

# **USB Explorer 280 Analyzer**

# **User Manual**

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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**

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### Jurisdiction; Venue

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# SuperSpeed USB Explorer 28(

# 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:

- <u>www.microsoft.com/net</u> to download the Microsoft .NET Framework version 2.0.
- <u>www.update.microsoft.com</u> 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:

👹 Ellisys USB Explorer 280 Analyzer	
Confirm Installation	ellisys
The installer is ready to install Ellisys USB Explorer 280 Analyzer on your computer. Click "Next" to start the installation.	
Cancel < <u>B</u> ack	<u>N</u> ext ≻

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



An Installation Progress screen appears:

🛃 Ellisys USB Explorer 280 Analyzer	
Installing Ellisys USB Explorer 280 Analyzer	ellisys
Ellisys USB Explorer 280 Analyzer is being installed.	
Please wait	
Cancel	<u>B</u> ack <u>N</u> ext >

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

🖟 Ellisys USB Explorer 280 Analyzer 📃 🗖 🔀
Installation Complete
Ellisys USB Explorer 280 Analyzer has been successfully installed. Click "Close" to exit.
Please use Windows Update to check for any critical updates to the .NET Framework.
Cancel < <u>B</u> ack <b>Close</b>

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:

ellisys	USB EXPLORER 280 Analyzer and Traffic Generator for SuperSpeed USB 3.
Power	Up Down Link • • Downstream
<ul> <li>Operating</li> <li>Trigger</li> </ul>	Receive O O Transmit O O

Figure 2 USB Explorer 280 Front Panel



When connecting USB cables <u>DO NOT</u> 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 downstreamfacing port on a hub.

### **Downstream Connector**

The Downstream connector is usually used to connect the Analyzer to a device or an upstreamfacing 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:

Model: USB Explorer 280 Serial: EX280-61100 Rev: B	1	FOR OFFI	CE Cellisys
		8	Inter-equipment
Power Computer OUT		12	11
		Auxiliary E	quipment
12-24VDC Max 5VDC			0

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:

Found New Hardware Wizard		
	Welcome to the Found New Hardware Wizard	
	This wizard helps you install software for:	
	Ellisys USB Explorer 280	
	If your hardware came with an installation CD or floppy disk, insert it now.	
	What do you want the wizard to do?	
	<ul> <li>Install the software automatically [Recommended]</li> <li>Install from a list or specific location (Advanced)</li> </ul>	
	Click Next to continue.	
	< <u>B</u> ack <u>N</u> ext > Cancel	

- 5. Select Install the software automatically (Recommended).
- 6. Click on Next.



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

Found New Ha	ırdware Wizard
Please wait	while the wizard installs the software
¢	Ellisys USB Explorer 280
	ellex280.sys To C:\WINDOWS\system32\DRIVERS
	< <u>B</u> ack <u>N</u> ext > Cancel

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 X 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  $\P$  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.
2	Open	Opens a previously saved capture file.
W	Save	Saves a capture file.
<b>#</b>	Search	Opens the Search dialog.
	Start Recording	Starts a recording on the given analyzer unit.
<b>9</b>	Stop Recording	Stops the current recording.
4	Restart	Abort the current recording and restarts a new one.
set	Set Time Reference	Sets the time reference at the line selected in the USB 3.0 Overview at 0.000.000.000
reset	Reset Time Reference	Resets the time reference at the line selected in the USB 3.0 Overview to its original value.
0	Markers	Opens the markers menu.
<b>P</b>	Find Previous Marker	Jumps to previous marker.
ц,	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.
2	Open (CTRL+O)	Opens a folder to open a previously saved capture.
<b>L</b>	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 <i>Page Setup</i> dialog allowing user to set page margins and other parameters.
4	Print Preview	Opens the Print Preview window.
<u></u>	Print	Print the selected overview window.
	Exit	Closes the application.
View		
<u>_</u>	Details	Opens the <i>Details</i> pane.
101 011	Raw Data	Opens the Raw Data pane.
0	Summary	Opens the Summary pane.
<b>10 a</b>	Instant Timing	Opens the Instant Timing pane.
\$3	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 <i>Recording Activity</i> pane.
<b>H</b>	Front-End Settings	Opens the Front-End Settings pane.
<b>e</b> a	Tasks	Opens the Tasks pane.

### Layout

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		
<b>#</b>	Search (CTRL+F)	Opens the <i>Find</i> 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.
5	Restart Recording	Abort the current recording and restarts a new one.
	Select an Analyzer	Opens the <i>Available Analyzers</i> dialog to allow for selection of attached analyzer to be used.
3	Recording Options	Opens the Recording Options dialog.
Tools		
set	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	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		
ē	Ellisys website	Opens the Ellisys website in the default browser.
<u> Ø</u>	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 <i>About</i> 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:

Open						? 🗙
Look jn:	🚞 Samples	~	0	ø 🖻	•	
My Recent Documents Desktop My Documents	🔁 Mass Storage v	vith Errors in LTSSM vith Errors in LTSSM1 vith Errors in LTSSM2 ched SCSI)				
<b></b>	File <u>n</u> ame:	Mass Storage		~		<u>O</u> pen
My Network	Files of <u>type</u> :	Ellisys USB 3.0 Trace Files (*.u30	t)	~		Cancel

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:

Save As						? 🗙
Savejn:	🚞 Samples		*	G 🦻	بي مح	
My Recent Documents Desktop		ith Errors in LTSSM1 ith Errors in LTSSM2				
My Documents						
My Computer						
	File <u>n</u> ame:	Mass Storage2			*	<u>S</u> ave
My Network	Save as <u>t</u> ype:	Ellisys USB 3.0 Trace Files (*.)	u30t)		*	Cancel

- 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.

ellisys



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:

💀 Print preview	
🗁 🔎 🕶 🔃 🔛 🔛 🖾 💷	Page 1 📚
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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:

P	rint		? 🛛
	Printer		
	<u>N</u> ame:	Microsoft XPS Document Writer	Properties
	Status:	Ready	
	Туре:	Microsoft XPS Document Writer	
		XPSPort:	
	Comment:		Print to file
	Print range		Copies
			Number of <u>c</u> opies: 1
	🔘 Pages	from: 1 to: 2	
	O <u>S</u> electi	on	
			OK Cancel



- 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:

Import	×
<b>Import</b> Please select the type of data to import in the list below.	Con the second
What would you like to import? USB 3.0 packets and ordered sets USB 3.0 raw symbols	
Description Import USB 3.0 packets and ordered sets from a standard format	
< Back Next >	Cancel

- 2. Select USB 3.0 packets and ordered sets.
- 3. Click on Next.



The Import Options Menu appears:

Import	×
<b>Import</b> Please select the importing options below.	E C
Options         ✓       Update Packet LCW CRC-5         ✓       Update Packet Header CRC-16         ✓       Update Packet Payload CRC-32	
< Back Next > C	ancel

4. Select the desired options and click on Next.

The Import file and format menu appears:

Import	×
<b>Import</b> Please choose the input file and format.	Seres Seres
Import format:	
Ellisys USB 3.0 Packets	Preview
Import data from:	
C:\Program Files\Ellisys\Ellisys USB Explorer 280 Analyzer\Ellisys USE	Browse
< <u>B</u> ack Fi <u>n</u> ish	Cancel



- 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:

nport	X
<b>Import</b> Please select the type of data to import in the list below.	Con and a start
What would you like to import?	
USB 3.0 packets and ordered sets USB 3.0 raw symbols	
C Description	
Import USB 3.0 raw scrambled or unscrambled symbols	
< <u>B</u> ack <u>N</u> ext >	Cancel

- 2. Select USB 3.0 raw symbols.
- 3. Click on Next.



The Import Options menu appears:

Import	×
Import Please select the importing options below.	Entro
Options         Scrambling options:         Auto-detect       Unscramble         Synchronization options:         Wait TS       Wait COM         Do not wait         Filtering options:         Drop Training Sequences Equalizations (TSEQ)         Drop Training Sequences (TS1/TS2)         Drop Skips         Drop Unknown Patterns	
< <u>B</u> ack <u>N</u> ext >	Cancel

4. Select the desired options and click on Next.

The Import file and format menu appears:

Import		×
<b>Import</b> Please choose the	input file and format.	Cores and
Import format:		
Ellisys USB 3.0 S	Symbols	Preview
Import data from		
Upstream	C:\Program Files\Ellisys\Ellisys USB Explorer 280 Ar	Browse
Downstream	C:\Program Files\Ellisys\Ellisys USB Explorer 280 Ar	Browse
	< <u>B</u> ack Fi <u>n</u> ish	Cancel



- 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. Formatbased 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:

Export	X
Export Please select the type of data to export in the list below.	Que de la compañía de
What would you like to export? USB 3.0 overview USB 3.0 packets and data Ellisys USB 3.0 Generator Script  Description Export data as displayed in the USB 3.0 overview columns (Item, Device, Endpoint, etc.)	
< <u>B</u> ack <u>N</u> ext > C	ancel

- 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:

Export	×
Export Please select the USB 3.0 overview columns to export in the list	below.
Columns to export  Item  Device  Endpoint  Payload  Status  Time  Packet #  Direction	Set as default Set as displayed
Options • Export displayed items  • Export all items	
< Back Nex	t > Cancel

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:

Export	×
Export Please choose the output file and format.	and a start
Export format: CSV (Comma Separated Values)	Preview
XML (Extensible Markup Language)	
Save exported file as:	
C:\Desktop\myexportfile.csv	Browse
< Back Finish	Cancel

- 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:

Export	X
<b>Export</b> Please select the type of data to export in the list below.	Cores Cores
What would you like to export? USB 3.0 overview USB 3.0 packets and data Ellisys USB 3.0 Generator Script Description Export USB 3.0 packets and data to text, XML or binary format file.	
< Back Next >	Cancel

- 2. Select USB 3.0 packets and data.
- 3. Click on Next.



4. The Export options menu appears:

export				
ngth				
ata				
) Packet raw data				
) Packet payload				
	🔘 Export all it	ems		
	export ime ength vata ) Packet raw data ) Packet payload s xport displayed items	ime ength vata ) Packet raw data ) Packet payload	ime ength ata ) Packet raw data ) Packet payload	ime ength vata ) Packet raw data ) Packet payload

5. Select the options desired and click on Next.

The Export output file and format menu appears:

Export	×
Export Please choose the output file and format.	Energy Contraction
Export format: CSV (Comma Separated Values) Text file XML (Extensible Markup Language) Binary data file	Preview
Save exported file as: C:\Desktop\myexportfile.csv	Browse
< <u>B</u> ack Fi <u>n</u> ish	Cancel



- 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:

Export	×
Export Please select the type of data to export in the list below.	Ser.
What would you like to export? USB 3.0 overview USB 3.0 packets and data Ellisys USB 3.0 Generator Script	
Description Export data as an Ellisys USB 3.0 Generator Script file (*.u30s).	
< Back Next > Ca	ancel

- 2. Select Ellisys USB 3.0 Generator Script.
- 3. Click on Next.



The Export options menu appears:

Export Please select the exporting options below.	Con Contraction
<ul> <li>Traffic to export</li> <li>Export upstream and downstream (Host and Device)</li> <li>Export upstream link only (Device traffic)</li> <li>Export downstream link only (Host traffic)</li> </ul>	
Options • Export displayed items  • Export all items	
< <u>B</u> ack <u>N</u> ext >	Cancel

4. Select the options desired and click on Next.

The Export file and format menu appears:

Export	×
Export Please choose the output file and format.	Surger State
Export format:	
Ellisys USB 3.0 Script File	Preview
Save exported file as:	
C:\Desktop\myexport u30s	Browse
< <u>B</u> ack Fi <u>n</u> ish	Cancel



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

# 6. Click on Finish.

The file is exported in the desired format.



# Analyzer User Guide

# 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:

Workspace		×
Select a workspa The workspace cont below.	i <b>ce</b> ains all your settings and options. Choose a worksp	ace name to use
Workspace name:	<ul> <li>Default vertings</li> <li>● Create using default settings</li> <li>● Create using current workspace's settings</li> </ul>	New Remove
	ОК	Cancel

2. Click on New.



Workspace		
Select a workspa The workspace cont below.	ice ains all your settings and options. Choose a workspa	ace name to use
Workspace name:	My new workspace Create using default settings Create using current workspace's settings	New Remove
	ОК	Cancel

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:

Workspace		X	
Select a workspace The workspace contains all your settings and options. Choose a workspace name to use below.			
Workspace name:	Default 🗸	New	
	Create using default settings	Remove	
	Create using current workspace's settings		
	ОК	Cancel	

- 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:

Import and Export Settings Wizard	
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	Ser.
What do you want to do?	
• Export settings Settings will be saved to a file so they can be imported on another computer.	
Import settings Import settings from a file to apply them to the environment.	
Restore default settings	
Reset all environment settings to the defaults.	
< Back Next > Ca	ancel

- 2. Select Export settings.
- 3. Click on Next.



The *Export* menu appears:

Import and Export Settings Wizard	×
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	Que de la como de la como de la c
Store my settings in this file: Browse  Export all workspace's settings Export only the selected categories of settings below	
<ul> <li>Window Layouts</li> <li>Most Recently Used Files (MRU)</li> <li>Recording Options</li> <li>USB 3.0 Overview</li> <li>Details View</li> <li>Raw Data View</li> <li>Summary View</li> <li>Instant Timing</li> <li>General Options</li> </ul>	
< Back Finish Car	ncel

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:

Import and Export Settings Wizard	
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	Con and a second
What do you want to do?	
Export settings Settings will be saved to a file so they can be imported on another computer.	
<ul> <li>Import settings</li> <li>Import settings from a file to apply them to the environment.</li> </ul>	
Restore default settings Reset all environment settings to the defaults.	
< Back Next > Ca	ancel

- 2. Select Import settings.
- 3. Click on Next.



Import and Export Settings Wizard	×
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	E COLOR
Load my settings from this file: C:\Program Files\Ellisys\Ellisys USB Explorer 280 Analyzer\set) Browse Import all settings Import only the selected categories of settings below Recording Options Instant Timing Most Recently Used Files (MRU) Summary View General Options Raw Data View Details View USB 3.0 Overview Window Layouts	
< <u>B</u> ack Fi <u>n</u> ish Cano	:el

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:

Import and Export Settings Wizard	
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	Con and a second
What do you want to do?	
Export settings Settings will be saved to a file so they can be imported on another computer.	
Import settings Import settings from a file to apply them to the environment.	
• Restore default settings	
Reset all environment settings to the defaults.	
< Back Next > Ca	ncel

- 2. Select Restore default settings.
- 3. Click on Next.



The reset default menu appears:

Import and Export Settings Wizard	
Import and Export Workspace Settings You can use this wizard to import or export specific categories of settings, or to reset your workspace to the default settings.	Sec.
<ul> <li>Reset all settings to defaults</li> <li>Reset only the selected categories of settings below</li> <li>Window Layouts</li> <li>Most Recently Used Files (MRU)</li> <li>Recording Options</li> <li>USB 3.0 Overview</li> <li>Details View</li> <li>Raw Data View</li> <li>Summary View</li> <li>Instant Timing</li> <li>General Options</li> </ul>	
< <u>B</u> ack Fi <u>n</u> ish Ca	ancel

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:

New Layout			X
Layout name	myLayout		
		ОК	Cancel

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:

ecording Options			Adversed	
General Filter In	gger Conne	ectors	Advanced	
- Traffic Record	ing			1
USB 2.0 Tr	affic			
🕑 USB 3.0 Tr	affic 🗹 🔽	Upstre	am 🔽 Downstream	
<ul> <li>Recording Act</li> </ul>	ions			
When reco		Toggle	SMA Output	
			· · · · · · · · · · · · · · · · · · ·	
When reco	rding stops	Force	Low SMA Output	
Limits —				
Stop after	<b>5</b> 12	\$	MBytes	
Stop after	300	^ ~	seconds	
Stop after	10,000	*	packets	
			'	



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:

Recording Options
General Filter Trigger Connectors Advanced
Basic Filter
🔘 Keep all items
O Drop only polling link commands
O Drop frequent link commands and packets
Orop specified items
🖃 🗹 😳 USB 3.0 Ordered Sets
Training Sequence Eq (TSEQ)
Training Sequence 1 (TS1)  Training Sequence 2 (TS2)
USB 3.0 Link Commands
Link Pollings
Link Goods
Link Bad
Link Retry      Link Credits
Link Power Management
🖨 🔲 🖛 USB 3.0 Packets 💽
OK Cancel Apply

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:

Recording Options	×
General Filter Trigger Connectors Advanced	
Basic Trigger	
Conditions: External SMA Input Connector Currents Cur	
Link: Upstream Downstream Action: Start Recording	
Pre-trigger     Level 0%     100%	
At most 1024 MBytes of data will be kept before the trigger event starting the recording.	
OK Cancel Apply	]



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:

General Filter Trigger   SMA Output   Default State:   Pulse Duration:   1 us	
Default State:	
Pulse Duration: 1 us	
OK Cancel Apply	

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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:

Recording Options	×
General Filter Trigger Connectors Advanced	
SuperSpeed Parameters Link Speed 5 GT/s	
External Clock Reference	
Enable Spread Spectrum Clocking Tolerance	
Disable Scrambler	
Disable Terminations Detection	
Keep Skip Ordered Sets	
OK Cancel Apply	



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:

Available analyzers	<
Please select an analyzer:	
Ellisys USB Explorer 280 (EX280-61259)	
Ellisys USB Explorer 280 (EX280-61260)	
Use this analyzer by default OK Cancel	



- 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 <a>> on the toolbar.</a>

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.

View 🔻 📳 Groupi	ng 🝷 🛛 63 items displayed				Search	•
Enter text here	▼ ■ Enter text here	T - Enter	🍸 🕶 Enter t	▼ - Enter text here	🝸 🗸 Ente	в
Time	Item	Device	Endpoint	Payload	Sta	atus
0.200 000 000	Power ON				OK	
0.200 020 000	Terminations Detected				OK	
0.200 040 000	Terminations Detected				OK	
0.215 040 000	Keset				OK	
0.315 140 000					OK	
0.315 140 000	🕀 🎆 Polling.LFPS (x 17)				OK	
0.315 207 000	🗉 💮 Training Sequence Equalization (× 65'5	36)		31 bytes (FF 17 C0 14 B2 E7 02 8	82 72 6E 28 A6 BE 6D BF 4A 4A OK	
0.315 207 000	🕀 💮 Training Sequence Equalization (× 65'5	36)		31 bytes (FF 17 C0 14 B2 E7 02 8	82 72 6E 28 A6 BE 6D BF 4A 4A OK	
0.319 401 320	🗉 🧟 Training Sequence 1 (x 8)			12 bytes (00 00 4A 4A 4A 4A 4A	4A 4A 4A 4A 4A) OK	
0.319 401 320	🕀 🧸 Training Sequence 1 (x 8)			12 bytes (00 00 4A 4A 4A 4A 4A	4A 4A 4A 4A 4A) OK	
0.319 401 592	🕀 🧏 Training Sequence 2 (x 17)			12 bytes (00 00 45 45 45 45 45 4	15 45 45 45 45) OK	
0.319 401 592	🕀 🧸 Training Sequence 2 (x 17)			12 bytes (00 00 45 45 45 45 45 4	15 45 45 45 45) OK	
0.319 402 184	🕞 🎉 Link Advertisement transaction			No data	OK	
0.319 402 200	🗉 🎪 Link Advertisement transaction			No data	OK	
0.319 402 360	😠 🚀 Port Configuration transaction			No data	OK	
0.319 402 856	🚓 📴 GetDescriptor (Device)	0	0	18 bytes (12 01 00 03 00 00 00 0	09 A0 0E 68 21 00 02 01 02 03 0 OK	
0.319 404 008	Unrecognized raw data (32 symbols)			No data	ERF	ROR
0.319 404 136	Wakeup				OK	
0.319 604 136	🕞 📴 SetAddress (1)	0	0	No data	OK	
0.319 604 756	🕀 🛃 GetDescriptor (Device)	1	0	18 bytes (12 01 00 03 00 00 00 0	09 A0 0E 68 21 00 02 01 02 03 0 OK	
0.319 605 892	🕀 🕎 GetDescriptor (BOS)	1	0	42 bytes (05 0F 27 00 03 07 10 0	02 02 00 00 00 0A 10 03 00 0E 0 OK	
0.319 607 076	🕢 😥 GetDescriptor (Configuration)	1	0	57 bytes (09 02 27 00 01 01 00 8	30 64 09 04 00 00 03 08 06 50 0 OK	
0.319 608 290	🕞 📴 SetConfiguration (1)	1	0	No data	OK	
0.319 608 910	🕀 뜣 Accepted PM transaction (Go to U1)			No data	OK	
0 319 658 958	LEPS 111 EVIE				OK.	

# 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.
- 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:

Colorize USB 3.0 Packets	×
🗹 👥 Payload 🔲 🗋 Text 🗌 🔧 Field	
Data to search for	
Data type Search for all data types	~
Interpreted bytes Hex bytes: <none> ASCII text: <none> Unicode text: <none></none></none></none>	× ×
Length From 1 to 3	bytes
Search in 🔿 Packets 💿 Transactions	
Colorize items that 🛞 Match All	Colorize



# 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.
  - O Match Any Finds items that match any of the criteria.
  - On't Match All Finds items that do not match all of the selected criteria (opposite of Match All).
  - On'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:

Colorize USB 3.0 P	ackets	×
101 Payload     101	🗹 📇 Text 🔲 🏤 Field	
Texts are se	arched in column strings	
Item	Isochronous Timestamp Packet (ITP)	(e.g: GetDesc)
Device	×	(e.g: 1, 3, 7)
Endpoint	×	(e.g: 25)
Payload	×	(e.g: 31 bytes)
Status	×	(e.g: !OK, ACK)
Time	×	(e.g: 13.7)
Packet #	×	
Direction	×	
Colorize items that	Match Any	Colorize

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:

Colorize USB	3.0 Packets		X
101 Pay	load 🔲 🔚 Text 🖳	🖸 🔩 Field	t
Fields a	re searched in the Details	view	
Name	×	Value	<b>~</b>
Name	~	Value	~
Name	~	Value	×
Name	~	Value	~
Name	~	Value	×
Sample	DeviceAddress	Value	13
Colorize item	s that 🔞 Match Any	*	Colorize 🗸



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:

Σ Count

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:

Device Context	
Device Information	
Device Address	
Configuration Descriptor (hex bytes)	
	<u>^</u>
	✓
	<u>OK</u> <u>C</u> ancel

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.

evice Information
Device Address 1
Configuration Descriptor (hex bytes)
08 00 00 02 00 00 8B 00 00 00 100 00 18 48 07 68 09 02 8B 00 101 01 00 E0 96 08 0B 00 02 08 106 50 00 90 40 00 06 08 06 150 00 07 05 84 02 00 04 05 06 130 0F 00 00 10 07 05 85 03 00 104 06 06 30 03 00 00 10 07 05 186 01 00 04 07 06 30 03 00 00 110 07 05 01 02 00 04 02 06 30 10F 00 00 10 07 05 02 03 00 04 103 06 30 03 00 00 10 07 05 03 119 00 04 06 30 03 00 00 10 00 90 40 00 10 20 8 06 50 00 07 105 84 02 00 04 05 06 30 07 00 10 07 05 01 02 00 04 02 06 130 0F 00 00 10 68 1C 92 16



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.

Enter text here	🍸 🔻 !Trainii		▼ Ent	nter t 🏾	7 -	Enter	γ.	Enter text here	🍸 🕶 En.		· •
Time	Item	1	De	Device		Endpoint		Payload	St	atus	^

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.

Enter text here	▼ - Read	× • Enter t V • Enter V • 512	🗙 🝷 En 🍸 👻
Time	Item	Device Endpoint Payload	Status

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



Enter text here	γ.	GetDescriptor	<b>X</b> - I	1	× -	Enter	γ.	• Enter text here	γ.	En	7.
Time		Item		Device		Endpoint		Payload		Stat	us

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

00.275	T - Enter text here	𝔍 ▪ Enter t 🔍 ▪	Enter 🍸 🗸	Enter text here	𝕎 ▾ En 𝟹 ▾
Time	Item	Device	Endpoint	Payload	Status 🛆

# 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:

Enter text here	🛛 🕶 Enter tex	t here	<b>7</b> • 1	× -	Enter t	<b>7</b> -	Enter I	text here 7	7 -
Time	Item		Device	Y	Filter			ad	
				×	Clear criter	ria		-	

# 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

XXXX	Bus	States	
	~	Show Bus States	Shows/hides all bus states.
	0+50	Show Power Changes	Shows/hides all bus power changes (Power ON/OFF).
	8	Show Receiver Lock Changes	Shows/hides changes in the analyzer's receiver lock statuses.
	$\propto$	Show Lane Polarity Changes	Shows/hides changes in lane polarity.
	mait QQ	Show Rx Termination Changes	Shows/hides changes in the analyzer's detection of receiver terminations on the attached devices.
	LFPS XXX	Show LFPS	Shows/hides LFPS events.
٢	Orde	ered Sets	
	~	Show Ordered Sets	Shows/hides all ordered sets.
	<b>*</b>	Show Training Sequence Equalization	Shows/hides TSEQ ordered sets.
	2	Show Training Sequence 1 (TS1)	Shows/hides TS1 ordered sets.
	2	Show Training Sequence 2 (TS2)	Shows/hides TS2 ordered sets.
	٢	Show BERT Ordered Sets	Shows/hides BERT ordered sets.
		Show Skip Ordered Sets	Shows/hides SKP ordered sets.
Ð	Shov	v Link Commands	
	~	Show Link Commands	Shows/hides all link commands.
	Ð	Show Link Pollings	Shows/hides link pollings (LDN/LUP).
	+	Show Link Handshakes	Shows/hides link handshakes.
	Ð	Show Link Credits	Shows/hides link credits.
	ţ	Show Link Power Management	Shows/hides link power management link commands.
$\overline{\mathbf{O}}$	Shov	v Isochronous Timestamps	Shows/hides isochronous timestamp transactions.
1010 0101	Shov	w 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.

U	USB 3.0 Overview			
(م	/iew 📲 Groupi	ng 🔻	1\$ items displayed	
	Enter text here	Υ.	Enter text here	
	Time		Item	

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

f	irouping 🔻	_	
~	Enable Grouping		
LFPS XXXX	Group Consecutive LFPS		
٢	Consecutive Ordered Sets	~	Group Consecutive Ordered Sets
ģ	Group Power Management Transactions	٢	Group Training Sequence Equalization
Ð	Group Link Advertisement Transactions	Å	Group Training Sequence 1 (TS1)
+	Group Link Transactions	2	Group Training Sequence 2 (TS2)
Ø	Group Port Configuration Transactions	Ø	Group Link Polling
$\odot$	Group Isochronous Timestamp Transactions	٢	Group BERT Ordered Sets
.⇒	Group Transactions	₽₽	Group Skip Ordered Sets
<b>E</b> A	Group Transfers		,

The selected category is grouped or ungrouped.

# To individually group or ungroup in the I tems column:

- 1. Scroll as needed to the desired grouped or ungrouped item.
- 2. Select the  $\mbox{+}$  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:



🗉 🧸 Training Sequence 1 (x 8)	🖃 🧸 Training Sequence 1 (x 8)
-	🧏 Training Sequence 1
	🧏 Training Sequence 1
🗉 🕎 GetDescriptor (Device)	🖃 🙀 GetDescriptor (Device)
_,	🗉 🔿 SETUP transaction
	🗉 🚭 IN transaction
	⊕ ⇒ STATUS transaction

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:

<b>~</b>	Enable Grouping	Enables/Disables all grouping.
LFPS XXXX	Group Consecutive LFPS	Groups/Ungroups consecutive LFPS events.
۲	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.
ţ	Group Power Management Transactions	Groups/Ungroups power management transactions.
Ð	Group Link Advertisement Transactions	Groups/Ungroups link advertisement transactions.
+	Group Link Transactions	Groups/Ungroups link transactions.
Ð	Group Port Configuration	Groups/Ungroups power management transactions.


Transactions

$\overline{\mathbf{S}}$	Group Isochronous Timestamp Transactions	Groups/Ungroups transactions.	isochronous	timestamp
⇒	Group Transactions	Groups/Ungroups all	transactions.	
62	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.

ew 🔹 📳 Grouping	<ul> <li>63 items displayed</li> </ul>				mm		•
Enter text here 🛛 🕅	Enter text here	▼ - Enter	Y - Enter	t 🍸 •	Enter text here	- Ente	1
Time	Item	Device	End	point	Payload	Status	
0.200 000 000	Power ON					OK	
0.200 020 000	Terminations Detected					OK	
0.200 040 000	Terminations Detected					OK	
0.215 040 000	Reset					OK	
0.315 140 000	EFFS Polling.LFPS (x 17)					OK	
d.315 140 000	LFPS Polling.LFPS (x 17)					OK	
0,315 207 000	Training Sequence Equalization (x 65'536)	I			31 bytes (FF 17 C0 14 B2 E7 02 82 72 6E 28 A6 BE 6D BF 4A 4A	OK	
0,315 207 000	Training Sequence Equalization (x 65'536)	I			31 bytes (FF 17 C0 14 B2 E7 02 82 72 6E 28 A6 BE 6D BF 4A 4A	OK	
0 319 401 320	Image: Training Sequence 1 (x 8)				12 bytes (00 00 4A 4A)	OK	
0 319 401 320	Image: Training Sequence 1 (x 8)				12 bytes (00 00 4A 4A)	OK	
0 319 401 592	Training Sequence 2 (x 17)				12 bytes (00 00 45 45 45 45 45 45 45 45 45 45 45 45)	ОК	
0 319 401 592	Image: Training Sequence 2 (x 17)				12 bytes (00 00 45 45 45 45 45 45 45 45 45 45 45 45)	ОК	
0 319 402 184	Link Advertisement transaction				No data	OK	
0 319 402 200	Link Advertisement transaction				No data	ОК	
0 319 402 360	🗉 🖉 Port Configuration transaction				No data	OK	
0,319 402 856	🕂 🔂 GetDescriptor (Device)	0	0		18 bytes (12 01 00 03 00 00 00 09 A0 0E 68 21 00 02 01 02 03 0	. ок	
0,319 404 008	Unrecognized raw data (32 symbols)				No data	ERROR	
0,319 404 136	US Wakeup					OK	
0 319 604 136	🕀 🔂 SetAddress (1)	0	0		No data	OK	
0 319 604 756	🕀 🔂 GetDescriptor (Device)	1	0		18 bytes (12 01 00 03 00 00 00 09 A0 0E 68 21 00 02 01 02 03 0	. ОК	
0 319 605 892	🕀 🔂 GetDescriptor (BOS)	1	0		42 bytes (05 0F 27 00 03 07 10 02 02 00 00 00 0A 10 03 00 0E 0	. ОК	
0 319 607 076	🕀 🔂 GetDescriptor (Configuration)	1	0		57 bytes (09 02 27 00 01 01 00 80 64 09 04 00 00 03 08 06 50 0	. ОК	
0 319 608 290		1	0		No data	OK	
0,319 608 910	🕀 🏐 Accepted PM transaction (Go to U1)				No data	OK	
d.319 658 958	U1 Exit					OK	
0.319 659 058	UTPS U1 Exit					OK	
∮.319 661 458	🖃 🧸 Training Sequence 1 (x 8)				12 bytes (00 00 4A 4A)	OK	
0.319 661 458	🔏 Training Sequence 1				12 bytes (00 00 4A 4A)	OK	
0.319 661 490	K Training Sequence 1				12 bytes (00 00 4A 4A)	OK	
0.319 661 522	Training Sequence 1				12 bytes (00 00 4A 4A)	ОК	

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:

📑 Add a ne	w marker X Close
Marker #11	
	🗙 <u>Delete marker</u>

- 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.

Mark this item	
Write 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:

n 🗋	1arkers 🔻 📣 🕒		
	Mark selected item	F9	
	Delete all markers		
	GetDescriptor (Configuration)	52.391 376 748	Go to marker
	My Marker.		Edit
	<b>GetDescriptor (Device)</b> Marker #2	55.314 510 412	Delete
	GetDescriptor (String 0) Marker #3	57.993 135 132 •	

🛄 Markers 🦄

#### 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.



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.

🚥 🖪 💮 Training Sequence Equalization (x 65'536)

The Markers on sub-items menu appears:

<b>1</b>	Add a new marker	× Close
Mar	kers on sub-items	
	Training Sequence Equalization Marker #10	0.315 207 128
	Training Sequence Equalization Marker #16	0.315 207 320
	Training Sequence Equalization Marker #17	0.315 207 512
	Training Sequence Equalization Marker #15	0.315 207 768
	Training Sequence Equalization Marker #13	0.315 208 408
	Training Sequence Equalization Marker #14	0.315 208 664

2. Select the desired marker.

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

🖃 💮 Training Sequence Equalization (x 65'536)
Training Sequence Equalization
Training Sequence Equalization
🎒 Training Sequence Equalization

## 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.

USB 3.0 Overview	↓ ▷
● View ▼   Grouping ▼   63 items displayed	Search 🚽

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:

Search USB 3.0 Packel	Text	X
Data to search for		
Data type	Search for all data types	
Interpreted bytes	Hex bytes: <none> ASCII text: <none> Unicode text: <none></none></none></none>	
Length	From 1 to 25 bytes	
Search in	Packets	
Find items that	) Match All	0

#### 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.



Search USB 3.0 P	
101 011 Payload	Text 🖸 🔧 Field
Texts are s	earched in column strings
Item	(e.g: GetDesc)
Device	(e.g: 1, 3, 7)
Endpoint	(e.g: 25)
Payload	(e.g: 31 bytes)
Status	(e.g: !OK, ACK)
Time	(e.g: 13.7)
Packet #	✓
Direction	×
Find items that	Match All

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:

Name     Value     32,000 ns       Name     Value     Value	
	*
Nama Valua	~
value value	*
Name Value	*
Name Link Advertisement trans: Value Device to Host	*
Sample DeviceAddress Value 13	



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 i at the bottom-right of the *Search* dialog.
- 4. Select Count Σ 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:

Go to item		
Reference		
<ul> <li>Closest item number</li> </ul>		~
🔘 Closest item time	0.319 402 856	~
	<u> </u>	<u>C</u> ancel

- 2. Select Closest item number and enter an item number
  - or

Select Closest item time and enter a timestamp in x.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:

Sear	rch		_			
	<u>S</u> earch	Ctrl+F				
ħ	Instant search	Ctrl+I				
	Go <u>t</u> o	Ctrl+G				
	Go to next	•		USB Element: Type	×	
	Go to previous	+		Link Event: Upstream	۲	
1	Find <u>n</u> ext	F3		Link Event: Downstream	۲	
				Ordered Set: Upstream	۲	
				Ordered Set: Downstream	×	
				Packet: Upstream	⊁	LMP: Port Capabilities (2 items)
				Packet: Downstream	۲	LMP: Port Configuration Ack (2 items)
				Link Command: Upstream	×	TP: ACK (1067 items)
				Link Command: Downstream	۲	TP: NRDY (40 items)
				Error: Upstream	۲	TP: ERDY (40 items)
				Error: Downstream	۲	DP: Data Packet (613 items)
				Transaction: Device Address	۲	
				Transaction: Endpoint Number	۲	
				Transaction: Device Address	۲	
				Transaction: Handshake	•	

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, highand 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:

Instant Ti	iming								X
🕨 🕐 🤇	🔍 🔳 🚡 - 🛛 origin: 319	9,661.86 us 🔹 s	span: 1.29 us	🔹 Symbol Format 👻 🗋					
USB 3.0 THost TS2	TS2 TS2 TS2 TS2 T	52 TS2 TS2 TS2	TS2 TS2 TS2						
Device S2	TS2 TS2 TS2 TS2 T	52 T52 T52 T52	TS2 TS2 TS2						0.319 663 066 s
					-	<ul> <li>84 ns (42 symbols</li> </ul>	)		
🖧 Trainin	P packet (DP) ng Sequence 2 (x 17)								319,663.063 us
61.90 Zoom bar	61.95 319,6 62.00 us	62.10 62.15	62.20 62.25 62.30	62.35 62.40 62.45 <b>319,662.50</b>	62,55 62,60 US	62.65 62.70 6	2.75 62.80 62.85	62.90 62.95 <b>31</b> 9	63.05 63.10 63.15

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

k	Pointer Mode	Switches to Pointer Mode.
?</th <th>Pan Mode (Hold SHFT)</th> <th>Switches to Pan Mode.</th>	Pan Mode (Hold SHFT)	Switches to Pan Mode.
Q	Zoom Mode (Hold CTRL)	Switches to Zoom Mode.
	Enable/Disable Smooth Scrolling	Enables and disables the smooth scrolling feature.
<b>*</b>	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 <i>Instant Timing</i> pane is synchronized to the <i>USB 3.0 Overview</i> .
origin:	Origin Box	Displays the timestamp origin of the <i>Instant Timing</i> pane. Allows for user input of timestamp for jumping.
span:	Span Box	Displays the time span (zoom level) of the <i>Instant Timing</i> 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 <i>Instant Timing</i> 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

L)

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.

origin:	319,085.37 us	•	:
---------	---------------	---	---

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.

span: 0.49 ms 🔹

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:

Sym	bol Format 👻
~	Hex Bytes
	Raw Symbols
	Formatted Symbols

2. Select the desired format.



Symbols are updated in the format selected:

Instant Ti	imina																																															6
	_		- 0	rigin:	319,6	62,3	17.19	ns		span	1: 7	9.65	ns				Sym	bol F	orma	st =	D																											
USB 3.0 Host Device		KIFE	KFIE Iol #0	KFE							0	FE		KF	E							ю	T	KIFIE	KFI	10	7 0	000	DA0	De	0   D.	_	KFE	KFE	KF	E	KF7	D80	DA	0 0	D80		KFE	KIFE	105	С Ю	7	D01
Link State	=																																															
[→ Link Go 20.00 Zoom bar	0		25.00	12.60	30.	00		7	5,00			40.0	00		4	5.00	3	19,6	62,3	3 50.	00	55.	00		6	0.00			65.00			70.2	0		757	00		8	oho			as 100		5	0.00		9	s.loo

### 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:

nstant Timing	
👠 🙄 🔍 🚺 🚡 - origin: 319,662.76 us 🔹 span: 0.34 us 🔹 Symbol Format -	- Da
USB 3.0	
Hoot	LGOOD_3 LCRD_D SETUP DPP
LGOOD_7 LCRD_D P_ACK	
Unk State	
	80 ns (10 symbols)
8 To 10 To 10 To 10	95.4 MB/s
န္ကို Training Sequence 2 (r. 17) သေား သူသာ သူသာ သော သူသာ သူသာ သူသာ သူသာ သူသာ	Q32 Q34 Q36 Q38 G32 G34 G36 G38 Q30
319,662.80 us 62.89 62.89 62.89 62.89	51.52 52.74 52.76 52.76 52.76 52.76 52.76 52.76 52.76 52.76



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.

Instant Tir	ning		C
N 🕐 🔍	🐛 🚺 🚡 -   origin: 319,665.32 us 🛛 - sp	oan: 0.38 us - Symbol Format - 🕞	
USB 3.0	4	6	
Host	ACK		DPH DPP
Device		LCRD_A	LCRD_B
Unk State			
	_	4 32 ns (16 symbols)	178 ns (89 symbols)
		. Se of the spinology	231 M0/s
65.34	65.36 65.38 319,665.40 us	ત્વ હોય હોય હોય હોય હોય હો	2 65.54 65.58 65.58 <b>319,665.60 us</b> 65.82 65.84 65.86 65.88 65.70
Zoom bar			

## 8.5 Exporting Images

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



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



#### The Save menu appears:

Save						? 🗙
Savejn:	🗀 Ellisys USB Ex	plorer 280 Analyzer	~	3 🔊	<del>ب</del>	
My Recent Documents	C Drivers Samples					
My Documents						
My Computer						
My Network	File <u>n</u> ame: Save as <u>t</u> ype:	Mass Storage (origin GIF Image (*.gif)	319,662,317.19	ns, span	<ul><li></li><li></li><li></li></ul>	<u>S</u> ave Cancel



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.
- Select a directory location. 3.
- Select the file type in Save as type drop-down (e.g., \*.gif, \*.png, \*.jpg, \*.bmp). 4.
- 5. Click on Save.

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

#### Link State Indications 8.6

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	UO
BLUE	Low power states



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

The link state appears in the fly-over indication:

Instant Tir	ming				
🕨 🕐 🛛	🔍 🔲 🚡- 🛛 origin: S	19,402.02 us 🔹	span: 0.32 us	• Symbol Format • 🕞	
USB 3.0					
Host	152	TS2	TS2		LCRD_A LCRD_B LCRD_C LCRD_D
Device	TS2	TS2	TS2		LGOD_7 LCRD_A LCRD_B LCRD_C LCRD_D
Unk State					
		Polling.	Configuration		
🖉 Link Cre					
ACK Pa 02		02.08 02.1	0 02.12	02.14 02.16 0	2.19 319,402.20 us 02.22 02.24 02.28 02.29 02.30 03.32 02.34

# 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	ОК
0.319 664 588	🗢 DATA Packet (DP)	1	1	36 bytes (00 80 02 02 1F 00 00 00 54 69 6E 79 44	ОК
0.319 664 740	<ul> <li>Link Good (0)</li> </ul>			2 bytes (00 10)	ОК
0.319 664 760	🚀 Link Credit (A)			2 bytes (80 A0)	ОК

Instant Tir	ning								X
🕨 🕐 🔍	🔪   🎹 🚡 -   o	origin: 319,664.51	us 🔹 span: 0.31 us	<ul> <li>Symbol Forma</li> </ul>	st 🕶 🗋				
USB 3.0									
Host							LGOOD_0	LCRD_A	
Device	LGOOD_5	LCRD_B	DPH		DPP				
Link State									
Link State									
4.52	64.54	64.56 6	4.58	i4.62 64.64	64.66 64.68	64.70 64	64.74	64.76 64.78	64.82
Zoom bar	04.54	04.50	319,664.60 us		04.00	0450 04	0404	0450 0450	319,664.80 us



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).

Summary			×
③ ⑤ Find next			÷
Item		Total	^
LMP: Port Capabilities	2	40 bytes	
LMP: Port Configuration	2	40 bytes	-
TP: ACK	659	12.9 kB	
TP: STATUS	7	140 bytes	~

#### 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.

0.319 402 608	🔏 Port Configuration (Lf	4P)	N	lo data		OK
0.319 402 680	🗧 Link Good (1)		2	2 bytes (01 E8)		OK
0.319 402 700	💋 Link Credit (B)		2	2 bytes (81 58)		OK
	•					
Instant Timing						X
🕲 🔍   🎹 🚡 -   origin	: 319,402.56 us 🔹 span: 0.31 us 📼	Symbol Format 👻 🗋				
USB 3.0						
Host	P_CONF				LGOOD_1 LCRD_B	SETUP
Device LOR D_A	L	GOOD_1 LCRD_B	P_ACK			
Link State						
A Port Configuration (LMP)						
02.58 319,402.60 u	02.62 02.64 02.66 02.68	02.70 02.72	02.74 02	2.76 02.78	02.82 02.84 02.86	02.88
Zoom bar						

#### To Synchronize to the Instant Link State pane:

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



Instant Link State				×
🚱 🚱 Go to Next Transition	ı •			Ŧ
Transitions States				
State	Transition Reason	Н	D	^
KX.Delett.Reset	Warm Reset			
Polling.LFPS	Far-end RRX-DC Detected	•	٠	
- Polling.RxEQ	LFPS Handshake	•	٠	_
Polling.Active	TSEQ Ordered Sets Transmitted	•	•	
Polling.Configuration	8 Consecutive TS1 or TS2 Received	٠		
Polling.Idle	TS2 Handshake	٠	٠	
UO	Idle Symbol Handshake	•	٠	
U1	LGO_U1 Sequence Completed	•	•	
Recovery.Active	U1 LFPS Exit Handshake	•	٠	
Recovery.Configuration	8 Consecutive TS1 or TS2 Received	•	٠	
Recovery.Idle	TS2 Handshake	•	•	Ξ
	Tdle Symbol Handshake			$\mathbf{\mathbf{z}}$
👏 Summary 🞎 Instant Lini	< State			

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

Instant T	iming																		
🕨 🕐 🤇	۵ ا	🚡 - 🛛 ori	gin: 319,400	).59 us	▼ spa	an: 1.34 us		<ul> <li>Symbol</li> </ul>	Format 👻										
USB 3.0																			
HostTSEQ	TSI	EQ T	SEQ T	5EQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TS1 TS1 T	'SI TSI TSI	TS1 TS1 TS1	TS2 TS2 1	IS2 TS2 TS	52 TS2 TS	2 TS2 T	S2 TS2 TS2
<b>Pevice</b> EQ	TSI	EQ T	SEQ T	5EQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TSEQ	TS1 TS1 T	'S1 TS1 TS1	TS1 TS1 TS1	TS2 TS2 1	IS2 TS2 TS	52 TS2 TS	2 TS2 T	S2 TS2 TS2
Link State																			
Unk State																			
												Polling.Ac	ctive						
0.60 00		e 1 .70 ' 00.	75 00.80	00.85	00.90	00.95	1 '!		1 or 10	·	01.25 01.3	319,401. 0 0135 01			01.60 01.65	01.70	01.75 01.8	30 01.85	01.90
Zoom bar		JU UU.	/5 00.80	00.85	00.90	319,	401.00 us	05 01.10	01.15	01.20	01.25 01.3	0 01,35 01	1,40 01,45 31	9,401.50 us	01.60 01.65	01.70	01.75 01.8	50 01.85	01.90

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:

Find next			
Item		Total	
1000 USB Element Summary	Count	Bytes	
010 0101 <b>Total</b>	141'838	5.75 MB	
IO10 By Type			
<ul> <li>Ordered set</li> </ul>	138'263	4.06 MB	
<ul> <li>Packet</li> </ul>	3'534	1.69 MB	
Raw data	1	32 bytes	
<ul> <li>Link event</li> </ul>	40	0 bytes	
□ XXX Link Events	Count	Bytes	
X0X Total	40	0 bytes	
🖃 💓 Upstream			
Lane Polarity Changed		0 bytes	
<ul> <li>Rx Termination Detected</li> </ul>	1	0 bytes	
<ul> <li>Bit Lock Changed</li> </ul>		0 bytes	
<ul> <li>Char Lock Changed</li> </ul>			
LFPS	18	0 bytes	
🖃 💓 Downstream			



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 Find next 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.

Instant Link State			X
😟 🕲 Go to Next Transitio	n •		Ę
Transitions States			
State	Transition Reason	Н	D
SS.Disabled	Starting State		
Rx.Detect loop	Far-end RRX-DC Not Detected		
Rx.Detect.Quiet	Far-end RRX-DC Not Detected		
Polling.LFPS	Far-end RRX-DC Detected	•	•
Rx.Detect.Reset	Warm Reset		
- Polling.LFPS	Far-end RRX-DC Detected		•
Polling.RxEQ	LFPS Handshake	•	•
Polling.Active	TSEQ Ordered Sets Transmitted	•	•
Polling.Configuration	8 Consecutive TS1 or TS2 Received	•	•
Polling.Idle	TS2 Handshake	•	•
U0	Idle Symbol Handshake	•	•
U1	LGO_U1 Sequence Completed		٠
Recovery.Active	U1 LFPS Exit Handshake	•	•
Recovery.Configuration	8 Consecutive TS1 or TS2 Received	•	•
···· Recovery.Idle TS2 Handshake		•	•
UO	Idle Symbol Handshake	•	•
芝 Summary 🛟 Instant Lin	k State		

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	UO
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:

Instant Link State			1
🔄 🕲 Go to Next Transitio	n 🝷 🛛 19 host states	, 19 device states	
Transitions States			
States (Host)	Next State	Transition	
SS.Disabled	SS.Disabled	Directed (Remove Terminations)	
🖻 SS.Inactive	Active	Timeout	
🖃 Rx.Detect			
Reset			
- Active			
Quiet			
📮 ·· Polling			
···· LFPS			
···· R×EQ			
Active			
···· Configuration			
Idle			
···· Compliance Mode			
UO			
U1			
U2			
U3	Ry Detect:	Warm Reset handling and receiver terminations detection	
🗄 - Recovery		-	
🖶 - Loopback		as not detected far-end receiver terminations and waits	
🗄 - Hot Reset	ror 12 ms ber	ore attempting another detection	
🗊 Details 🌍 Summary 🧜	Directant Link State	Descuding Achivity	

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:

S DEC HEX BIN	OFS LEN 📑 📄
¥	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:

V DEC HEX BIN OFS LEN							
Name	Value	Dec	Hex	Bin	Offset	Length	[
→ Packet							
🚽 🥥 Packet Type	Transaction Packet	4	0×04	00100	0	5	
🗝 🧼 Route String	0:0:0:0:0	0	0×00000	0000 0000000	5	20	
🧼 Device Address	1	1	0×01	0000001	25	7	
🚽 🥥 SubType	STATUS	4	0×4	0100	32	4	
\cdots 🧳 Endpoint Direction	Host to Device	0	0×0	0	39	1	
🗝 🧼 Endpoint Number	0	0	0x0	0000	40	4	
							ΣÌ

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

- 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:

Save As						? 🛛
Savejn:	🚞 Ellisys USB Ex	plorer 280 Analyzer	~	3 🤣	<del>ب 🔝</del> 👏	
My Recent Documents	C Drivers					
Desktop						
My Documents						
My Computer						
	File <u>n</u> ame:	Details			▼	<u>S</u> ave
My Network	Save as <u>type</u> :	Text file (*.txt)			<b>~</b>	Cancel

- 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:

Raw data															E
Data type:	Rav	v dat	a				-						Sea	irch	- ;
	0	1	2	3	4	5	6	7	8	9	A	в	С	0123456789ABC	-
0x0000:	08	00	00	02	1E	02	00	04	00	00	00	00	7B		
0x000D:	F2	06	90	С1	53	25	FD	21	DB	BF	94	63	A1	. <mark></mark> .S%.!c.	
Ox001A:	24	FO	37	АЗ	0C	24	F1	ΕO	F4	CF	43	Ε6	5A	\$.7\$C.Z	-
0x0027:	30	ЕD	34	22	AЗ	57	16	FC	A6	F1	A4	во	DA	0.4".W	
0x0034:	OA	A1	2 D	08	СВ	9B	60	A5	44	DA	ΕO	OF	AE	`.D	
0x0041:	DO	$C\mathbf{E}$	OC	22	ЕC	D4	DB	F9	F4	10	$\mathbf{E}\mathbf{C}$	В8	1B	"	
0x004E:	ЗD	4D	A4	7D	FΕ	93	F2	32	19	50	B2	EΒ	03	=M.}2.P	
Ox005B:	A8	86	В5	ΕB	12	54	13	F5	87	47	EF	84	05	TG	
0x0068:	CF	D5	Ε1	15	90	41	50	во	5E	12	00	С7	DC	AP.^	
0x0075:	4C	1C	7B	В6	7E	59	36	E8	2 C	54	44	08	FD	L.{.~Y6.,TD	
0x0082:	97	A5	26	В5	06	В4	F8	F9	С4	1D	51	04	BF	Q	
0x008F:	71	9A	53	4 A	73	В4	24	36	07	F6	79	DO	С8	q.SJs.\$6y	
0x009C:	95	4D	1C	АЗ	80	9C	OC	93	Α9	AB	89	A8	0C	. M	•

#### 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 Mass Storage Class Transfers Transactions with Payload Link Transactions **USB** Descriptor Transfers

Raw Data/Raw Chars Command/Data/Status Payload Packet/Link Command 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:

Options	(
Protocol verifications	
Select in the list below fields to be verified by the software.	
USB 3.0 Low Level	
🖭 🔽 USB 3.0 Packet	
🗄 🖓 🔽 USB 3.0 Transaction	
🖃 🗹 Standard USB Requests	
👾 🔽 USB Setup Transaction	
🗄 🔽 USB Standard Request	
OK Cancel	Apply

- 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:

③ Find next			
Item		Total	
<sup>1010</sup> USB Element Summary	Count	Bytes	Ī
000 <b>Total</b>	141'838	5.75 MB	
International State S			
<ul> <li>Ordered set</li> </ul>	138'263	4.06 MB	
<ul> <li>Packet</li> </ul>	3'534	1.69 MB	
<ul> <li>Raw data</li> </ul>	1	32 bytes	
<ul> <li>Link event</li> </ul>	40	0 bytes	
X001 Link Events	Count	Bytes	
XXX Total	40	0 bytes	
🖃 💯 Upstream			
Lane Polarity Changed		0 bytes	
<ul> <li>Rx Termination Detected</li> </ul>	1	0 bytes	

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

Sum	imary			X
¢	) 🕝 Find next			
Iten	n		Total	^
	ologe Errors	Count	Bytes	
	🗤 Total	2	0 bytes	
	🍖 Upstream			
	Framing Error	1	0 bytes	
	<ul> <li>Elastic Buffer Overflow</li> </ul>		0 bytes	
	<ul> <li>Elastic Buffer Underflow</li> </ul>		0 bytes	
	Unexpected K Symbols	1	0 bytes	
	Decoding Error		0 bytes	
	<ul> <li>Disparity Error</li> </ul>		0 bytes	
	<ul> <li>Link Bad</li> </ul>		0 bytes	
	<ul> <li>Lup Missing</li> </ul>		0 bytes	_
	Skip Missing		0 bytes	
	Header CRC Error		0 bytes	

- 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:

	<u>-</u>			
0.319 402 856	🕞 🕎 GetDescriptor (Device)	0	0	18 bytes (12 01 00 03 00 00 00 09 A0 0E 68 21 00
0.319 402 856	🕞 🔿 SETUP transaction	0	0	8 bytes (80 06 00 01 00 00 12 00)
0.319 402 856	🚓 🔿 SETUP link transaction	0	0	8 bytes (80 06 00 01 00 00 12 00)
0.319 402 972	💋 Link Credit (C)			2 bytes (82 18)
0.319 403 004	🔜 🔶 ACK link transaction	0	0	No data
0.319 403 004	👉 ACK Packet (TP)	0	0	No data
0.319 403 076	→ Link Good (2)			2 bytes (02 A8)
0.319 403 096	🖉 Lini 🥸 Invalid packet framing.	2 bytes (82 18)		
0.319 403 178	🕀 🚓 IN trar 🔇 Unexpected K symbols detecte			18 bytes (12 01 00 03 00 00 00 09 A0 0E 68 21 00
0.319 403 694	🕀 🔿 STATL 🔇 The Link Control Word CRC-5 is	d.	No data	

#### 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:

×
iks

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:

Capture:     N/A     MB       Throughput:     N/A     MB/s       Phy Error Ratio:     N/A       Link Error Ratio:     N/A       Downstream       Capture:     N/A       Throughput:     N/A       MB/s	Capture:     N/A     MB       Throughput:     N/A     MB/s       Phy Error Ratio:     N/A       Link Error Ratio:     N/A       Downstream       Capture:     N/A       Throughput:     N/A       Phy Error Ratio:     N/A	neral Performance Ad	vanced Options	
Phy Error Ratio: N/A   Link Error Ratio: N/A   Downstream Capture:   Capture: N/A   MB   Throughput: N/A   MB/s   Phy Error Ratio: N/A	Phy Error Ratio: N/A   Link Error Ratio: N/A   Downstream	•	N/A MB	
Link Error Ratio: N/A Downstream Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A	Link Error Ratio: N/A Downstream Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	Throughput:	N/A MB/s	
Downstream       Capture:     N/A       MB       Throughput:     N/A       MB/s	Downstream       Capture:     N/A       MB       Throughput:     N/A       MB/s       Phy Error Ratio:     N/A       Link Error Ratio:     N/A	Phy Error Ratio:	N/A	
Capture:         N/A         MB           Throughput:         N/A         MB/s           Phy Error Ratio:         N/A	Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	Link Error Ratio:	N/A	
	Reset <u>T</u> hroughputs Reset <u>E</u> rrors	Capture: Throughput: Phy Error Ratio:	N/A MB/s N/A	

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

#### Analyzer

	Status	connected		he analyzer's ro erly communica	•				
	Duration	Indicates	the elapsed	I time of the rec	ording				
	Total	Indicates the amount of data captured.							
	Recorded								
General		Provides	capture,	performance,	link	status,	and	error	



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.

Analyzer Status: Not connected Duration: N/A Total recorded: N/A General Performance Advanced Options Upstream Capture: N/A MB Throughput: N/A MB/S Phy Error Ratio: N/A Link Error Ratio: N/A Downstream Capture: N/A MB Throughput: N/A MB/S Phy Error Ratio: N/A Link Error Ratio: N/A Enter Status: N/A MB/S Phy Error Ratio: N/A Link Error Ratio: N/A Enter Status: N/A Link Error Ratio: N/A Enter Status: N/A Enter Status: N/A NA	ording Activity		
Duration: N/A Total recorded: N/A  General   Performance Advanced Options	Analyzer		
Seneral     Performance     Advanced     Options       Upstream     Capture:     N/A     MB       Throughput:     N/A     MB/s       Phy Error Ratio:     N/A       Link Error Ratio:     N/A       Oownstream     Capture:       Capture:     N/A       MB     Throughput:       Phy Error Ratio:     N/A       MB     Throughput:       N/A     MB       Throughput:     N/A       Phy Error Ratio:     N/A       Link Error Ratio:     N/A	Status: Not connecte	d	
Upstream         Capture:       N/A         Throughput:       N/A         MB/s         Phy Error Ratio:       N/A         Link Error Ratio:       N/A         Capture:       N/A         MB         Throughput:       N/A         MB         Phy Error Ratio:       N/A         MB/s         Phy Error Ratio:       N/A         Link Error Ratio:       N/A	Duration: N/A	Total recorded: N,	/A
Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	General Performance Adva	nced Options	
Throughput: N/A ME/s Phy Error Ratio: N/A Link Error Ratio: N/A Downstream Capture: N/A ME Throughput: N/A ME/s Phy Error Ratio: N/A Link Error Ratio: N/A	Upstream		
Phy Error Ratio: N/A Link Error Ratio: N/A Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	Capture:	N/A MB	
Link Error Ratio: N/A  Downstream Capture: N/A MB Throughput: N/A ME/s Phy Error Ratio: N/A Link Error Ratio: N/A	Throughput:	N/A MB/s	
Capture: N/A MB Throughput: N/A ME/s Phy Error Ratio: N/A Link Error Ratio: N/A	Phy Error Ratio:	N/A	
Capture: N/A MB Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	Link Error Ratio:	N/A	
Throughput: N/A MB/s Phy Error Ratio: N/A Link Error Ratio: N/A	Downstream		
Phy Error Ratio: N/A Link Error Ratio: N/A	Capture:	N/A MB	
Link Error Ratio: N/A	Throughput:	N/A MB/s	
	Phy Error Ratio:	N/A	
Reset <u>I</u> hroughputs Reset <u>E</u> rror	Link Error Ratio:	N/A	
			Reset Throughputs Reset Errors

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						



#### To reset throughput and error indications:

 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.

nalyzer Status: No	t connecte	d				
Duration: N/	A	Total reco	rded:	N/A		
eneral Perform	. Adus	and a u				
	ance	Option	s			
Upstream						
State:	N/A					
Capture:		N/A				packets
Throughput:	Last	N/A	MB/s		N/A	packets/s
	Min	N/A	MB/s		N/A	packets/s
	Max	N/A	MB/s		N/A	packets/s
Errors:	Phy	N/A		Link	N/A	
Error Ratio:	Phy	N/A		Link	N/A	
Downstream						
State:	N/A					
Capture:		N/A	MB		N/A	packets
Throughput:	Last	N/A	MB/s		N/A	packets/s
	Min	N/A	MB/s		N/A	packets/s
	Max	N/A	MB/s		N/A	packets/s
Errors:	Phy	N/A		Link	N/A	
Error Ratio:	Phy	N/A		Link	N/A	
					Reset Throu	ghputs Reset Er

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



#### To reset throughput and error indications:

 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

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

Analyzer				
Status:	Not conne		N / A	
Duration:	N/A	Total recorded:	N/A	
General Pe	rformance Ac	Ivanced Options		
Options				
	uu dialaa whaa u	ecording starts		
_	-	error ratios on large cha		
Muc	umatically reset	error racios on large cha	nges	

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

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

Check for Update		×
Checking for an upd	ate	
Update Information Current version New version	1.1.3518	
Summary		
Check automatically eve	ry Startup 💌 💶 🛄	

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	Kfe	D10	D00	D00	D00	D00	D00	D00
D08	D00	D00	D00	Kfe	D00						
D45	D00	D00	D00	K£7	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						
D45	D00	D00	D00	Da0	D00						
D45	D00	D00	D00	Kfe	D00						
D45	D00	D00	D00	Kfe	D00						
D45	D00	D00	D00	Kfe	D00	D00	D00	D00	D00	D00	Dfd
D45	D00	D00	D00	K£7	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						
Kbc	D00	D00	D00	D58	D00						
Kbc	D00	D00	D00	Kfe	D00						
D00	D00	D00	D00	Kfe	D00						
D00 D08	D00 D00	D00	D00	Kfe	D00	D00	D00	D00	Kfe	D00	D00
D08 D45	D00 D00	D00 D00	D00 D00	KIE Kf7	D00 D00	D00	D00	D00	Kfe	D00	D00
D45 D45	D00 D00	D00 D00	D00 D00	D82	D00 D00	D00 D00	D00 D00	D00 D00	KIE	D00 D00	D00
D45 D45	D00 D00	D00 D00	D00 D00	D82 D18	D00 D00	D00 D00	D00 D00	D00 D00	KIE Kf7	D00 D00	D00 D00
D45 D45	D00 D00	D00 D00	D00 D00	D18 D82	D00 D00	D00 D00	D00 D00	D00 D00	D00	D00 D00	D00 D00
	D00 D00	D00 D00	D00 D00	D82 D18	D00 D00	D00 D00	D00 D00	D00 D00	D00 D10	D00 D00	D00 D00
D45										D00 D00	D00 D00
D45	D00	D00	D00	Kfe	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	K£7	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	Kfe	D00								
D45	D00	Kf7	D00								
D45	D00	D00	D00	D04	D00	D00	D00	D00	D00	D81	D00
D45	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
	xample in to col		escribes	the raw	ı charac	ter form	at (Host	side). S	Symbols	are wra	pped from
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 D08	D00 D00	Kfe Kf7	D00 D00	D00 D00	D00 D00	D00 D10	D00 D64	D00 D00	D00 D00	D00 D00	D00 D00
D08 D45	D00 D00	D82	D00 D00	D00 D00	D00 D00	D10 D00	D04 D43	D00 D00	D00 D00	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 D45	D00 D00	Kfe Kf7	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D45 D45	D00 D00	D83	D00 D00	D00 D00	D00 D00	D00 D00	D00 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 D08	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D08 D45	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 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 D45	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D45 D45	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D15 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 D10	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
Kbc D00	Kfe Kfe	D00 D00	D00 D00	D00 D00	D00 D00	D10 D00	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D08	Kfe	D00	D00	D00	D00	D00 D10	D00	D00	D00	D00	D00
D45	K£7	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 D00
D45 D45	D68 Kfe	D00 D00	D00 D00	D00 D00	D00 Kfb	D80 Da0	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D45 D45	Kfe	D00	D00	D00	Kfb	D80	D00	D00	D00	D00	D00 D00
D45	Kfe	D00	D00	D00	Kfb	Da0	D00	D00	D00	D00	D00
D45	K£7	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 Do0	D00	D00	D00	D00	D00
D00 D00	Da0 Kfe	D00 D00	D00 D00	D00 D00	D00 D04	Da0 D02	D00 D00	D00 D00	D00 D00	D00 D00	D00 D00
D00 D00	KIE Kfe	D00 D00	D00 D00	D00 D00	D04 D00	D02 D00	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	K£7	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 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 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

