

LeCroy

UWB TRACER™ / TRAINER™

**Protocol Verification for
Certified Wireless USB
(WUSB) and WiMedia Ultra
Wideband Applications**



LeCroy's UWB Tracer/Trainer™ system is the industry's most advanced verification tool for radio-based communications using WiMedia™ Alliance's Ultra Wideband (UWB) common radio platform and certified Wireless USB protocol. A single integrated system, the UWB Tracer/Trainer reliably transmits multi-stage test scenarios while simultaneously recording the exchange and displaying the results using the CATC Trace™ display. Invaluable in the development of UWB silicon, firmware and software, this all-in-one solution allows design engineers to test functionality, error recovery and protocol compliance.

Flexible and Extendable Verification Platform

LeCroy's UWB Tracer/Trainer system is designed to verify functionality and interoperability between WiMedia devices. The analyzer is capable of capturing and decoding traffic transmitted on multiple logical channels within a WiMedia network.



Swappable RF modules allow users to upgrade the analyzer front-end to support future changes in the UWB specification



The UWB Tracer/Trainer system captures and decodes WiMedia and Certified Wireless USB protocol using the CATC Trace display

It faithfully records the exchange between a single wireless USB host and multiple endpoint devices. By operating in a completely silent "listening" mode, the analyzer does not participate in beaconing and does not impact channel allocation time intervals.

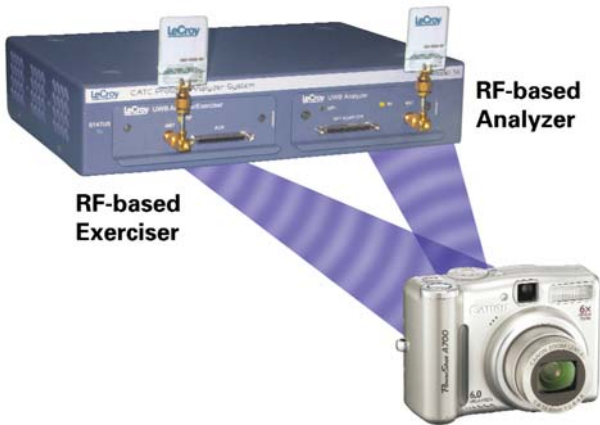
Both the analyzer and exerciser utilize a plug-in design that installs within the LeCroy 5K expandable chassis. These removable modules allow users to field-upgrade the PHY components on the system to support

changes in the UWB specification, or to optimize compatibility with a specific test environment.

The LeCroy system successfully anticipates every verification need for WiMedia based devices. From capturing the wired USB cable association sequence, to generating custom traffic patterns, to field upgradable RF components, the UWB Tracer/Trainer is the ultimate solution for testing WiMedia devices.

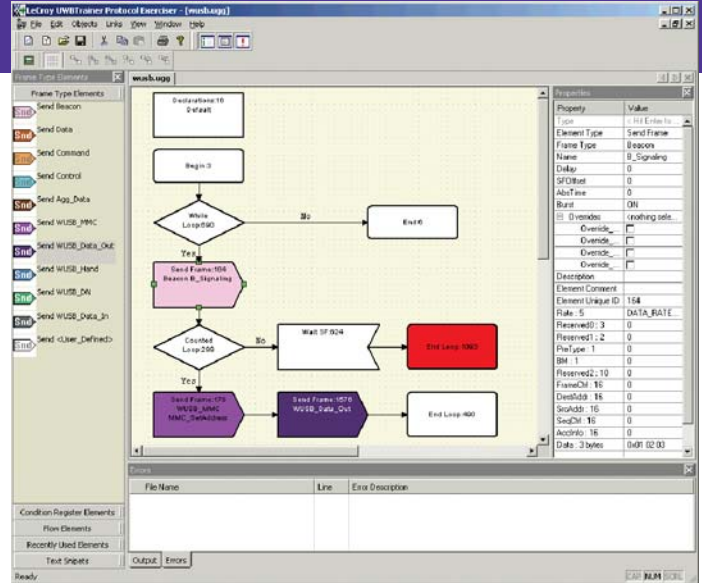
UWB Trainer: Powerful, Flexible Exerciser

The UWB Trainer module adds a full-featured exerciser option to the LeCroy analyzer platform. Seamlessly integrated with the analysis engine, the UWB Trainer allows users to transmit valid or invalid packets while the analyzer simultaneously records the device response. The exerciser provides complete control of the data stream at the bit-level including payload, MAC and PHY header as well as channel, timing, and frequency. The analyzer/exerciser combination features exceptional clock accuracy (< 4 ppm) allowing the system to transmit and record all packets over-the-air with the unmatched timing precision.



Dual transmit (TX) and receive (RX) PHYs allow the UWB Trainer to receive, process, and respond to inbound packets in real time. The ability to extract header or data strings from received packets (RX) and use in transmitted (TX) packets eliminates the need to hard-code dynamic fields (e.g., addresses).

Test scenarios can be constructed using a simple drag-and-drop interface. A text-based script editor is also provided with time-saving features like "Intellisense" editing, runtime debugging (breakpoints, stepping, etc.) and frame templates. Users can also export packets from previously recorded trace files directly to the generator script format. This allows any traffic captured over-the-air with the analyzer to be re-played making it easy to reproduce problems reported in the field.



Graphical interface allows drag-and-drop construction of test scenarios eliminating common syntax errors

The exerciser offers a comprehensive development API with advanced flow control commands like conditional branching, looping and wait states. Equipped with a powerful embedded processor, the system is capable of monitoring multiple concurrent user defined states including variables, counters or any series of sequential events. The analyzer also has the ability to extract header or data strings from received packets (RX) and use in transmitted (TX) packets. This allows the exerciser to generate context sensitive responses for dynamic fields, like addresses.

WiMedia Compliance Testing Solution

The UWB Trainer Exerciser also includes a comprehensive set of test scripts for pre-qualifying device compliance with the WiMedia Platform test specification. The exerciser operates as a "stimulus" device while the analyzer records the exchange and analyzes the results. Any issues uncovered are easily debugged using the captured trace files. Full source is provided for the compliance scripts allowing users to easily modify this substantial test bed for custom verification projects.

With the ability to serve as a low-level frame generator, compliance tester and also host sophisticated traffic emulation programs, the UWB Trainer is the complete "cradle-to-grave" WiMedia validation platform.

UWB Tracer Automatically Detects and Alerts the User to Potential Violations at All Levels of the Protocol Layering



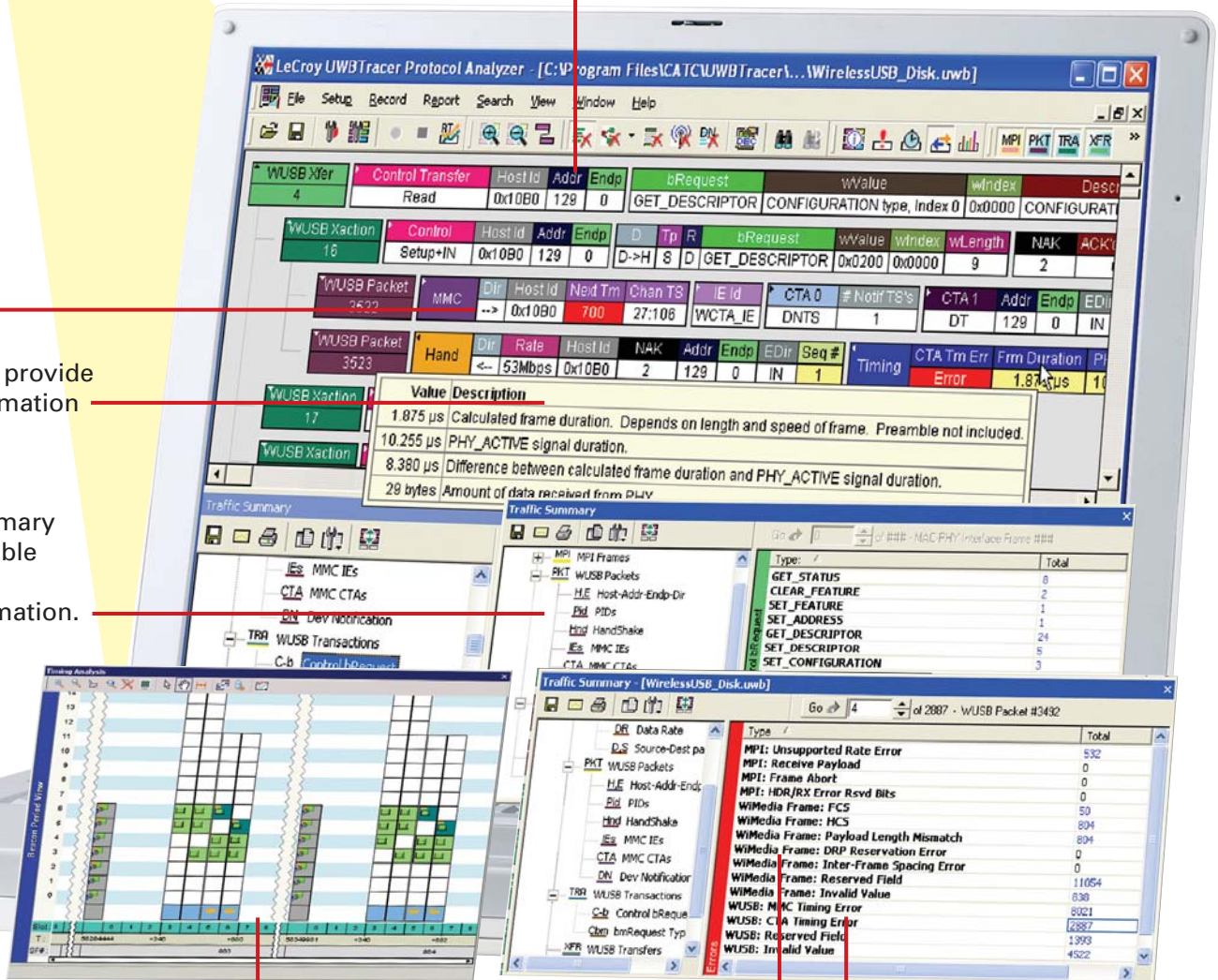
- Extensible design provides for future upgrades
- Interchangeable radio capability
- WUSB Association and Security Model Support
- Two recording channels: radio and MAC-PHY
- High-speed USB 2.0 interface to host PC
- 1 and 2 GB recording memory options

Command level can be expanded and collapsed to show the packet, transaction and transfer layer.

Packets are grouped and shown in logical order.

Pop-up tooltips provide additional information when desired.

The traffic summary gives you valuable reporting and statistical information.



Beacon Period Viewer makes it easy to troubleshoot Beacon Occupancy issues.

Error Report detects potential violations at all levels of the protocol layering.

Hyperlink back to the CATC Trace display to see events in context.

Certified Wireless USB Association and WiMedia Security

The UWB *Tracer* offers full support for Certified Wireless USB Association Models. This includes the ability to derive the Pair-wise Temporal Keys (PTK) for each session by using a Connection Context to decode the 4-way handshake. This enables UWB *Tracer* to record, decrypt, and trigger on secured wireless USB traffic in real time. Users can manually enter a Connection Context before recording, or, for devices that utilize the Cable Association Model, users can purchase an optional plug-in for capturing the Connection Context using a wired USB tap. In both cases, the UWB *Tracer* system stores the Connection Context for each host-device pair and automatically derives the session key for decrypting secure payloads.

Solve MAC-PHY Integration Issues with Two-channel Recording

The MPI option is supported through a special cabled interface that taps between MAC and PHY components. It provides packet level visibility to payload, MAC and PHY header fields. The MPI option includes a variety of cabled interfaces including 40-pin IDE, 68-pin and 60-pin Hirose connections to provide support for the most common MAC-PHY links. The UWB *Tracer's* MAC-PHY Interface recording can operate concurrently with the over-the-air capture to effectively provide two independent recording channels.

Custom Data Displays for Easier Analysis of Protocol Traffic

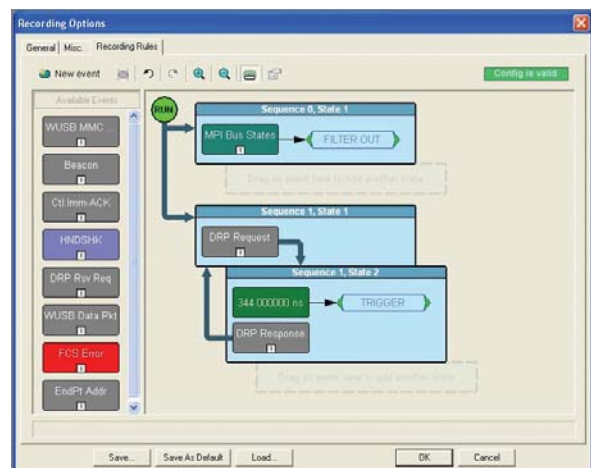
The UWB *Tracer* analyzer utilizes the CATC Trace display that has become the industry's de facto standard for wired USB protocol analysis. The system shows WiMedia frames time-synchronized in separate rows with every field labeled and color-coded. At the Wireless USB transfer layer, the system automatically groups the WiMedia frames that part of a logical USB transaction and decodes the equivalents for USB Token, Data, and Handshake packets.

Find the Issues Fast

The UWB *Tracer* Analyzer offers event triggering to pinpoint specific WiMedia events of interest. For secured Wireless USB packets, the system can de-encrypt and trigger on specific USB events in real time. The recording options utilize a drag-and-drop interface that makes multilevel triggering easy (up to 256 sequential wait states). There's full support for counters, timers, and looping within the trigger logic. Users can also trigger on protocol errors like length mismatch, aborted frames, FCS, and HCS errors.

Comprehensive search is supported for all WiMedia and wireless USB layers. Additionally, the advanced search capabilities allow users to find frames with specific combinations of protocol events using Boolean search functions. The analyzer system also includes real-time statistics that offer a continuous, live display of device operation, including active addresses, signal strength, error, and frame events.

UWB *Tracer* allows on-the-fly hardware-based filtering to remove repetitive events like bus conditions or data frames. UWB *Tracer* also makes it easy to filter out traffic transmitted on specific channels or sent from specific device addresses. Using the Filter-in option, users can record only beacon frames to simplify superframe analysis.



Advanced triggering option supports sequential events and timers for identifying CTA fairness issues in Wireless USB protocol



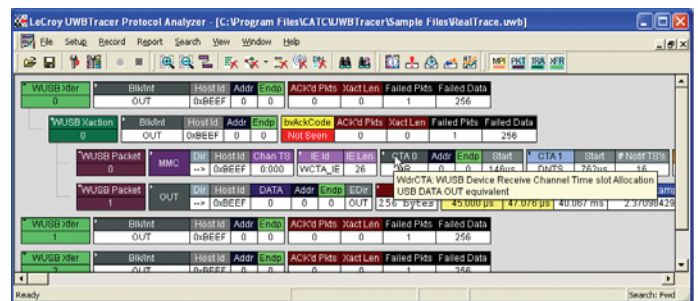
LeCroy UWB Tracer/Trainer System – comprehensive solution for Wireless USB protocol verification

Comprehensive Framework for Test Automation

Both the analyzer and exerciser support COM automation allowing users to control the LeCroy system with calls from third-party applications. There is also a programming API called Verification Script Engine (VSE) for automating post-processing analysis tasks. Custom scripts can be used to automatically perform precise timing calculations or extract specific data strings from a trace. The VSE framework can be used to generate pass/fail reports or export data to other applications.

Automatic Error Reporting

The CATC Trace automatically detects and alerts the user to potential violations at all levels of the protocol layering. The proper formation of each frame is checked for validity and compliance to the specification, including validating FCS, MIFS/SIFS and beacon format. For effective analysis of WiMedia flow control and channel efficiency, precise capture of timing information is required. The LeCroy system captures all MMC timing elements including USB channel time. For beacon frames, it provides full decoding of Distributed Reservation Protocol (DRP) and verifies that transmission timing adheres to DRP requests. By automatically verifying CTA Start time for individual packets, UWB Tracer helps ensure interoperability between Wireless USB devices.



Designed to help explain WiMedia protocol, the system uses tool tips to display extensive information about Wireless USB

Complete Solution

Beginning with the initial debug of the MAC-PHY communication path, to eventual interoperability testing between different WiMedia-based RF devices, the UWB Tracer/Trainer analyzer is designed to reduce time-to-market for Certified Wireless USB chipsets, devices and software. With its unique plug-in module design, the LeCroy system provides for future expansion as the needs of early adopters change and this new communication standard matures.

Specifications

UWB Tracer System

Host Requirements	Windows® Vista, Windows® XP and Windows® 2000; Intel® Pentium® IV processor or greater or compatible; USB port (2.0)
Recording Memory Size	1 or 2 GB option for trace capture, timing, and control information
Power Requirements	90-254 VAC, 47-63 Hz (universal input), 150 W maximum
Connectors	
Rear Panel Connectors	DC Power, USB Type B host computer, EXT/DATA, SYNC IN, SYNC OUT
Standard Cables Supplied	One (1) BNC Y-Cable for cross triggering external instruments, One (1) Sync Cable for cascading 5K platforms, One (1) Coaxial Cable for direct attach to UWB Radio, USB type "B" host computer connection, AC power connection
Dimensions	249 x 175 x 51 mm (9.8" x 6.9" x 2")
Net Weight	2.0 kg (4.4 lbs.)
Temperature Operating	0 °C to 55 °C (32 °F to 131 °F)
Temperature Non-Operating	-20 °C to 80 °C (-4 °F to 176 °F)
Humidity Operating	10% to 90% RH (non-condensing)

UWB Tracer Plug In Module

Analysis Interfaces	WiMedia Certified RF Interface, and MAC-PHY interface option available for non-intrusive recording of MPI Traffic; MAC-PHY Connection Kit includes external cable and board adapter with 40-pin IDE, 68-pin and 60-pin Hirose connectors for link between MAC-PHY components
---------------------	--

UWB Trainer Plug In Module

RF Interface	WiMedia Certified RF Interface
--------------	--------------------------------

UWB Tracer Features

Display Levels	WiMedia Frames, MAC-PHY Interface (MPI) packets, Wireless USB packets, Wireless USB Transfers, Wireless USB Transactions, Wire Adapter Segments and Wire Adapter Transfers
Decoding	Micro-scheduled Management Commands (MMC's), IN and OUT data, Handshakes, and Device Notifications, Wire Adapter, Wireless USB protocol, WiNET option includes WiNET packets, WiNET Ethernet, and WiNET IP protocol units
Real-time Statistics	Frame Occurrences, RSSI

Ordering Information

Product Description	Product Code
Ultra Wideband Systems	
UWB <i>Tracer</i> Standard Analyzer System (includes CATC 5K platform, analyzer module #1, 1 GB Memory Option, Single Event Triggering, Carrying Case, and 1 year software maintenance)	UW002AAA-X
UWB <i>Tracer</i> Advanced Analyzer System (includes CATC 5K platform; analyzer module #1 with one (1) Wireless channel and one (1) MPI channel; 2 GB Memory Option; Advanced Triggering Option; Carrying Case, and 1 year software maintenance)	UW003AAA-X
UWB <i>Tracer</i> Pro Analyzer System (includes CATC 5K platform; analyzer module #1 with one (1) Wireless channel and one (1) MPI channel; 2 GB Memory Option; Advanced Triggering Option; Carrying Case; USB Association module, and 1 year software maintenance)	UW004AAA-X
UWB <i>Tracer/Trainer</i> System (includes CATC 5K platform; UWB <i>Tracer</i> analyzer module #1 with one (1) Wireless channel and UWB <i>Trainer</i> Exerciser module #1 with one (1) RF exerciser channel (TX) and one (1) RF analyzer channel (RX); 2 GB Memory Option; Advanced Triggering Option; Carrying Case, and 1 year software maintenance)	UW005APA-X
Ultra Wideband Options	
UWB <i>Tracer</i> Analyzer Module #1 (UWB analyzer module #1 enables recording of one (1) Wireless channel and 1 year software maintenance)	UW002MAA-X
UWB <i>Tracer</i> Analyzer Module #2 (UWB analyzer module #2 enables recording of one (1) Wireless channel and 1 year software maintenance)	UW003MAA-X
UWB <i>Trainer</i> Exerciser Module #1 (UWB exerciser module enables one (1) RF exerciser channel (TX) and one (1) RF analyzer channel (RX) on CATC 5K platform – TX and RX does not operate concurrently and 1 year software maintenance)	UW005MGA-X
UWB <i>Tracer</i> MPI KIT (enables MPI recording; includes cable and board adapter with 40-pin IDE, 68-pin, and 60-pin Hirose connectors)	UW001UAA-X
2 GB Memory Option for 5K (adds 1 GB memory to CATC 5K 1 GB system to support 2 GB total recording memory)	UW001SUA-X
Advanced Triggering Option for 5K (Software Key enables sequential event triggering for CATC 5K system)	UW002SUA-X
USB Analysis Module (Plug-in module for wired USB association capture and 1 year software maintenance)	US007MAA-X
WiNET Option (Software Key enables WiNET decoding for UWB <i>Tracer</i> Analyzer System)	UW003SUA-X