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Better Analysis.

USB Explorer 280 Analyzer

User Manual

PROTOCOL TEST SOLUTIONS

Version 1.0
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ellisys

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This manual is populated throughout with screens captured from a specific version of Ellisys Protocol Analyzer software. All the information contained in the screens are samples and serve as instructional purposes only.

Document Revision History

Date	Revision	Changes
July 1, 2009	1.0	Initial release.

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The warranty begins on the date of purchase and covers a period of two (2) years.

Governing Law

These conditions and terms shall be governed by and construed in accordance with the law of Switzerland.

Jurisdiction; Venue

The parties consent to the exclusive personal jurisdiction of, and venue in, the District Court of Geneva, Switzerland.

Table of Contents

About this Manual

Typographic Conventions

Bold is used to indicate menu commands, buttons, and tabs.

Italics are used to indicate fields, pane names, window names and cross references.

A warning symbol describes a possible critical situation and how to avoid it.

An information symbol tells you how to respond to a situation that may arise.

A tip symbol tells you information that will help you carry out a procedure.

Where to Find More Help

Go to the Ellisys website and the following pages for the latest information:

- Ellisys products page - Go to **www.ellisys.com/products/** for the latest product information and documentation.
- Application notes and white papers - Go to **www.ellisys.com/technology/** to find up-to-date information about the technology.
- Distributors - Go to **www.ellisys.com/sales/** to find a list of Ellisys distributors.
- Technical support - Go to **www.ellisys.com/support/** to send a question directly to the Ellisys support team.

1. Analyzer Overview

1.1 Introduction

The Ellisys USB Explorer 280 Analyzer is an advanced protocol analysis system for SuperSpeed USB 3.0 and USB 2.0 protocols. The Analyzer records USB 2.0 and USB 3.0 traffic and bus events occurring between two USB system components, such as a host and device, and presents comprehensive analytical information to the user, including detailed packet, transaction, and transfer level information, statistical and performance metrics, protocol error detection, link state analysis, timing characterizations, and other related information.

Major uses for the Analyzer include verification of specification compliance and design goals, debugging of software stacks and applications, and system performance characterizations.

Figure 1 - Ellisys USB Explorer 280 Hardware

1.2 Main Features

The Analyzer includes the following major features and capabilities:

- Capture and display of USB 2.0 and USB 3.0 traffic
- *Instant Timing* graphical timing analysis
- Detailed decode of standard descriptors and class requests
- Bus performance, power management and error rate information
- *Instant Link State* graphical LTSSM analysis
- Export of captured traffic to Ellisys USB Explorer 280 Generator script
- Comprehensive triggering, filtering, and search features

2. Installing the Application

Before installing the USB Explorer 280 Analyzer software application, please ensure the computer system on which it will reside meets the following requirements:

- Microsoft Windows XP SP1 or later.
- Microsoft Windows Installer 3.0 or later. If the installation does not run smoothly, or if the system indicates a version error, update your Windows installer.
- Microsoft .NET Framework version 2.0 or later.
- Intel Core, 1.5 GHz or compatible processor, or better.
- 512 MB RAM or more.
- 1280 x 1024 screen display resolution with 65,536 colors, or better.
- USB 2.0 EHCI Host Controller.

2.1 Software Prerequisites

The USB Explorer 280 Analyzer requires several software components. Ellisys recommends that you visit the following web pages as needed, to update your versions of Microsoft .NET Framework and Windows:

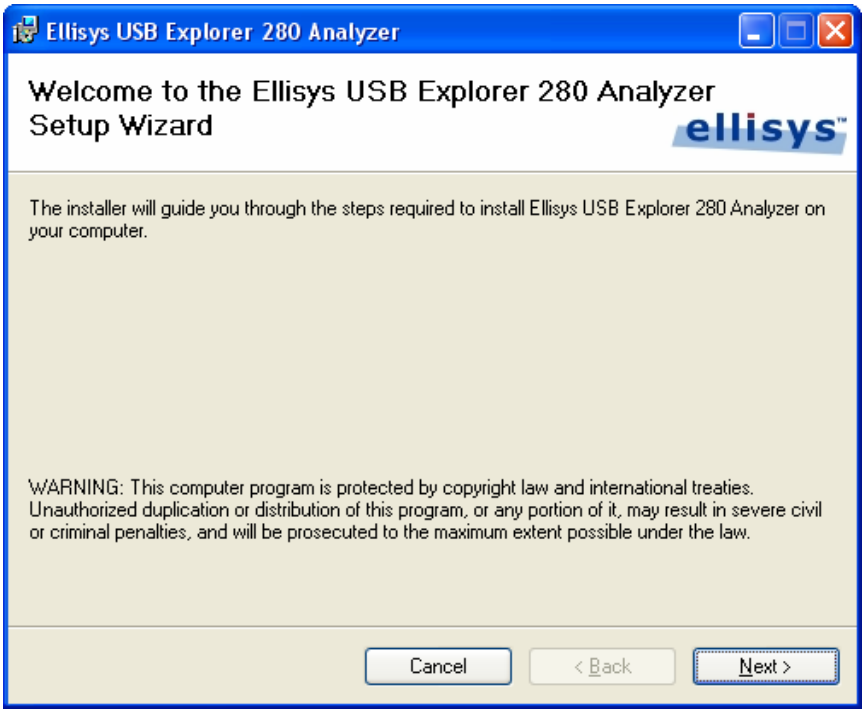
- www.microsoft.com/net to download the Microsoft .NET Framework version 2.0.
- www.update.microsoft.com to update your version of Windows. When using the Windows update service it will automatically download and install the Microsoft .NET Framework version 2.0.

See your system administrator for more information about updating Microsoft .NET Framework and Windows.

2.2 Software Installation

1. Insert the CD-ROM that accompanies the product into the computer's CD-ROM drive.

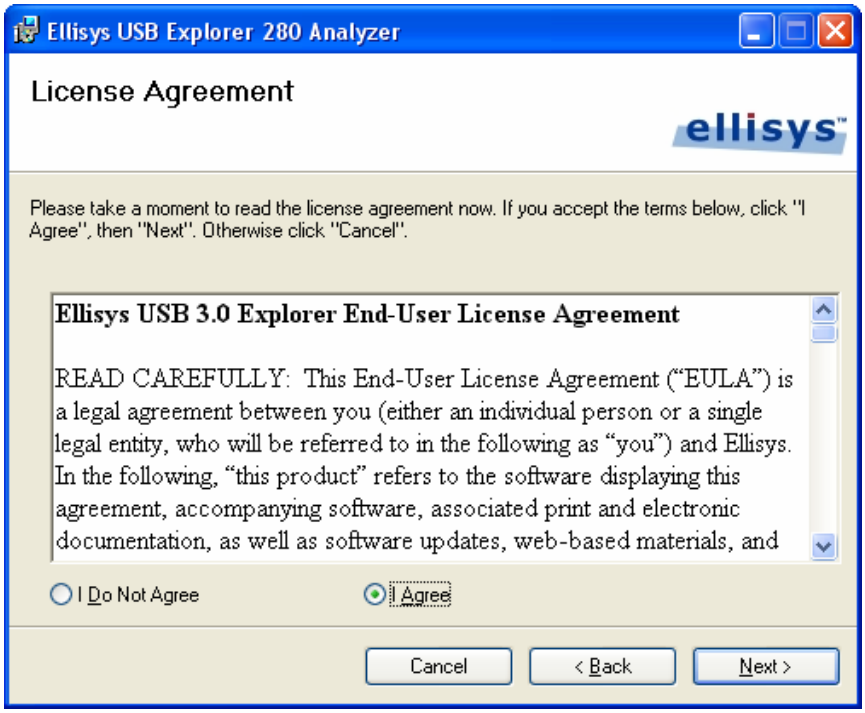
The Ellisys USB Explorer 280 Analyzer *Setup Wizard* screen appears:



If the Ellisys USB Explorer 280 Analyzer Setup Wizard does not appear automatically, click the START button on your Windows toolbar, then RUN, and type *d:\setup.exe* (change *d:* to match the drive letter designation of your CD-ROM drive as needed), then click OK.

2. Read the WARNING note and click on **Next**.

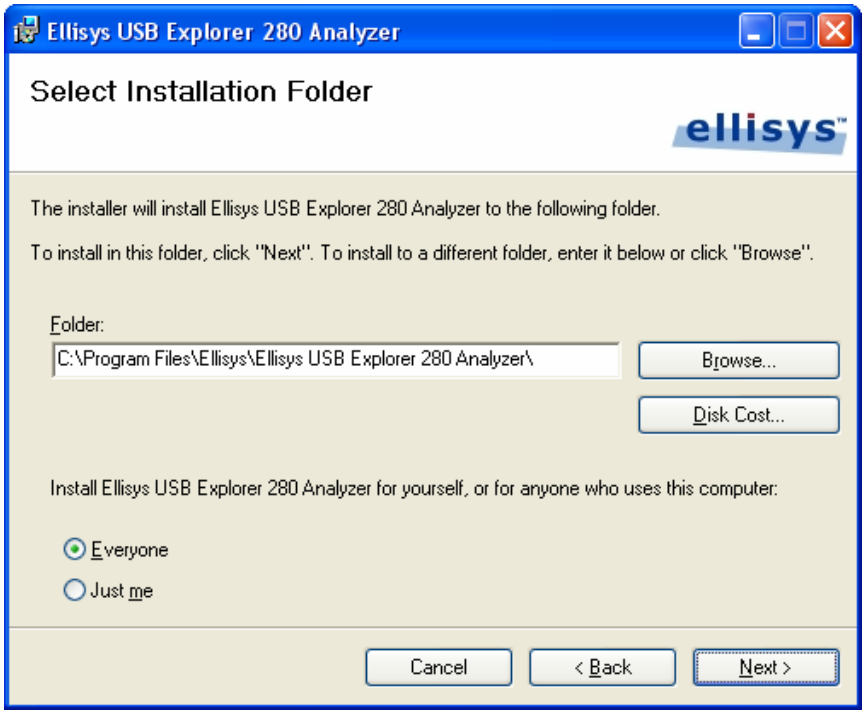
The Ellisys SuperSpeed USB Explorer 280 *License Agreement* screen appears:



3. Read the License Agreement carefully, and then select **I Agree**.

4. Click on **Next**.

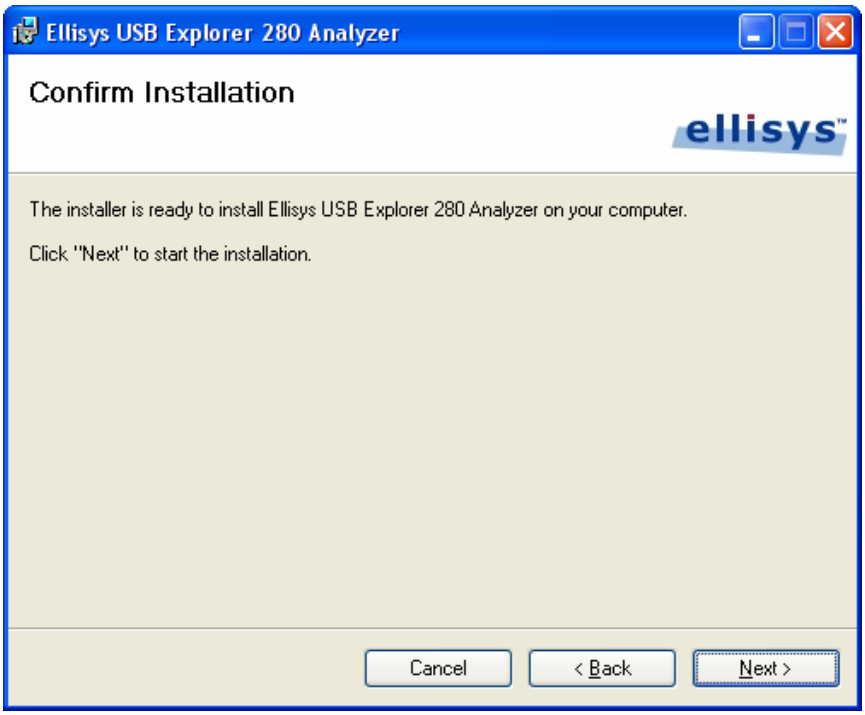
The *Select Installation Folder* screen appears.



5. The default installation folder appears in the *Folder* field. Ellisys recommends that you use the default folder, however if you wish to change this folder, click on **Browse** and navigate to the folder required.

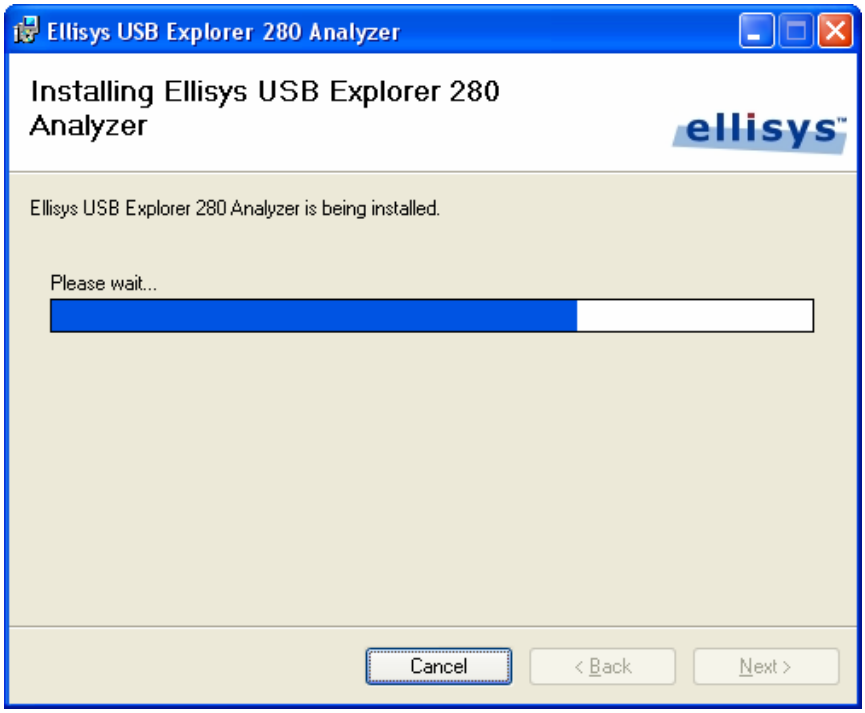
6. Select whether anyone or only the user currently logged on can access the software by selecting either **Everyone** or **Just me**. Click on **Next**.

The *Confirm Installation* screen appears:

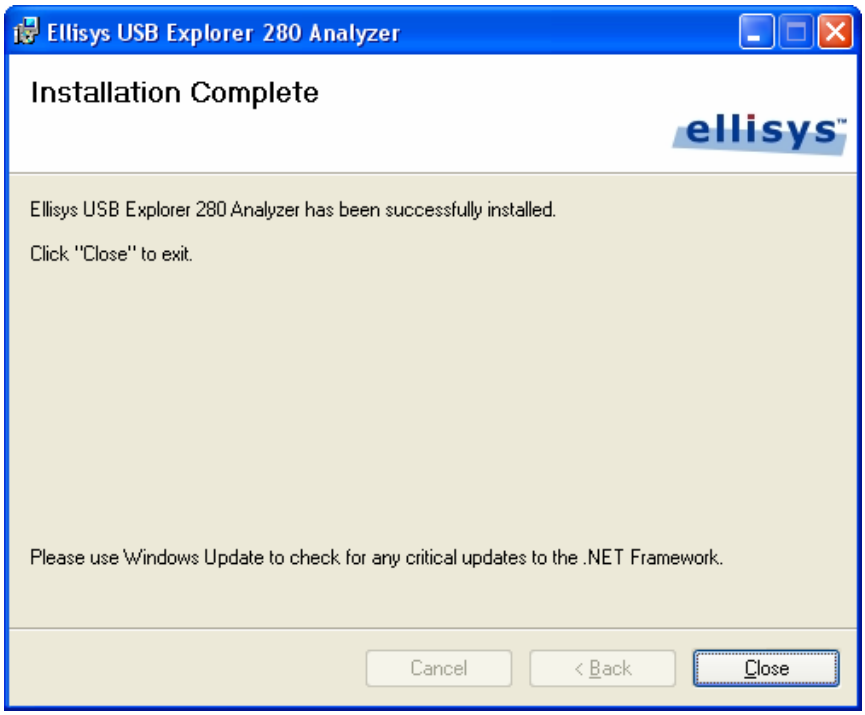


7. Click on **Next** to continue the installation.

An Installation Progress screen appears:



When the software has been installed, the *Installation Complete* screen appears:



8. Click on **Close**.

The USB Explorer 280 Analyzer software is now installed.

After installing the USB Explorer 280 Analyzer software, a new Hardware Wizard will appear if your unit is connected to a PC. Refer to section 2.5, Connecting to the Control Computer, for more information about installing the USB driver.

2.3 Front Panel Overview

The front panel of the USB Explorer 280 Analyzer is shown below:

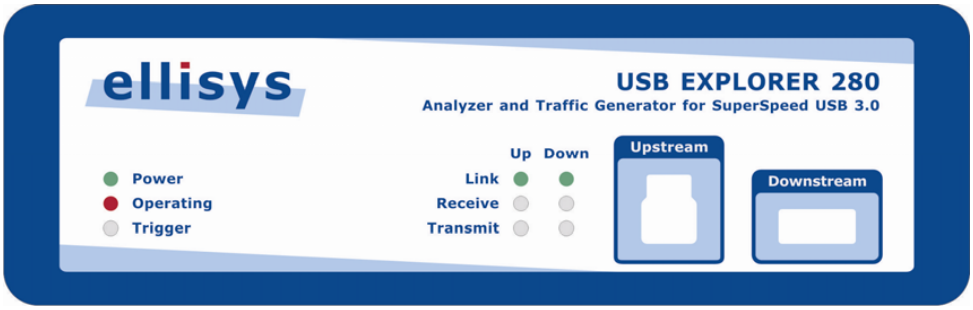


Figure 2 USB Explorer 280 Front Panel

When connecting USB cables DO NOT force the connector into the unit. The metal part of the connector should not be inserted completely into the connection port. Forcing the connector or inserting all of the metal part of the connector will break the port connection and is not covered by the warranty.

Upstream Connector

The Upstream connector is usually used to connect the Analyzer to a host or a downstream-facing port on a hub.

Downstream Connector

The Downstream connector is usually used to connect the Analyzer to a device or an upstream-facing port on a hub.

Power LED

The Power LED indicates if the unit is correctly powered from the supplied 24VDC/2A power adapter and connected to the control computer.

Constant green: Powered and connected, ready to operate.

Flashing green: Powered but not connected.

Flashing red: Connected but not powered.

Off: Not powered and not connected. The Power LED may also be off if when the unit is in power-saving mode after the control computer has been turned off.

Operating LED

The Operating LED indicates if the unit is presently operating or not, for example as protocol analyzer or as traffic generator.

- **Off:** Unit is not in use and available.
- **Constant green:** Unit is in use.
- **Orange:** In use, waiting for trigger.
- **Red:** Memory full, downloading; or triggered occurred, downloading

Trigger LED

The Trigger LED indicates whether a trigger event has occurred.

- **Green flash:** Trigger event detected.
- **Off:** No trigger event detected.

Link LED

The Link LED indicates the status of the upstream and downstream ports connected to the analyzer.

- **Off:** No receiver detected.
- **Constant orange:** Receiver detected, no SuperSpeed signaling detected.
- **Constant green:** SuperSpeed signaling detected, receiver synchronized.
- **Flashing red:** Link is unstable, frequent loss of synchronization.

Receive LED

The Receive LED indicates if payload (Data Packets) or errors (CRC, invalid symbols) are received on a given port.

Off: No payload or errors detected.

Flashing green: Payload detected.

Flashing red: Errors detected.

Transmit LED

The Transmit LED indicates if payload (Data Packets) is transmitted on a given port.

Off: No data sent.

Flashing green: Data Packet sent.

2.4 Back Panel Overview

The back panel of the USB Explorer 280 Analyzer is shown below:

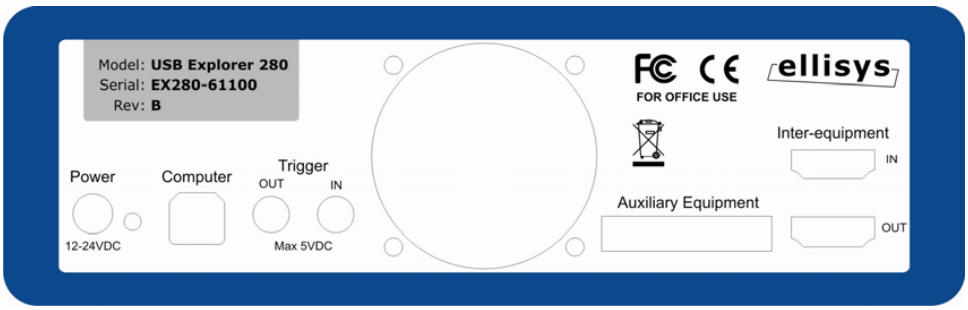


Figure 3 USB Explorer 280 Back Panel

When connecting the USB cable DO NOT force the connector into the unit. The metal part of the connector should not be inserted completely into the connection port. Forcing the connector or inserting all of the metal part of the connector will break the port connection and is not covered by the warranty.

Power

DC jack power input. The nearby LED illuminates constant green if a correct voltage is applied, and illuminates constant red if the voltage is applied reversed.

Accepted Voltage Range: 12V to 24V DC.
Minimum Power: 18W

Computer

Type B USB 2.0 receptacle. Attaches to the control computer.

Trigger OUT

SMA connector used for sending TTL voltage level shift or pulse to external equipment.

Trigger IN

SMA connector used for accepting TTL voltage level shift or pulse from external equipment.

Auxiliary Equipment

Reserved for future extensions.

Inter-equipment

Reserved for future extensions.

2.5 Connecting to the Control Computer

The USB Explorer 280 Analyzer is controlled over a high-speed USB 2.0 connection by a PC hosting the Analyzer application, enabling the use of any notebook or desktop computer. The USB driver must be installed before the Analyzer can be used.

Although the unit can upload or download data on a full speed USB 1.1 connection, Ellisys strongly recommends that you connect it to a high speed USB 2.0 port to obtain optimal performance. If you experience problems with the USB Explorer 280, please ensure it is connected on a high speed USB 2.0 enabled host controller before contacting technical support.

Follow the steps below to install the USB driver:

1. Connect a USB 2.0 cable between the Type B USB receptacle on the Analyzer's back panel and the PC. If attaching the Analyzer for the first time, wait until Windows displays a message indicating that a new device has been found (typically a small bubble indication at the lower-right of the screen), then go to step 3.

2. To update a previously installed device driver:

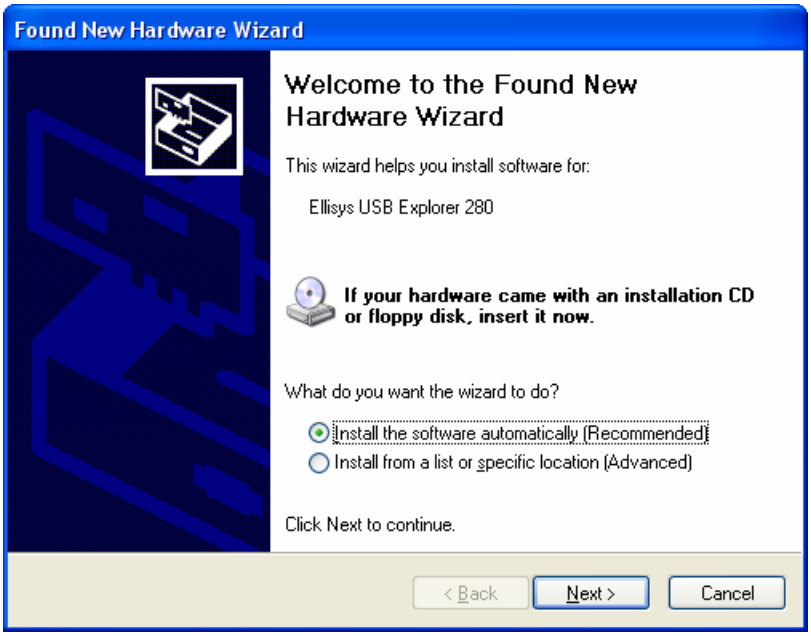
    - Open the Device Manager: Start | Control Panel
    - Double-Click the System icon.
    - Click on the Hardware tab.
    - Click on Device Manager.
    - Click on Ellisys protocol analyzers.
    - Right-click and select Update Driver.

The *Hardware Update Wizard* opens:

3. Select **No, not this time**.

4. Click on **Next**.

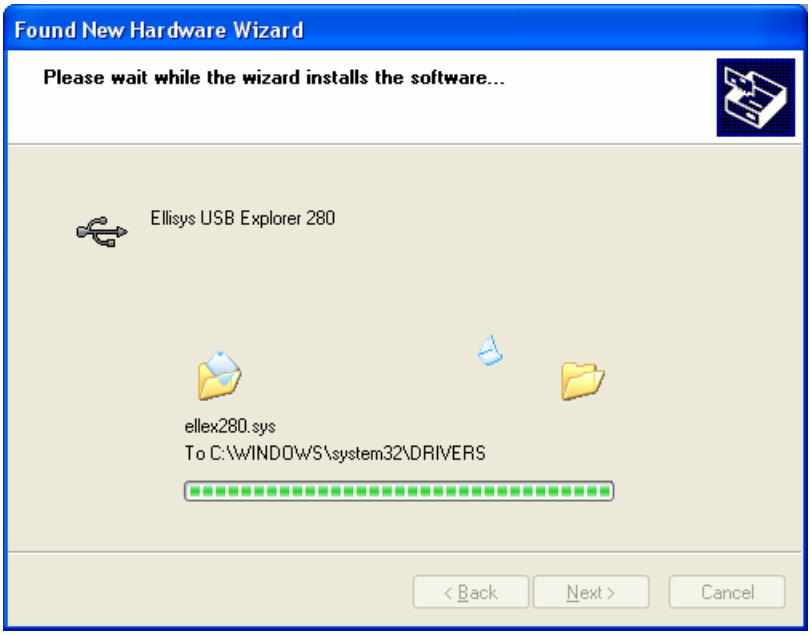
The *Found New Hardware Wizard* appears:



5. Select **Install the software automatically (Recommended).**

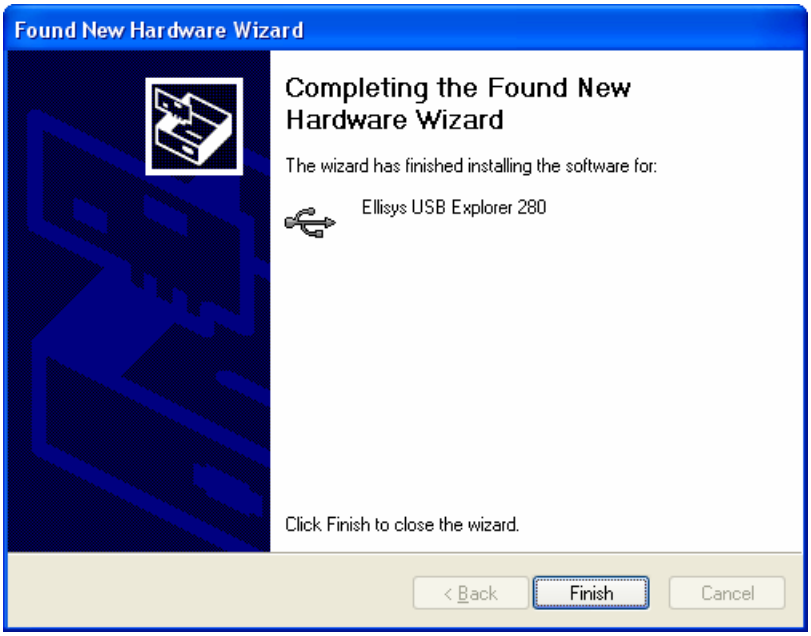
6. Click on **Next**.

The *Please wait while the wizard installs the software* window appears:



Windows now installs the driver.

7. When the installation is complete, the *wizard has finished installing the software* screen appears:

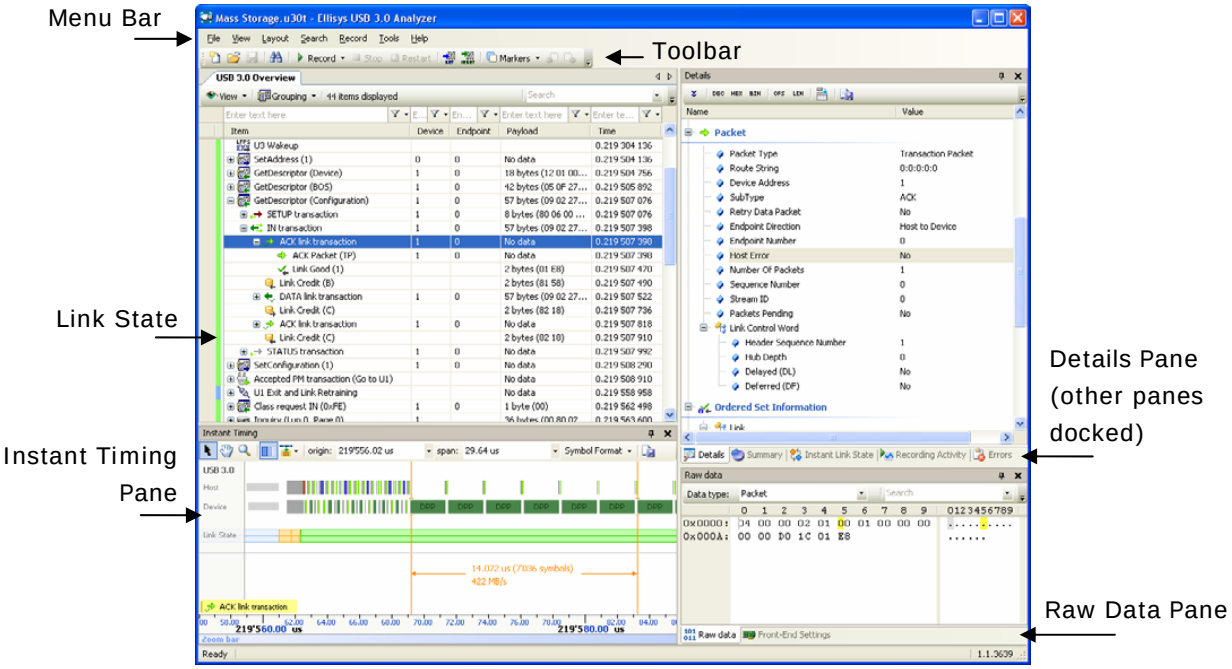


8. Click on **Finish**.

The installation is complete.

3. User Interface Reference

The user interface of the USB Explorer 280 Analyzer application provides various windows, panes, menus, toolbars, and other visual elements. All panes are dockable, can be hidden, resized, and most are inter-linked to provide synchronization with other panes.



The Analyzer application displays several windows and panes in the default layout. Each pane displays specific information or allows the user to interact with the software for a given task:

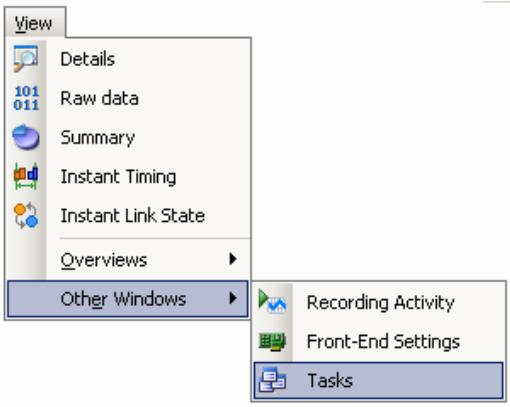
- ***USB 3.0 Overview*** – Displays a chronological record of bus traffic and events.
- ***Details Pane*** – Displays a breakdown of the event selected in the *USB 3.0 Overview*.
- ***Raw Data Pane*** – Displays the raw data of the event selected in the *USB 3.0 Overview*.
- ***Instant Timing Pane*** – Displays a graphical representation of bus events, including characters, ordered sets, packets, and link states as well as timing and bandwidth measurements.
- ***Summary Pane*** – Displays a statistical summary bus traffic captured.
- ***Instant Link State Pane*** – Displays and tracks LTSSM states.
- ***Recording Activity Pane*** – Displays performance metrics on the capture in progress.

3.1 Organizing Panes

The various panes provided can be shown/hidden, moved, docked, and resized to suit the user's preferences. See 5.2, Using Layouts, for more information on saving display preferences.

To open or display a pane:

1. Select **View** in the menu and select the desired pane.



The selected pane opens.

To close a pane:

1. Click on **Close** positioned at the top-right corner of the title bar of the pane.

The pane closes.

To hide a pane:

1. Click on **Auto-Hide** positioned at the top-right corner of the title bar.

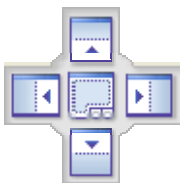
The pane is hidden and the pane's name now appears as a tab at the right side of the screen.

To move a pane or a window:

1. Click on the title bar of the desired pane or window.

2. Depress and hold the left mouse button and drag the pane or window.

A window placer appears:



3. Keep the mouse button depressed and point to one of the following:

   -  **Center** to open a pane as a floating window in the screen.
   -  **Top** to move the pane to the top of the screen or pane group.
   -  **Right** to move the pane to the right of the screen or pane group.
   -  **Left** to move the pane to the left of the screen or pane group.
   -  **Bottom** to move the pane to the bottom of the screen or pane group.

3.2 Main Toolbar

The table below shows the USB Explorer 280 Analyzer toolbar buttons and their actions:

	New	Creates a new empty capture file.
	Open	Opens a previously saved capture file.
	Save	Saves a capture file.
	Search	Opens the Search dialog.
	Start Recording	Starts a recording on the given analyzer unit.
	Stop Recording	Stops the current recording.
	Restart	Abort the current recording and restarts a new one.
	Set Time Reference	Sets the time reference at the line selected in the *USB 3.0 Overview* at 0.000.000.000
	Reset Time Reference	Resets the time reference at the line selected in the *USB 3.0 Overview* to its original value.
	Markers	Opens the markers menu.
	Find Previous Marker	Jumps to previous marker.
	Find Next Marker	Jumps to next marker.

3.3 Main Menu

The table below shows the USB Explorer 280 Analyzer main menu options and their actions, with shortcuts shown in parentheses:

File

	**New** (CTRL+N)	Creates a new recording session.
	**Open** (CTRL+O)	Opens a folder to open a previously saved capture.
	**Save** (CTRL+S)	Saves a capture
	Save As	Saves an existing capture to a new name.
	Load Sample	Opens sample files provided with application.
	Import (Ctrl+P)	Imports a file to view in the analyzer application.
	Export (Ctrl+E)	Exports a trace to various formats.
	Switch Workplace	Allows user to switch to a different Workspace or to create a new Workspace.
	Import and Export Settings	Opens the *Import and Export Settings Wizard*.
	**Page Setup**	Opens *Page Setup* dialog allowing user to set page margins and other parameters.
	**Print Preview**	Opens the *Print Preview* window.
	**Print**	Print the selected overview window.
	Exit	Closes the application.

View

	**Details**	Opens the *Details* pane.
	**Raw Data**	Opens the *Raw Data* pane.
	**Summary**	Opens the *Summary* pane.
	**Instant Timing**	Opens the *Instant Timing* pane.
	**Instant Link State**	Opens the *Instant Link State* pane.

View | Overviews

	USB 3.0 Overview	Opens the *USB 3.0 Overview*.

View | Other Windows

	**Recording Activity**	Opens the *Recording Activity* pane.
	**Front-End Settings**	Opens the *Front-End Settings* pane.
	**Tasks**	Opens the *Tasks* pane.

Layout

Default	Opens the default layout.
New Layout	Creates a new layout.
Rename Layout	Renames the existing layout.
Reset Layout	Resets the existing layout.
Delete Layout	Deletes the existing layout (default layout excluded).

Search

 **Search** (CTRL+F)	Opens the *Find* menu.
Instant Search (CTRL+I)	Places the cursor in the *Instant Search* window.
Go To (CTRL+G)	Opens the *Go To Item* window.
Go To Next	Expands a menu to enable search for next various USB items.
Go To Previous	Expands a dialog to enable search for previous various USB items.
Find Next (F3)	Searches forward for the last event found in a search.

Record

 **Start Recording** (CTRL+R)	Starts a recording.
 **Stop Recording** (CTRL+SHFT+R)	Stops the current recording.
 **Restart Recording**	Abort the current recording and restarts a new one.
Select an Analyzer	Opens the *Available Analyzers* dialog to allow for selection of attached analyzer to be used.
 **Recording Options**	Opens the *Recording Options* dialog.

Tools

 **Set Time Reference** (CTRL+T)	Sets the time reference at the line selected in the *USB 3.0 Overview* at 0.000.000.000
 **Reset Time Reference** (CTRL+SHFT+T)	Resets the time reference at the line selected in the *USB 3.0 Overview* to its original value.
Options	Open the *Options* dialog.

Help

	**Ellisys website**	Opens the Ellisys website in the default browser.
	**Contact support**	Opens a form in the default browser to contact Ellisys technical support.
	Check for updates	Checks online for the latest software version.
	**About**	Opens the *About* window.

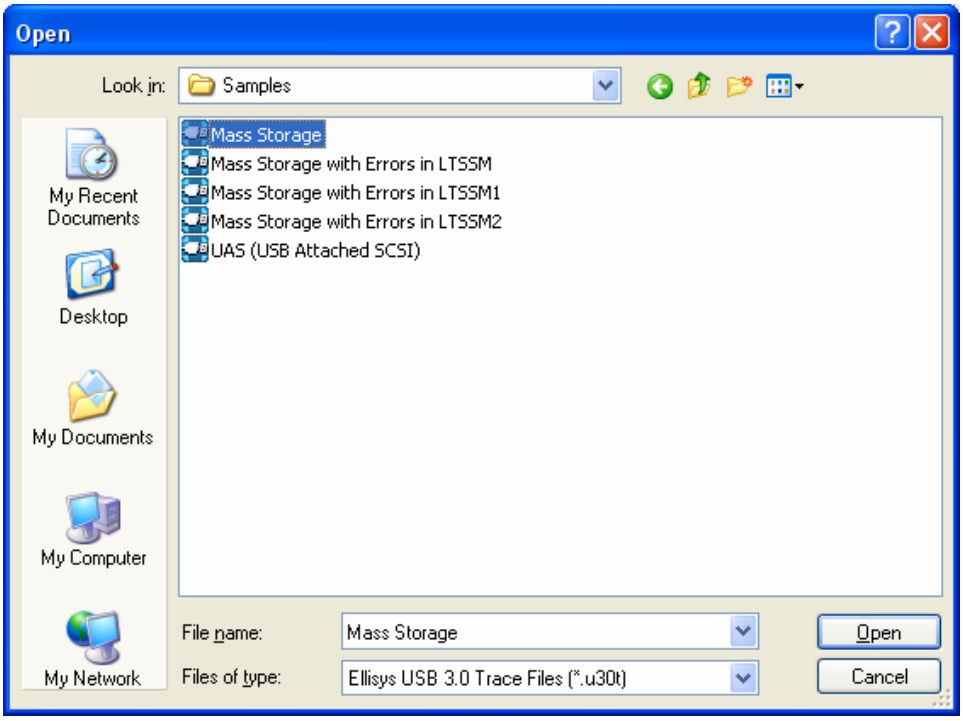
4. Managing Trace Files

4.1 Opening a Trace File

To open a trace file:

Select **File |Open** in the menu or click on **Open.**

The *Open* menu appears:



1. Select the file required and click **Open**.

The selected file opens in the software.

4.2 Saving a Trace File

To save a trace file:

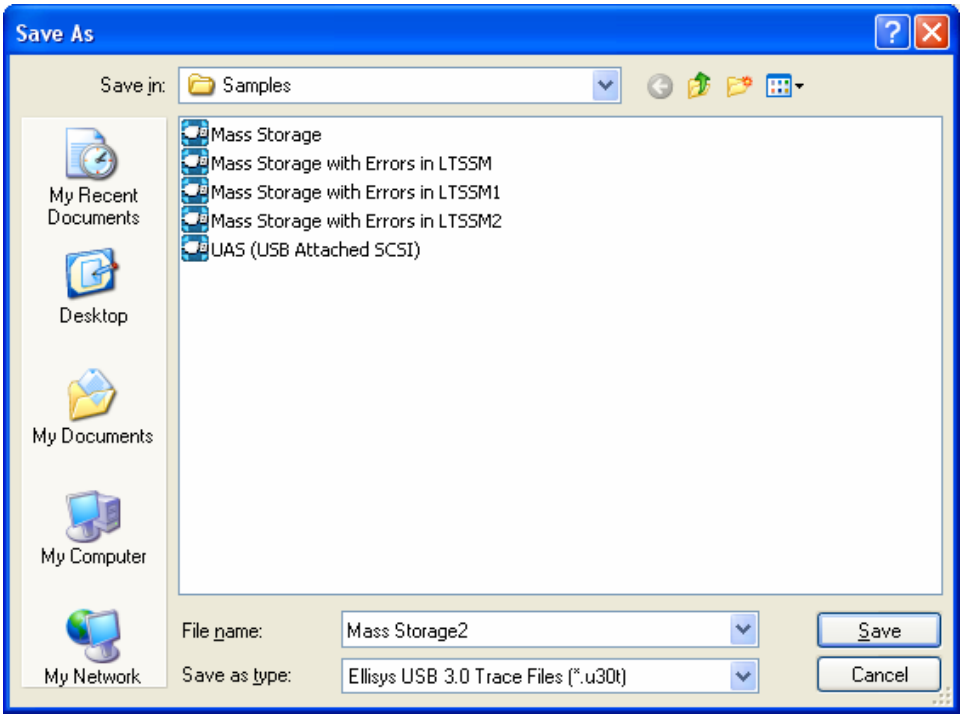
1. Select **File | Save As** in the menu or click on **Save.**

The file is saved.

To save a trace file with a new name:

Select **File | Save As** in the menu**.**

The *Save As* menu appears:



1. Navigate to the directory where the file is to be saved.

2. Enter the desired name of the file in the **File name** field and click on **Save**.

The file is saved with the modified name and the original file is not modified.

4.3 Opening a Sample Trace File

Several sample trace files are included with the application.

To open a sample file:

1. Select **File | Load Sample** in the menu.

2. Click on the desired sample.

   or

   Select **More samples online...** to browse to the Ellisys website for more sample files.

4.4 Printing a Trace File

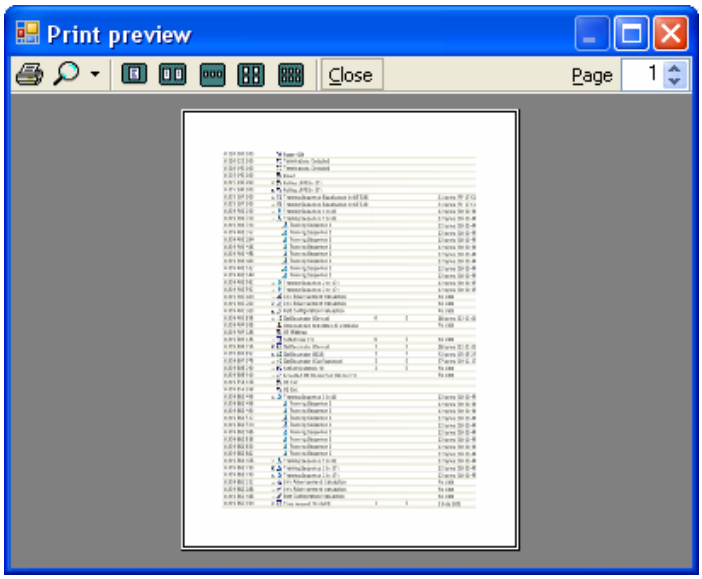
Use the *Page Setup* option, **File | Page Setup**, to setup how the trace should be printed. This option will depend on the printer; please see your printer's documentation for more information.

To preview a print job:

1. Select **File | Print Preview | USB 3.0 Overview** from the menu.

A file can be very large therefore it is advisable to check the size of the file before trying to print the file.

The *Print preview* window appears:



2. Print directly from the *Print preview* window using the print icon.

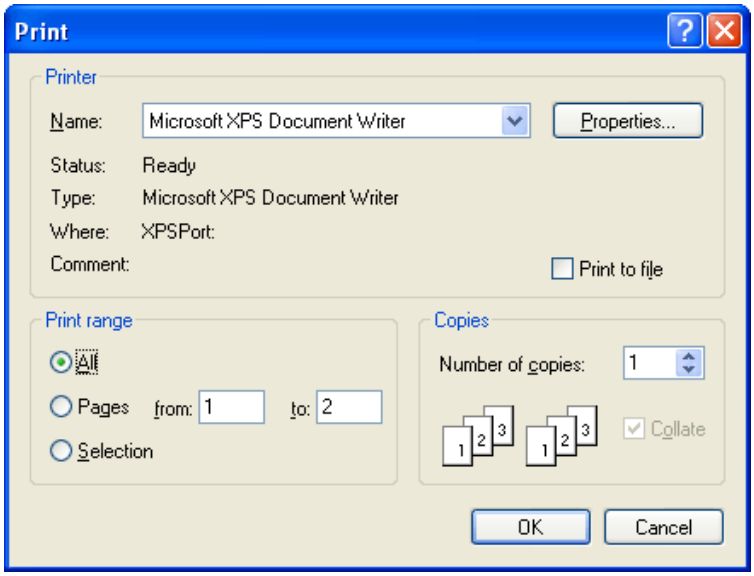
   or

   Click on **Close** to return to the trace file.

To print a file:

1. Select **File | Print** in the menu then select **USB 3.0 Overview**.

The *Print* window appears:



2. Select the printer and printer setup if required.

3. Click on **OK**.

The file is printed.

4.5 Importing Data to View in a Trace File

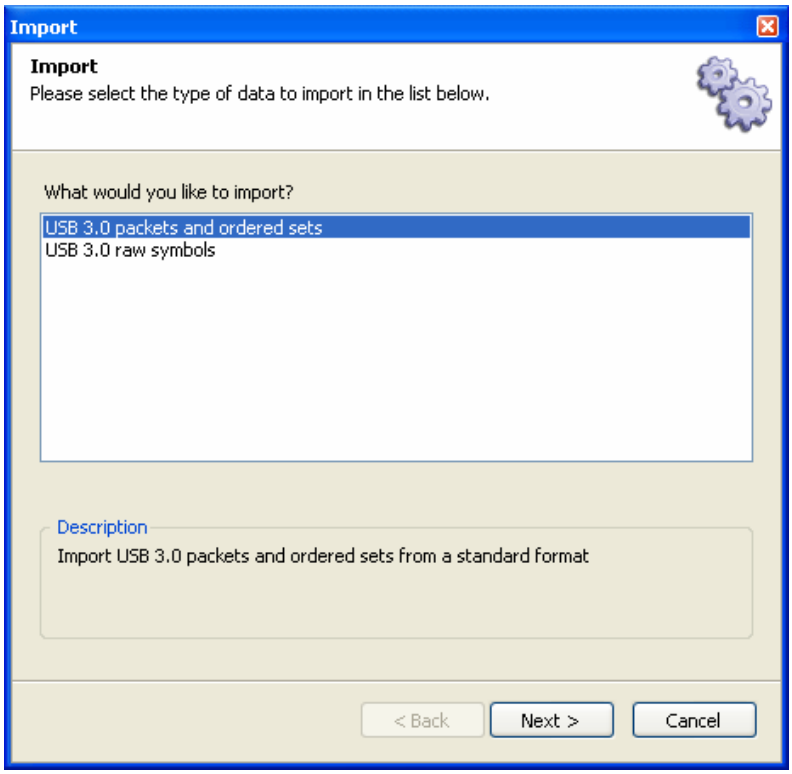
The application permits the user to import data from formatted text files for display in the Ellisys viewer format. The analyzer hardware is not required for these operations. Data can be imported from a packet and ordered set format or from a character-based format. See *Appendix 1 (*

Raw Character Import Format) or *Appendix 2 (Packet Import Format)* for more information on import formats.

To import USB 3.0 packets and ordered sets:

1. Select **File | Import** in the menu.

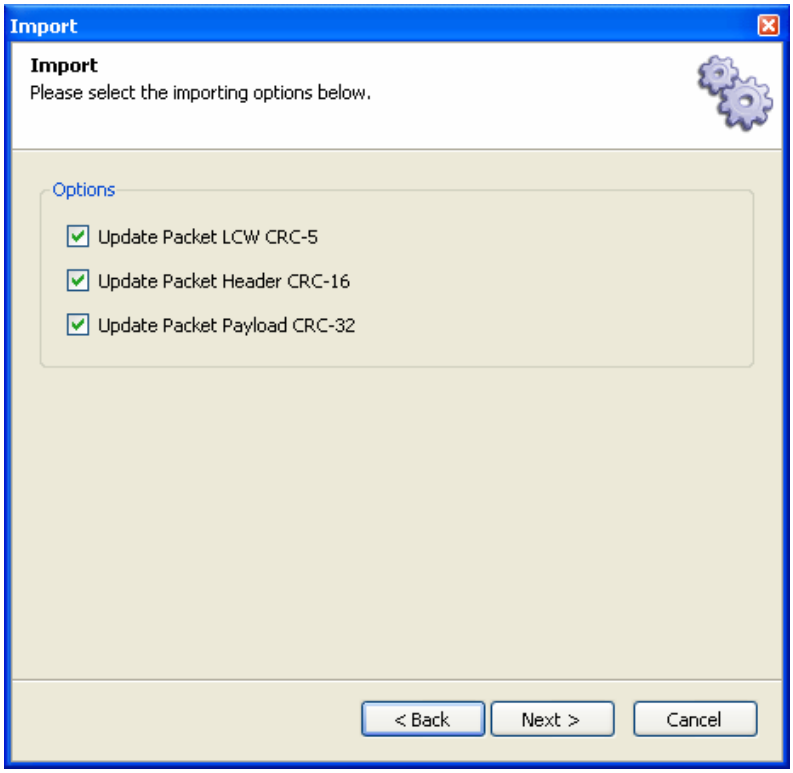
The *Import* menu appears:



2. Select **USB 3.0 packets and ordered sets**.

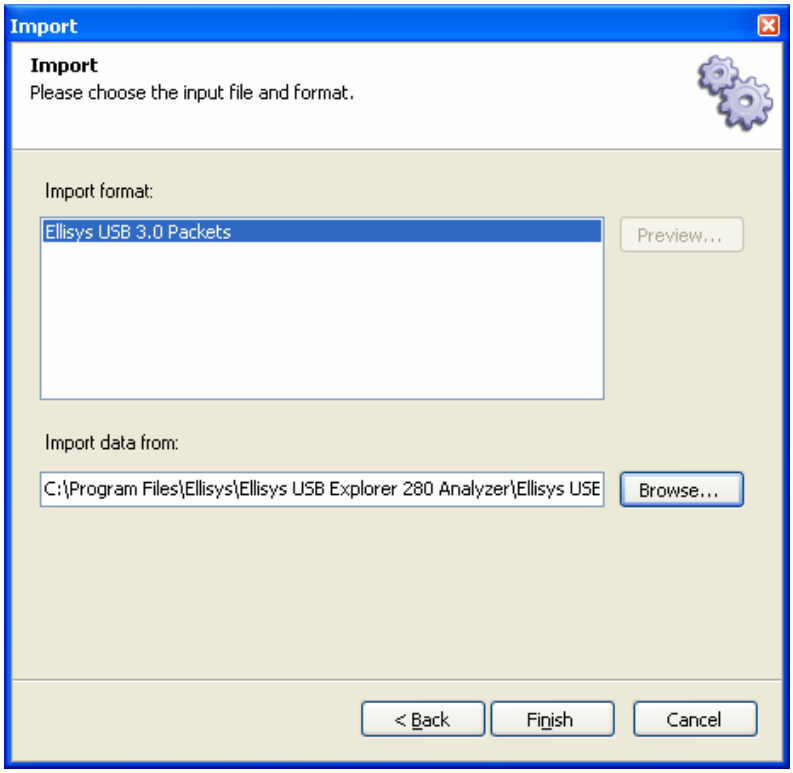
3. Click on **Next**.

The *Import Options* Menu appears:



4. Select the desired options and click on **Next**.

The *Import file and format* menu appears:



5. Select **Browse** and point to the desired u30pkt file.

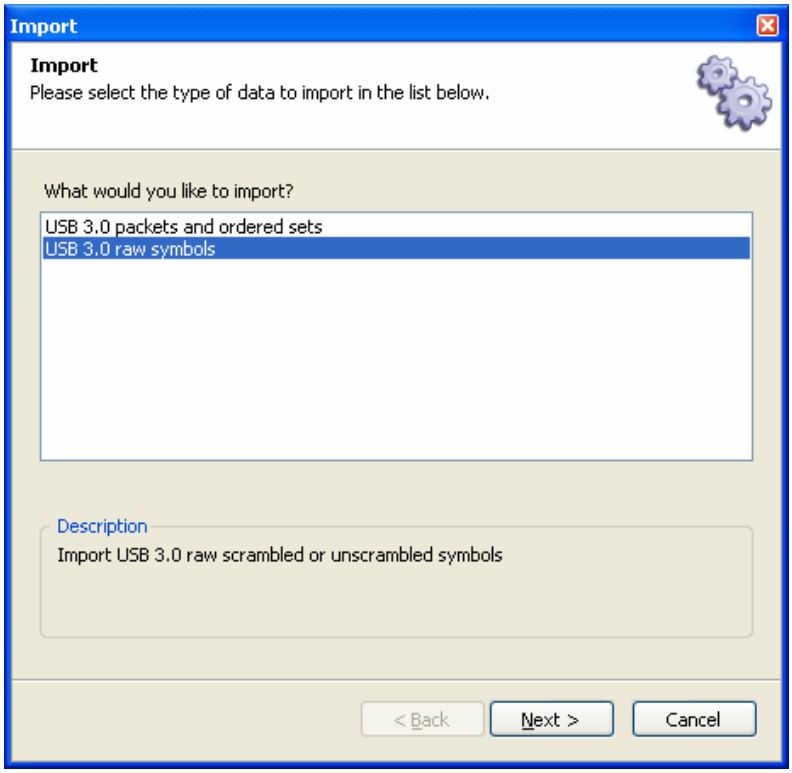
6. Select **Finish** to complete the import.

The application now displays the imported data.

To import USB 3.0 raw symbols:

1. Select **File | Import** from the menu.

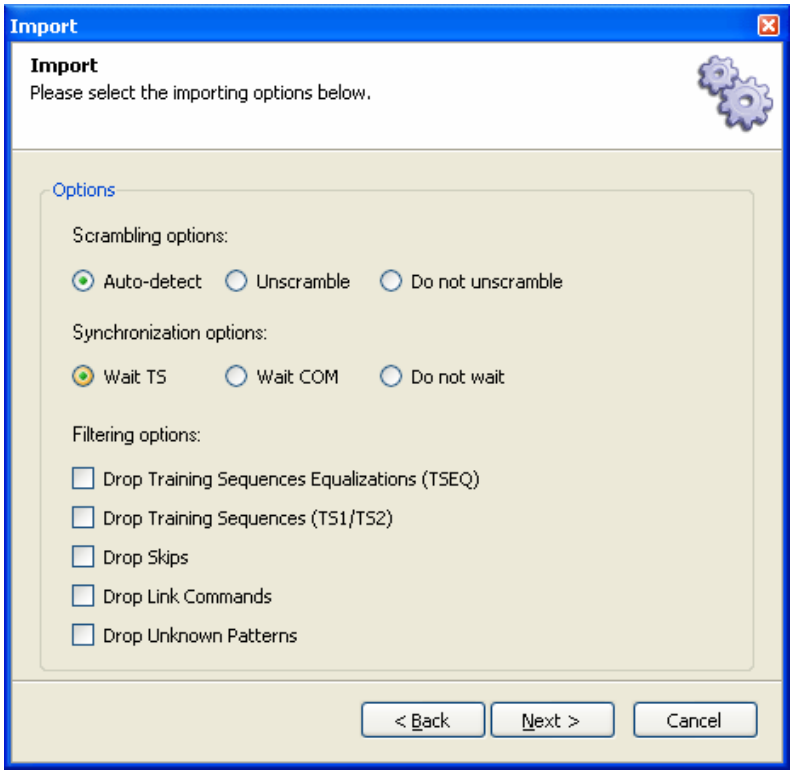
The *Import* menu appears:



2. Select **USB 3.0 raw symbols**.

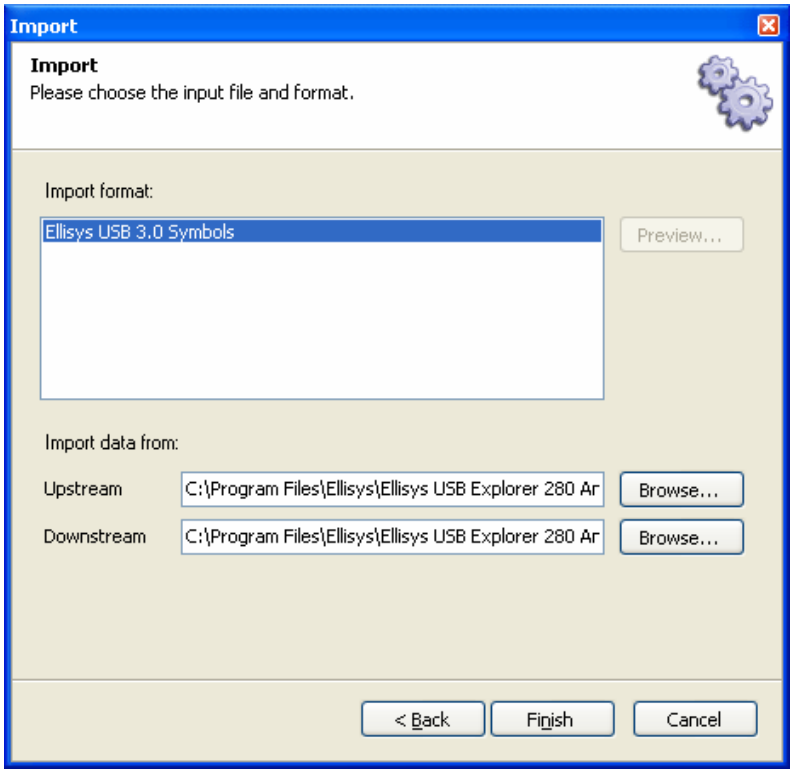
3. Click on **Next**.

The *Import Options* menu appears:



4. Select the desired options and click on **Next**.

The Import file and format menu appears:



5. Select **Browse** and point to the desired u30chars upstream file.

6. Select **Browse** and point to the desired u30chars downstream file.

7. Select **Finish** to complete the import.

The application now displays the imported data.

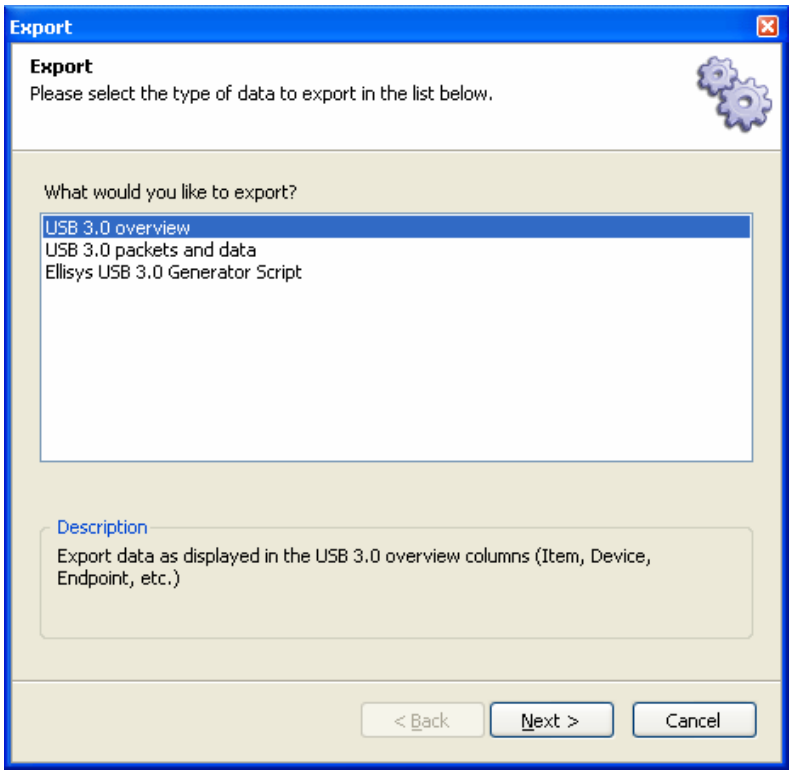
4.6 Exporting a Trace File

A trace file can be exported for various ancillary purposes and in several formats. Format-based exports are available in XML, CSV, text, and binary. Export of a trace file to an EX280 SuperSpeed generator script is also available.

To export data as displayed in the *USB 3.0 Overview*:

1. Select **File | Export** from the menu.

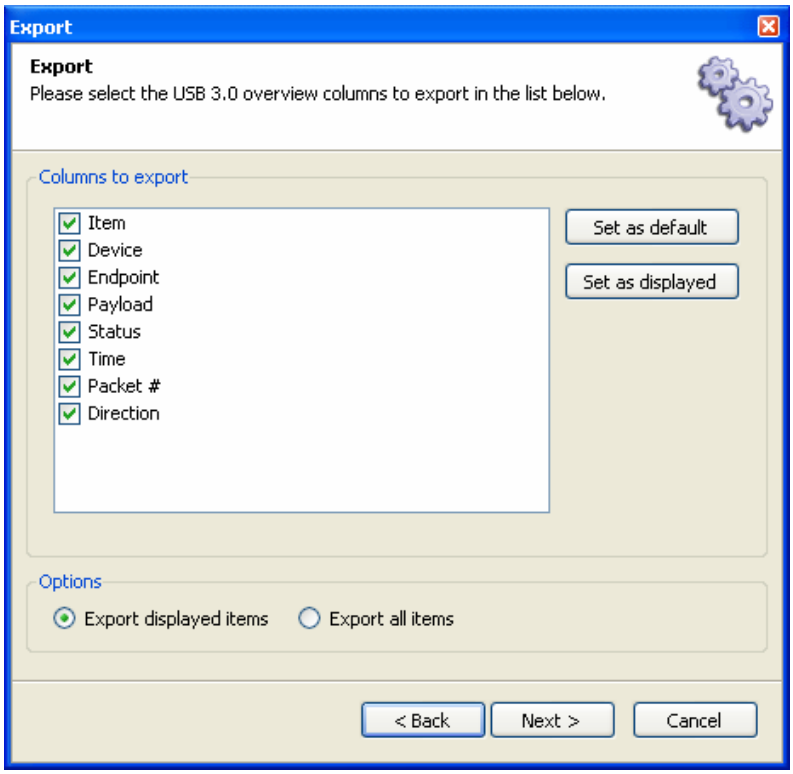
The *Export* menu appears:



2. Select **USB 3.0 Overview**.

3. Click on **Next**.

The **Columns to export** menu appears, which includes a default list of columns available for export:



4. Click on **Set as Displayed** to populate the **Columns to Export** to match the columns displayed in the *USB 3.0 Overview*.

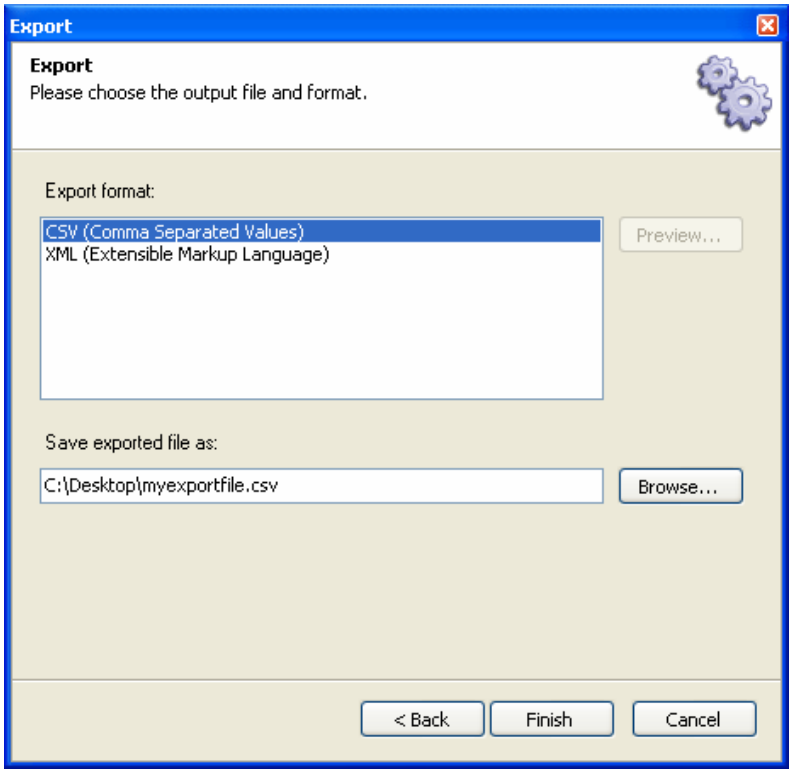
   or

   Check the boxes desired for export in **Columns to export**.

   To customize the columns displayed in the *USB 3.0 Overview*, right click on the column headers and add columns from a default list, or drag any blue icon from the various fields displayed in the Details view and drop on the column header.

5. Click on **Next**.

The *Export output file and format* menu appears:



6. Select the desired output format.

7. Select **Browse** to select a destination folder for the exported file.

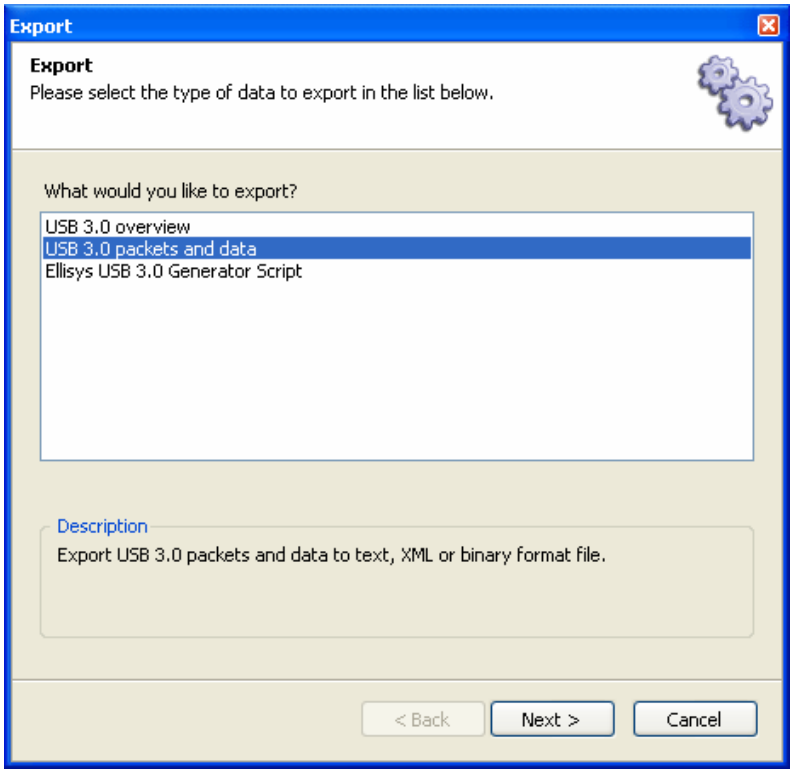
8. Click on **Finish**.

The file is exported in the selected format to the selected destination.

To export USB 3.0 packets and data:

1. Select **File | Export** from the menu.

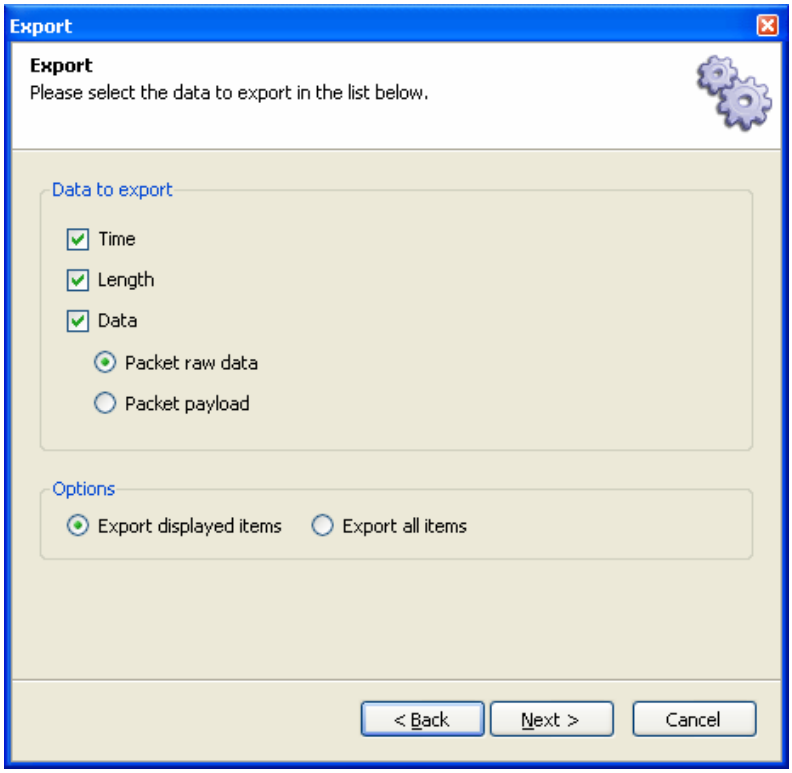
The *Export* menu appears:



2. Select **USB 3.0 packets and data**.

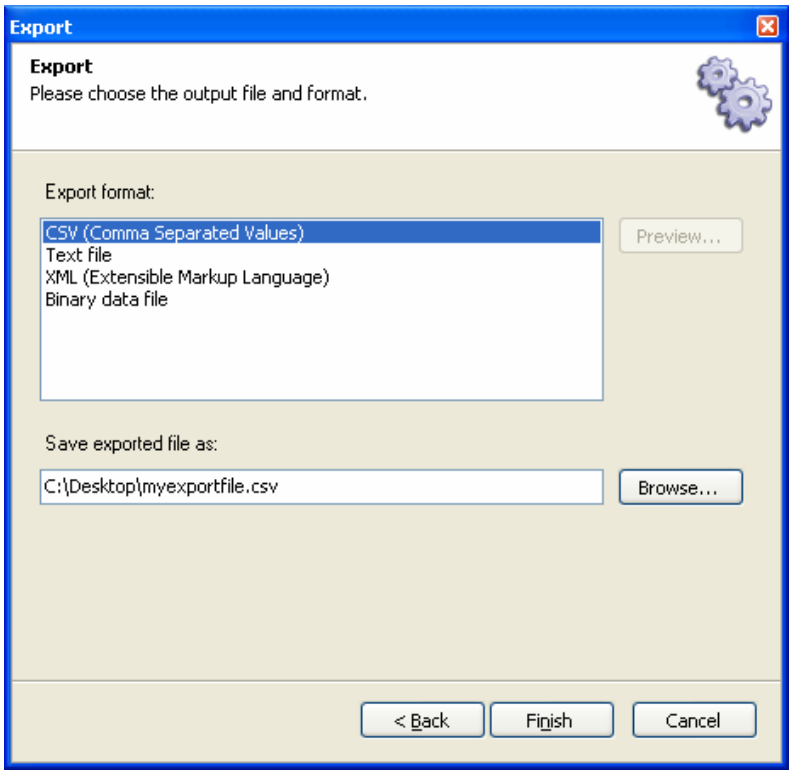
3. Click on **Next**.

4. The *Export options* menu appears:



5. Select the options desired and click on **Next**.

The *Export output file and format* menu appears:



6. Select the desired export format.

7. Select **Browse** to select a destination folder for the exported file.

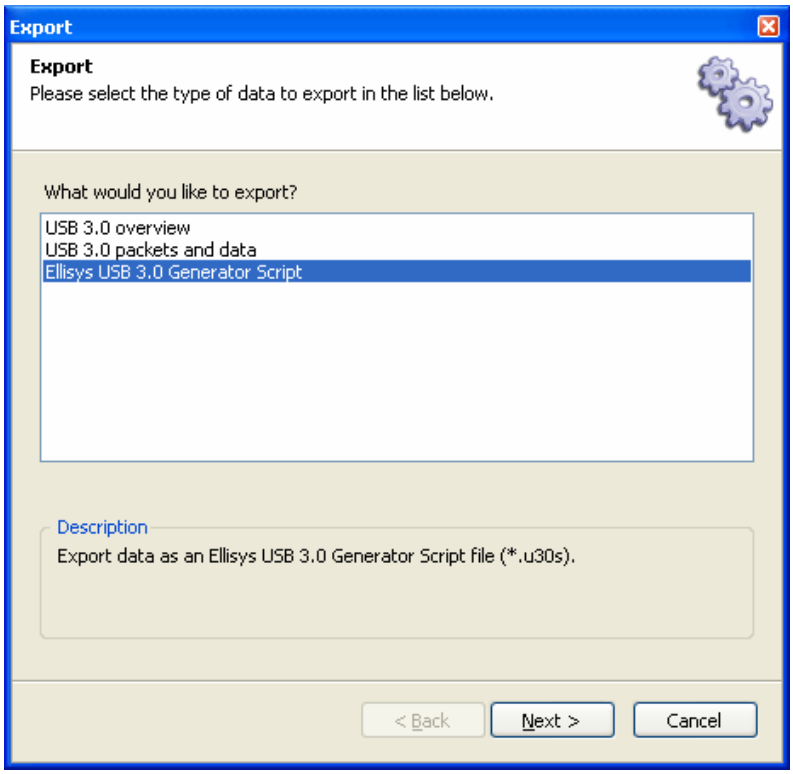
8. Click on **Finish**.

The file is exported in the selected format to the selected destination.

To export a trace file to an Ellisys Explorer 280 Generator script format:

1. Select **File | Export** from the menu.

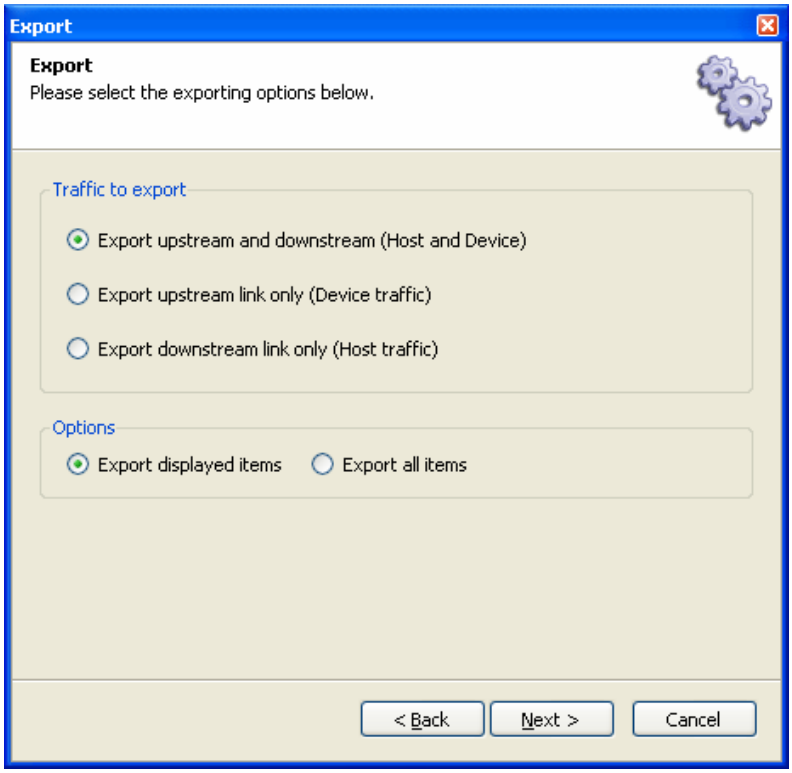
The *Export* menu appears:



2. Select **Ellisys USB 3.0 Generator Script**.

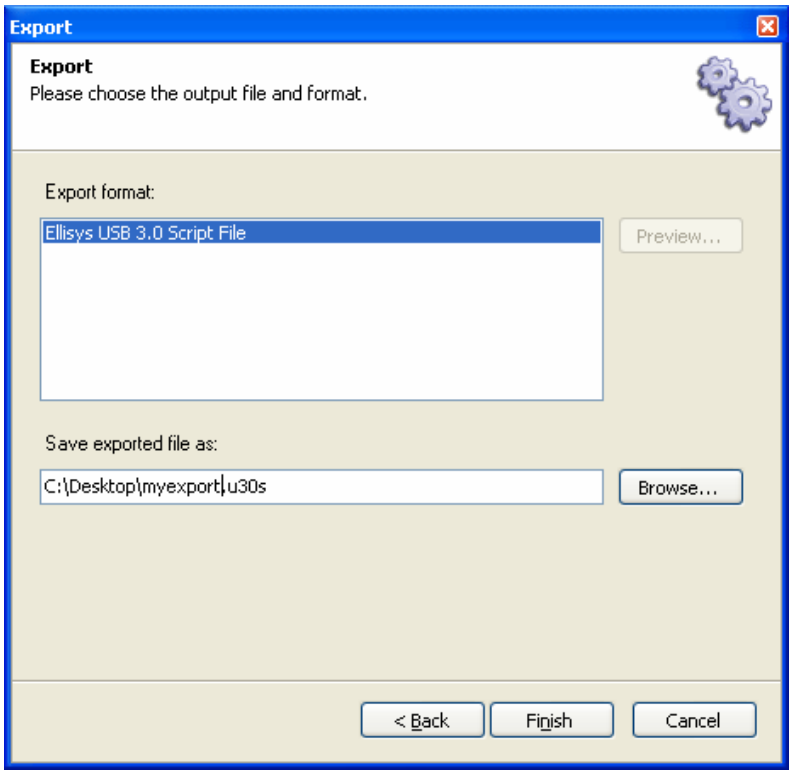
3. Click on **Next**.

The *Export options* menu appears:



4. Select the options desired and click on **Next**.

The *Export file and format* menu appears:



5. Select **Browse** to select a destination folder for the exported file.

6. Click on **Finish**.

The file is exported in the desired format.

5. Workspaces and Layouts

5.1 Using Workspaces

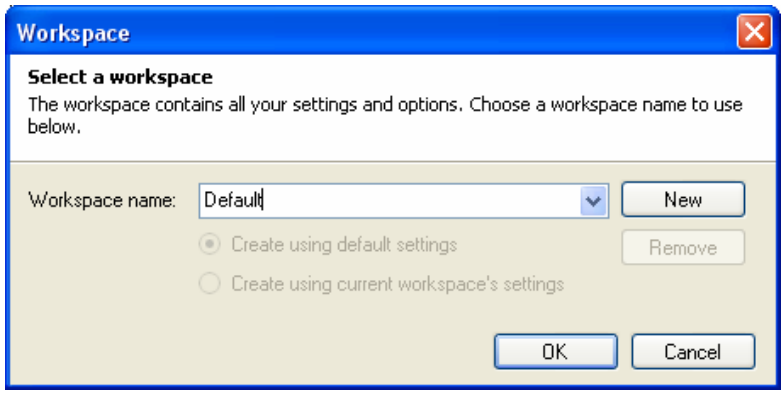
The application allows the user to define a Workspace, which is a way of saving different sets of user settings preferences, such as display settings and other settings, like recording options, window layouts and protocol verifications options. A default Workspace is provided by the application, but users may create and save new Workspaces as desired. A non-exhaustive list of items affected by Workspace setting is shown below:

- General options
- Window layouts
- Most recently used (MRU) files
- Recording options
- USB 3.0 overview
- Details view
- Raw data view
- Summary view
- Instant Timing view

To create a new Workspace:

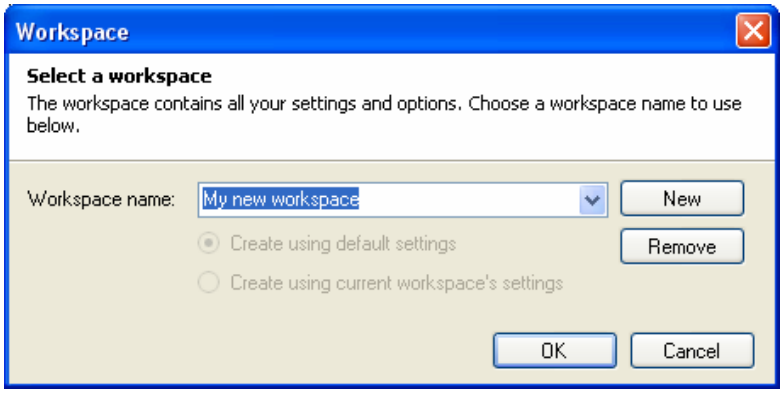
1. Select **File | Switch Workspace** from the menu.

The *Workspace* menu appears:



2. Click on **New.**

A new **Workspace name** appears:



3. Accept the name provided by the application, or type in a new name in the **Workspace name** box. Select **Create using default settings** to establish a new Workspace based on the default settings.

   or

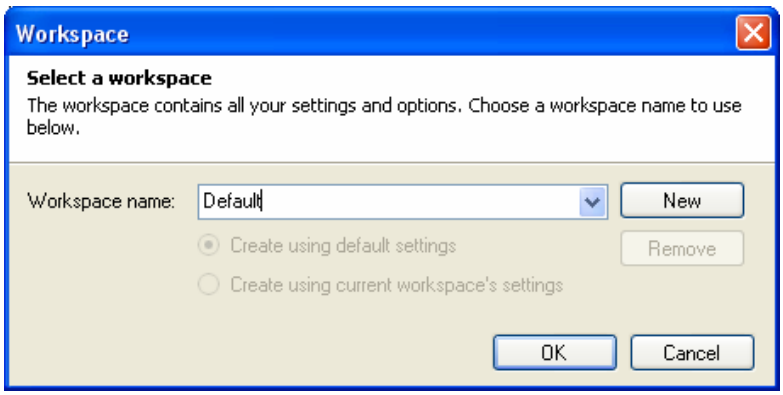
   Select **Create using current workspace's settings** to establish the new workspace based on the current settings.

4. Select **OK**.

To change from one Workspace to another:

1. Select **File | Switch Workspace** from the menu.

The *Workspace* menu appears:



2. Select the **Workspace name** drop-down arrow.

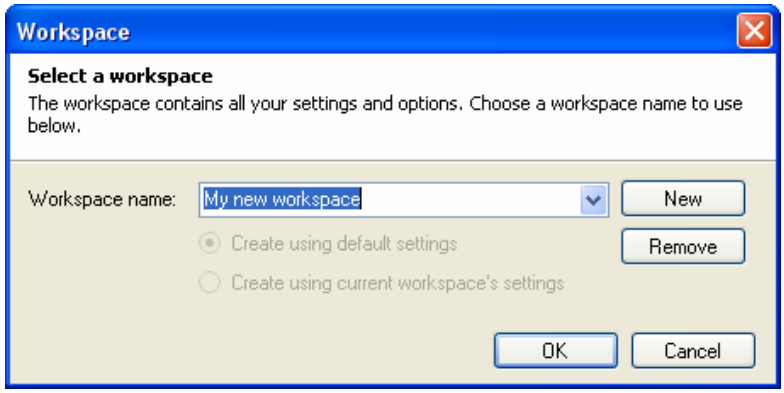
3. Select the desired Workspace name.

4. Click on **OK**.

To remove a Workspace:

1. Select **File | Switch Workspace** from the menu.

The *Workspace* menu appears:



2. Select the **Workspace name** drop-down arrow.

3. Select the desired Workspace name.

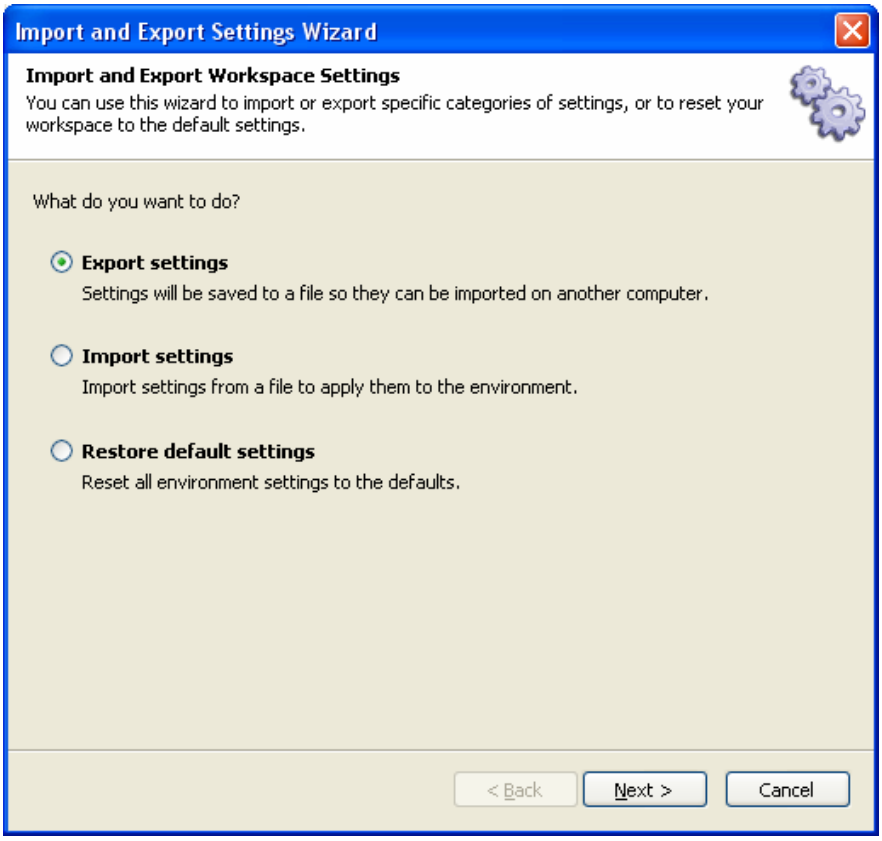
4. Click on **Remove**.

5. Click on **OK**.

To export Workspace settings to a file:

1. Select **File | Import and Export Settings** from the menu.

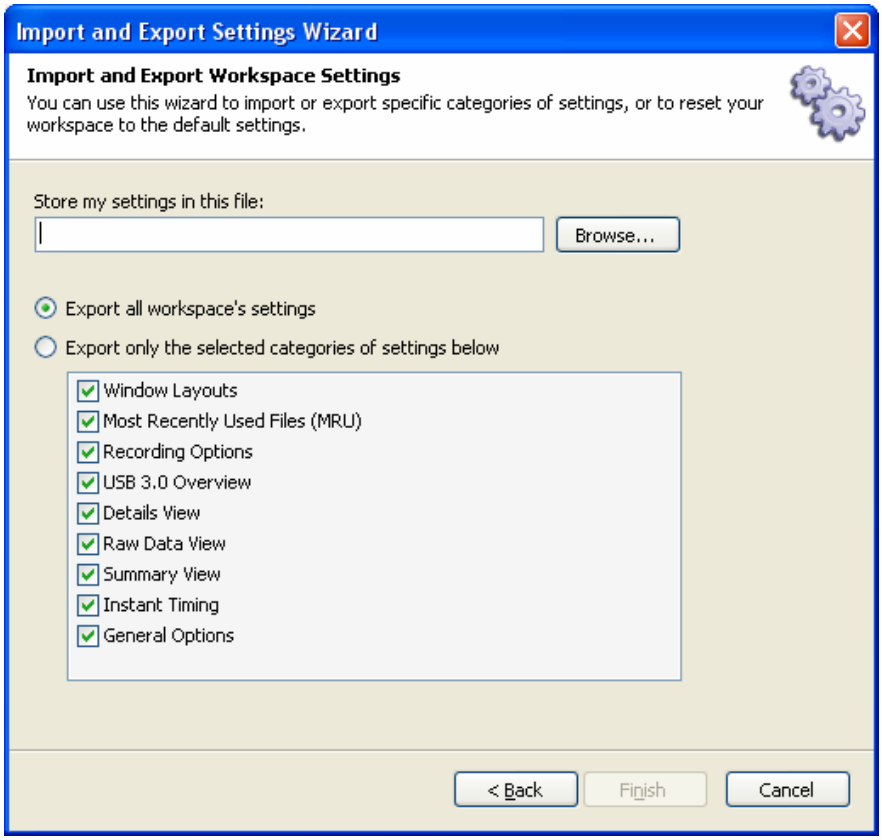
The *Import and Export Settings Wizard* menu appears:



2. Select **Export settings**.

3. Click on **Next**.

The *Export* menu appears:



4. Select **Export all workspace's setting**

   or

   Select **Export only the selected categories of settings below** and check the desired categories.

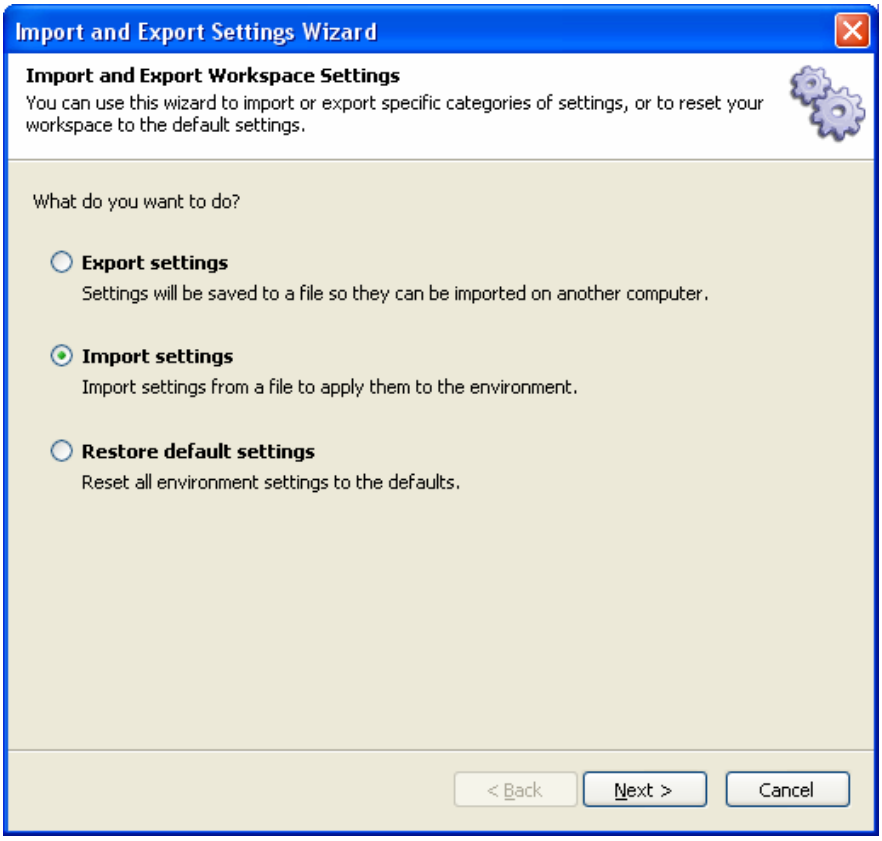
5. Select **Browse** to specify a location to name and save the file.

6. Click on **Finish**.

To import a Workspace settings file:

1. Select **File | Import and Export Settings** from the menu.

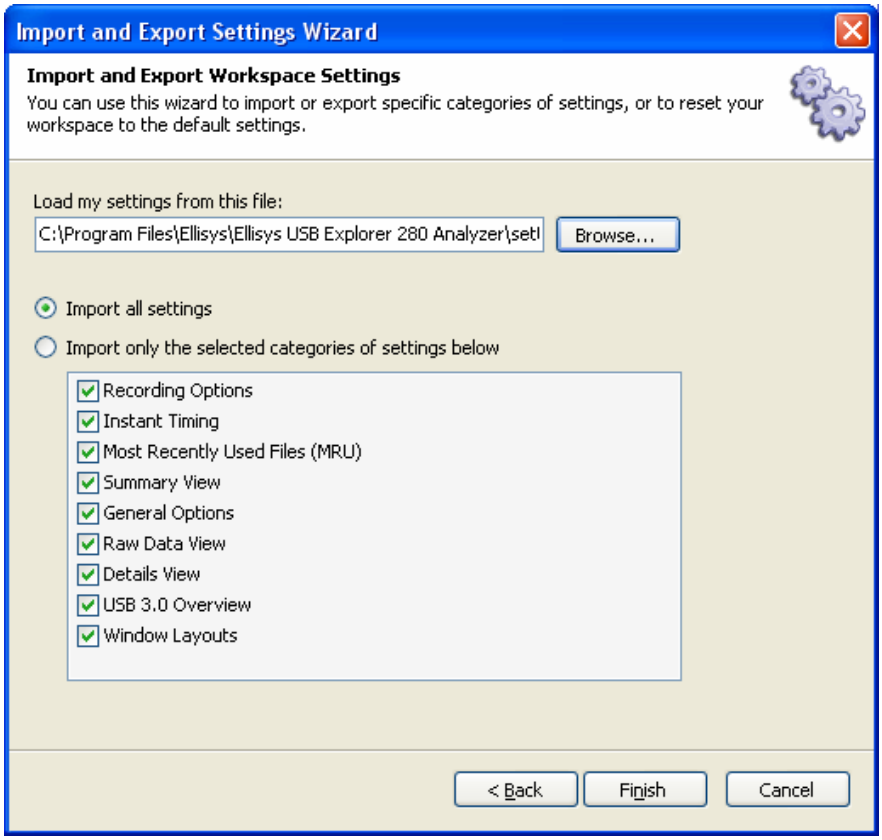
The *Import and Export Settings Wizard* menu appears:



2. Select **Import settings**.

3. Click on **Next**.

The *import* menu appears:



4. Select **Import all settings**

or

Select **Import only the selected categories of settings below** and check the desired categories.

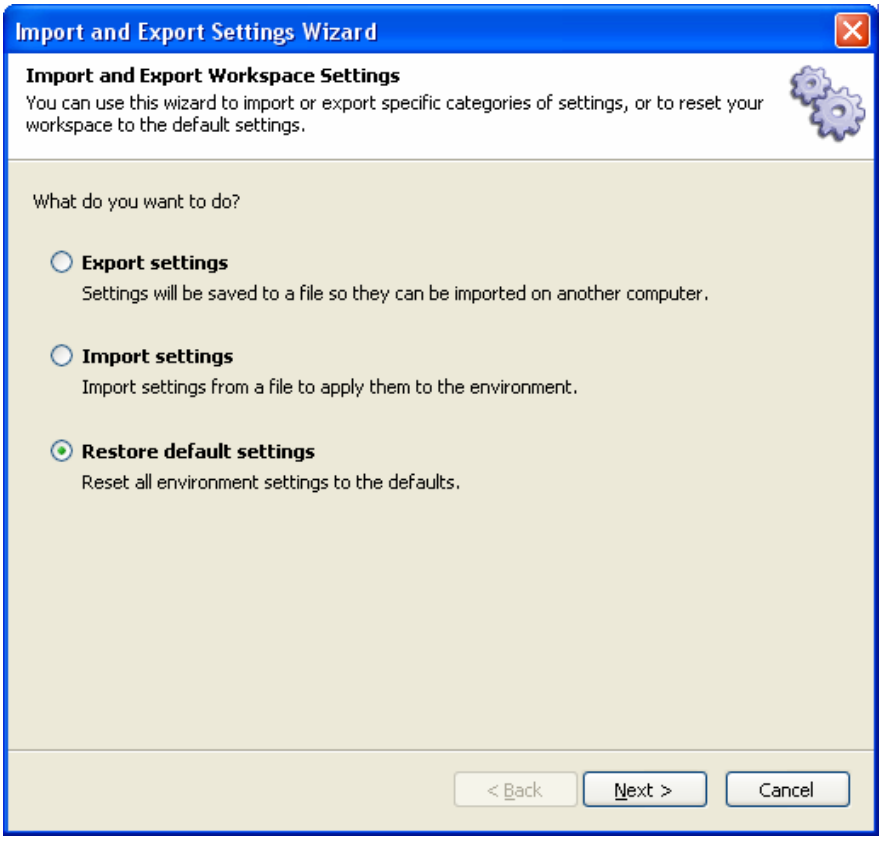
5. Select **Browse** to specify a location to name and save the file.

6. Click on **Finish**.

To restore default Workspace settings:

1. Select **File | Import and Export Settings** from the menu.

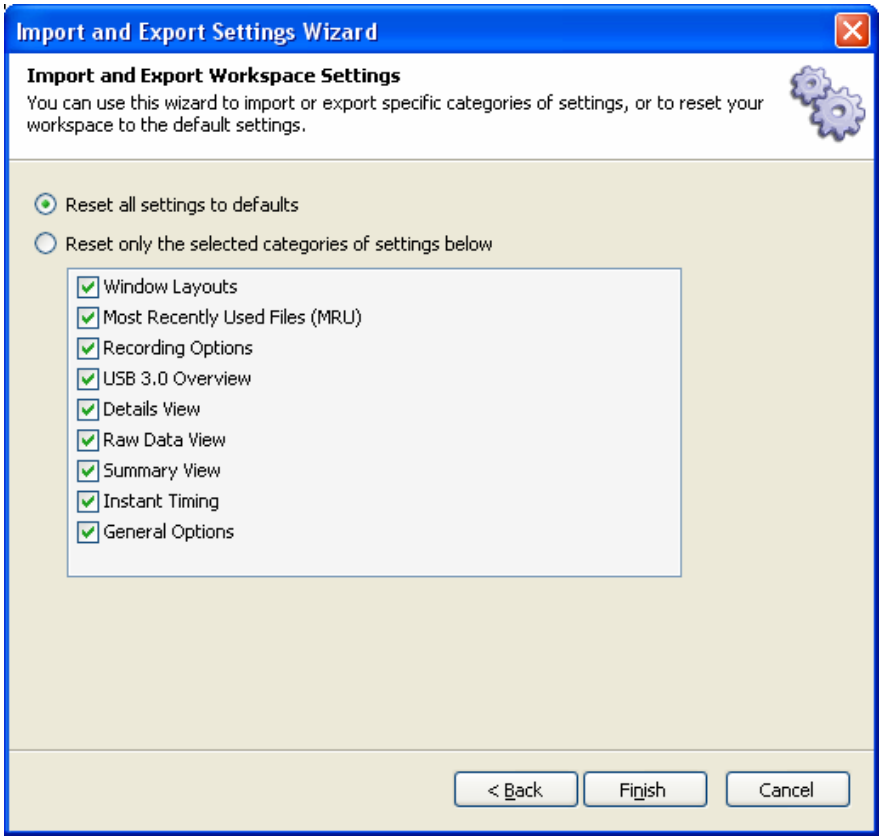
The *Import and Export Settings Wizard* menu appears:



2. Select **Restore default settings.**

3. Click on **Next**.

The reset default menu appears:



4. Select **Reset all settings to defaults**.

   or

   Select **Reset only the selected categories of setting below** and check the desired categories.

5. Click on **Finish**.

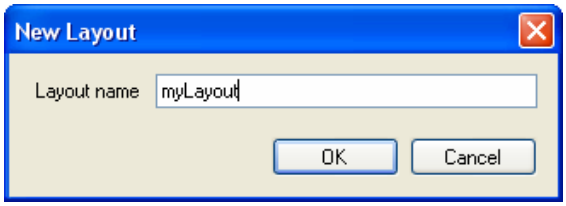
5.2 Using Layouts

Layouts can be used to customize the size and position of the application's various panes and windows. Layouts can also be used to customize which panes and windows are displayed. On installation of the analyzer application, a default layout is provided, but users may add additional layouts as desired. Layouts are auto-saved, in that as changes are made to the active layout, they are saved to that layout without any further action required by the user.

To create a new layout:

1. Select **Layout | New Layout** from the menu.

The *New Layout* dialog appears:



2. Enter a name for the layout and click on **OK**.

The new layout is created and is now accessible in the **View | Layout** menu.

To reset a layout to factory default:

1. Select **Layout | Reset Layout** from the menu.

The layout is reset to the factory default.

To delete a layout:

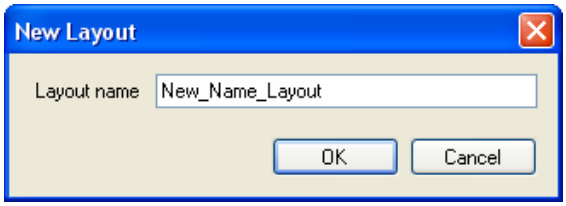
1. Select **Layout | Delete Layout** from the menu.

The active layout is deleted and removed from the layouts listed in the **View | Layout** menu.

To rename a layout:

1. Select **Layout | Rename Layout** from the menu.

The *New Layout* dialog appears:



2. Type the name desired in the dialog and click on **OK**.

The layout is renamed.

The Default layout cannot be renamed or deleted.

6. Recording Traffic

Traffic passing through the analyzer is not recorded until the user takes action to capture this traffic into the analyzer's memory. However, front-panel LED indicators are active even when traffic is not being recorded. Various settings are available to control how traffic is captured, whether any traffic is filtered from the analyzer's memory, when a capture should start and end, and various other settings that configure the analyzer to properly record traffic in accordance with the user's preferences and expected bus characteristics.

6.1 Analyzer Hardware Setup

The basic setup for taking a recording is as shown below in Figure X (the analyzer's required DC power supply is not shown). The Explorer 280 is placed between two system components, such as a USB host and device, and is connected over a USB high-speed connection to a computer that hosts the analyzer application. The USB high-speed connection is used to program the analyzer for the capture characteristics desired by the user, and to upload traffic to the analyzer application.

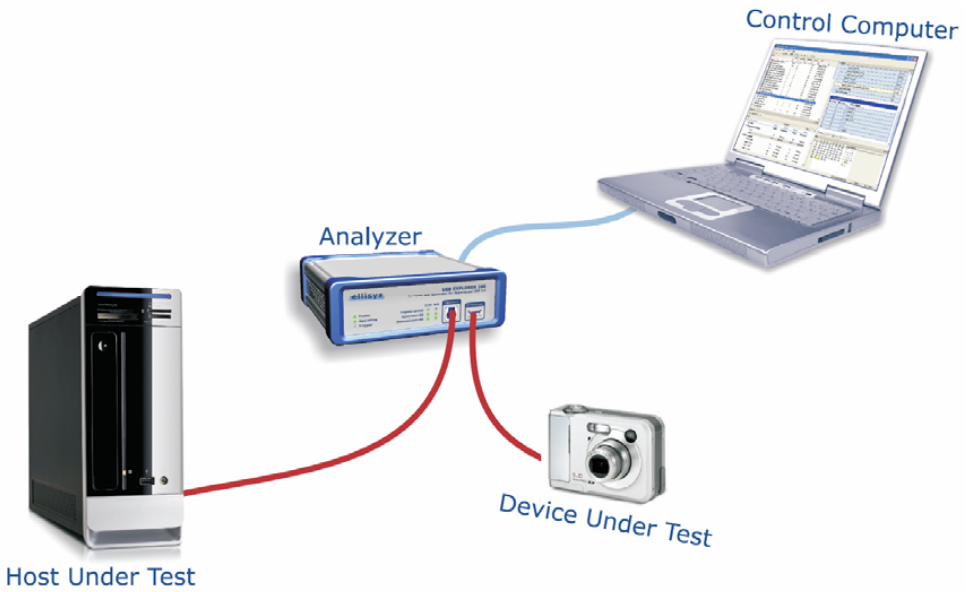


Figure 4 - Basic Analyzer Setup

6.2 Setting the Recording Options

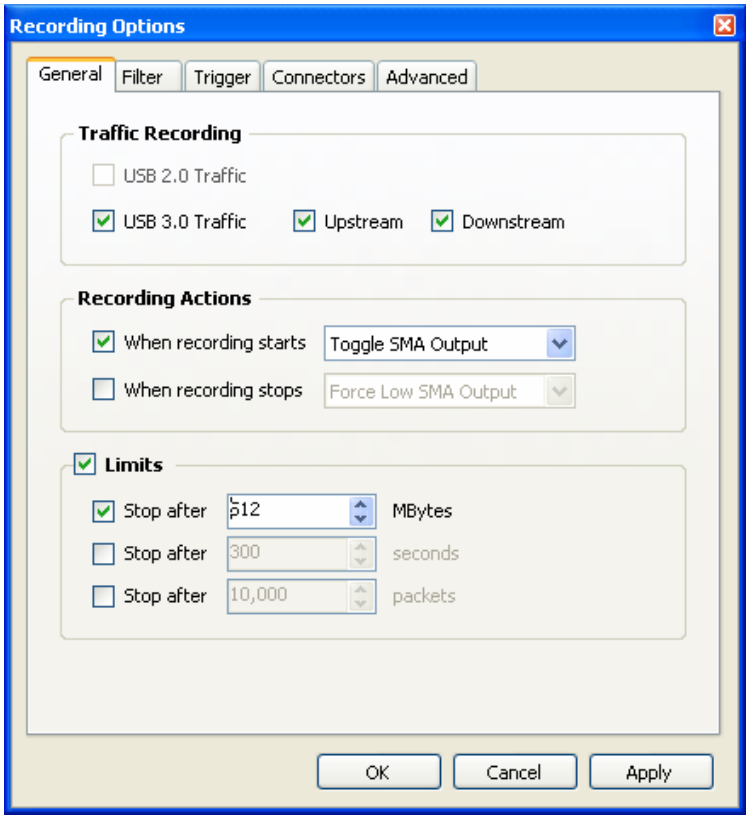
The *Recording Options* menu settings control various characteristics of the analyzer hardware during a recording.

Options selected in the *Recording Options* menu are critical. Captures with errors or missing data may reflect incorrect settings. Review these settings carefully before taking a capture.

To access the recording options:

1. Select **Record | Recording Options** from the menu.

The *Recording Options* menu appears:



The table below explains the recording options settings available under the **General** tab.

General Tab

Traffic Recording

USB 2.0 Traffic	Enables the recording of USB 2.0 traffic.
USB 3.0 Traffic	Enables the recording of USB 3.0 traffic.
Upstream	Enables the recording of USB 3.0 upstream traffic.
Downstream	Enables the recording of USB 3.0 downstream traffic.

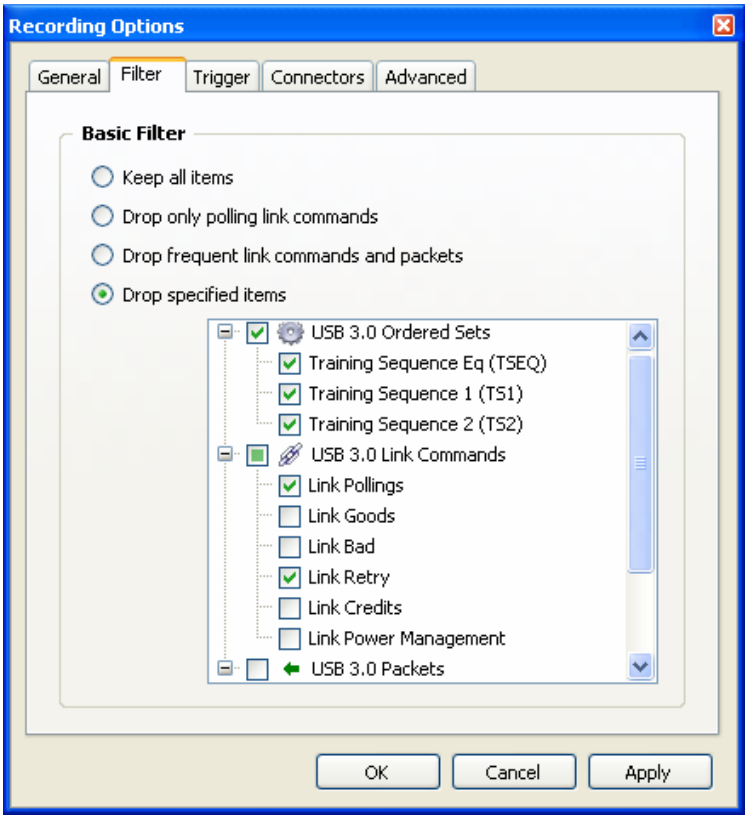
Recording Actions

When Recording Starts	Specifies an action (pulse, toggle, or state change) on the EXT TRIG connector when recording starts.
When Recording Ends	Specifies an action (pulse, toggle, or state change) on the EXT TRIG connector when recording ends.

Limits

Stop after N Mbytes	Stops the capture after the specified amount of Mbytes are recorded (range = 1MB to 2047MB).
Stop after N **Seconds**	Stops the capture after the specified amount of seconds (range = 1S to 3,000,000S).
Stop after N **items**	Stops the capture after the specified amount of items are recorded.

To set hardware filter options, select the **Filter** tab:



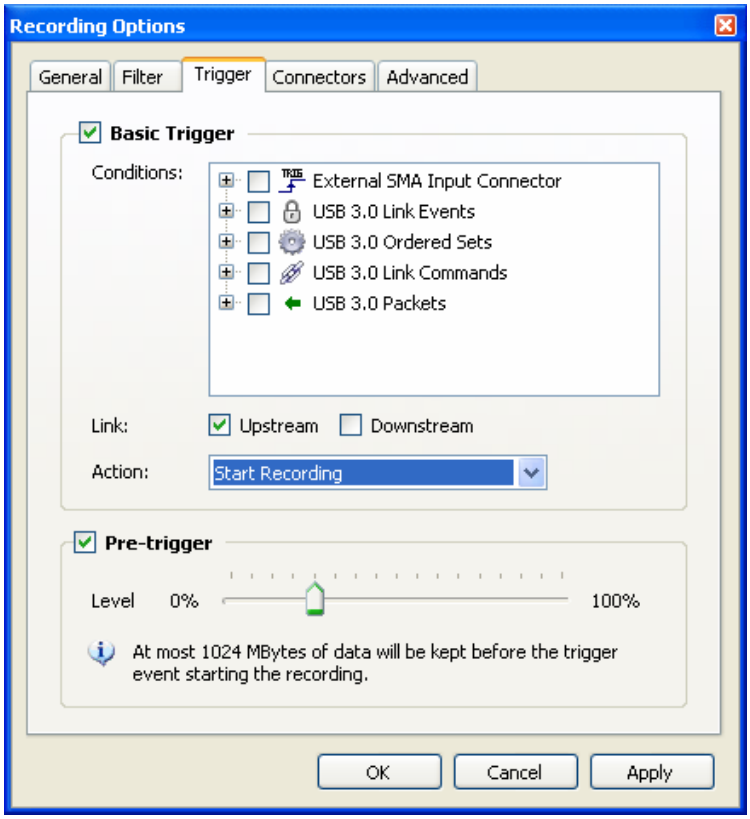
The table below explains the settings available under the **Filter** tab:

Filter Tab

Basic Filter

Keep all items	All traffic is captured to the analyzer's memory.
Drop only polling link commands	Polling link commands (LUP/LDN) are not captured.
Drop frequent link commands and packets	Frequent link commands (LUP/LDN, LGOOD_N, LCRD_X) and packets (ITP) are not captured.
Drop specified items	Enables a list of USB 3.0 ordered sets, link commands, and packets that can be selected for exclusion from the capture.

To set trigger options, select the **Trigger** tab:



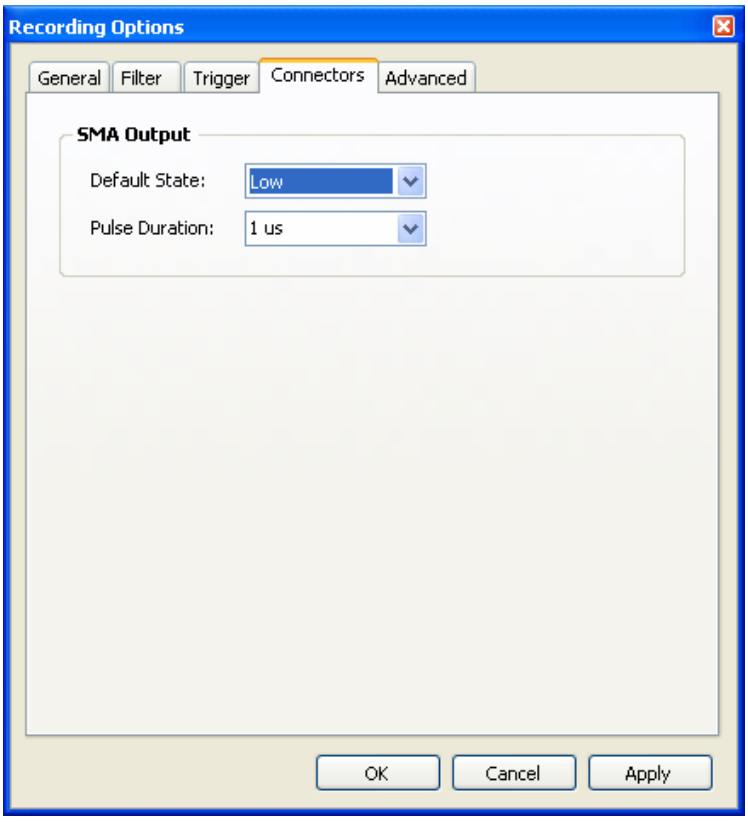
The table below explains the settings available under the **Trigger** tab:

Trigger Tab

Basic Trigger

Conditions	Enables selection of various conditions that can be used to trigger the analyzer recording.
Link Upstream	Applies the selected trigger condition(s) to the downstream link.
Link Downstream	Applies the selected trigger condition(s) to the upstream link.
Action	Defines the recording behavior upon recognition of the selected trigger condition(s). These include Start Recording, Stop Recording, or an action on the EXT TRIG connector (pulse, toggle, or state change).
Pre-trigger	Controls the amount of traffic kept in the analyzer's memory before a trigger event is recognized. When enabled, places recording into a circular buffer mode, which is uploaded when a trigger event occurs or the capture is manually stopped. When disabled, places recording into a stream-to-display mode.

To set rear-panel connector options, select the **Connectors** tab:



The table below explains the settings available under the **Connectors** tab:

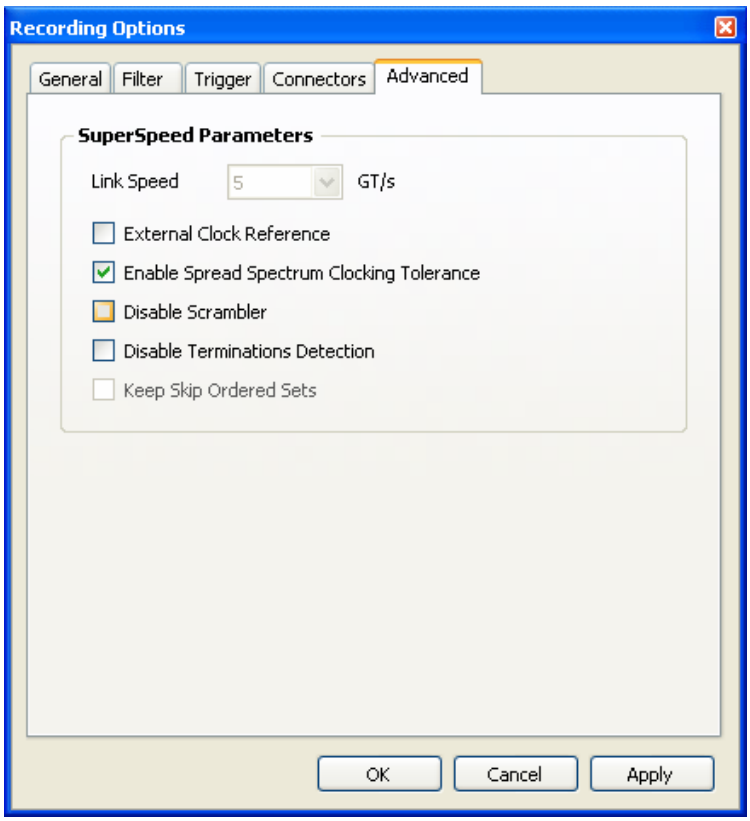
Connectors Tab

SMA Output

Default State Specifies the default state of the SMA EXT TRIG connector.

Pulse Duration Specifies the pulse duration on the SMA EXT TRIG connector.

To set advanced options, select the **Advanced** tab:



The table below explains the settings available under the **Advanced** tab:

Advanced Tab

SuperSpeed Parameters

Link Speed	Specifies the link operating speed. Defaults to 5Gb/s. Future implementation
External Clock Reference	Enables use of non-standard link speed. Future implementation.
Enable Spread Spectrum Clocking Tolerance	When checked, configures the analyzer to record traffic that utilizes spread spectrum clocking.
Disable Scrambler	When checked, traffic captured by the analyzer is not descrambled.
Disable Terminations Detection	When checked, the receive lines on the analyzer's upstream and downstream ports will always present receiver terminations to the attached device's transmit lines. When unchecked, the analyzer presents receiver terminations only when both upstream and downstream devices are attached to the analyzer's front panel.
Keep Skip Ordered Sets	When checked, the Skip ordered sets are kept. Please be aware that this option will generate a huge quantity of items.

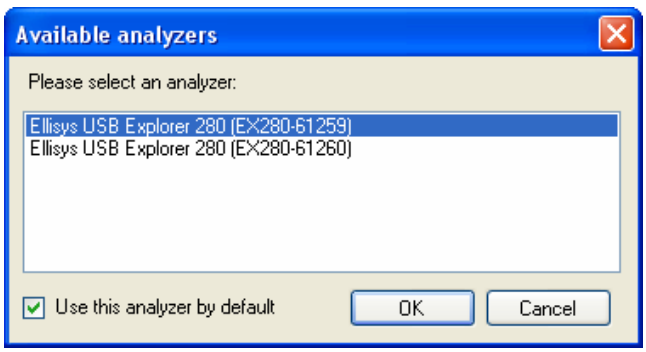
6.3 Selecting an Analyzer

It is possible that multiple Explorer 280 analyzer and/or generator units may be attached to a single PC hosting the analyzer desired for recording.

To select an analyzer:

1. Select **Record | Select an analyzer** from the menu.
   or
   Select the drop-down arrow located on the **Record** button located on the toolbar.

The *Available analyzers* dialog appears:



2. Select the desired analyzer.

3. Click on **OK**.

If a recording is initiated without having first selected an analyzer, the *Available analyzers* dialog will pop up to request the user to select an analyzer. Selecting the default checkbox in this dialog will conveniently force the automatic selection of the specified analyzer on each new recording.

6.4 Initiating a Recording

A recording can be initiated from the toolbar, keyboard, or the menu.

To initiate a recording:

1. Click on **Record** on the toolbar.

   or

   Select **Record | Start Recording** (CTRL+R) from the menu.

Recording is initiated according to settings in the **Record | Recording Options** menu.

6.5 Stopping a Recording

A recording can be manually stopped from the toolbar, keyboard, or the menu. Recording may also stop automatically based on settings made in the **Recording Options | Trigger** menu.

To stop a recording:

1. Click on **Stop** on the toolbar.

   or

   Select **Record | Stop Recording** (CTRL+SHFT+R) from the menu.

The recording is stopped. Traffic remaining in the analyzer's memory is uploaded to the PC hosting the analyzer application.

6.6 Restarting a Recording

A recording in progress can be restarted from the toolbar or from the **Record** menu. When restarting a recording, a dialog will give the user the option to save or discard traffic presently captured in the analyzer's memory.

To restart a recording:

1. Click on **Restart** on the toolbar.

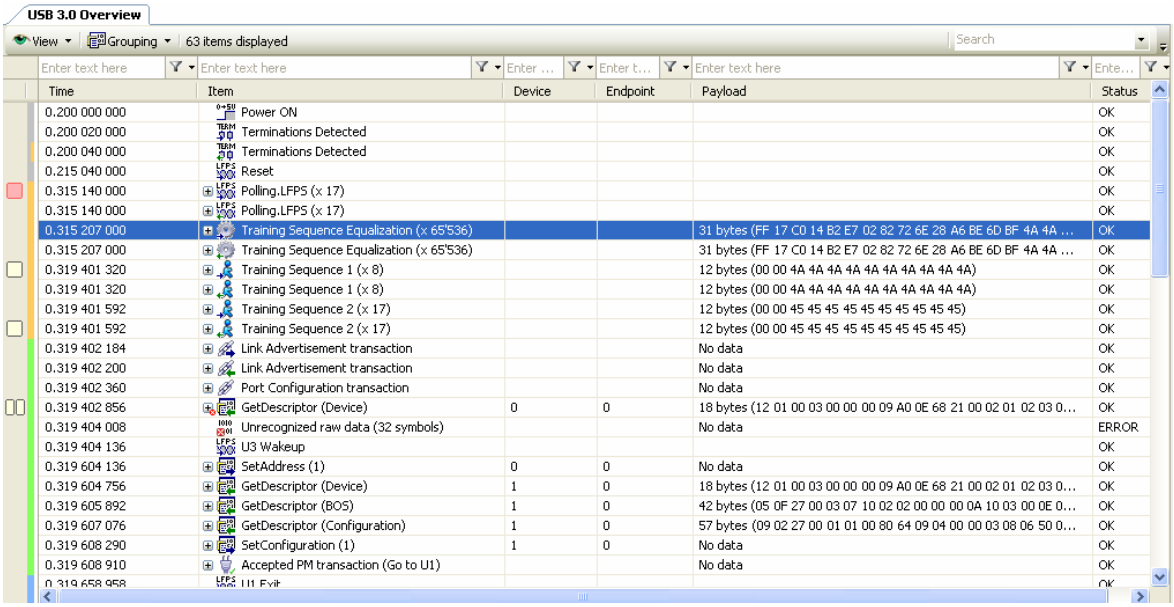
   or

   Select **Record | Restart Recording** from the menu.

The capture in progress is halted, traffic captured is discarded, and a new recording is initiated.

7. Overview Window

The *Overview* is the primary viewer window, providing a user-configurable display of all bus events and traffic, search features, filter features, LTSSM state change indicators, standard descriptor and class-specific information.



7.1 Configuring the Display

The columns and displayed in the *USB 3.0 Overview*, including their position and width, are fully configurable by the user. Color assignments are also available.

To add a column to the *USB 3.0 Overview*:

1. Right-click on any column header (e.g., Item, Time, etc.).

2. Select the desired column to be added from the default list.
   or
   Select the desired event in the *USB 3.0 Overview* to highlight the event.

3. Go to the *Details View* (**View | Details**)

4. Left-click and drag the icon at the left of the desired field in the *Details View* to the column header in the *USB 3.0 Overview*.
   or
   Click on the *Display this field in the Overview* button in the Details toolbar.

The new column is added and populated with the relevant data.

To move a column in the *USB 3.0 Overview*:

1. Left-click the column header atop the desired column and drag left or right as desired.

The column is re-positioned.

To resize a column:

1. Position the mouse pointer at the vertical line border at the left or right of the desired column.

2. When the mouse pointer changes to a resize indicator, left-click and drag to the desired size.

The column is resized.

To hide a column:

1. Right click on the desired column header.

2. Select **Hide Column**.
   or
   Right-click on any column header.

3. Select **Columns**.

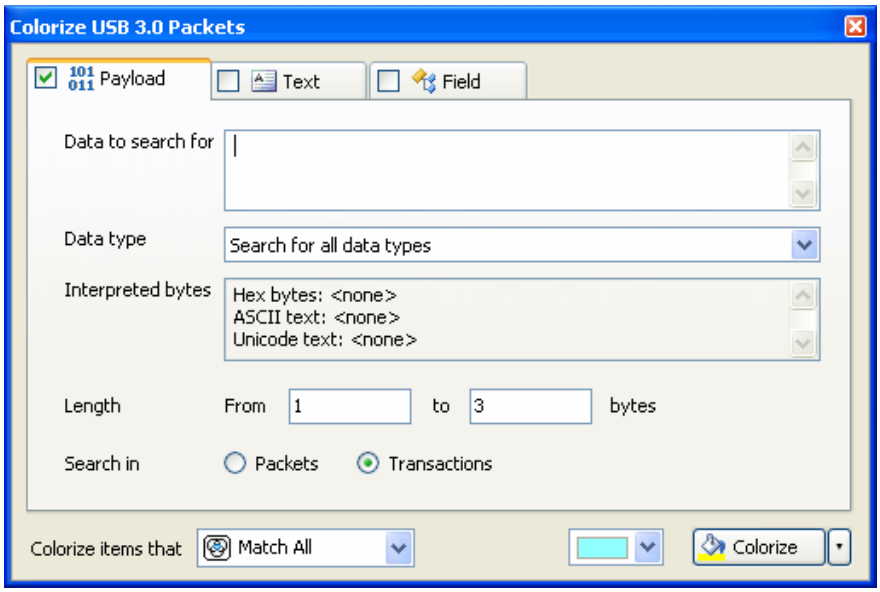
4. Deselect the desired column from the list.

The column is hidden.

To add color-coding:

1. Right-click in the *USB 3.0 Overview* and select **Coloring | Add Color.**

The *Colorize USB 3.0 Packets* dialog appears:



To colorize events by payload content:

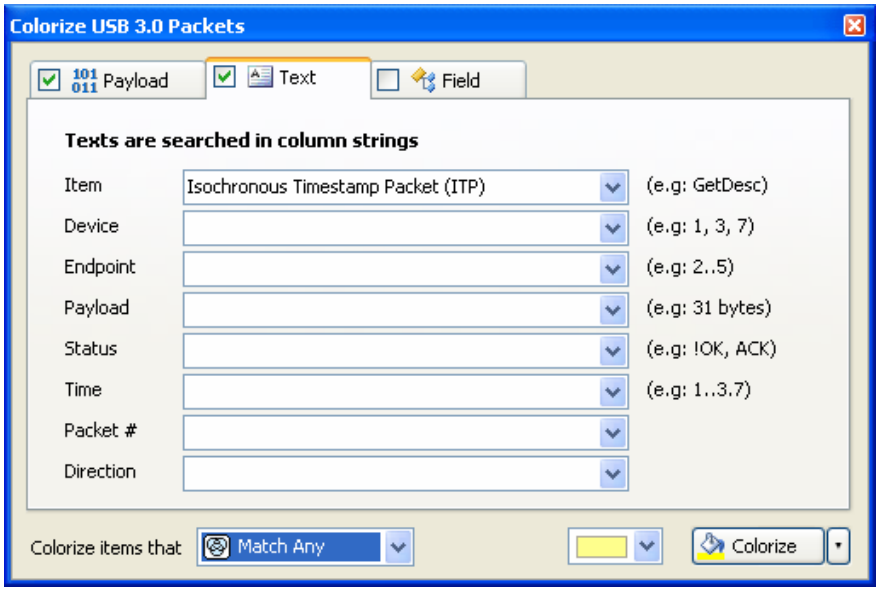
1. Select the **Payload** tab.
2. Enter **Data to search for** and/or a payload **Length** range.
3. Select **Data Type** as needed.
4. Select **Search in Packets** or **Search in Transactions** to highlight matching packets or transactions.
5. Select the desired match type in the **Colorize items that** drop-down menu.
   - **Match All** – Finds items that match all selected criteria.
   - **Match Any** – Finds items that match any of the criteria.
   - **Don't Match All** – Finds items that do not match all of the selected criteria (opposite of Match All).
   - **Don't Match Any** – Finds items that do not match any of the selected criteria (opposite of Match Any).
6. Select the desired color and click on **Colorize**.

Events matching are colorized in the *USB 3.0 Overview*.

To colorize events by text string:

1. Select the **Text** tab.

The **Text** tab appears:



2. Use the one or more text string drop-down menus provided to characterize the color search.

Text entered into the various boxes by selecting an item in the drop-down menus can be edited, or text may simply be entered directly into the boxes without selecting the drop-down menus. Use commas to separate OR items on any line. Use of the ! (NOT) symbol will exclude a text string from the search.

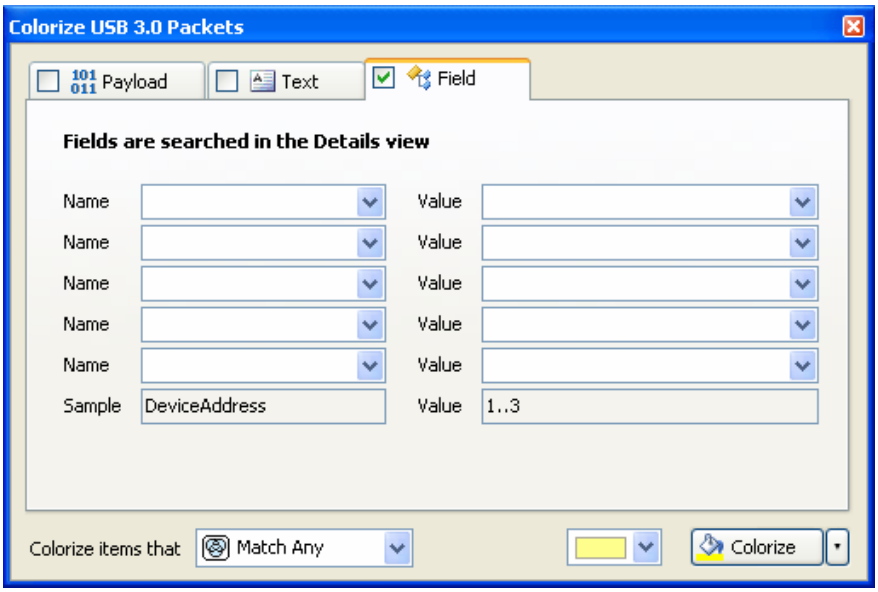
3. Select the desired color and click on **Colorize**.

Events matching are colorized in the *USB 3.0 Overview*.

To colorize events by field value:

1. Select the **Field** tab.

The **Field** tab appears:



Values in the Name boxes are synchronized to the selected event in the USB 3.0 Overview, which is synchronized to the Details view. The Value boxes reflect data elements displayed in the Details View. Users may type strings (values, wildcards, or ranges) directly into the Value boxes.

2. Select one or more items from the **Name** boxes.

3. Select corresponding items from the **Value** boxes.

4. Select the desired match type in the **Colorize items that** drop-down menu.

5. Select the desired color and click on **Colorize**.

Events matching are colorized in the *USB 3.0 Overview*.

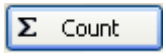
To display a count of matching criteria:

1. Define the search/colorize criteria from the **Payload**, **Text**, and/or **Field** tabs.

2. Select the drop-down arrow at the bottom-right of the **Colorize** dialog.

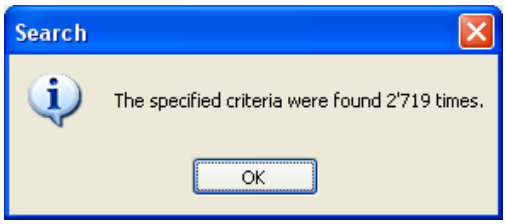
3. Select **Count**.

The **Colorize** button changes to a **Count** button:



4. Click on the **Count** button.

A count of items matching the criteria is displayed:

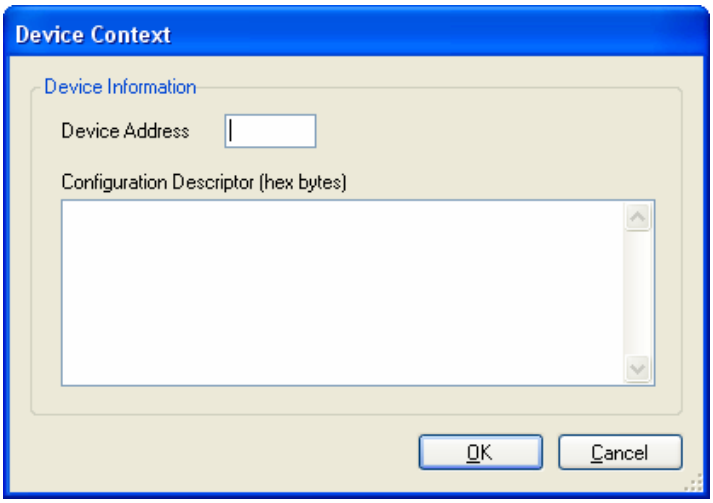


To add a Device Profile:

1. Right-click in the *USB 3.0 Overview*.

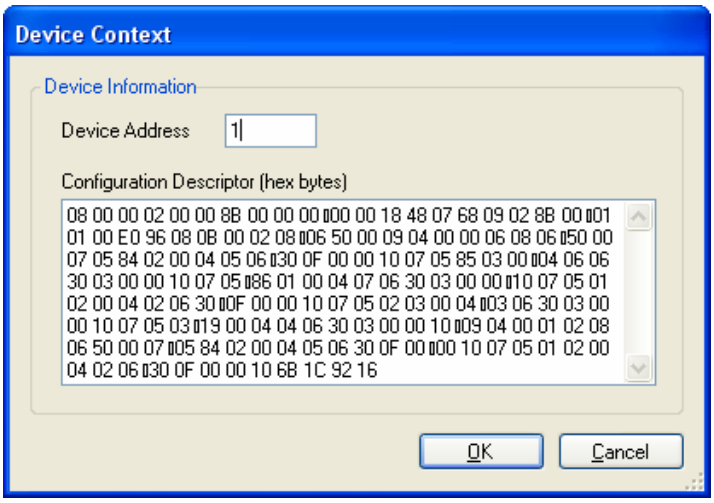
2. Select **Add Device Profile**.

The *Device Context* dialog appears:



3. Enter the address desired in the **Device Address** box.

4. Type, or paste a configuration descriptor using hex bytes into the **Configuration Descriptor** box as shown below.



To copy a configuration descriptor from another trace file, open that trace file, select the GetDescriptor (Configuration) transfer, and use the Raw Data dialog to copy the data for pasting into the Device Context dialog..

5. Click on **OK**.

The capture presently displayed is updated with the new device profile.

7.2 Applying Display Filters

Two display filter options are available in the *USB 3.0 Overview*. These include Instant Filters (enacted as text strings in the Instant Filter boxes atop the columns) as well as a set of categorized filters, located in the drop-down **View** menu at the top-left of the *USB 3.0 Overview*.

Instant Filters provide a quick and simple way to remove information from the *USB 3.0 Overview* using a simple syntax entered in the Instant Filter boxes atop each column. Instant Filters are comprised of a sequence of character chains separated by commas. Instant Filters are not case-sensitive.

Use of display filters can speed the process of uploading captured traffic to the PC. Filtering commonly occurring items that may not be required for the analysis task at hand, such as LCRD, LGOOD, or Isochronous Timestamp Packets can be helpful.

Instant Filters Syntax

The syntax of Instant Filters is as shown below:

```
filters = [!]filter[,filter,...]
filter = string or wildcard range
wildcard = string containing * or ? characters
range = min..max
```

Wildcards can be used to perform advanced filtering operations. Use an interrogation point '?' to match to match any character, or an asterisk '*' to match any suite of characters. An asterisk is always implied at the end of any search string. A few examples:

`0?FE` will match any line that starts with `0` and end with `FE`.
`*data` will match any line that contains the word `data`.
`E*r` will match any line that starts with an `E` and contains an `r`.
`*read` will match any line that contains `read`.

Filters also accept advanced criteria. For example, type `0..1` in the time column to keep only events that occur between 0 and 100 milliseconds.

Several criteria can be combined with a logical OR operation using a comma. For example, typing `2,4` in the device column will keep events having devices addresses beginning with 2 or 4.

A criteria can be inverted by using an exclamation point '!' as the first character in the filter. In this case, all events that would have been included are now excluded, and vice versa.

To apply an Instant Filter:

1. Select an Instant Filter from one of the columns in the *USB 3.0 Overview*.

2. Type the desired filter in the *Filter* field.

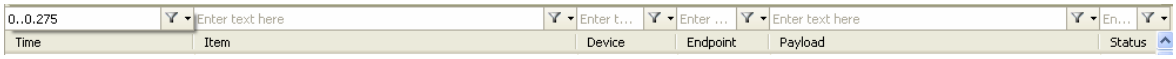
Examples

The example below will remove all items in the *USB 3.0 Overview* that begin with the string "`Training`," typically all training sequence ordered sets.

The example below will remove all items from the *USB 3.0 Overview* except events in the Items column beginning with the word Read returning payloads of 512 bytes.

The example below will remove all items from the *USB 3.0 Overview* except GetDescriptor requests to all addresses, except address 1.

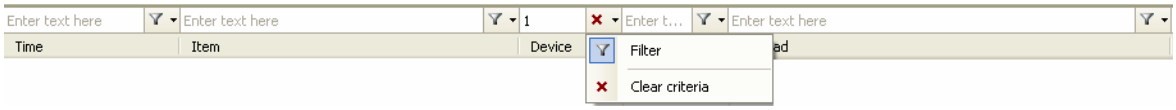
The example below will remove all items except those items taking place between timestamps located at 0 and 275 milliseconds.



To remove a filter:

1. Click on the red cross adjacent to the filter desired for removal  .
   or
   Click on the down arrow next to the red cross  .

A menu appears:



2. Click on **Clear Criteria**.

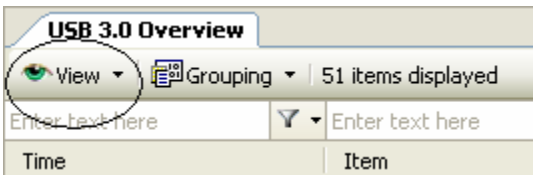
The selected filter is removed and the display updates.

Categorized Display Filters

A selection of categorized display filters is available in the *USB 3.0 Overview* by selecting the **View** drop-down button located at the top-left of the *USB 3.0 Overview.*

To enable or disable a categorized filter:

1. Select the arrow adjacent to the **View** button at the top-left of the *USB 3.0 Overview*.



2. Select or deselect the desired filter as needed.

The *USB 3.0 Overview* updates with the selected setting.

The table below describes the categorized filters:

Bus States	
Show Bus States	Shows/hides all bus states.
Show Power Changes	Shows/hides all bus power changes (Power ON/OFF).
Show Receiver Lock Changes	Shows/hides changes in the analyzer's receiver lock statuses.
Show Lane Polarity Changes	Shows/hides changes in lane polarity.
Show Rx Termination Changes	Shows/hides changes in the analyzer's detection of receiver terminations on the attached devices.
Show LFPS	Shows/hides LFPS events.
Ordered Sets	
Show Ordered Sets	Shows/hides all ordered sets.
Show Training Sequence Equalization	Shows/hides TSEQ ordered sets.
Show Training Sequence 1 (TS1)	Shows/hides TS1 ordered sets.
Show Training Sequence 2 (TS2)	Shows/hides TS2 ordered sets.
Show BERT Ordered Sets	Shows/hides BERT ordered sets.
Show Skip Ordered Sets	Shows/hides SKP ordered sets.
Show Link Commands	
Show Link Commands	Shows/hides all link commands.
Show Link Pollings	Shows/hides link pollings (LDN/LUP).
Show Link Handshakes	Shows/hides link handshakes.
Show Link Credits	Shows/hides link credits.
Show Link Power Management	Shows/hides link power management link commands.
Show Isochronous Timestamps	Shows/hides isochronous timestamp transactions.
Show Unrecognized Raw Data	Shows/hides data not fitting recognized formats.

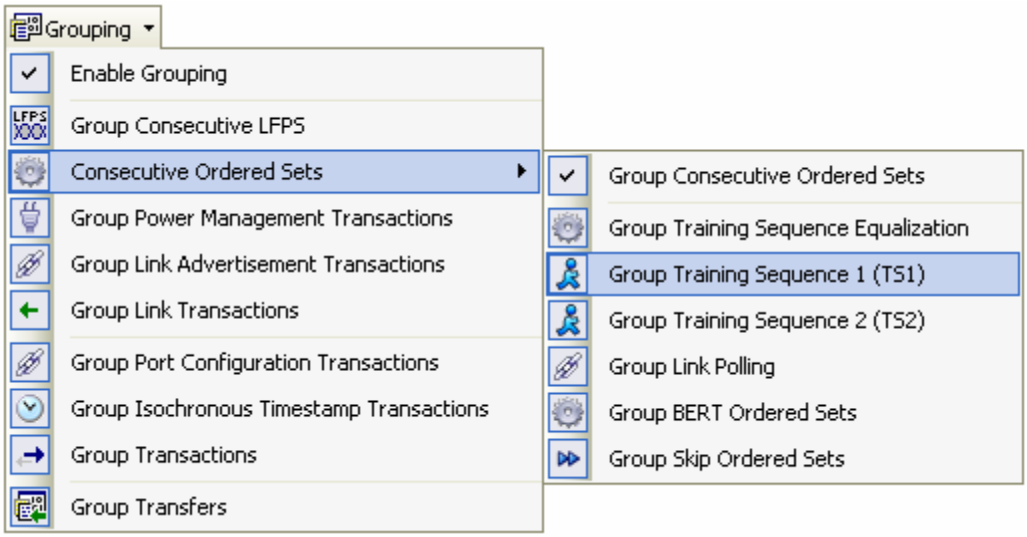
7.3 Grouping and Ungrouping

The USB Explorer 280 application provides the user with the option to group or ungroup transactions, transfers, and consecutive (contiguous) ordered sets and LFPS events. Items that are grouped, can be ungrouped individually by selecting the **+** icon associated with the grouped event in the *USB 3.0 Overview*, or collectively by selecting the desired item type in the **Grouping** drop-down menu located at the top-left of the *USB 3.0 Overview*.

To enable or disable grouping:

1. Select the **Grouping** drop-down menu from the *USB 3.0 Overview*.

2. Select or deselect (as applicable) the desired grouping category:



The selected category is grouped or ungrouped.

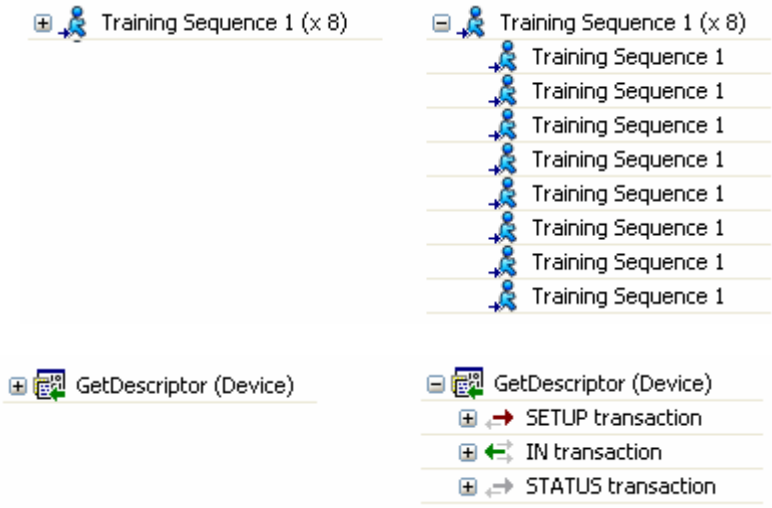
To individually group or ungroup in the Items column:

1. Scroll as needed to the desired grouped or ungrouped item.
2. Select the **+** icon associated with the desired item to ungroup.

   or

3. Select the **–** icon associated with the desired item to group.

The selected item is ungrouped or grouped as shown below:



When consecutive grouping is enabled, the number of consecutive events is listed in parentheses along with the grouped item.

The table below lists all grouping options available:

Enable Grouping	Enables/Disables all grouping.
Group Consecutive LFPS	Groups/Ungroups consecutive LFPS events.
Group Consecutive Ordered Sets	
Group Consecutive Ordered Sets	Groups/Ungroups all consecutive ordered sets.
Group Training Sequence Equalization	Groups/Ungroups consecutive TSEQ ordered sets.
Group Training Sequence 1 (TS1)	Groups/Ungroups consecutive TS1 ordered sets.
Group Training Sequence 2 (TS2)	Groups/Ungroups consecutive TS2 ordered sets.
Group Link Polling	Groups/Ungroups consecutive link polling ordered sets.
Group BERT Ordered Sets	Groups/Ungroups consecutive BERT ordered sets.
Group Skip Ordered Sets	Groups/Ungroups consecutive SKP ordered sets.
Group Power Management Transactions	Groups/Ungroups power management transactions.
Group Link Advertisement Transactions	Groups/Ungroups link advertisement transactions.
Group Link Transactions	Groups/Ungroups link transactions.
Group Port Configuration	Groups/Ungroups power management transactions.

Transactions	
Group Isochronous Timestamp Transactions	Groups/Ungroups isochronous timestamp transactions.
Group Transactions	Groups/Ungroups all transactions.
Group Transfers	Groups/Ungroups all transfers.

7.4 Timing Measurements

The *USB 3.0 Overview* includes timestamps associated with each event captured. Timestamp format is shown as *S mmm uuu nnn.*

The *USB 3.0 Overview* can be linked and unlinked to the *Instant Timing* pane. By default, it is linked, and events selected in the *USB 3.0 Overview* are displayed in the *Instant Timing* pane. Timing measurements are easily made with cursors available in the *Instant Timing* pane.

To set a time reference:

1. Right-click in the *USB 3.0 Overview*.
2. Click on **Set Time Reference**.

The selected event is assigned a timestamp of zero. Events occurring after the zero-stamped event are incremented with positive timestamps, and events occurring before the zero-stamped event are incremented with negative timestamps.

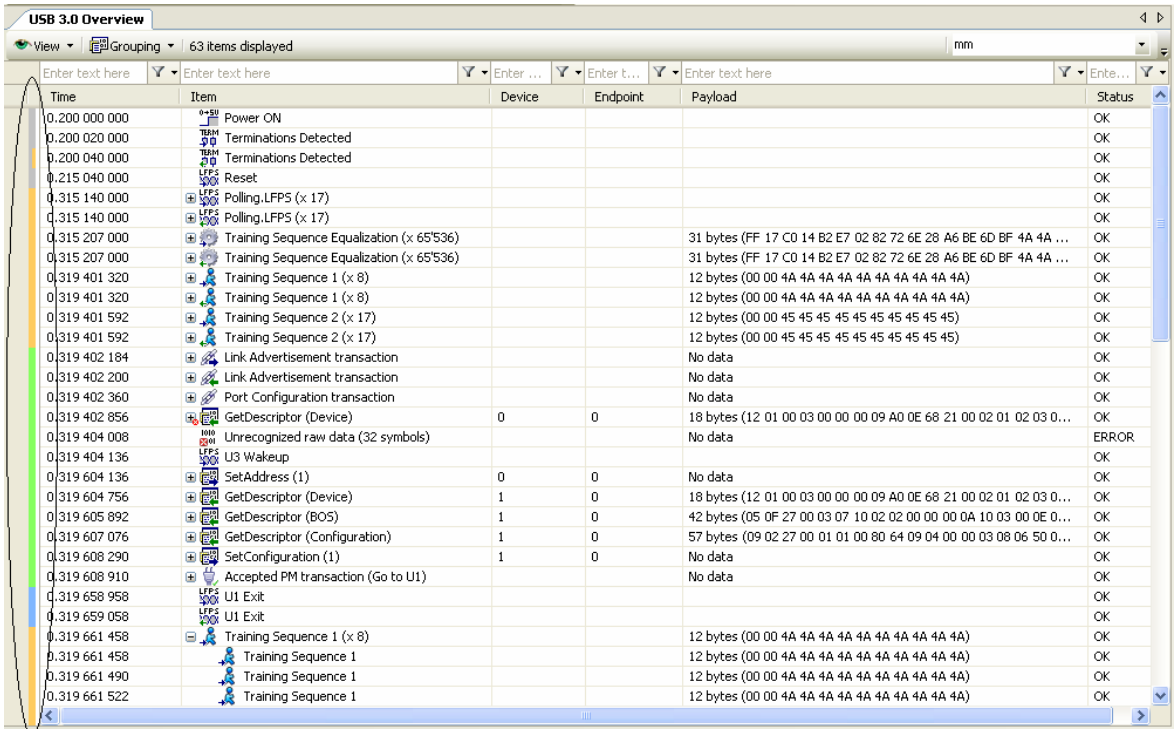
To reset a time reference to the original value:

1. Right-click in the *USB 3.0 Overview*.
2. Select **Reset Time Reference**.

The events captured are reset with the timestamp values originally when the capture was taken.

7.5 Tracking Link State Changes

LTSSM state changes are tracked in the *USB 3.0 Overview* using color-coded vertical bars at the far-left of the view that indicate particular link state changes. These link state changes are coordinated with like color-coding in the *Instant Timing* and *Instant Link State* panes.



The table below describes the link state changes and related color-coding:

Gray Line	Power ON/OFF transition
ORANGE Line	Transition to LFPS and link training sequences
GREEN Line	Transition to U0
BLUE Line	Transition to low power states

7.6 Synchronization to Other Panes

The *USB 3.0 Overview* is synchronized to other views in order to give the user a comprehensive understanding of the traffic captured. Synchronizations are available to the *Instant Timing*, *Raw Data*, *Instant Link State*, and *Details* panes. Synchronization to the *Instant Timing* pane can be disabled in the *Instant Timing* pane toolbar, but is enabled by default.

To force the selected event in the *USB 3.0 Overview* to display in *Instant Timing*:

1. Right-click in the *USB 3.0 Overview*.
2. Select **Show in Instant Timing view**.

The *Instant Timing* pane jumps to the event selected in the *USB 3.0 Overview*.

7.7 Using Markers

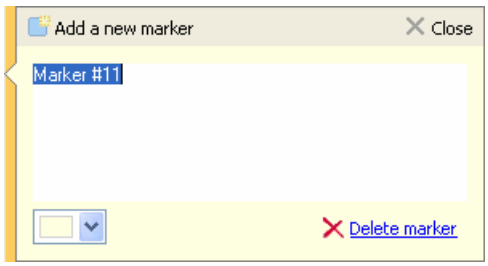
Items listed in the *USB 3.0 Overview* can be annotated with markers and saved with the trace. Markers can be edited to add descriptive notes as well.

To add a marker:

1. Select the event to be marked in the *USB 3.0 Overview*.
2. Click on the **Markers** button (F9) on the toolbar 

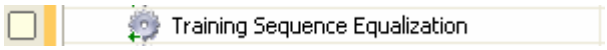
.
   or
   Left-click in the gray column at the far-left of the *USB 3.0 Overview*, adjacent to the item desired for marking.

The *Add a new marker* dialog appears:

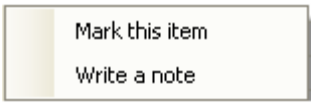


3. Add comments as desired.
4. Select a color for the marker in as desired.
5. Click on **Close**.

A marker is placed adjacent to the event:



Alternatively, right-click in the gray column at the far-left of the *USB 3.0 Overview* to add a marker, or to add a marker with a note.



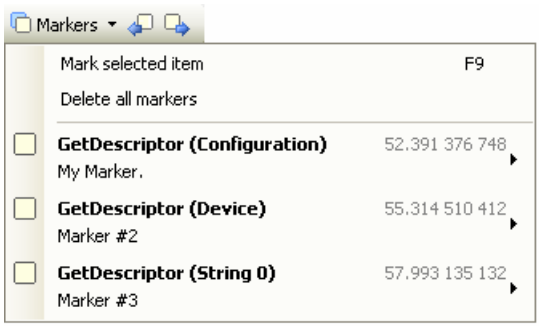
Multiple markers may be placed on a single event.

To search markers:

1. Click on the **Markers** button (F9) on the toolbar 

.

A list of all markers installed appears:



2. Select the desired marker from the list.

The *USB 3.0 Overview* jumps to the selected marker.

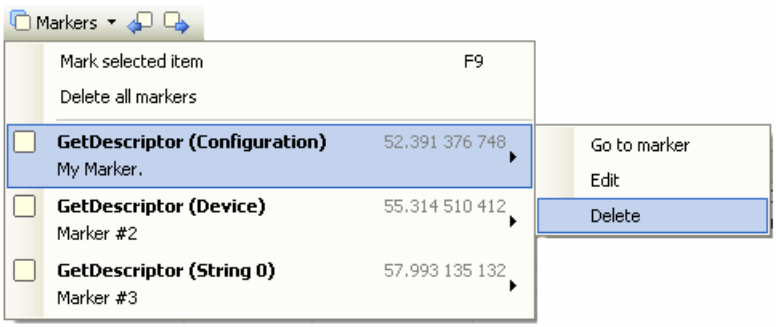
To delete a marker:

1. Position the mouse pointer over the marker to be removed.

2. Right-click and select **Remove marker**.
   or
   Click on the **Markers** button (F9) on the toolbar 

.

3. Position the mouse pointer over the desired marker:



4. Select **Delete**.

The marker is removed.

To edit a marker:

1. Position the mouse pointer over the marker to be edited.

2. Left-click the marker.
   or
   Right-click and select **Edit Marker**.
   or
   Select the **Marker** button on the toolbar.

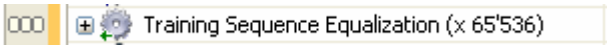
3. Select the desired marker.

4. Select **Edit**.

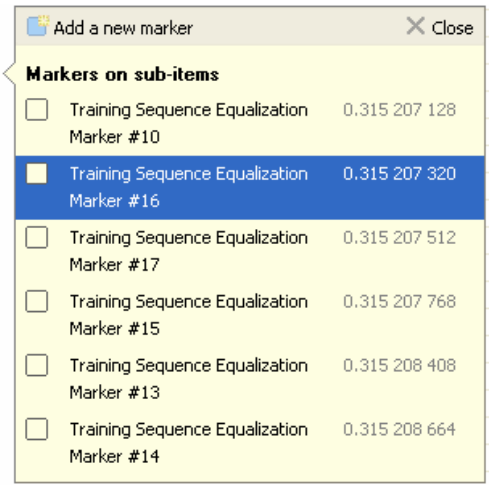
The selected marker opens for editing.

To access markers embedded in Sub-Items (Grouped Items):

1. Place the mouse pointer over the marker(s) at the left of the desired event.

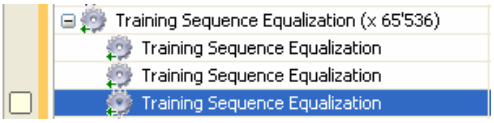


The *Markers on sub-items* menu appears:



2. Select the desired marker.

The grouped item expands, with the marked item adjacent to the selected marker highlighted:

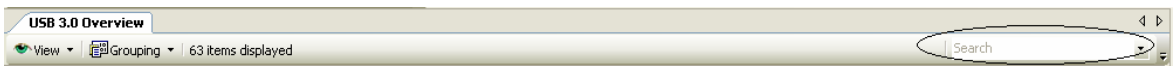


7.8 Search Features

Several search features are provided to enable searching the *USB 3.0 Overview*. These include *Instant Search*, a configurable search menu, and several *Go-To* features.

To enable the Instant Search:

1. Type the text string desired in the *Instant Search* box located at the top-right of the *USB 3.0 Overview*, or select **Search | Instant Search** (CTRL+I) from the menu to place the cursor in the *Instant Search* box.



2. Click ENTER.

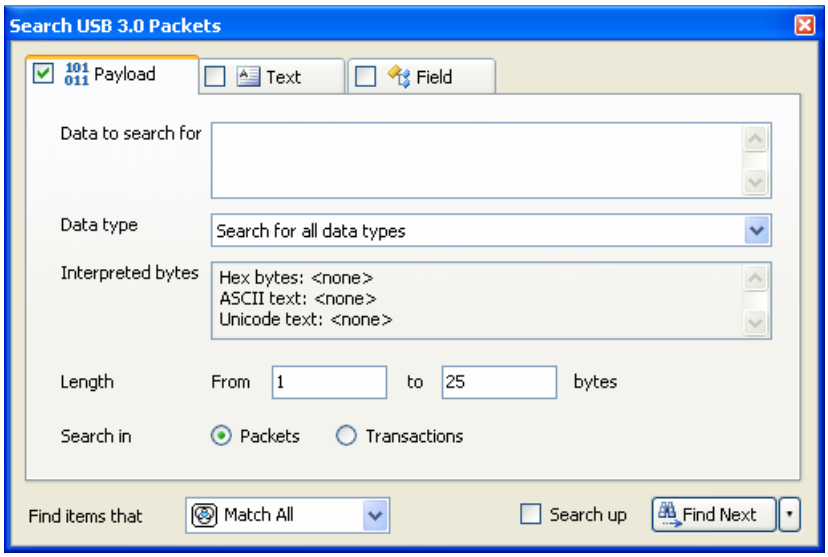
The line where the string is found is highlighted in the *USB 3.0 Overview*.

Press F3 to search next.

To use the Search menu:

1. Right-click in the *USB 3.0 Overview* and select **Search** or select **Search | Search** (CTRL+F) from the menu.

The *Search USB 3.0 Packets* dialog appears:



To search events by payload content:

2. Select the **Payload** tab.
3. Enter **Data to search for** and/or a payload **Length** range.
4. Select **Data Type** as needed.
5. Select **Search in Packets** or **Search in Transactions** to search packets or transactions.
6. Select the desired match type in the **Find items that** drop-down menu.
7. Click on **Find Next** 

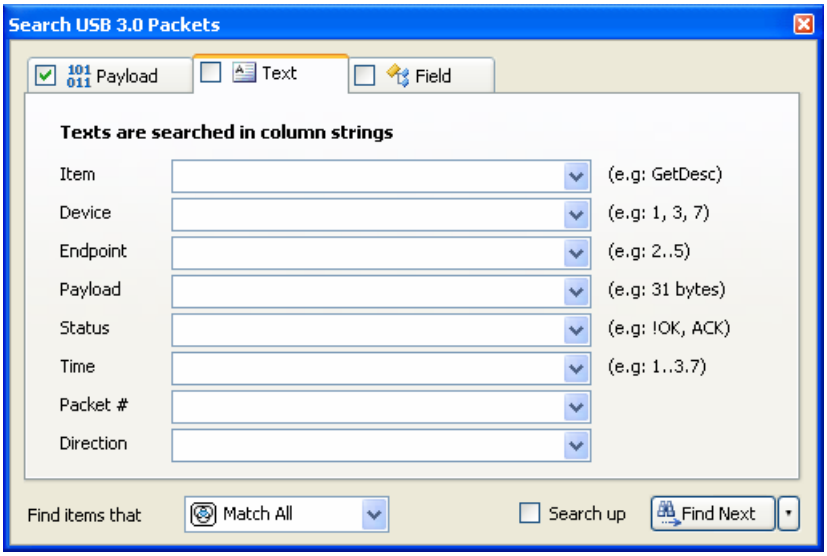
.

The next event matching the search criteria is highlighted in the *USB 3.0 Overview*.

To search events by text string:

1. Select the **Text** tab.

The **Text** tab appears:



2. Use the one or more text string drop-down menus provided to characterize the search.

   Text entered into the various boxes by selecting an item in the drop-down menus can be edited, or text may simply be entered directly into the boxes without selecting the drop-down menus. Use commas to separate OR items on any line. Use of the ! (NOT) symbol will exclude a text string from the search.

3. Select the desired match type in the **Find items that** drop-down menu.

4. Click on **Find Next** 

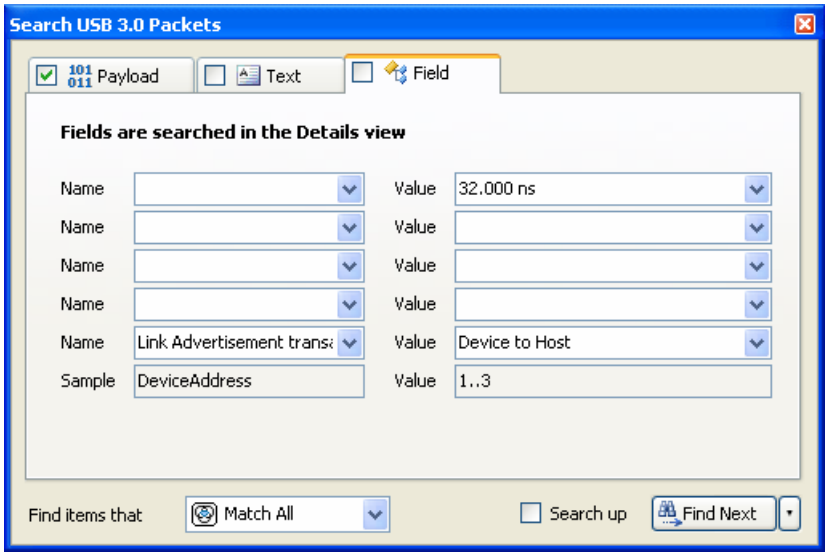
.

The next event matching the search criteria is highlighted in the *USB 3.0 Overview*.

To search events by field value:

1. Select the **Field** tab.

The **Field** tab appears:



Values in the Name boxes are synchronized to the selected event in the USB 3.0 Overview, which is synchronized to the Details view. The Value boxes reflect data elements displayed in the Details View. Users may type strings (values, wildcards, or ranges) directly into the Value boxes.

2. Select one or more items from the **Name** boxes.
3. Select corresponding items from the **Value** boxes.
4. Select the desired match type in the **Find items that** drop-down menu.
5. Click on **Find Next** 

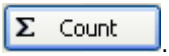
.

The next event matching the search criteria is highlighted in the *USB 3.0 Overview*.

To display a count of matching criteria:

1. Define the search criteria from the **Payload**, **Text**, and/or **Field** tabs.
2. Select the desired match type in the **Find items that** drop-down menu.
3. Select the drop-down arrow  at the bottom-right of the *Search* dialog.
4. Select **Count** 

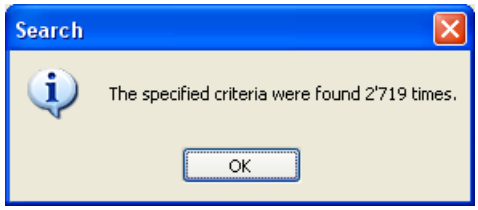
.

The **Find Next** button changes to a **Count** button 

.

5. Click on the **Count** button.

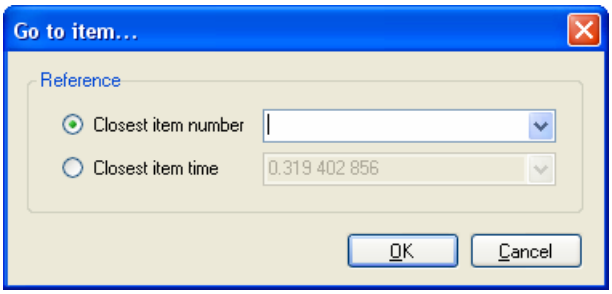
A count of items matching the criteria is displayed:



To search using an Item Number or Item Time:

1. Select **Search | Go To** (CTRL+G) from the menu.

The *Go to item* dialog appears:



2. Select **Closest item number** and enter an item number
   or
   Select **Closest item time** and enter a timestamp in *x.xxx xxx xxx* format.

   The Closest item time value may be entered as an abbreviated timestamp, such as x.xxx or x.x, in order to approximate the search.

3. Click on **OK**.

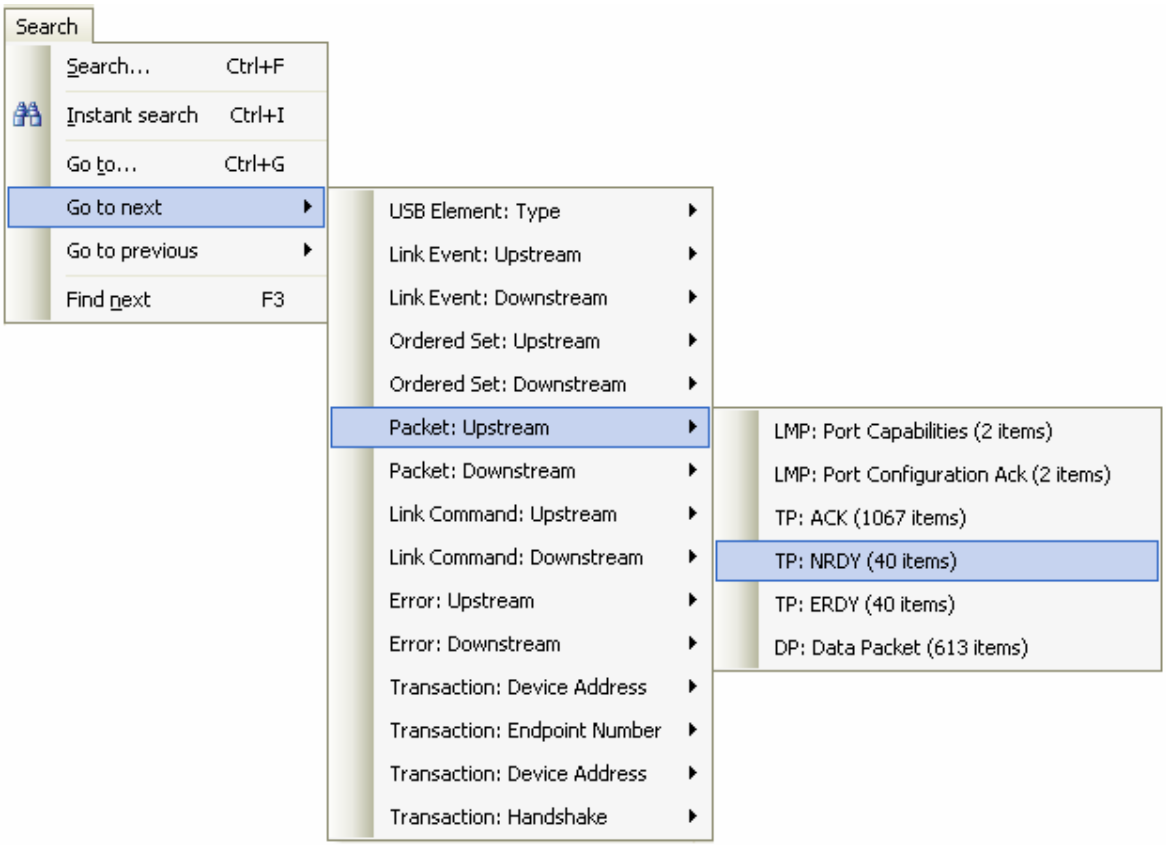
The item found is highlighted in the *USB 3.0 Overview*.

The Item Number correlates to the Packet Number column, which is available in the *USB 3.0 Overview*. If it is not displayed, right-click on the column header to add this column.

To use a content-sensitive search:

1. Select **Search | Go to next** or **Search | Go to previous** from the menu, as desired.

A content-sensitive menu of searchable items appears:



2. Click on the item desired.

The selected event is highlighted in the *USB 3.0 Overview*.

Note that a count of searchable items is included. Events not captured in the trace are not listed or may be grayed out.

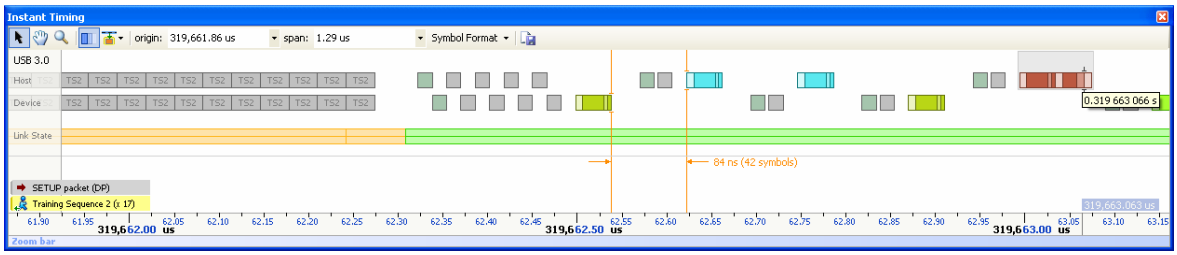
8. Instant Timing Pane

The *Instant Timing* pane provides a unique and intuitive way to understand bus traffic. This feature provides for quick and easy timing measurements, characterization of the LTSSM, high- and low-level graphical depiction of bus traffic, error detection, bandwidth measurements, and easy navigation tools.

To access the *Instant Timing* pane:

1. Select **View | Instant Timing** from the menu

The *Instant Timing* pane appears:



The table below lists the *Instant Timing* toolbar buttons and their actions:

	**Pointer Mode**	Switches to Pointer Mode.
	**Pan Mode** (Hold SHFT)	Switches to Pan Mode.
	**Zoom Mode** (Hold CTRL)	Switches to Zoom Mode.
	**Enable / Disable Smooth Scrolling**	Enables and disables the smooth scrolling feature.
	**Highlighting Options**	
	**Highlight Active Overview Selection**	When enabled, the Instant Timing view will be synchronized to the active overview selection.
	**Highlight USB Overview Selection**	When enabled, the item selected in the *USB 3.0 Overview* is highlighted in the *Instant Timing* pane.
	**Follow Overview Selection**	When enabled, the *Instant Timing* pane is synchronized to the *USB 3.0 Overview*.
	**Origin Box**	Displays the timestamp origin of the *Instant Timing* pane. Allows for user input of timestamp for jumping.
	**Span Box**	Displays the time span (zoom level) of the *Instant Timing* pane. Allows for user input to adjust span.

Symbol Format ▾	**Symbol Format Options**	
☑	**Hex Bytes**	When sufficiently zoomed in, displays characters in hex format, prefaced with K or D designators.
☑	**Raw Symbols**	When sufficiently zoomed in, displays characters in K/D format.
☑	**Formatted Symbols**	When sufficiently zoomed in, displays characters having formatted designations (e.g., SHP, EPF) in that format, with all other characters in K/D format.
	**Export Image**	Exports the *Instant Timing* pane to an image file.

8.1 Panning Left and Right

Various methods are available to pan (scroll) the *Instant Timing* pane to the left or right. Left goes toward the start of the trace, right goes toward the end of the trace.

To use the mouse to pan:

1. Position the mouse over the time scale at the bottom of the *Instant Timing* pane (recommended).

   or

   Click on Pan mode. 

The pointer changes to a pan (hand) symbol.

2. Press and hold the left mouse button, and drag left or right as desired.

The mouse cursor automatically rolls around the screen, such that the user can smoothly scroll large amounts of time without having to press and release the mouse button several times.

To use the keyboard to pan:

1. If no events are selected, press LEFT or RIGHT ARROW to move incrementally left or right.

   or

   If an event is selected, these keys will jump to the previous or next event.

   or

   Press PAGE UP to scroll left or PAGE DN to scroll right.

To jump to another location:

1. Press HOME to jump to the start of the trace, or END to jump to the end of the trace.

To define a new timing view origin:

1. Enter a timestamp value in the *origin* box.

The following values are allowed:

- s – seconds
- ms – milliseconds
- ns – nanoseconds
- ps – picoseconds

If a unit is not specified, then the previously displayed unit is used.

2. Press ENTER

The *Instant Timing* pane is updated with the new origin.

The analyzer application retains new timing origin entries. Click the Down arrow in the origin field to view and select previously entered timing origin entries.

8.2 Zooming In and Out

The *Instant Timing* pane provides a zoom feature to expand or contract the display in order to view information from a high level or low level. Various display features are enabled or disabled automatically as the user zooms in our out, such as character-level information and identifiers for packets, commands, and ordered sets.

To use the mouse to zoom:

1. Place the pointer over the *Zoom* bar, located at the bottom of the display (recommended).
   or
   Click on Zoom .

The pointer changes to a spyglass symbol .

2. Press and hold the left mouse button and drag the pointer to the right to zoom in and expand the display, or drag to the left to zoom out and contract the display.

The mouse cursor automatically rolls around the screen, such that the user can smoothly scroll large amounts of time without having to press and release the mouse button several times.

The mouse wheel can be used to zoom in and zoom out by moving the wheel forward to zoom in and backwards to zoom out. The zoom is centered at the mouse position.

To use the keyboard to zoom:

1. Press the PLUS key to zoom in, and the MINUS key to zoom out.

To define a new time span:

2. Type the new timing span in the *span* field.

The following values are allowed:

- s – seconds
- ms – milliseconds
- ns – nanoseconds
- ps – picoseconds

If a unit is not specified, then the previously displayed unit is used.

3. Press ENTER.

The *Instant Timing* display is updated with the new span value.

The analyzer application retains new time span entries. Click the Down arrow in the span field to view and select previously entered time span entries.

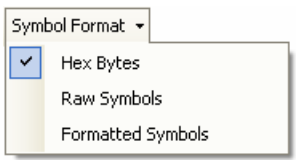
8.3 Setting a Symbol Format

Several symbol formats are available in the *Instant Timing* pane. These symbols are automatically displayed once the zoom-in level reaches a sufficient resolution.

To select a symbol format:

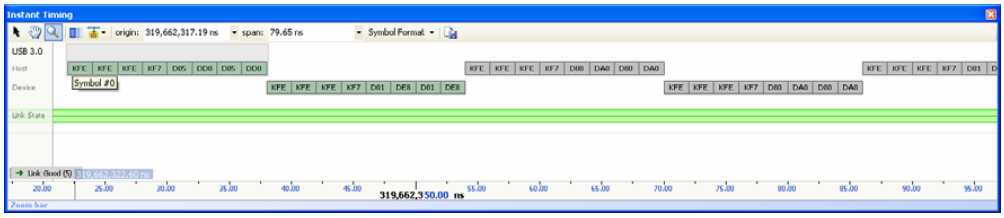
1. Click on the drop-down arrow in the **Symbol Format** menu on the *Instant Timing* toolbar.

The symbol format options appear:



2. Select the desired format.

Symbols are updated in the format selected:



8.4 Taking Measurements

The *Instant Timing* pane provides very quick and simple methods to characterize timing between selected events as well as instantaneous bandwidth measurements.

Cursors available include:

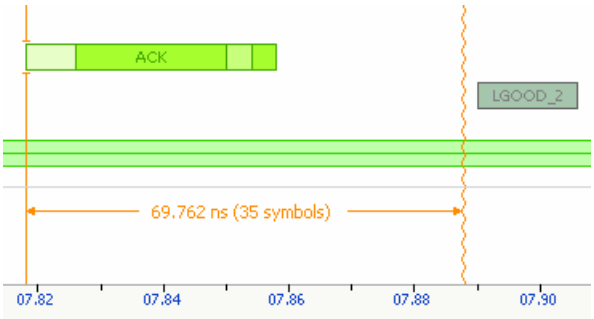
- Timing Cursors
- A-B Independent Cursors

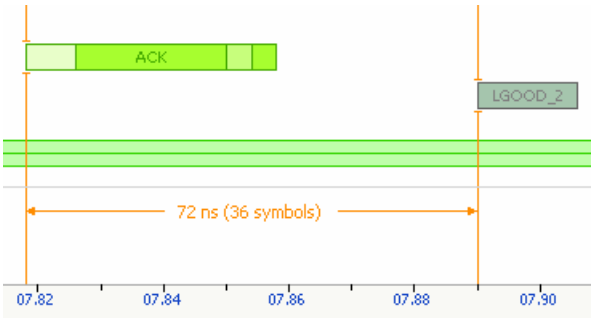
To make a timing or bandwidth measurement:

1. Select the pointer icon at the top-left of the *Instant Timing* pane.

2. Left-click in the desired location or on the desired event.

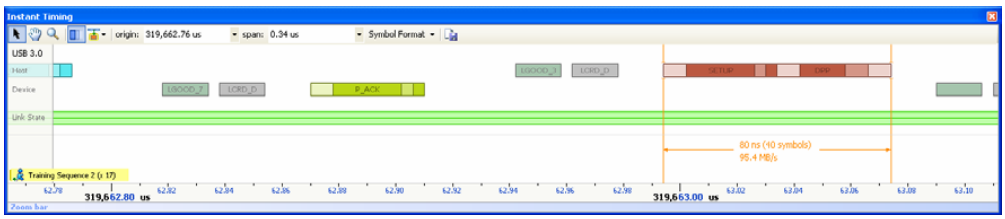
The vertical lines associated with the *Instant Timing* cursors are waved if not attached to an event, and straight when attached. To adjust cursor position, place the mouse pointer over either cursor and left-click and drag to adjust position horizontally.



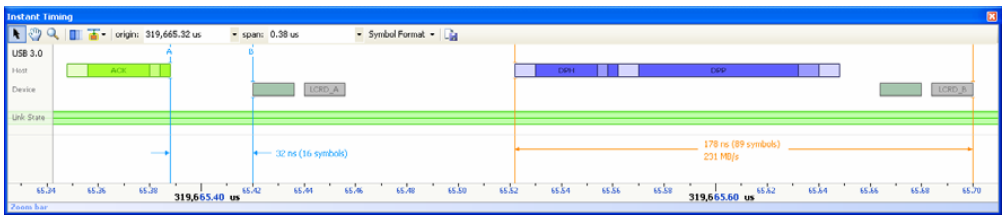


3. Drag the mouse to the desired location or desired event.

The time between the cursors is displayed along with an equivalent symbol time count. If the measurement includes payload, an instantaneous bandwidth is also displayed:



The vertical position of the displayed timing information, including the horizontal arrows, can be changed by selecting the information with the pointer, then dragging to the desired position.



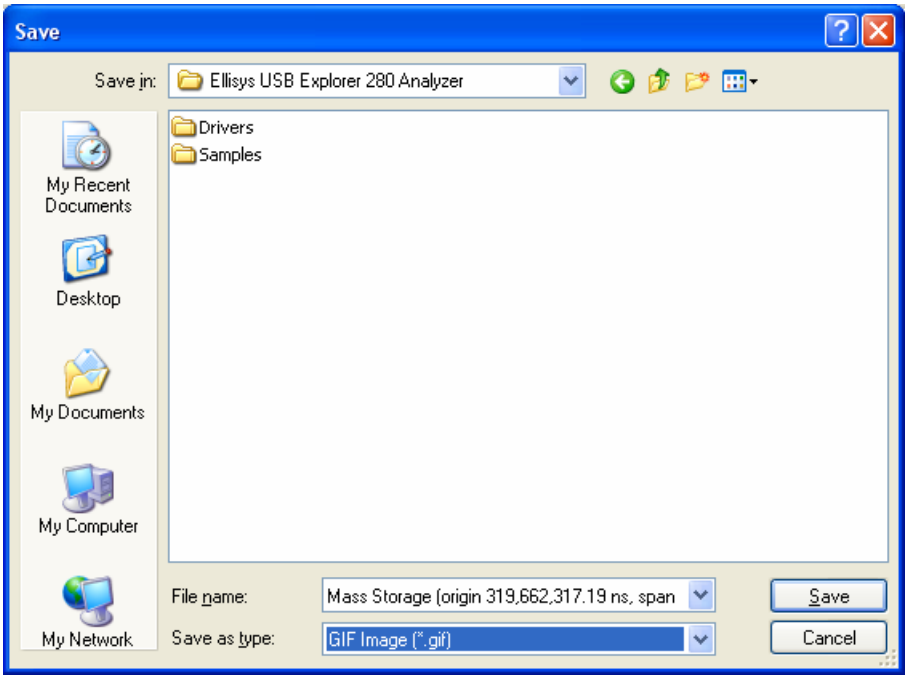
8.5 Exporting Images

The *Instant Timing* display can be exported into various graphics formats.

To export the *Instant Timing* display to a graphics format:

1. Click on the **Export Image** icon located in the *Instant Timing* toolbar.

The *Save* menu appears:



Images to be exported are automatically assigned a file name that includes the origin and span values.

2. Accept the default file name or assign a new file name.
3. Select a directory location.
4. Select the file type in **Save as type** drop-down (e.g., *.gif, *.png, *.jpg, *.bmp).
5. Click on **Save.**

The file is exported in the desired format to the selected directory.

8.6 Link State Indications

Link states are tracked in the *Instant Timing* pane. These states are color-coded, demarcated, and include fly-over labels.

Link states are color-coded as shown below:

ORANGE	LFPS and link training sequences
GREEN	U0
BLUE	Low power states

To determine a link state:

1. Place the mouse pointer over the horizontal **Link State** bars at the desired location.

The link state appears in the fly-over indication:

8.7 Synchronizing to Other Views

The *Instant Timing* pane is synchronized to other views, either directly or indirectly, in order to give the user a comprehensive understanding of the traffic captured. Synchronizations are available to the *USB 3.0 Overview*, *Instant Link State*, and *Summary* panes. Synchronization to the *Instant Timing* pane can be disabled in the *Instant Timing* toolbar, but is enabled by default.

To synchronize with the *USB 3.0 Overview*:

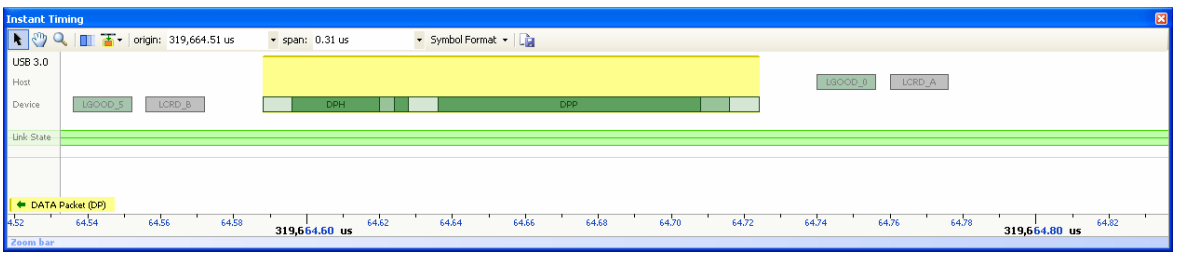
1. Select the highlighting options drop-down in the *Instant Timing* toolbar:

2. Select **Follow overview selection**.

3. Select any line in the *USB 3.0 Overview*.

The selected line is highlighted in the *Instant Timing* pane.

0.319 664 588	DATA link transaction	1	1	36 bytes (00 80 02 02 1F 00 00 00 54 69 6E 79 44 ...	OK
0.319 664 588	DATA Packet (DP)	1	1	36 bytes (00 80 02 02 1F 00 00 00 54 69 6E 79 44 ...	OK
0.319 664 740	Link Good (0)			2 bytes (00 10)	OK
0.319 664 760	Link Credit (A)			2 bytes (80 A0)	OK



When selecting a transactions or transfer, all associated packets, commands, and ordered sets are highlighted.

To force synchronized line highlights in the *USB 3.0 Overview*:

1. Left-click once on the desired event in the *Instant Timing* pane.

The event selected is highlighted in the *USB 3.0 Overview* in light yellow.

or

2. Double-click on the desired event in the *Instant Timing* pane.

The event selected is highlighted in the *USB 3.0 Overview* in bright yellow.

To unsynchronized with the *USB 3.0 Overview*:

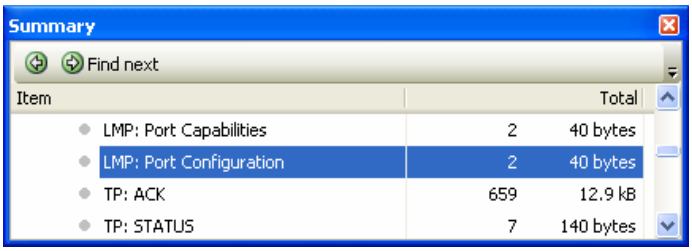
1. Select the highlighting options drop-down in the *Instant Timing* toolbar:

2. De-select **Follow overview selection**.

The *Instant Timing* pane will no longer follow selected lines in the *USB 3.0 Overview*.

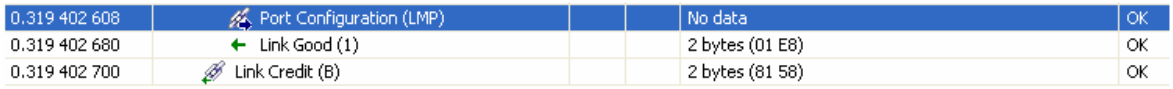
To synchronize with the *Summary* Pane:

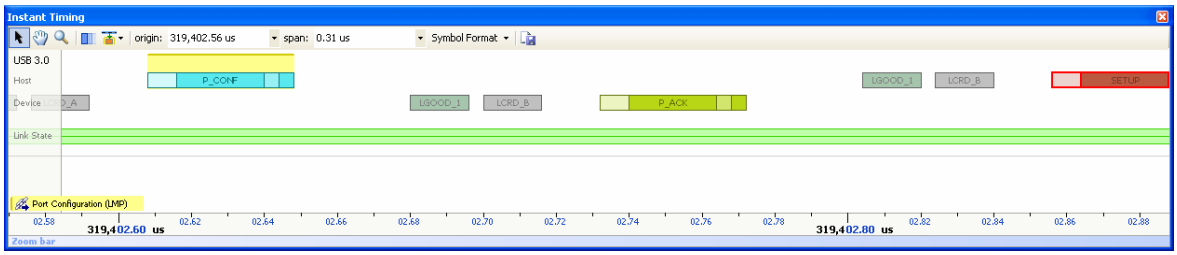
1. Select any event in the *Summary* pane (**View | Summary**).



2. Click on **Find next** or **Find previous**.

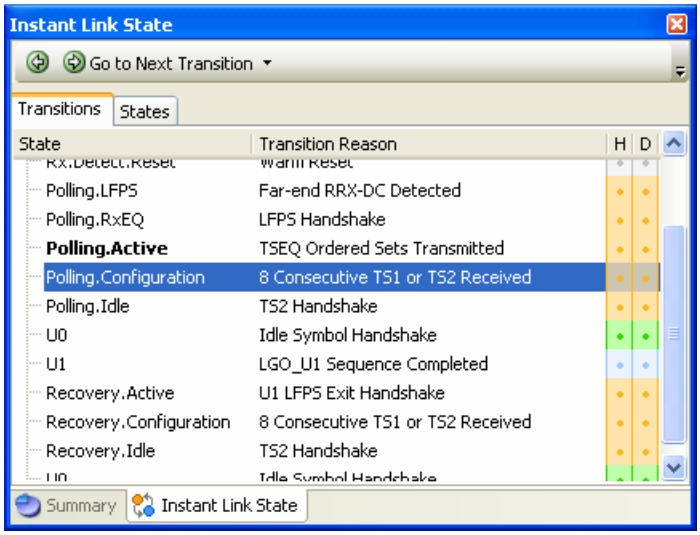
The *Summary* selection synchronizes directly to the *USB 3.0 Overview*, which is linked to the *Instant Timing* pane. The *Instant Timing* pane orients to the selected event.



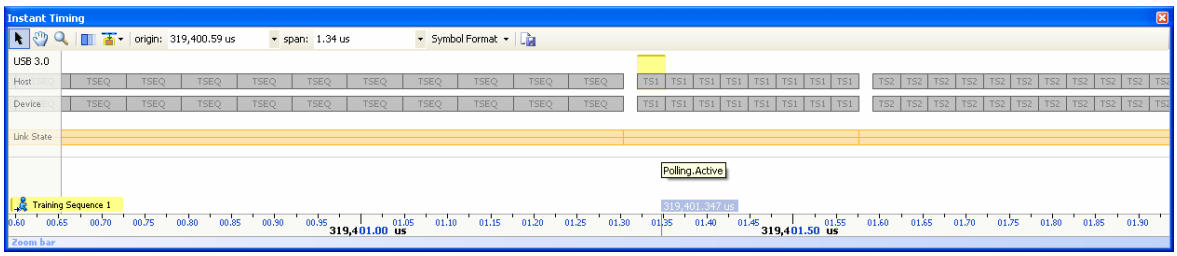


To Synchronize to the *Instant Link State* pane:

1. Select any event in the *Instant Link State* pane (**View | Instant Link State**).



The *Instant Timing* pane orients to the event selected in *Instant Link State*.



The *USB 3.0 Overview* orients to the event selected in *Instant Link State*:

0.319 401 320	Training Sequence 1 (x 8)
0.319 401 320	Training Sequence 1
0.319 401 352	Training Sequence 1
0.319 401 384	Training Sequence 1
0.319 401 416	Training Sequence 1
0.319 401 448	Training Sequence 1
0.319 401 480	Training Sequence 1
0.319 401 512	Training Sequence 1
0.319 401 544	Training Sequence 1

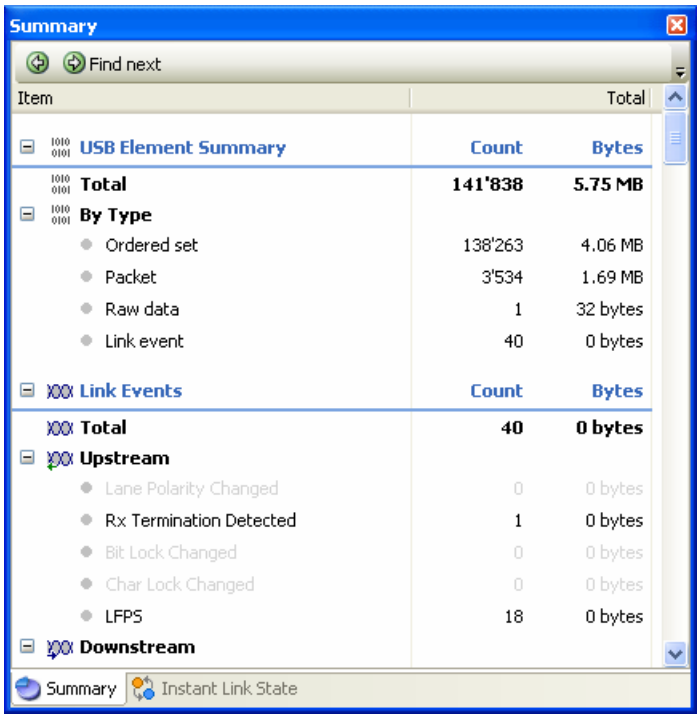
9. Summary Pane

The *Summary* pane provides a comprehensive summary of all traffic recorded, including numerical counts, byte counts, and other summary statistics. The *Summary* pane will update real-time as traffic is captured. The *Summary* pane includes a Find feature to jump to a location in the *USB 3.0 Overview* from events selected in the *Summary* pane.

To access the *Summary* pane:

1. Select **View | Summary** from the menu.

The *Summary* pane appears:



Items not captured will be grayed out in the Summary pane.

To find an event located in the *USB 3.0 Overview*:

1. Select the item or event desired in the *Summary* pane.
2. Click on the **Find next** arrow  to search forward, or the left arrow  to search backward.

The *USB 3.0 Overview* orients to the searched item, highlighting it with a gray line.

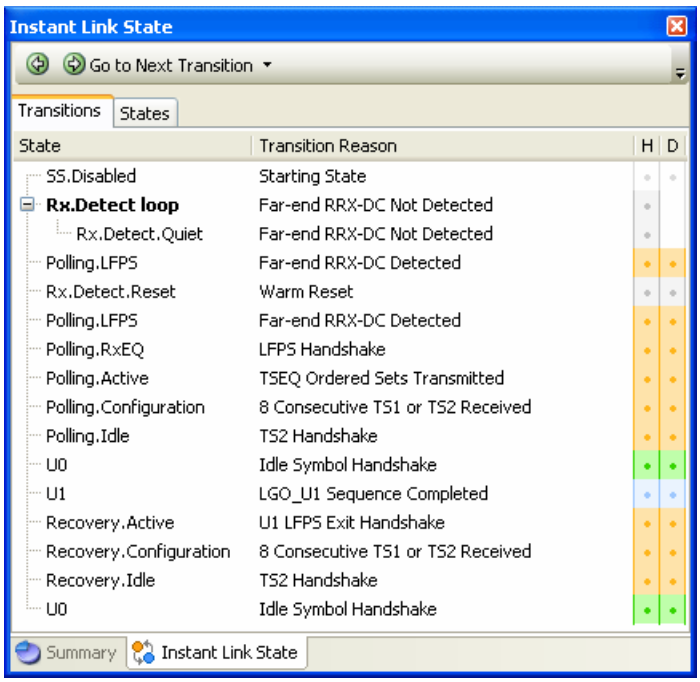
10. Instant Link State Pane

The *Instant Link State* tracks LTSSM states, and changes to these states, including illegal state transitions. The *Instant Link State* is synchronized to the *USB 3.0 Overview*, and indirectly to the *Instant Timing* pane. The *Instant Link State* pane is updated in real-time as a capture is underway. Additional state progression information is provided to the user as well, in the **States** tab.

To access the *Instant Link State* pane:

1. Select **View | Instant Link** State from the menu.

The *Instant Link State* pane appears.



Individual Host (H) and Device (D) states are color-coded as shown below.

GRAY	Power ON/OFF and electrical idle
ORANGE	LFPS and link training sequences
GREEN	U0
BLUE	Low power states

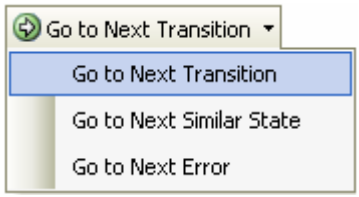
To jump from a state in the *Instant Link State* to the *USB 3.0 Overview*:

1. Double-click the desired **State** in the *Instant Link State* pane.

The *Instant Timing Pane* will also orient to the selected state, if it is enabled to follow the *USB 3.0 Overview* (located in the highlighting options on the *Instant Timing* toolbar).

To jump to the Next LTSSM state:

1. Select the down arrow on the *Instant Link State* toolbar .

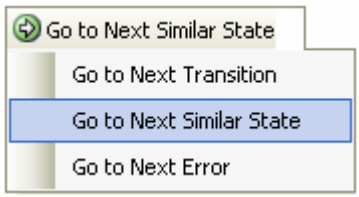


2. Select **Go to Next Transition**.

The *Instant Link State* pane and the *USB 3.0 Overview* jump to the next/previous state as selected.

To Jump to the next similar state:

1. Select the down arrow on the *Instant Link State* toolbar .

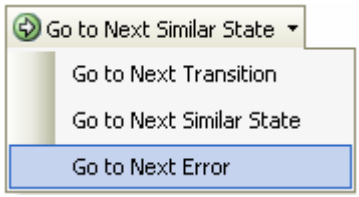


2. Select **Go to Next Similar State**.

The *Instant Link State* pane and the *USB 3.0 Overview* jump to the next similar state as selected.

To Jump to the next LTSSM error:

1. Select the down arrow on the *Instant Link State* toolbar .



2. Select **Go to Next Error**.

The *Instant Link State* pane and the *USB 3.0 Overview* jump to the next LTSSM error as selected.

To jump to the previous transition, similar state, or LTSSM error:

1. Select the jump type as described in the steps above.

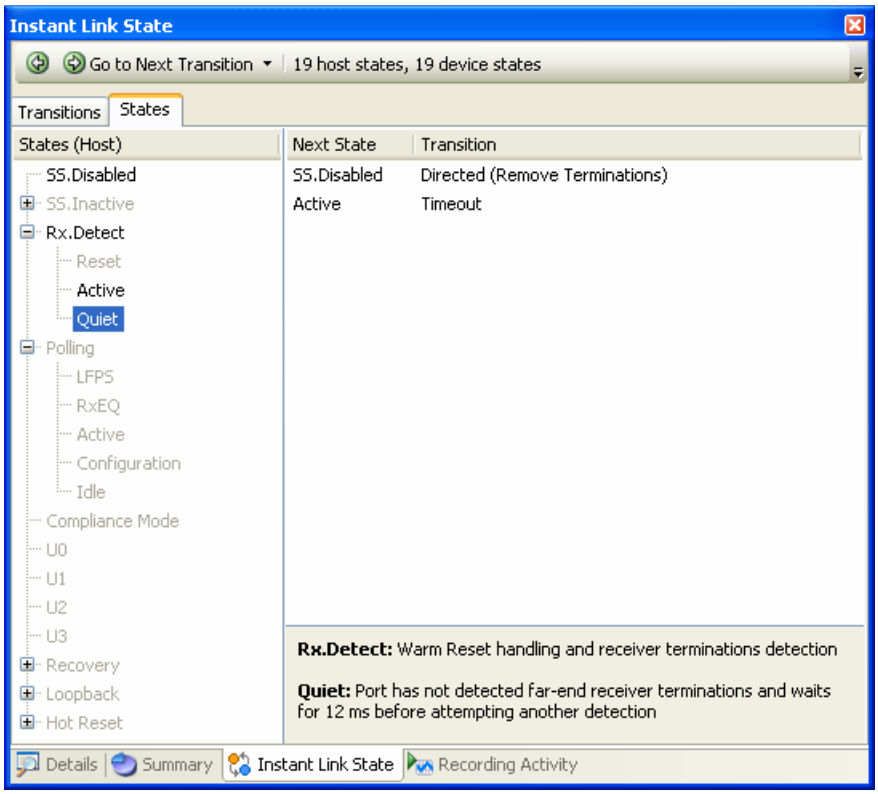
2. Click on the previous arrow .

The *Instant Link State* pane and the *USB 3.0 Overview* jump to the next transition, similar state, or LTSSM error as selected.

To view all possible LTSSM Transitions:

1. Select the **States** tab in the *Instant Link State* pane.

The **States** tab appears:



2. Select a desired state in the left panel.

Potential progressions from the selected state are now shown in the right panel under the **Next State** column, with actions required for specific progressions shown in the **Transition** column. Descriptions of the selected states and sub-state are provided at the bottom.

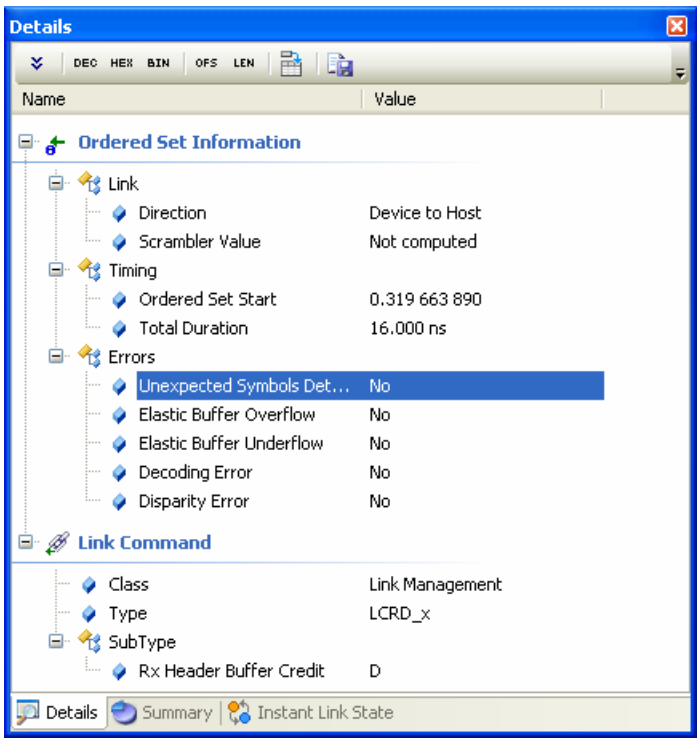
11. Details Pane

The *Details* pane provides additional information on events selected in the *USB 3.0 Overview*, including packet and ordered set fields, descriptor details, and class-specific details. The *Details* pane can also be used to customize the columns displayed in the *USB 3.0 Overview*. The *Details* pane is synchronized to the *USB 3.0 Overview*- items selected in the *USB 3.0 Overview* are displayed in the *Details* pane.

To access the *Details* pane:

1. Select **View | Details** from the menu.

The *Details* pane appears:



Details pane toolbar:

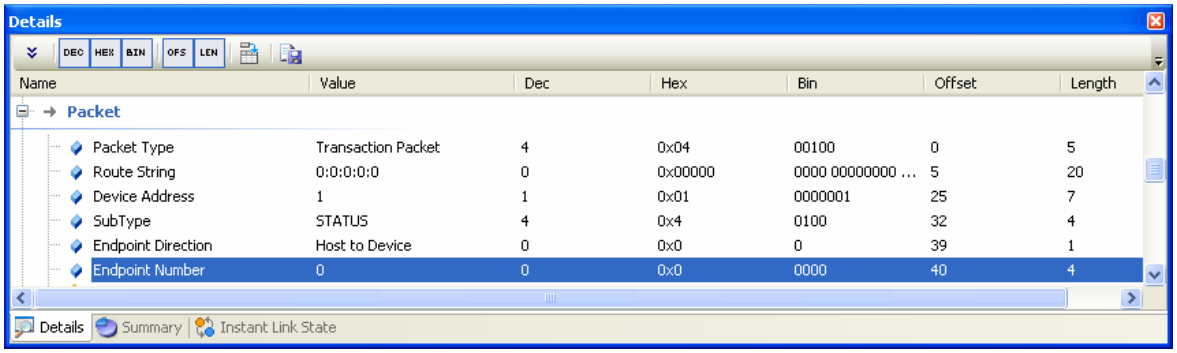
	Shows/hides hidden fields.
DEC	Adds a column in decimal format.
HEX	Adds a column in hex format.
BIN	Adds a column in binary format.
OFS	Adds a column showing the data offset.
LEN	Adds a column showing field length.
	Adds selected field to the USB 3.0 Overview.

Exports the Details pane contents to text or XML.

To add formatting information to the *Details* pane:

1. Select one or more format buttons from the toolbar at the top of the *Details* pane.

The format selected is added to the *Details* pane:



To create a new column in the *USB 3.0 Overview* from a field in the *Details* pane:

1. Select the field name at the desired field in the *Details* pane  .

2. Left-click and drag the icon to the column header in the *USB 3.0 Overview*.

   or

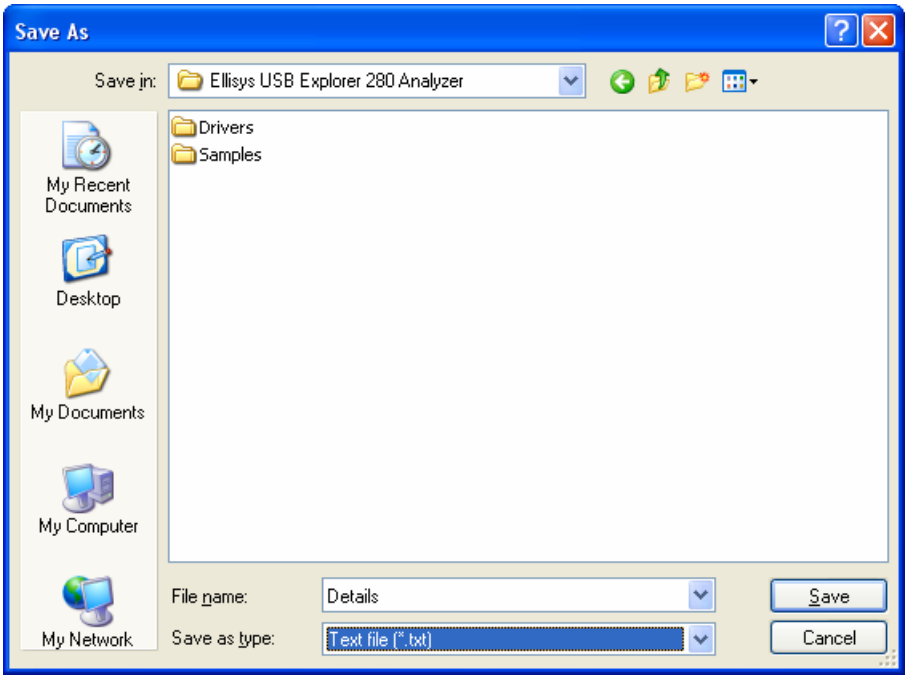
   Select the **Display this field in the overview** button in the *Details* toolbar  .

The selected field is added in a new column in the *USB 3.0 Overview*.

To export the *Details* pane contents:

1. Select the **Export** button in the *Details* toolbar  .

The *Save As* menu appears:



2. Enter a name in the **File name** box.

3. Select .xml or .txt in the **Save as type** box.

4. Click on **Save**.

The contents of the *Details* pane are saved in the selected format.

To show / hide hidden fields in the *Details* pane:

1. Select the **Show all fields** icon in the *Details* pane toolbar  .

Hidden fields (fields not displayed by default) are toggled on or off.

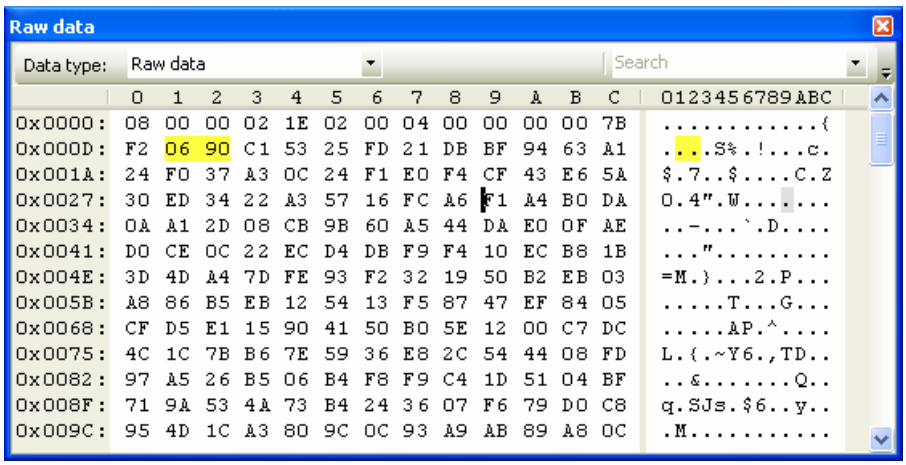
12. Raw Data Pane

The *Raw Data* pane provides a low-level data view of items selected in the *USB 3.0 Overview* and includes various format and copy options. The *Raw Data* pane is also linked to the *Details* pane. Fields selected in the *Details* pane are highlighted in the *Raw Data* pane.

To access the *Raw Data* pane:

1. Select **View | Raw Data** from the menu.

The *Raw Data* pane appears, showing data from the item selected in the *USB 3.0 Overview*:



To highlight *Details* pane fields in the *Raw Data* pane:

1. Select the desired item in the *USB 3.0 Overview*.

The *Details* pane displays all fields applicable to the item selected.

2. Select the desired field from the *Details* view.

The selected field is highlighted in the *Raw Data* pane.

To search the *Raw Data* pane:

1. Enter the desired hex value string in the **Search** box.

2. Press ENTER.

The left area of the *Raw Data* pane is searched. Strings found are highlighted in blue in the left and right areas.

To toggle the display between raw characters and raw data:

1. Select a packet, link command, or ordered set in the *USB 3.0 Overview*.

2. Click on the **Data Type** drop-down arrow in the *Raw Data* pane.

3. Select **Raw data** or **Raw chars** as desired.

Data displayed toggles between hex data and character data.

The contents of the Data Type menu are context-sensitive, as per the item type selected in the *USB 3.0 Overview*.

USB 3.0 Items Selected	Selectable Data Type Menu Contents
Packets, Ordered Sets, or Link Commands	Raw Data/Raw Chars
Mass Storage Class Transfers	Command/Data/Status
Transactions with Payload	Payload
Link Transactions	Packet/Link Command
USB Descriptor Transfers	Raw Data/Raw Chars

To format the *Raw Data* pane display:

1. Right-click in the left or right areas in the *Raw Data* pane.

2. Set display options as per the table below:

Addresses	Sets left-border addressing to hex or decimal.
Width	Sets horizontal length of data displayed.
Group by	Groups data in byte, word, long, or quad formats.
Left Area	Formats the left area in character, hex, binary, decimal, or octal.
Right Area	Formats the right area in character, hex, binary, decimal, or octal.
Text Size	Sets text size to small, medium, or large.

To copy data from the *Raw Data* pane:

1. Right-click in the left or right areas in the *Raw Data* pane.

2. Select **Edit**.

3. Select **Copy as Displayed** (CTRL+C) to copy data in the format presently displayed.

   or

4. Select **Copy as Binary Data** (CTRL_SHFT+C) to copy data in a binary data format.

   or

   Select **Copy as Generator Hex Array** to copy in a format used by the USB Explorer 280 Generator.

Copy actions will copy all data from the left area of the *Raw Data* pane, unless a mouse selection is made over specific data, in which case only the selected data is copied.

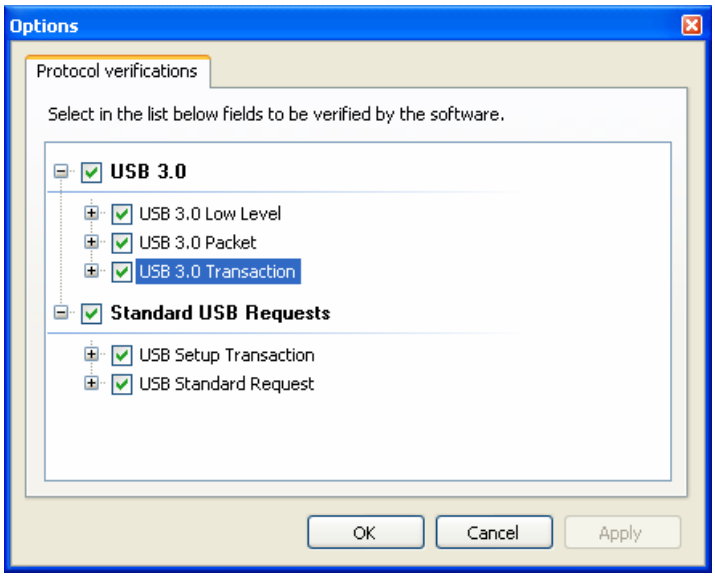
13. Protocol Error Verifications

The analyzer is designed to detect and display various protocol errors. Protocol errors of various types are flagged in the *USB 3.0 Overview*, the *Details* pane, *Instant Timing* pane, and *Summary* pane. Detection of these errors can be disabled as desired.

To disable verification and display of protocol errors:

1. Select **Tools | Options** from the menu.

The *Options* menu appears:



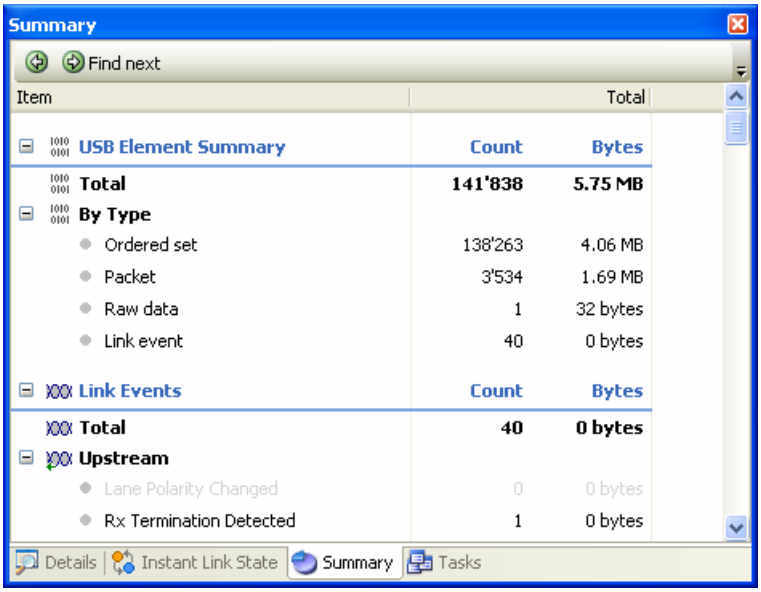
2. Under the *Protocol verifications* tab, expand the categories to reveal the desired verification and uncheck the associated box.

3. Click on **OK**.

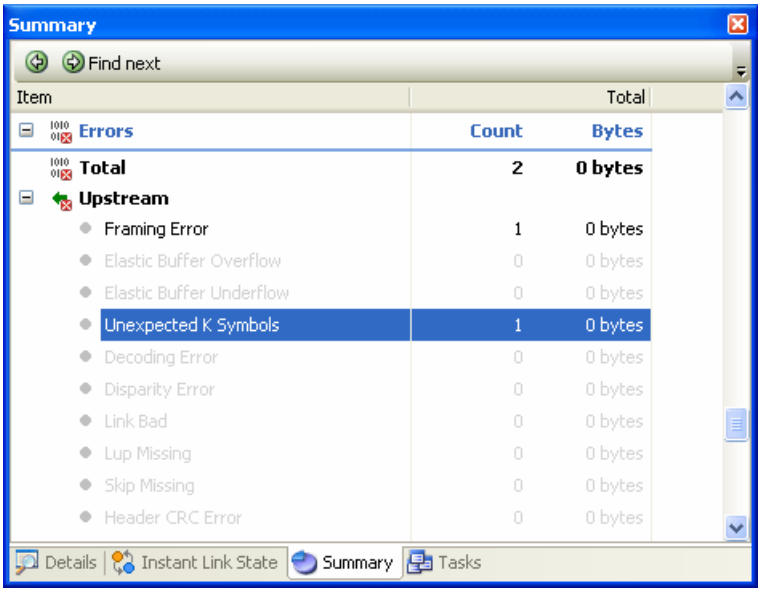
To locate a protocol error in a capture:

1. Select **View | Summary** from the menu  .

The *Summary* pane opens:



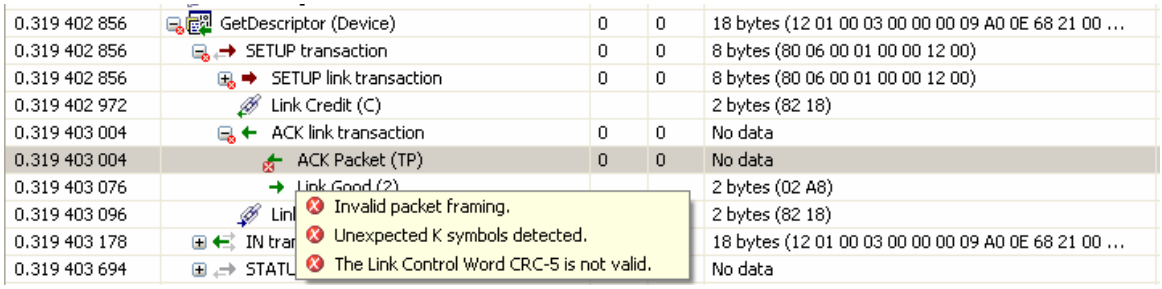
2. Scroll in the *Summary* pane to locate the **Errors** category:



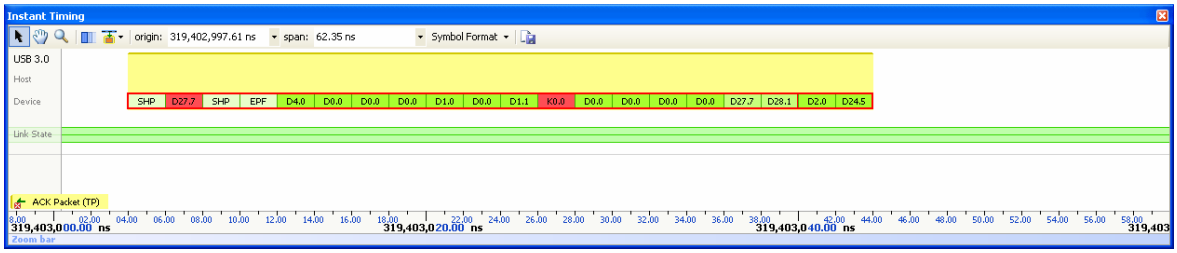
3. Select the error.

4. Click on the **Find next** arrow or **Find previous** arrow as needed.

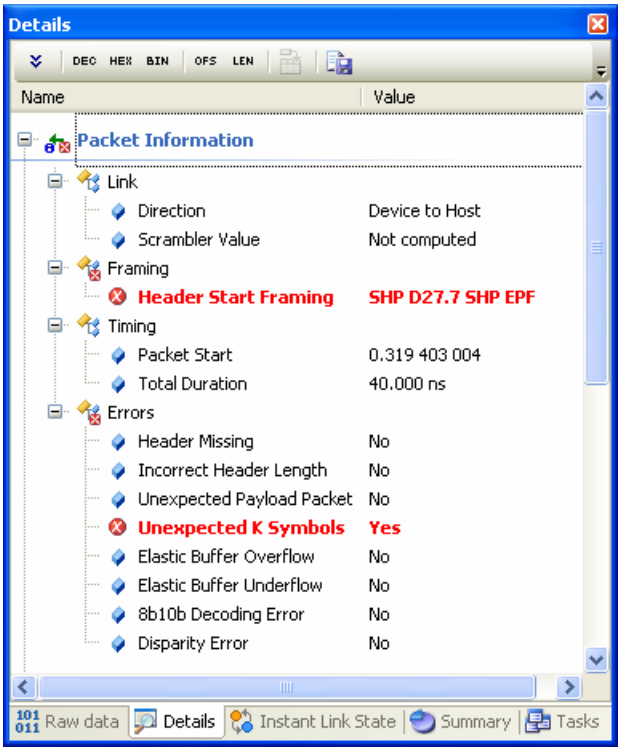
The error is located in the *USB 3.0 Overview*:



The error is located in the *Instant Timing* pane:



The error is located in the *Details* pane:



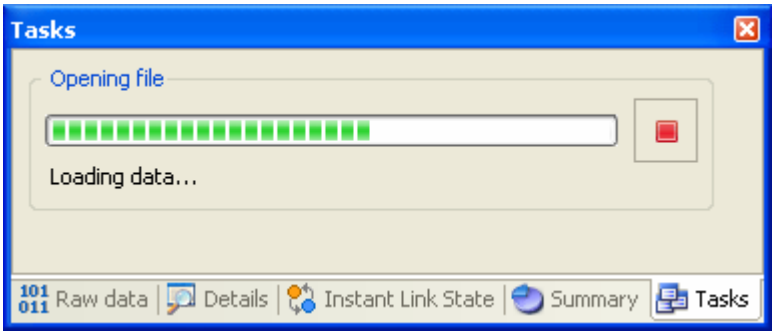
14. Task Pane

The *Task* pane provides the user with statuses on various actions initiated by the user and also allows the user to cancel tasks in progress.

To access the Task pane:

1. Select **View | Other Windows | Tasks** from the menu.

The *Task* pane appears:



Task statuses provided by the Tasks pane include:

- File Open
- File Save
- Search
- Instant Search
- File Export
- File Import

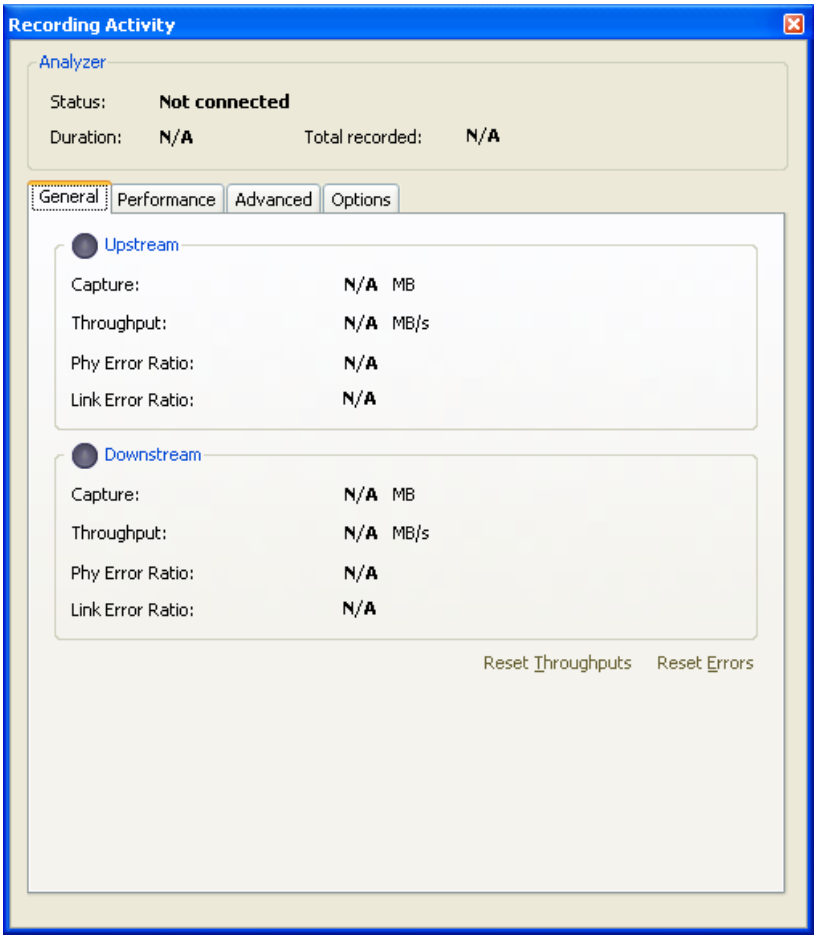
15. Recording Activity Menu

The *Recording Activity* menu provides various real-time performance and status information on the analyzer hardware and on the bus under analysis.

To access the *Recording Activity* menu:

1. Select **View | Other Windows | Recording Activity** from the menu.

The *Recording Activity* menu appears:



The table below summarizes information available in the *Recording Activity* menu:

Analyzer

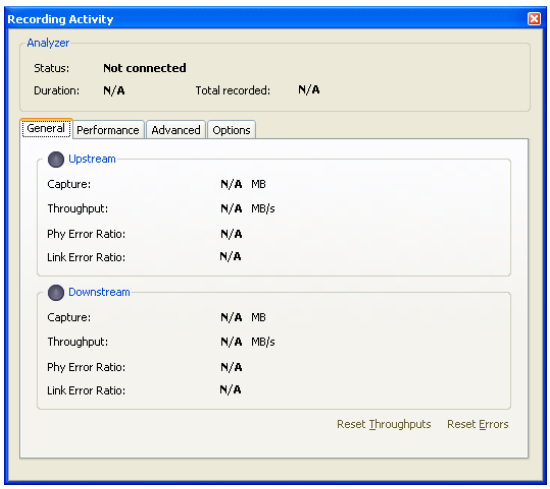
Status	Indicates whether the analyzer's rear-panel USB connector is connected and properly communicating to the PC hosting the analyzer application.
Duration	Indicates the elapsed time of the recording.
Total Recorded	Indicates the amount of data captured.

General Provides capture, performance, link status, and error

	information.
Performance	Provides graphical throughput information.
Advanced	Provides detailed link status, capture, throughput, and error information.
Options	Provides display and error tracking options.

15.1 General

The *Recording Activity - General* tab provides real-time capture, performance, link status, and error information.



The table below describes **Upstream** and **Downstream** link indicators:

Off: No receiver detected.

Constant orange: Receiver detected, no SuperSpeed signaling detected.

Constant green: SuperSpeed signaling detected, receiver synchronized.

Flashing red: Link is unstable, frequent loss of synchronization.

The table below describes information fields in the *General* tab for **Upstream** and **Downstream** links:

Capture	Indicates the total of data captured in Mbytes.
Throughput	Indicates the instantaneous throughput in MByte/s.
Phy Error Ratio	Indicates the ratio of all characters captured to characters identified by the analyzer as having 10b coding or disparity errors.
Link Error Ratio	Indicates the ratio of link items captured with errors to the total count of link items. Errors can be CRC errors or symbols error inside the link item. A link item can be a training ordered set, a link command, a header packet or a

data payload packet.

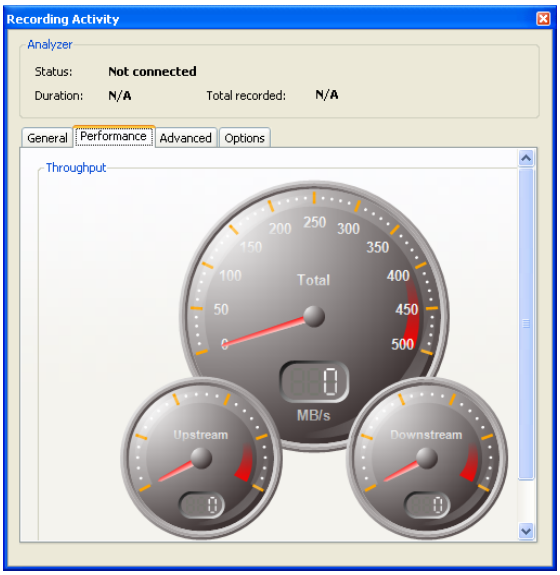
To reset throughput and error indications:

1. Select **Reset Throughputs** to reset cumulative throughput calculations to zero.
   or
   Select **Reset Errors** to reset cumulative error calculations to zero.

The selected indication is reset to zero.

15.2 Performance

The *Recording Activity - Performance* tab provides a real-time graphical indication of throughput for upstream and downstream links, as well as an aggregate throughout indication.



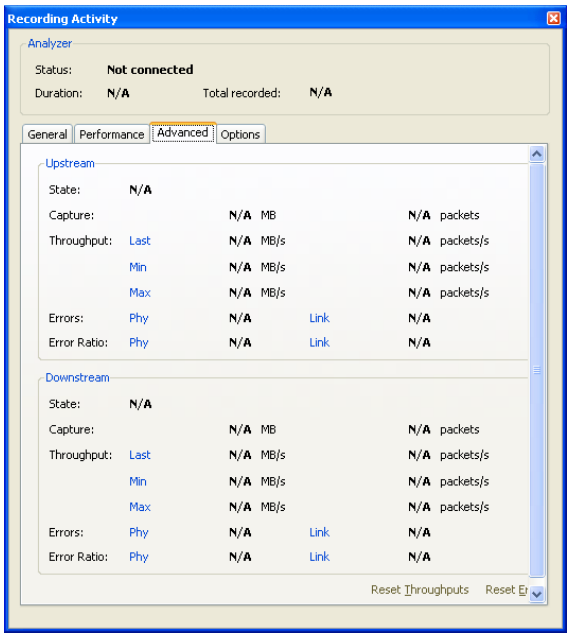
To reset the throughput indications:

1. Click on **Reset Throughputs**.

Throughput indicators are reset to zero.

15.3 Advanced

The *Recording Activity – Advanced* tab provides detailed link status, capture, throughput, and error information.



The table below describes information presented in the *Advanced* tab for **Upstream** and **Downstream** links:

State Indicates the current link status as one of the following:

- No receiver detected.
- Electrical idle.
- Receiver detected, no SuperSpeed signaling detected.
- SuperSpeed signaling detected, receiver synchronized.
- Link is unstable, frequent loss of synchronization.

Capture Indicates the total of data captured in MBs.

Throughput Indicates three different data throughput metrics as described below:

- **Last** indicates last-calculated throughput and packet rate.
- **Min** indicates the low-water throughput and packet rate.
- **Max** indicates the high-water throughput and packet rate.

Errors Indicates error count information as described below:

- **Phy** indicates a count of 10b and disparity errors.
- **Link** indicates a count of link-layer errors.

Error Ratio Indicates error ratio information as described below:

- **Phy** indicates the ratio of all characters captured to characters identified by the analyzer as having 10b coding or disparity errors.
- **Link** indicates the ratio of link items captured with errors to the total count of link items. Errors can be CRC errors or symbols error inside the link item. A link item can be a training ordered set, a link

command, a header packet or a data payload packet.

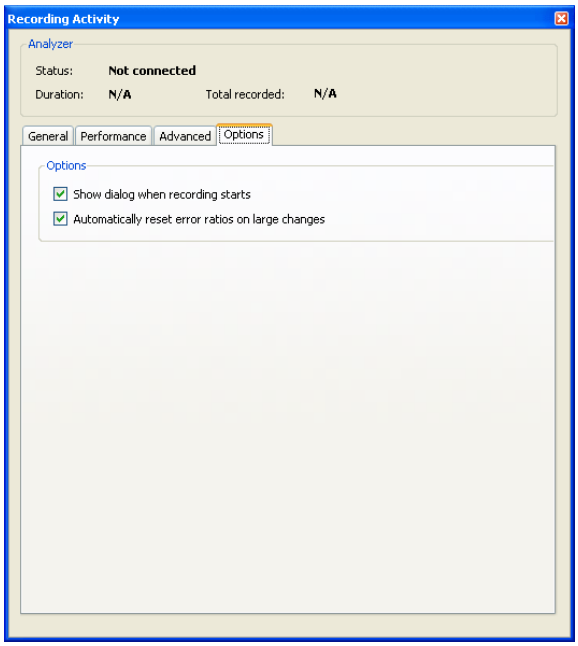
To reset throughput and error indications:

1. Select **Reset Throughputs** to reset cumulative throughput calculations to zero.
   or
   Select **Reset Errors** to reset cumulative error calculations to zero.

The selected indication is reset to zero.

15.4 Options

The *Recording Activity - Options* tab provides display and error tracking options. Options available are shown below:



Options available in the *Options* tab are described below:

Show dialog when recording starts	When checked, automatically opens the *Recording Activity* menu when a recording is started.
Automatically reset error ratios on large changes	When checked, automatically resets error ratio indications on large changes.

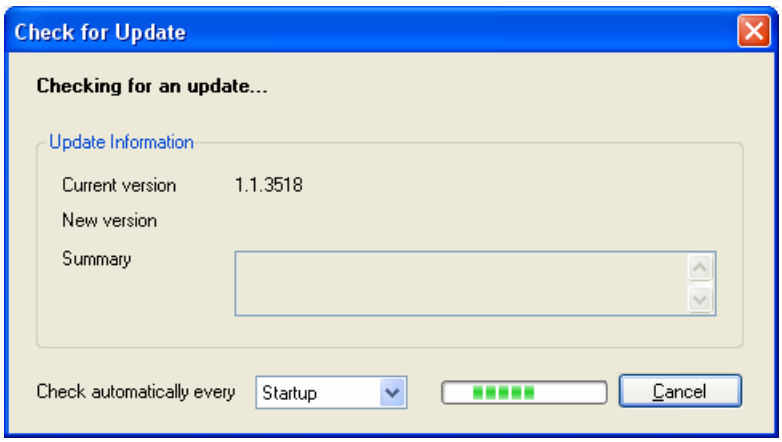
16. Updating the Analyzer Software

The analyzer application provides a convenient method to access the latest updated software from an Internet-connected PC.

To check for the latest software:

1. Select **Help | Check for updates** from the menu.

The *Check for Update* window appears:



2. Follow the onscreen prompts to download and install the updated application software.

Appendix 1. Raw Character Import Format

Format Definition

Symbols streams must be provided in two separate files for the upstream and the downstream. The extension of the files is u30chars. The file is an ASCII text file with one symbol on each line. Symbols shall be formatted as Dxx or Kxx, with D or K specifying if the symbols is data or control and xx specifying the hexadecimal value of the symbol.

Example

The example below describes the raw character format (Device side). Symbols are wrapped from column to column. See 4.5, Importing Data to View in a Trace File for more information.

Kbc	D00	D00	D00	D68	D00	D00	D00	D00	D00	D00	Kf7
Kbc	D00	K3c	D00	D07	Dd9	D00	D00	D00	D00	D00	Dc0
Kbc	D00	K3c	D00	D68	Dc0	D00	D00	D00	D00	D00	D02
Kbc	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D00	D00	D00	D00	Kfe	D10	D00	D00	D00	D00	D00	D00
D08	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Kf7	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	D80	D00	D00	D00	D00	K3c	D00	D00
D45	D00	D00	D00	Da0	D00	D00	D00	D00	K3c	D00	D00
D45	D00	D00	D00	D80	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Da0	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	Dfd
D45	D00	D00	D00	Kf7	D00	D00	D00	D00	D00	D00	D5f
D45	D00	D00	D00	D81	D00	D00	D00	D00	D00	D00	D01
Kbc	D00	D00	D00	D58	D00	D00	D00	D00	D00	D00	De8
Kbc	D00	D00	D00	D81	D00	D00	D00	D00	D00	D00	D00
Kbc	D00	D00	D00	D58	D00	D00	D00	D00	D00	D00	D00
Kbc	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D00	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D08	D00	D00	D00	Kfe	D00	D00	D00	D00	Kfe	D00	D00
D45	D00	D00	D00	Kf7	D00	D00	D00	D00	Kfe	D00	D00
D45	D00	D00	D00	D82	D00	D00	D00	D00	Kfe	D00	D00
D45	D00	D00	D00	D18	D00	D00	D00	D00	Kf7	D00	D00
D45	D00	D00	D00	D82	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	D18	D00	D00	D00	D00	D10	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D10	D00	D00
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	Kfe	D00	D00
D45	D00	D00	D00	Kf7	D00	D00	D00	D00	Kfe	D00	D00
D45	D00	D00	D00	D83	D00	D00	D00	D00	Kfe	Kfe	D00
Kbc	D00	D00	D00	De0	D00	D00	D00	D00	Kf7	Kfe	D00
Kbc	D00	D00	D00	D83	D00	D00	D00	D00	D80	Kfe	D00
Kbc	D00	D00	D00	De0	D00	D00	D00	D00	Da0	Kf7	D00
Kbc	D00	D00	D00	Kfb	D00	D00	D00	D00	D80	D01	D00
D00	D00	D00	D00	Kfb	D00	D00	D00	D00	Da0	De8	D00
D08	D00	D00	D00	Kfb	D00	D00	D00	D00	D00	D01	D00
D45	D00	D00	D00	Kf7	D00	D00	D00	D00	D00	De8	D00
D45	D00	D00	D00	D80	D00	D00	D00	D00	D00	Kfe	D00
D45	D00	D00	D00	D02	D00	D00	D00	D00	D00	Kfe	D00
D45	D00	D00	D00	D00	D00	D00	D00	D00	D00	Kfe	D00
D45	D00	D00	D00	D00	D00	D00	D00	D00	D00	Kf7	D00
D45	D00	D00	D00	D04	D00	D00	D00	D00	D00	D81	D00
D45	D00	D00	D00	D00	D00	D00	D00	D00	D00	D58	D00
D45	D00	D00	Kfe	D02	D00	D00	D00	D00	D00	D81	D00
D45	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	D58	D00
D45	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	Kfb	D00
D00	D00	D00	Kf7	D00	D00	D00	D00	D00	D00	Kfb	D00
D00	D00	D00	D07	D00	D00	D00	D00	D00	D00	Kfb	D00

```
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
```

The example below describes the raw character format (Host side). Symbols are wrapped from column to column.

```
Kbc  D00  D81  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  D58  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  Kfe  D00  D00  D00  D45  D00  D00  D00  D00  D00
Kbc  D00  Kfe  D00  D00  D00  D18  D00  D00  D00  D00  D00
D00  D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00
D08  D00  Kf7  D00  D00  D00  D10  D64  D00  D00  D00  D00
D45  D00  D82  D00  D00  D00  D00  D43  D00  D00  D00  D00
D45  D00  D18  D00  D00  D00  D00  D01  D00  D00  D00  D00
D45  D00  D82  D00  D00  D00  D00  De8  D00  D00  D00  D00
D45  D00  D18  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  Kf7  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D83  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  De0  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  D83  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  De0  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D08  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  K3c  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  K3c  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  D00
D45  D00  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  D00
Kbc  D00  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  D00
Kbc  D00  D00  D00  D00  D00  Kf7  D00  D00  D00  D00  D00
Kbc  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
Kbc  Kfe  D00  D00  D00  D00  D10  D00  D00  D00  D00  D00
D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D08  Kfe  D00  D00  D00  D00  D10  D00  D00  D00  D00  D00
D45  Kf7  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  D00
D45  D07  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  K3c
D45  D68  D00  D00  D00  D00  Kfe  D00  D00  D00  D00  K3c
D45  D07  D00  D00  D00  D00  Kf7  D00  D00  D00  D00  D00
D45  D68  D00  D00  D00  D00  D80  D00  D00  D00  D00  D00
D45  Kfe  D00  D00  D00  Kfb  Da0  D00  D00  D00  D00  D00
D45  Kfe  D00  D00  D00  Kfb  D80  D00  D00  D00  D00  D00
D45  Kfe  D00  D00  D00  Kfb  Da0  D00  D00  D00  D00  D00
D45  Kf7  D00  D00  D00  Kf7  Kfb  D00  D00  D00  D00  D00
D45  D80  D00  D00  D00  D80  Kfb  D00  D00  D00  D00  D00
D00  Da0  D00  D00  D00  D02  Kfb  D00  D00  D00  D00  D00
D00  D80  D00  D00  D00  D00  Kf7  D00  D00  D00  D00  D00
D00  Da0  D00  D00  D00  D00  Da0  D00  D00  D00  D00  D00
D00  Kfe  D00  D00  D00  D04  D02  D00  D00  D00  D00  D00
D00  Kfe  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  Kfe  D00  D00  D00  D01  D00  D00  D00  D00  D00  D00
D00  Kf7  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D81  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
D00  D58  D00  D00  D00  D00  D00  D00  D00  D00  D00  D00
```

```
Kfe     Kfe     D01     D01     Kfe     Kfe     D81     D81     D00
Kfe     Kf7     De8     De8     Kfe     Kf7     D58     D58     D00
```

Appendix 2. Packet Import Format

The example below describes the standard import format. Fields are wrapped from column to column. See 4.5, Importing Data to View in a Trace File for more information.

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 000
Data: 07 68

Type: OrderedSetLink
Link: IN
Time: 0.000 000 016
Data: 07 68

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 032
Data: 80 A0

Type: OrderedSetLink
Link: IN
Time: 0.000 000 048
Data: 80 A0

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 064
Data: 81 58

Type: OrderedSetLink
Link: IN
Time: 0.000 000 080
Data: 81 58

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 096
Data: 82 18

Type: OrderedSetLink
Link: IN
Time: 0.000 000 112
Data: 82 18

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 128
Data: 83 E0

Type: OrderedSetLink
Link: IN
Time: 0.000 000 144
Data: 83 E0

Link: IN
Time: 0.000 000 176
Data: 80 02 00 00 04 00 02 00 00 00 00 00 D9 C0 00 10

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 248
Data: 00 10

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 268
Data: 80 A0

Link: OUT
Time: 0.000 000 300
Data: 80 02 00 00 04 00 01 00 00 00 00 00 45 18 00 10

Type: OrderedSetLink
Link: IN
Time: 0.000 000 372
Data: 00 10

Type: OrderedSetLink
Link: IN
Time: 0.000 000 392
Data: 80 A0

Link: OUT
Time: 0.000 000 424
Data: A0 02 00 00 00 00 00 00 00 00 00 00 64 43 01 E8

Type: OrderedSetLink
Link: IN
Time: 0.000 000 496
Data: 01 E8

Type: OrderedSetLink
Link: IN
Time: 0.000 000 516
Data: 81 58

Link: IN
Time: 0.000 000 548

Data: C0 02 00 00 00 00 00 00 00 00 00 00
FD 5F 01 E8

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 620
Data: 01 E8

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 640
Data: 81 58

Link: OUT
Time: 0.000 000 672
Data: 08 00 00 00 00 80 08 00 00 00 00 00
07 E3 02 A8 80 06 00 01 00 00 12 00 EA
36 5D 10

Type: OrderedSetLink
Link: IN
Time: 0.000 000 768
Data: 02 A8

Type: OrderedSetLink
Link: IN
Time: 0.000 000 788
Data: 82 18

Link: IN
Time: 0.000 000 820
Data: 04 00 00 00 01 00 21 00 00 00 00 00
FB 3C 02 A8

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 892
Data: 02 A8

Type: OrderedSetLink
Link: OUT
Time: 0.000 000 912
Data: 82 18

Link: OUT
Time: 0.000 000 994
Data: 04 00 00 00 01 00 01 00 00 00 00 00
84 52 03 50

Type: OrderedSetLink
Link: IN
Time: 0.000 001 066
Data: 03 50

Type: OrderedSetLink
Link: IN
Time: 0.000 001 086
Data: 83 E0

Link: IN
Time: 0.000 001 118
Data: 08 00 00 00 40 00 12 00 00 00 00 00
4F A1 03 50 12 01 00 03 00 00 00 09 A0
0E 68 21 00 02 01 02 03 01 32 BC 76 37

Type: OrderedSetLink
Link: OUT
Time: 0.000 001 234
Data: 03 50

Type: OrderedSetLink
Link: OUT
Time: 0.000 001 254
Data: 83 E0

Link: OUT
Time: 0.000 001 336
Data: 04 00 00 00 01 00 20 00 00 00 00 00
8F 74 04 28