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## USB*Tracer/Trainer*

The Teledyne LeCroy USB*Tracer™* USB 2.0 Design & Verification System is the fifth generation product of Teledyne LeCroy's analysis tools for USB development and testing. The USB bus & protocol Analyzer interfaces with standard USB cables and connections to capture and display all speeds of USB 2.0 bus traffic.

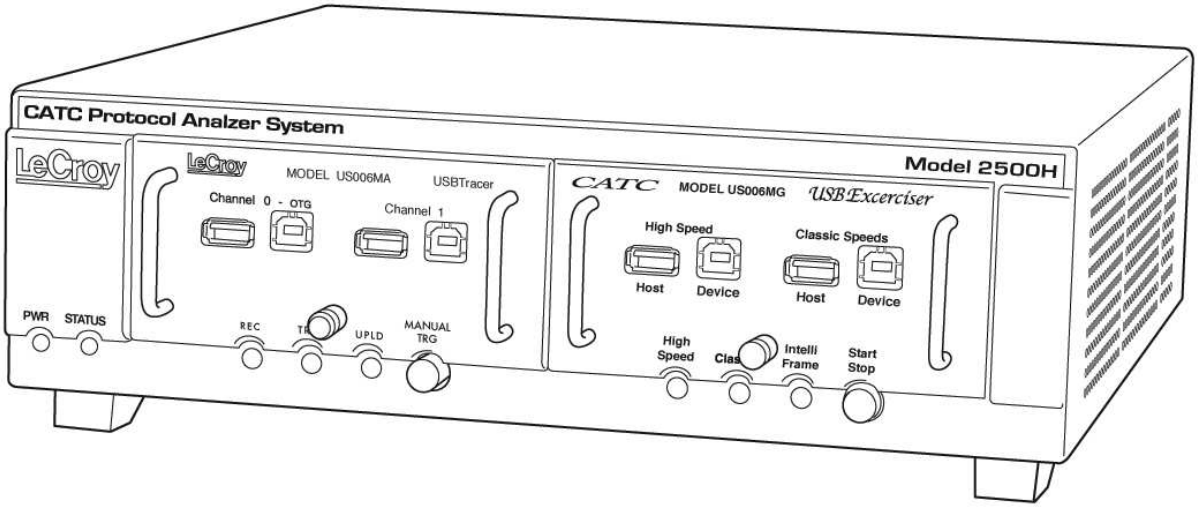



Figure 1.7: USB Tracer/Trainer

### General Description

The USB*Tracer*™ hardware module installs into the Teledyne LeCroy Universal Protocol Analyzer System. A portable or desktop host machine connects to USB*Tracer* at its USB port and configures and controls the Analyzer. The "CATC Trace™" user interface is the industry standard for documenting the performance of high-speed serial protocols.

USB*Tracer* non-intrusively provides traffic capture and analysis for USB protocol development and testing. Hardware triggering allows real-time event capture. Hardware filtering filters different types of packets in or out of the recording. Filtering also preserves recording memory, so that recording time can be extended.

The trace viewer application displays recorded data in colored graphics. Advanced search and viewing capabilities allow you to quickly locate specific data, errors, and other desired conditions.

USB*Tracer* functions with any host machine using the Microsoft® Windows® XP, Windows 8, or Windows 7 (32 or 64) operating system and equipped with a functional USB interface.

The Analyzer is a plug-in module that installs into a Teledyne LeCroy Universal Protocol Analyzer System (UPAS). Together, the Analyzer and UPAS are controlled from a host machine USB port across a USB connection.



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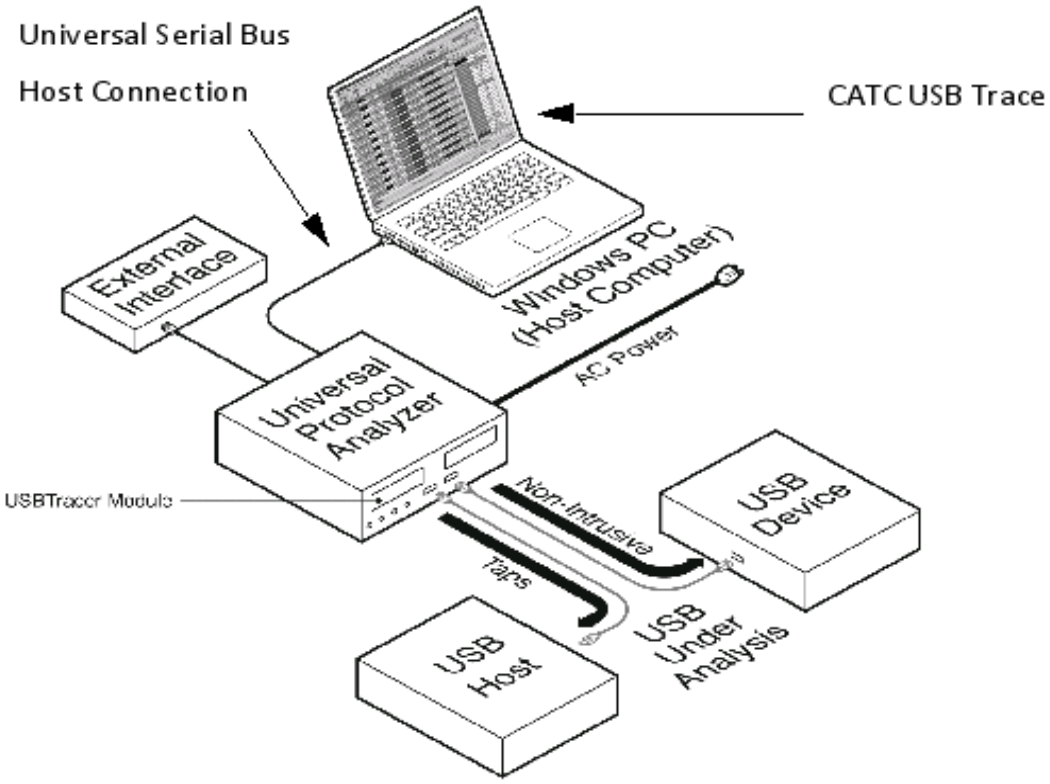



Figure 1.8: System Setup

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

Upon detection of a triggering event, the Analyzer continues to record data up to a point specified by the user. You can individually enable or disable real-time detection of events to allow triggering on events as they happen, including predefined exception or error conditions and user-defined sets of trigger events. An externally supplied signal can trigger the Analyzer. An external DB-25 connector provides a path for externally supplied data or timing data to be recorded along with traffic.

The DB-25 connector also provides a path for USB*Tracer* to transmit externally the software trigger signal or a user-defined event, for probing or use by other circuitry.

Search functions allow the software to identify and highlight specific events. In addition to immediate analysis, you can print any part of the data. You can save the data on disk for later viewing. You can generate timing information and data analysis reports.



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Please refer to the *Universal Serial Bus Specification, version 2.0* for details on the protocol. The USB specification is available from the USB Implementers Forum (USB-IF) at:

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

## Features

### General

- ❑ Fully complies with USB specification revision 2.0.
- ❑ Supports Link Power Management extension to USB 2.0 specification.
- ❑ Allows reconfigurable hardware for future enhancements.
- ❑ Has field-upgradeable firmware and recording engine.
- ❑ Supports all USB speeds (480 Mb/s, 12Mb/s, and 1.5 Mb/s).
- ❑ Has dual recording channels to aid development of multiple speed functions upstream and downstream of speed-matching hub or transaction translator.
- ❑ Displays bus traffic using color and graphics in the CATC Trace interface.
- ❑ Has free non-recording, view-only Trace Viewer software.
- ❑ Comes with online manual.
- ❑ Self-diagnoses at power on.
- ❑ Works in conjunction with the Teledyne LeCroy USB*Trainer* USB Traffic Generator hardware module to create a fully customizable USB test platform.

### Physical Components

- ❑ Hardware module for the Teledyne LeCroy Universal Protocol Analyzer System
- ❑ Desktop or portable Microsoft Windows XP, Windows 8, or Windows 7 (32 or 64) host machine with USB capability
- ❑ Plug-and-Play USB installation
- ❑ High-impedance tap: Inserts non-intrusively in any branch of a USB system.
- ❑ 512 MB of physical data-recording memory
- ❑ Two all speed (Low, Full, or Hi-Speed) recording channels
- ❑ Full-Speed USB connection to desktop or portable host machine. Hi-Speed on UPAS 2500H platform.
- ❑ Internal wide-range AC power supply
- ❑ Break-out board to interface to external test equipment

### Recording Options

- ❑ Versatile triggering: bit-wise value and mask data patterns up to sixteen bytes wide for Setup transactions and data packets
- ❑ Triggering on new High-speed PIDs and split transaction special tokens (ERR, SPLIT, PING, NYET, DATA2, and MDATA).
- ❑ CATC Trace displays and enumerates High-speed Micro Frames.
- ❑ Three forms of triggering: Snapshot, Manual, and Event.



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- ❑ Transaction sequencer: Allows triggering on a token qualified by a data pattern and/or specific handshake, or can filter transactions (such as NAK'd transactions).
- ❑ Advanced triggering with event counting and sequencing
- ❑ Dedicated trigger for recording input and output used to interface to external test equipment
- ❑ Triggering on multiple error conditions: PID bad, bit stuffing bad, CRC bad, end-of-packet bad, babble, activity loss, frame length violation, time-out or turn-around violation, data toggle violation, Token, Bus Conditions, Data Length, and excessive empty frames
- ❑ Real-time traffic capture filtering and data packet truncation variable up to 256 bytes
- ❑ Adjustable buffer size from 0.4 MB to 512 MB

### Display Options

- ❑ Uses the CATC Trace graphical display of bus packets, transactions, split transactions, and transfers.
- ❑ Groups numerous packets and transactions under a single transfer while quickly decoding all essential information.
- ❑ Decodes split transactions upstream and downstream of a transaction translator with a special hierarchical view.
- ❑ Has reports summarizing key statistics and conditions of interest, with the ability to jump to the selected item in the trace display.
- ❑ Records flexible input signaling with the CATC Trace.
- ❑ Uses a Trace Viewer backward compatible with Advisor™, Chief™, Inspector™, and Detective™ trace files.
- ❑ Indicates trigger position by different pre-trigger and post-trigger packet colors.
- ❑ Sets markers to assist with navigation and time calculations. Each marker can contain unique comments.
- ❑ Hides start-of-frame (SOF) packets and any packet or transaction.
- ❑ Searches for a specific PID.
- ❑ Detects, and alerts you to, every potential bus error and protocol violation, and their combinations.
- ❑ Has high-resolution, accurate time stamping of bus packets and timing measurement and analysis functions.
- ❑ Has search and packet hiding capabilities.
- ❑ Allows comprehensive device class decoding and user-defined protocol decoding.

## Traffic Generation

Traffic generation capability is available as an add-on module, USB*Trainer™,* for the Universal Protocol Analyzer System.



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### Hi-Speed Slow Clock

The ability to trace and generate Hi-Speed traffic at fractional (slow) clock rate is available on both USB*Tracer* platforms (2500 and 2500H). You can purchase this feature with a License Key. Contact Teledyne LeCroy for more information.



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