control).



Hide Upstream Packets.



Hide LMP Packets.



Hide Downstream Packets.



Hide Electrical Idles.



Hide Skip Sequences.



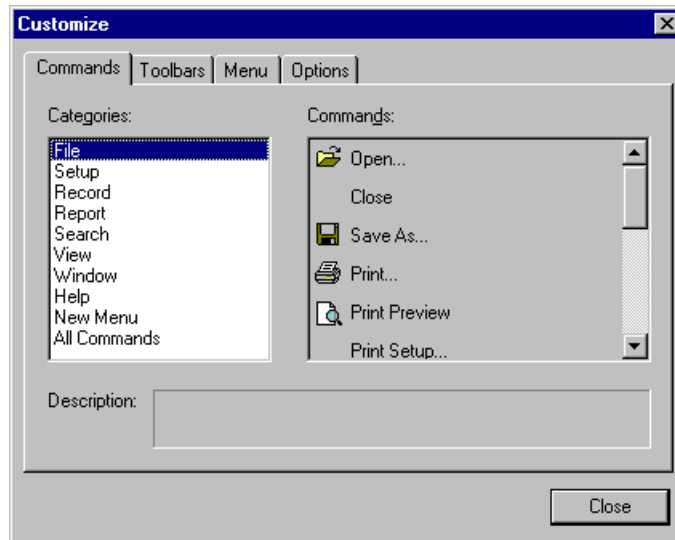
Hide LFPS Packets.

Resetting the Toolbar

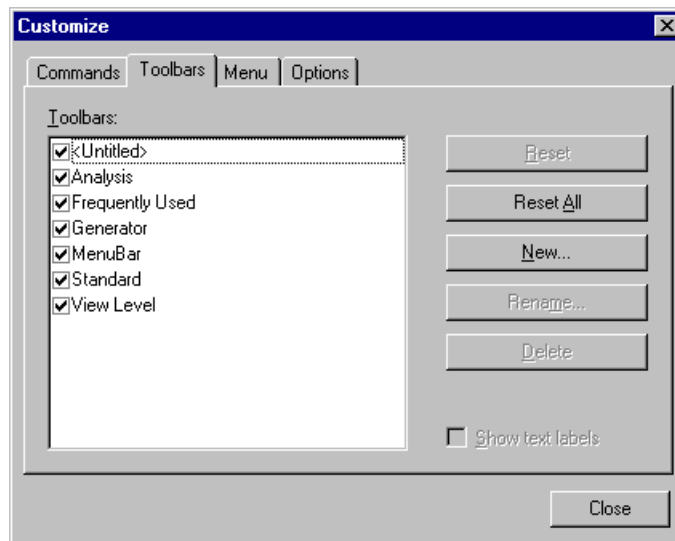
From time to time (such as following a software upgrade), it is possible for the buttons on the toolbar to not match their intended function. You can reset the toolbar by performing the following steps:

Step 1 Select **View > Tool bars** from the menu bar.

Step 2 Select **Customize** from the submenu to display the Customize dialog box.



Step 3 Select the **Toolbars** tab to display the Toolbars page of the Customize dialog box.



Step 4 Click the **Reset All** button.

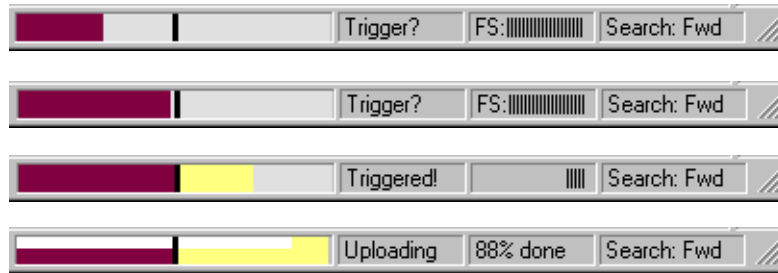
The toolbar resets to the factory defaults.

4.5 Status Bar

The Status bar is located at the bottom of the main display window. Depending on the current activity, the bar can be divided into as many as four segments.

Recording Progress

When you begin recording, the left-most segment of the Status Bar displays a Recording Progress Indicator:



As recording progresses, the Progress Indicator changes to reflect the recording progress graphically:

In the Progress Indicator, a black vertical line illustrates the location of the Trigger Position you selected in Recording Options.

- Pre-Trigger progress is displayed in the field to the left of the Trigger Position in the before-Trigger color specified in the Display Options.
- When the Trigger Position is reached, the progress indicator wiggles as it waits for the trigger.
- After the trigger occurs, the field to the right of the Trigger Position fills in the after-Trigger color specified in the Display Options.
- When recording is complete, the upper half of the progress indicator fills in white, indicating the progress of the data upload to the host computer.

You should be aware of two exceptional conditions:

- If a Trigger Event occurs during the before-Trigger recording, the before-Trigger color changes to the after-Trigger color to indicate that not all the expected data was recorded pre-Trigger.
- When you click **Stop** before or after a Trigger Event, the Progress Bar adjusts accordingly to begin uploading the most recently recorded data.

The Progress Bar fills with color in proportion to the specified size and actual rate at which the hardware is writing and reading the recording memory. However, the Progress Indicator is normalized to fill the space within the Status Bar.

Recording Status

During recording, the current Recording Status is displayed in the next segment. When you activate the **Record** function, this segment flashes one of the following messages (depending on the selected Recording Options):

- Trigger?
- Triggered!
- Uploading

After recording stops,

- The flashing message changes to **Uploading data-x% done** (x% indicates the percentage completion of the data uploading process).
- The traffic data is copied to disk (overwriting any previous version of this file) using the default file name **data.usb**. You can also create a file name of your choice by specifying one in the Recording Options dialog box.

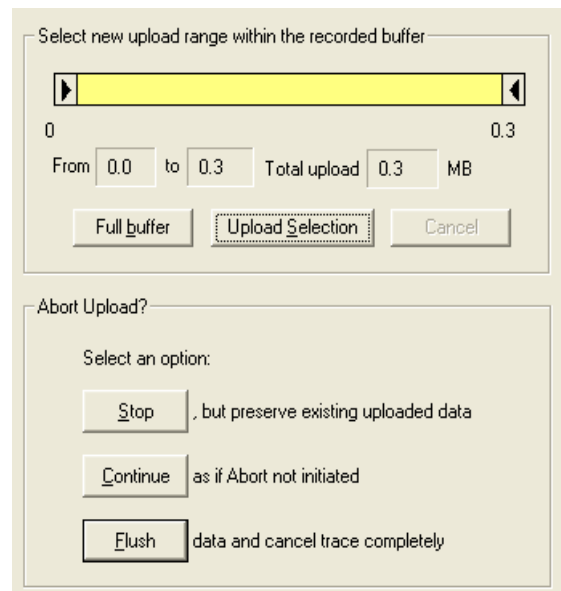
To abort the upload process:

- Press **Esc** on your keyboard
OR
- Again click  in the Tool Bar.

You are asked if you want to keep or discard the partially uploaded data.

Note: While uploading is in progress, clicking the stop button again brings up a dialog opens a dialog that allows you to do a partial upload, flush the current file, keep what has uploaded at this point, and to continue uploading.

The Partial Upload button is enabled when you have partially uploaded data. When you click **Partial Upload**, a dialog box appears that gives you options on what portion of data you want to upload again.



When the data is saved, the Recorded Data file appears in the main display window and the Recording Status window is cleared.

- If the recording resulted from a Trigger Event, the first packet following the Trigger (or the packet that caused the Trigger) is initially positioned second from the top of the display.
- If the recording did not result from a Trigger Event, the display begins with the first packet in the traffic file.

Recording Activity

During recording, the fourth segment from the left of the Status Bar displays Recording activity as a series of vertical bars.

The more vertical bars that are displayed, the greater the amount of activity being recorded. If there are no vertical bars, there is no recorded activity.

During uploading, the percent of the completed upload is displayed.

Note: If packets are filtered from the recording or data are truncated, the recording activity is reduced.

Search Status

The rightmost segment displays the current search direction: **Fwd** (forward) or **Bwd** (backward). Change the search direction from the Search Menu or double-click the Search Status segment.

4.6 Navigation Tools

You can zoom in and out, and wrap packets/transactions/transfers to fit within the screen using the following buttons:

Zoom In

Zoom In increases the size of the displayed elements, allowing fewer (but larger) packet fields per screen.

- Click  on the Tool Bar.


Zoom Out

Zoom Out decreases the size of the displayed elements, allowing more (but smaller) packet fields per screen.

- Click  on the Tool Bar.

Wrap

Select **Wrap** to adjust the Trace View so that packets fit onto one line. If a packet is longer than the size of the window, the horizontal scroll bar can be used to see the hidden part of the packet.

- Click  on the Tool Bar or select **Wrap** under **View** on the Menu Bar.

4.7 Analyzer Keyboard Shortcuts

Several frequently-used operations are bound to keyboard shortcuts.

Table 1: Keyboard Shortcuts

Operation	Key Combination
Trace Navigation	
Find Next	F3
Search Backwards	Ctrl+B
Search Forwards	Ctrl+F
Jump to First Packet	Ctrl+Home
Jump to Last Packet	Ctrl+End
Go to Any Error	Shift+E
Go to Channel 0	Ctrl+Shift+0
Go to Channel 1	Ctrl+Shift+1
PID	
Go to ACK	Shift+A
Go to DATA0	Shift+0
Go to DATA1	Shift+1
Go to DATA2	Shift+2
Go to DATAx	Shift+D
Go to IN	Shift+I
Go to MDATA	Shift+M
Go to NAK	Shift+N
Go to NYET	Shift+Y
Go to OUT	Shift+O
Go to PING	Shift+G
Go to PRE/ERR	Shift+P
Go to SETUP	Shift+S
Go to SOF	Shift+F
Go to SPLIT	Shift+X
Go to STALL	Shift+L
Go to EXT	Shift+R

Bus Conditions	
Go to Reset	Shift+T
Go to Resume	Shift+6
Go to SE0	Shift+Z
Go to SE1	Shift+7
Go to Keep-Alive	Shift+5
Go to Suspend	Shift+U
Go to Chirp	Shift+C
Go to Full Speed J	Shift+J
Go to Full Speed K	Shift+K
OTG	
Go to SRP	Ctrl+Q
Go to HNP	Shift+H
Go to VBus Voltage Change	Shift+V
Go to OTG Host A	Ctrl+Shift+A
Go to OTG Host B	Ctrl+Shift+B
Misc.	
Marker Menu	Ctrl+M
Open File	Ctrl+O
Print...	Ctrl+P
Record	Ctrl+R
Stop Recording	Ctrl+T
Open Display Options dialog	Ctrl+Shift+D
Open Recording Options dialog	Ctrl+Shift+R
Hide SOFs	Ctrl+Shift+S
Hide NAKs	Ctrl+Shift+N
Hide Chirps	Ctrl+Shift+C
Apply Decoding Scripts	Ctrl+Shift+Y
Set Quick Timing Marker Start	Ctrl+Left-click-mouse
Set Quick Timing Marker End	Ctrl+Shift+Left-click-mouse

Chapter 5: Reading a Trace

5.1 Trace View Features

The Trace View has these features:

- The packet view display makes extensive use of color and graphics to fully document the captured traffic.
- Packets are shown on separate rows, with their individual fields both labeled and color coded.
- Packets are numbered (sequentially, as recorded), time-stamped (with a resolution of 8 ns), and highlighted to show the transmitted speed (low-speed, full-speed or high-speed).
- Display formats can be named and saved for later use.
- Pop-up Tool Tips detail the contents of packet fields.
- Data fields can be collapsed to occupy minimal space in the display, and you can zoom in and out to optimize screen utilization.
- The display software can operated independently of the hardware and so can function as a stand-alone Trace Viewer that may be freely distributed.
- High Speed SOFs display Microframes (shown below.)

Packet	Dir	H	SOF	Frame #	CRC5	Pkt Len	Idle	Time Stamp
0	-->	S	0xA5	1156.?	0x1C	12	124.767 μ s	00000.4056 3910
Packet	Dir	H	SOF	Frame #	CRC5	Pkt Len	Idle	Time Stamp
1	-->	S	0xA5	1156.?	0x1C	14	124.767 μ s	00000.4057 3908

↑
Microframes

3.0 Packets

USB 3.0 has the following packet types:

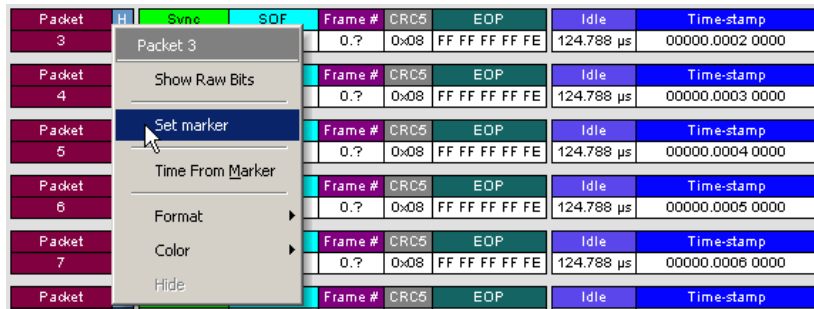
- Link Commands (Flow Control).
- Link Training Sequences (TS1, TS2, TSEQ).
- Logical Idle Packets
- Upstream Packets
- Downstream Packets
- Skip Sequences.
- ISO Time Stamp Packets
- Inter-Packet Symbols (unexpected packets)
- Link Commands (other than Flow Control)
- LMP Packets
- Electrical Idles
- LFPS Packets

5.2 Set Marker

You can define a unique Marker for each packet.

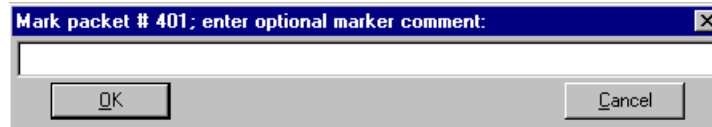
To place a marker on a packet:

Step 1 Right-click **Packet #** for the packet you wish to mark to display the Packet menu:



Step 2 Select **Set Marker**.

You see the **Edit Marker Comment** window where you can enter a unique comment about this packet.:



Step 3 Enter your comment.

Step 4 Click **OK**.

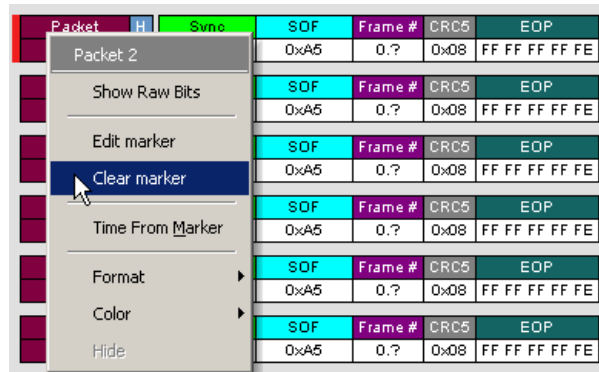
A marked packet is indicated by a vertical red bar along the left edge of the packet # block:

Packet #	F	Sync	SETUP	ADDR	ENDP	CRC5	EOP	Idle
398	S	00000001	0xB4	2	0	0x15	2.50	2

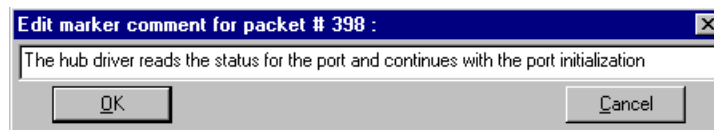
5.3 Edit or Clear Marker

To clear or edit the comments associated with a packet marker:

Step 1 Right-click **Packet #** to display the Packet menu:



Step 2 To edit the Marker Comment, select **Edit Marker Comment** to display the **Edit marker comment** window. Edit the comment, then click **OK**:



Step 3 To clear a Marker, click **Clear Marker**.

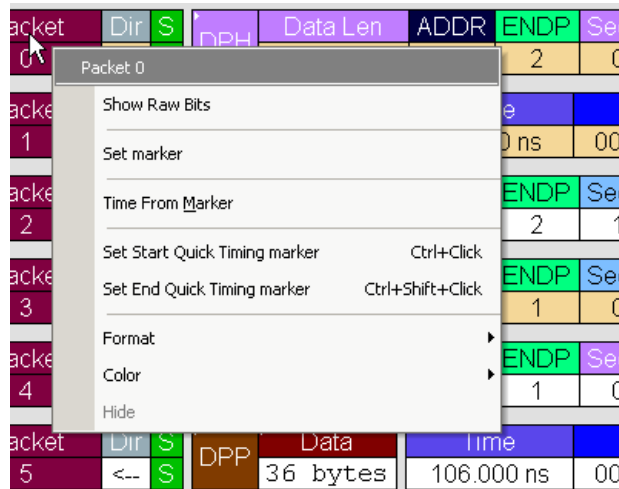
The vertical red Marker bar disappears.

5.4 Set or Clear Quick Timing Markers

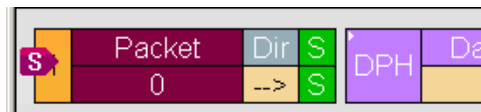
Quick Timing Markers provide immediate time deltas and bandwidth calculations. If the Start is placed on a packet that contains an Address and Endpoint, the bandwidth for that combination is displayed in the Status Bar below the trace data.

To set or clear quick timing markers:

Step 1 Right-click **Packet** to display the Packet menu:



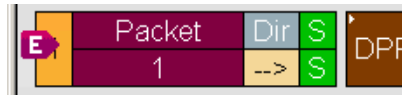
Step 2 To set the start quick timing marker, select **Set Start Quick Timing Marker** to mark the packet with a red **S**.



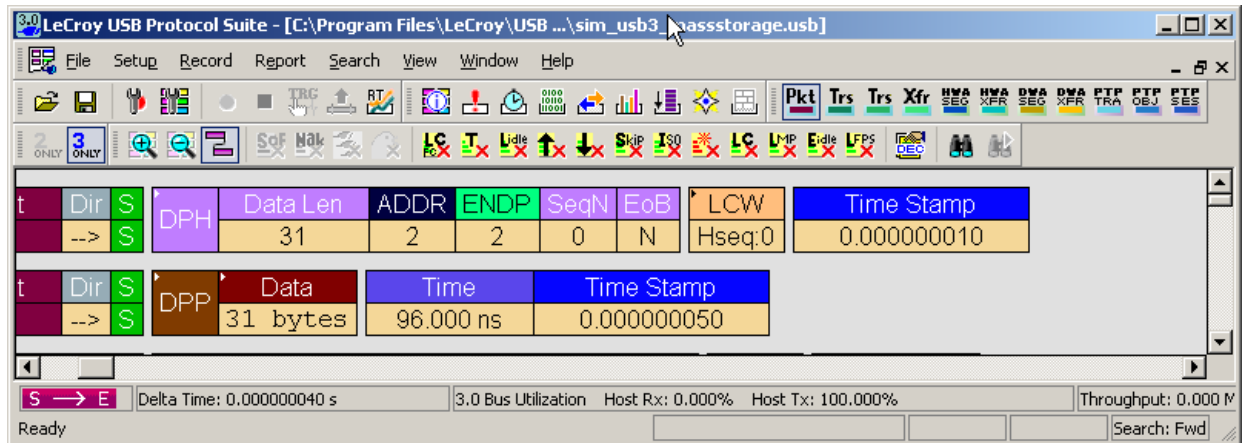
Step 3 To clear a marker, right-click **Packet** to display the Packet menu, then click **Clear Quick Timing Marker**.

The red **S** disappears.

Step 4 To set the end quick timing marker, right-click **Packet** to display the Packet menu, then select **Set End Quick Timing Marker** to mark the packet with a red **E**.



The time from marker appears in the Status Bar as the **Delta Time** from **S -> E**.

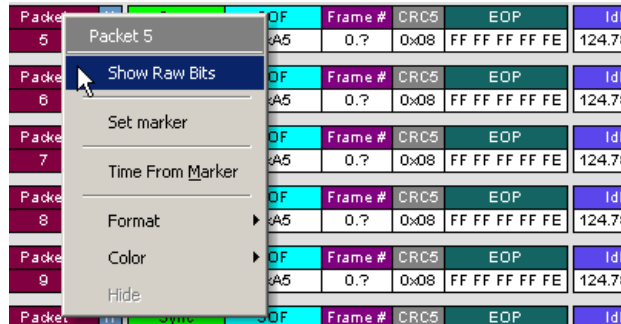


5.5 View Raw Bits (2.0)

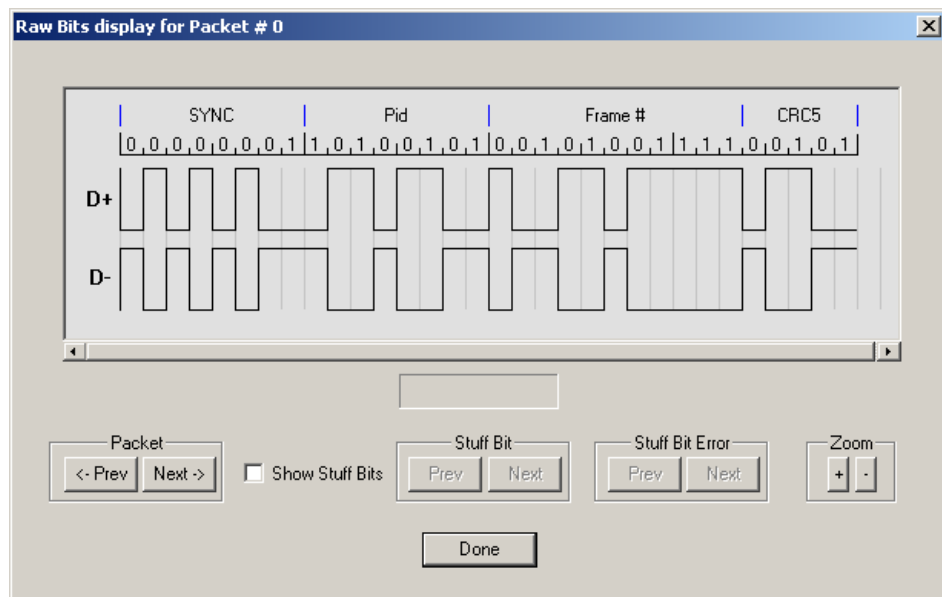
You can expand a specific packet to view the raw bits in detail.

To view the raw bits:

Step 1 Right-click **Packet #** for the packet you wish to view to display the **Packet** menu:



Step 2 Select **Show Raw Bits** to display the Raw Bits View for that packet:



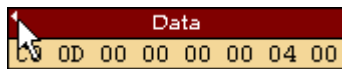
Along the top of the Raw Bits View is a linear strip of the logical bit values with corresponding field demarcations. Bit stuffing is displayed in color. Below the logical bit values is a representation of the D+/D- signaling complete with NRZ encoding. A scroll bar assists in navigation of larger packets. Use the two buttons under the label **Packet** to view previous or next packets. Two buttons under the label **Zoom** allow you to zoom in or out on packets.

5.6 Expanding and Collapsing Data Fields

You can expand a Data field to view it in greater detail or collapse it when you want a more compact view.

Using the Expand/Collapse Data Field Arrows

Data Fields can be easily expanded or collapsed by clicking the small triangular arrows on the left side of the data field.



Double-Clicking to Expand/Collapse Data Fields

Data fields can also be expanded or collapsed by double-clicking anywhere in the data field.

Expanding or Collapsing All Data Fields

Expand or collapse all data fields by holding down the button for more than a second.

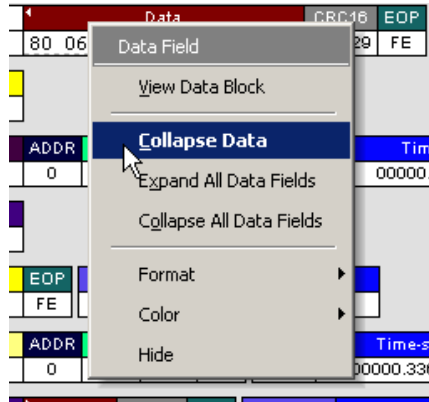
Using the Data Field Pop-up Menus

Data fields can expand or collapse by clicking a data field and selecting **Expand Data** or **Collapse Data** from the pop-up menu.

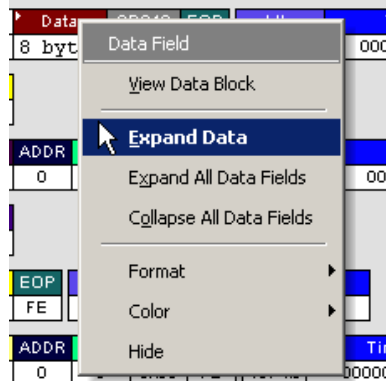
To expand and collapse data using the menu:

Step 1 Right-click **Data** in the Data packet you want to expand or collapse. to display the Data Field menu.

If your Data Trace View is currently expanded, you see the **Collapse Data** command:



If your Data Trace View is currently collapsed, you see the **Expand Data** command:



Step 2 Select the desired Expand Data or Collapse Data menu item.

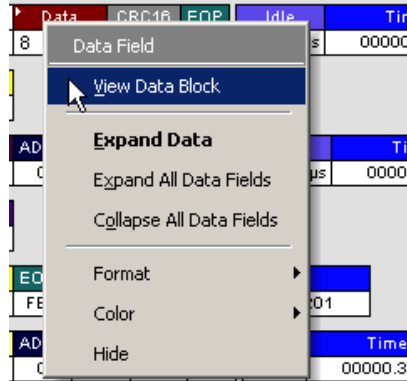
The Trace View is repositioned with the selected packet(s) adjusted in the format you have specified.

Expand or Collapse All Data Fields

All data fields can be expanded or collapsed by selecting **Expand All Data Fields** or **Collapse All Data Fields** from the data field pop-up menus.

5.7 View Data Block

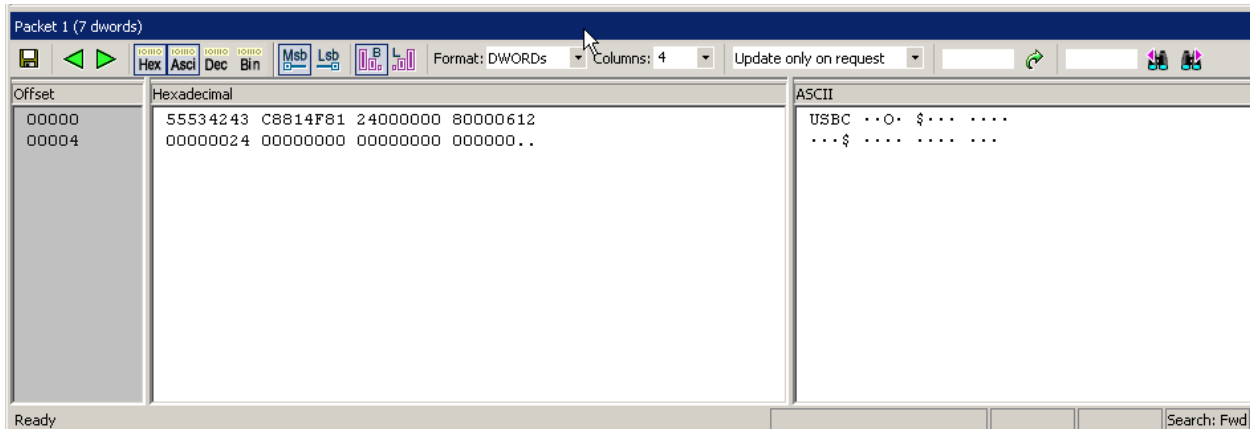
The data field pop-up menu has an option for viewing the raw bits in a data field.



To view these bits:

Step 1 Click the data field to open the data field pop-up menu.

Step 2 Select **View Data Block** or the  **Data View** button to open the Data Block dialog box.



The View Data Block window has options for displaying the raw bits in different formats:

- **Format:** Lets you display data in Hex, Decimal, ASCII or Binary formats
- **Show Per Line:** Lets you control how many bits are displayed per line
- **Bit Order:** Most Significant Bit, Least Significant Bit

5.8 Pop-up Tool-tips


Many fields within the trace display pop-up tool-tips when the mouse pointer is suspended over them. These tips provide added details about the field.

SETUP	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp
0xEB	2	0	0x15	233 ns	183 ns	00004.2833 6330

Starts SETUP transaction to a control pipe

5.9 Hide SOF Packets (2.0)


You can hide Start-of-Frame (SOF) packets that may be uninteresting in a given context from a Trace View by clicking the Hide SOF Packets button on the Tool Bar:

- Click  to hide all SOF packets.


Note: This also hides low-speed EOPs.

5.10 Hide NAKs (2.0)


You can hide NAKs that may be uninteresting in a given context from a Trace View by clicking the Hide NAKs button on the Tool Bar:

- Click  to hide all NAK packets.


5.11 Hide Devices

Click the  button to open a menu for select any address/endpoint combination to be hidden. Click the Control (CTRL) key to select multiple values. This menu can be moved from its default location and floated in the trace window for later use.

5.12 Hide Chirps (2.0)

Click the  button to hide any Chirped-J or Chirped-K packets recorded in a USB 2.0 Hi-Speed trace.


5.13 Hide Link Commands (Flow Control) (3.0)

Click the  button to Hide Link Commands (Flow Control).


5.14 Hide ISO Time Stamp Packet (3.0)

Click the  button to Hide ISO Time Stamp Packets.


5.15 Hide Link Training Sequences (3.0)

Click the  button to Hide Link Training Sequences (TS1, TS2, TSEQ).

5.16 Hide Inter-Packet Symbols (3.0)

Click the  button to Hide Inter-Packet Symbols (unexpected symbols that do not form a legal packet or ordered set).


5.17 Hide Logical Idle Packets (3.0)

Click the  button to Hide Logical Idle Packets (which only occur when Idle Filtering is Off).


5.18 Hide Link Commands (non Flow Control) (3.0)

Click the  button to Hide Link Commands (other than Flow Control).


5.19 Hide Upstream Packets (3.0)

Click the  button to Hide Upstream Packets.

5.20 Hide LMP Packets (3.0)

Click the  button to Hide LMP Packets.

5.21 Hide Downstream Packets (3.0)

Click the  button to Hide Downstream Packets.


5.22 Hide Electrical Idles (3.0)

Click the  to Hide Electrical Idles.


5.23 Hide Skip Sequences (3.0)

Click the  to Hide Skip Sequences.


5.24 Hide LFPS Packets (3.0)

Click the  button to Hide LFPS Packets.

5.25 Display 2 Only

Click the  button to display only USB 2.0 traffic.

5.26 Display 3 Only

Click the  button to display only USB 3.0 traffic.

5.27 Switch to Transactions View

A **Transaction** is defined in the USB specification as the delivery of service to an endpoint. This consists of a token packet, an optional data packet, and an optional handshake packet. The specific packets that make up the transaction vary based upon the transaction type.

The program default display mode is Packet View. Before you can view decoded transactions, you must switch from Packet View to Transactions View.

To select Transactions View:

Step 1 Click  on the toolbar.

The Trace View screen is re-drawn to display Transactions.

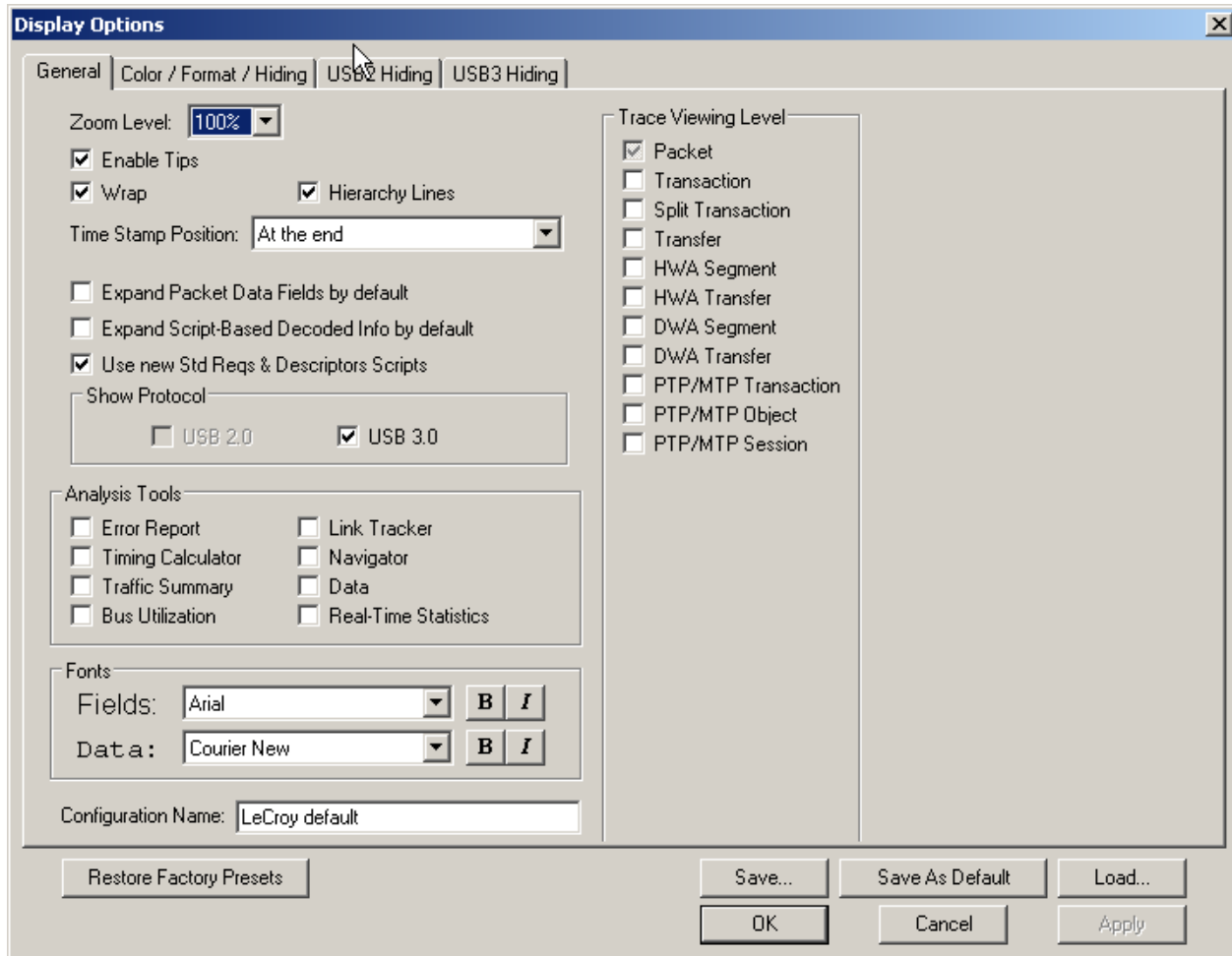
Transaction	F	OUT	ADDR	ENDP	T	Data	ACK	Time		
1336	S	0x87	1	0	0	8 bytes	0x4B	999.717 µs		
Transaction	F	OUT	ADDR	ENDP	T	Data	ACK			
1337	S	0x87	1	0	1	8 bytes	0x4B			
Packet	Dir	F	Sync	OUT	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp
6946	-->	S	00000001	0x87	1	0	0x17	233 ns	183 ns	00011.6037 1516
Packet	Dir	F	Sync	DATA1	Data	CRC16	EOP	Idle	Time Stamp	
6947	-->	S	00000001	0xD2	8 bytes	0x4FB5	233 ns	500 ns	00011.6037 1701	
Packet	Dir	F	Sync	ACK	EOP	Time	Time Stamp			
6948	<--	S	00000001	0x4B	250 ns	988.000 µs	00011.6037 2225			
Transaction	F	OUT	ADDR	ENDP	T	Data	ACK	Time		
1338	S	0x87	1	0	0	8 bytes	0x4B	999.800 µs		
Transaction	F	OUT	ADDR	ENDP	T	Data	ACK	Time		
1339	S	0x87	1	0	1	8 bytes	0x4B	999.800 µs		

Note: This menu selection displays a check next to **Show USB transactions** when you have selected it. When you want to switch back to Packet View mode, right-click anywhere in the trace window and then left-click **Show USB transactions**.

Note: This view also shows Extension Transactions, such as the Link Power Management (LPM) transaction defined by the USB 2.0 LPM specification.

You can also switch to Transaction View from the Menu Bar:

Step 1 Select **Display Options** under Setup to display the Display Options General window.



Step 2 Check **Transaction**.

Step 3 Click **OK**.

5.28 View Decoded Transactions

After you set Display Options, the Trace View screen is re-drawn to display decoded transactions in the colors and format you selected.

Transaction 1337										
F	OUT	ADDR	ENDP	T	Data	ACK				
S	0x87	1	0	1	8 bytes	0x4B				
Transaction 1338										
F	OUT	ADDR	ENDP	T	Data	ACK	Time			
S	0x87	1	0	0	8 bytes	0x4B	999.800 µs			
Transaction 1339										
F	OUT	ADDR	ENDP	T	Data	ACK	Time			
S	0x87	1	0	1	8 bytes	0x4B	999.800 µs			
Transaction 1340										
F	OUT	ADDR	ENDP	T	Data	ACK				
S	0x87	1	0	0	8 bytes	0x4B				
Transaction 6946										
Dir	F	Sync	OUT	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp	
-->	S	00000001	0x87	1	0	0x17	233 ns	183 ns	00011.6037 1516	
Transaction 6947										
Dir	F	Sync	DATA1	Data	CRC16	EOP	Idle	Time Stamp		
-->	S	00000001	0xD2	8 bytes	0x4FB5	233 ns	500 ns	00011.6037 1701		
Transaction 6948										
Dir	F	Sync	ACK	EOP	Time	Time Stamp				
<--	S	00000001	0x4B	250 ns	988.000 µs	00011.6037 2225				
Transaction 6958										
Dir	F	Sync	OUT	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp	
-->	S	00000001	0x87	1	0	0x17	250 ns	166 ns	00011.6061 1481	
Transaction 6959										
Dir	F	Sync	DATA0	Data	CRC16	EOP	Idle	Time Stamp		
-->	S	00000001	0xC3	8 bytes	0x155D	233 ns	483 ns	00011.6061 1666		

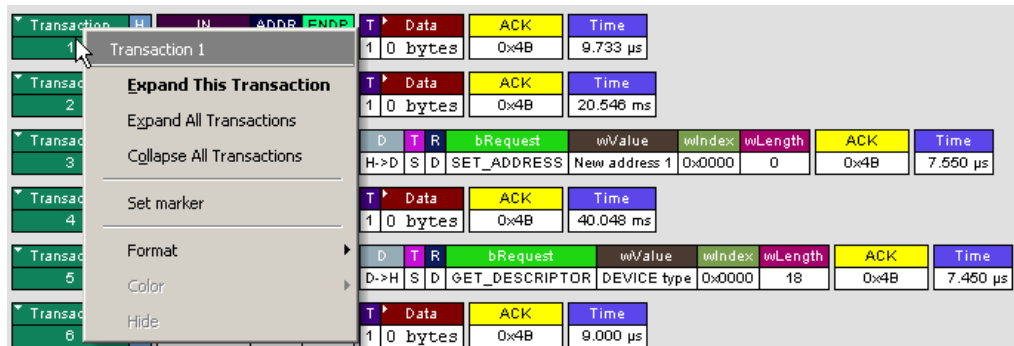
When you instruct the Analyzer to display USB transactions, the components of each transaction are collected from the current recording and are grouped and indented below each decoded transaction. Each row shows a transaction with a unique numeration, a label, and color-coded decoding of important data.

Expanded and Collapsed Transactions

You can expand a specific transaction to view its parts, which are grouped and indented below the transaction.

To expand a transaction:

Step 1 Right-click the transaction number you wish to view to display the Expand Transaction menu:



Step 2 Select **Expand This Transaction**.

The screen displays the selected transaction in expanded format.

Note: The Expand/Collapse transaction feature operates as a toggle: when one format is active, the other appears as an option on the Expand/Collapse drop-down menu.

To collapse a transaction, perform the same operation and select **Collapse This Transaction**.

Note that you can choose to expand or collapse

- **Only** the selected Transaction
OR
- **All** Transactions

It is not necessary to use the Expand/Collapse Transactions menu to shift between expanded and collapsed views of a transaction. You can double-click the **Transaction number field** to toggle back and forth between collapsed and expanded views.

5.29 Switch to Split Transaction View

To select Split Transaction View:

Step 1 Click the  button on the toolbar.

The Trace View screen is re-drawn to display Split Transactions.

Split Trans	L	IN	ADDR	ENDP	T	Data	ACK
44	H	0x96	3	0	1	12 01 00 01 00 00 00 08	0x4B

You can also switch to Split Transactions View from the Menu Bar:

Step 1 Select **Display Options** under Setup.

You see the Display Options General window:

Step 2 Check **Split Transactions**.

5.30 Switch to Transfer View

A **Transfer** is defined in the USB specification as one or more transactions between a software client and its function. USB transfers can be one of four kinds: Control, Interrupt, Bulk, and Isochronous. The system can display all four types.

The default display mode is Packet View. Before you can view decoded transfers, you must switch from Packet View (or Transaction View) to Transfer View.

To select Transfer View:

Step 1 Click  on the toolbar.

The Trace View screen is re-drawn to display Transfers.

Note: Selecting **Show USB transfers** adds a check next to this menu item. If you want to return to Packet View, open the menu and reselect **Show USB transfers**. This action removes the check and returns the display to Packet View.

You can also switch to Transfer View from the Menu Bar:

Step 1 Select **Display Options** under Setup to display the Display Options General window:

Step 2 Check **Transfers**.

Step 3 Click **OK**.

5.31 View Decoded Transfers

After you set Display Options, the Trace View screen is re-drawn to display decoded transfers in the colors and format you selected.

Transfer	H	Control	ADDR	ENDP	bRequest	wValue	wIndex	Descriptors																																																																																																																																																																													
1	S	GET	1	0	GET_DESCRIPTOR	CONFIGURATION type	0x0000	23 descriptors																																																																																																																																																																													
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6	S	0x96	1	0	1	43 bytes	0x4B	9.733 μ s																																																																																																																																																																													
7	S	0x87	1	0	1		0x4B	525.027 ms																																																																																																																																																																													
2	S	GET	1	0	GET_DESCRIPTOR	DEVICE type	0x0000	DEVICE descriptor	1.224 sec																																																																																																																																																																												
3	S	GET	1	0	GET_DESCRIPTOR	STRING type, Index 1	Language ID 0x001B		362.4																																																																																																																																																																												

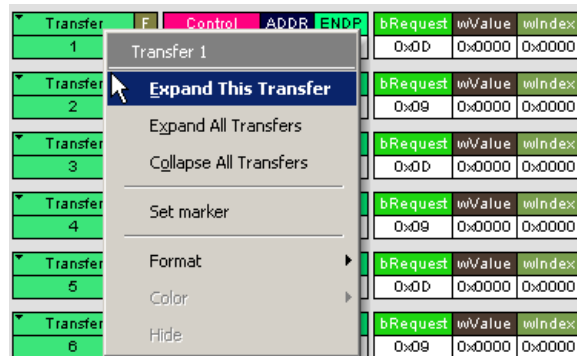
When you instruct the Analyzer to display USB transfers, the components of each transfer are collected from the current recording and are grouped below each decoded transfer. Each transfer row shows a transfer with a unique numeration, a label, and color-coded decoding of important data.

Expanded and Collapsed Transfers

You can expand a specific transfer to view its parts, which are grouped and indented below the transfer.

To expand a transfer:

Step 1 Right-click the transfer number you wish to view to display the Expand Transfer menu:



Step 2 Select **Expand This USB Transfer** to display the selected transfer in expanded format.

Transfer	F	Control	ADDR	ENDP	bRequest	wValue	wIndex
9	S	SET	1	0	SET_INTERFACE	New alternate setting 0	Interface # 0

Transaction	F	SETUP	ADDR	ENDP	D	T	R	bRequest	wValue	wIndex	wLength	ACK
1332	S	0xB4	1	0	H->D	S	I	SET_INTERFACE	New alternate setting 0	Interface # 0	0	0x4B

Packet	Dir	F	Sync	SETUP	ADDR	ENDP	CRC5	EOP	Idle	Time Stamp
6925	-->	S	00000001	0xB4	1	0	0x17	233 ns	183 ns	00011.5989 1586
6926	-->	S	00000001	0xC3	8 bytes	0x231F	233 ns	483 ns	00011.5989 1771	
6927	<--	S	00000001	0x4B	233 ns	988.017 μs	00011.5989 2294			

Transaction	F	IN	ADDR	ENDP	T	Data	ACK	Time
1333	S	0x96	1	0	1	0 bytes	0x4B	2.000 ms

Transfer	F	Control	ADDR	ENDP	bRequest	wValue	wIndex	Data	Time
10	S	SET	1	0	0x01	0x0000	0x0000	64 bytes	10.998 ms
11	S	SET	1	0	0x01	0x0000	0x0001	64 bytes	10.998 ms

Note: The Expand/Collapse transfer feature operates as a toggle: when one format is active, the other appears as an option on the Expand/Collapse drop-down menu.

To collapse a transfer, perform the same operation and select **Collapse This USB Transfer**.

Note that you can choose to expand or collapse

- **Only** the selected Transfer
OR
- **All** Transfers

It is not necessary to use the **Expand/Collapse Transfers** menu to shift between expanded and collapsed views of a transfers. You can double-click the **Transfer number field** to toggle back and forth between collapsed and expanded views.

5.32 Decoding Protocol-Specific Fields in Transactions and Transfers


When transfers or transactions are displayed, the fields in setup transactions and in control, interrupt, and Bulk transfers do not get decoded (by default) and are shown in hexadecimal values. The exceptions are setup transactions and control transfers for standard USB device requests, which are always decoded.

To show specific decoding for class- and vendor-specific device requests and endpoints, you have to use the decoding association mechanism that is described in Chapter 9 on decoding. When you have performed the association, you see the protocol-specific fields of transfers and transactions decoded in the trace view.

5.33 Switch to Host Wire Adapter Segment View

A **Host Wire Adapter Segment** is one or more transfers between a PC and a host wire adapter. To view host wire adapter segments, switch to the Host Wire Adapter Segment trace viewing level.

To select the Host Wire Adapter Segment trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show Host Wire Adapter Segment**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **HWA Segment**, and then click **OK**.


The program redraws the trace view.

Packet	Dir	H	SOF	Frame #	CRC5	Pkt Len	Time	Time Stamp							
149023	-->	S	0xA5	1214.5	0x19	14	500.000 ns	00013.3883 4922							
Transaction	H	IN	ADDR	ENDP	NAK	Time	Time Stamp								
47556	S	0x96	1	3	0x5A	46.900 µs	00013.3883 4952								
HWA Xfr	Control Transfer	HWA_Adr	RPipe	TransferId	bRequest	wValue	Time Stamp								
1	No Data	1	0	0x00000001	SET_ADDRESS	New address 129	00013.3884 0266								
HWA Seg	Control	HWA_Adr	RPipe	TransferId	Seg	Last	D	Trp	R	bRequest	wValue	wIndex	wLength	ResStatus	ResLen
1	Setup+NoData	1	0	0x00000001	0	1	H->D	S	D	0x05	0x0081	0x0000	0	SUCCESS	0
Time Stamp 00013.3884 0266															
Transfer	H	Bulk	ADDR	ENDP	Transfer Request	Setup	Data	Time	Time Stamp						
31	S	OUT	1	1	CONTROL	Data	8 bytes	5.827 ms	00013.3884 0266						
Transfer	H	Interrupt	ADDR	ENDP	Notification	Time	Time Stamp								
32	S	IN	1	3	TRANSFER	377.133 µs	00013.3930 4892								
Transfer	H	Bulk	ADDR	ENDP	Transfer Result	Status	Time Stamp								
33	S	IN	1	2	TRANSFER	SUCCESS	00013.3933 5020								
Transaction	H	IN	ADDR	ENDP	T	Data	ACK	Time Stamp							
47605	S	0x96	1	2	0	16 bytes	0x4B	00013.3933 5020							
Packet	Dir	H	IN	ADDR	ENDP	CRC5	Pkt Len	Idle	Time Stamp						
149174	-->	S	0x96	1	2	0x03	8	433.330 ns	00013.3933 5020						
Packet	Dir	H	DATA0	Data	CRC16	Pkt Len	Idle	Time Stamp							
149175	-->	S	0xC3	16 bytes	0xC9ED	24	300.000 ns	00013.3933 5054							
Packet	Dir	H	ACK	Pkt Len	Time	Time Stamp									
149176	-->	S	0x4B	8	-6.128 ms	00013.3933 5096									
Packet	Dir	H	SOF	Frame #	CRC5	Pkt Len	Time	Time Stamp							
149029	-->	S	0xA5	1214.6	0x19	14	533.330 ns	00013.3884 4920							
Transaction	H	IN	ADDR	ENDP	NAK	Time	Time Stamp								
47558	S	0x96	1	3	0x5A	124.467 µs	00013.3884 4952								

5.34 Switch to Host Wire Adapter Transfer View

A **Host Wire Adapter Transfer** is one or more wire adapter segments or one or more transfers between a PC and a host wire adapter. To view host wire adapter transfers, switch to the Host Wire Adapter Transfer trace viewing level.


To select the Host Wire Adapter Transfer trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show Host Wire Adapter Transfer**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **HWA Transfer**, and then click **OK**.

5.35 Switch to Device Wire Adapter Segment View

A **Device Wire Adapter Segment** is one or more transfers between a PC and a device wire adapter. To view device wire adapter segments, switch to the Device Wire Adapter Segment trace viewing level.


To select the Device Wire Adapter Segment trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show Device Wire Adapter Segment**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **DWA Segment**, and then click **OK**.

5.36 Switch to Device Wire Adapter Transfer View

A **Device Wire Adapter Transfer** is one or more wire adapter segments or one or more transfers between a PC and a device wire adapter. To view device wire adapter transfers, switch to the Device Wire Adapter Transfer trace viewing level.

To select the Device Wire Adapter Transfer trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show Device Wire Adapter Transfer**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **DWA Transfer**, and then click **OK**.


5.37 Switch to PTP Transactions

The Analyzer supports the Picture Transfer Protocol (PTP) and also supports the Media Transfer Protocol (MTP), which is an extension of PTP. The Analyzer can track PTP transactions, object transfers, and sessions.

A **transaction** is a standard sequence of phases for invoking an action. In PTP, an Initiator-initiated action provides input parameters, responses with parameters, and binary data exchange, and is a single **PTP Transaction**. Also, a single Asynchronous Event sent through the interrupt pipe is a single PTP Transaction.

The PTP Transaction trace viewing level is the lowest PTP level.

To view PTP transactions, switch to the PTP Transaction trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show PTP Transaction**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **PTP Transaction**, and then click **OK**.


5.38 Switch to PTP Object Transfers

A logical object on a device has a unique 32-bit identifier (**object handle**). The object handle is also unique for the session (defined below). An **object transfer** contains all the transactions for an object handle. In PTP, all of an object handle's PTP Transactions are a single **PTP Object Transfer**.

A PTP Object Transfer can include both PTP Transactions that involve an Initiator-initiated action (for example, **GetObject**, **DeleteObject**, and **GetObjectInfo** transactions) and PTP Transactions that involve a single Asynchronous Event sent through the interrupt pipe.

The PTP Object Transfer trace viewing level is the middle PTP level.

To view PTP object transfers, switch to the PTP Object Transfer trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show PTP Object**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **PTP Object**, and then click **OK**.


5.39 Switch to PTP Sessions

A **session** is a state of persisting communication between a device and a host during which the connection is continuous and the login and other communication parameters do not change. A session begins with an **OpenSession** operation, which establishes the communications connection and parameters, and ends with a **CloseSession** operation.

A session contains all object transfers (and their transactions), plus all transactions that do not belong to object transfers, between an OpenSession operation and a CloseSession operation. For PTP, all PTP Object Transfers and all PTP Transactions that occur from the OpenSession operation to the CloseSession operation is a single **PTP Session**.

The PTP Session trace viewing level is the highest PTP level.

To view PTP sessions, switch to the PTP Session trace viewing level:

- Click  on the toolbar.
OR
- Select **View > Show PTP Session**.
OR
- Select **Setup > Display Options** to display the Display Options window, check **PTP Session**, and then click **OK**.

5.40 Using the Trace Navigator

You can use the Trace Navigator to show the structure of the entire trace from different points on the Trace view, thereby refining the trace view to a packet range in the trace that is most interesting to you. This range can be set by you to show smaller parts of the trace.

To display the Navigator bar, click  in the toolbar or select the Navigation Bar checkbox in the Display Options General window.

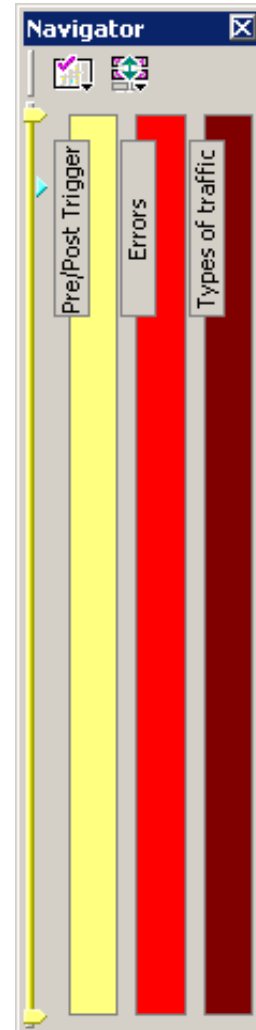
The Navigator bar can be repositioned in the trace and can be oriented horizontally or vertically, docked or undocked by dragging the parallel bars at the top or side of the Navigator bar. By default, the Navigator bar appears vertically to the right of the trace window.

The Navigator bar represents different types of trace information in the order of the packets. The top of each bar corresponds to the first packet in the trace, and the bottom corresponds to the last packet. The Navigator bar is made up of three parts: Pre and Post-Trigger traffic, Errors, and Types of Traffic.

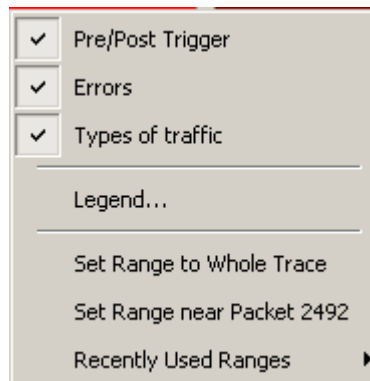
At any time, a line in the navigator bar of one pixel in height represents a fraction of the trace data. If the Navigation bar is 400 pixels high, then each bar in this example would represent 1/400 of the trace. If the trace had 4000 packets total, each bar would represent ten packets. In the Types of Traffic portion of the navigation bar, the color of the bar would be that of the most important item in those ten packets. See “Navigator Bar Attributes” on page 70.

Drag the yellow caret, at the top or bottom, to set the packet range. When you move the caret, a message shows the packet range.

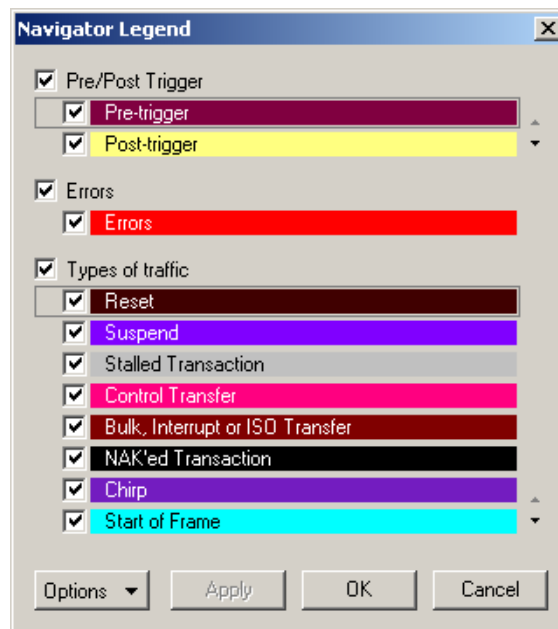
The blue caret indicates the current packet position in the trace view.



Right-click the **Navigator** to display the pop-up menu.



- **Pre/Post Trigger, Errors, Types of Traffic:** Shows or hides traffic information in the Navigator.
- **Legend:** Shows or hides Trigger, Error, and Traffic Type categories in the Navigator.



- **Set Range to Whole Trace:** Resets packet range to the entire trace.
- **Set Range near Packet number:** Sets the packet range near the packet where your mouse pointer is positioned in the Navigator bar.
- **Recent Ranges:** Displays a history of ranges that were previously selected.

Navigator Bar Attributes

Pre/Post Trigger Bar

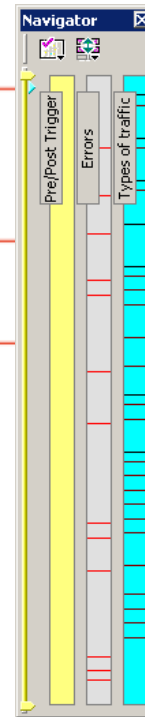
- Brown - Pre-trigger packets
- Yellow - Post-trigger packets

Errors Bar

- Red - Packet errors in a trace

Traffic Type Bar

- Dark red - Reset
- Purple - Suspend
- Grey - Stall
- Pink - Control transfers
- Brown - Data transactions
- Black - NAK'd transactions
- Light blue - Start of Frame (SOF)



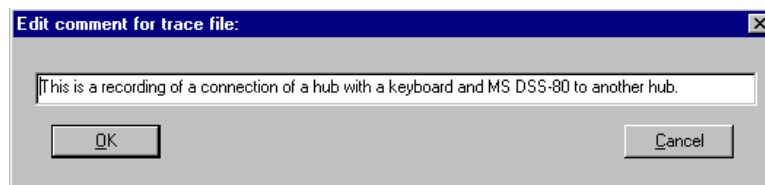
The traffic types are shown in order of importance. For example, if a NAK'd transaction occurred in the same sample area as a SOF, the NAK would take precedence, and the Navigator would show the black bar.

5.41 Edit Comment

You can create, view, or edit the 100-character comment field associated with each Trace file. These comments are visible in the Windows® Explorer if the Comments attribute is included in the Details view.

Step 1 Select **Edit Comment** under **File** on the Menu Bar.

You see the **Edit comment for trace file** window:



Step 2 Create, view, or edit the comment.

Step 3 Click **OK**.

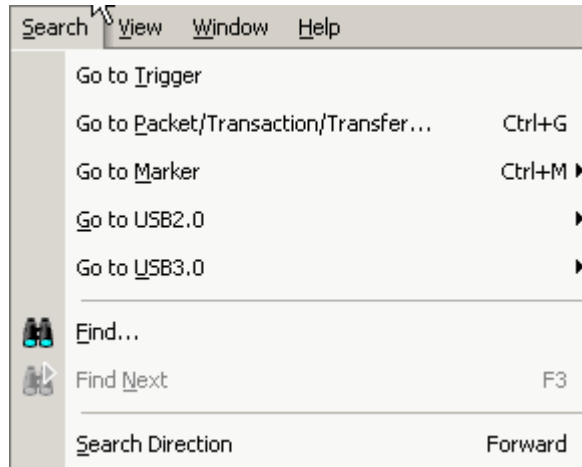
You can view comments in Windows Explorer by selecting the Comments attribute.

Chapter 6: Searching Traces

The Search feature provides several options for searching through recorded traffic, allowing you to find specific packets based on triggering status, packet number, marking, or content.

To view the Search options:

- Click **Search** in the Menu bar to display the Search drop-down menu:



6.1 Go to Trigger

Note: **Go to Trigger** is enabled only when a trigger has created the traffic file.

To display a Trigger Event:

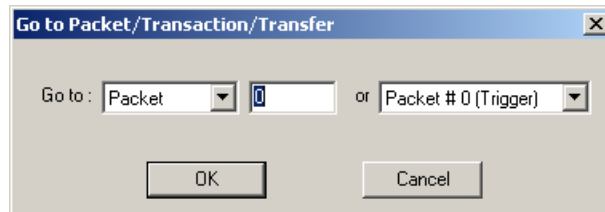
- Select **Go to Trigger** under **Search** on the Menu Bar.

The Trace View is repositioned to the first packet following the Trigger event. This packet is at the top of the screen.

6.2 Go to Packet/Transaction/Transfer

To display a specific packet:

- Step 1** From the menu bar, select the command **Search > Go to Packet/Transaction/Transfer** to display the Go to Packet/Transaction/Transfer window:



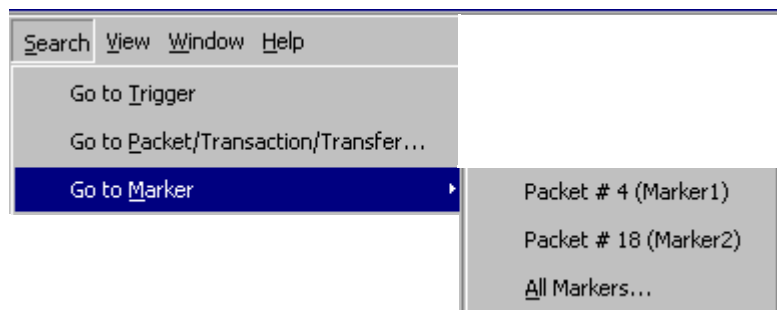
- Step 2** Select the desired viewing level (packet, transaction etc.) from the drop-down menu next to the words **Go to**.
- Step 3** Enter the number of the packet you want to display.
- Step 4** Click **OK**. The Trace View is repositioned with the selected packet at the top of your screen.

6.3 Go to Marker

To instruct the Analyzer to display a marked packet:

- Step 1** Select **Go to Marker** under **Search** on the Menu Bar.

You see a drop-down menu listing the marked packets in that Trace View:



- Step 2** Select the desired packet from the displayed list. The Trace View is repositioned with the selected packet at the top of your screen.

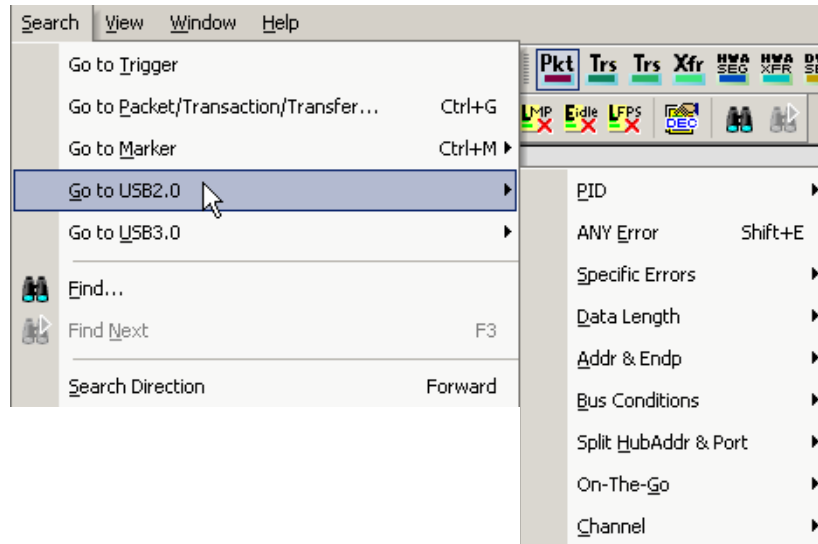
Note: The **Go to Marker** feature functions in conjunction with the **Set Marker** feature. The comments within the parentheses following each marked packet are added or edited with the **Set Marker** feature. Please refer to “Set Marker” on page 46.

You can use **Ctrl+M** to go immediately to the All Markers dialog.

6.4 Go To USB2.0

The Go To USB2.0 feature takes you directly to an event in a Trace.

Step 1 Select Go To USB2.0 under Search on the Menu Bar to display the Go To USB2.0 drop-down menu. For 2.0 data, the menu is:



Step 2 Select the event you want to go to and enter the necessary information.

Packet IDs (PIDs)

PID		OUT	Shift+O
ANY Error	Shift+E	IN	Shift+I
Specific Errors		SOF	Shift+F
Data Length		SETUP	Shift+S
Addr & Endp		DATA0	Shift+0
Bus Conditions		DATA1	Shift+1
Split HubAddr & Port		DATA2	Shift+2
On-The-Go		MDATA	Shift+M
Channel		ACK	Shift+A
		NAK	Shift+N
		STALL	Shift+L
		NYET	Shift+Y
		PRE/ERR	Shift+P
		SPLIT	Shift+X
		PING	Shift+G
		EXT	Shift+R
		DATAx	Shift+D

Select the type of packet to which you want to go.

ANY Error

Repositions the trace to show the next instance of any error.

Errors

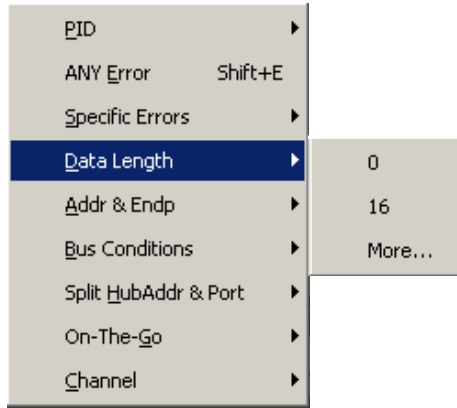
The Errors menu allows you to search for five different types of error: PID, CRC5, CRC16, Packet Length, and Stuff Bits. Menu items appear in bold if they are present in the trace or are grayed out if not present in the trace, as shown in the example below.



You can press **Shift+E** to go to the first error of any type.

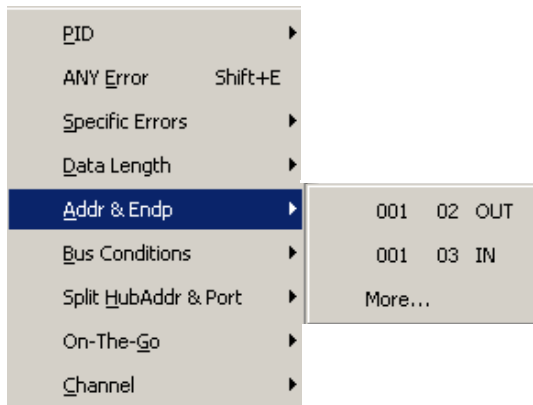
Data Length

Allows you to search for data packets of particular lengths. Lengths are displayed in Bytes in a drop down menu as shown below. Selecting a length causes the display to move to the next instance of that packet length.



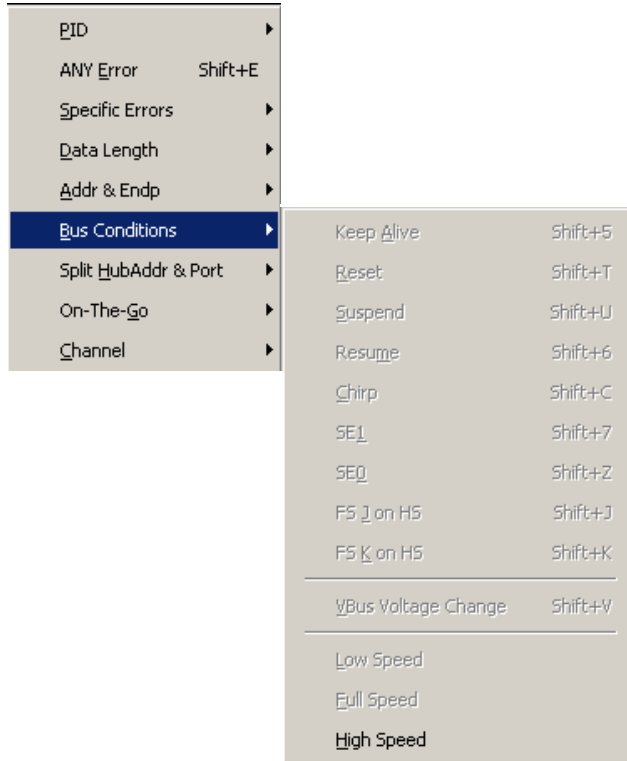
Addr & Endp

The Addr & Endp feature allows you to search for the next packet which contains a particular address and endpoint. All available address endpoint combinations are displayed in the pull down menu.



Bus Conditions

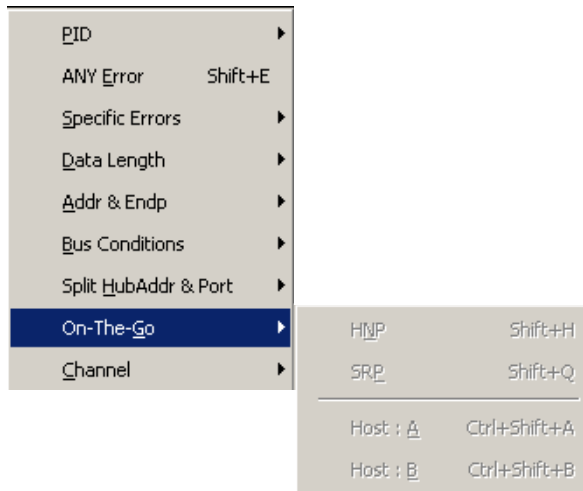
Allows you to search by bus conditions such as traffic speed, reset, and suspend. All available bus conditions are displayed in the pull down menu.



On-the-Go

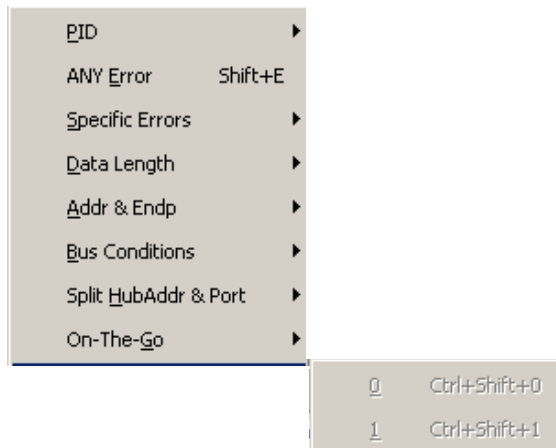
Allows you to search for On-the-go attributes. The On-the-Go submenu contains entries for:

- **HNP**: Host Negotiation Protocol
- **SRP**: Session Request Protocol
- **Host: A**: Hosts with an A plug
- **Host: B**: Hosts with a B plug



Channel

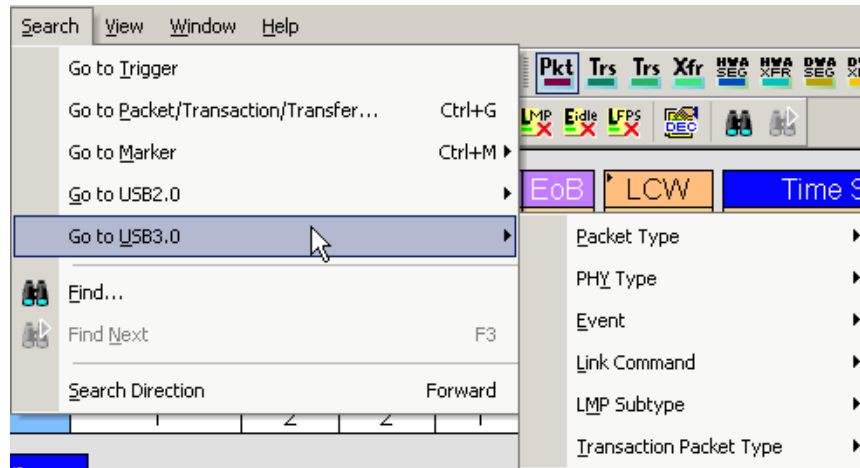
Allows you to search for traffic by 1 (Classic-Speed) or 0 (Hi-Speed).



6.5 Go To USB3.0

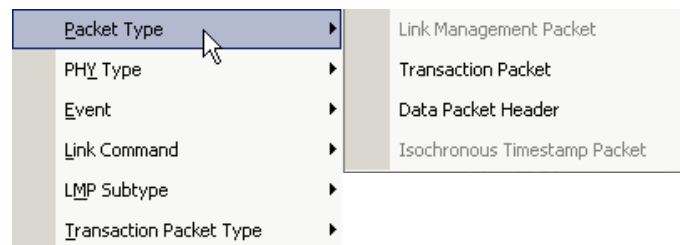
The Go To USB3.0 feature takes you directly to an event in a Trace.

Step 1 Select Go To USB3.0 under Search on the Menu Bar to display the Go To USB3.0 drop-down menu. For 3.0 data, the menu is:



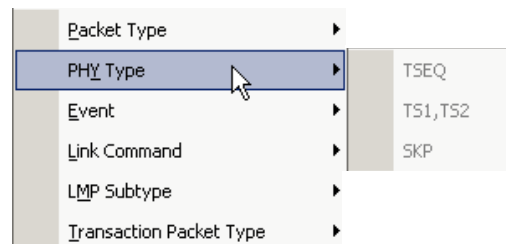
Step 2 Select the event you want to go to and enter the necessary information.

Packet Type



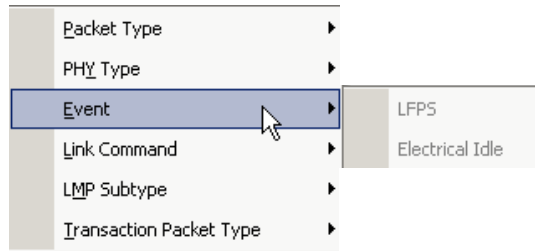
Select the Packet Type to which you want to go.

PHY Type



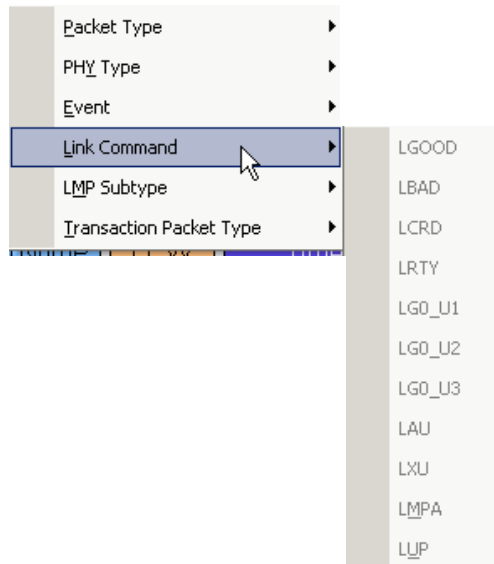
Select the PHY Type to which you want to go.

Event



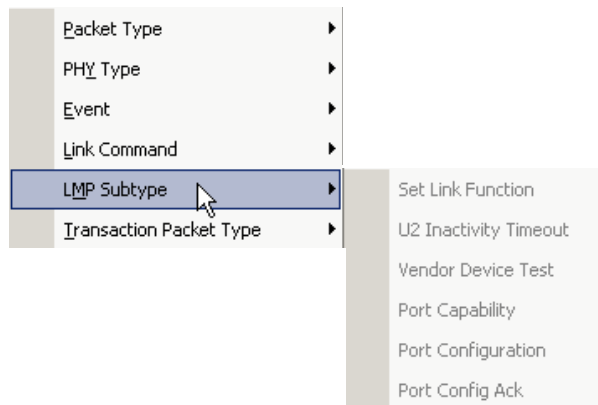
Select the Event to which you want to go.

Link Command



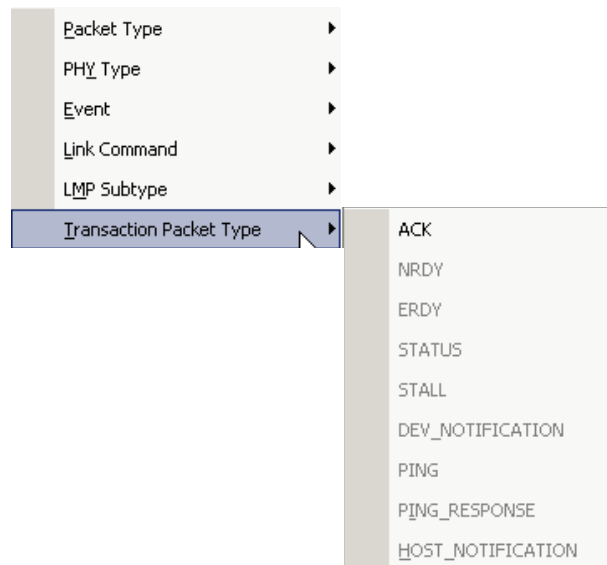
Select the Link Command to which you want to go.

LMP Subtype



Select the LMP Subtype to which you want to go.

Transaction Packet Type



Select the Transaction Packet Type to which you want to go.

6.6 Find

Find allows searches on an open trace using one or more criteria. You can search by packet, transactions, split transaction, transfer, packet type, and fields within packets.

To run **Find**, select **Search > Find** or by click  on the toolbar.

Searches can combine criteria using the options **Intersection** and **Union**.

Intersection creates AND statements such as “Find all packets with x and y.”


Union creates OR statements such as “Find all packets with x OR y.”

You can also perform searches in which packets or events are excluded from a trace, using the **Exclusion** option.

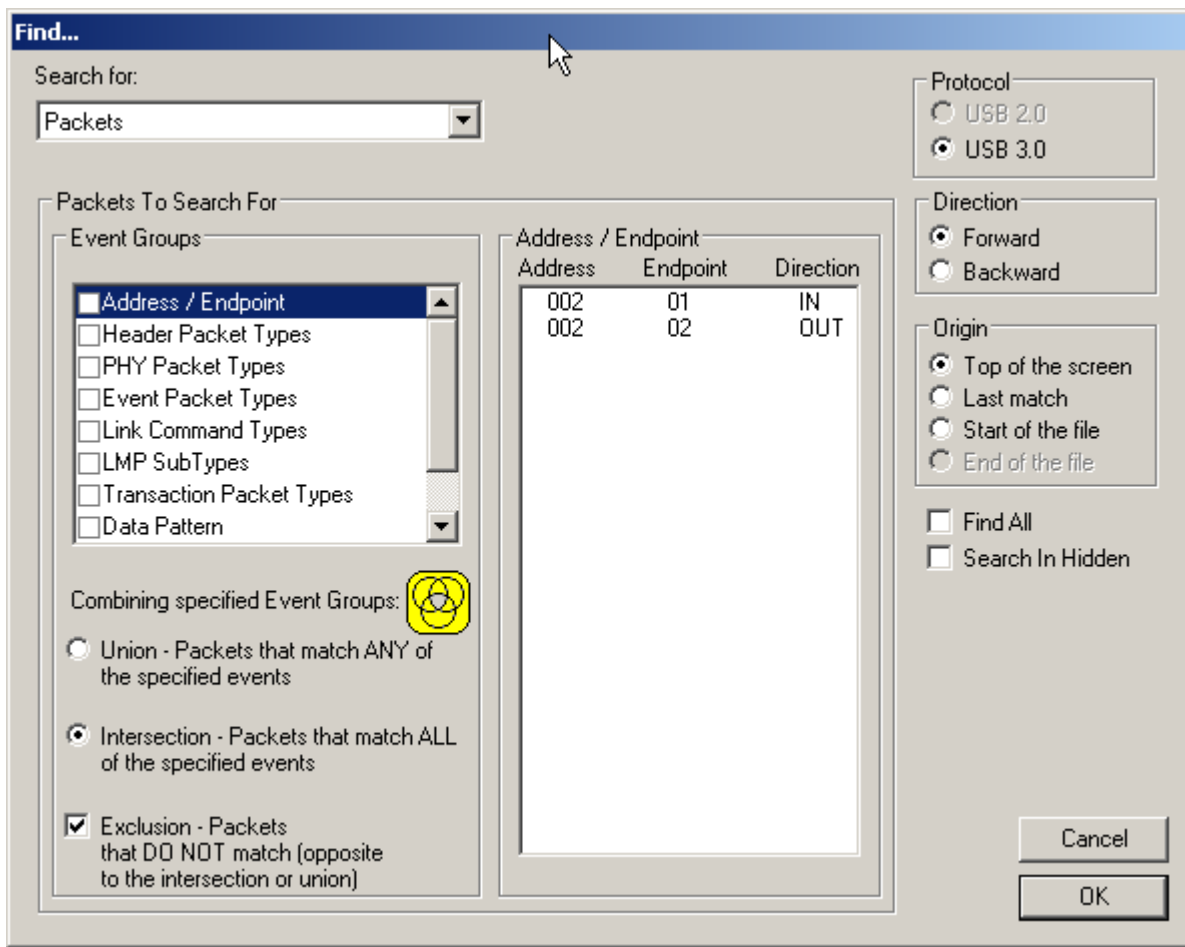
To perform a search:

Step 1 Select **Find...** under **Search** on the Menu Bar

OR

Click  in the Tool Bar.

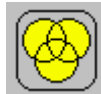
You see the User-Defined Find Events screen:



- Step 2** If the file has both USB 2.0 and USB 3.0 traffic, select either of these technologies in the Protocol area (upper right): **USB 2.0** or **USB 3.0**.
- Step 3** Select **Packets, Transactions, Split Transactions, Transfers, HWA Segments, HWA Transfers, DWA Segments, DWA Transfers, PTP/MTP Transactions, PTP/MTP Objects, or PTP/MTP Sessions** from the top left list box to list that type of event in the Events Group box.
- Step 4** Select one or more events from the **Events Group** box:
- Address/Endpoint
 - Address/RPipe
 - Data Lengths
 - Data Pattern
 - Errors
 - Handshake
 - Link Command Types
 - LMP Subtypes
 - Object Counts
 - Object Handler
 - Object Format Type
 - On-the-Go Protocol
 - Operation Code
 - Packet Types (Header, PHY, Event, Transaction)
 - Result Status
 - Split
 - Transfer Lengths

Step 5 Select one of the following options:

- **Union:** Find all packets matching ANY of the specified events.



- **Intersection:** Find packets matching ALL of the specified events.



- **Exclusion:** Exclude packets matching any of the specified events.

Exclusion works with the other two options:

Select **Union AND Exclusion** (=Exclude packets with ANY of the following fields) or

Intersection AND Exclusion (=Exclude packets with ALL of the following fields.)



Step 6 Optionally set the search **Direction** and **Origin**.

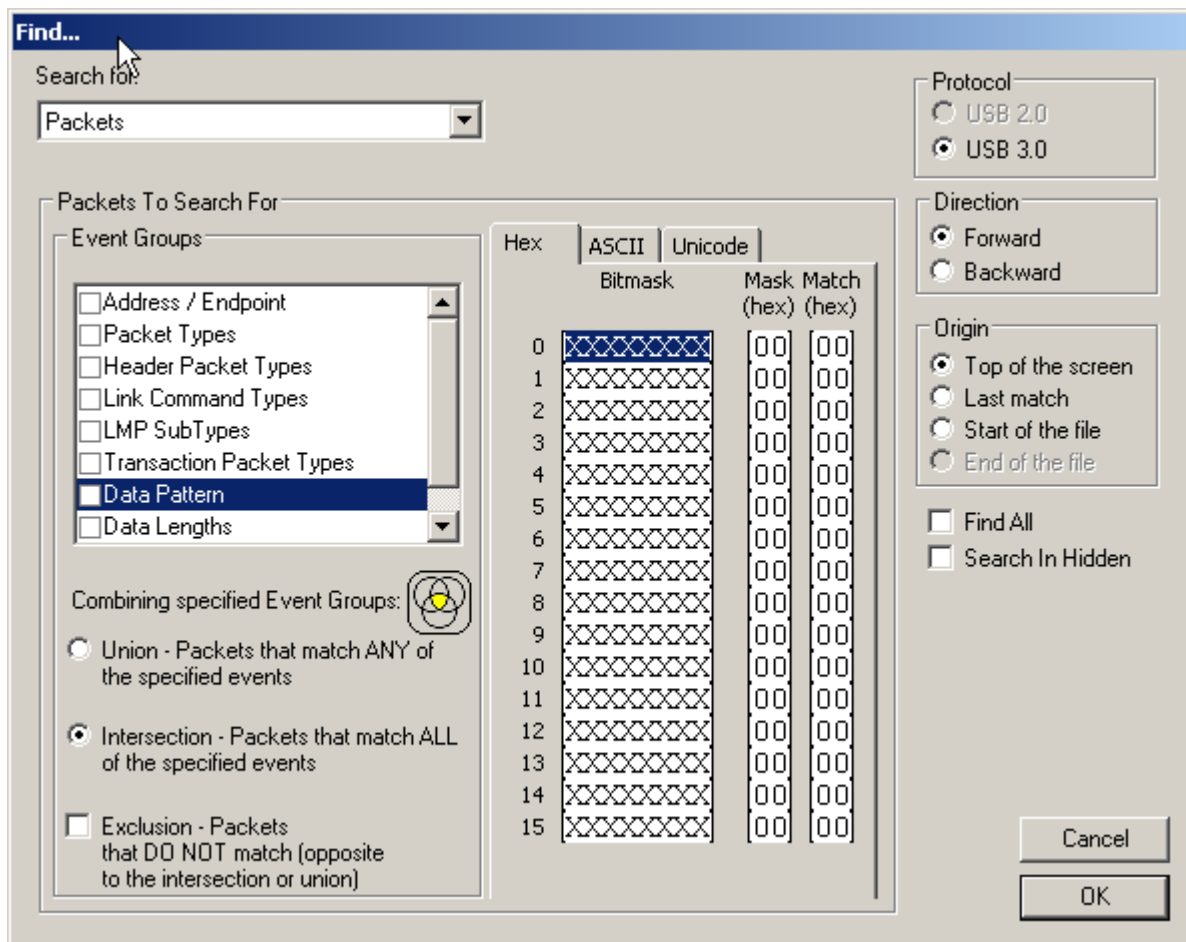
Step 7 Optionally check to **Search in Hidden** or **Find All**.

Step 8 Click **OK**.

After the search finishes, the program displays the packets meeting the search criteria.

Data Pattern Mask and Match

If you select Data Pattern as the Event Group in the Find dialog, you can set the Bitmask, Mask, and Match for each bit,




Bitmask and Match always correlate. When you set Bitmask or Match, the other changes to maintain their correlation.

Note: If you set Bitmask/Match before setting Mask, the Mask changes to the default mask. You must change to the Mask that you want.

If you set an appropriate Mask before setting Bitmask/Match, the Mask does not change automatically to a default mask if you change Bitmask/Match.

6.7 Find Next

To apply the previous **Find** parameters to the next search:

- Select **Find Next** under **Search** on the Menu Bar.
OR
- Click  on the Tool Bar.

6.8 Search Direction

Toggles the search forward or backwards. The current direction is indicated in the menu.


6.9 Protocol

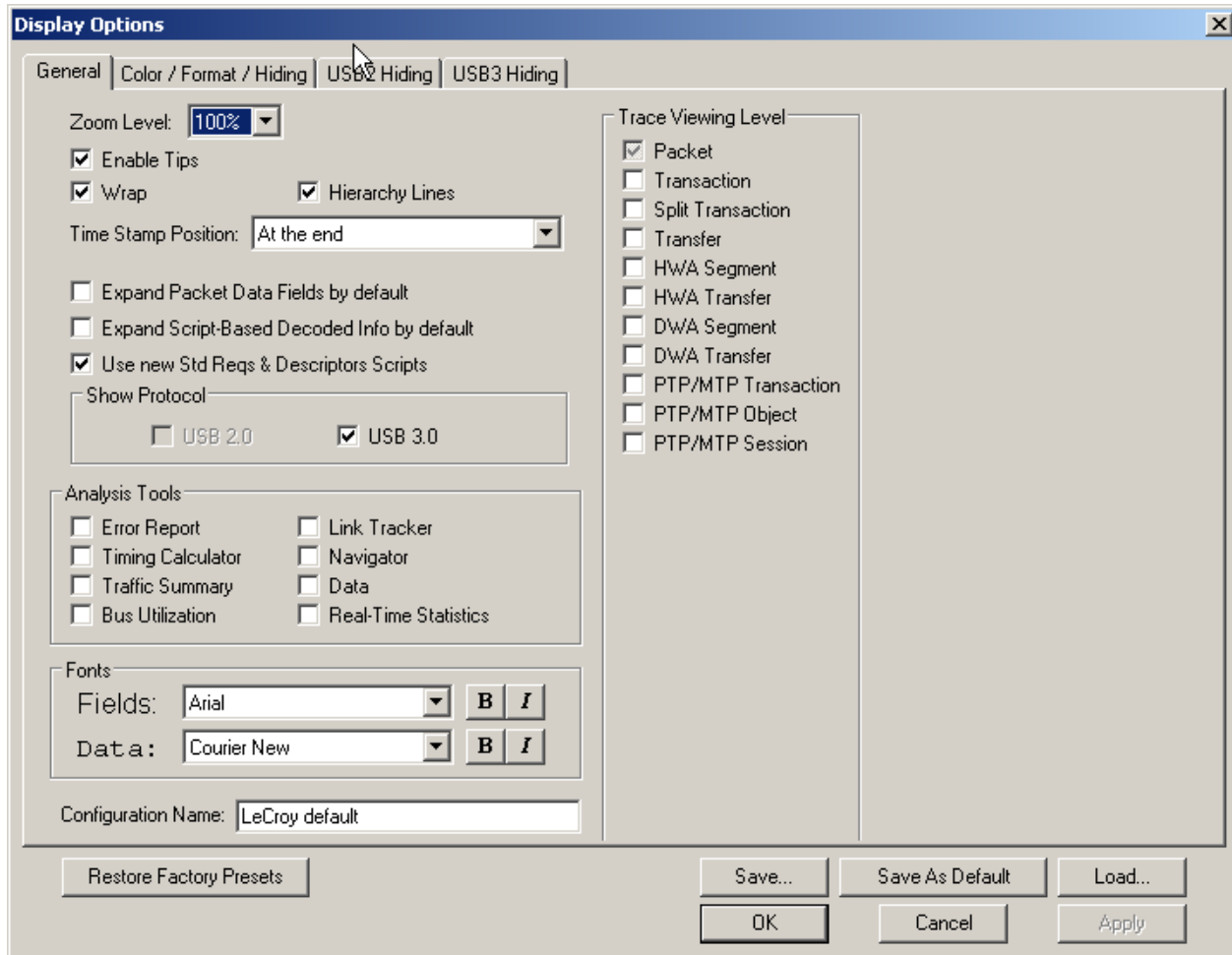
Select **USB 2.0** or **USB 3.0** for the technology to use for a mixed file.

Chapter 7: Display Options

You can select what information to display in Trace Views using the Display Options window.

To open the Display Options window:

- Select **Display Options** under Setup on the Menu Bar.
OR
- Click  on the Tool Bar.:



You can select General, Color/Format/Hiding, and Level Hiding display options. The following sections describe these display options.

7.1 General Display Options

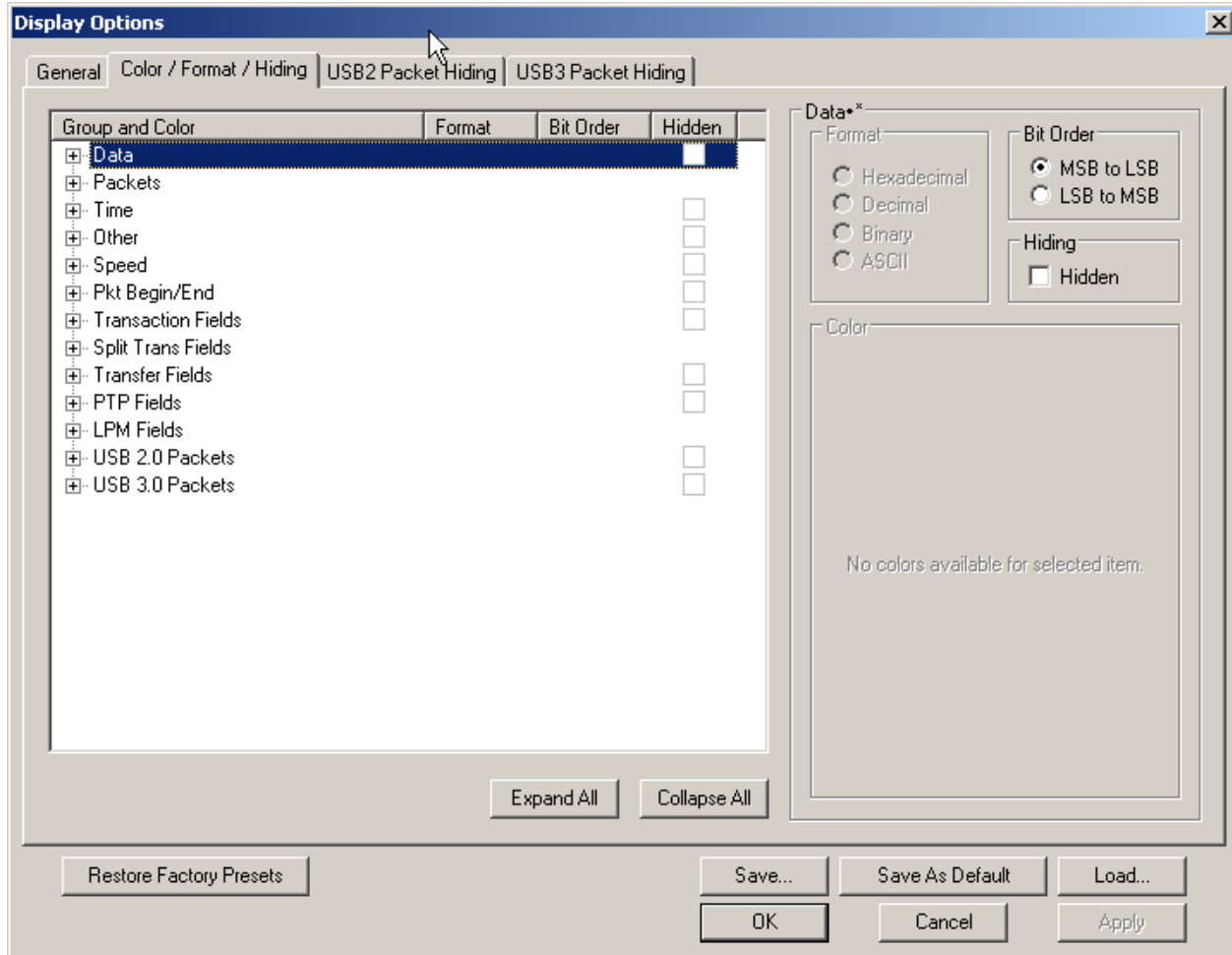
You specify the main Trace View information types and settings using General Display Options (see figure on previous page):

- **Zoom Level:** Zooms out from 100% (default) to 10% or zooms in from 100% to 200%.
- **Enable Tips:** Pops up text when you position the cursor over a field.
- **Wrap:** Wraps lines of traffic information instead of truncating lines at the right edge of the display.
- **Hierarchy Lines:** Displays lines on the left side of Trace View showing the hierarchy from Packets to Transactions to Split Transactions to Transfers if you show higher-level decodes.
- **Timestamp Position:** Aligns the Timestamp field **At the beginning** (in a column on the left side of the Trace View), **At the end** (in a column on the left side of the Trace View), or **Merge with Packet/Transaction/Translation**. Selecting this option allows easier comparison with previous or following timestamps.
- **Expand Packet Data Fields by default:** Displays packet data fields in expanded mode. If this option is not selected, packet data fields display in collapsed mode, and you can expand them manually.
- **Expand Script-Based Decoded Info by default:** Displays decoded transfer fields in expanded mode. If this option is not selected, decoded transfer fields display in collapsed mode, and you can expand them manually.
- **Use new Std Reqs & Descriptors Scripts:** Use dynamically loaded **.DEC** files (rather than **.REQ** and **.DSC** files) for decoding Class and Vendor requests or endpoints.
- **Show Protocol:** Use USB 2.0 or USB 3.0.

- **Analysis Tools**
 - **Error Report:** Displays the Errors section of the Traffic Summary window.
 - **Timing Calculator:** Displays the Timing Calculator window from the beginning of a packet or marker to the beginning of another packet or marker, including Total Time unit, Bus Utilization Time and Bandwidth, and selected Global, Low Speed, Full Speed, High Speed, Transactions, and Devices.
 - **Traffic Summary:** Displays the Traffic Summary window, showing all reports, including Packets, Transactions, Transfers, and Errors.
 - **Bus Utilization:** Displays the Bus Utilization window, including Packet length, Bus usage, and Bus usage by device.
 - **Link Tracker (3.0):** Opens window that displays traffic in a strictly chronological view.
 - **Navigator:** Displays the Navigation bar, including Pre/Post Triggers, Errors, and Types of Traffic.
 - **Data View:** Displays packet payload information.
 - **Real-Time Statistics (2.0):** Displays the Real-Time Statistics window, including Data Packet Count, Data Payload Throughput, and Bus Usage.
- **Trace Viewing Level:** Displays Packets, Transactions, Split Transactions, Transfers, Host Wire Adapter Segments, Host Wire Adapter Transfers, Device Wire Adapter Segments, Device Wire Adapter Transfers, PTP/MTP Transactions, PTP/MTP Objects, and PTP/MTP Sessions.
- **Fonts:** Sets the font type and bold or italic style for Fields and Data.
- **Configuration Name:** You can name the current set of Display Options values for use with an **.opt** file. (The options file can have a different name.)
- **Restore Factory Presets:** Sets all Display Options values to the installed values.

7.2 Color/Format/Hiding Display Options

To modify the colors, formats, and hiding options, select the **Color/Format/Hiding** tab.

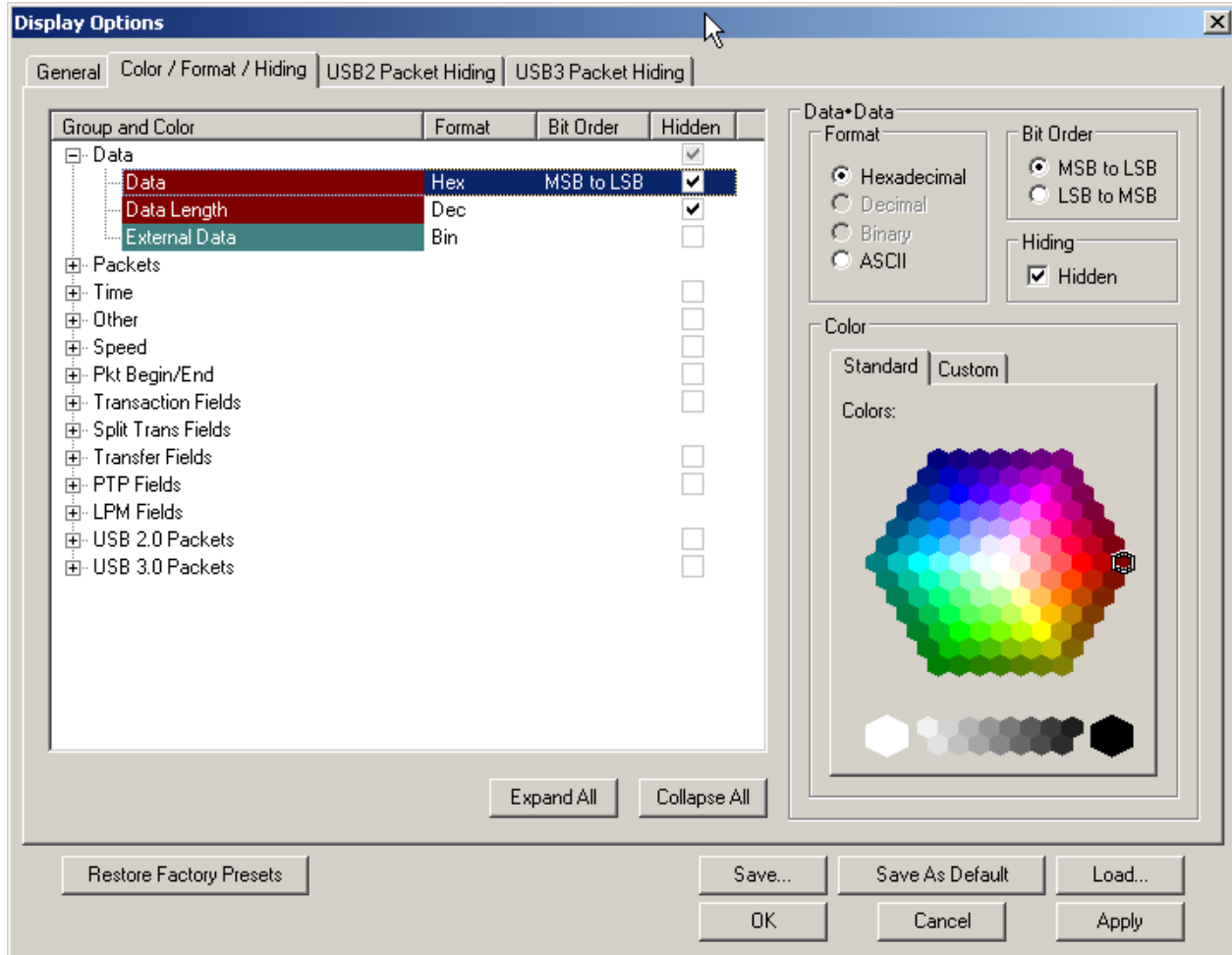


Color Display Options

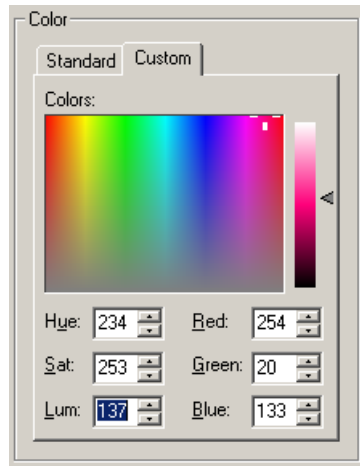
The program uses a default set of colors for each type of data in each group of data. The colors and color combinations are appropriate for most graphic systems. You can alter any color.

To specify a color for an information type, in the Color/Format/Hiding tab, select a row (such as Data) in the Group and Color column and expand it.

Select a data type (such as Data Length) in the Group, then select a color in the Color section, using Standard or Custom colors. Use a bright color for each important field.



To customize colors, use the Custom tab.



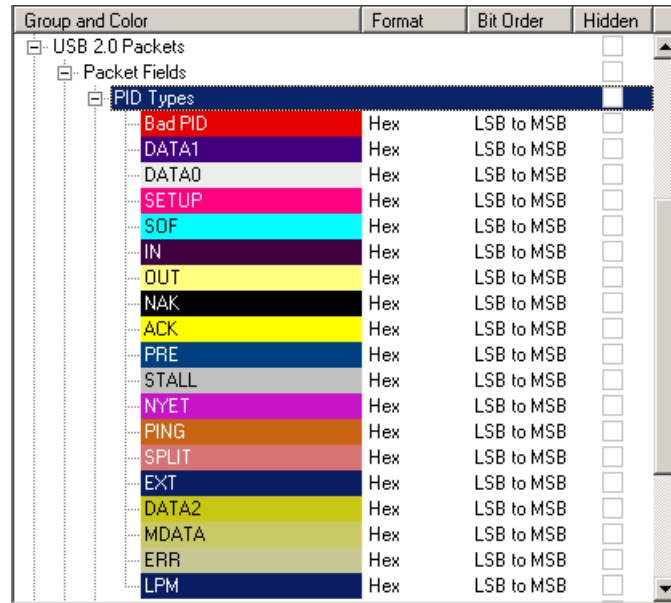
Note: You cannot change the color of an Invalid Data (packet error) field. It is permanently set to red.

Formats Display Options

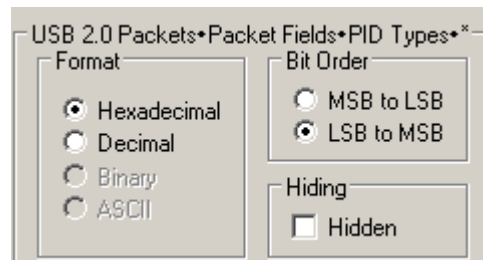
For each type of data in each group of data, the program has a default data format. Examples of number data formats are Bin (binary), Dec (decimal), and Hex (hexadecimal). Examples of date and time data formats are Hex uFrame, Dec uFrame, Date & Time, Time, Bit Time, seconds, microseconds, and nanoseconds. An example of a text data format is ASCII. You can alter some data formats.

To specify a data format for an information type, in the Color/Format/Hiding tab, select a row (such as Packet Fields) in the Group and Color column and expand it.

Select a data type (such as PID Types) in the Group:



Select a format in the Format section. The following formats are available for PID Types:

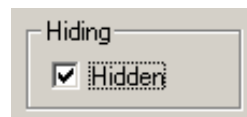


If available, select Bit Order in the Format section. The options are MSB to LSB or LSB to MSB.

Hiding Display Options

By default, no data is hidden. You can hide any group of data and any type of data. You can hide transactions, SOFs; NAKs; High, Full, or Low Speed packets; traffic from one or both recording channels; and Addresses and Endpoints.

To hide one or more fields, select the Group and Data type in the Group and Color column, then click the Hidden checkbox in the display or the Hidden checkbox in the Hidden section of the Format section.



7.3 USB 2.0 Hiding Options

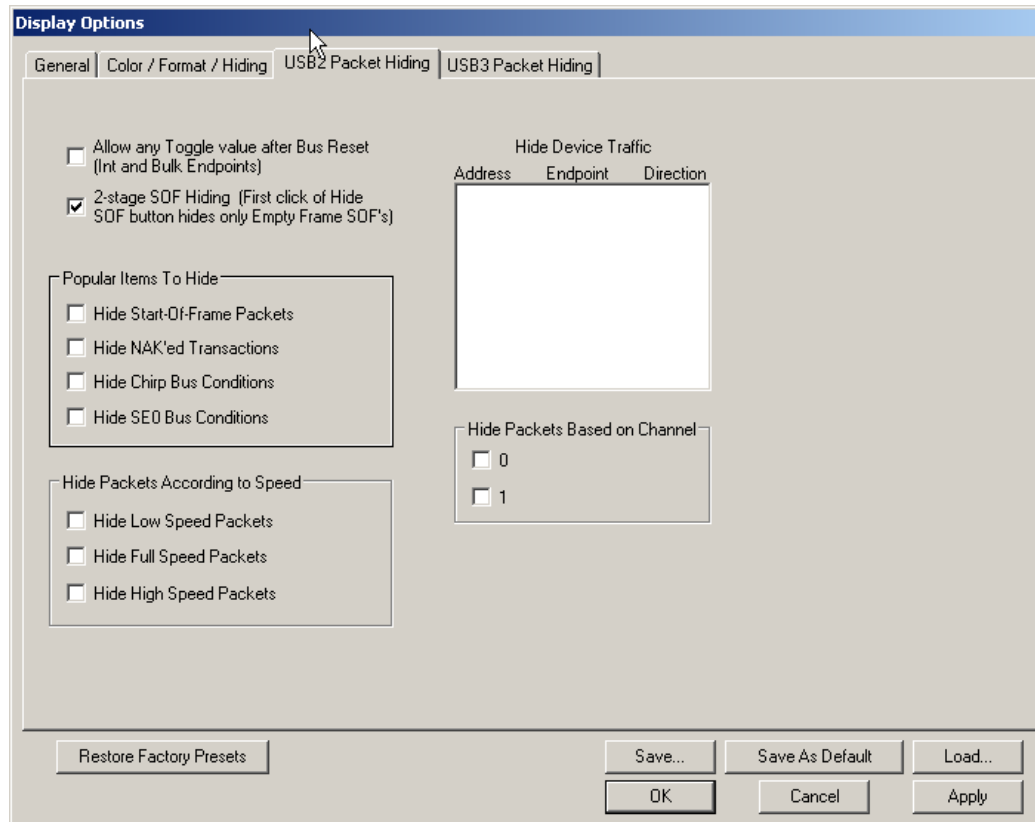
By default, no data packets, transactions, or bus conditions are hidden. You can hide:

- Start of Frame packets
- NAK'ed transactions
- Chirp Bus conditions
- SE0 Bus conditions
- High, Full, or Low Speed packets
- Channel 0 or Channel 1 packets

You can allow any toggle value after bus reset (Int and Bulk Endpoints). Depending on the device, after Bus Reset the endpoint toggle state might or might not be reset. Selecting this option prevents display of a toggle violation error.

You can have 2-stage SOF hiding. You can display all SOFs, hide all SOFs, or hide empty SOFs (show only SOFs with endpoint traffic and hide empty frames). Selecting this option allows you to hide empty SOFs with one click of the Hide SOF button or hide all SOFs with two clicks of the Hide SOF button.

Select the **USB2 Hiding** tab, then select the data types to hide.

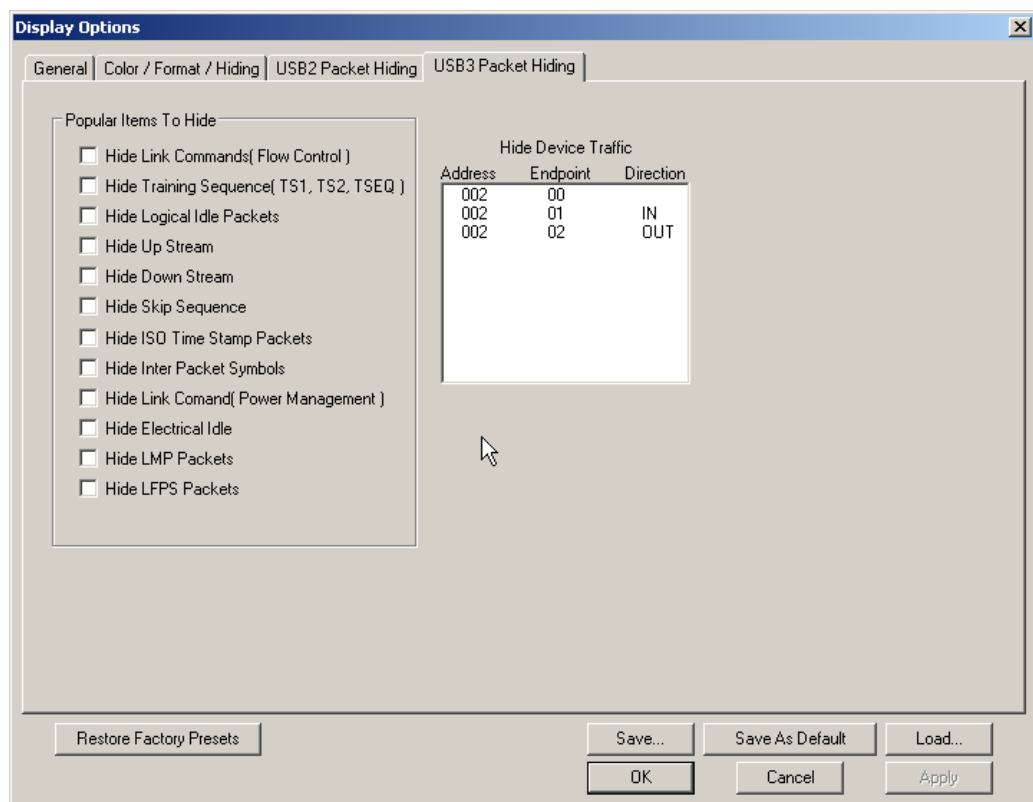


7.4 USB 3.0 Hiding Options

By default, no data packets, transactions, or bus conditions are hidden. You can hide:

- Link Commands (Flow Control)
- Training Sequences (TS1, TS2, TSEQ)
- Logical Idle Packets
- Upstream Packets
- Downstream Packets
- Skip Sequences
- ISO Time Stamp Packets
- Inter-Packet Symbols (unexpected packets)
- Link Commands (Power Management)
- Electrical Idles
- LMP Packets
- LFPS Packets

Select the **USB3 Hiding** tab, then select the data types to hide



7.5 Saving Display Options

You can save a set of Display Options values, make a set the default settings, or use a saved set of values with the commands at the bottom of the **Display Options** window:

- To save the current Display Options values in an options file for use in future sessions, click **Save**. Enter a file name without a file name extension. The program adds the **.opt** extension. (The file must have an **.opt** file name extension.)
- To load a previously saved **.opt** file, click **Load** and select a file name.
- To save the current Display Options values in the **default.opt** options file for use as the default display options, click **Save as Default**. (Do not delete the **default.opt** file.)
- To apply the current Display Options values, click **Apply**. The Display Options window remains open.
- To apply the current Display Options values and close the Display Options window, click **OK**.
- To cancel unsaved changes to display values and exit the Display Options window, click **Cancel**.

Chapter 8: Decode Requests

8.1 Class and Vendor Definition Files

LeCroy Analyzers use script files to decode class and vendor requests. The script files are read when the application is initialized. After reading, the Analyzer decodes class and vendor requests as instructed by the files.

.DEC files represent the new method of decoding. DEC stands for “decoder” and describes both Class and Vendor requests in a C-like language. Each **.dec** file stores an endpoint or request decode. When the application starts, these files are loaded dynamically. Subdirectories are supported.

Note: The **.dec** files listed in the following table are in the **Scripts** directory under the installation directory:

USB Decode	USB Decoder Name	USB-IF Codes		
		Base Class	Sub Class	Protocol ID
Audio Class decoding 2.0 AudioClass\Audio1.0Requests.dec AudioClass\Audio2.0Requests.dec	Audio	01h		
Communications and CDC Control	CCID	02h		
Direct Line Control Model	CCID	02h	01h	
Abstract Control Model	CCID	02h	02h	
Telephone Control Model	CCID	02h	03h	
Multi-Channel Control Model	CCID	02h	04h	
CAPI Control Model	CCID	02h	05h	
Ethernet Networking Control Model	CCID	02h	06h	
ATM Networking Control Model	CCID	02h	07h	
Wireless Handset Control Model	CCID	02h	08h	
Device Management Model	CCID	02h	09h	
Mobile Direct Line Model	CCID	02h	0Ah	
OBEX Model	CCID	02h	0Bh	
Communication Device Subclass/EEM Communications\CommRequests.dec Communications\CommInterrupt.dec Communications\CommCDCEEM.dec	CCID	02h	0Ch	

USB Decode	USB Decoder Name	USB-IF Codes		
		Base Class	Sub Class	Protocol ID
HID (Human Interface Device)	HID	03h		
HUT (HID extension)	HID	Extension		
Monitor (HID extension)	HID	Extension		
Physical Interface (force-feedback extension to HID)	HID	Extension		
Point of Sale Devices (HID extension)	HID	Extension		
Power (HID extension)	HID	Extension		
Hid\hid.dec				
Hid\Hid_Req.dec				
Physical	HID	05h		
Hid\hid.dec				
Hid\Hid_Req.dec				
Still Imaging Class	PTP	06h	01h	01h
StillImageClass\PTPStillImageBulkIn.dec	Still Image			
StillImageClass\PTPStillImageBulkOut.dec				
StillImageClass\PTPStillImageRequests.dec				
StillImageClass\PTPStillInterrupt.dec				
Printer	Printer	07h	01h	xxh
Printer\Printer_req.dec				
Mass Storage	Mass Storage	08h		
SCSI/Bulk Protocol	Mass Storage	08h	06h	50h
MassStorageClass\MS_BulkOnly_Requests.dec	SCSI Bulk			
MassStorageClass\MS_BulkOnlySCSIInEndpoint.dec				
MassStorageClass\MS_BulkOnlySCSIOutEndpoint.dec				
MassStorageClass\MS_BulkOnlySCSIOutEndpoint.dec				
UFI (floppy)/CBI Protocol	MassStrg Class	08h	04h	00h
MassStorageClass\MS_UFI_CBI_Requests.dec	UFI CBI			
MassStorageClass\MS_UFI_CBI_BulkInEndp.dec				
MassStorageClass\MS_UFI_CBI_BulkOutEndp.dec				
MassStorageClass\MS_UFI_CBI_InterruptEndp.dec				
Hub support	Hub Class	09h		
HubClass\HubClassRequests.dec				
HubClass\HubClassStatusEndpoint.dec				

USB Decode	USB Decoder Name	USB-IF Codes		
		Base Class	Sub Class	Protocol ID
Picture Transfer Protocol (PTP) [Photographic and Imaging Manufacturers Association (PIMA) 15740 and ISO 15740] StillImageClass\PTPStillImageBulkIn.dec StillImageClass\PTPStillImageBulkOut.dec StillImageClass\PTPStillImageRequests.dec StillImageClass\PTPStillInterrupt.dec	PTP Still Image	Extension		
Communications Device Class (CDC) Data Communications\CDCDataBulkIn_wCTE.dec Communications\CDCDataBulkIn_wPW.dec Communications\CDCDataBulkIn_wPW_wCTE.dec Communications\CDCDataBulkOut_wCTE.dec Communications\CDCDataBulkOut_wPW.dec Communications\CDCDataBulkOut_wPW_wCTE.dec Communications\CDCDataIsochIn_wCTE.dec Communications\CDCDataIsochIn_wPW.dec Communications\CDCDataIsochIn_wPW_wCTE.dec Communications\CDCDataIsochOut_wCTE.dec Communications\CDCDataIsochOut_wPW.dec Communications\CDCDataIsochOut_wPW_wCTE.dec		0Ah	00h	
Smart Card (CCID) SmartCard\CCIDBulkIn.dec SmartCard\CCIDBulkOut.dec SmartCard\CCIDInterrupt.dec SmartCard\CCID_req.dec SmartCard\ICCDBulkIn.dec SmartCard\ICCDBulkOut.dec SmartCard\ICCDInterrupt.dec SmartCard\ICCD_req_Ver.A.dec SmartCard\ICCD_req_Ver.B.dec	CCID and ICCD	0Bh		
Video Class (UVC) decoding 1.1 (currently at 1.0) VIDEO CONTROL VIDEO STREAMING VIDEO INTERFACE COLLECTION VideoClass\VideoBulkIn.dec VideoClass\VideoBulkOut.dec VideoClass\VideoInterrupt.dec VideoClass\VideoIsochIn.dec VideoClass\VideoIsochOut.dec VideoClass\Video1.0Requests.dec VideoClass\Video1.1Requests.dec	Video Video Video	0Eh 0Eh 0Eh	01h 02h 03h	00h 00h 00h

USB Decode	USB Decoder Name	USB-IF Codes		
		Base Class	Sub Class	Protocol ID
Wireless Controller		E0h		
BT	HCI	E0h	01h	01h
UWB	WA Radio Control	E0h	01h	02h
Remote Network Driver Interface Specification (RNDIS)	Remote NDIS	E0h	01h	03h
Host Wire Adapter	Wire Adapter Class	E0h	02h	01h
Device Wire Adapter	Wire Adapter Class	E0h	02h	02h
Device Wire Adapter Isochronous interface	Wire Adapter Class	E0h	02h	03h
WireAdapter\WA_DataInEndpoint.dec				
WireAdapter\WA_DataOutEndpoint.dec				
WireAdapter\WA_NotifEndpoint.dec				
WireAdapter\WA_Requests.dec				
WireAdapter\WA_Radio_Requests.dec				
WireAdapter\WA_RadioNotifEndpoint.dec				
Miscellaneous Device Class		EFh		
Interface Association Descriptor	Standard, so no decoder method needed	EFh	02h	01h
Wire Adapter Multifunction Peripheral programming interface	Wire Adapter Class	EFh	02h	02h
Cable Based Association Framework (CBAF) Requests	Association Frameworks	EFh	03h	01h
Standard\StandardRequests.dec				
IEEE\IEEECompanies.dec				
Virtual\VirtualDATAIn.dec				
Virtual\VirtualDATAOut.dec				
Virtual\VirtualUARTIn.dec				
Virtual\VirtualUARTOut.dec				
AssociationFrameworks\ WUSB_CableBasedAssociation.dec				
IrDA Bridge	IrDA Bridge	FEh	02h	00h
ATAPI	ATAPI	08h	02h	50h
IP	IP			
HTTP	HTTP			
Personal Healthcare Devices	Personal Healthcare	0Fh		
PersonalHealthcare\PersonalHealthcareRequest.dec				
PersonalHealthcare\PersonalHealthcareDescriptors.inc				
PersonalHealthcare\PersonalHealthcareDataBulkIn.dec				
PersonalHealthcare\PersonalHealthcareDataBulkOut.dec				
PersonalHealthcare\PersonalHealthcareDataBulk.inc				
Content Security Devices	Content Security	0Dh		
ContentSecurity\ContentSecurityRequest.dec				
ContentSecurity\ContentSecurityDescriptors.inc				
ContentSecurity\ContentSecurityInterrupt.dec				

You can create your own **.dec** file for a Class or Vendor Request. For more information on the format of these Script Decoder files and the Script Decoding language, read the *Script Decoder Manual*.

8.2 Class/Vendor Decoding Options

You can permanently assign a class or vendor decoding for an address and/or endpoint or interface in a trace file. Once assigned, the decoding occurs automatically when you display transactions.

Mapping Request Recipient to Class/Vendor Decoding

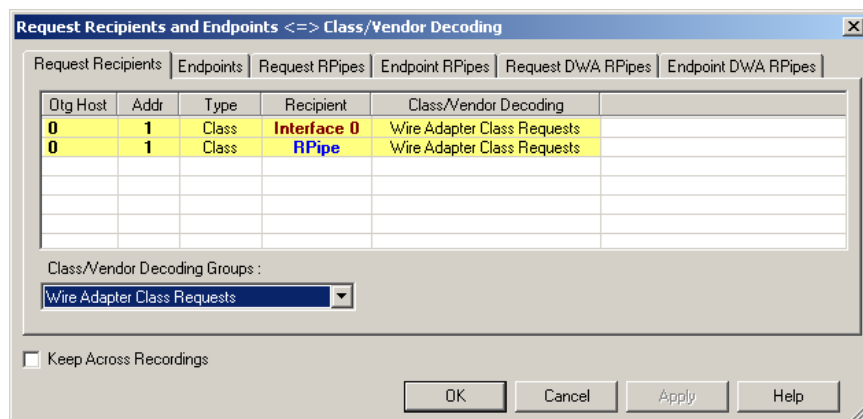
To assign a decoding group to a request recipient,

Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

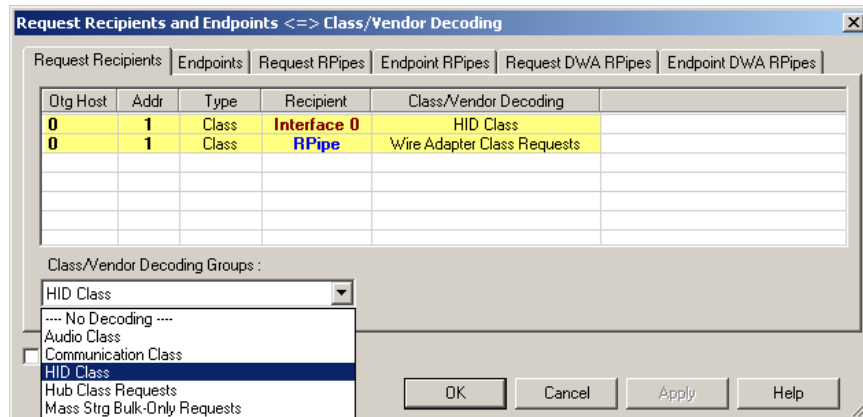
Right-click the **Control Transfer** field to display the USB Device Request menu:

Step 2 Select **Map Request Recipients to Class/Vendor Decoding** to display the Request Recipient and Endpoints dialog box:



The Recipient field shows all Class and Vendor Request Recipients found in the trace file. The display shows the Host, Address, and Type (Class or Vendor) for the recipient. On the right are the names of Class/Vendor Decoding groups currently assigned to recipients. If blank, no decoding is assigned for a recipient.

Step 3 Select a recipient.

Step 4 Display the **Class/Vendor Decoding Groups** drop-down menu.

The drop-down menu lists the defined Class/Vendor request decoding groups. The Class/Vendor Decoding Groups are:

- No Decoding
- Audio 1.0 Class Requests
- Audio 2.0 Class Requests
- Audio Class Requests
- CCID Requests
- Communication Class Requests
- HCI Command
- HID Class
- HID Class Requests
- Hub Class Requests
- ICCD Ver. A Requests
- ICCD Ver. B Requests
- IrDA Bridge Class Requests
- Mass-Strg Bulk-Only Requests
- Mass-Strg Class UFI CBI Requests
- Printer Class Requests
- RNDIS Communication Class Requests
- Standard Requests
- Still Image/PTP/MTP/PictBridge Class Requests
- Video 1.0 Class Requests
- Video 1.1 Class Requests
- Video Class Requests
- Wire Adapter Radio Control Request
- Wire Adapter Class Requests
- WUSB CBAF Requests

Step 5 Select a decoding group.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 6 Repeat the previous steps for additional recipients.

Step 7 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 8 Click **OK**.

Mapping Endpoint to Class/Vendor Decoding

To assign a Class/Vendor Endpoint decoding,

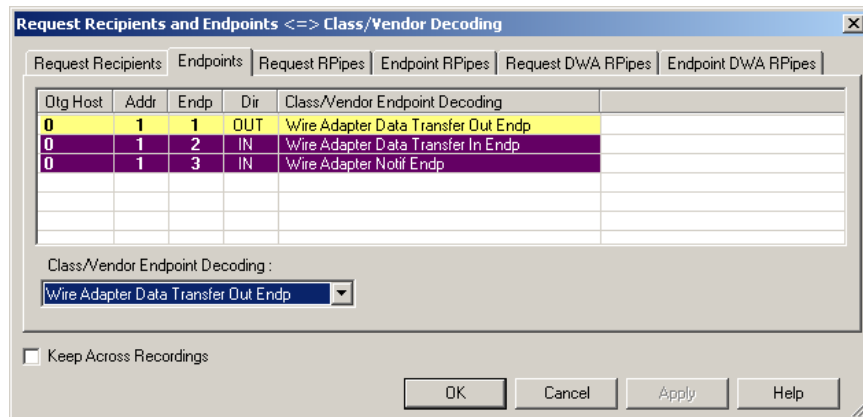
Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Right-click the **Bulk/Int Transfer** field to display the USB Device Request menu.

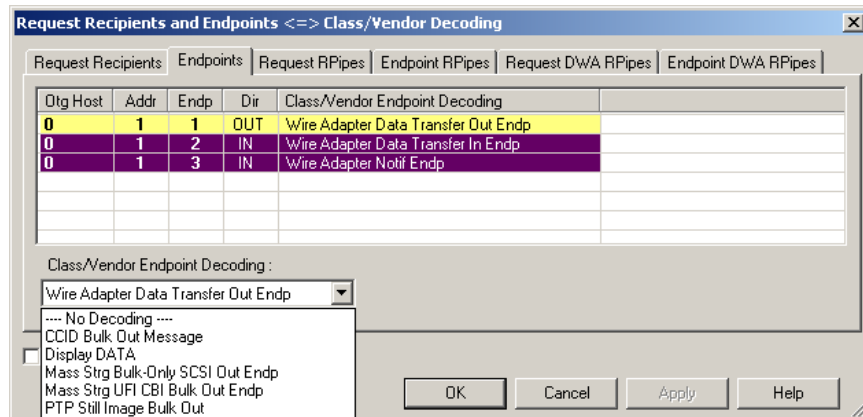
Step 2 Select **Map Endpoint to Class/Vendor Decoding** to display the Request Recipients and Endpoints dialog box.

Step 3 Click the **Endpoints** tab to display the **Endpoints** dialog box.



The Endpoint field (Endp) shows all Endpoints found in the trace file. The displays shows the Host, Address, and Direction for the recipient. On the right are the names of Class/Vendor Endpoint Decoding groups currently assigned to endpoints. If blank, no decoding is assigned for a recipient.

Step 4 Select an endpoint.

Step 5 Display the **Class/Vendor Endpoint Decoding** drop-down menu:

The Class/Vendor Endpoint Decoding options for an OUT endpoint are:

- No Decoding
- ATAPI MMC4 Out Endp
- ATAPI SPC3 Out Endp
- ATAPI SSC2 Out Endp
- CCID Bulk Out Message
- CCD Data Bulk Out w/ Cmd Wrapper
- CCD Data Bulk Out w/ Prot & Cmd Wrapper
- CCD Data Bulk Out w/ Prot Wrapper
- CCD Data Isoch Out w/ Cmd Wrapper
- CCD Data Isoch Out w/ Prot & Cmd Wrapper
- CCD Data Isoch Out w/ Prot Wrapper
- Display DATA
- HCI data out
- HCI SCO out
- HTTP Out Endp
- ICCD Bulk Out Message
- IP_ET0800 (Internet Protocol) Out Endp
- IPv6_ET0800 (Internet Protocol) Out Endp
- IrDA Bridge Out Endp
- Mass Strg Bulk-Only SCSI Out Endp
- Mass Strg UFI_CBI Bulk Out Endp
- RNDIS_PACKET_MSG Bulk Out
- Still Image/PTP/MTP/PictBridge Bulk Out
- TCP (Transmission Control Protocol) Out Endp
- Video Bulk Out
- Video Isoch Out
- Virtual UART
- Wire Adapter Data Transfer Out Endp

The Class/Vendor Endpoint Decoding options an IN or Interrupt endpoint are:

- No Decoding
- ATAPI MMC4 In Endp
- ATAPI SPC3 In Endp
- ATAPI SSC2 In Endp
- CCID Bulk In Message
- CCD Data Bulk In w/ Cmd Wrapper
- CCD Data Bulk In w/ Prot & Cmd Wrapper
- CCD Data Bulk In w/ Prot Wrapper
- CCD Data Isoch In w/ Cmd Wrapper
- CCD Data Isoch In w/ Prot & Cmd Wrapper
- CCD Data Isoch In w/ Prot Wrapper
- Communication Class Interrupt Notification
- Display DATA
- HCI data in
- HCI event
- HCI SCO in
- HID In Endp
- HTTP In Endp
- Hub Class Status Change Endp
- ICCD Bulk In Message
- ICCD Interrupt Message
- IP_ET0800 (Internet Protocol) In Endp
- IPv6_ET0800 (Internet Protocol) In Endp
- IrDA Bridge In Endp
- Mass Strg Bulk-Only SCSI In Endp
- Mass Strg CBI Interrupt Endp
- Mass Strg UFI_CBI Bulk In Endp
- Mass Strg UFI_CBI Interrupt Endp
- RNDIS_PACKET_MSG Data In
- Still Image/PTP/MTP/PictBridge Bulk In
- Still Image/PTP/MTP/PictBridge Interrupt
- TCP (Transmission Control Protocol) In Endp
- Video Bulk In
- Video Interrupt
- Video Isoch In
- Virtual UART
- Wire Adapter Radio Notif Endp
- Wire Adapter Data Transfer In Endp
- Wire Adapter Notif Endp

Step 6 Select the type of decoding.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for any additional endpoints you would like to map.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

Mapping Request RPipe to Class/Vendor Decoding

Before mapping Request RPipes to Class/Vendor Decoding, you must first assign the following endpoint decoders:

- Wire Adapter Data Out
- Wire Adapter Data In
- Wire Adapter Notif

To assign a decoding group to a Request RPipe:

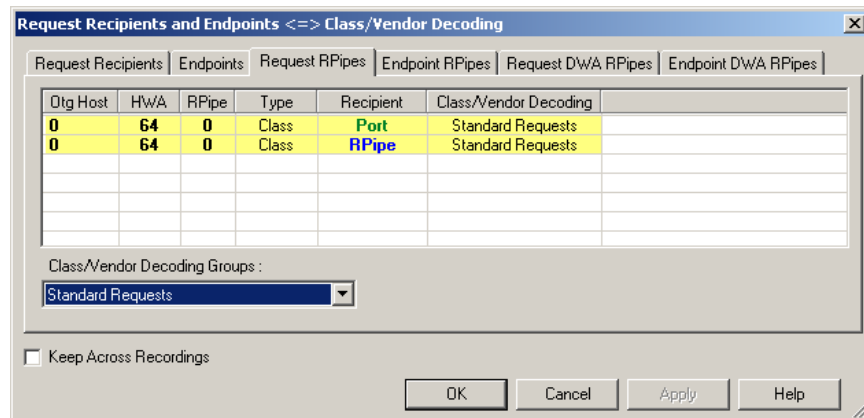
Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Right-click the **Control Transfer** field to display the USB Device Request menu.

Step 2 Select **Map RPipe to Class/Vendor Decoding** to display the Request Recipient and Endpoints dialog box.

Step 3 Click the **Request RPipes** tab to display the Request RPipes dialog box:



The Recipient field shows all Class and Vendor Request recipients found in the trace file. The RPipe field shows all Class and Vendor Request RPipes found in the trace file. The displays shows the Otg Host, HWA address, and Type (Class or Vendor) for the recipient. On the right are the names of Class/Vendor Decoding groups currently assigned to recipients. If blank, no decoding is assigned for a recipient.

Step 4 Select a recipient.

Step 5 Display the **Class/Vendor Decoding Groups** drop-down menu. The Class/Vendor Decoding Groups are the same as for Request Recipients.

Step 6 Select a decoding group.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for additional recipients.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

Mapping Endpoint RPipe to Class/Vendor Decoding

To assign a Class/Vendor Endpoint R Pipes decoding:

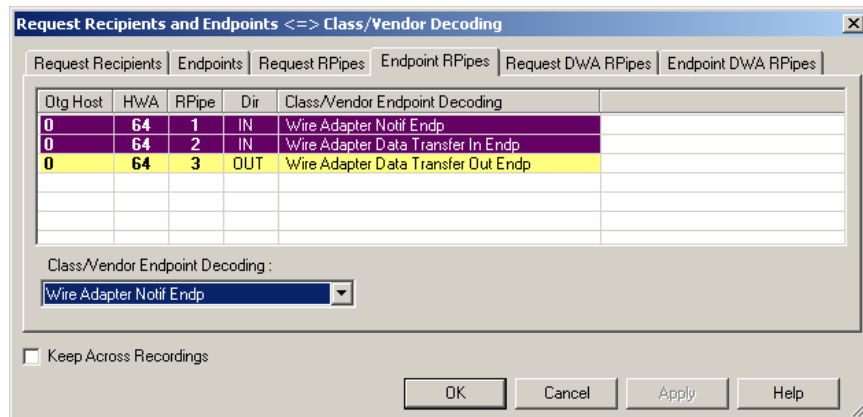
Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Right-click the **Bulk/Int Transfer** field to display the USB Device Request menu.

Step 2 Select **Map Endpoint RPipe to Class/Vendor Decoding** to display the Request Recipients and Endpoints dialog box.

Step 3 Click the **Endpoint R Pipes** tab to display the Endpoint R Pipes dialog box:



The RPipe field shows all R Pipes found in the trace file. The displays shows the Otg Host, HWA address, and Direction for the recipient. On the right are the names of Class/Vendor Endpoint Decoding groups currently assigned to endpoints. If blank, no decoding is assigned for a recipient.

Step 4 Select an endpoint R Pipe.

Step 5 Display the **Class/Vendor Endpoint Decoding** drop-down menu. The Class/Vendor Endpoint Decoding options are the same as for Endpoints.

Step 6 Select the type of decoding.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for any additional R Pipes you would like to map.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

Mapping Request DWA RPipe to Class/Vendor Decoding

Before mapping Request DWA RPipes to Class/Vendor Decoding, you must first assign the following endpoint decoders:

- Wire Adapter Data Out
- Wire Adapter Data In
- Wire Adapter Notif

To assign a decoding group to a Request RPipe:

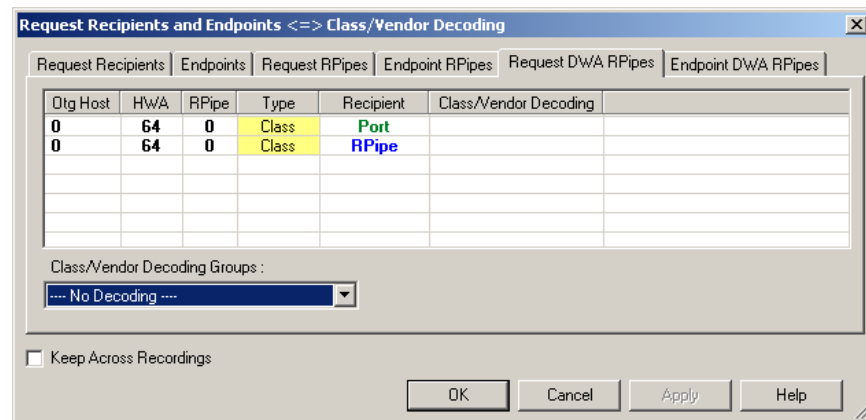
Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Right-click the **Control Transfer** field to display the USB Device Request menu.

Step 2 Select **Map DWA RPipe to Class/Vendor Decoding** to display the Request Recipient and Endpoints dialog box.

Step 3 Click the **Request DWA RPipes** tab to display the Request DWA RPipes dialog box:



The Recipient field shows all Class and Vendor Request recipients found in the trace file. The RPipe field shows all Class and Vendor Request RPipes found in the trace file. The displays shows the Otg Host, HWA address, and Type (Class or Vendor) for the recipient. On the right are the names of Class/Vendor Decoding groups currently assigned to recipients. If blank, no decoding is assigned for a recipient.

Step 4 Select a recipient.

Step 5 Display the **Class/Vendor Decoding Groups** drop-down menu. The Class/Vendor Decoding Groups are the same as for Request Recipients.

Step 6 Select a decoding group.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for additional recipients.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

Mapping Endpoint DWA RPipes to Class/Vendor Decoding

To assign a Class/Vendor Endpoint DWA RPipes decoding:

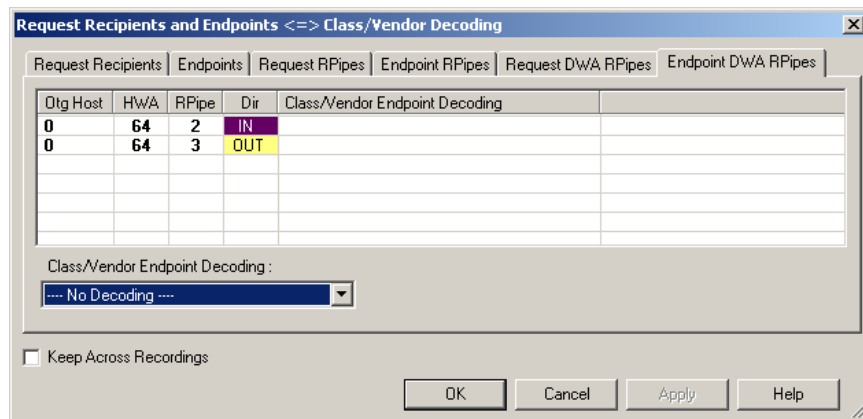
Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Right-click the **Bulk/Int Transfer** field to display the USB/WUSB Device Request menu.

Step 2 Select **Map Endpoint RPipe to Class/Vendor Decoding** to display the Request Recipients and Endpoints dialog box.

Step 3 Click the **Endpoint RPipes** tab to display the Endpoint RPipes dialog box:



The RPipe field shows all RPipes found in the trace file. The displays shows the Otg Host, HWA address, and Direction for the recipient. On the right are the names of Class/Vendor Endpoint Decoding groups currently assigned to endpoints. If blank, no decoding is assigned for a recipient.

Step 4 Select an endpoint DWA RPipe.

Step 5 Display the **Class/Vendor Endpoint Decoding** drop-down menu. The Class/Vendor Endpoint Decoding options are the same as for Endpoints.

Step 6 Select the type of decoding.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for any additional RPipes you would like to map.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

8.3 General Options

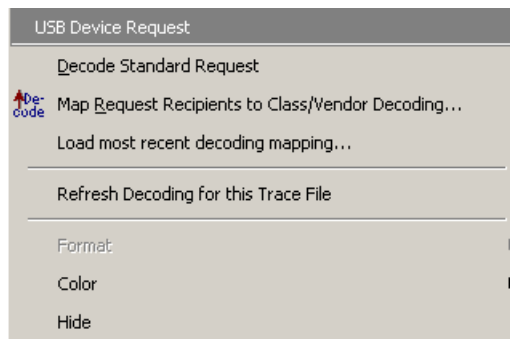
Commands are transferred on USB using special control transfers called USB Device Requests. The Analyzer can decode Device Requests as they are defined in the USB specifications and various Device Class and Vendor specifications.

Each USB Device Request is sent using a Control Transfer. Each Control Transfer starts with a SETUP transaction.

Decoding USB Device Requests

To decode a USB Device Request:

Step 1 Right-click the **Control Transfer** field or the **SETUP** field of the USB Device Request to display the USB Device Request menu:



Note: The menus shown in this section are context-sensitive. You may see slightly different menus.

Step 2 To refresh decoding, click Refresh Decoding for this Trace File. Use this option to reanalyze all transactions.

Step 3 To use the previous decoding, click **Load most recent decoding mapping**.

This option loads the most recent mapping of endpoints/requests to decoding types that was done on a previous trace. If the endpoints of the new trace are the same as the last one mapped, the mappings are applied to the current trace. This saves the user from having to constantly apply the mapping to a new trace every time the application is restarted and a new trace created.

The ability to retain the mapping from trace to trace DURING an application session already exists: the Keep Across Recordings button in the endpoint map dialog. This new feature simplifies the process when the application has been re-started.

Note: You can also change the format, color, and hidden status of fields, using the same methods as in Display Options. (See Chapter 6, Display Options.)

Decoding Standard Requests

To decode a standard request:

Step 1 From the USB Device Request menu, select **Decode Standard Request** to display the View Fields for Standard Request text box:

REQUEST SUMMARY

Setup Data	80 06 00 01 00 00 40 00
Direction	Host-to-device
Type	Standard
Recipient	Device
bRequest	GET_DESCRIPTOR
wValue	DEVICE
wIndex	0x0000
wLength	0x0040

DECODING INFORMATION

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bRequest	8	8	GET_DESCRIPTOR	0x06	bRequest HexVal: 0x0006
wValue	16	16	DEVICE type	0x0100	Type of Descriptor
wIndex	16	32	0x0000	0x0000	index info

DEVICE Descriptor

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bLength	8	0	0x12	0x12	Descriptor size is 18 bytes
bDescriptorType	8	8	0x01	0x01	DEVICE Descriptor Type
bcdUSB	16	16	0x0200	0x0200	Device compliant to the USB specification version 2.00
bDeviceClass	8	32	0xEF	0xEF	The device belongs to the Miscellaneous Device Class
bDeviceSubClass	8	40	0x02	0x02	The device belongs to the Common Class Subclass
bDeviceProtocol	8	48	0x02	0x02	The device uses the Wire Adapter Multifunction Peripheral Protocol
bMaxPacketSize0	8	56	0x40	0x40	Maximum packet size endpoint zero is 64
idVendor	16	64	0x1461	0x1461	Vendor ID is 5217: Staccato Communications
idProduct	16	80	0x0400	0x0400	Product ID is 1024
bcdDevice	16	96	0x0100	0x0100	The device release number is 1.00
iManufacturer	8	112	0x01	0x01	The manufacturer string descriptor index is 1
iProduct	8	120	0x02	0x02	The product string descriptor index is 2
iSerialNumber	8	128	0x00	0x00	The device doesn't have the string descriptor describing the serial number
bNumConfigurations	8	136	0x01	0x01	The device has 1 possible configurations

Step 2 To find a word in the text box, click the **Find** button. Enter the word in the Find What field. To use a case-sensitive search, check **Match Case**. To find only the exact word, check **Match Whole Word Only**. You can search **Up** or **Down**. To search, click **Find Next**.

Step 3 To save the View Fields text box as an HTML file, click the **Save As** button, enter a file name in the Save As dialog box, then click **Save**.

Step 4 To view the previous or next Transfer Control field request of the same request type, click **Previous** or **Next**.

The View Fields for Standard Request dialog box displays field definitions and values of the Standard Request.

For field definitions, please refer to the *Universal Serial Bus Specification, version 2.0*. The USB specification is available from the USB Implementers Forum (USB-IF) at:

USB Implementers Forum	Tel: +1/503.296.9892
1730 SW Skyline Blvd.	Fax: +1/503.297.1090
Suite 203	Web: http://www.usb.org/
Portland, OR 97221	

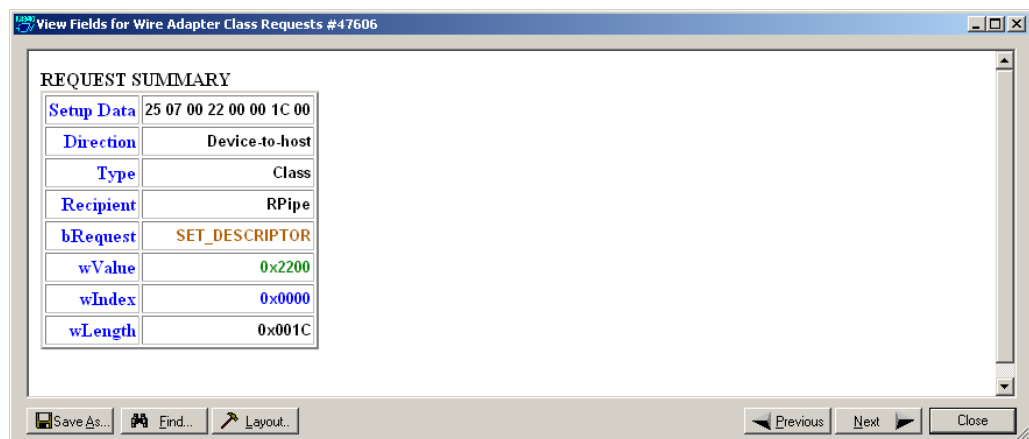
Decoding Class Requests

Examples of a class request are Mass-Strg Class UFI CBI Requests, PTP Still Image Class Requests, Video Class Requests, and Wire Adapter Class Requests.

To decode a class request:

Step 1 From the USB Device Request menu, select **Decode ... Request** to display the View Fields for ... Class Requests text box.

The following figure shows a Wire Adapter Class Requests decoding:



Decoding Vendor Requests

To decode a vendor request:

- From the USB Device Request menu, select **Decode ... Request** to display the View Fields for ... Vendor Requests text box.

An example of a vendor request is Command Set.

Decoding Undefined USB/WUSB Device Requests

A Decoding Request may not belong to any of the defined decoding groups (Standard, Class, or Vendor).

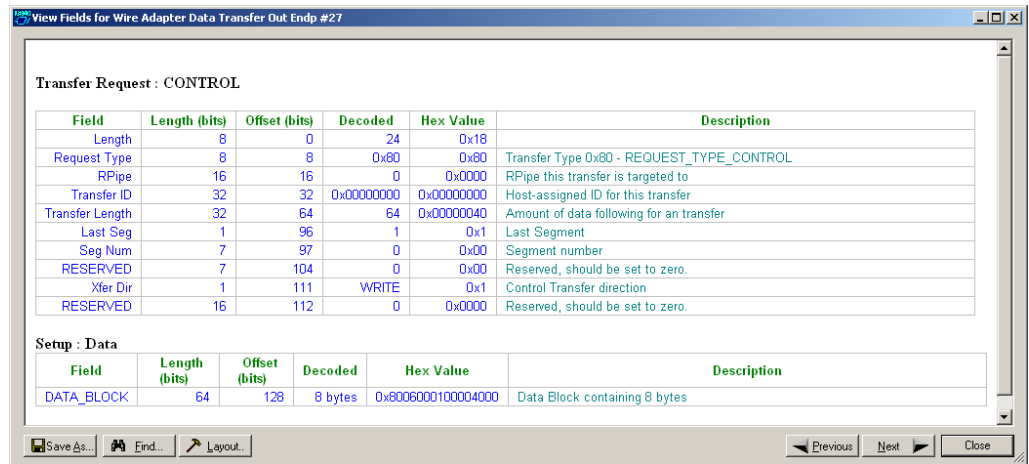
Decoding using Endpoint Information

To decode using the endpoint information:

Step 1 Right-click the **Bulk/Int Transfer** field to display the Bulk/Int Transfer (IN/OUT transaction with data) menu.

Step 2 Select **Decode as ... Endp** to open a View Fields for ... Endp text box.

The following figure shows a Wire Adapter Data Transfer Out Endp decoding:



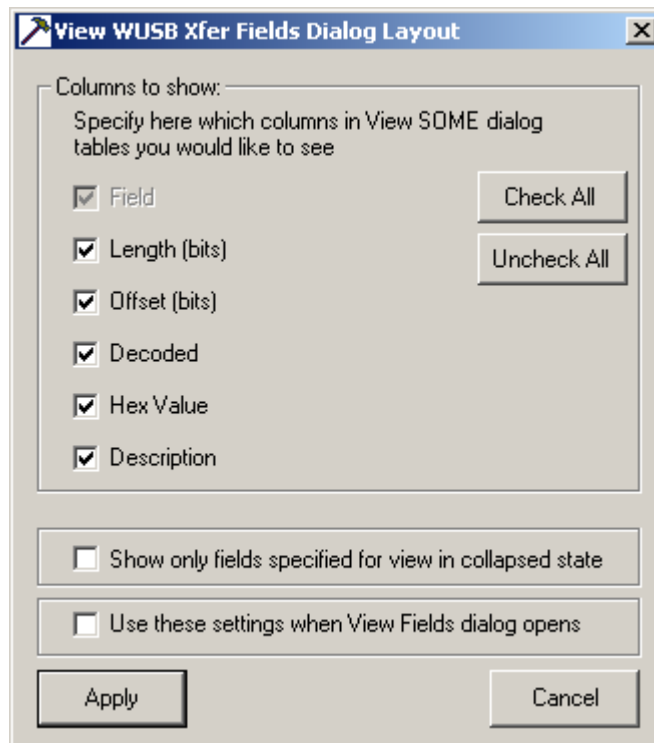
Changing the Layout of Decode Requests

In the View ... Fields windows, the Decoding Information and the Descriptor information blocks (following the Request Summary information) have the following columns:

- **Field:** such as bRequest, wValue, wIndex, bLength, bDescriptorType, wTotalLength
- **Length in bits**
- **Offset in bits**
- **Decoded:** hex value typically equal to Hex Value
- **Hex Value:** hex value typically equal to Decoded
- **Description:** short description of field

To change the layout of decode requests display:

Step 1 Click **Layout** to display the View ... Fields Dialog Layout dialog box:



Step 2 To display the available columns of data, use the checkboxes for **Length**, **Offset**, **Decoded**, **Hex Value**, and **Description**.

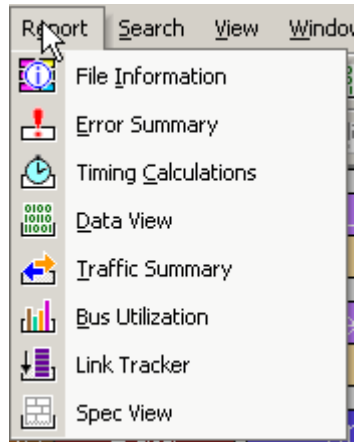
You can **Check All** or **Uncheck All**.

Step 3 To show only the fields of Collapsed mode, check **Show only fields specified for view in collapsed mode**.

Step 4 To retain settings for future viewing of Decode Request fields, check **Use these settings when View Fields dialog opens**.

Chapter 9: Reports

The Report menu provides several reports to assist you in analyzing USB traffic recorded by the Analyzer.




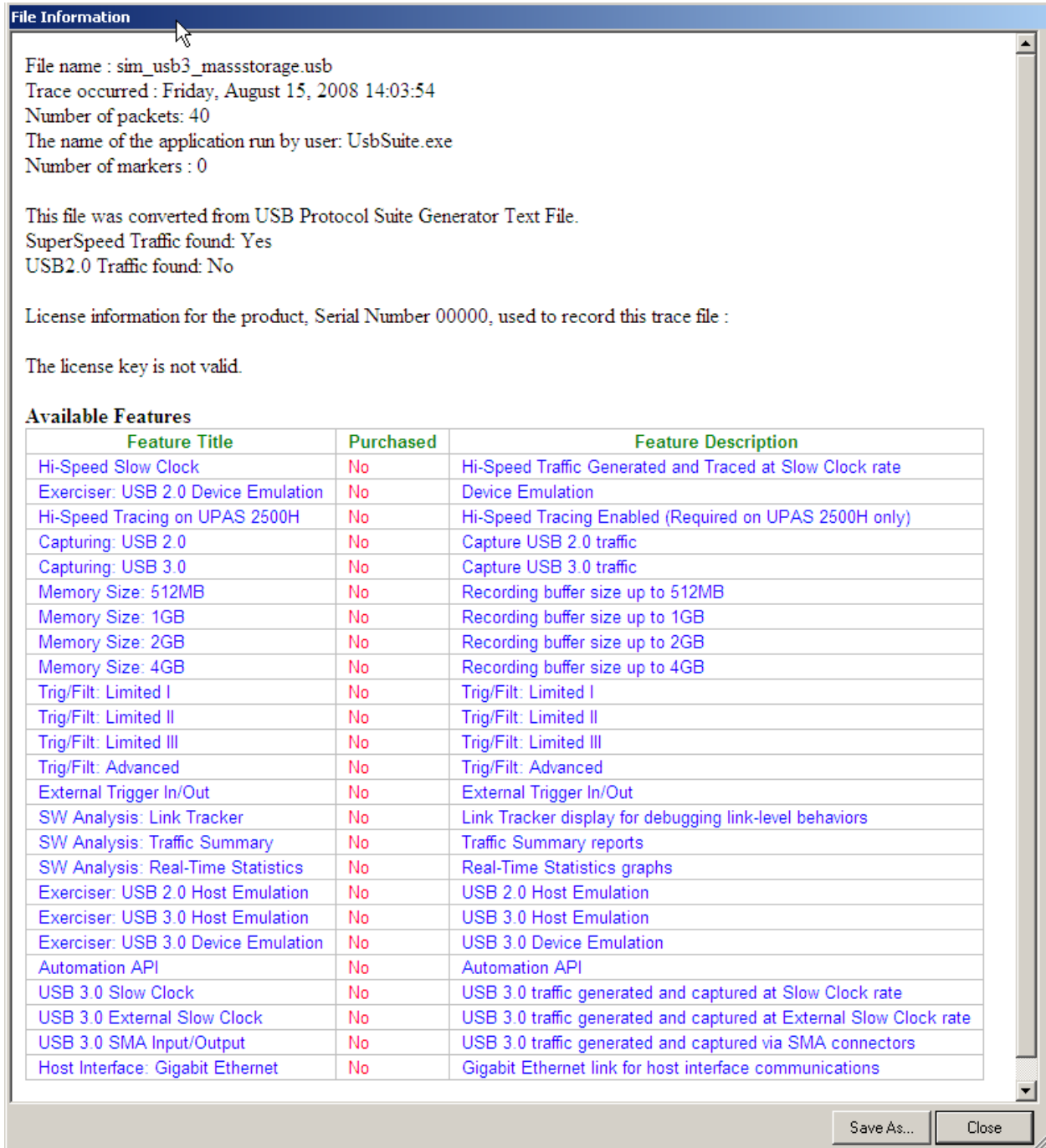
Reports assist you in analyzing traffic recorded by the Analyzer. The available reports are:

- **File Information:** To view general information about the trace file.
- **Error Summary:** To view a count of errors in a trace file.
- **Timing Calculations:** To view timing measured between two events set within the trace file.
- **Traffic Summary:** To view a summary of protocol-related information in the trace file summary information about a selected group of items in the trace file (such as a count of particular frame or packet types).
- **Bus Utilization:** To display information on bandwidth usage for the transmit and receive channels.
- **Link Tracker (3.0):** Displays a detailed chronological view of events.
- **Spec View (3.0):** Shows packet header information and other items, in a view that matches the USB 3.0 specification.
- **Packet Data:** Shows packet payload contents.
- **Trace Navigator:** Navigates within the trace to view the location of errors and triggers, narrow the range of traffic on display, and jump to any point in the trace.
- **Real Time Statistics:** To display statistical information for the channels.

Reports are available from the Report menu and buttons on the Tool bar. Tools are available from the Tools menu.

9.1 File Information

To display a File Information report, select **File Information** under **Report** in the Menu Bar, or click  in the Tool Bar to display the File Information screen:



File Information

File name : sim_usb3_masmstorage.usb
 Trace occurred : Friday, August 15, 2008 14:03:54
 Number of packets: 40
 The name of the application run by user: UsbSuite.exe
 Number of markers : 0

This file was converted from USB Protocol Suite Generator Text File.
 SuperSpeed Traffic found: Yes
 USB2.0 Traffic found: No

License information for the product, Serial Number 00000, used to record this trace file :

The license key is not valid.

Available Features


Feature Title	Purchased	Feature Description
Hi-Speed Slow Clock	No	Hi-Speed Traffic Generated and Traced at Slow Clock rate
Exerciser: USB 2.0 Device Emulation	No	Device Emulation
Hi-Speed Tracing on UPAS 2500H	No	Hi-Speed Tracing Enabled (Required on UPAS 2500H only)
Capturing: USB 2.0	No	Capture USB 2.0 traffic
Capturing: USB 3.0	No	Capture USB 3.0 traffic
Memory Size: 512MB	No	Recording buffer size up to 512MB
Memory Size: 1GB	No	Recording buffer size up to 1GB
Memory Size: 2GB	No	Recording buffer size up to 2GB
Memory Size: 4GB	No	Recording buffer size up to 4GB
Trig/Filt: Limited I	No	Trig/Filt: Limited I
Trig/Filt: Limited II	No	Trig/Filt: Limited II
Trig/Filt: Limited III	No	Trig/Filt: Limited III
Trig/Filt: Advanced	No	Trig/Filt: Advanced
External Trigger In/Out	No	External Trigger In/Out
SW Analysis: Link Tracker	No	Link Tracker display for debugging link-level behaviors
SW Analysis: Traffic Summary	No	Traffic Summary reports
SW Analysis: Real-Time Statistics	No	Real-Time Statistics graphs
Exerciser: USB 2.0 Host Emulation	No	USB 2.0 Host Emulation
Exerciser: USB 3.0 Host Emulation	No	USB 3.0 Host Emulation
Exerciser: USB 3.0 Device Emulation	No	USB 3.0 Device Emulation
Automation API	No	Automation API
USB 3.0 Slow Clock	No	USB 3.0 traffic generated and captured at Slow Clock rate
USB 3.0 External Slow Clock	No	USB 3.0 traffic generated and captured at External Slow Clock rate
USB 3.0 SMA Input/Output	No	USB 3.0 traffic generated and captured via SMA connectors
Host Interface: Gigabit Ethernet	No	Gigabit Ethernet link for host interface communications

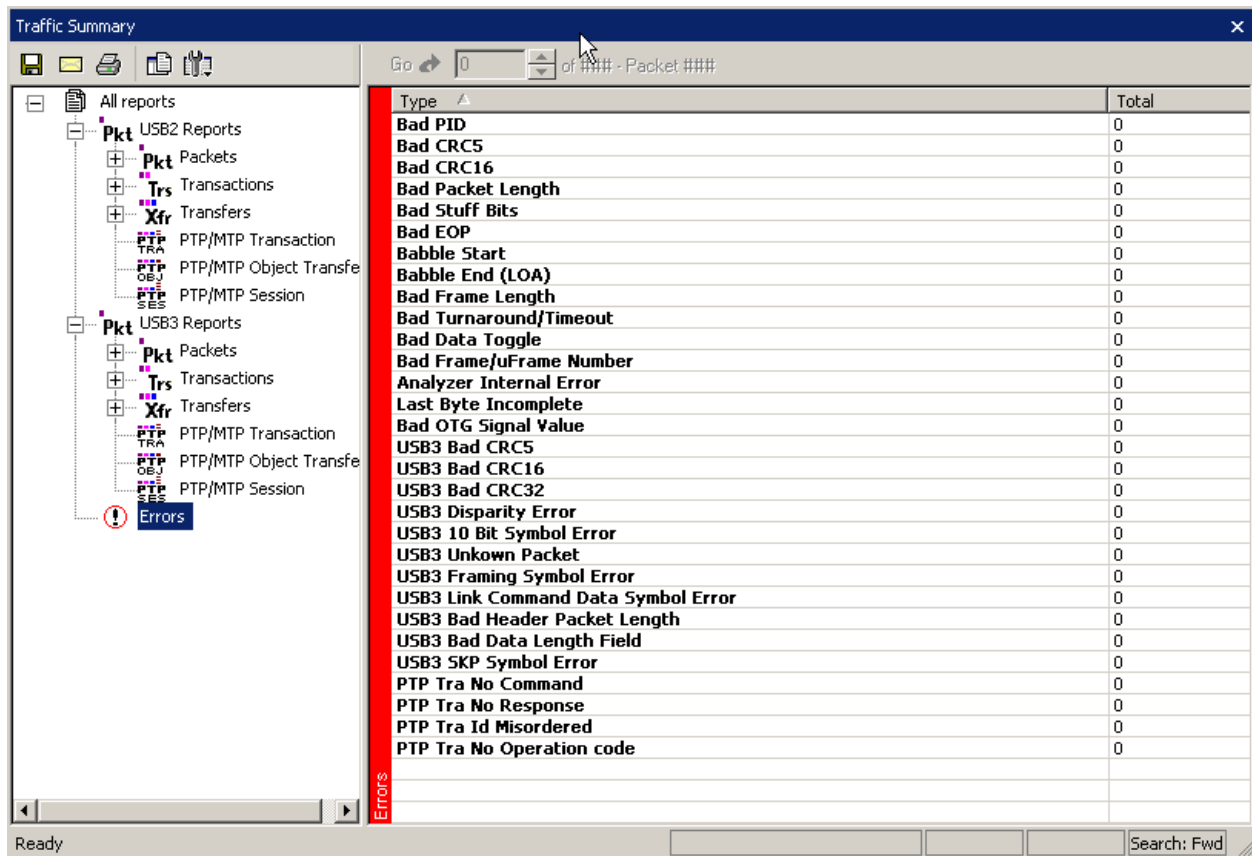
Save As... Close

The File Information report provides information about how the recording was made, what the buffer settings were, what the trigger options were, and what version of all the Analyzer hardware was used to make the recording.

9.2 Error Summary

The Error Summary details all errors analyzed throughout the recording.


- Select **Error Summary** under **Report** in the Menu Bar
OR
- Click  in the Tool Bar to display the Error screen below the Trace View:

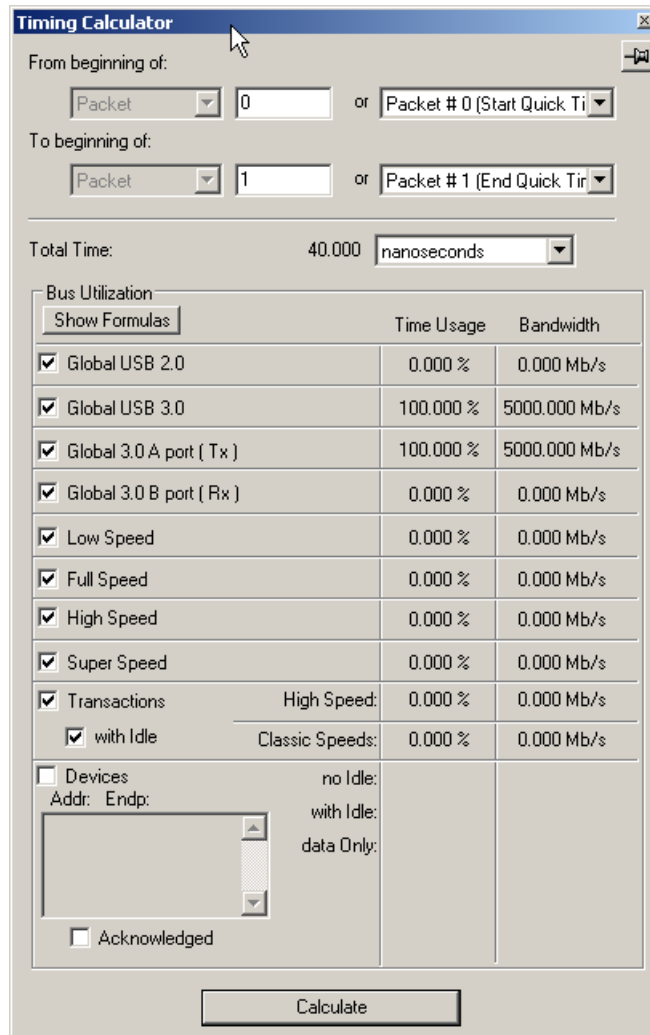


Type	Total
Bad PID	0
Bad CRC5	0
Bad CRC16	0
Bad Packet Length	0
Bad Stuff Bits	0
Bad EOP	0
Babble Start	0
Babble End (LOA)	0
Bad Frame Length	0
Bad Turnaround/Timeout	0
Bad Data Toggle	0
Bad Frame/uFrame Number	0
Analyzer Internal Error	0
Last Byte Incomplete	0
Bad OTG Signal Value	0
USB3 Bad CRC5	0
USB3 Bad CRC16	0
USB3 Bad CRC32	0
USB3 Disparity Error	0
USB3 10 Bit Symbol Error	0
USB3 Unkown Packet	0
USB3 Framing Symbol Error	0
USB3 Link Command Data Symbol Error	0
USB3 Bad Header Packet Length	0
USB3 Bad Data Length Field	0
USB3 SKP Symbol Error	0
PTP Tra No Command	0
PTP Tra No Response	0
PTP Tra Id Misordered	0
PTP Tra No Operation code	0

9.3 Timing Calculations

The Timing Calculator is used to measure timing between any two packets.

- Select **Timing Calculations** under **Report** in the Menu Bar
OR
- Click  in the Tool Bar to display the Timing and Bus Usage Calculator screen:



Timing Calculator

From beginning of: or

To beginning of: or

Total Time: 40.000


Bus Utilization

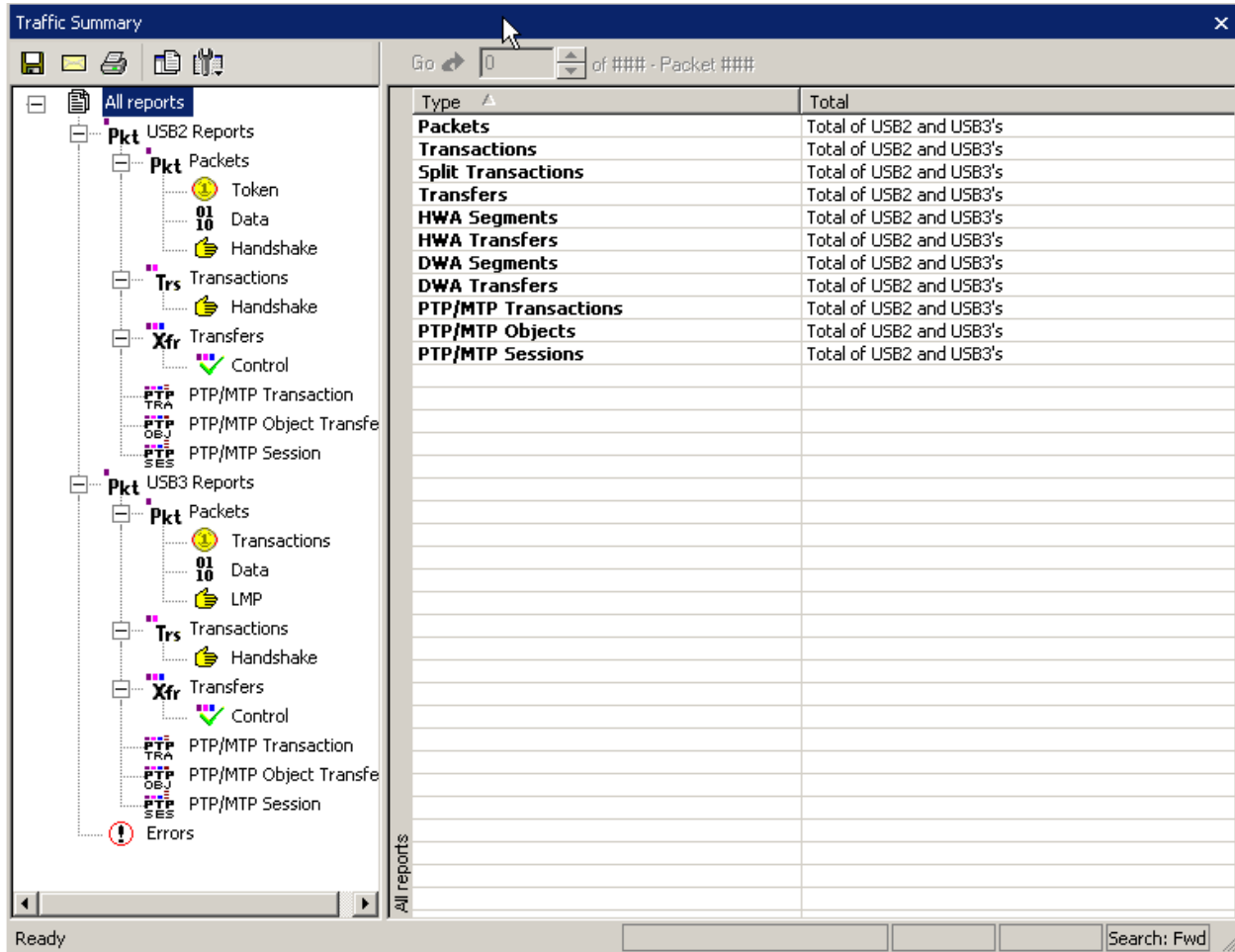
	Time Usage	Bandwidth
<input checked="" type="checkbox"/> Global USB 2.0	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> Global USB 3.0	100.000 %	5000.000 Mb/s
<input checked="" type="checkbox"/> Global 3.0 A port (Tx)	100.000 %	5000.000 Mb/s
<input checked="" type="checkbox"/> Global 3.0 B port (Rx)	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> Low Speed	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> Full Speed	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> High Speed	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> Super Speed	0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> Transactions	High Speed: 0.000 %	0.000 Mb/s
<input checked="" type="checkbox"/> with Idle	Classic Speeds: 0.000 %	0.000 Mb/s
<input type="checkbox"/> Devices	no Idle:	
Addr: Endp:	with Idle:	
<input type="text" value=""/>	data Only:	
<input type="text" value=""/>		
<input type="checkbox"/> Acknowledged		

9.4 Traffic Summary

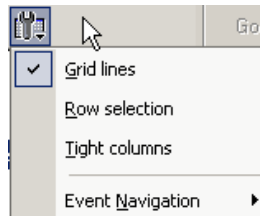
Traffic Summary summarizes the numbers and types of packets, transactions etc. that occurred in the open trace.

To run **Traffic Summary**, select **Report >Traffic Summary** or

click the button marked . The program prompts you to specify a range of packets, then displays the following window:



The Options menu allows you to show Grid lines, Row selection, and Tight columns. You can have Event Navigation: Skip hidden items, Show hidden items, and Prompt for hidden.



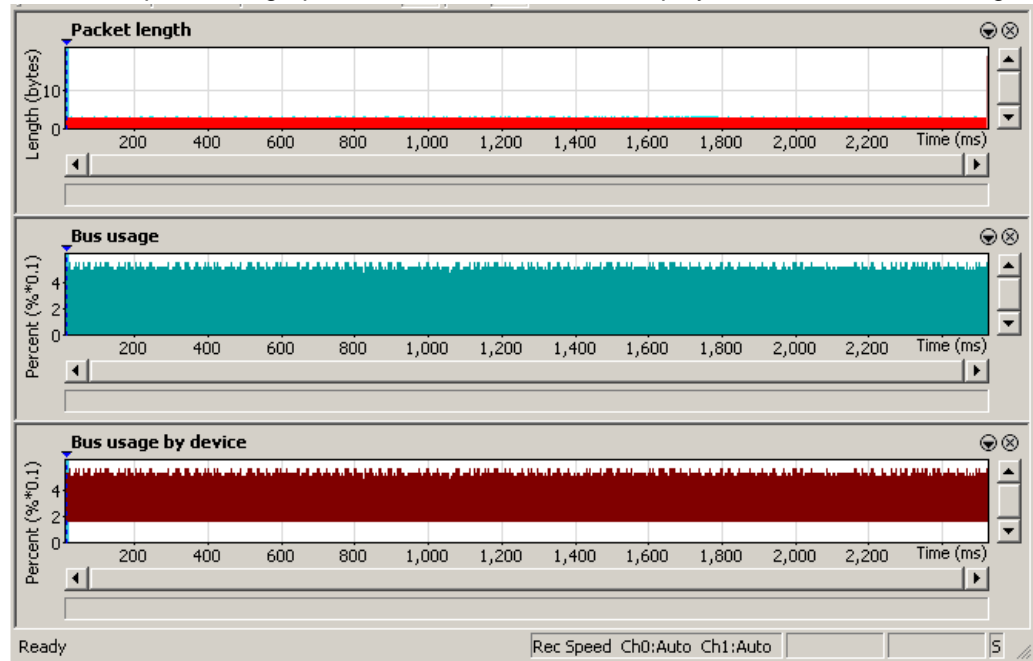
9.5 Bus Utilization

The **Bus Utilization** window displays information on bandwidth use for the three recording channels.

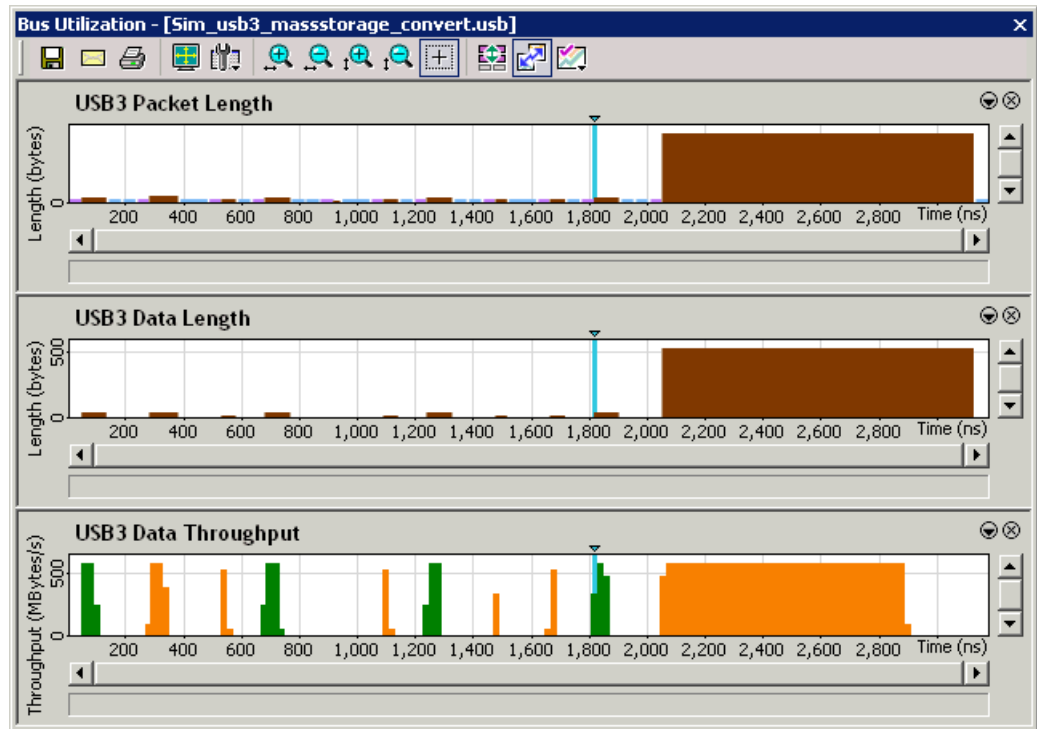
To open the Bus Utilization window, select **Report >Bus Utilization**

or click the button marked .

A window opens with graph areas. For USB 2.0, the display is similar to the following:



For USB 3.0, the display is similar to the following:
















Bus Utilization Buttons


The Bus Utilization window has a row of buttons for changing the format of the displayed data and for exporting data:

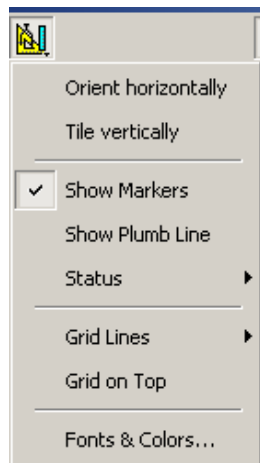


The buttons have the following functions:

	Save As - Saves the graphs as a bitmap file (*.bmp)		Vertical zoom in
	Email - Creates an email with a *.bmp file attachment of the graphs		Vertical zoom out
	Print		Click and Drag zoom - Click diagonally to select and zoom in on part of the graph
	Full Screen		Select Range.
	View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below.		Sync and Graph areas - If two or more graphs are displayed, this button synchronizes the graphs to one another. Once synchronized, the positioning slider of one graph moves the other graphs.
	Horizontal zoom in		Graph Areas - Presents options for displaying additional graphs of data lengths, packet lengths, and percentage of bus utilized.
	Horizontal zoom out		

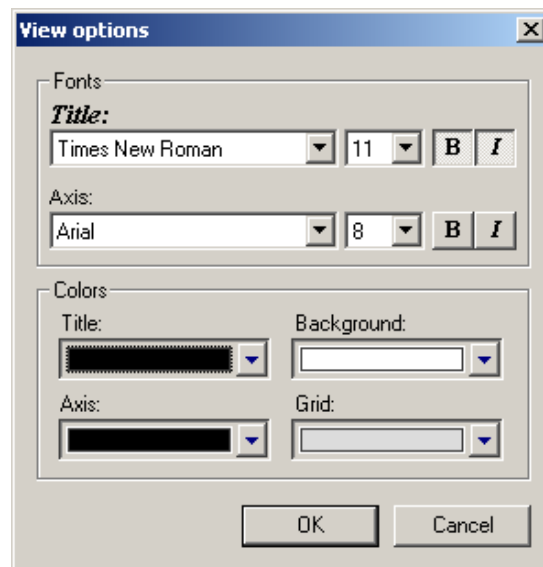
View Settings Menu

Clicking the View Settings button  causes a menu to open with options for formatting the display.



- **Orient Horizontally:** changes the orientation of bus usage to horizontal. After selecting this option, the menu has Orient Vertically.
- **Tile Vertically:** tiles the two graphs vertically (i.e., side by side). After selecting this option, the menu has Tile Horizontally.
- **Show Markers:** Places "tick" marks along the x axis of each graph.
- Show Plumb Line
- **Status:** Opens a sub-menu with the following options:
 - **Bar:** Displays a status bar at bottom of graph.
 - **Tooltip:** Causes a tooltip to appear if you position your mouse pointer over part of the graph and leave it there for a couple of seconds.
 - **None:** Turns off tooltips and the status bar.
- **Grid Lines:** Opens a sub-menu with the following options:
 - Both: Displays both X and Y axis gridlines
 - X Axis: Displays X axis gridlines
 - Y Axis: Display Y axis gridlines
 - None: Turns off gridlines
- **Grid on Top:** Moves the grid lines above the graph.


- **Fonts and Colors:** Opens a dialog box for setting the colors and fonts used in the graphs:

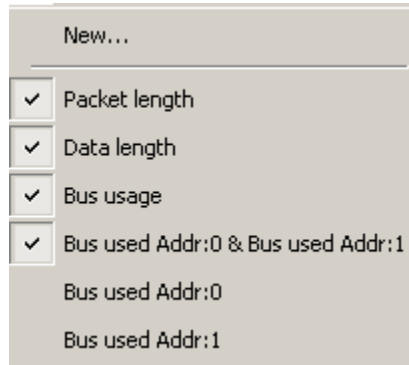


Graph Areas Menu

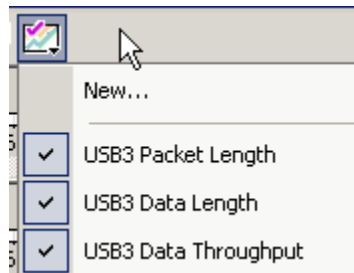
The Graph Areas menu allows you to view different information in the Bus Utilization window.

To view information:

Step 1 Click the  button to open the Graph Areas menu. For USB 2.0, the display is similar to the following:



For USB 3.0, the display is similar to the following:

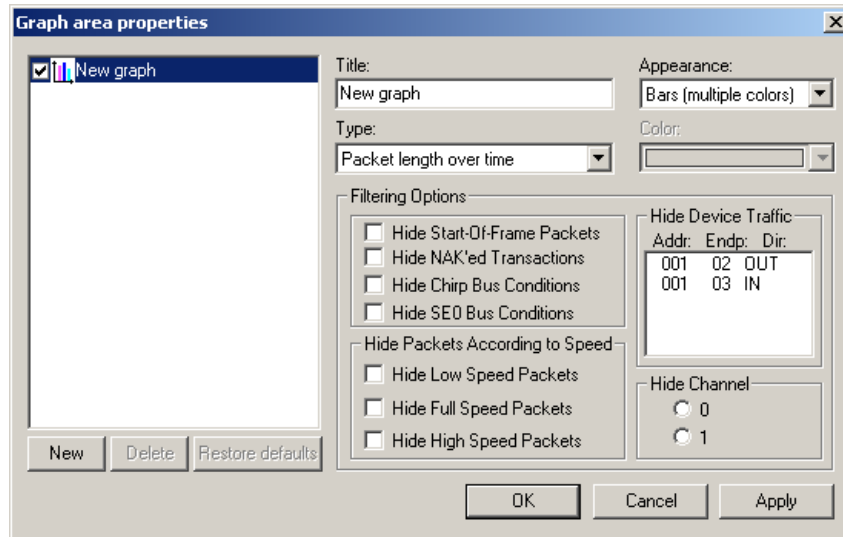


Step 2 Select the data you want to appear in the Graph Areas window.

Step 3 To make a new graph, click **New**.

To change the properties in the Bus Utilizations graph:

Step 1 In the **Graph Area** properties dialog box, select what you want your graph to display, then click **OK**.




Step 2 To make a new graph, click **New**.

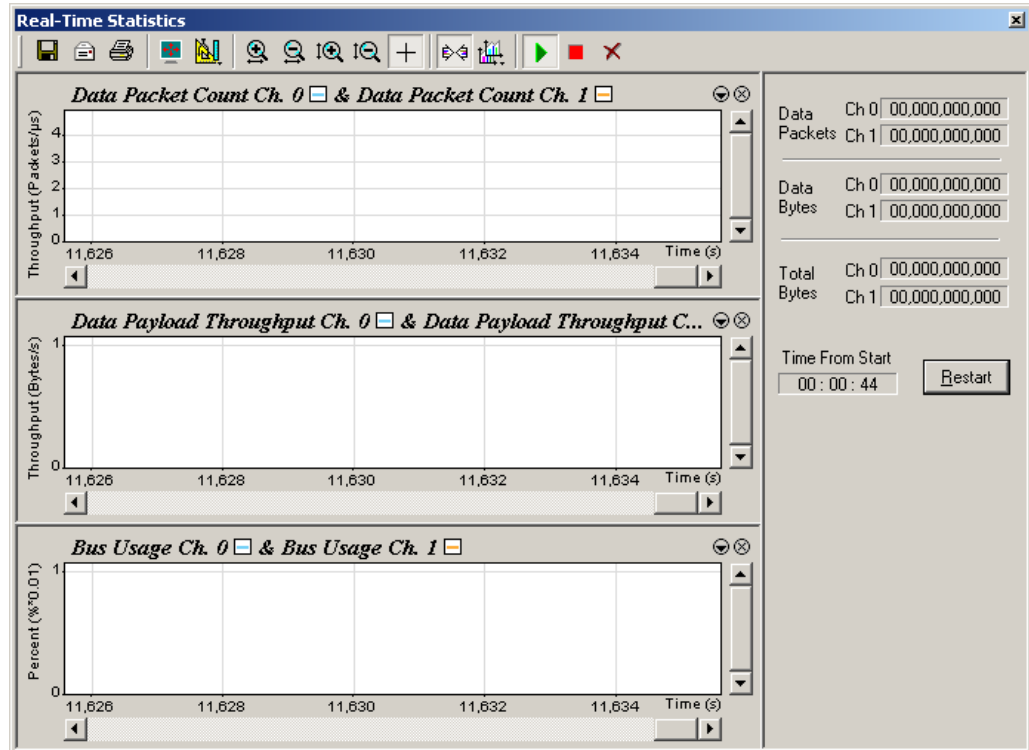
9.6 Real Time Monitoring

The Real-Time Statistics window displays a graph of real-time link activity.

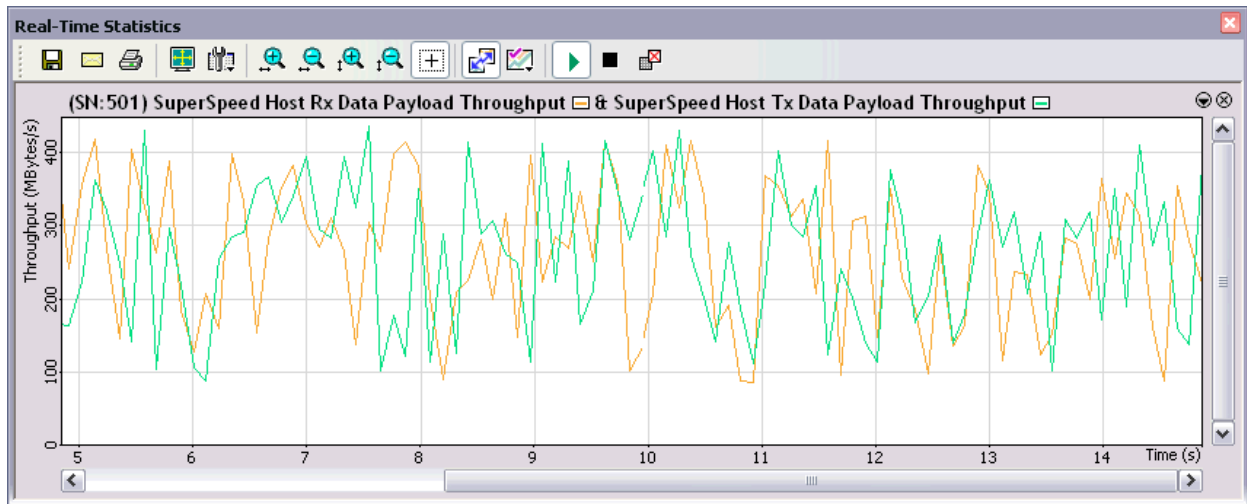
Real Time Statistics displays a summary of the traffic currently being recorded by the Analyzer.

To display the Real-Time Statistics window, click  in the Tool Bar to open the Real Time Statistics window.


For USB 2.0, the display is similar to the following:



For USB 3.0, the Real-Time Statistics window can display a SuperSpeed graph of real-time link activity.



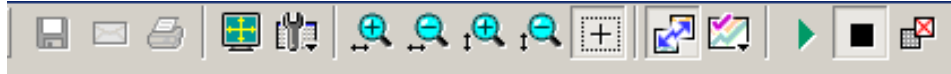
In order to see a graph of traffic, you must start recording.

Press  to start the Real-Time statistics monitor. As traffic is recorded, data is streamed in real time to this window and presented in a format of your choice.
















To stop the monitor, press .

Real-Time Statistics Buttons

The Real-Time Statistics toolbar has buttons for changing the format of the displayed data and for exporting data:

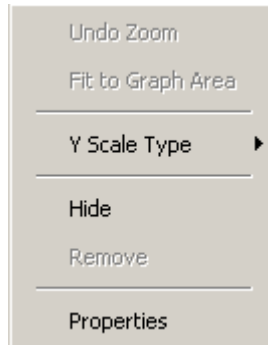


The buttons have the following functions:

- | | | | |
|---|---|---|--|
|  | Save As - Saves Real-Time graphs as bitmap files (*. bmp) |  | Vertical zoom in |
|  | Email - Creates an email with a *.bmp file attachment of the graphs |  | Vertical zoom out |
|  | Print |  | Click and Drag zoom - Click diagonally to select and zoom in on part of the graph |
|  | Full Screen |  | Sync and Graph areas - If two or more graphs are displayed, this button synchronizes the graphs to one another. Once synchronized, the positioning slider of one graph moves the other graphs. |
|  | View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below. |  | Graph Areas - Presents options for displaying additional graphs of data lengths, packet lengths, and percentage of bus utilized. |
|  | Horizontal zoom in |  | Start. Starts the Real-Time Monitor. |
|  | Horizontal zoom out |  | Stop Real-Time Monitoring. |
| | |  | Reset graphs. |

Real-Time Statistical Monitor Pop-up Menu

If you right-click a graph in the Real-Time window, a pop-up menu appears with options for changing the format of the display:



- **Undo Zoom:** If you have zoomed in, undoes the zoom.
- **Fit to Graph Area:** Displays graph so that the entire trace fits inside the graph area.
- **Y Scale Type:**
 - **Linear:** Converts display to linear format.
 - **Logarithmic:** Converts display to logarithmic format.
- **Hide:** Hides the selected graph.
- **Properties:** Opens a dialog box with options for changing the colors, titles and other features of the graphs.

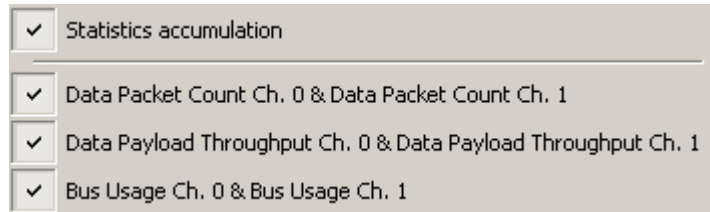
Displaying Multiple Graphs

The Real Time Statistics window gives you the ability to create up to three separate graphing windows so that you can create separate graphs of traffic and tile them vertically. Within these windows, you can format the graphs in a number of ways.

- To view two or three graphs simultaneously,

click the **Graph Areas**  button.

The following menu opens.

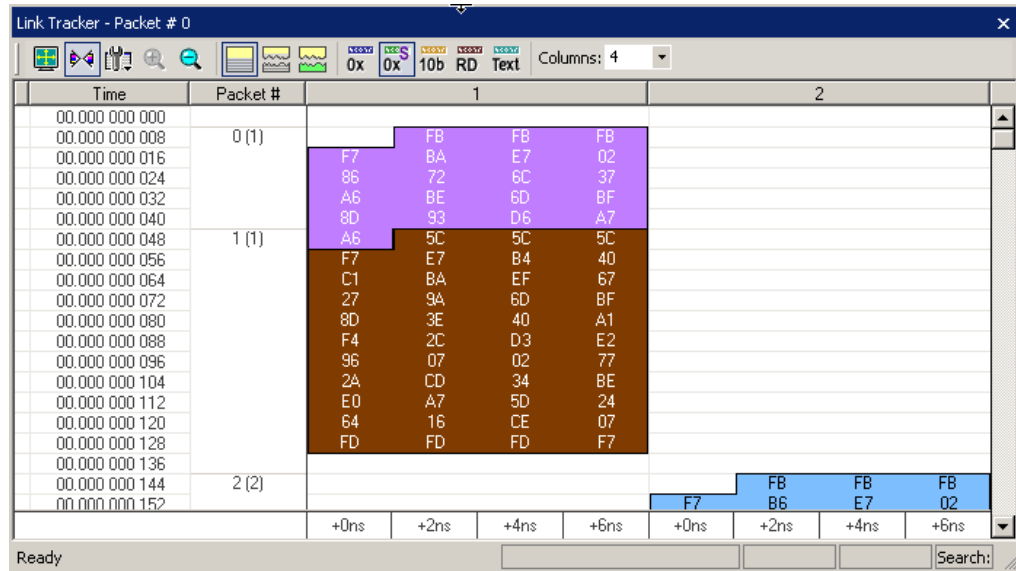


Selecting a checkbox displays the selected graph type:

- **Statistics Accumulation:** Plots the percentage of Link utilization by non-idle traffic for both directions of the link.
- **Data Packet Count (Packets/s):** Plots counts of Data Packets per second for both directions of the link.
- **Data Payload Throughput (MBytes):** Plots data payload throughput for both directions of the link.
- **Bus Usage:** Plots amount of Bus usage.

9.7 Link Tracker (3.0)

The Link Tracker window displays a detailed chronological view of events. Events are shown on a channel-by-channel basis in columns within the window.



You can select the number of columns to view more or less data at one time.

Each time slot in the vertical axis represents the minimum time that a DWORD requires to traverse the bus.

Toolbar: Presents buttons for changing the format of the Link Tracker window.

Main Display Area: Displays traffic chronologically as it occurred in the recording. The window divides into columns: the first column shows time and traffic is shown on a channel-by-channel basis in the columns on the right.

Using the Link Tracker Window

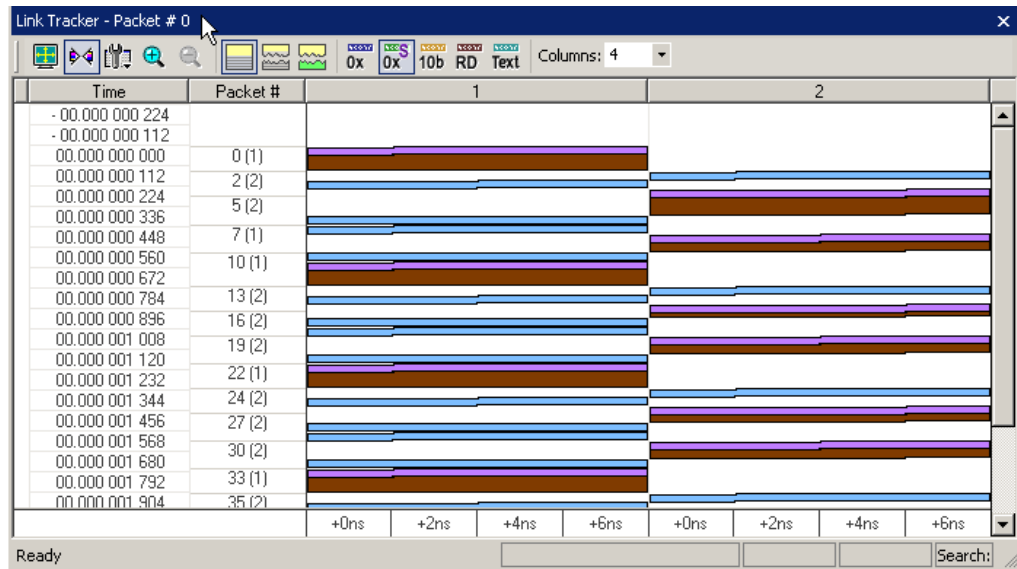
The Link Tracker window can be reformatted in several ways.

Zooming In and Out


Zooming out can give you a quick, high-level view of a trace. A fully zoomed out trace only shows columns and colored lines. Using the colors, you can see what types of traffic run through the trace.

Further information can be obtained on any point of interest in the trace by positioning your mouse pointer over it. Tool tips provide detailed description of events.

Note: When fully zoomed out, the smallest graphical unit is the DWORD, represented by a single line. Zooming out makes the trace appear smaller and increases the time scale in the first column.



Collapsing Idle Time, Enabling Tool tips, and Resetting Column Widths

Click the **View Options** button  to open a menu with options for formatting the display. Three options are presented:

Collapsible Idle Time: Opens a dialog box for setting the Idle time value. Setting a value tells the Analyzer when to collapse Idle times and display them as grayed out strips within the Bus View window.

Tooltip Display: Opens a menu with options for adding content to Tooltips. Tooltips display when you position the mouse pointer over an item in the Bus View window. The options are:

- Tooltips Display Values
- Tooltips Display Scrambled Values
- Tooltips Display 10-bit Codes
- Tooltips Display Symbols

Time Format: Seconds or Clock

Reset Column Widths: This option resets column widths to their defaults and enables columns to resize themselves automatically any time the application window is resized. Normally, columns automatically resize themselves if the application window is made larger or smaller. However, if you manually resize any columns in the Bus View window, column widths become static. Thereafter, if you resize the application window, the Bus View columns do not adjust automatically. Reset Column Widths re-enables the automatic resizing capability.

Reset Columns Order: Return to default column sequence.

Docking and Undocking the Window

You can undock the Link Tracker window by double-clicking the blue title bar along the left side of the window. Once undocked, the window can be dragged anywhere in the application. To redock, double-click again on the title bar.

Setting Markers

Markers can be set on any event within the Link Tracker window.

To set a marker, right-click an event, then select **Set Marker** from the pop-up menu.

Once marked, you can navigate to events with the **Go to Marker** command in the Search menu.

Markers set in the Link Tracker window display the packet number and DWORD number. In contrast, markers set in the Trace window just show the packet number.

Hiding Traffic

You can hide Idles and other data from the Link Tracker window by clicking the **Hide** buttons on the toolbar.

Link Tracker Buttons

The Link Tracker window has a row of buttons for changing the format of the displayed data and for exporting data: The buttons have the following functions:



Full Screen. Expands the Link Tracker window to fill the entire screen.



View Options. Opens a menu with three options:

- **Collapsible Idle Time** (Collapse Idle Bigger Than **n** nanoseconds.
Note: Does not affect Collapse Idle Plus.)
- **Tooltip Display** (Values, Scrambled Values, 10-bit Codes, Symbols)
- **Time Format** (Seconds, Clock)
- **Reset Columns Widths** (return to default widths)
- **Reset Columns Order** (return to default column sequence)

See “Using the Link Tracker Window” on page 134 for further details.



Synchronize Trace View. Synchronizes the Trace View and Link Tracker windows so that a move in one window repositions the other.

Because of the differences in scale and logic between the Link Tracker and Trace view window, scrolling produces different effects depending on which window is being scrolled.

Scrolling in the trace window causes the Link Tracker window to rapidly jump from event to event. Long periods of idle time are thus skipped.

Scrolling in the Link Tracker window, in contrast, produces modest movements within the trace window.

Scrolling in the Link Tracker window causes the trace window to pause until the beginning of a packet is displayed. At that point, the trace window repositions itself. While scrolling long Idle periods or through the contents of a packet, the trace window does not move.



Zoom In



Zoom Out



Continuous Time Scale. No collapsing.



Collapse Idle. Do not show some periods of Link being idle.



Collapse Idle Plus. Do not show periods of Link being idle.



Show Values



Show Scrambled Values



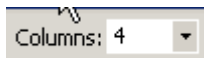
Show 10b Codes



Show Symbols



Show Text



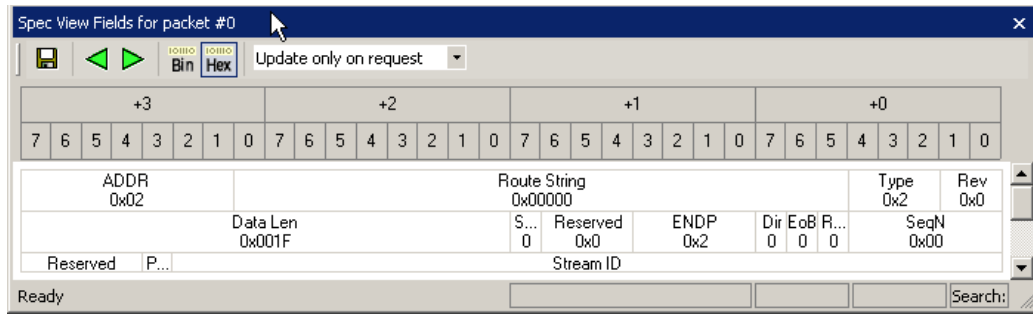
Columns to view

9.8 Spec View (3.0)

The Spec View shows packet header information.

To obtain the Spec View, select **Report > Spec View**

or click the  Spec View toolbar icon.



The toolbar allows you to Save, go to Previous or Next, display Hexadecimal or Binary, and Update only on request, Update on click, or Update on scroll.

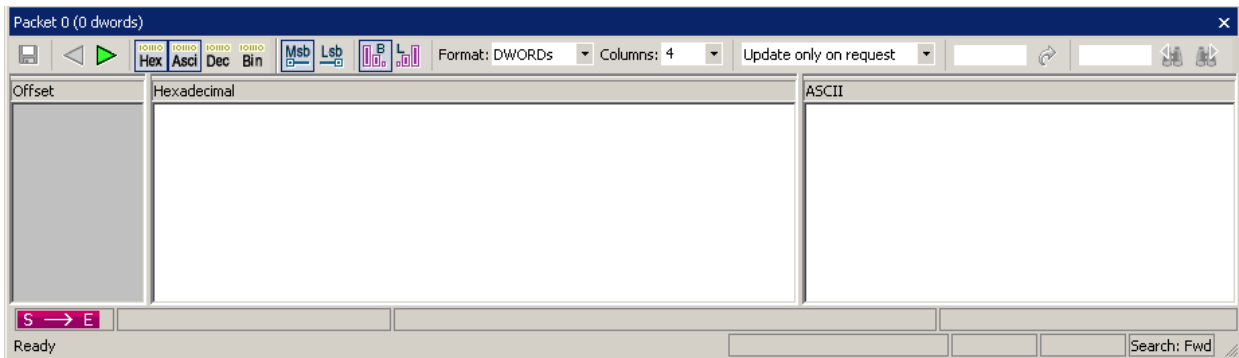


9.9 Data View

The Data View window shows packet information.

To obtain the Data View window, select **Report > Data View**

or click the  toolbar icon.



The Data View toolbar buttons allow you to:

- Save
- Go to Previous or Next
- Display Hexadecimal, ASCII, Decimal, or Binary
- Use MSB Format or LSB Format
- Use Big Endian or Little Endian



The Format field allows you to enter the number of BYTEs, WORDs, or DWORDs per line.

The Columns field allows you to set the number of columns.

You can **Update only on request**, **Update on click**, or **Update on scroll**.

You can enter an offset in the Scroll to Offset field and click the **arrow** to scroll there.

You can enter text in the Search field and click **Search Previous** or **Search Next** to go there.

Navigator Toolbar

The Navigator toolbar lets you quickly set Navigator features. The toolbar has two buttons.



Navigator Ranges: This button brings up a pop-up menu that lets you reset the Navigator range. The range determines what packets are viewable in the trace display.



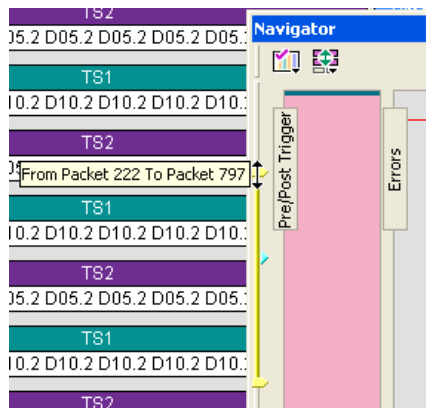
Navigator Panes: This button has two purposes: To select which Navigator panes appear and to bring up the Navigator legend. The legend determines how information is shown in the panes.

Navigator Ranges

You set the viewing range by dragging the **yellow range delimiters** along the slider.

To set the lowest packet viewable, drag the **top delimiter up**. As you do so, a tool tip appears to indicate the current range. Stop dragging when you reach the desired lowest packet.

To set the highest packet viewable, drag the **bottom delimiter down**. Stop when the tool tip indicates you are at the desired highest packet.



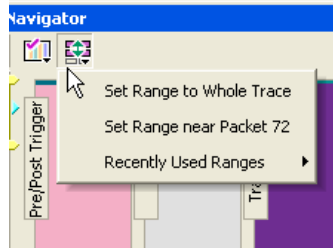
To Determine Current Position

In addition to the two range delimiters, the slider has a **blue current-position** indicator (see above). The current-position indicator shows where you are in the trace display with respect to the possible viewing range.

For example, suppose you set viewing range to packet 0 through packet 500 (the top range delimiter is at packet 0, and the bottom range delimiter is at packet 500). If you then move the current-position indicator on the slider to midway between the top and bottom delimiters, then packet 250 appears in the middle of the trace display.

To Reset Navigator Range

You can reset the Navigator range using the toolbar **Navigator Range** button. Press the button to bring up the Navigator Range drop-down menu.

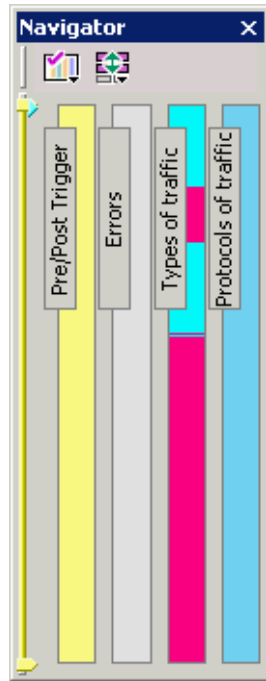


The menu has the following options:

- **Set Range to Whole Trace:** Allows you to reset the range to include the entire trace file contents. The top range delimiter is placed at the lowest packet number in the trace. The bottom range delimiter is placed at the highest packet number in the trace.
- **Set Range Near Packet xxx:** Allows you to collapse the range so that only the packets immediately above and below the xxx packet are displayed. The xxx packet is whatever packet is currently at the top in the trace display.
- **Recently Used Ranges:** Allows you to reset the range to any of a number of recently used (previously set) ranges.

Navigator Panes

You can display any combination of trace Navigator panes.



From left to right, the panes are: Pre/Post Trigger, Errors, Traffic Types, and Protocols of Traffic. Each pane represents the entire trace with respect to different types of information. The top of each pane represents the start of the trace file, and the bottom represents the end of the trace file.

- **Pre/Post Trigger:** To view the trigger event in the trace and the relative size of pre-trigger and post-trigger portions of the trace. The two portions are set apart as different colors. The trigger event occurs at the point the two colors meet.
- **Errors:** To view any errors in the trace. A thin red line represents each error in the pane.
- **Traffic Types:** To view the types of packets that occur in the trace. A different color represents each packet type in the pane. The relative size of colored portions in the pane corresponds to the amounts of the various packet types in the trace. As described below, you can use the Navigator legend to change the types of packets that take precedence in the display.
- **Protocols of Traffic:** To view USB 2.0, USB 3.0 Host Tx, or USB 3.0 Host Rx.

To Show/Hide Navigator Panes

You can show/hide any of the panes using pop-up menus accessible through right-click the **Navigator Panes** button or by right-click anywhere in any Trace Navigator pane.

Navigator Slider

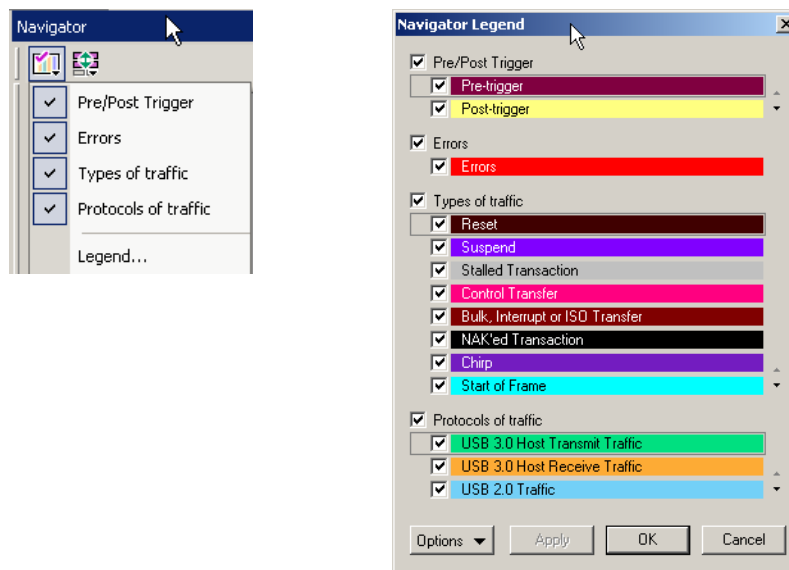
The Navigator slider appears at the left of Navigator panes. The slider has **yellow upper and lower range delimiters** and a **blue current-position** indicator.

The Navigator slider lets you to set the range of packets viewable in the trace display. In other words, it sets scrolling range of the display. You can scroll the display up to the lowest packet number in the viewing range. You can scroll the display down to the highest packet number in the viewing range.

Trace Navigator Legend

The Navigator legend lets you control the display of content in Navigator panes.

You bring up the legend through the Navigator Panes drop-down menu. Press the toolbar **Navigator Panes** button to access the menu. Select the **Legend** option to bring up the Navigator Legend dialog box.



The Navigator Legend dialog box has areas corresponding to each of the panes. Each area has check boxes that allow you to hide/display information in the pane. You can set the priority of information displayed in the panes using the up and down triangles on the right.

Using the Legend to Show/Hide Navigator Panes

To use the legend to show/hide an entire pane, use the **checkbox** next to the name of each pane in the legend.

In the case of the Pre/Post Trigger and Errors areas, the action of show/hide in the legend is identical to that provided by Trace Navigator pop-up menus.

In the case of the Traffic Types pane, there is no equivalent show/hide available through the pop-up menus.

Using the Legend to Set the Priority of Information Display

You can use the legend to set the priority of information displayed in the Pre/Post Trigger Traffic Type panes. This is a two-step process.

Step 1 For a particular item in a pane, click the **column next to the checkbox** for the item. That labels the item as currently active.


Step 2 Next, use the **up-down** at the lower-right of the area to move the item higher or lower in priority.

In the case of the Traffic Type pane, priority determines display priority of each packet type. For portions of the trace that are dominated by a particular packet type, this setting no effect: only the color corresponding to that packet type is displayed in that portion of the pane. Suppose, however, that part of the trace includes equal or near equal numbers of several types of packets. In that case, you can use the legend to select which among those types is represented in that portion of the Traffic Types pane. This allows you to view only packets of interest in crowded portions of the trace display.

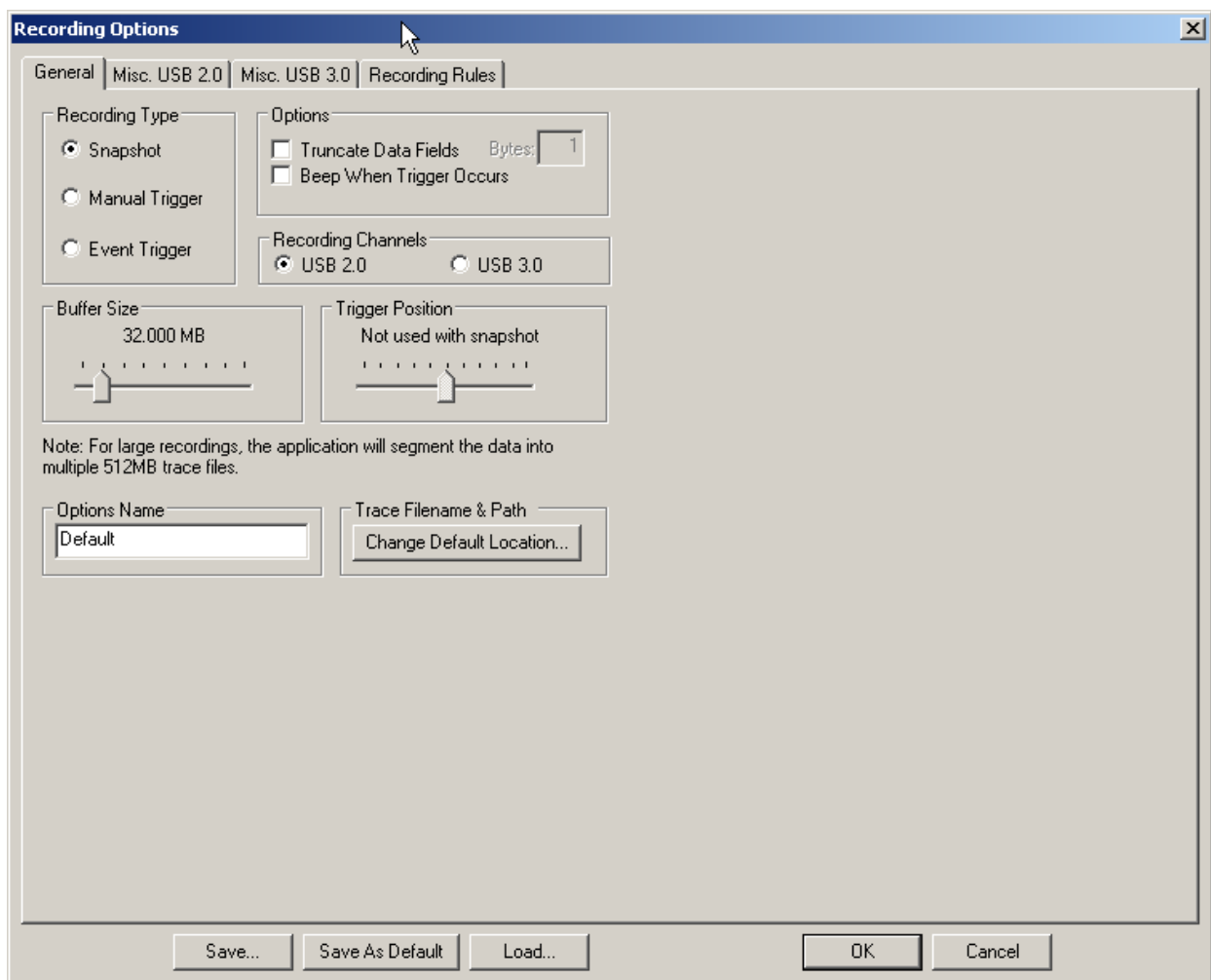
Chapter 10: Recording Options

Use **Recording Options** to create and change various features that control the way information is recorded by the Analyzer.

To open the **Recording Options** dialog box:

- Select **Recording Options** under **Setup** on the Menu Bar.
OR
- Click  on the Tool Bar.

You see the **Recording Options** dialog box:



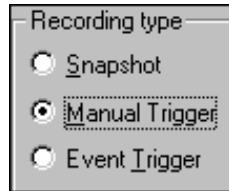
The **Recording Options** window always opens with the **General** tab showing.

10.1 General Recording Options

The General Recording Options allow you to select or adjust the recording type, the buffer size, the amount of post-trigger recording, and the trace filename and path.



Recording Type

The **Recording Type** box presents three options that allow you to set how the Analyzer begins and ends a recording.




The options are: *Snapshot*, *Manual Trigger*, and *Event Trigger*.


Snapshot

A Snapshot is a fixed-length recording. The size of this recording is set by the Buffer Size box. Recording begins when  is clicked and ends when either the selected buffer size is filled or the  button is pressed.


Manual Trigger

A Manual Trigger is a recording whose trigger point is caused by pressing the trigger button on the front panel.

Recording begins when you click  on the Tool Bar. Recording continues in a circular manner within the limits set by the buffer size.

Recording ends when  is clicked on the Tool Bar or after post-trigger memory has been filled following depression of the trigger button on the front panel.

Event Trigger

Recording begins when you click  on the Tool Bar.

Recording continues in a circular manner within the limits set by the buffer size until an event is detected that meets the Trigger conditions specified in the Triggering Options and the defined amount of data has been recorded after the Trigger Event.

Options

- **Truncate Data Fields (2.0):** Allows data fields to be truncated during recording in order to save Analyzer memory and allow recording of more packets. Enter a minimum data length value in the Bytes box. The system truncates the data to the stated value or slightly larger.

Note: Truncation of data may cause incorrect transaction or transfer decoding.

- **Beep When Trigger Occurs:** The computer connected to the Analyzer beeps three times when a Trigger condition is first detected.

Recording Channels

You can choose **USB 2.0** or **USB 3.0** as the recording channel.

Buffer Size

You can adjust the size of the recording buffer from 3.2 megabytes to 1 or 4 gigabytes.

The **Recording type** option determines how this buffer is used. Although there are 1 or 4 gigabytes of physical memory in the Analyzer, the efficiency of the recording is about a 2:1 ratio of physical memory to actual USB traffic. Shorter USB packets yield a slightly less efficient recording. The non-traffic portion of physical memory is utilized for control and timing information.

Note: The scale is not linear and affords more granularity in the smaller buffer sizes.

Trigger Position

You can adjust the amount of recording to be done post-Trigger or select where you want the Trigger located within the defined buffer. You can adjust the Triggering Position between 1 and 99% post-Trigger. **Trigger Position** is available only when **Manual Trigger** or **Event Trigger** is selected as **Recording type**.

As an example, if the buffer size is set to 16MB, then for the following Trigger Position settings, the amount of pre- and post-Trigger data is

- 95% post-triggering: 0.8MB pre-trigger, 15.2MB post-trigger
- 75% post-triggering: 4MB pre-trigger, 12MB post-trigger
- 50% post-triggering: 8MB pre-trigger, 8MB post-trigger
- 25% post-triggering: 12MB pre-trigger, 4MB post-trigger
- 5% post-triggering: 15.2MB pre-trigger, 0.8MB post-trigger

Note: When a Trigger occurs, recording continues until the post-Trigger amount of the buffer is filled or when **Stop** is selected.

Options Name

The **Options Name** is a descriptive label of the current Recording Options settings. Options Names are associated with files that have a **.rec** suffix.

The default option name is **default**. **Default** preserves the current Recording Options settings.

The purpose of the **Options Name** box is to give you a place to preserve different Recording Options that you use on a recurrent basis. For example, if you use two or three different Recording Options configurations, you can save these configurations and load them the next time they are needed.

Because Options Names are descriptive labels and not file names, you can enter in any text you like into the box. Your labels can be very descriptive such as "Trigger on High Speed traffic when CRC errors occur."

To create a new Recording Options name:

Step 1 Enter a comment for the new file in the **Options Name** field.

Step 2 Click **Save** to display the **Save As** window.

Step 3 Specify a filename (*.rec)

Step 4 Click **Save**.

To load a Recording Options name:

Step 1 Click **Load** to display the **Open** window.

Step 2 From the list of **.rec** files, select the one that represents your Options Name.

The options settings for that name then display.

Trace File Name & Path

Trace File Name & Path opens a **Save As** dialog box for saving your trace file. The default recording file name is **data.usb** for Low, Full, and High Speed recordings. If you are recording on both channels, then the system creates two files: **data_0.usb** for Channel 0, and **data_1.usb** for Channel 1.

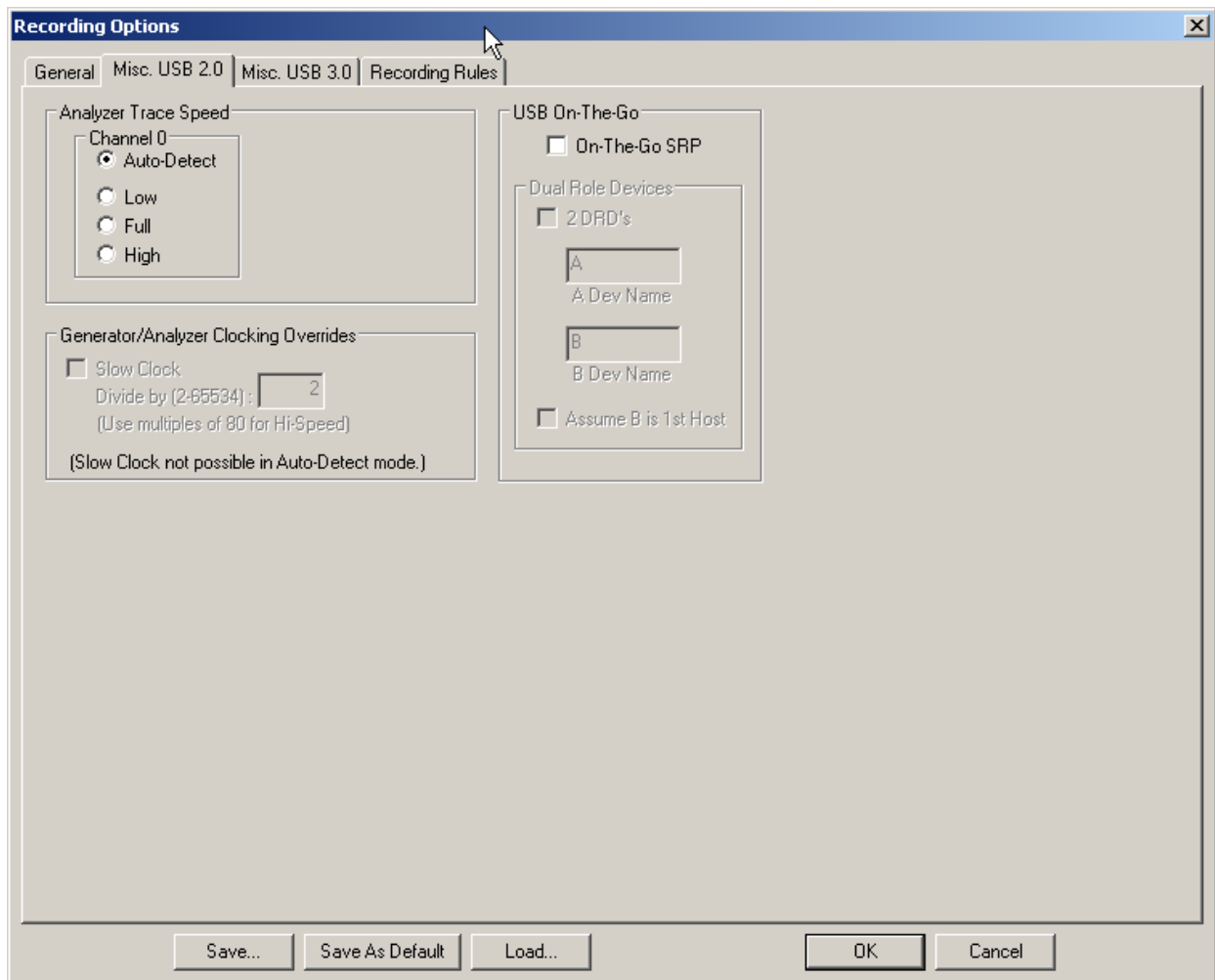
- Click **Trace File Name & Path**.

You see a **Save As...** window in which to enter the recording file name ***.usb** for all subsequent recordings.

10.2 Recording Options - Misc. USB 2.0

The **Misc. USB 2.0** page presents options for setting:

- **Analyzer Trace Speed:** Select Auto-Detect, Low, Full, or High.
- **USB On-the-Go:** Check **On-the-Go SRP**. Optionally select **Dual Role Devices** as **2 DRD's** and enter device names. Optionally assume that B is the first host.
- **Generator/Analyzer Clocking Overrides:** Select **Slow Clock** and enter number of megahertz.



Analyzer Speed

This option sets the speed of the traffic recorded by the Analyzer. The default setting is **Auto-detect**. This setting tells the Analyzer to discover what speed traffic is running and to label packets accordingly. If you are having problems with your recordings, you might try setting the traffic speed to one of the fixed values -- Low, Full, and Hi speed. These settings are used when you want to manually set the traffic speed.

In some rare cases, auto-detection circuitry causes Full Speed devices to fail to enumerate on plug-in. Changing the Analyzer speed to Full Speed can sometimes solve this problem.

Setting the speed to one of the fixed values is sometimes useful for debugging purposes. For example, if a device that is producing numerous errors at a particular speed, you may wish to set the recording to that speed in order to ensure that the Analyzer does not misread the error packets and label them the wrong speed. While it is unlikely that the Analyzer will mislabel packets in this way, manually setting the recording speed guarantees that the Analyzer always records packets at the correct speed.

Notes on Hi Speed Recordings

Erroneous chirp blocks can be recorded on an idle bus when the Device has its FS terminations on while the Host has HS terminations connected. This causes a small differential voltage (“tiny-J”) on the USB bus that causes false Chirp detection.

This condition occurs during speed negotiation:

- On a HS bus, the condition is momentary just before the device chirps.
- On a CS bus, the condition occurs both before and after the device chirp (until the end of Reset). The user is discouraged from using **Speed=HIGH** to record signals on a classic speed bus.
- The Analyzer stops recording anything for 2.5 milliseconds following a FS_K state (which is at least 2 microseconds long). This is to avoid presenting “garbage” which is a by-product of the high-speed probe settling down.

Generator/Analyzer Clocking Overrides

Generator/Analyzer Clocking Overrides allows changes to be made to the Analyzer/generator clocking. Select **Slow Clock**, then enter a value in the box on the right. The value that is entered tells the Analyzer how much to divide the base clock by. For example, entering a 4 causes Full Speed traffic to be generated at a 3-megabit rate as opposed to the standard 12-megabit rate.

You can use the slow clock selection to slow down the base clock during generation. This also changes the Analyzer’s clock base to match.

Step 1 In the **Misc. USB 2.0** tab, make sure you are out of Auto-Detect mode.

Step 2 Select the **Slow Clock** checkbox.

Step 3 In the **Divide By** field, enter a value.

Step 4 Click **OK**.

USB On-The-Go

USB On-The-Go option sets the Analyzer to record the USB On-The-Go traffic. This protocol lets you run two devices, specify one of them as the host, one of them as the device, and to assign each device a name.

10.3 Recording Options - Misc. USB 3.0

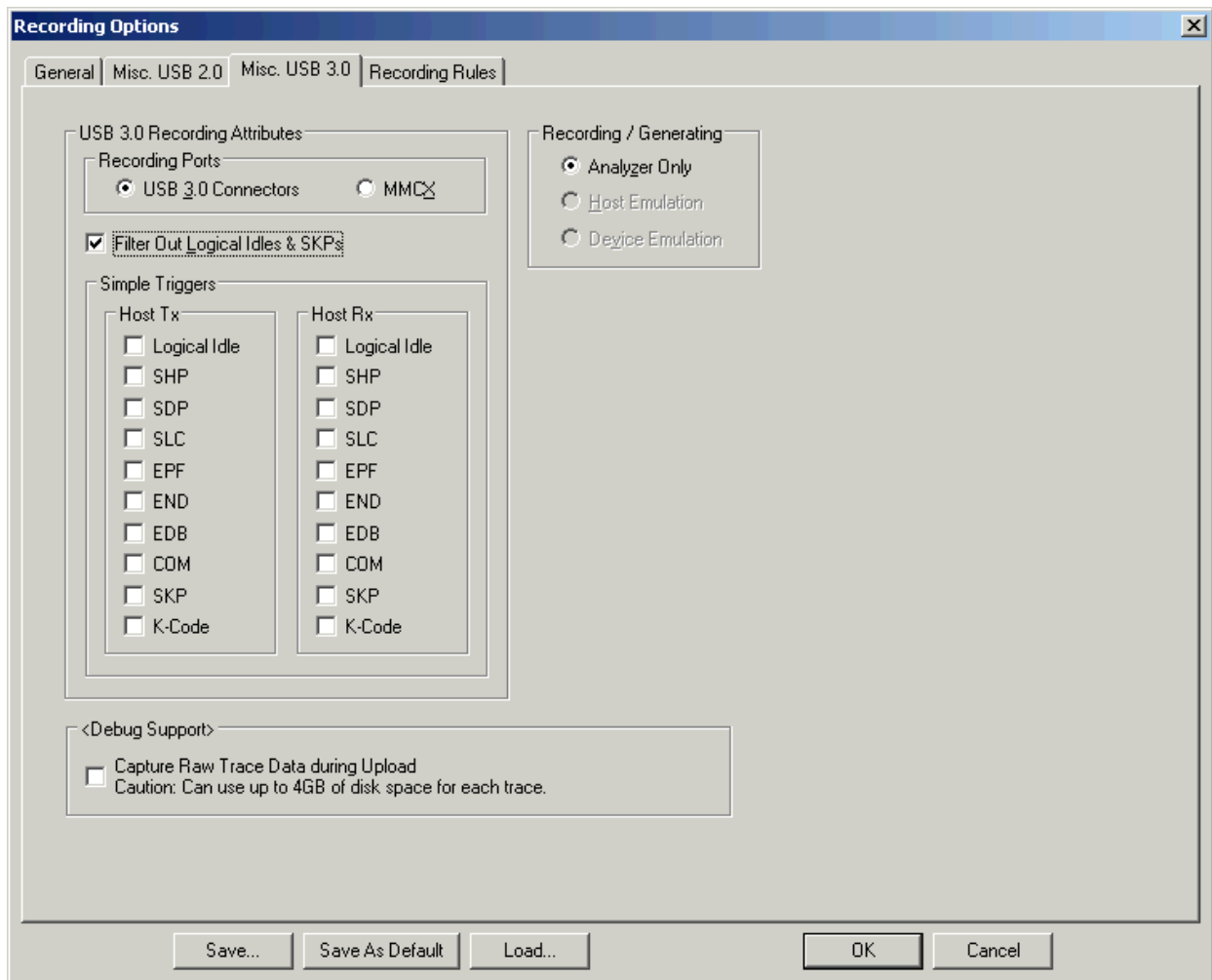
The **Misc. USB 3.0** page presents options for setting Recording Ports, Simple Triggers, and Recording/Generating.

For Recording Ports, select **USB 3.0 Connectors** or **MMCX**.

You can **Filter Out Logical Idles and SKPs**.

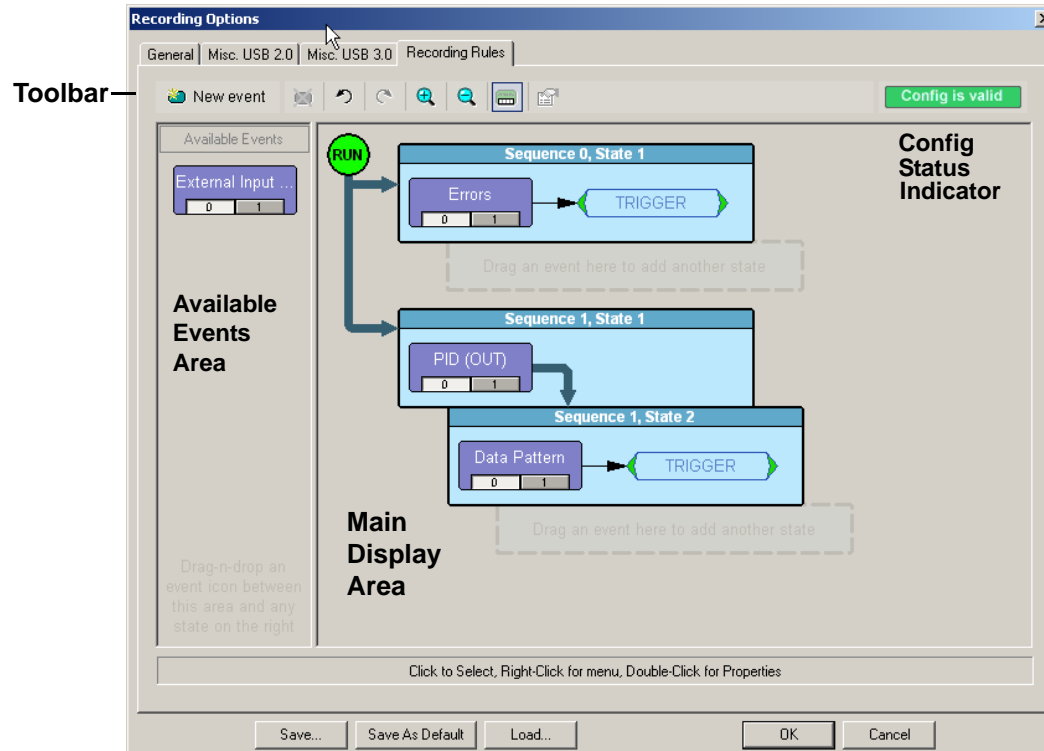
For Simple Triggers, and Host Tx or Host Rx, select: **Logical Idle, SHP, SDP, SLC, EPF, END, EDB, COM, SKP**, and/or **K-Code**.

For Recording/Generating, select **Analyzer Only**, **Host Emulation**, or **Device Emulation**.



10.4 Recording Rules

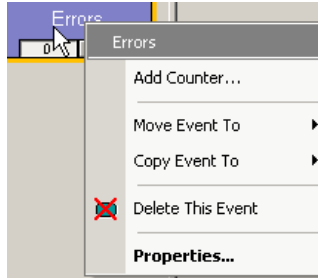
Use the Recording Rules to set triggers and filters.



The page has the following areas:

- **Toolbar:** Contains buttons that control the Recording Rules page.
- **Available Events Area:** Area where you can park Event buttons that you intend to use in the Main Display area.
- **Main Display Area:** Area where you configure trigger and filter rules. You configure rules by dragging Event buttons from the Available Events area and then assigning actions to those buttons.
- **Config Status Indicator:** A button that indicates if the rule is valid or invalid. If a trigger or filter rule is configured correctly, the button is green and indicates Config is Valid. If a rule is not configured correctly, the button is red and indicates Config is Invalid.

Pop-Up Menus: When you right-click a button or area in the Recording Rules page, a context-sensitive pop-up menu appears that lets you do operations that relate to that button or area.



Properties Dialogs: When you click the Show/Hide Properties Dialog button for an event, action, or state, a dialog allows you to perform the same operations as in the pop-up menus.








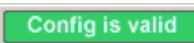


Recording Rules Toolbar

The Recording Rules toolbar buttons control the Recording Rules page.



Figure 10.1 Recording Rules Toolbar

Table 10.1 Recording Rules Buttons

	New Event. Creates a new event in the Available Events area.		Zoom Out. Makes the display appear smaller.
	Delete Event. Deletes the selected event.		Show/Hide Channels. Shows or hides the channel icon on the Event button.
	Undo. Undoes the change made to Recording Rules page. The Undo buffer has unlimited size.		Show/Hide Properties Dialog. Shows or hides the properties dialog of the selected event, action, or state.
	Redo. Restores changes done to the Recording Rules page.		This display appears when the current Recording Rules configuration can be executed by the hardware.
	Zoom In. Enlarges the display (see note). There are five zoom levels. The default level is the middle one.		This display appears when the current Recording Rules configuration cannot be executed by the hardware.

Note: If you have a wheel on the mouse, you can zoom by holding down the CTRL key and rolling the mouse wheel.

Recording Rules Page: How It Works

You can think of the Recording Rules page as a workspace for creating recording rules (rules that determine how the analyzer records traces). Recording rules are combinations of events and actions.

An event and the action or actions associated with it form a rule state. One or more states are encapsulated in a sequence.

Note: There can be from one to 512 states within a sequence. You can associate one or more events with each state, and you assign each event a different action or the same action.

A sequence that has only one state is called a single-state sequence. The analyzer continuously watches for each event in the sequence and executes the corresponding action if the event is detected.

A sequence that has multiple states is a multi-state sequence. The states are arranged in a hierarchy, with a top state and successively lower states. Only one state in a multi-state sequence is active at a time. The analyzer does not go to a successive state unless it is directed to do so by the previous state.

Sequences are described in detail in “Using Sequences” later in this chapter.

Briefly, creating a rule involves the following steps:

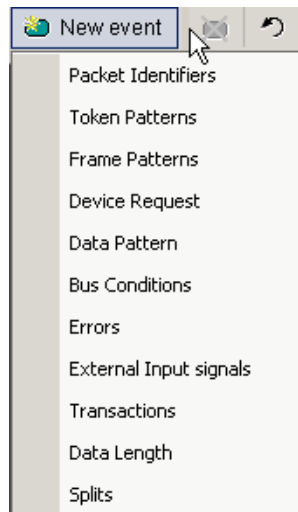
- Step 1** Creating Event buttons in the Available Events area.
- Step 2** Drag-and-drop of Event buttons to the appropriate areas (cells) in the Main Display area.
- Step 3** Assigning an action or actions to each Event button.

Creating Event Buttons

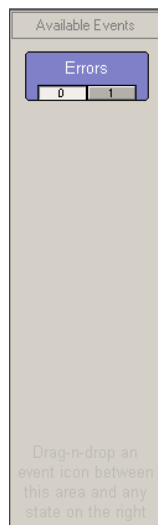
To create a rule, first create one or more Event buttons. As you create Event buttons, they appear in the Available Events area. You then can drag-and-drop them into the Main Display area.

To create event buttons:

Step 1 Click the **New Event** button at the left side of the toolbar to display the New Event pop-up menu.



Step 2 Select an event, such as Errors. The event appears in the Available Events area.



Dragging a Button to the Main Display Area

After you create an Event button in the Available Events area, you can drag the button to the Main Display area and drop it in the appropriate cell (a cell is a grayed-out rectangle with a dashed line around it). You can think of each cell as a target for drag-and-drop of an Event button.

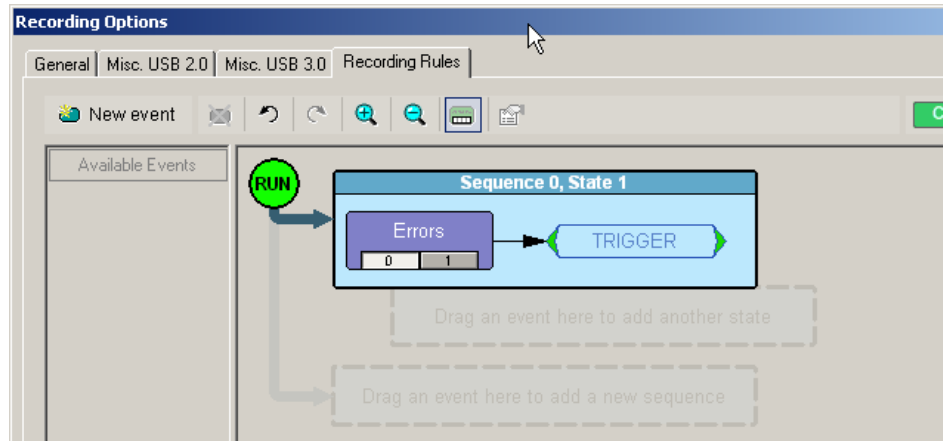
There are two types of cell that might appear: Sequence cell and State cell. In the Main Display area, they are labelled as follows:

- **Sequence cell:** Drag an event here to add a new sequence.
- **State cell:** Drag an event here to add another state.

If there currently are no events in the Main Display area, a single sequence cell appears at the top of the area.

To drag-and-drop the Event button:

- Step 1** Place the mouse cursor on the Event button in the Available Events area. Click the left mouse button.
- Step 2** Drag the button to the cell. When the button is in the cell, a dashed highlight line appears around the cell. Drop the button in the cell (release the left mouse button). The Event button appears in the cell.



The default label for the first cell is “Sequence 0, State 1.” As described later in this section, you can change that label using the Properties pop-up for that cell.

Two new cells appear under the first cell. The first of these new cells is a state cell that allows you to create another state in rule Sequence 0 (to make Sequence 0 a multi-state sequence).

The second of the new cells is to create a separate sequence, which would be labelled Sequence 1.

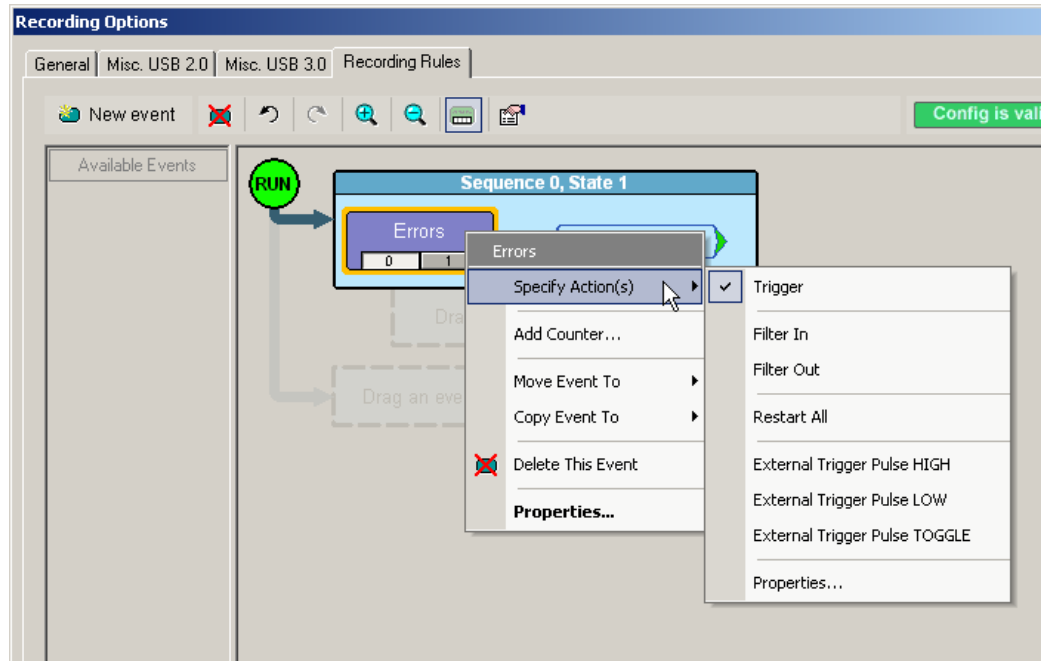
Assigning an Action

After you have dropped the Event button in a cell in the Main Display area, you can assign an action to the event.

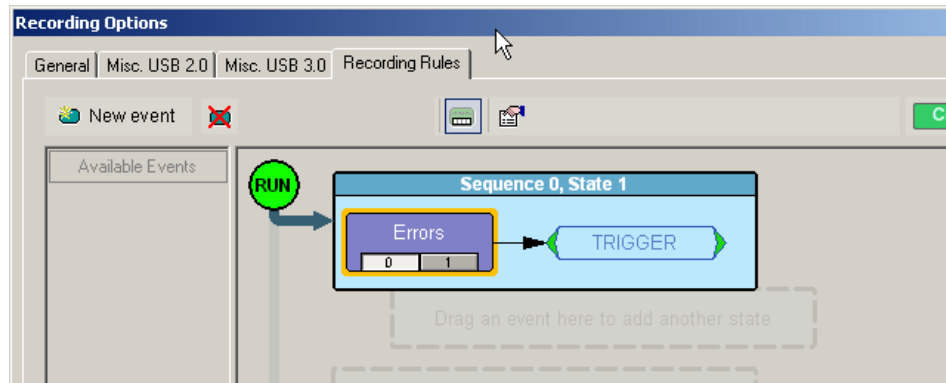
Note: If you do not assign an action to an Event button, the analyzer ignores the event.

To assign an action to an Event button:

Step 1 Right-click the **Event** button to display a pop-up menu.



Step 2 Select **Specify Action**, and then choose an action from the submenu. The menu closes, and the action is assigned.



Note: You can also set actions within the Properties dialog for each event. Double-click the Event button to open the Properties dialog, then select the Actions tab and set your actions.

Recording Rules Pop-Up Menu

The Recording Rules window has context-sensitive pop-up menus that are associated with the following types of object: cells, events, and actions.

Cell Pop-up Menu

If you click a cell in the Main Display area that has an Event button contained in it, the Cell pop-up menu appears. The Cell pop-up menu has the following options.

- **New Event:** Displays the same menu that you get when you click the New Event button on the toolbar.
- **Properties:** Displays the Properties dialog for the selected cell.

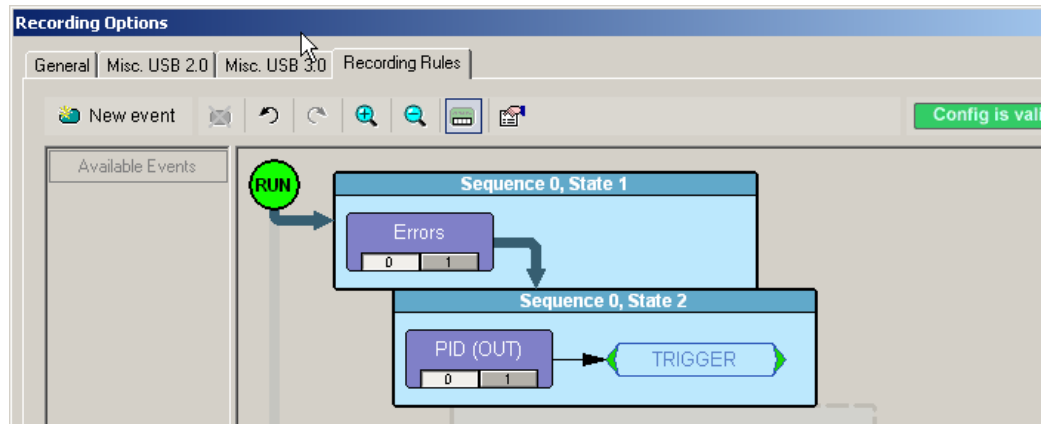
Action Pop-up Menu

If you click an Action button in the Main Display area, the Action pop-up menu appears. The Action pop-up menu has the following trigger and filter options:

- **Trigger:** Sets or clears Trigger action.
- **Filter In:** Sets or clears Filter In action. If Filter In is set, you cannot use Filter Out (it is disabled).
- **Filter Out:** Sets or clears Filter Out action. If Filter Out is set, you cannot use Filter In (it is disabled).

Note: Examples that show use of filters are provided later in this chapter.

Advance the Sequence: Creates an event sequence consisting of the event you clicked on and an event in a successive state of the sequence. A thick arrow appears from the selected event and points downward.



In other words, the **Advance the Sequence** button is the link between two states in a multi-state sequence. The **Advance the Sequence** arrow tells the analyzer to go to the next state if it detects the event at the tail (origin) of the arrow.

The Action pop-up menu has the following restart and trigger options:

- **Restart the Sequence (not shown):** Restarts the sequence. Note that this option is context-sensitive and only appears if you have created a multi-state sequence. A thick arrow appears from the selected event and point upward towards the first event in the sequence.
- **Restart All:** Restarts all rules in all sequences and in the global state and displays an arrow and a Restart All button. This action precludes selecting Advance the Sequence and Restart the Sequence.
- **External Trigger Pulse HIGH:** Sends an output signal with a Pulse High format through the output ports on the back of the UPAS. Pulse High is the default format. Pulse High causes the analyzer to transmit a 5-volt, 40-nanosecond signal.
- **External Trigger Pulse LOW:** Sends an output signal with a Pulse Low format through the output ports on the back of the UPAS. Pulse Low causes the analyzer to transmit a 0-volt, 40-nanosecond signal.
- **External Trigger Pulse TOGGLE:** Causes the analyzer to transmit a signal that toggles at a trigger event between a continuous 5 volt signal and a continuous 0 volt signal.
- **Properties:** Displays the Action Properties dialog for the selected action.

Event Pop-up Menu

If you click an Event button in the Main Display area, the Event pop-up menu appears. The Event pop-up menu has the following options:

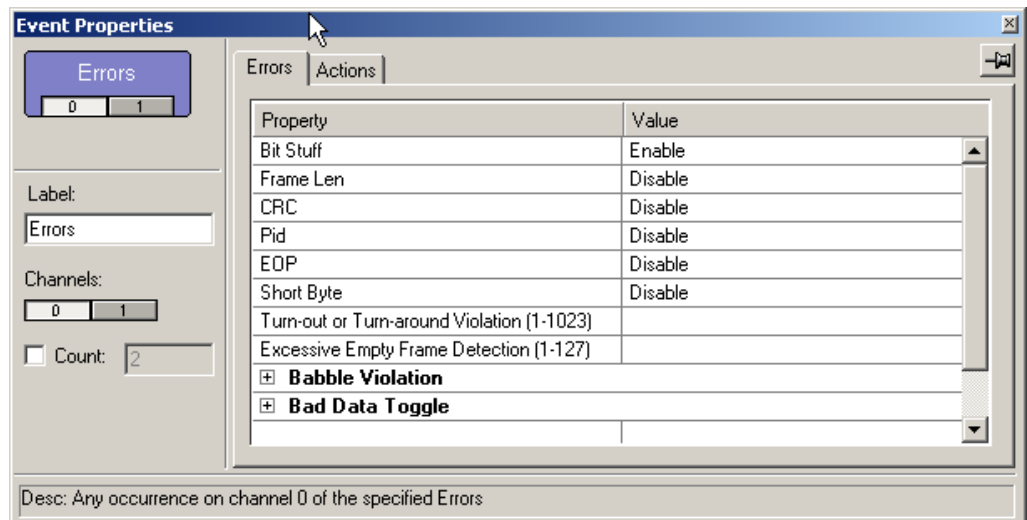
- **Specify Action(s):** Opens the Actions submenu, allowing you to assign an action to the event. Options on this submenu are the same as those on the Action pop-up, described previously.
- **Add Counter:** Adds a counter to count a specified number of times the event occurs before the analyzer executes the corresponding action.
- **Move Event to:** Moves the selected event to a different position in the Recording Rules window.
- **Copy Event to:** Copies the selected event to a different position in the Recording Rules window.
- **Delete This Event:** Deletes the selected Event. Alternatively, you can use the Delete button on the toolbar or keyboard to delete events.
- **Properties:** Displays the Event Properties dialog for the selected event.

Events and Event Properties

Recording rules are associations between events and actions. These associations determine how trace recording occurs. The supported events are:

- Packet Identifiers
- Token Patterns
- Frame Patterns
- Device Request
- Data Pattern
- Bus Conditions
- Errors
- External Input Signals
- Transactions
- Data Length
- Splits

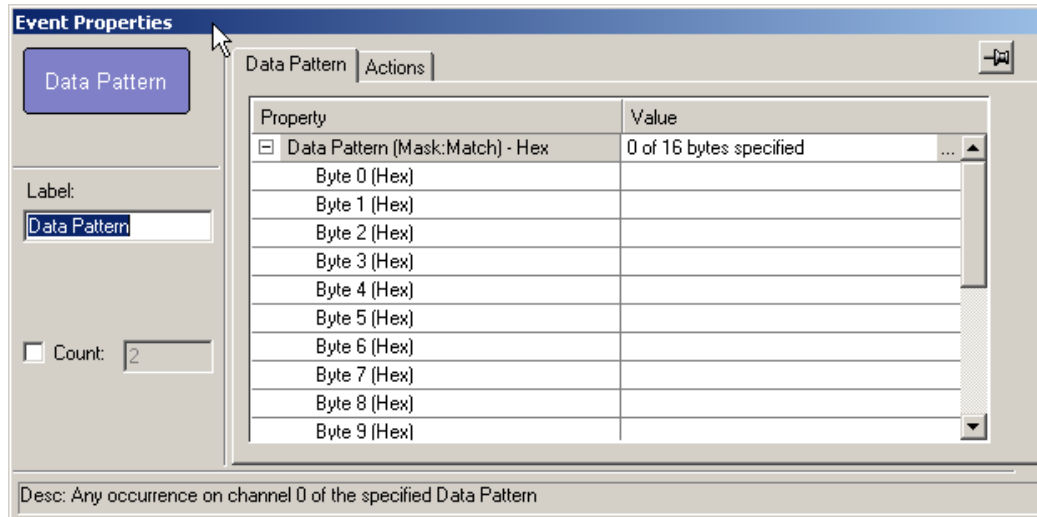
Event Properties (of the Error Event)



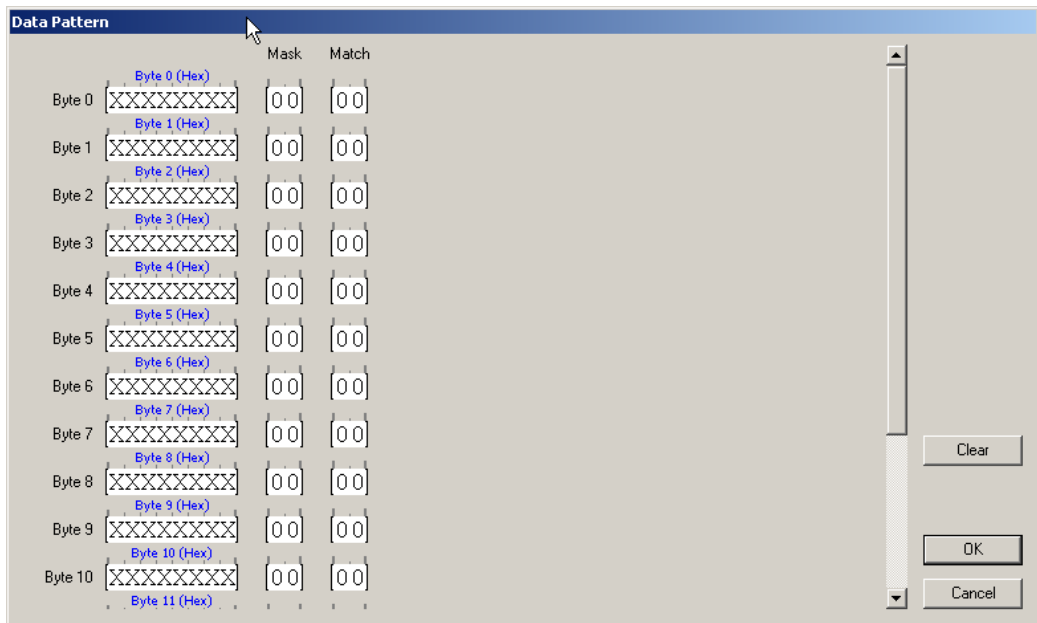
The dialog lists the Properties and their Values.

Data Pattern Mask and Match

If you select Data Pattern as the Event, you can set Data Pattern event properties in the Event Properties dialog.



Click the ... button at the right of the first line to display the Data Pattern dialog.



In the Data Pattern dialog, you can set the Bitmask, Mask, and Match for each bit, Bitmask and Match always correlate. When you set Bitmask or Match. the other changes to maintain their correlation.

Note: If you set Bitmask/Match before setting Mask, the Mask changes to the default mask. You must change to the Mask that you want.

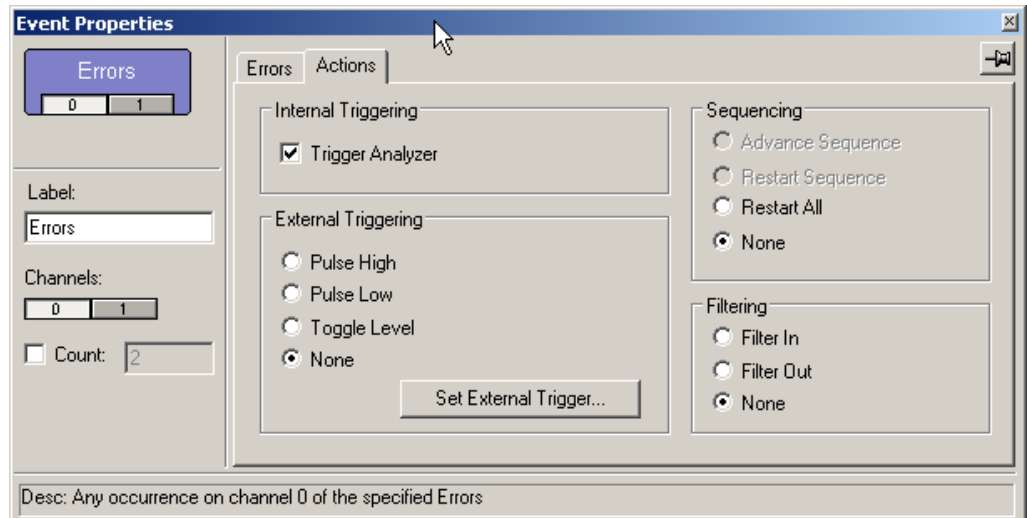
If you set an appropriate Mask before setting Bitmask/Match, the Mask does not change automatically to a default mask if you change Bitmask/Match.

Actions and Action Properties

The Actions are:

Event	Description
Trigger	Start recording.
Filter In	Include in the trace file the event specified (and no others).
Filter Out	Exclude from the trace file the event specified.
Advance the Sequence	Go to the next state in this sequence (sequence in which this action is located).
Restart All	Restart all sequences.
External Trigger Pulse HIGH	Send HIGH pulse on external trigger output.
External Trigger Pulse LOW	Send LOW pulse on external trigger output.
External Trigger Pulse TOGGLE	Send HIGH-LOW pulse on external trigger output.
Properties	Opens the Event Properties dialog box.

Action Properties (of the Error Event)



You can set Internal Triggering, External Triggering, Sequencing, and Filtering.

Using a Single-State Sequence

As described previously, a sequence can be single-state or multi-state. A single-state sequence is a simple combination of events and actions. You cannot create looping or branching conditions with this type of sequence.

A multi-state sequence allows you to branch successively to (advance to) lower states in the sequence or to loop to the front of the sequence (restart the sequence).

Using a Multi-State Sequences

Multi-state sequences allow you to create conditions that branch down to successive states or loop back to the beginning of the sequence. They are more complex than single-state sequences but very powerful.

Using Independent Sequences

You can use up to two independent sequences. By default, they are labeled Sequence 0 and Sequence 1.

The two sequences operate in parallel and have no effect on each other with the following exception. Either of the two sequences can contain the action Restart All. This action restarts both sequences in the Main Display area.

10.5 Saving Recording Options

To complete your Recording Options settings, use the features at the bottom of the **Recording Options** screen. These features remain the same no matter which of the three Recording Options screens you are working in.

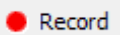
- Click **Save** to save the currently specified Recording Options for use in future recording sessions. Any file name can be specified, though use of the **.rec** is recommended; if no extension is specified, **.rec** is added by default.
- Click **Load** to load a previously saved ***.rec** file, thus restoring a previous set of Recording Options.
- The **Save as Default** function is equivalent to the **Save** function, specifying the file name **default.rec**. Whenever you start up the Analyzer, it automatically loads the **default.rec** file if one exists.
- Click **OK** to apply any changes and close this dialog box.
- Click **Cancel** to cancel any immediate changes you have made and exit the Recording Options menu.

10.6 Recording Bus Data


To start recording USB traffic once the appropriate Recording Options have been set perform the following steps. Note: If you have inserted any event triggers, be sure to select *Event Trigger* under the General tab in the Recording Options dialog box.

Step 1 Select **Start** under **Record** on the Menu Bar

OR

Click  on the Tool Bar.


Your recording session can continue until it has finished naturally,

or you may need to stop manually by clicking  on the Tool Bar, depending on how you set the Recording Options.

To manually stop recording:

Step 1 Select **Stop** under **Record** on the Menu Bar

OR

Click  on the Tool Bar.

Click  again during the uploading to upload only a portion of the recorded memory.


Note: The manual Stop Recording feature is primarily of use when recording low-speed traffic, which can take a long time to fill the recording buffer.

When the recording session is finished, the bus traffic is saved to the hard drive as a file named **data.usb** or whatever name you assign as the default filename.

To save a current recording for future reference:

Step 1 Select **Save As** under **File** on the Menu Bar.

OR

Click  on the Tool Bar.

You see the standard **Save As** screen.

Step 2 Give the recording a unique name and save it to the appropriate directory.

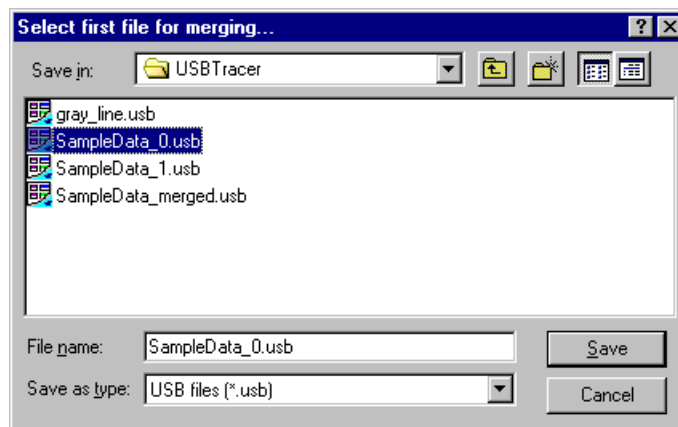
10.7 Merging Trace Files (2.0 USB Trainer Files only)

It is possible to merge a Classic-Speed trace file with a Hi-Speed trace file using the Merge Trace File command under the File menu. This option only works with files that were created simultaneously through a single recording session. If the files were recorded during separate recording sessions, the system generates an error message and prevents the merge from completing.

Note: The system can merging High Speed and Classic Speeds traffic into a single merged file if the **Auto-Merge 2 Channel Trace Files** option is checked in the Recording Options dialog box.

To merge two trace files:

Step 1 Select **File > Merge Trace Files** to display a dialog box asking for the first source file.

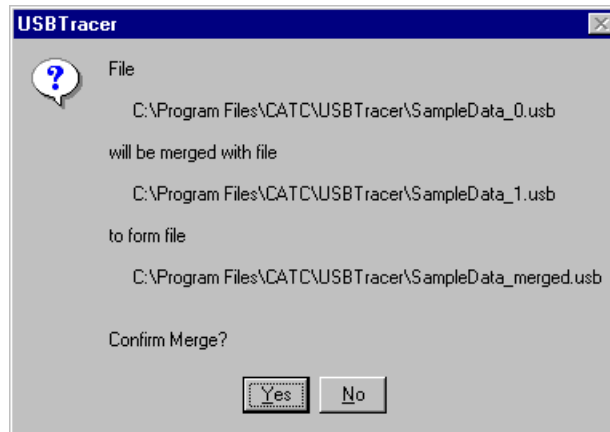


Note: The **Merge Trace Files** command can be run with or without a trace file open on the screen. The merge process ignores the open file.

Step 2 Select the first trace file to be merged, then click **Save**.

Note: It does not matter which of the two trace files is first selected so long as both were recorded in the same session.

- Step 3** Select the second trace file to be merged, then click **Save**.
Confirm your choices.



- Step 4** Click **Yes**.

The two files are merged into the new file **data_merged.usb**.

- Note:** If you attempt to merge two files that were recorded in separate recording sessions, the following error message appears:



Chapter 11: Traffic Generation (2.0)

USB Traffic Generation allows you to generate USB traffic and test designs under realistic conditions. Traffic Generation can also transmit known bad packets, providing an opportunity for engineers to observe how a device handles specific adverse conditions.

Traffic Generation Files

The system generates USB traffic from traffic generation files (*.utg) which are text-based script files that instruct the Generator how to generate USB traffic. These script files can be edited with either a simple text editor such as Notepad or with the Script Editor utility provided by the application. The Script Editor utility has several aids to simplify the process of writing and editing scripts: tool-tips, drop-down menus, and colored fields.

The script example below shows the beginning of a traffic generation file created through the **Export** command. This command provides an easy way to create a generation file - you open a trace file, then run the **Export** command. The trace serves as a blueprint for the traffic generation file.

The example below shows several commented lines followed by some instructions.

```
; File C:\Documents and Settings\Administrator\Desktop\enumeration\High_Hub_Sample.usb.  
; Packets 0 to 24328.  
  
; Device Side Packets were filter out during Export  
; NAK'ed transactions were filtered out during Export  
; Saved from Channel 0.  
  
file_type=UPAS  
file_version=2  
file_speed=HIGH  
  
chirp=here ; This needs to be added by hand, since the Export function does not export it.  
  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF  
frame=auto idle=TO_EOF
```

This generation file causes the system to simulate a hub and to generate 24,320 packets. See Section 11.3, "Device Emulation" on page 182 for details about the format of traffic generation files.

Creating Traffic Generation Files

If you choose to write a script with a text editor, a good way to start is to edit the sample generation file that is provided: **HS_Hub_Sample.utg**. This file is located in the same directory as the application (for example, **C:\Program Files\LeCroy\USB Protocol Suite**). You can open this generation file with Notepad or other editor and then add or remove text as needed.

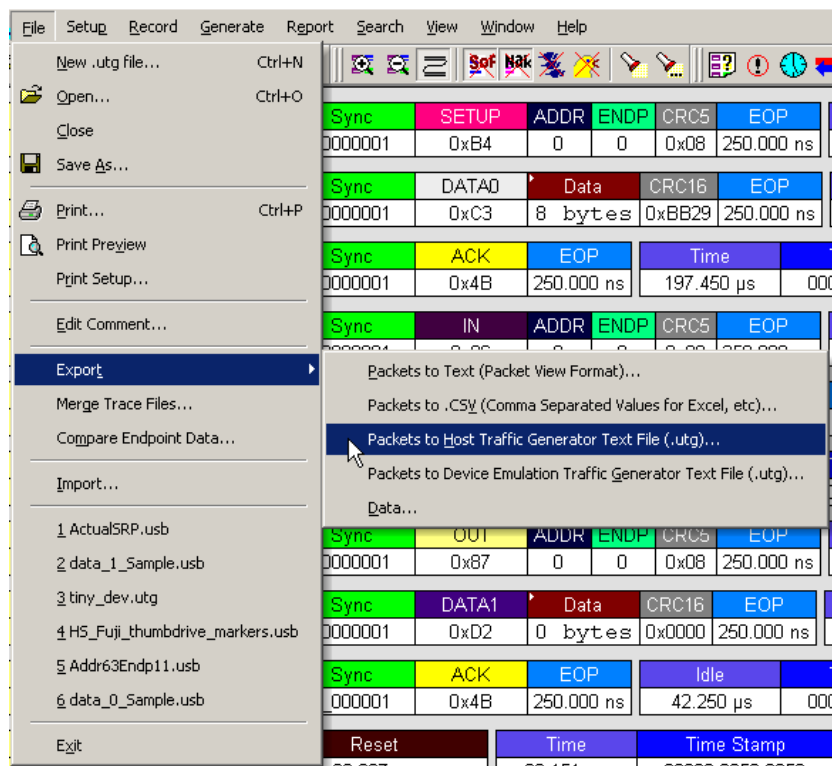
Creating a Traffic Generation File with the Export Command

The Export command offers an easy alternative method of creating a generator file. This command converts the trace to a *.utg file, removes all device traffic, and leaves only the traffic from the host device. You can then use this file to emulate the host and determine whether the device under test is generating the correct traffic.

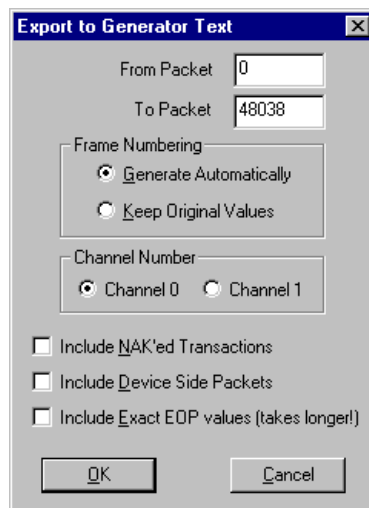
When creating a .utg file through the Export Packets to Text (Generator Text File Format) menu selection, it is suggested that you use the default values presented. Adding NAK transactions clutters the .utg file, and including the device side packets creates a .utg file which does not work with a real device attached.

To use the **Export** command:

- Step 1** Start the application.
- Step 2** Open a trace that has the pattern of traffic you would like to generate.
- Step 3** Select **File > Export** from the menu bar to display the File Export menu:



Step 4 Select **Packets to Text (Generator Text File Format)** from the **Export** drop-down menu. You see the **Export to Generator Text** window:



Step 5 Enter the numbers of the first and last packets in the series.

Note: The device packets are removed from the exported generator text. This is essential in creating a generator text file that can be used to handshake with your device.

Step 6 You can opt to regenerate the frame numbers and remove the NAKed transactions.

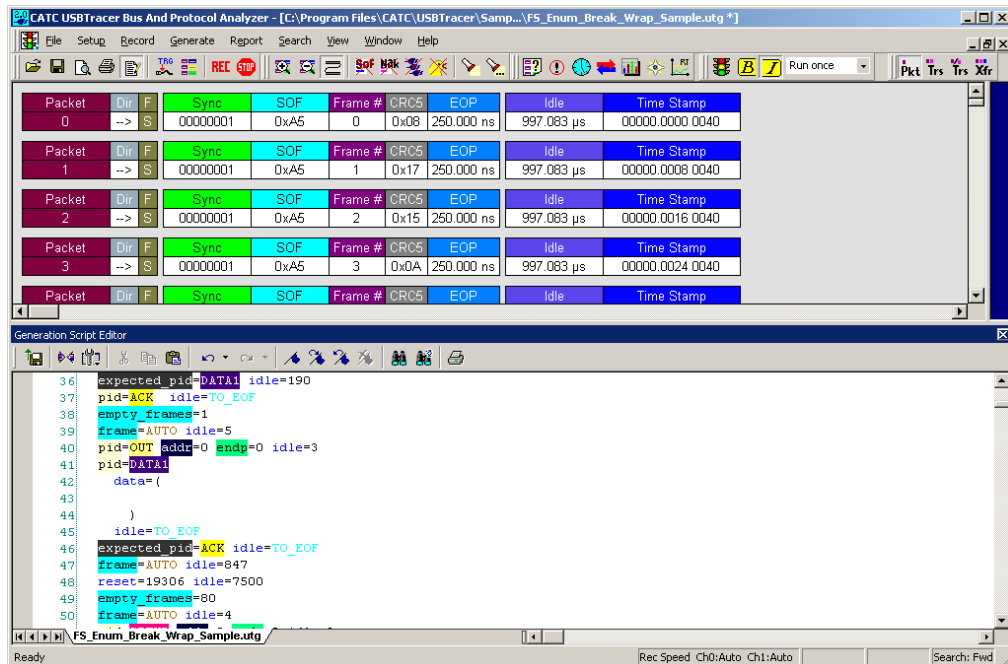
Once the generator text file is exported, you may need to edit the file and adjust idle time to properly anticipate the responses from your device.

11.1 Editing a Generation File

A **.utg** file is a text file that can be edited with any text editor such as Notepad. A better editing option, however, is Script Editor of the application. Script Editor provides the usual editing functions such as select, cut, copy, and paste but also adds tool-tips, colored keywords, drop-down parameter values, and expandable/collapsible packet data fields.

To launch the Script Editor, click the **Script Editor**  button on the toolbar or right-click the trace window and choose **Edit as Text**.

The Script Editor window opens in the lower portion of the trace window.

















The Script Editor divides into three areas: the toolbar, the script window, and the file tabs at the bottom of the window. If errors occur, a log opens at the bottom of the window.

Toolbar

The Script Editor toolbar contains buttons for saving your edits, navigating, searching and other functions.

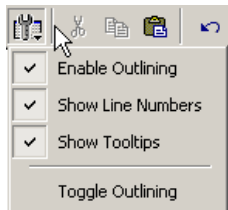


The buttons have the following functions:

	Save. Saves your edits and immediately updates the setting bars and Frames shown in the trace window.		Add/Remove bookmark. Allows markers to be set or removed to aid in navigation.
	View Options. Opens a menu with three options: Enable Outlining, Toggle Outlining, and Line Numbers. See View Options Menu below.		Go to next bookmark.
	Cut.		Go to previous bookmark.
	Copy.		Clear all bookmarks.
	Paste.		Find.
	Undo.		Find and Replace.
	Redo.		Go to Trace View

View Options Menu

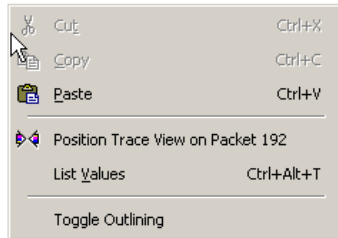
The View Options button has a menu with three options:



- **Enable Outlining:** Adds an expandable/collapsible tree structure to the left side of the Script Editor showing the hierarchical relationships of the script lines.
- **Show Line Numbers:** Adds line numbers to the left side of the Script Editor window.
- **Show Tooltips:** Enables tooltips to appear when the mouse pointer is suspended over a script item.

Pop-up Menu

Right-click anywhere in the script window to open a pop-up menu with the following options:



- Cut
- Copy
- Paste
- Position Trace View on Packet xxx
- List Values
- Toggle Outlining

The List Values option displays the types of values that can be entered for a parameter in a line. To see the types of values, select the current parameter, then choose **Show Values** from the pop-up menu.

File Tabs

At the bottom of the window is a tab that shows the name of the **.utg** file. If your **.utg** file has an Include statement in it, the supporting Include files automatically open when the **.utg** file is first opened. Tabs for the opened Include files appear at the bottom of this window.



Error Log

Whenever you create a scripting error, a log opens at the bottom of the application window. When the error is corrected, the window automatically closes.

Tooltips

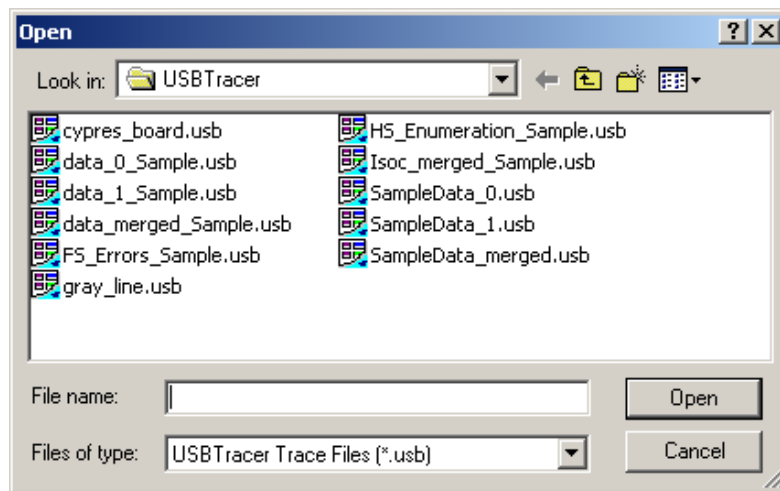
The Script Editor window includes extensive tooltips for each keyword. To see a tooltip, hold the mouse pointer over a keyword.

11.2 Loading the Generation File

The USB Traffic Generation files are scripts that instruct the Analyzer how to generate USB traffic. A traffic generation file contains text in special format and is named with a *.utg extension. These files can be created by any text editor, or using the **File > Export > Packets to Text (Generator File Format)** menu selection when viewing a Trace File. There are several examples of Traffic Generation files included with the installation of the software.

To load a generation file:

Step 1 Select **File > Open ...** from the menu to display the Open dialog box:

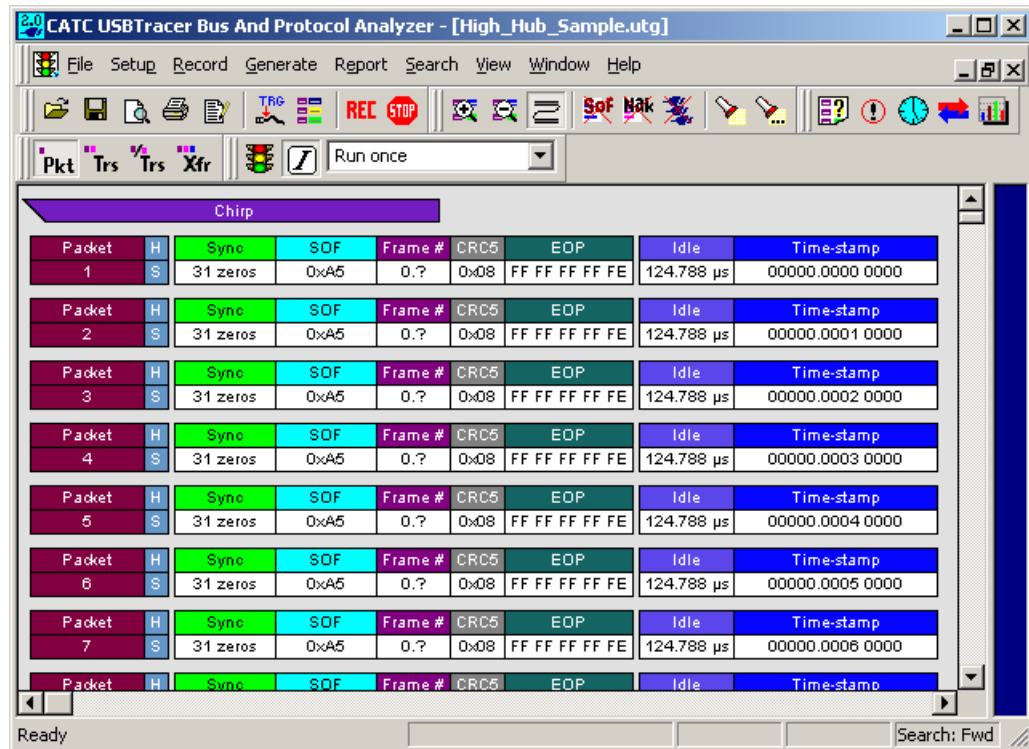


Step 2 Select **Generation Files (*.utg)** from the drop-down menu marked **Files of Type** to display a list of Traffic Generation files.

Step 3 Select a Traffic Generation file (*.utg).

Step 4 Click **Open**.

The file opens.



Step 5 Decide how many times you want the traffic pattern to be generated, then select a value from the **Repeat** drop-down menu.



The **Repeat mode** allows for a single pass through the generation file, looping forever, or looping 1 to 65,534 times, as desired by the user. If a **wrap=HERE** location is found in the **.utg** file, that location is where the looping portion begins. The loop end is at the end of the **.utg** file or up to the **stop=HERE** statement in the file.

Step 6 Select the **Generation mode** in which to generate traffic (see below for an explanation) by depressing or undepressing the

IntelliFrame button  on the toolbar:

- Depressed = IntelliFrame
- Undepressed = Bitstream


Traffic Generation Modes: Bitstream vs. IntelliFrame

IntelliFrame and **Bitstream** are modes that control how the generator interacts with other devices when it is generating traffic.

- **Bitstream Mode** - In Bitstream Mode, the generator constructs a bitstream of traffic based on the UTG file and assumes that packets start at pre-calculated times. For example, after an IN packet, the generator waits a calculated fixed time before presenting an ACK. The time between them is determined by the **idle=** time statement in between the IN and ACK packets in the **.utg** file. In this mode, every bit time of a generation stream (including idles and SE0's) is represented by 4 bits of data, so the file to be downloaded to the Generator can be very large.
- **IntelliFrame Mode** - In IntelliFrame mode, the generator can wait for Device responses to complete before it continues generating more host packets. For example, after issuing an IN, the generator looks for the DATAx packet issued by the device to finish, and then issues an ACK. This way, the data length can vary and does not need to be pre-calculated. Also, using the **idle=TO_EOF** statement allows the generator to calculate where the end of the frame occurs, so that a subsequent **frame=AUTO** statement creates a Start of Frame at the correct time. Moreover, the Generator can be made to retry transactions that are NAKed automatically, and to use the PING protocol where appropriate. Retries can be made to occur within the same frame or in the next frame. For further information on the flexible behavior that can be instituted during the generation, see the syntax descriptions for the generation files here. An additional advantage of the IntelliFrame mode is that it creates an image in the Generator's memory that is MUCH smaller than that of the Bitstream mode, so it downloads much faster.

Note: Device emulation only works in IntelliFrame mode.

Starting Traffic Generation

To start traffic generation, click  on the Tool Bar.

Repeating a Generation Session

If you wish to repeat a generation session, press the

Traffic Generation Start/Stop  button again. There is no need to reload the **.utg** file.

You can make an additional entry in a Generator Text File that allows you to specify a portion of the file for repetition:

- Enter **wrap=here** in the Generator Text File.

The traffic above the entry is run only once. The traffic below the entry is repeated continuously.

Note: For a usage example, see the sample file **Wrap.utg**.

Stop Traffic Generation

To instruct the Analyzer to halt traffic generation:

- Click  on the Tool Bar.

11.3 Device Emulation

Device Emulation is a licensed option that allows the system to generate device-side traffic. Like host traffic generation, device emulation uses text-based generation files (**.utg**) to generate traffic.

Device emulation has three steps: create a generation file, configure generation settings, and then generate traffic.

Creating a Generation File

Generation files can be created one of two ways:

- Write a generation script file using either LeCroy's context-sensitive script editor or any text editor that you choose.
OR
- Use a pre-recorded trace file that has the type of traffic that you want to generate. This file is a blueprint for the traffic generation script file.

If you decide to use a pre-recorded trace file as a generation blueprint, then verify that the trace file contains traffic for only one device. If it does not, hide all the other devices (**Setup > Level Hiding**) and save the file as a new file without the hidden traffic (**File > Save As** and check the option **Do not save hidden packets/transactions/transfers**).

Setting Generation Options

Step 1 Set the Traffic Generation options by configuring the **Misc** page in the Recording Options dialog box:

Setup > Recording Options > Misc

Step 2 In the Misc page, select **Device Emulation Mode**.

Step 3 Configure Resume settings.

- If you want the simulated device to issue Resumes, then select **Device Resumes** and enter a delay time (in milliseconds). If you do not select Device Resumes, then the emulated device waits for a Host to issue a Resume.
- If you want the simulated device to take its address from the Traffic Generation (.utg) script file, then select **Use Address in .utg file**. This option causes the system to read the **.utg** file and assign a Device Address based on the device traffic that it sees in the file.


Note: In this release, the Device Emulator does not look at the Set Address in the script, so if your host controller is running more than one device, it may enumerate your device emulator incorrectly when you begin to generate traffic. The solution is to manually assign a device address. To manually configure the Device Address, select Emulated Device's Hex Address and enter an address or mask (Note: A mask allows the system to respond to multiple device addresses.)

Step 4 Click **OK** to close the Recording Options dialog and apply the changes. The generation settings take effect as soon as you execute a script.

Run the Traffic Generation Script File

Step 1 Connect the system's port B (either Hi Speed or Classic Speed) to the Host.

Step 2 Open the Traffic Generation .utg file.

Step 3 Begin traffic generation by clicking  .

When execution begins, the system reads the entire generation file and then parses the generation commands into groups according to their endpoints. Each of the parsed groups of commands are then written into dedicated memory segments in the generator. Up to eight memory segments can be created for the various endpoints. In the case of Endpoint 0 or any Control endpoints, a single memory segment is created.

Each memory segment can be thought of as a queue of the commands and responses for a particular endpoint that occur in the generation file.

Commands are stored sequentially within each memory segment as they occur in the generation file. For example, if a generation file has a sequence of command X and Y for the Endpoint 1, the commands are extracted in this order and placed in the Endpoint 1 memory segment.

When the host calls for a particular device endpoint response, the first command listed in that endpoint memory segment is then executed. With each subsequent call to the same endpoint, commands are executed sequentially down the list as they occur in the memory segments. For example, if three calls were made to Endpoint 0 IN, then the first three commands in that endpoint's memory segment would then execute.

Note: Each of the endpoint memory segments execute independently: there are no behavioral interactions between the individual endpoints.

11.4 Format of Traffic Generation Files

Whether you create a traffic generation from scratch or use the **Export** command, there are a few rules about the format of the generation file that you should review. These are presented in this section.

Traffic is generated from a text file named ***.utg**. Within the text file:

- The data format for data fields such as Pids and Raw bits is hex.
- Each packet definition consists of this set of assignments: **key=value**.
- White space is permitted around the equal sign.
- There are no restrictions on dividing packet definition to lines nor is it necessary to define each packet in a separate line, although it is recommended.
- The maximum number of characters in a line is 250.
- The characters **#** and **;** indicate end-of-line comments (i.e. the rest of the line is ignored)
- Comments are not allowed within brackets (**()**).
- No keys or values are case-sensitive.

Each packet definition starts with one of these assignments:

- **pid=N** (where N is a string representing a valid packet identifier or an eight bit value)
OR
- **frame=N** (where N is an eleven bit value of the frame number or the strings **auto** and **keep_alive**).

A bus condition definition starts with one of these assignments:

- **reset=N** (where N is a positive integer or string)
- **suspend=N** (where N is a positive integer)
- **resume=N** (where N is a positive integer)
- **chirp=here**

Subsequent assignments after a packet's starting assignment define the values of particular fields within the packet. If a field is not defined, it is assumed to be **0**. Values are assumed to be decimal unless they are prefixed with **0x** and then are interpreted as hexadecimal. Values within a data block assignment are always assumed to be hexadecimal and should not be prefixed by **0x**.

Table 1: Support Keys for Defining Fields within a Packet

Key Code	Format	Description
File Control Keys		
file_type	UPAS CHIEF	This must be included at the beginning of the file to determine the speed of packets to be generated. Value must be file_type=UPAS to allow for High speed traffic, IntelliFrame operation, expected_pid and device_pid key support. Full and Low speed traffic, and Bitstream operation are supported on all file_type= values. If this statement does not appear in the file, the default is file_type=CHIEF , allowing backward compatibility with older USB Chief™ .usb files.
file_version	integer	This must be included after the file_type= key to determine the version of this file. Value is currently 3. Usage: file_version=3
file_mode	HOST DEVICE	Sets generation mode to host or device. For generation to work, this must match the selection found in the Recording Options > Misc dialog.
file_speed	HIGH HI FULL LOW	This must be included after the file_version= key to determine the speed of packets to be generated. Values are HIGH, HI, FULL, or LOW. Example: file_speed=FULL . Only one file_speed= is allowed per .utg file, but low speed traffic on a full speed bus can be created by adding the speed=LOW key to a low speed packet in a file defined as file_speed=FULL . No other mixing of speeds is allowed. HI is the same as HIGH and was added to conform to the USB terms.
loop_count wrap_count	0 through 16382 or "infinite"	These two terms are interchangeable. Device Emulation Only. This key defines the loop count for each memory segment. Examples: loop_count=INFINITE or wrap_count=9
wrap loop	HERE	This key marks the wrap point in the traffic. When generation is in Repeat mode, all the traffic before the wrap point is going to be sent once. All the traffic after the wrap point is going to be repeated in a loop. The usage of the keyword is wrap=HERE or loop=HERE . For Device Emulation, the value would be a memory segment number, so that the looping is associated with only that one endpoint, such as wrap=4 .

Key Code	Format	Description
skip	HERE	<p>Causes a region in the .utg file to be ignored, as if commented out.</p> <p>Can be used multiple times in the file.</p> <p>Must be used in conjunction with skip_end=HERE.</p> <p>Example:</p> <p>skip=HERE frame=auto makes this statement be ignored!</p> <p>skip_end=HERE</p>
skip_end	HERE	<p>Causes a region in the .utg file to be ignored, as if commented out.</p> <p>See above in skip=HERE.</p>
stop	string	<p>If you want to run only some first portion of the beginning of a .utg file, insert this statement where you want generation to halt. This saves having to edit a file into smaller files when testing a portion of traffic.</p> <p>The usage of the keyword is stop=HERE.</p>
break	HERE	<p>Host Generation Only.</p> <p>Enables you to generate up to a point in the .utg file, then wait for input before continuing in the file. During the breakpoint time, the traffic signal icon in the toolbar flashes yellow, indicating that a breakpoint was hit.</p> <p>When you click the traffic light icon, generation resumes.</p> <p>If you want to stop rather than continue, select Stop from the Generation menu or hit the Start/Stop button on the front of the generator module.</p> <p>Start-of-frames are issued automatically during the breakpoint duration. When you resume running, traffic begins after another start-of-frame is issued.</p> <p>The break=HERE statement must be inserted between frame=xxx statements.</p> <p>Syntax example:</p> <p>frame=AUTO break=HERE frame=AUTO</p>

Key Code	Format	Description
Endpoint Configuration		
begin_config	HERE	<p>Defines the beginning of the region in the file used to configure the endpoint types.</p> <p>The configuration is necessary to determine the default behavior of the NAK retry mechanism during IntelliFrame operation.</p> <p>Between the begin_config=HERE and the end_config=HERE statements is a series of config_endpoint=xxx statements, which define each endpoint's type and default retry behavior.</p> <p>The config region must precede any actual packet or bus condition statements.</p> <p>For Device Emulation, the config region is mandatory. It provides the mapping of the endpoints into their corresponding segments of Analyzer memory, which contain the traffic for those endpoints.</p> <p>When exporting to a .utg file from a trace file, these sections are created automatically.</p> <p>Syntax example: begin_config=HERE</p>
end_config	HERE	<p>Terminates the region in the file used for configuring the endpoints.</p> <p>See begin_config.</p> <p>Syntax example: end_config=HERE</p>
config_endpoint	CONTROL INTERRUPT ISOCHRONOUS BULK	<p>Begins a statement that defines a particular endpoint's type, default retry behavior (Host Generation only), and memory segment (Device Emulation only).</p> <p>Usage example: config_endpoint=BULK addr=1 endp=3 direction=OUT retry=TRUE retry_next_frame=FALSE</p>
endp_mem_seg	1 2 3 4 5 6 7 8	<p>Device Emulation Only.</p> <p>Separates each endpoint function into a different queue (also referred to as a Memory Segment) of commands and responses.</p> <p>There are a maximum of eight of these queues, and each has a unique address/direction combination.</p> <p>For control endpoints, one queue is shared by both directions of the endpoint.</p> <p>Traffic on the Default Endpoint (Address 0, Endpoint 0) shares the same queue as the endpoint 0 of the selected device address (the address it gets from the Host through the SetAddress request).</p> <p>These always use endp_mem_seg=1.</p> <p>These are all set automatically when exporting a trace file to a Device Emulation .utg file.</p>

Key Code	Format	Description
direction	IN OUT	<p>Defines the transfer direction of data for the specified endpoint.</p> <p>For all transfer types but CONTROL, there can be two distinct logical connections using the same address and endpoint. They would differ only in defined direction.</p> <p>Syntax example: direction=IN</p>
retry	TRUE FALSE	<p>Host Generation Only.</p> <p>Defines whether an automatic retry should be performed on packets to/from this endpoint in the case that they are NAKed (or in some cases NYETed), or if a timeout on device response occurs. RETRY only works for the Pids: Setup, In, and Out. If TRUE, the Exerciser automatically retries the specified sequence if a Pid is received on the bus which does not match the expected_pid, or if a timeout occurs.</p> <p>The generator re-issues the host packet(s) after waiting either 1/10th of a frame, or until after the next start-of-frame (depending on the value set for retry_next_frame).</p> <p>The retries continue until the expected_pid is received.</p> <p>When a retry attempt finds its expected_pid, the Exerciser automatically generates a new start-of-frame before continuing with the rest of the Gen File. (The start-of-frame is either an SOF packet or a keep-alive signal.)</p> <p>If FALSE, the Exerciser waits for a Pid before proceeding. There is no timeout.</p> <p>If a Pid is received which does not match the expected_pid, the Exerciser continues to wait for the correct Pid to appear.</p> <p>If the user stops the generation, a message states that the generator was waiting patiently for the expected_pid, and it never showed up. The user must examine the problem by viewing the trace file.</p> <p>This statement can also be used in conjunction with any pid=xxx statement in the .utg file. This can be done to override the configured or default retry behavior.</p> <p>Syntax example: retry=TRUE</p>

Key Code	Format	Description
retry_next_frame	TRUE FALSE	<p>Host Generation Only.</p> <p>Determines when a retry will be attempted after a failed match of an expected_pid.</p> <p>This statement only applies if a retry=TRUE statement also exists.</p> <p>If TRUE, the Exerciser waits until the current frame completes, issues a start of frame, and then retries the transaction.</p> <p>If FALSE, the Exerciser waits 1/10th of a frame before retrying the transaction.</p> <p>Before each retry attempt, the Exerciser checks to see where in the frame interval it is. If it is too close to the EOF, it automatically generates the next start-of-frame before performing the retry. If it is not too close to the EOF, it performs the retry without generating a new frame.</p> <p>This statement can also be used in conjunction with any pid=xxx statement in the .utg file. This can be done to override the configured or default retry behavior.</p> <p>Syntax example: retry_next_frame=FALSE</p>
ping_on_retry	TRUE FALSE	<p>Host Generation Only.</p> <p>Determines whether an OUT transaction is retried by repeating the OUT-DATAx sequence, or whether a PING sequence should be initiated.</p> <p>If TRUE, the Exerciser automatically generates PINGs (and retries) before going through a Retry Loop. PINGs are repeated until an ACK is received, and then the original OUT-DATAx transaction Sequence is attempted. During the PING retries, the Exerciser automatically generates frames. When the original Retry Sequence receives its expected_pid, the Exerciser generates a new frame before continuing with the Gen File.</p> <p>If FALSE, the original transaction is always retried.</p> <p>This statement can also be used in conjunction with any pid=xxx statement in the .utg file. This can be done to override the configured or default retry behavior.</p> <p>Syntax example: ping_on_retry=TRUE</p>

Key Code	Format	Description
ping_after_nyet		<p>Host Generation Only.</p> <p>If TRUE, the Exerciser automatically generates PINGs (and retries) after receiving a NYET instead of the expected_pid. This feature is only used if the expected_pid is an ACK. PINGs are retried until an ACK is received. When the PING is ACKed, the Exerciser generates a new frame before continuing with the Gen File.</p> <p>If FALSE, the Exerciser continues as if an ACK occurred.</p> <p>This statement can also be used in conjunction with any pid=xxx statement in the .utg file. This can be done to override the configured or default retry behavior.</p> <p>Syntax example: ping_after_nyet=TRUE</p>

Key Code	Format	Description
Packet Starting Keys		
pid	8 bits (0-0xFF) or pid string	<p>Host Generation Only.</p> <p>Use this as the first key of most packets sent by the Host (Exception: Use frame= for SOF packets).</p> <p>The key should be assigned to a valid packet identifier string per the USB specification: SETUP, IN, OUT, DATA0, DATA1, ACK, PRE, PING, SPLIT, DATA2, MDATA, EXT, or LPM.</p> <p>Optionally, you may assign this key a raw eight bit value to force an error condition.</p> <p>Warning: If you specify PID=0xNN, you must use raw_data=() to specify the rest of the packet data, because the packet structure is unknown.</p>
expected_pid	pid string	<p>Host Generation Only.</p> <p>Use this as the PID key for packets which are expected to be sent by the device.</p> <p>In IntelliFrame mode, the generator waits until this PID has completed before sending the next generated packet or bus condition.</p> <p>The key should be assigned to a valid packet identifier string per the USB specification: DATA0, DATA1, ACK, NAK, STALL, NYET, DATA2, MDATA, EXT, or LPM.</p> <p>The generator engine waits forever until this expected_pid appears, so the user may have to hand edit the file to achieve the desired results.</p> <p>For example, if a NAK comes where the expected_pid was a DATA1, the user should edit the .utg file to move the pid=IN command to later in the file by inserting some frame=AUTO idle=TO_EOF pairs before it. This allows time for the device to be ready for the IN.</p> <p>If RETRY=TRUE for this address/endpoint, the NAKs are ignored and the SOF's are generated automatically until the expected PID occurs.</p>
device_pid	pid string	<p>Use this as the first key of most packets sent by a device.</p> <p>The key should be assigned to a valid packet identifier string per the USB specification: DATA0, DATA1, ACK, NAK, STALL, NYET, DATA2, MDATA, EXT, or LPM.</p> <p>Normally, the device_pid= statement is NOT present in a Host Generation .utg file, because the device responses are intended to come from real devices. By default, Host Generation files exported from Trace Files do NOT include device_pid= statements.</p> <p>Warning: If you specify PID=0xNN, you must use raw_data=() to specify the rest of the packet data, because the packet structure is unknown.</p>

Key Code	Format	Description
frame	11 bits or AUTO KEEP_ALIVE	<p>Creates a start of frame packet and generates a SOF PID as expected.</p> <p>The key should be assigned a value of the frame number, AUTO, or KEEP_ALIVE.</p> <p>AUTO instructs the generator to increment the frame number automatically.</p> <p>KEEP_ALIVE instructs the Analyzer to generate a low-speed EOP in place of a SOF packet for traffic on a low-speed branch (file_speed=LOW).</p> <p>For Device Emulation, this statement is ignored by the Device Emulator, but serves to organize the .utg file in a more readable manner.</p>
empty_frame	integer	<p>Host Generation Only.</p> <p>This key creates a sequence of start of frame packets with idle=TO_EOF values for the idle time. This results in N empty frames, where N is the integer value specified.</p> <p>If the branch speed is LOW, the frames contain only the keep-alive standalone EOP's. This key makes for an easier to manage .utg file by eliminating the need for many lines of frame=AUTO idle=TO_EOF statements.</p> <p>Usage: empty_frames=23; insert 23 empty frames here</p>
host_exp_pid	PID	<p>Device Emulation Only.</p> <p>Defines the PID that is expected to be received from the Host.</p> <p>The Device Emulator waits until this PID has completed before sending the next generated packet.</p> <p>The key should be assigned to a valid packet identifier string per the USB specification: SETUP, IN, OUT, DATA0, DATA1, ACK, DATA2, or MDATA.</p> <p>PRE and PING are for Hubs only and are not supported.</p> <p>Each memory segment waits forever until it receives the expected PID to its address/endpoint, so the user may have to hand edit the file to achieve the desired results.</p> <p>Each endpoint memory segment acts independently.</p>

Key Code	Format	Description
Bus Condition Keys		
reset	positive integer or LS_EOP	Host Generation Only. Indicates the number of microseconds that single-ended zeros (SE0) are driven onto the bus. Assign a positive integer to this key. This key can also be assigned the string LS_EOP to drive two low-speed bit times of SE0 followed by one bit time of J.
se0	positive integer <2500	Host Generation Only. Same SE0 signal as reset, but the range is in nanoseconds (accuracy: +/- 33 ns).
suspend	positive integer	Host Generation Only. Indicates the number of microseconds of idle and suspend after the previous packet (for example, for ten milliseconds of suspend, the key should equal 13000). Assign a positive integer to this key. Note that suspend begins after 3 milliseconds of idle.
resume	positive integer	Host Generation Only. Indicates the number of microseconds of K driven onto the bus. Assign a positive integer to this key. For a proper resume sequence, this should be followed by the condition reset=LS_EOP speed=LOW.
wait_resume	HERE	Host Generation Only. Place this immediately before a resume=<> statement to implement a device resume, also known as Remote Wakeup. This causes the host to wait for the device to issue the Resume (K) condition before the Host proceeds with its own Resume signalling. This statement MUST be followed by the resume=<> statement.
chirp	HERE	Used to create a chirp sequence for a High Speed generation. Usage: chirp=HERE
wait_vbus	VALID	Device Emulation Only. Wait for VBus to go Hi.
termination	HERE	Device Emulation Only. Set terminations now.

Key Code	Format	Description
Keys for Packet Fields		
speed	LOW	Used to cause a low speed packet on a full speed branch. The only legal value is speed=LOW .
addr	7 bits (0-127)	Assign a value for the address field.
endp	4 bits (0-15)	Assign a value for the endpoint number field.
hub_addr	7 bits (0-127)	Host Generation Only. Assign a value for the hub_address field of a SPLIT packet.
port	7 bits (0-127)	Host Generation Only. Assign a value for port field of a SPLIT packet.
data	(AB CD)	Assign data bytes for the data field. Use the following syntax: data=(12 34 56 78 90 AB CD EF DC 13 40 78 11 CA 70 65) You can wrap bytes of the data field to the next line. The bytes are in the order they come across the bus, and the bits within the bytes are in MSB to LSB order. Maximum number of bytes allowed is 1049.
crc	5 bits (0x0-0x1F) or 16 bits (0x0-0xFFFF)	Assign a value for the crc field. The default value is the correct crc calculated for the packet.
s	0 or 1	Host Generation Only. Assign a value for the s (High Speed SPLIT Start/Speed) field.
sc	0 or 1	Host Generation Only. Assign a value for the sc (High Speed SPLIT Start/Complete) field.
e	0 or 1	Host Generation Only. Assign a value for the e (High Speed SPLIT End) field.
et	0 to 3	Host Generation Only. Assign a value for the et (High Speed SPLIT Endpoint Type) field: 0 = Control 1 = Isoch 2 = bulk 3 = Interrupt
eop	positive integer	Assign a positive integer for the length of the end of packet (EOP). The default value is the correct length (2 bits of SE0, 1 bit of J). The value is reflected by <val-1> bits of SE0 plus one bit of J.

Key Code	Format	Description
hi_eop	(AB CD) Hex	Used to generate a high speed EOP pattern. The bytes are in the order they come across the bus, and the bits within the bytes are in LSB to MSB order. Maximum number of bytes allowed is 13.
idle	positive integer or TO_EOP	Defines the length of idle after the current packet. Assign a positive integer or string to this key. The positive integer indicates the number of full-speed or low-speed bit times. The default value is around 4 bits for Classic speeds and around 150 bits for High speeds. When this keyword is assigned a string TO_EOF, USB Chief automatically calculates the amount of idle remaining in the frame. When handshaking with a device, you can use this keyword to add idle where you anticipate a packet being returned from the device. The idle= key is always associated with the proceeding packet or bus condition, so you should not put file control keys between the packet or bus condition statement and the idle= statement.
marker	string	Assign a string in quotation marks to be put in the marker for the defined packet.
raw_data	(aa bb)	Use to send a non-modulo 8 number of bits in a classic speed raw_data packet. It is only valid in conjunction with the raw_data statement. Normally, every bit of the array defined in a raw_data=(xx yy) type of statement would be sent. However, particularly in the case where bit_stuff=off , you need more control over the number of bits to be output on the bus. By adding the statement raw_data_bits = 11 , only the first 11 bits of the defined bytes are sent. For the following case, raw_data=(8F F0) raw_data_bits=13 the output bitstream would be: 1111 0001 0000 1 (Each byte is described in MSB to LSB format, but is output on the wire in LSB to MSB format.)

Key Code	Format	Description
raw_data_bits	integer	<p>Use to send a non-modulo 8 number of bits in a classic speed raw_data packet.</p> <p>It is only valid in conjunction with the raw_data statement.</p> <p>Normally, every bit of the array defined in a raw_data=(xx yy) type of statement would be sent. However, particularly in the case where bit_stuff=off, you need more control over the number of bits to be output on the bus. By adding the statement raw_data_bits = 11, only the first 11 bits of the defined bytes are sent.</p> <p>For the following case, raw_data=(8F F0) raw_data_bits=13 the output bitstream would be: 1111 0001 0000 1 (Each byte is described in MSB to LSB format, but is output on the wire in LSB to MSB format.)</p>
bit_stuff	OFF ON	<p>Assign the string OFF to disable bit stuffing within the current packet.</p> <p>The default value is ON.</p>
sync	integer 1-40	<p>Assign an integer from 1 to 40 to represent the sync field. The integer is the number of zeros transmitted before the one.</p> <p>For Low and Full Speed files, the default value is 7 to give a sync of 00000001.</p> <p>For High Speed files, the default value is 31 resulting in a sync of 00000000000000000000000000000001.</p>
retry ping_on_retry ping_on_nak retry_next_frame	TRUE FALSE	<p>Host Generation Only.</p> <p>These four keys may be applied to individual packets to override the behavior in a given instance.</p> <p>Normally, they are used in the config_endpoint statement.</p> <p>See their descriptions in the Endpoint Configuration section earlier.</p>
Keys for Class Decoding		
These keys are populated into the .utg script file automatically whenever the menu command File > Export to .utg file is run. These keys do not need to be edited.		
sd_prod		
sd_vend		
sd_bm_req_type		
sd_interface		
sd_host_id		
sd_class_code		
sd_subclass		
sd_protocol		
sd_end_sd		

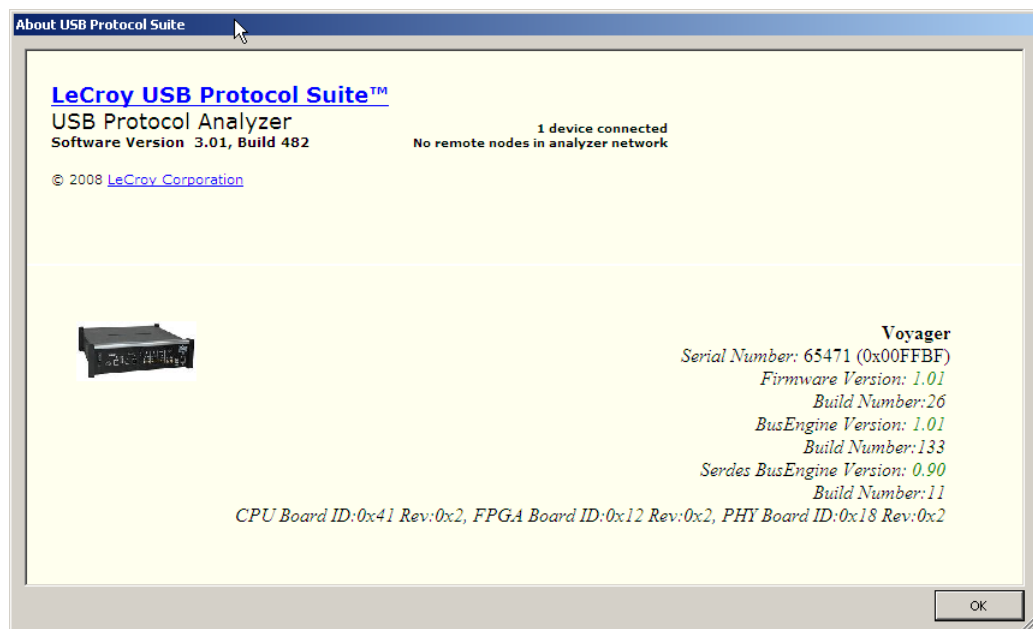
Chapter 12: Updates

From time to time as modifications are made to the Analyzer, it is necessary to update for optimal performance. Updates can be performed two ways: either automatically or manually. This chapter describes both procedures.

12.1 Software, Firmware, and BusEngine Revisions

The **Readme.txt** file on the first installation disk and in the installed directory gives last-minute updates about the current release. Included with each release are the most recent downloadable images of the Firmware and the BusEngine™.

Once the Analyzer has completed the self diagnostics and is connected to the PC, you can check the latest revision of the software and BusEngine by selecting **About** from the **Help** menu.



About details revisions of the following software and hardware:

- Software Version
- Unit Serial Number
- Firmware Version
- BusEngine Version
- Serdes BusEngine Version

Note: When contacting LeCroy for technical support, please have available the revisions reported in the **About** window.

12.2 Software Updates

You can check for software updates manually, or the application can automatically check for updates at startup.

Note: To check for software updates and to download available updates, you need an open internet connection.

Manual Check for Software Updates

In the application, you can check for software updates:

Step 1 Select **Help > Check for Updates...** to display the Software Update window.

If no update is available, the window is:



If an update is available, the window is:



To install an available update, click **Go to Download Page Now** to go to the LeCroy web site. Follow the on-screen instructions to download and install the software update.

To install available updates later, click **Later** to close the window and return to the application. **Note:** If you select **Later**, when you are later ready to install, again select **Help > Check for Updates...**, then download and install the software update.

Automatic Check for Software Updates

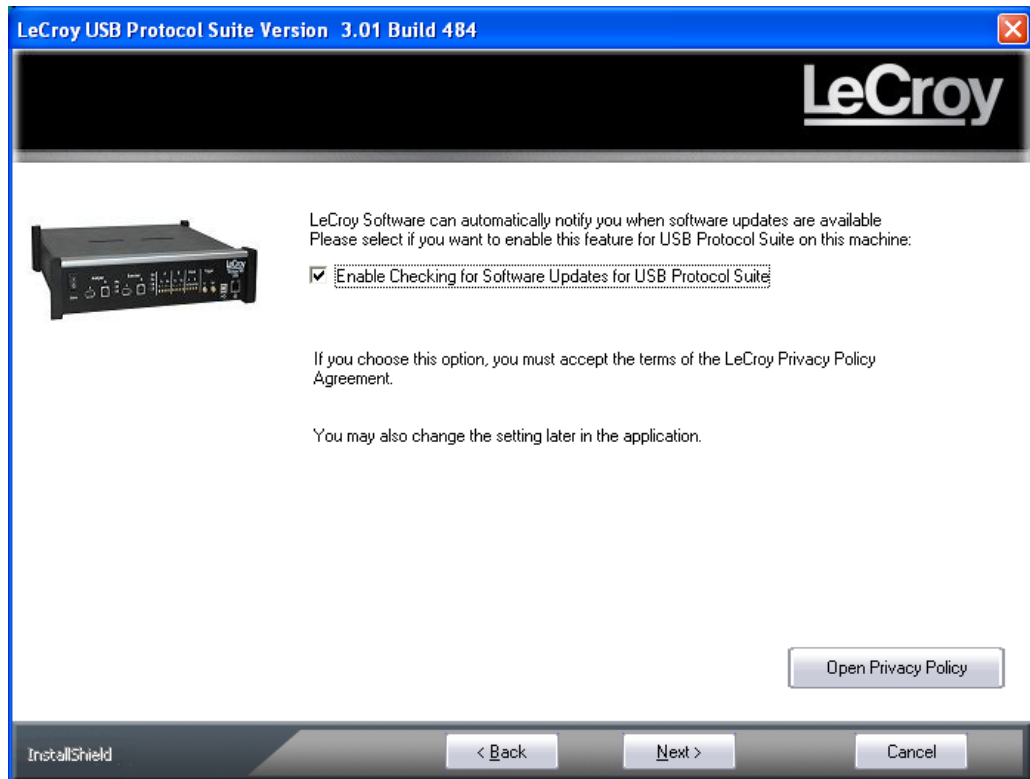
You can set the application to automatically check for software updates, either during software installation or in the installed application.

After enabling automatic software update checking, when you start the application, the application checks for any software updates. If an update is available, the application notifies you. **Note:** To automatically check for software updates, you need an open internet connection.

Note: Automatic checking for software updates does not download, install, or update the application. It only notifies you that an update is available. After receiving notification, you must use the Software Update window to download and install the latest version of the application.

During Software Installation

During software installation, a window asks if you would like to receive automatic notification when software updates are available. Select the checkbox to enable automatic checking for software updates.



When you enable automatic notification of software updates, you accept the LeCroy Privacy Policy Agreement. Click the **Open Privacy Policy** button to view the agreement.

In the Application

In the application, you can set the software to automatically check for software updates:

Step 1 Select **Help > Check for Updates...** to display the Software Update window.

If no update is available, the window is:



If an update is available, the window is:



Step 2 To enable automatic checking for software updates, select the **Check for updates at application start up** checkbox.

The next time you open the application, if you have an open internet connection, the application will notify you if an update is available.

12.3 BusEngine and Firmware Updates

BusEngine, Serdes BusEngine, and Firmware updates often need to be performed when you update the USB Protocol Suite software. These updates can be performed automatically or manually. Both processes are described.

Updating the BusEngines

The BusEngine core is the heart of the Analyzer. Using state-of-the-art Electronically Programmable Logic Device (EPLD) technology, it incorporates both the high speed recording engine and the configurable building blocks that implement data/state/error detections, triggering, capture filtering, external signal monitoring, and event counting and sequencing. The BusEngine program and the Serdes BusEngine program, and the Firmware that manages the internal microcontroller, are fully field upgradeable.

Within a new software release, it may be necessary to update the Analyzer's BusEngine and Serdes BusEngine hardware for proper operation. The Readme file lets you know if this is necessary.

Updating the Firmware

Within a new software release, it may also be necessary to update the Analyzer's firmware for proper operation. The Readme file informs you if this is necessary.

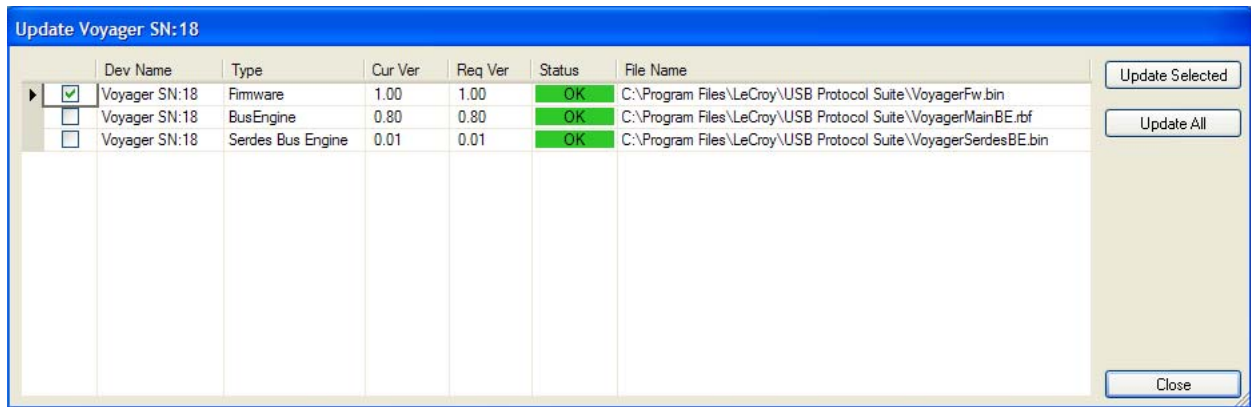
Automatic Updates

When the USB Protocol Suite software is upgraded, the software may become incompatible with the BusEngine, Serdes BusEngine, and/or Firmware. The next time you connect to the analyzer, the application will prompt you if any of the components needs to be updated. Follow the on-screen instructions to complete the update.

Manual Updates to Firmware, BusEngine, and Serdes BusEngine

You can manually update the Firmware, BusEngine™, and/or Serdes BusEngine by performing the following steps:

Step 1 Select **Setup > Update Device** on the Menu Bar to display the Update Device dialog:



The dialog shows the Device Name, Type, Current Version, Required Version, Status, and File Name.

Step 2 To update the Firmware, BusEngine, and/or Serdes BusEngine, first select its check box.

Step 3 Click **Update Selected** or click **Update All** to update all three.

Note: The most current files were copied to your **\LeCroy\USB Protocol Suite** directory when you installed the program.

Step 4 Power cycle the Analyzer. Re-initialization takes a couple of minutes.

12.4 License Information

You can view license information by selecting **Display License Information** from the Help menu. The License Information window indicates the maintenance expiration data. It also provides a list of the named features supported by the current software version.



Named features enabled on your PC are indicated by **Yes** in the Purchased column. Named features that are not enabled on your PC are indicated by **No** in the Purchased column. Whether or not named features are enabled depends on the license key stored in your analyzer.

If you try to use a feature for which you do not yet have a license, the program displays the License Protection Message. Named features that are not enabled on your PC are indicated by **No** in the Purchased column. To use the feature, you must purchase a license.

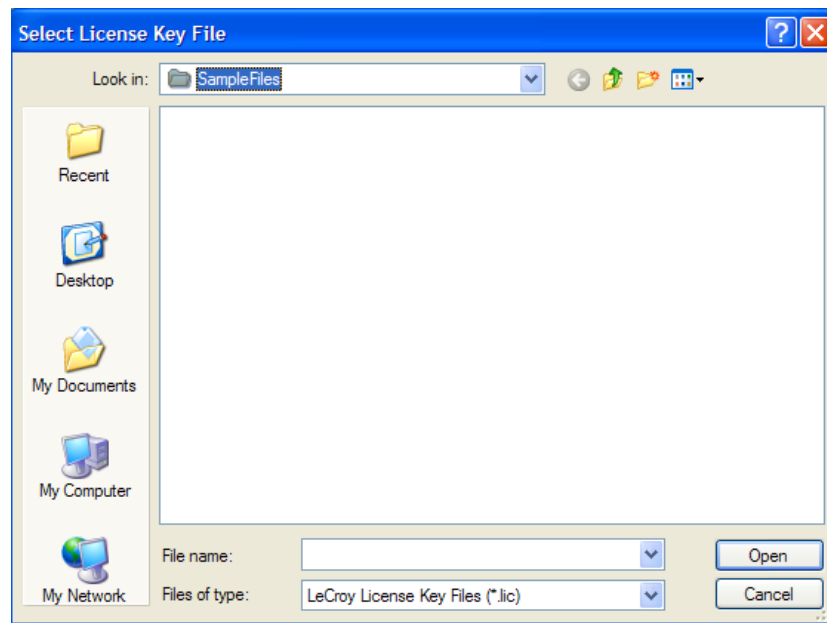
12.5 Updating the Software License

A current license agreement with LeCroy entitles the Analyzer owner to continued technical support and access to software updates as they are published on the LeCroy website.

If your license expires, you must obtain a license key from LeCroy (refer to the contact information at the back of this manual.)

After you obtain a license key, follow these steps to install it:

Step 1 From the Help menu, select **Update License** to display the Select License Key File dialog box.



Step 2 Enter the path and filename for the license key.

OR

Browse to the directory that contains the license key and select the *.lic file.

Step 3 Click **Open**.

12.6 Registering Online

To register the product online, select **Help > Register Product Online**.

Appendix A: China Restriction of Hazardous Substances Table

The following tables are supplied in compliance with China's Restriction of Hazardous Substances (China RoHS) requirements:

部件名称	有毒有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCBAs	X	O	X	X	X	X
机械硬件	O	O	X	O	O	O
金属片	O	O	X	O	O	O
塑料部件	O	O	O	O	X	X
电源	X	X	X	O	X	X
电源线	X	O	X	O	X	X
保护外壳(如有)	O	O	O	O	X	X
电缆组件(如有)	X	O	X	O	X	X
风扇(如有)	X	O	X	O	X	X
交流滤波器和熔丝组件(如有)	X	O	X	O	O	O
外部电源(如有)	X	X	X	O	X	X
探头(如有)	X	O	X	O	X	X
O: 表明该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求之下。						
X: 表明该有毒有害物质至少在该部件的某一均质材料中的含量超过 SJ/T11363-2006 标准规定的限量要求。						

EFUP (对环境友好的使用时间) 使用条件: 参阅本手册“规范”部分规定的环境条件。

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr ⁶⁺)	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCBAs	X	O	X	X	X	X
Mechanical Hardware	O	O	X	O	O	O
Sheet Metal	O	O	X	O	O	O
Plastic Parts	O	O	O	O	X	X
Power Supply	X	X	X	O	X	X
Power Cord	X	O	X	O	X	X
Protective Case (if present)	O	O	O	O	X	X
Cable Assemblies (if present)	X	O	X	O	X	X
Fans (if present)	X	O	X	O	X	X
AC Filter/Fuse Assy (if present)	X	O	X	O	O	O
Ext Power Supply (if present)	X	X	X	O	X	X
Probes (if present)	X	O	X	O	X	X
O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement specified in SJ/T11363-2006.						
X: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement specified in SJ/T11363-2006.						

EFUP (Environmental Friendly Use Period) Use Conditions: refer to the environmental conditions stated in the specifications section of this Manual.

How to Contact LeCroy

Type of Service	Contact
Call for technical support...	US and Canada: 1 (800) 909-7112
	Worldwide: 1 (408) 653-1260
Fax your questions...	Worldwide: 1 (408) 727-6622
Write a letter...	LeCroy Customer Support 3385 Scott Blvd. Santa Clara, CA 95054
Send e-mail...	psgsupport@lecroy.com
Visit LeCroy's web site...	http://www.lecroy.com/

Limited Hardware Warranty

So long as you or your authorized representative ("you" or "your"), fully complete and return the registration card provided with the applicable hardware product or peripheral hardware products (each a "Product") within fifteen days of the date of receipt from LeCroy or one of its authorized representatives, LeCroy warrants that the Product will be free from defects in materials and workmanship for a period of 13 months (the "Warranty Period"). You may also complete your registration form via the internet by visiting <http://www.catc.com/support/register/>. The Warranty Period commences on the earlier of the date of delivery by LeCroy of a Product to a common carrier for shipment to you or to LeCroy's authorized representative from whom you purchase the Product.



What this Warranty Does Not Cover

This warranty does not cover damage due to external causes including accident, damage during shipment after delivery to a common carrier by LeCroy, abuse, misuse, problems with electrical power, including power surges and outages, servicing not authorized by LeCroy, usage or operation not in accordance with Product instructions, failure to perform required preventive maintenance, software related problems (whether or not provided by LeCroy), problems caused by use of accessories, parts or components not supplied by LeCroy, Products that have been modified or altered by someone other than LeCroy, Products with missing or altered service tags or serial numbers, and Products for which LeCroy has not received payment in full.

Coverage During Warranty Period

During the Warranty Period, LeCroy or its authorized representatives will repair or replace Products, at LeCroy's sole discretion, covered under this limited warranty that are returned directly to LeCroy's facility or through LeCroy's authorized representatives.

How to Obtain Warranty Service

To request warranty service, you must complete and return the registration card or register via the internet within the fifteen day period described above and report your covered warranty claim by contacting LeCroy Technical Support or its authorized representative.

You can reach LeCroy Technical Support at 800-909-7112 or via email at support@catc.com. You may also refer to the LeCroy website at <http://www.lecroy.com> for more information on how to contact an authorized representative in your region. If warranty service is required, LeCroy or its authorized representative will issue a Return Material Authorization Number. You must ship the Product back to LeCroy or its authorized representative, in its original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. LeCroy must receive the Product prior to expiration of the Warranty Period for the repair(s) to be covered. LeCroy or its authorized representative will thereafter ship the repaired or replacement Product to you freight prepaid by LeCroy if you are located in the continental United States. Shipments made outside the continental United States will be sent freight collect.

Please remove any peripheral accessories or parts before you ship the Product. LeCroy does not accept liability for lost or damaged peripheral accessories, data or software.

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If LeCroy evaluates and determines there is “no trouble found” in any Product returned or that the returned Product is not eligible for warranty coverage, LeCroy will inform you of its determination. If you thereafter request LeCroy to repair the Product, such labor and service shall be performed under the terms and conditions of LeCroy’s then current repair policy. If you chose not to have the Product repaired by LeCroy, you agree to pay LeCroy for the cost to return the Product to you and that LeCroy may require payment in advance of shipment.

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The limited warranty on a Product may be transferred for the remaining term if the then current owner transfers ownership of the Product and notifies LeCroy of the transfer. You may notify LeCroy of the transfer by writing to Technical Support at LeCroy, 3385 Scott Blvd., Santa Clara, CA 95054 USA or by email at: support@catc.com. Please include the transferring owner's name and address, the name and address of the new owner, the date of transfer, and the Product serial number.

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