Analyze.

Generate.

Examine.

All-in-one SuperSpeed USB 3.0 Analysis System including Protocol Analyzer, Traffic Generator and Compliance Examiner

ellisys

Better Analysis.

Unique Ellisys Features:

- **Precise graphical display of protocol items and events**
- **Non-intrusive capture with no retiming and automatic termination detection**
- **Concurrent USB2.0 and USB 3.0 traffic capture and visualization**
- **Advanced link layer and protocol errors checking**
- **Support of latest Mass Storage and USB Attached SCSI (UAS) protocols**
- **Maximum bandwidth Host and Device emulation**
- **Reliable link, protocol and class layers compliance testing**

Ellisys USB Explorer 280
All-in-one USB 3.0 and 2.0 Analysis System

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Overview

The Ellisys USB Explorer 280 is a sophisticated protocol test and analysis system for USB SuperSpeed traffic monitoring, driver and software stack debugging, and performance analysis. The USB Explorer 280 is designed to reduce R&D time by finding issues early and debugging more efficiently, and can improve quality and reliability by verifying adherence to the specification.

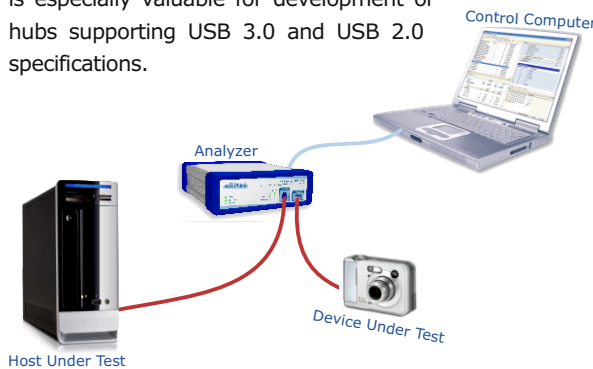The multifunction USB Explorer 280 can:

- Analyze USB 3.0 (SuperSpeed) and USB 2.0 links (High Speed, Full Speed, Low Speed)
- Emulate USB hosts and devices
- Automatically detect link speed and SS receivers
- Upload and display live data during recording
- Record LFPS states and display state transitions
- Connect to differential SMA for alternative front-end probing during prototype stages

The USB Explorer 280 builds on a successful legacy of Ellisys USB analyzer and generator products, and delivers a superior design efficiency that includes an embedded 4GB of memory, configuration-flexible hardware, and a custom-made processor with the power needed to test and analyze the USB 3.0 5GT/s SuperSpeed mode.

Each Ellisys USB Explorer 280 hardware unit is capable of acting as either a protocol analyzer or packet generator, depending on the configuration.

Configurations

The **Ellisys USB Explorer 280 Analyzer** includes extensive protocol analysis features, including real-time monitoring and live upload of captured traffic, detailed decoding of standard and class requests, trigger, filter, and search functions, and comprehensive statistical analyses. Automated support for spread spectrum clocking (SSC), data scrambling, and receiver equalization techniques is included.

The USB Explorer 280 Analyzer is based on the intuitive Ellisys Visual USB™ software application that is well-proven for performance optimization and validation of device enumeration, bus operation, and interoperability testing. New analysis features designed specifically for USB SuperSpeed have been added to provide the user with a comprehensive analysis solution ideal for any USB design effort.

The **Ellisys USB Explorer 280 Generator** supplements protocol analysis by emulating USB hosts and devices. The USB Explorer 280 Generator is ideal for testing corner cases, error recovery protocols, link power state transitions, and link training issues. The Generator includes a low-level, powerful scripting interface favored by engineers looking to control protocol sequences and responses at precise timing granularities.

The **Ellisys USB Explorer 280 Duo** is a highly flexible bundle of two full-featured units that can be used as one analyzer and one generator, two analyzers, or two generators, depending on the needs of the user. Even more convenient that simply having these two functions on a single hardware unit, this innovative and flexible architecture allows engineers to share units among the R&D team.

Typical Analysis Setup

The USB Explorer 280 is connected in a logically passive mode to record traffic and bus events passing between host and device. The analyzer provides same-link concurrent support for USB 3.0 and USB 2.0 speeds, which is especially valuable for development of hubs supporting USB 3.0 and USB 2.0 specifications.

Host Emulation Setup

The USB Explorer 280 Generator is connected through a USB Explorer 280 Analyzer to a USB device. The Generator emulates the automated protocol processes of the USB host, while allowing the user full control over these processes, including arbitrary packet and error generation. The Analyzer records all traffic and gives real-time performance and compliance information.

Examiner Compliance Suite (optional, sold separately)

The Ellisys Examiner is an automated, stand-alone SuperSpeed USB 3.0 host and device compliance test application that operates on an enabled EX280 hardware unit. Examiner delivers a comprehensive set of robust compliance tests covering Chapter 6 (Physical Layer), Chapter 7 (Link Layer) of the USB 3.0 Specification, Chapter 9 (Device Framework), class-specific tests for Mass Storage devices, as well as electrical tests.
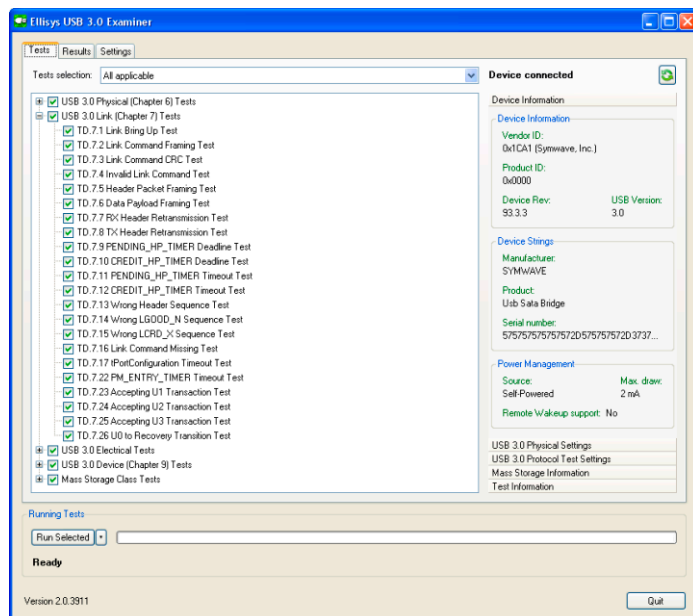
Test results are pass/fail, annotated with descriptive detail, and are summarized in a convenient HTML-formatted summary report upon completion of testing. Protocol traces from each test can optionally be captured automatically with an EX280 Protocol Analyzer, providing for quick and in-depth analysis of test results.

Examiner is an essential tool for IC, IP, or device manufacturers preparing for certification. Examiner is not only useful at the end of the development cycle, but from the beginning to the end for ensuring non-regressions with new improvements.

Operation

Operating Examiner is simple. Just attach your device or host under test to the EX280 platform, click the Run button, and wait for the results. Examiner does all the work from here. Hundreds of tests and sub-tests execute in a few minutes. An EX280 Protocol Analyzer can be optionally installed between the Examiner-enabled EX280 platform and the unit under test, to capture test activity for detailed review of results in the intuitive Ellisys trace format.

When Examiner is launched, a summary of the device or host characteristics is conveniently and automatically displayed on the straightforward user interface. Applicable tests are automatically selected or can be configured manually.

Dynamic Test Configuration

Examiner reads the attached device's descriptors automatically upon attach, and structures the available tests accordingly. For example, a mass storage class device will enable selection of tests specific to that class only.

The device's configurations, interfaces, and endpoints are all read by Examiner and test cases and suites are dynamically created and made available to the user, according to the device's capabilities, such as class, speeds supported, number of endpoints, and endpoint types.

Available Test Suites

Physical Layer (Ch. 6) Tests
- Lane Polarity Inversion Test
- Skip Test
- Elasticity Buffer Test
- LFPS Frequency Test
- Polling.LFPS Duration Test
- U1 Exit Duration Test
- U2 Exit Duration Test
- U3 Wakeup Duration Test

Link Layer (Ch. 7) Tests
- Link Bring-up
- Link Commands Framings Robustness
- Link Commands CRC-5 Robustness
- Invalid Link Commands
- Header Packet Framing Robustness
- Data Packet Framing Robustness
- RX Header Packet Retransmission
- TX Header Packet Retransmission
- PENDING_HP_TIMER Deadline
- CREDIT_HP_TIMER Deadline

Link Layer (Ch.7) Tests
- PENDING_HP_TIMER Timeout
- CREDIT_HP_TIMER Timeout
- Wrong Header Sequence
- Wrong LGOOD_N Sequence
- Wrong LCRD_X Sequence
- Run out of Link Credits
- Link Command Missing (US)
- tPortConfiguration Time Timeout
- Low Power initiation for U1 (DS)
- Low Power initiation for U2 (Ds)
- PM_LC_TIMER Deadline (DS)
- PM_LC_TIMER Timeout (DS)
- PM_ENTRY_TIMER Timeout (US)
- Accepted Pwr Mgmt Transaction for U1
- Accepted Pwr Mgmt Transaction for U2
- Accepted Pwr Mgmt Transaction for U3
- Transition to U0 from Recovery
- Hot Reset Detection in Polling (US)
- Hot Reset Detection in U0 (US)
- Hot Reset Initiation in U0 (DS)

Device Framework (Ch. 9) Tests
- Device Descriptor
- Standard Configuration Descriptor
- Standard Int. Association Descriptor
- Standard Interface Descriptor
- Endpoint Descriptor
- SS Endpoint Companion Descriptor
- BOS and Device Capability Descriptor
- String Descriptor
- Halt Endpoint
- Bad Descriptor
- Bad Feature
- Remote Wakeup
- Set Configuration
- Suspend/Resume
- Function Remote Wakeup
- Enumeration
- LTM
- Bus- or Self- Powered
- Endpoint Stall

Mass Storage Class Tests
- Interface Descriptor

More information on: www.ellisys.com/products/usbex280

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Analyzer Features

- Non-intrusive capture with no retiming and automatic terminations detection
- Hardware triggering and filtering
- Powerful, easy-to-use, industry leading software
- InstantTiming™ view for graphical, intuitive understanding of bi-directional traffic elements and critical timing measurements

Generator Features

- Powerful host and device emulation, capable of supporting highest throughput
- Generation of arbitrary packets with precise timing
- Error injection capabilities to test recovery mechanisms
- Replay of traces captured by analyzer
- Powerful scripting environment with integrated editor and debugger

Technical Specifications

Analyzer Characteristics

- Supported specifications: USB 3.0, USB 2.0, and USB 1.x
- Supported link speeds: 5GT/s, 480Mb/s, 12Mb/s and 1.5Mb/s
- Timestamp accuracy: 2ns for USB 3.0, and 16.7ns for USB 2.0/1.x
- Low-level error detection: CRC-5, CRC-16, CRC-32, state transition errors, invalid PID, framing errors, frame sequence errors, length errors
- Bus states: detection of SuperSpeed link operating states and all USB 2.0/1.x electrical bus states

Generator Characteristics

- Supported specifications: USB 3.0, USB 2.0, and USB 1.x
- Supported link speeds: 5GT/s, 480Mb/s, 12Mb/s and 1.5Mb/s
- Supported modes: host or device emulation
- Timing: 2ns for USB 3.0, and 16.7ns for USB 2.0/1.x

Embedded Memory

- 4 GBytes of FIFO Memory
- Data is stored in highly optimized format
- Analyzed data is uploaded in real time through a USB connection

Front-Panel Connectors

- Link under test: USB 3.0 STD-A and STD-B

Rear-Panel Connectors

- Computer interface: USB STD-B
- Auxiliary equipment: supports connection of extension boards
- SMA trigger: in and out, 50 Ω, max 5VDC
- Inter-equipment: in and out, supports connection of several units together
- Power: max 25W

Power Supply

- 12VDC nominal (accepts up to 24VDC)
- Universal 90-264VAC, 47-63Hz, Energy Star

InstantTiming™ View

- Nanosecond-precise display
- Automatic quotes of important timings
- Concurrent USB 2.0 and USB 3.0 display, as well as Vbus voltage and power display

Front-panel Indicators

- Power: unit powered on
- Operating: unit performing requested task
- Trigger: trigger event detected
- Link, Receive and Transmit for US and DS

Enclosure

- 174 x 111 x 58 mm (6.9 x 4.4 x 2.3")
- 1.2 kg (2.6 lbs)

Hardware Upgrade

- The decoding engine is automatically updated with each software release (no user intervention required)

Product Warranty

- Two years warranty

Ordering Information

Description	Code
USB Explorer 280 Analyzer (includes 1 hardware unit with USB analysis option, 1 CD-ROM, 2 USB cables and 1 carrying bag)	USBEX280A
USB Explorer 280 Generator (includes 1 hardware unit with USB generation option, 1 CD-ROM, 2 USB cables and 1 carrying bag)	USBEX280G
USB Explorer 280 Duo (includes 2 hardware units both able to operate as either analyzer or generator, 2 CD-ROMs, 4 USB cables and 2 carrying bags)	USBEX280DUO
SuperSpeed Examiner Compliance Suite Option (includes CD with Examiner software; requires one of the configurations listed above)	USBEX280-EXAM

Options Chart

	Analyzer	Generator	Duo
Hardware units	1	1	2
USB Analysis	yes		yes
USB Generation		yes	yes
USB Examiner	opt	opt	opt

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