



PROTOCOL SOLUTIONS GROUP
3385 SCOTT BLVD
SANTA CLARA, CA 95054

LeCroy UWB *Tracer*TM

Ultra-Wideband Protocol Analyzer

User Manual

Manual Version 2.0



For Software Version 2.0

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Chapter 1: Overview

This chapter describes the UWBTracer™ product and Ultra-Wideband technology in general.

1.1 UWBTracer Ultra-Wideband Analyzers

The LeCroy UWBTracer is a portable Ultra-Wideband (UWB) test and debug platform that combines non-intrusive recording with extensive decoding features. The RF (wireless) recording functionality is designed to record non-intrusively off-the-air WiMedia UWB traffic from one or more devices, while the MPI recording functionality is designed to connect to the specification-defined MAC-PHY Interface (MPI) bus between the MAC and the PHY subsystems in WiMedia-compliant devices and to capture the traffic between them.

By leveraging years of experience in protocol analysis tools for emerging markets, UWBTracer blends sophisticated functionality with practical features to allow designers and validation engineers to easily specify multi-level, conditional trigger scenarios to pinpoint intermittent problems in the UWB connection.

System-level validation requires non-intrusive monitoring. UWBTracer ensures accurate data collection by providing transparent electrical taps. At the heart of UWBTracer is the CATC BusEngine™ protocol processor that features a real-time recording engine for UWB MAC-to-PHY traffic.

UWBTracer also supports remote operation over a LAN and unattended control of the analyzer with an Automation API. UWBTracer includes an advanced search capability that allows to search for specific fields in the recorded trace and to navigate faster to places of interest inside the trace.

UWBTracer features a real-time statistics display that continuously monitors and presents metrics for the recorded MAC-to-PHY traffic, providing a high-level view of network performance.

For complete product information, please visit www.LeCroy.com.

Table 1.1 summarizes key UWBTracer features.

Table 1.1 UWBTracer Features

Feature	Benefit
Wireless capturing & recording	Allows off-the-air (and non-intrusive) recording of UWB traffic
MPI capturing & recording	Probes the WiMedia specification-defined bus between the MAC and PHY layers, while remaining non intrusive. Suitable for three different popular connector types.
Simultaneous RF and MPI recording	Capable of recording one RF and one MPI channel at the same time and display a combined trace
Advanced Triggering	Robust capability of setting complex triggering and filtering sequences and act in real-time on those settings on each of the channels.
Trace View	Comprehensive viewing of the recorded traffic with convenient customization through the trace display options.
Advanced search	Fast and comprehensive trace searches.
Collapsible/expandable header	Increased drill-down on exchanges, sequences, or individual frames.
Real-time performance monitoring and statistics	Allows easy identification of throughput problems and anomalies.
Dynamically-allocated memory pool	(2 GB) Captures long time-windows for analysis and problem-solving.
Interchangeable Radios and room for future expansion	The modular design of the UWBTracer™ and the CATC 5K platform permits interchanging modules and radios

1.2 Ultra-Wideband Technology

UWB technology was available for over 40 years for military and civilian applications and was originally called either impulse radio or carrier-free communications. Today, the FCC definition for UWB is any radio technology with a spectrum that occupies greater than 20 percent of the center frequency or a minimum of 500MHz.

In 2002, the FCC allocated unlicensed radio spectrum from 3.1 GHz to 10.6 GHz expressly for enterprise and consumer applications. The FCC defined a specific minimum bandwidth of 500 MHz at a -10dB level. As current UWB implementations allow communication that requires high data rates over short distances, one immediate UWB application is WPAN (Wireless Personal Area Network).

The Multi-band OFDM technology, promoted by the WiMedia Alliance, is one of the technologies that can utilize the allocated band for UWB. The MB-OFDM transmits data simultaneously over multiple carriers spaced apart at precise frequencies. This approach provides benefits like high spectral flexibility and resiliency to RF interference and multi-path effects.

The WiMedia Alliance drives the efforts to create an ecosystem that would allow easy and secure operation of UWB devices. A data-rate targeted at 480Mbps would provide the ground for delivering Wireless-USB (WUSB) devices. To complete the picture, the USB-IF organization is responsible for the effort to establish the WUSB specification.

The WiMedia UWB specifications are available from the WiMedia Alliance. The URL for the WiMedia website:

<http://www.wimedia.org>

The WUSB specification is available from the USB Implementers Forum (USB-IF). The URL for the USB-IF website is:

<http://www.usb.org/home>

Chapter 2: Hardware Description

This chapter describes the CATC 5K-based UWBTracer™ analyzer and other components and accessories that accompany it.

2.1 CATC 5K Platform and the UWBTracer Analyzer

CATC 5K Platform

The CATC 5K platform has a modular design, as in previous CATC platforms. The lightweight platform is designed to be mobile. The flexible design is configurable through two front slots that accommodate up to two plug-in modules. The CATC 5K platform is powered by a small external power supply. Quiet built-in fans provide cooling.

UWBTracer Analyzer

The UWBTracer analyzer is composed of a CATC 5K platform and a UWB Analyzer plug-in module that is inserted into the right-side slot.

Connection to Host Machine

The CATC 5K platform connects to a Windows®-based PC (the host machine) through a USB cable. Though the system can operate over USB1.1 protocol data rates, it is advisable to use a USB2.0 connection between the Analyzer and the host machine to obtain faster upload of traffic.

2.2 System Components

Basic Components

The UWBTracer™ basic package includes the following components:

- Installation CD-ROM, with the installation program and all documents
- *UWBTracer Getting Started* manual, to help set up the system quickly
- CATC 5K Platform: See photograph on front cover. Also see “CATC 5K Front Panel” on page 13 and “CATC 5K Rear Panel” on page 14.
- CATC 5K Power Supply and Power Cord
- Vertical Stand

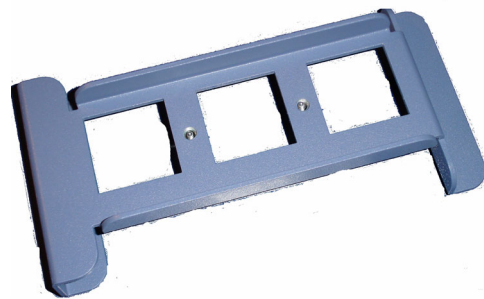


Figure 2.1 Vertical Stand

- UWB Analyzer Module, RF Antenna, and RF coaxial cable

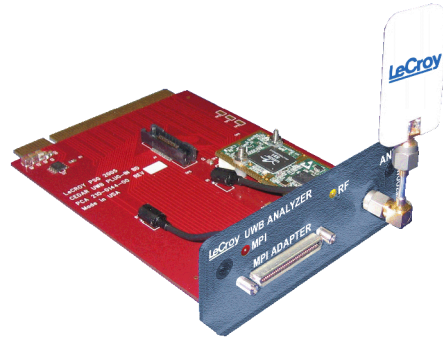


Figure 2.2 UWB Plug-in Module with Antenna

- USB cable for connecting the analyzer to a host machine

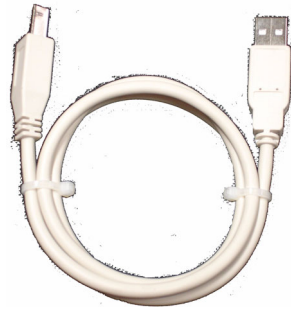


Figure 2.3 Vertical Stand

- RF Coaxial Cable (SMA) [as part of the Standard Cable Kit]

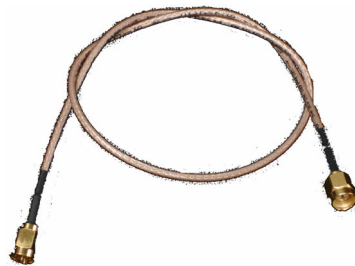


Figure 2.4 RF Coaxial Cable (SMA) [in Standard Cable Kit]

- Synchronization Cable for synchronizing multiple analyzers



Figure 2.5 Synchronization Cable

- Trigger Cable (TRIG-IN/TRIG-OUT BNC Y-cable) for connecting to external equipment (for example, for triggering capturing in a LeCroy oscilloscope).



Figure 2.6 Trigger Cable

Optional Components

In addition to the basic package, optional components are available:

- Carrying case
- MPI Kit (please refer to the Data Sheet for detailed information)
- UWB Analyzer plug-in module with support for different radio vendors

MPI Kit

The MPI kit is designed for hooking to the MPI bus in two types of setups:

1. PHY subsystem connects to the MAC subsystem through a short (ribbon) cable.
2. PHY subsystem piggybacks directly on the MAC subsystem. The two subsystems connect through an adapter board without the use of cables.

Three types of connectors are common for current designs:

1. IDE 40-pin connector
2. Hirose 68-pin Connector
3. Hirose 60-pin Connector

The optional MPI Kit includes:

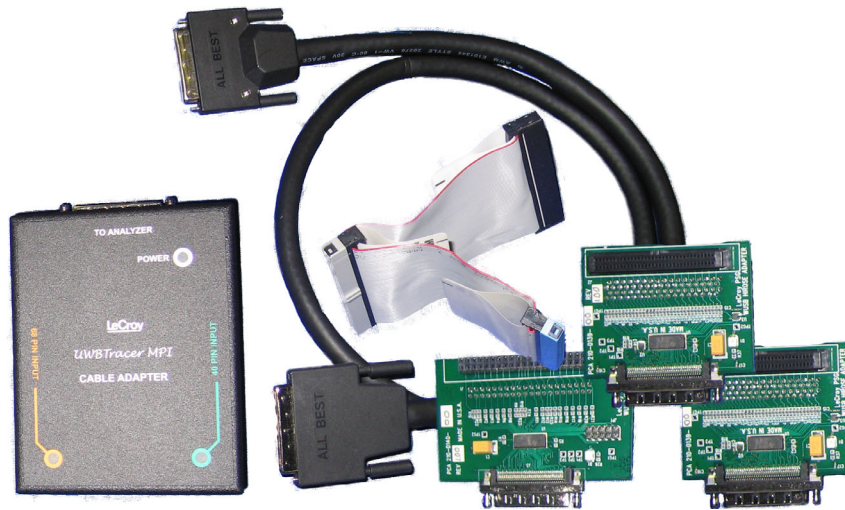


Figure 2.7 MPI Kit

- Adapter Cable (SCSI)



Figure 2.8 Adapter Cable (SCSI)

- Probe Cable for IDE 40-pin Connectors and Hirose 68-pin Connectors (2)



Figure 2.9 Probe Cable for IDE 40-pin Connectors and Hirose 68-pin Connectors

- Cable Adapter for Hirose 68-pin or IDE 40-pin Connectors



Figure 2.10 Cable Adapter for Hirose 68-pin or IDE 40-pin Connectors

- Board Adapter for IDE 40-pin Connectors

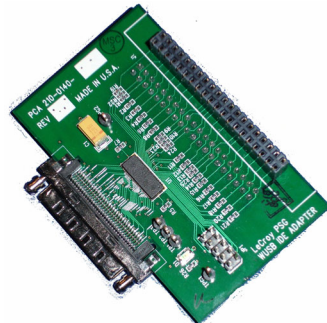


Figure 2.11 Board Adapter for IDE 40-pin Connectors

- Board Adapter for Hirose 68-pin Connectors

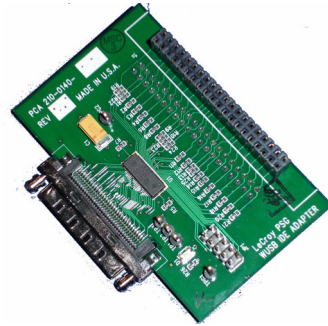


Figure 2.12 Board Adapter for Hirose 68-pin Connectors

- Board Adapter for Hirose 60-pin Connectors



Figure 2.13 Board Adapter for Hirose 60-pin Connectors

2.3 Connecting Cables and Adapters

Figure 2.14 shows the connections among CATC 5K, UWB Analyzer, connectors, and cables.

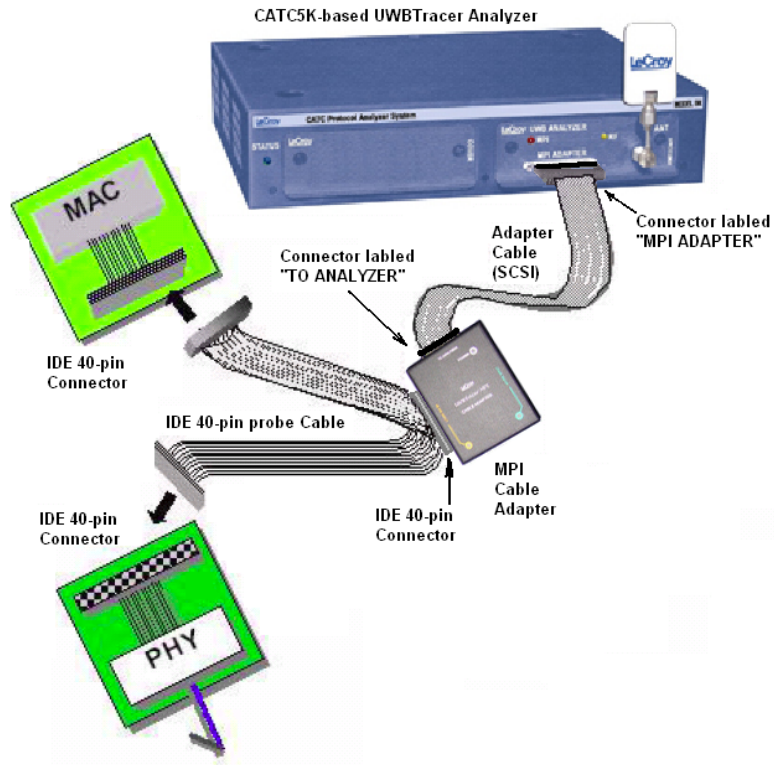


Figure 2.14 Example UWBTracer Device Connections Diagram for Recording MPI Traffic from Devices using the IDE 40-pin Cable Adapter

To use the Cable Adapter to connect with an IDE 40-pin connector:

- Step 1** Turn off the power on the analyzer and the device-under-test
- Step 2** Connect the middle connector on the IDE 40-pin Probe Adapter to the 40-pin connector on the Cable Adapter.
- Step 3** Connect one of the end connectors on the IDE 40-pin Probe Adapter to the PHY subsystem.
- Step 4** Connect the other end connector on the IDE 40-pin Probe Adapter to the MAC subsystem.
- Step 5** Connect the Adapter Cable (SCSI) to the MPI ADAPTER connector on the UWBTracer plug-in.
- Step 6** Connect the Adapter Cable (SCSI) to the TO ANALYZER connector on the Cable Adapter unit.
- Step 7** Turn on the power, then start capturing data.

To use the Cable Adapter to connect with a Hirose 68-pin connector:

Follow the same steps as for the IDE 40-pin connector, but use the Hirose 68-pin Probe Cable and the 68-pin connector on the Cable Adapter.

To use the Board Adapter to connect with an IDE 40-pin connector:

- Step 1** Turn off the power on the analyzer and the device under test.
- Step 2** Connect one side of the IDE 40-pin Board Adapter to the connector on the MAC subsystem.
- Step 3** Connect the PHY subsystem to the other IDE 40-pin connector on the Board Adapter.
- Step 4** Connect the Adapter Cable (SCSI) to the MPI ADAPTER connector on the UWBTracer plug-in.
- Step 5** Connect the other side of the Adapter Cable (SCSI) to the connector on the Board Adapter.
- Step 6** Turn on the power, then start capturing data.

To use the Board Adapter to connect with a Hirose 68-pin connector:

Follow the same steps as for the IDE 40-pin connector, but use the Hirose 68-pin Board Adapter.

To use the Board Adapter to connect with a Hirose 60-pin connector:

Follow the same steps as for the IDE 40-pin connector, but use the Hirose 60-pin Board Adapter.

2.4 UWB Tracer Front Panel Description

When powered ON, the CATC 5K Analyzer activates user-accessible controls and LEDs on front and rear panels of the platform. This section covers front panel features. The next section covers rear panel features.

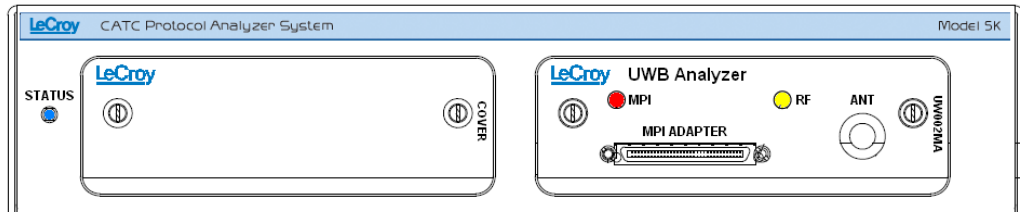


Figure 2.15 CATC 5K Front Panel

CATC 5K

The indicators (Figure 2.15) are:

STATUS (status of the platform)

LED	Description
No light	System is not powered on
Green Blink Slow	Initializing
Blue	System is operational
Red Blink Fast	System fault (contact Support)

UWB Analyzer

LEDs (status of the MPI or RF channel)

LED	State	MPI Channel	RF Channel
No light	Idle	Does not detect PCLK or PHY_ACTIVE	Does not detect wireless frames
Yellow Blink Fast	Synching	Trying to synchronize to MPI traffic and waiting for PCLK and PHY_ACTIVE	Trying to synchronize to RF traffic and waiting for wireless traffic
Yellow	Synched	Synchronized: Capturing MPI traffic with PHY_ACTIVE signal high	Synchronized: Capturing wireless frames
Red Blink Slow	Recording Pre-Trigger	Recording Pre-Trigger traffic	Recording Pre-Trigger traffic
Red	Recording Post-Trigger	Recording Post-Trigger MPI traffic	Recording Post-Trigger wireless traffic

Connectors

The connectors are:

- **MPI ADAPTER:** Connector to MPI Adapter
- **ANT:** SMA Connector for Antenna

2.5 UWBTracer Rear Panel Description

From left to right, the rear panel contains the following components:

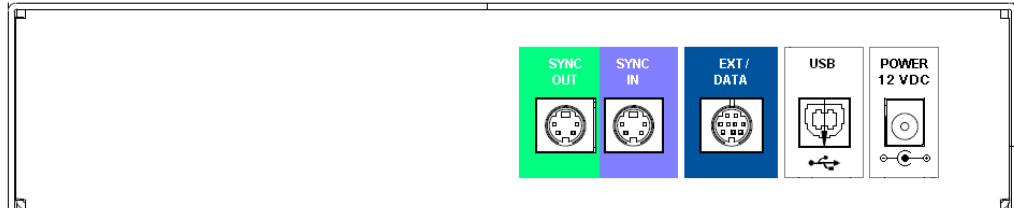


Figure 2.16 CATC 5K Rear Panel

- **SYNC IN/OUT:** For synchronized multi-analyzer operation, the analyzers must be connected in a daisy-chain topology to each other using the green/purple cable.
- **EXT DATA:** For attaching the TRIG-IN/TRIG-OUT BNC Y-cable (Trigger Cable) to external instruments
- **HOST:** For connecting the analyzer through USB to the host machine
- **POWER 12 VDC:** For connecting the external power supply to the analyzer.
Note: There is no power switch on the analyzer.

Warning! Do not open the CATC 5K enclosure. No operator serviceable parts are inside. Refer servicing to LeCroy.



2.6 RF Recording Setup

For wireless recording, the UWB Analyzer uses the UWB radio on the UWB analyzer plug-in. The plug-in module must be inserted into the right-side slot of the CATC 5K platform.

There are two options for eavesdropping UWB traffic:

- Wireless RF recording
- Wired RF Recording

Wireless RF Recording

Using the provided RF antenna, the analyzer can capture over-the-air wireless traffic. Perform the following steps:

Step 1 Make sure the antenna provided with the UWBTracer analyzer is tightly connected to the connector marked ANT.

Step 2 Position the analyzer and devices under test at an equal distance from each other, 10 inches apart (Figure 2.17).

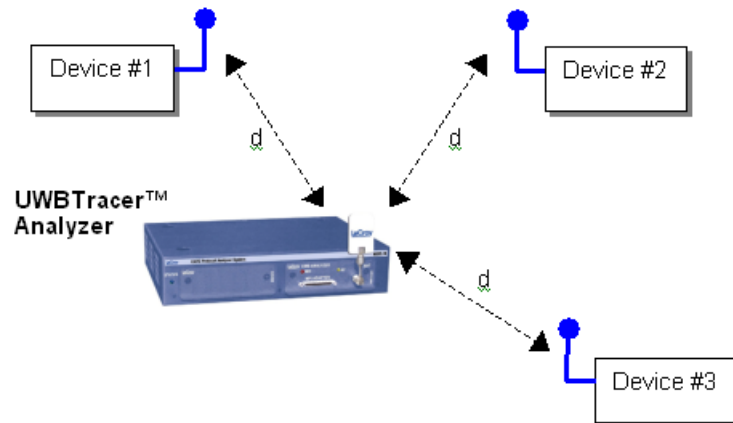


Figure 2.17 Wireless RF Recording

Note: RF signals and noise from external devices might affect wireless recording, as might the transmit and receive patterns of antennas on the analyzer and devices under test. If the recorded trace has many corrupted UWB frames, try the following:

- Try different positions of the devices and analyzer.
- Place the devices and analyzer as close as possible to each other and at equal distance (but not less than 10 inches apart).
- Remove any potential RF radiators from the test environment or find an RF-quiet location.

Wired RF Recording

Wired RF Recording can be used when the test setup requires isolation from external RF interference or when the effects of the antennas need to be negated. In this setup, coaxial cables are used to connect the analyzer to the devices under test.

To match the transmit power of the radios to the receive power ratings (because low-impedance wires are now used), use attenuators to lower the signal strength so that the input stages of the PHYs are not saturated (Figure 2.18). The -20 dB attenuators are given as an example. You might need to use different attenuators depending on the characteristics and signal strength of the radios in use.

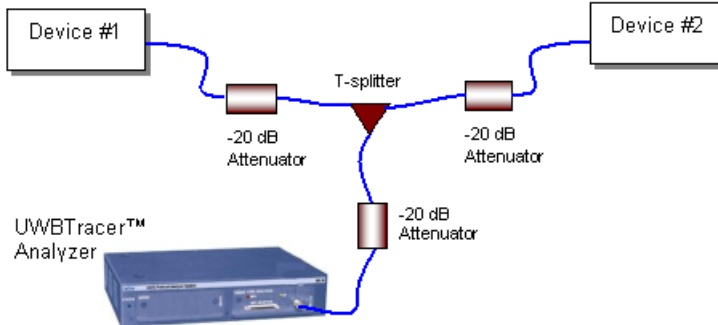


Figure 2.18 Wired RF Recording

Note: The attenuator values shown are only examples. You may need to use different values according to the PHYs used, their signal strengths, and your setup.

Chapter 3: Software Overview

The UWBTracer™ software can:

- Control recording of UWB traffic.
- Manage one or more Analyzers, which can be connected directly to the host machine or connected through the Analyzer network.
- View, analyze, and create reports about recorded traces.

3.1 Installing the Software

For instructions about installing the software, refer to the *UWBTracer Getting Started* manual.

3.2 Starting the UWBTracer Program

You can use the UWBTracer with or without the analyzer unit. When used without an analyzer, the program works as a trace viewer to view, analyze, and print trace files.

To start the UWBTracer Program from the PC Start menu:

Step 1 Select **Start > Programs > CATC > LeCroy UWBTracer** to display the application main window (Figure 3.1).

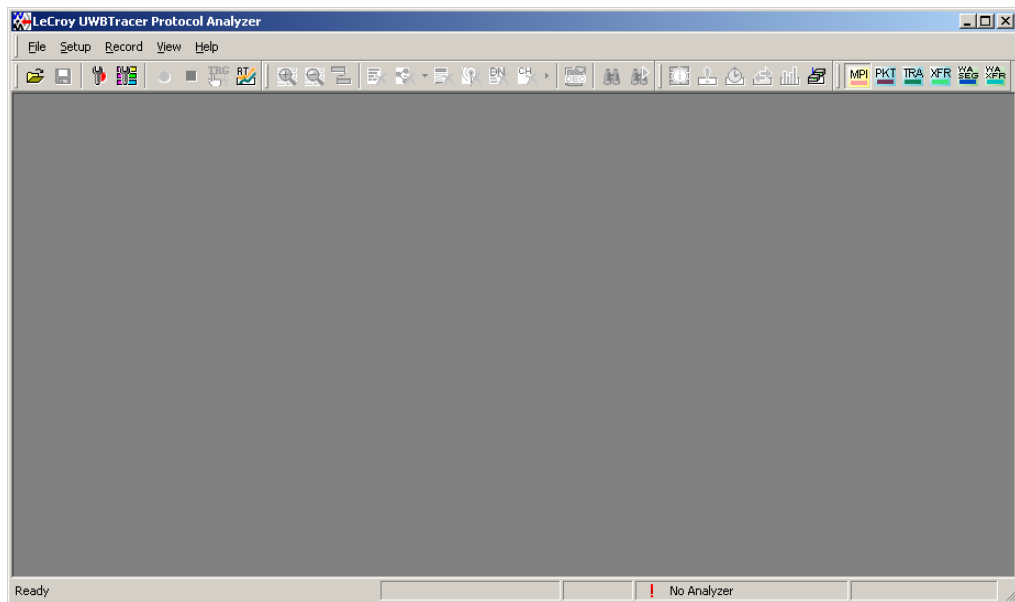


Figure 3.1 UWBTracer Main Window

3.3 Opening Sample Traces

A good way to gain familiarity with *UWBTracer* is to open some of the provided sample files and explore the menus, pop-up menus, and reports.

3.4 Opening Older Trace Files

The *UWBTracer* software has the capacity to open trace files created with earlier software versions. When an older trace file is opened, the program prompts you to convert the file to the current software version.

3.5 Tool Tips

Throughout the application, Tool Tips provide useful information about buttons on the toolbar.

To display a Tool Tip, position the mouse pointer over an item of interest such as part of the trace or a button (Figure 3.2).

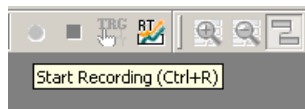


Figure 3.2 Tool Tip

3.6 Trace Tool-Tips

Many fields within the Trace display tool-tips when the mouse pointer is suspended over them. These tips may provide a simple legend for the cell or may give substantial added details about the field (Figure 3.3).

RF	Frame	Ch	PHY	Rate	Len	TF Code	MAC	Command	Dest ID	Src ID	Vers	Type	MAC FC Reserved	
	0	0x0E		53Mbps	64	0			0xACAC	0xACAC	4	Reserved	2	
			PHY Header Field (Expand/Collapse)										Time Stamp	
			SC Reserved				Sec	0xAB	44 bytes	0x45230100			12.339835055	
	1	0x0E		53Mbps	64	0			0xACAC	0xACAC	4	Reserved	2	
			SC Reserved				Sec	Secure Reserved	Secure Payload	FCS			Time Stamp	
			0x1				0xAB	44 bytes	0x45230100				12.339900867	

Figure 3.3 Trace Tool Tip

3.7 Menu Bar

Table 3.1 lists menus available from the Main window menu bar. Some menus and options are available only when a file is open.

Table 3.1 Menu Bar Menus

Menu/Option	Function
File	
<u>O</u> pen	Opens a trace file or traffic generation file.
<u>C</u> lose	Closes the current trace or generation file.
Save <u>A</u> s	Saves all or a specified range of frames with a specified name.
<u>P</u> rint	Prints part or all of the current trace or traffic generation file.
Print <u>P</u> review	Produces an on-screen preview before printing.
<u>P</u> rint Setup	Sets options for the current or new printer.
<u>E</u> dit Comment	Opens a dialog for entering a brief comment about the trace.
<u>E</u> xport	Packets to Text (Packet View Format) - Saves all or part of a trace to a text file. Used to save traces to floppy disk and to send in e-mail. Packets to CSV Text - Saves trace as a comma-separated-values text file for use with Microsoft® Excel.
<u>E</u> xit	Exits the UWB Tracer program.
Setup	
<u>D</u> isplay Options	Opens a window that controls the recording process.
<u>R</u> ecording Options	Opens a window that controls display options.
<u>U</u> ppdate BE/FW	Update BusEngine™ and Firmware manually
Analyzer <u>N</u> etwork	Opens a dialog box for browsing to local and networked analyzers. Within the dialog, click Add to browse. The dialog lists PCs that are on the LAN. If a PC has an analyzer attached to it, and if DCOM permissions have been set on the selected PC, clicking Select establishes a connection.
All Connected <u>D</u> evelopments	Opens a dialog box with a list of analyzers connected to the host PC. Lets you select an analyzer and update the BusEngine, Firmware, and licensing information.
Record	
<u>S</u> tart	Causes the Analyzer to begin recording.
<u>S</u> top	Causes the Analyzer to stop recording.

Menu/Option	Function
Report	
<u>F</u> ile Information	Displays information about the recording such as the number of frames and triggering setup.
<u>E</u> rror Summary	Displays the Errors report of the Traffic Summary, listing the numbers of each error type.
Timing <u>C</u> alculations	Calculates timing between two frames.
Traffic summary	Summarizes the numbers and types of errors, packets, transactions, split transactions, and transfers that occurred in the open trace.
<u>D</u> evice List	Lists the DUTs, active devices, archive devices, and wireless USB in the Device List window by DUTs, Type, EUI-48, Address, Alias, Last Updated, and User Notes.
Search	
Go to <u>T</u> rigger	Positions the display to show the triggering event at the top.
Go to <u>F</u> rame/ Packet/Transaction/ Transfer	Positions the display to show a specific frame or decode level.
Go to <u>M</u> arker >	Positions the display to the selected marked frame.
<u>G</u> o to >	Positions the display to the specified item.
<u>F</u> ind	Allows searches by multiple criteria.
Find <u>N</u> ext	Looks for the next instance of an event specified with Goto or Find.
<u>S</u> earch Direction	Allows the search direction to be changed from Forward to Backward or Backward to Forward.

Menu/Option	Function
View	
<u>T</u> oolbars	Displays list of available Tool bars.
Analyzer Network <u>C</u> hat Bar	Opens a dialog that allows users to conduct chat sessions over an IP LAN. In order to send and receive electronic text messages, each user must be working with a PC that is on an IP LAN and also attached to an analyzer.
<u>S</u> tatus Bar	Switches display of the Status Bar ON or OFF.
Hide Traffic on Channels	Hides traffic on the channel (MPI or RF) selected from the popup list.
Hide Reserved Field Warnings	Hides fields that have a Reserved Field Warning.
Unhide Cells	Unhides the cells (hidden by Display Options) selected from the popup list.
Zoom <u>I</u> n	Increases the size of the displayed elements.
Zoom <u>O</u> ut	Decreases the size of the displayed elements.
<u>W</u> rap	Wraps displayed Frames within the window.
Apply Decoding Scripts	Decoding scripts set the values of the display and recording options for optimum views of trace information from specific vendors or classes of data. The menu allows you to select the vendor or class of data for the request recipients and endpoints listed in the Request Recipients and Endpoints menu. You can keep the settings across recordings.
<u>R</u> eal-Time Statistics	Displays trace statistics.
Window	
<u>N</u> ew Window	Opens another instance of the Main Window.
<u>C</u> ascade	Displays all open Main windows in cascaded format.
Tile <u>H</u> orizontal	Displays all open Main windows in tiled horizontal format.
Tile <u>V</u> ertical	Displays all open Main windows in tiled vertical format.
<u>A</u> rrange Icons	Arranges Main window icons at bottom of display area.
Windows	Displays a list of open windows.
Help	
<u>H</u> elp Topics	Opens online help.
<u>U</u> ppdate License	Opens a dialog box for entering license key information for the analyzer.
<u>D</u> isplay License Information	Opens a dialog box with information about the current status of the analyzer's license
<u>A</u> bout	Displays version information about UWB Tracer.

3.8 Tool Bar

The Main window Tool bar provides quick access to most UWB *Tracer* software functions. You can learn the function of each button by passing the mouse pointer over it. Button descriptions appear on the Status bar at the bottom of the window and as tooltips above each button.

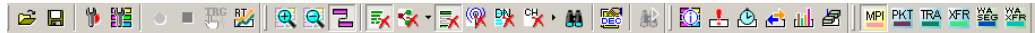





















Figure 3.4 Main Window Toolbar








General Buttons

	Open file		Zoom In
	Save As		Zoom Out
	Setup Recording Options		Wrap
	Setup Display Options		Find
	Start Recording		Find Next. Repeats last find.
	Stop Recording		Apply Decoding Scripts
	Manual Trigger		



Hide Buttons

	Hide Unassociated Traffic		Hide Beacon Frames
	Hide Devices		Hide MMC Packets with Empty DN frames
	Hide Empty Super Frame		Hide Channels (MPI or RF)

Reports Buttons

	File Information Report. Opens a summary of general information about the trace file.		Traffic Summary. Opens a summary of protocol-related information in the trace file.
	Error Report. Opens a summary of error information in the trace file.		Bus Utilization. Opens a window that shows packet length by time.
	Timing and Bus Usage Calculations. Opens a calculator for measuring timing between frames		Real-Time Statistics. Opens a window that shows realtime information on links activity.
			Device List Window

Decode Buttons

	View MPI Trace Level		View WUSB Transaction Level
	View WUSB Packet Level		View WUSB Transfer Level
	View WUSB WA Segment Level		View WUSB WA Transfer Level

3.9 Floating the Decode Toolbar

You can float any of the toolbars by dragging them from their current location at the top of the screen. If you float the decode toolbar, it arranges the decode buttons in their hierarchical order. Click the triangle to add or delete buttons.

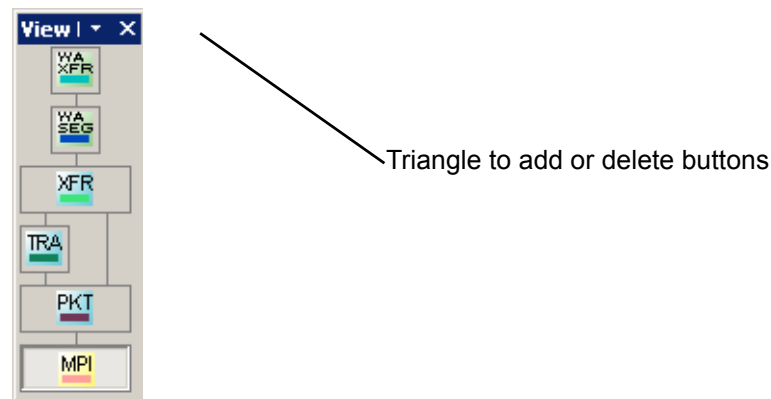


Figure 3.5 Decode Toolbar in Hierarchical Arrangement

3.10 Pop-Up Menus

Pop-up menus within the trace provide options for formatting the trace.

Left Mouse Button

Left-clicking a header opens a menu for expanding fields, viewing data fields, and formatting the trace. The menu is context-sensitive and changes, depending on what part of the trace you have clicked. Figure 3.6 shows three examples.

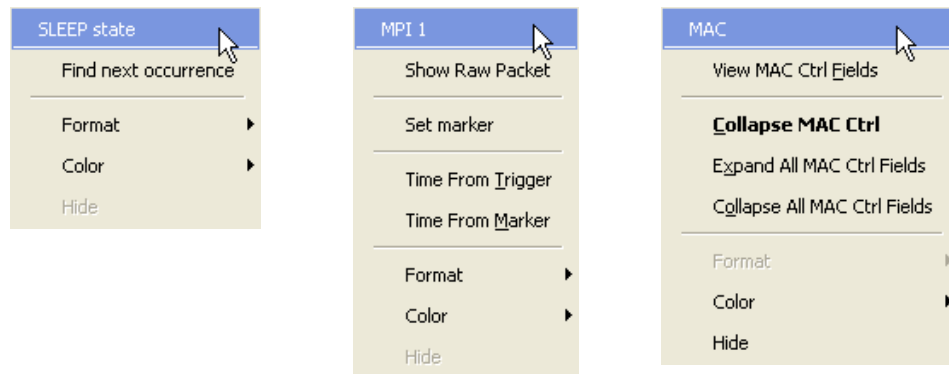


Figure 3.6 Trace Pop-Up Menus

Common options appear on most menus:

- **Format:** Presents choices for changing the numerical formatting of the data fields throughout the trace.
- **Color:** Presents choices for changing the color of the data fields throughout the trace.
- **Hide:** Hides data fields throughout the trace. To re-display hidden fields, right-click anywhere in the trace and select **Unhide Cells** and then one of the options from the sub-menu.

Left-clicking the small triangle in the upper left corner of the PHY, MAC, Payload, or Timing data block expands the data block to show all fields.

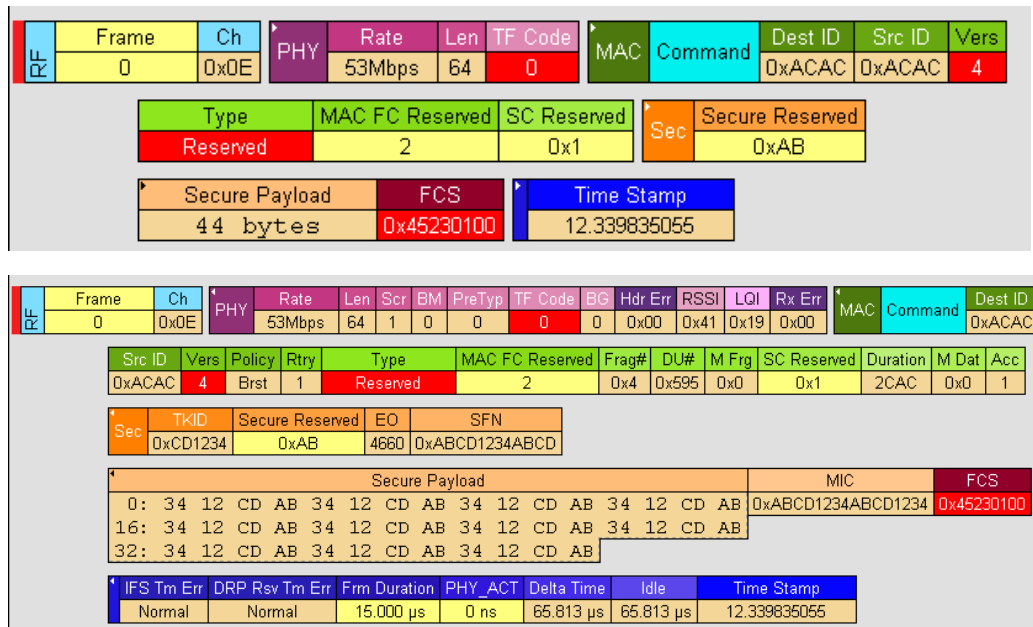


Figure 3.7 Expanded Data Block

If you double-click a cell of a PHY, MAC, Payload, or Timing data block, the trace displays all the fields of the block (see Figure 3.7). If you double-click a cell of an expanded block, the trace displays the truncated block

Right Mouse Button

If you right-click a cell in the trace, a pop-up menu allows changing display options, zooming in or out, wrapping the display, un hiding hidden cells, hiding fields with reserved field warnings, applying decoding scripts, and calculating real-time statistics (Figure 3.8).

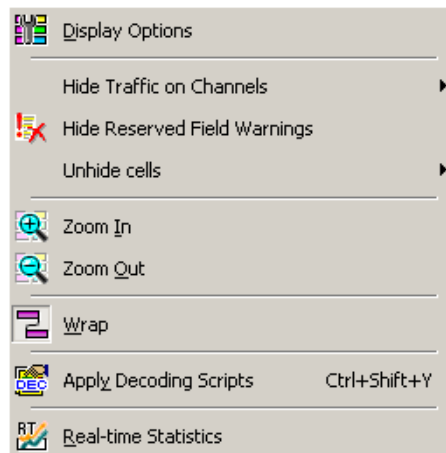


Figure 3.8 Trace Cell Pop-up Menu

3.11 Status Bar

The Status bar is located at the bottom of the Main window. Depending on the current activity, the bar can be divided into as many as four segments. Figure 3.9 shows an example status bar. In this example, no analyzers are connected to the application.

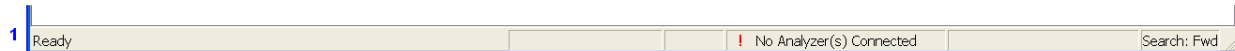


Figure 3.9 Status Bar Example 1

In Figure 3.10, an analyzer is connected to the application. Both the MPI and RF channels are in IDLE state.



Figure 3.10 Status Bar Example 2

In Figure 3.11, the MPI channel detects PCLK and is attempting to synchronize to the data. The RF channel is in IDLE state.



Figure 3.11 Status Bar Example 3

The MPI Channel is synchronized to the MPI data and PCLK. The RF channel is attempting to synchronize to wireless traffic.

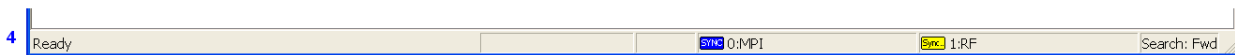


Figure 3.12 Status Bar Example 4

The MPI channel is synchronized to the MPI traffic and is recording. The RF channel is recording but lost synchronization and is attempting to regain synchronization.

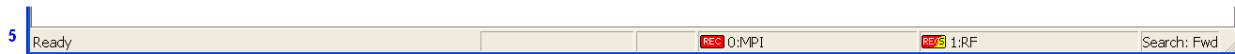


Figure 3.13 Status Bar Example 5

The MPI channel is in IDLE mode, not synchronized to PCLK. The RF channel is synchronized to wireless traffic and is recording.



Figure 3.14 Status Bar Example 6

Recording Progress

When you begin recording, the left-most segment of the Status bar displays a recording Progress Indicator (left side of Figure 3.15).

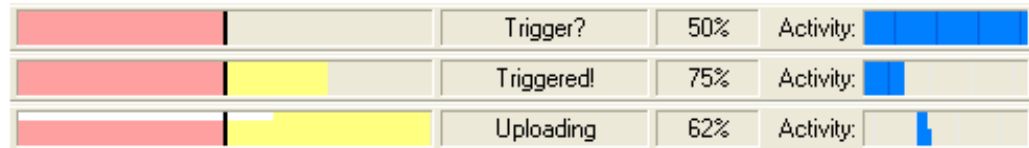


Figure 3.15 Example: Status Bar at Different Recording States

Keep the following in mind when reading the Progress Indicator:

- A black vertical line illustrates the location of the trigger position you selected in the Recording Options window. The pre-trigger progress is displayed in the field to the left of the trigger position.
- When the trigger position is reached, the progress indicator wiggles as it waits for the trigger.
- After the trigger occurs, the field to the right of the trigger fills in the post-trigger color specified in the Display Options window.
- When recording is complete, the upper half of the Progress Indicator fills in white, indicating the progress of the data upload to the host computer.

Some other key points about the Progress Indicator:

- If a trigger event occurs during the before-trigger recording, the before-trigger color changes to the after-trigger color to indicate that not all the expected data was recorded pre-trigger.
- When you click **Stop** before or after a trigger event, the Progress Indicator adjusts to begin uploading most recently recorded data.
- If you wish to abort an upload that is in progress, click the **Stop** button again.
- The Progress Indicator fills with color in proportion to the specified size and actual rate at which the hardware is writing and reading the recording memory. However, the Progress Indicator is normalized to fill the space within the Status bar.

Recording Status

During recording, current recording status is displayed in the next segment of the Status bar. When recording is begun, one of the following messages flashes (depending on options selected in the Recording Options window):

- Trigger?
- Triggered!
- Uploading

After recording stops, the following occurs:

- Flashing message changes to **Uploading data–x% done** (x% indicates the percentage completion of the data uploading process).
- Traffic data is copied to disk (overwriting any previous version of this file) using the default file name **data.uwb**. You can specify the file name in the Recording Options window.

To abort the upload process, press the **Stop** button. You are asked if you want to keep or discard the partially uploaded data.

When the data is saved, the Recorded Data file appears in the Main display window, and the Recording Status window is cleared.

- If the recording resulted from a trigger event, the first frame following the trigger (or the frame that caused the trigger) is initially positioned second from the top of the display.
- If the recording did not result from a trigger event, the display begins with the first frame in the traffic file.

Recording Activity

During recording, the fourth segment from the left of the Status bar displays recording activity as a series of vertical bars.

The more vertical bars that are displayed, the greater the amount of activity being recorded. If there are no vertical bars, there is no recorded activity.

During uploading, the percent of the completed upload is displayed.

Search Status

The rightmost segment of the status bar displays current search direction: Fwd (forward) or Bwd (backward).

3.12 View Settings Tools

You can zoom in and out, and wrap the trace to fit within the screen by using the following buttons:

Zoom In

Increases the size of the displayed elements, allowing fewer (but larger) Frame fields per screen.

- Click  on the Tool bar.

Zoom Out

Decreases the size of the displayed elements, allowing more (but smaller) Frame fields per screen.

- Click  on the Tool bar.

Wrap

Adjusts the Trace View so that frames fit onto the next line if they are longer than the size of the window. Without wrap, you can use the horizontal scroll bar to see the hidden part of a frame.

- Click  on the Tool bar.

In Figure 3.16, the timestamp extends off the right edge of the screen.

LL	Frame	Ch	PHY	Rate	Len	Scr	BM	PreTyp	TF Code	EG	Hdr Err	RSSI	LQI	Rx Err	MAC	Command	Dest ID	Src ID	Vers	Policy	Rtry
0x0E	0	0x0E		53Mbps	64	1	0	0	0	0	0x00	0x41	0x19	0x00			0xACAC	0xACAC	4	Brst	1

Figure 3.16 Trace With Wrap Turned OFF

In Figure 3.17, the entire frame appears in the window.

LL	Frame	Ch	PHY	Rate	Len	Scr	BM	PreTyp	TF Code	EG	Hdr Err	RSSI	LQI	Rx Err	MAC	Command	Dest ID	Src ID	Vers	Policy	Rtry	Type	MAC FC Reserved	Frag#
0x0E	0	0x0E		53Mbps	64	1	0	0	0	0	0x00	0x41	0x19	0x00			0xACAC	0xACAC	4	Brst	1	Reserved	2	0x4
DU#	M Frg	SC Reserved	Duration	M Dat	Acc	Sec	Secure Reserved	Secure Payload																
0x595	0x0	0x1	2CAC	0x0	1		0xAB	44 bytes																
FCS	Time Stamp																							
0x45230100	12.339835055																							

Figure 3.17 Trace With Wrap Turned ON

3.13 Adding Comments to the Trace

You can create, view, or edit the 100-character comment field associated with each Trace file.

- Step 1** From the **File** menu, select **Edit Comment** to display the **Edit Trace Comment** dialog box.

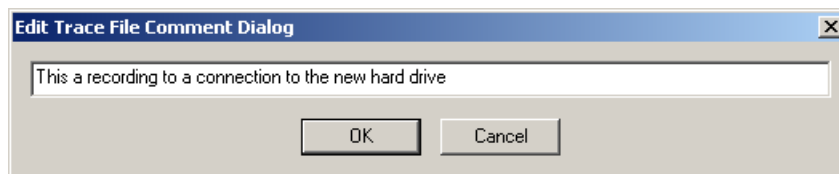


Figure 3.18 Edit Trace File Comment Dialog Box

- Step 2** Create, view, or edit the comment.
- Step 3** Click **OK**.

3.14 Set Marker

The Set Marker feature allows frames to be marked so you can navigate back to events of interest. Markers also provide you with a way of tagging events so you can perform timing calculations between them.

The Set Marker command works in conjunction with the Go to Marker feature. Once you have marked a frame, you can navigate back to it by selecting **Search > Go to Marker**, and then selecting the marker of interest from the list.

To set a marker on a frame:

Step 1 In the trace, click the **MPI** field for the frame number you wish to mark.

Step 2 From the pop-up menu that appears, Select **Set Marker** (Figure 3.19).

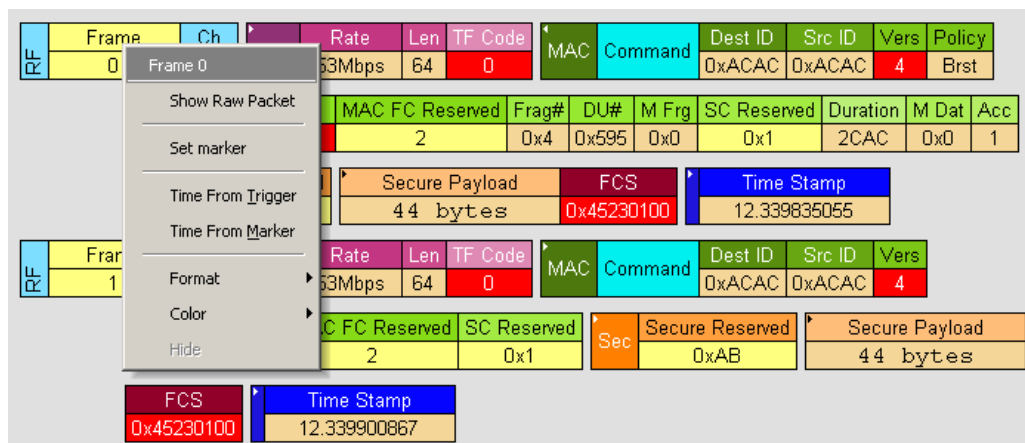


Figure 3.19 Setting a Frame Marker

Step 3 The **Edit Marker for Frame #** dialog box appears (Figure 3.20).

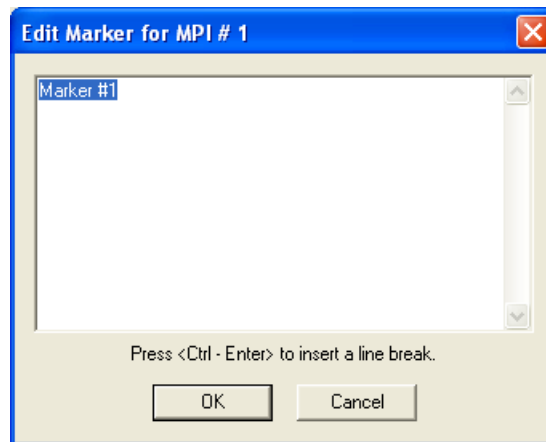


Figure 3.20 Edit Marker for Frame Dialog Box

Step 4 Enter your comment.

Step 5 Click **OK**.

Step 6 A marked frame is indicated by a vertical red bar along the left edge of the Frame # block (left side of Figure 3.21).

MPI	SLEEP state	Delta Time	Time Stamp
1	2.398 μ s	2.400 μ s	0.000002400

Figure 3.21 A Marked Frame

3.15 Edit or Clear Marker

To clear a marker or edit comments associated with a Frame marker:

Step 1 Click **Frame #** for the chosen packet to display a pop-up menu (Figure 3.22).

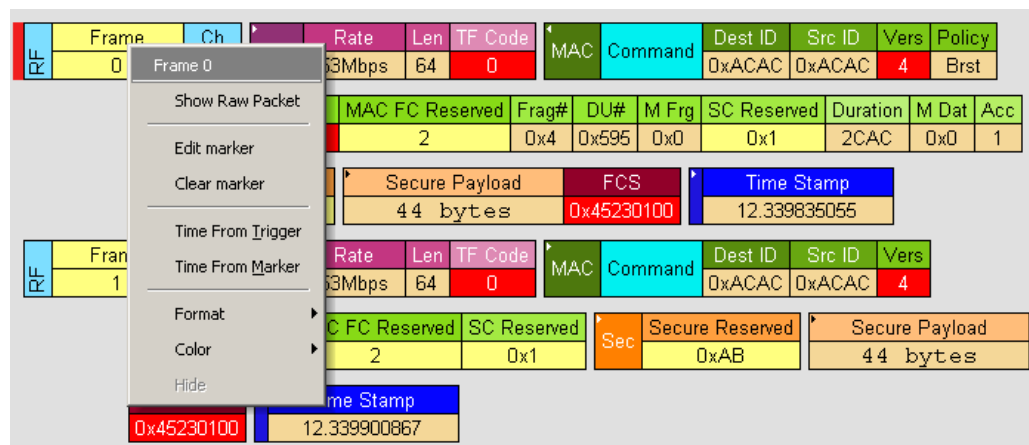


Figure 3.22 Editing a Frame Marker

Step 2 To edit the marker comment, select **Edit Marker** to display the **Edit Marker for Frame #** comment window (Figure 3.20).

Step 3 Edit the comment.

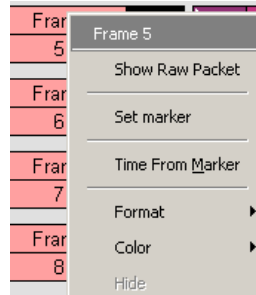
Step 4 Click **OK**.

Step 5 To clear a marker, click **Clear marker** in the frame pop-up menu (Figure 3.22). The vertical red Marker bar disappears.

3.16 Timing Calculations on Markers

You can use markers as reference points to calculate timing between events. To do a timing calculation:

Step 1 Click the **MPI** field of the frame number that you want to use as the first point of reference in the time calculation.



Step 2 In the pop-up that appears (Figure 3.22), select **Time from Marker** to display the Timing and Bus Usage Calculator. The first point is in the From Frame field.

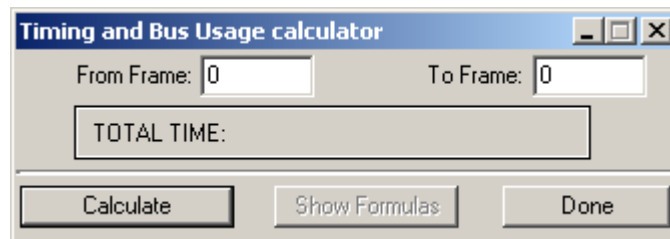


Figure 3.23 Timing Calculator Dialog Box

Step 3 In the All Markers window, select the marker that you want to use as the second (To MPI) point of reference in the time calculation.

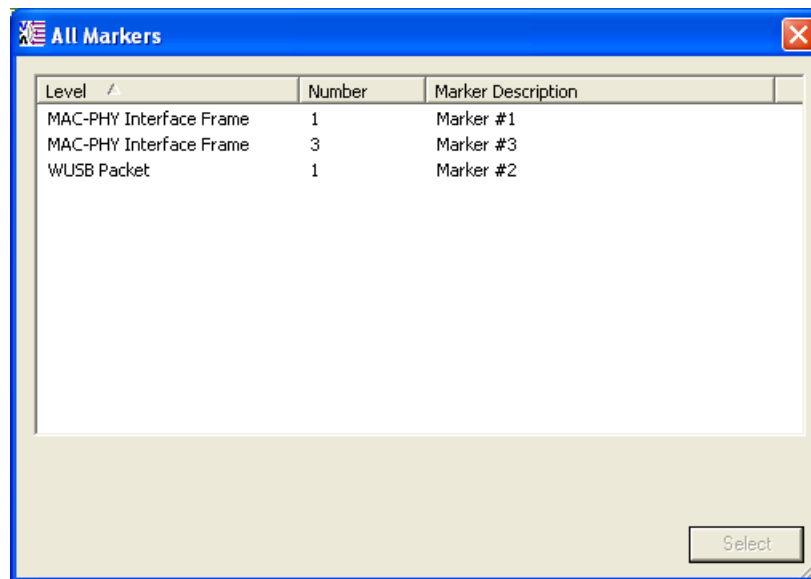


Figure 3.24 All Markers Window

Step 4 The time between the two markers appears in the Timing Calculator dialog box.

Chapter 4: Reading Traces

This chapter describes how to read and manipulate trace displays.

4.1 Trace Display Overview

UWB Tracer trace viewing software makes extensive use of color and graphics to fully document the captured (decoded) traffic (Figure 4.1).

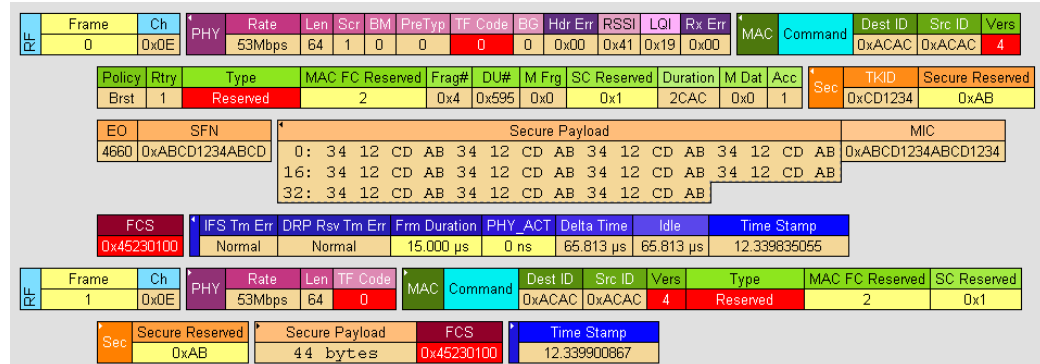


Figure 4.1 Trace Display Example

Frames are shown on separate time-stamped rows, with their individual fields both labeled and color coded. You can collapse data fields to save space in the display, and you can zoom in and out in the display. Pop-up Tool Tips annotate fields with detailed information about their contents.

The display software can operate independently of the hardware and so can function as a stand-alone trace viewer that may be freely distributed.

4.2 Trace Level Views

You can display traces at these viewing levels, listed from lowest to highest:

- MAC-PHY Interface Frame (MPI) [default]
- WUSB Packet (PKT)
- WUSB Transaction (TRA)
- WUSB Transfer (XFR)
- WUSB Wire Adapter Segment (WA SEG)
- WUSB Wire Adapter Transfer (WA XFR)

Changing Trace Level Views

You can select the trace viewing level in the Display Options window General tab Trace Viewing Level section (see Chapter 6, "Display Options") or with the Trace Viewing Level icons in the Tool bar (Figure 4.2).

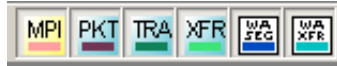


Figure 4.2 Trace Viewing Level Buttons

Note: To find frames, packets, transactions, segments, or transfers, scroll through the trace or use the **Search > Find** command (see Chapter 9, "Searching Traces").

MAC-PHY Interface Frame Level

The MPI view is the default decode level. An example MAC-PHY Interface Frame level is in Figure 4.3. Frame1 is marked.

Frame	Ch	PHY	Rate	Len	TF Code	MAC	Command	Dest ID	Src ID	Vers	Type	MAC FC Reserved	SC Reserv
0	0x0E	PHY	53Mbps	64	0	MAC	Command	0xACAC	0xACAC	4	Reserved	2	0x1
		Sec	Secure Reserved	Secure Payload	FCS	Time Stamp							
			0xAB	44 bytes	0x45230100	12.339835055							
1	0x0E	PHY	53Mbps	64	0	MAC	Command	0xACAC	0xACAC	4	Reserved	2	0x1
		Sec	Secure Reserved	Secure Payload	FCS	Time Stamp							
			0xAB	44 bytes	0x45230100	12.339900667							

Figure 4.3 Trace View: MPI Frame Level

WUSB Packet Level

Click the **PKT** button to show the WUSB Packet Level view. An example packet level is in Figure 4.4.

WUSB Packet	MMC	Dir	Host Id	Resvd	Chan TS	IE Id	CTA 0	# Notif TS's	CTA 1	Time Stamp	
0	MMC	-->	0x10B0	0x02FD	0.001	WCTA_IE	DNTS	1	EOL	12.344500532	
1	MMC	-->	0x10B0	0.003		WCTA_IE	DNTS	1	EOL	12.418938965	MMC Tm Err
										Error	

Figure 4.4 Trace View: WUSB Packet Level

WUSB Transaction Level

Click the **TRA** button to show the WUSB Transaction Level view. An example transaction level is in Figure 4.5.

WUSB Xaction	Control	Host Id	Addr	Endp	CTA Pkt#	Data Start	End CTA Pkt	D	Tp	R	bRequest	wValue	wIndex
0	Setup+IN	0x10A0	129	0	0:1	1400	1:255	D->H	S	D	GET_DESCRIPTOR	0x0100	0x0000
		wLength	NAK	ACK'd Pkts	Xact Len								
		64	2	0	0								
WUSB Xaction	Control	Host Id	Addr	Endp	Seq #	Data Len	bvDINAck	ACK'd Pkts	Xact Len				
1	IN	0x10A0	129	0	0	18	0x00000006	1	18				
WUSB Xaction	Control	Host Id	Addr	Endp	bvAckCode	ACK'd Pkts	Xact Len						
2	Status	0x10A0	129	0	0x00000003	0	0						

Figure 4.5 Trace View: WUSB Transaction Level

WUSB Transfer Level

Click the **XFR** button to show the WUSB Transfer Level view. An example transfer level is in Figure 4.6.

WUSB Xfer	Control Transfer	Host Id	Addr	Endp	bRequest	wValue	wIndex	Descriptors	
0	Read	0x10A0	129	0	GET_DESCRIPTOR	DEVICE type	0x0000	DEVICE Descriptor	
1	Read	0x10A0	129	0	GET_DESCRIPTOR	DEVICE type	0x0000	DEVICE Descriptor	
2	Read	0x10A0	129	0	GET_DESCRIPTOR	CONFIGURATION type, Index 0	0x0000		
		Descriptors							
		CONFIGURATION Descriptor							

Figure 4.6 Trace View: WUSB Transfer Level

WUSB Wire Adapter Segment Level

Click the **WASEG** button to show the WUSB Wire Adapter Segment Level view. An example wire adapter segment level is in Figure 4.7.

WA Segment	Control	Host Id	WA_Adr	RPipe	D	Tp	R	bRequest	wValue	wIndex	wLength	ResStatus	ResLen
2	Setup+IN	0x10A0	129	0	D->H	S	D	GET_DESCRIPTOR	0x0100	0x0000	18	SUCCESS	18
3	Setup+IN	0x10A0	129	0	D->H	S	D	GET_DESCRIPTOR	0x0200	0x0000	9	SUCCESS	9
4	Setup+IN	0x10A0	129	0	D->H	S	D	GET_DESCRIPTOR	0x0200	0x0000	32	SUCCESS	32
5	Setup+IN	0x10A0	129	0	D->H	S	D	GET_DESCRIPTOR	0x0300	0x0000	255	SUCCESS	128

Figure 4.7 Trace View: WUSB Wire Adapter Segment Level

WUSB Wire Adapter Transfer Level

Click the **WAXFR** button to show the WUSB Wire Adapter Transfer Level view. An example wire adapter transfer level is in Figure 4.8.

WA Transfer 2	Control Transfer Read	Host Id 0x10AD	WA_Addr 129	RPipe 0	bRequest GET_DESCRIPTOR	wValue DEVICE type	wIndex 0x0000	Descriptors DEVICE Descriptor
WA Transfer 3	Control Transfer Read	Host Id 0x10AD	WA_Addr 129	RPipe 0	bRequest GET_DESCRIPTOR	wValue CONFIGURATION type, Index 0	wIndex 0x0000	Descriptors CONFIGURATION Descriptor
WA Transfer 4	Control Transfer Read	Host Id 0x10AD	WA_Addr 129	RPipe 0	bRequest GET_DESCRIPTOR	wValue CONFIGURATION type, Index 0	wIndex 0x0000	Descriptors 4 Descriptors
WA Transfer 5	Control Transfer Read	Host Id 0x10AD	WA_Addr 129	RPipe 0	bRequest GET_DESCRIPTOR	wValue STRING type, LANGID codes requested	wIndex Language ID 0x0000	Descriptors Lang Supported

Figure 4.8 Trace View: WUSB Wire Adapter Transfer Level

Chapter 5: Searching Traces

This chapter describes how to search for trace events.

5.1 Trace Search Overview

UWB Tracer™ has several search commands that let you navigate a trace view to search for key events, such as errors and triggers. The commands are on the Search menu (Figure 5.1).

To view the search options, click **Search** in the Menu bar.

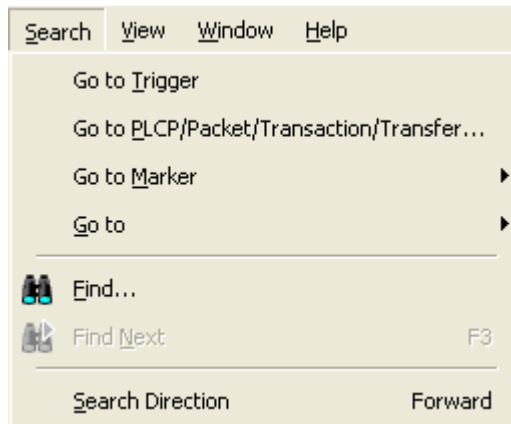


Figure 5.1 Search Menu

5.2 Go to Trigger

To display a trigger event, select **Go to Trigger** from the Search menu.

The trace view is repositioned with the first frame following the trigger event (or the frame that caused the trigger) at the top of your screen.

5.3 Go to PLCP/Package/Transaction/Transfer

To display a specific frame or decode level, follow these steps:

Step 1 From the Search menu, select:

Go to PLCP/Package/Transaction/Transfer

to display the Go to PLCP/Package/Transaction/Transfer dialog box (Figure 5.2):

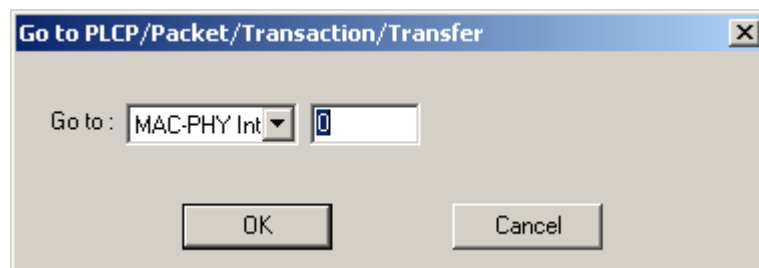


Figure 5.2 Go To PLCP/Package/Transaction/Transfer Dialog Box

Step 2 Select the trace level view in the Go to field from the drop-down list.

Step 3 Enter the number of the frame, packet, transaction, segment, or transfer.

Step 4 Click **OK**.

The trace view shows the selected item at the top of the main window.

5.4 Go to Marker

To instruct the analyzer to display a marked frame, follow these steps:

Step 1 From the Search menu, select **Go to Marker** (Figure 5.3).

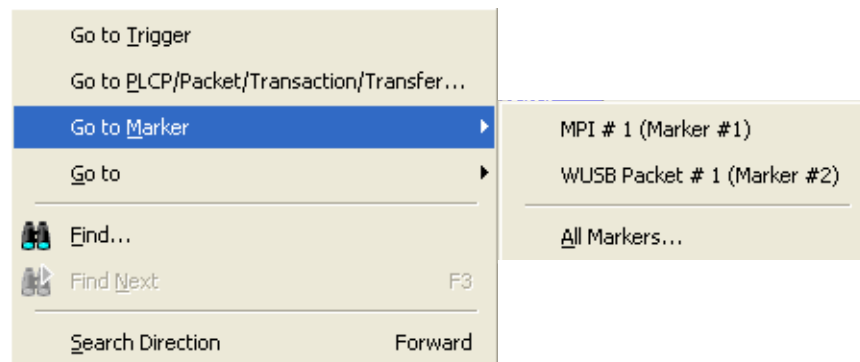


Figure 5.3 Selecting Go to Marker

Step 2 Select a frame or packet number from the listed markers. Alternatively, select **All Markers** to open the All Markers dialog box (see figure 5.17, "All Markers Window"), select a marker, and then click **Select**.

The trace view displays the selected item at the top of the main window.

Note: The **Go to Marker** feature functions in conjunction with the **Set Marker** feature. The comments within the parentheses following each marked Frame are added or edited with the **Set Marker** feature.

5.5 Go to

The **Go to** feature takes you directly to an item in the trace. After you select Go to, select the item from the listed items (Figure 5.4).

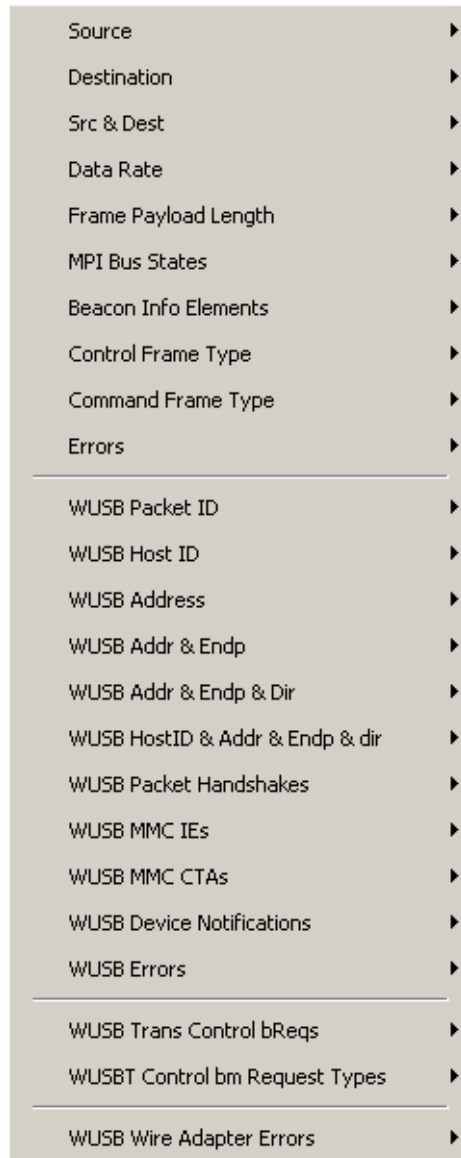



Figure 5.4 Go to Items List

5.6 Find

Find is a utility that allows you to conduct searches of one or more events in a trace. Find allows you to search for different hierarchical levels within the trace: the MPI frame level, WUSB packet level, WUSB transaction level, and WUSB transfer level.

To use Find:

- Select **Find...** under Search on the Menu bar
OR
- Click  in the Tool Bar.

You see the User-Defined Find Events window (Find window) (Figure 5.5).

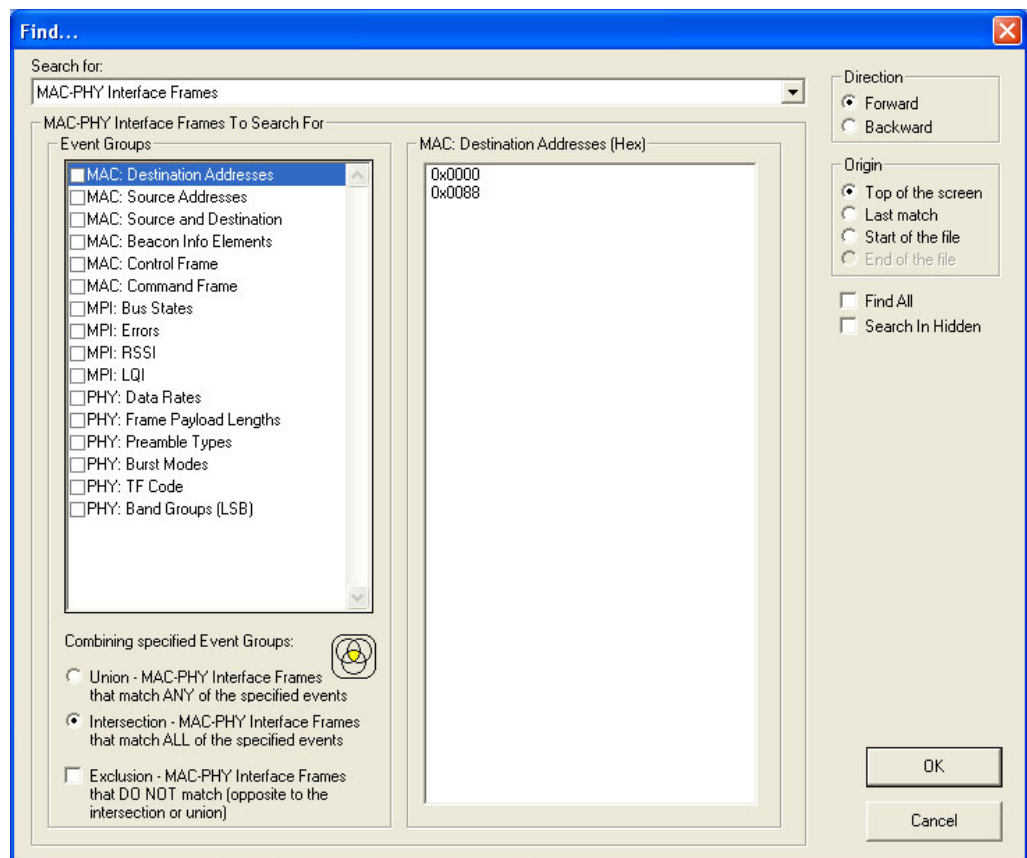


Figure 5.5 Find Events Window

Areas in Find Window

The **Find** window has three areas: Event Groups pane, a Context area to the right of the Event Groups pane (whose contents vary depending on items in the pane), and a Direction/Origin area at the right in the window.

Event Groups Pane: Left area that allows you to specify the events to find in the search. You can select as many checkboxes as desired (for multiple search events). You also can combine specified event groups, meaning you can use logical relationships in your search: OR, AND, and NOT:

- **Union:** OR relationship. A Find operation searches for frames that include any of the items selected in the Event Groups pane.
- **Intersection:** AND relationship. A Find operation searches for only those frames that match all the items selected in the Event Groups pane.
- **Exclusion:** NOT relationship. A Find operation searches for frames that do not match any of the items selected in the Event Groups pane.

Context area: Provides further selection criteria for the Event Group active in the Event Groups pane. For example, in Figure 5.5, the MAC Destination Addresses Event Group is currently active (selected). The context area lets you select a range of MAC addresses. In Figure 5.6, the PHY Data Rates is the active Event group. A different display appears in the context area.

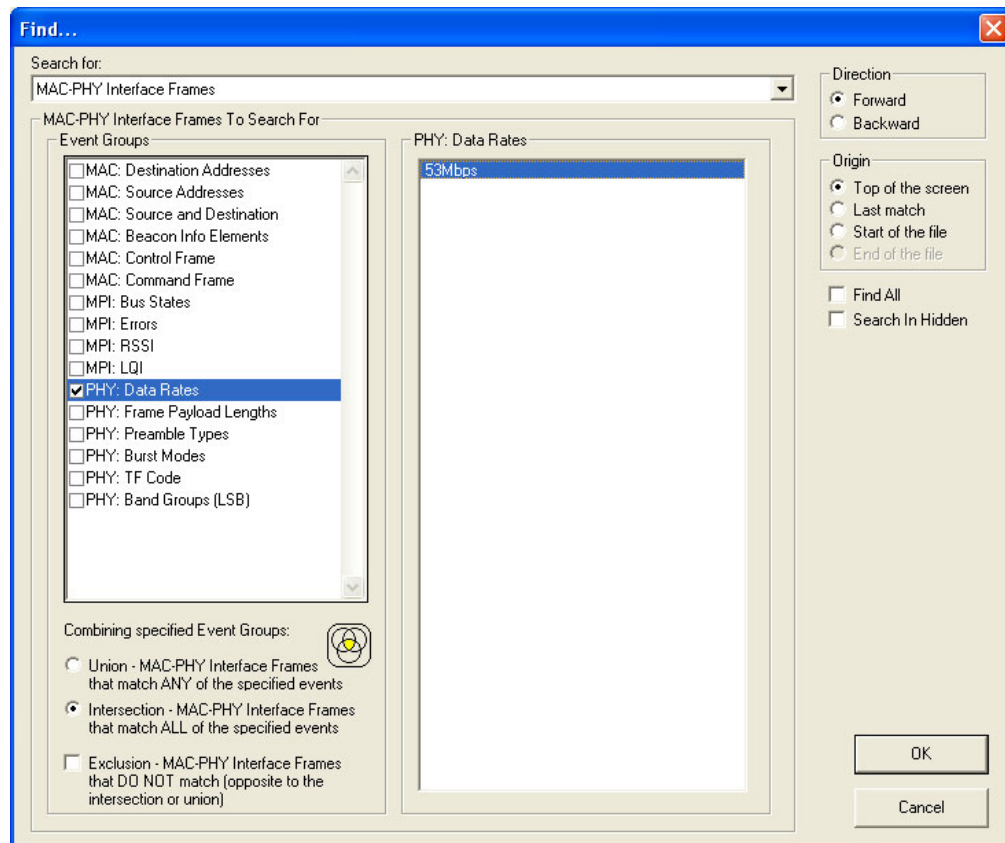


Figure 5.6 Find Events Window: MPI Bus States Active

**Direction/
Origin**


The radio buttons and checkboxes in the right part of the Find window let you specify where you want to start the search and search direction:

- **Direction:** You can search forward or backward in the file.
- **Origin:** You can choose the point-of-origin for the search.
- **Find All:** You can extract every instance of the search criteria in a separate trace file.
- **Search in Hidden:** You can search in frame elements that are hidden in the display as well as frame elements that are visible.

Chapter 6: Display Options

You can select what information to display in Trace Views using the **Display Options** window or the display options buttons on the Tool bar (see Section 3.8, “Tool Bar” on page 22).

To open the **Display Options** window:

- Select **Display Options** under **Setup** on the Menu Bar.
- OR
- Click  on the Tool Bar.

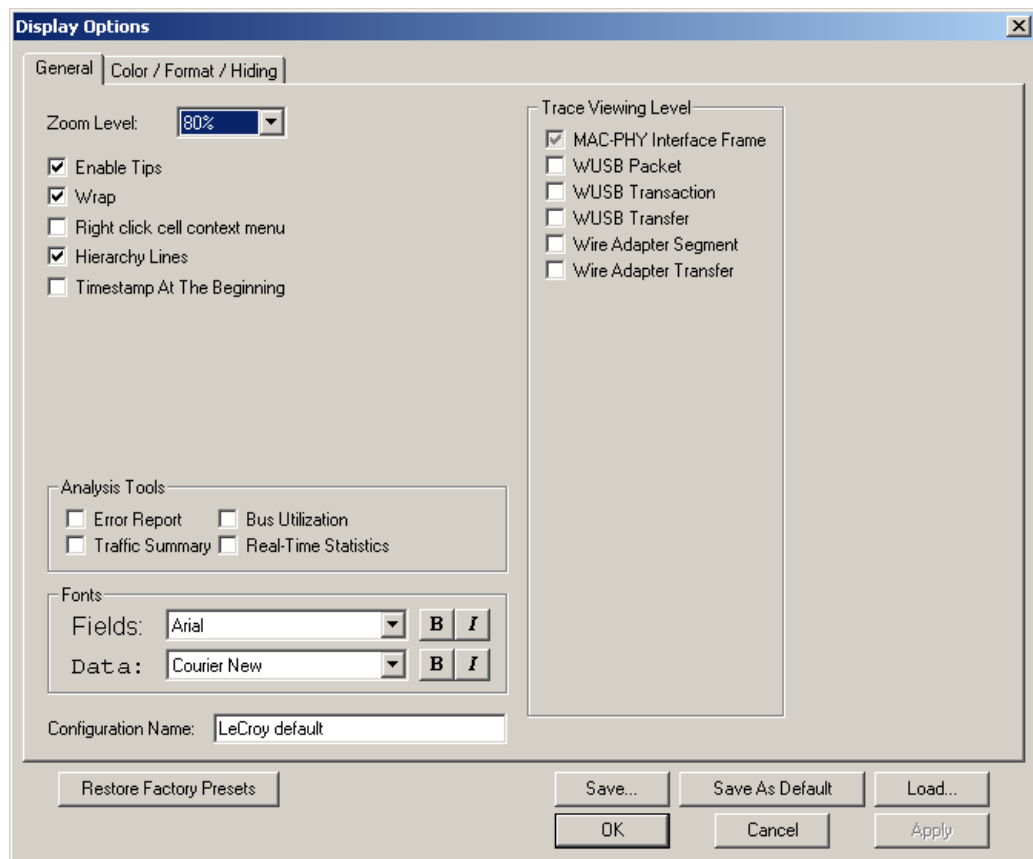


Figure 6.1 Display Options Window: General Page

You can select General and Color/Format/Hiding display options. The following sections describe these display options.

6.1 Display Options: General

You specify the main Trace View information types and settings using General tab of Display Options (see figure on previous page):

- **Zoom Level:** Zooms out from 100% (default) to 10% or zooms in from 100% to 200%.
- **Enable Tips:** Pops up text when you position the cursor over a field.
- **Wrap:** Wraps lines of traffic information instead of truncating lines at the right edge of the display.
- **Right click cell context menu:** By default, clicking the left mouse button on a field heading displays a context-sensitive pop-up menu providing commands about the field and clicking the right mouse button pops up a menu with display options. After selecting this option, clicking the right mouse button on a field heading displays the context-sensitive pop-up menu and clicking the left mouse button does nothing.
- **Hierarchy Lines:** Displays lines on the left side of Trace View showing the hierarchy from Packets to Transactions to Transfers if you show higher-level decodes.

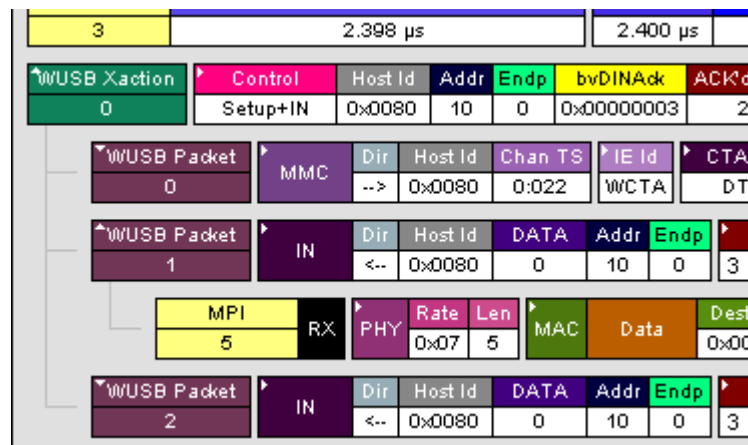


Figure 6.2 Hierarchy Lines

- **Timestamp At The Beginning:** Aligns the Timestamp field in a column on the left side of the Trace View. Selecting this option allows easier comparison with previous or following timestamps.
- **Trace Viewing Level:** Displays MAC-PHY Interface Frame, WUSB Packet level, WUSB Transaction, WUSB Transfer, WUSB Wire Adapter Segment, or WUSB Wire Adapter Transfer Level.
- **Error Report:** Displays the Errors section of the Traffic Summary window.
- **Traffic Summary:** Displays the Traffic Summary window, showing all reports, including Packets, Transactions, Transfers, and Errors.
- **Bus Utilization:** Displays the Bus Utilization window, including Packet length, Bus usage, and Bus usage by device.
- **Real-Time Statistics:** Displays the Real-Time Statistics window, including Data Packet Count, Data Payload Throughput, and Bus Usage.
- **Fonts:** Sets the font type and bold or italic style for Fields and Data.

- **Configuration Name:** You can name the current set of Display Options values for use with an `.opt` file. (The options file can have a different name.)
- **Restore Factory Presets:** Sets all Display Options values to the installed values.

6.2 Display Options: Color, Format, and Hiding

To modify the colors, formats, and hiding options, select the Color/Format/Hiding tab.

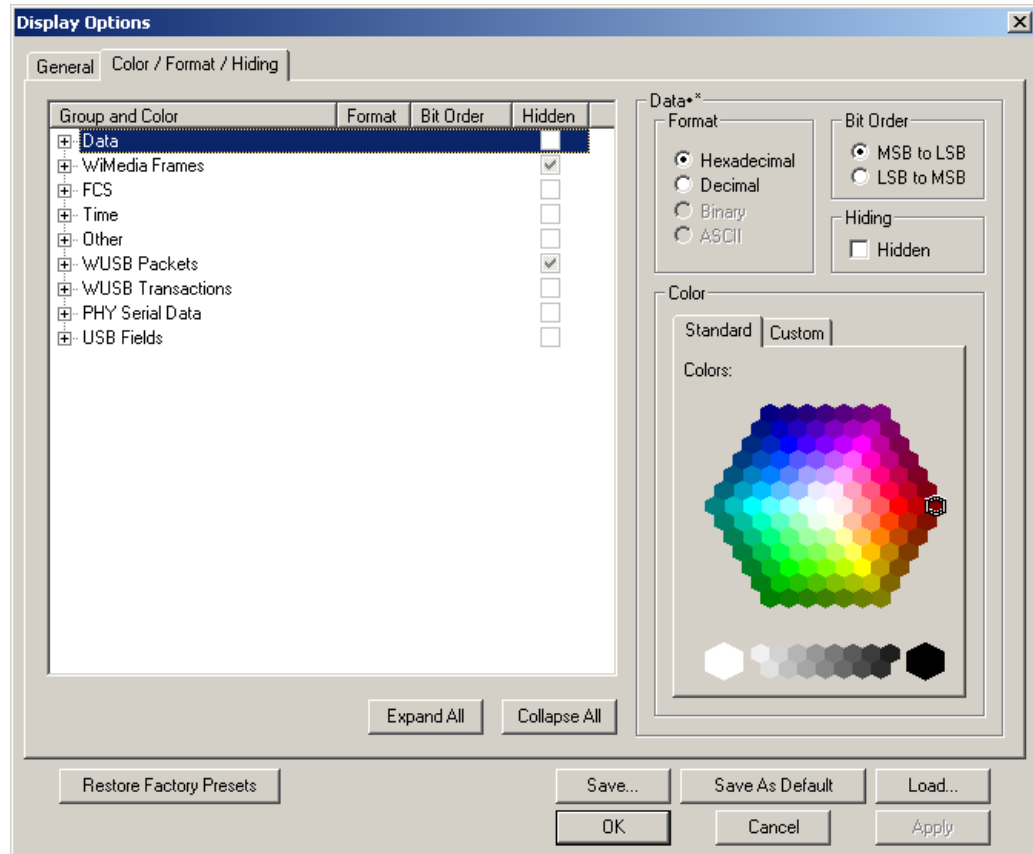


Figure 6.3 Display Options Window: Color, Format, and Hiding Page

Setting Colors

The program uses a default set of colors for each type of data in each group of data. The colors and color combinations are appropriate for most graphic systems. You can alter any color.

To specify a color for an information type, in the Color/Format/Hiding tab, select a row (such as Data) in the Group and Color column and expand it (see Figure 6.2).

Select a data type (such as Data Length) in the Group, then select a color in the Color section, using Standard or Custom colors. Use a bright color for each important field

To customize colors, use the Custom tab.

Note: You cannot change color of an Invalid Data (packet error) field. It is permanently set to red.

Changing Field Formats

For each type of data in each group of data, the program has a default data format. Examples of number data formats are Bin (binary), Dec (decimal), and Hex (hexadecimal). Examples of date and time data formats are Hex uFrame, Dec uFrame, Date & Time, Time, Bit Time, seconds, microseconds, and nanoseconds. An example of a text data format is ASCII. You can alter some data formats.

To specify a data format for an information type, in the Color/Format/Hiding tab, select a row (such as Data) in the Group and Color column and expand it.

Select a data type (such as Payload) in the Group:

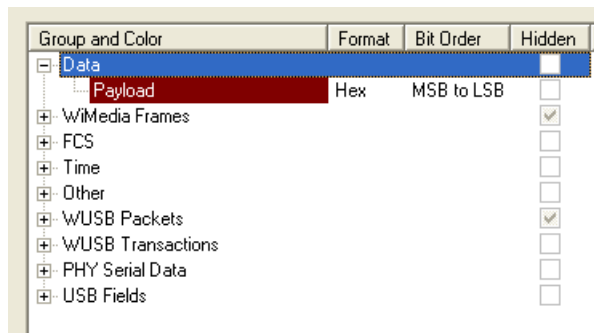


Figure 6.4 Group and Color Pane: Display Units Selected

Select a format in the Format section. The following formats are available for Payload:



Figure 6.5 Formats for Payload

If available, select Bit Order in the Format section. The options are MSB to LSB or LSB to MSB.

Hiding Fields

To hide one or more fields, select the Group and Data type in the Group and Color column, then click the Hidden checkbox in the display or the Hidden checkbox in the Hiding section of the Format section.

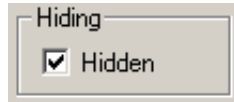


Figure 6.6 Hidden Check Box

6.3 Saving Display Options


You can save a set of Display Options values, make a set the default settings, or use a saved set of values with the commands at the bottom of the **Display Options** window:

- To save the current Display Options values in an options file for use in future sessions, click **Save**. Enter a file name without a file name extension. The program adds the **.opt** extension. (The file must have an **.opt** file name extension.)
- To load a previously saved **.opt** file, click **Load** and select a file name.
- To save the current Display Options values in the **default.opt** options file for use as the default display options, click **Save as Default**. (Do not delete the **default.opt** file.)
- To apply the current Display Options values, click **Apply**. The Display Options window remains open.
- To apply the current Display Options values and close the Display Options window, click **OK**.
- To cancel unsaved changes to display values and exit the Display Options window, click **Cancel**.

Chapter 7: Recording Options

The recording options are the parameters for the recording session. You set the recording options to obtain only the trace information you need.

To use the Recording Options window:

- From the Setup menu, select **Recording Options**.
OR
- From the Tool bar, select the **Recording Options**  button to display the Recording Options window (Figure 7.1).

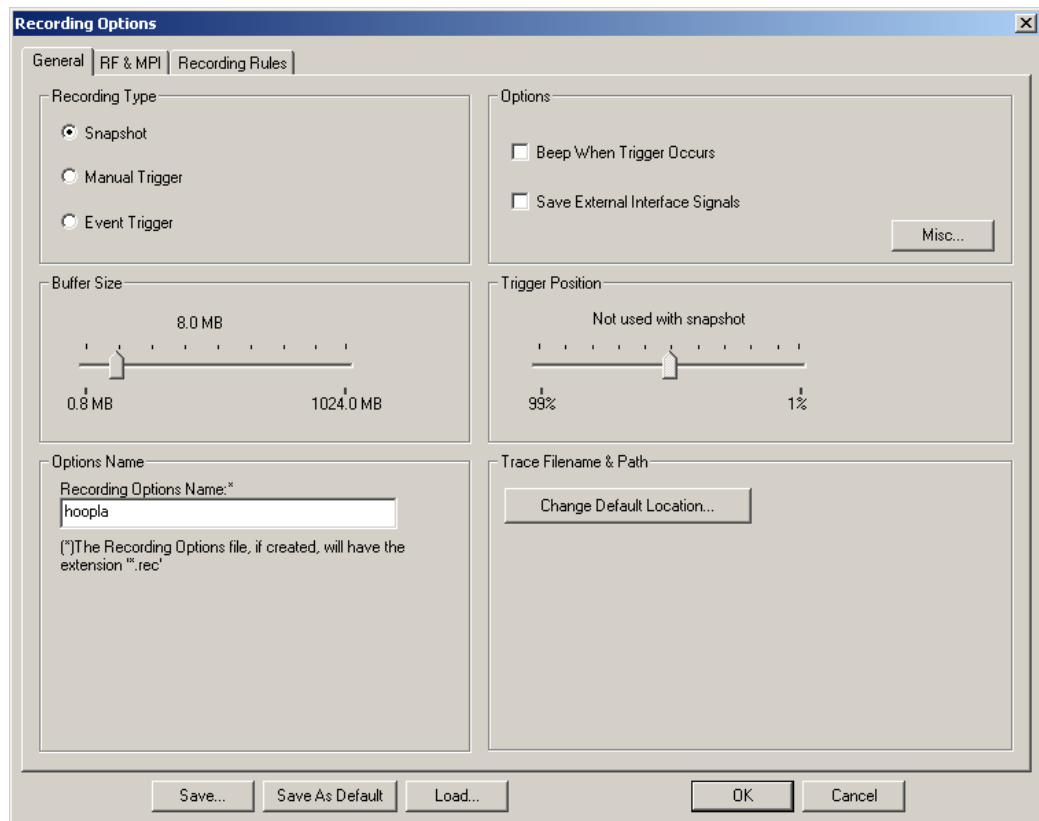


Figure 7.1 Recording Options Window: General Page

The Recording Options window has three tabs:

- **General:** General recording characteristics, including buffer size, recording type, and Trace filename and path.
- **RF & MPI:** Specific recording characteristics.
- **Recording Rules:** Sets triggers and filters.


Note: The settings you configure apply to all recordings made by the analyzer.

You can save and load recording options. The following sections describe the General, RF & MPI, and Recording Rules tabs.



7.1 Recording Options: General

The General page has boxes for Recording Type, Options, Options Name, and Trace Filename and Path.

Recording Type

Recording begins when you click the **Start Recording** button  on the Tool bar or select the **Record > Start** command. Maximum recording size is set in the Buffer Size box.

The Recording Type box options control how UWBTracer ends a recording:

- **Snapshot:** Recording ends when the length reaches the selected buffer size or you click the **Stop Recording** button .
- **Manual Trigger:** Recording continues until you press the Trigger button (on the front panel). After you press the Trigger button, recording continues until the post-trigger buffer is full or you click the **Stop Recording** button  on the Tool bar.
- **Event Trigger:** Recording continues until a (user-defined) trigger event occurs. After the event occurs, recording continues until the post-trigger buffer is full.

Note: See the Readme file on the software installation CD for current information on triggering support.

Options

The options checkboxes appear on the upper right side of the Recording Options window:

- **Beep When Trigger Occurs:** Makes the computer connected to the UWBTracer beep three times when a Trigger condition is first detected.
- **Save External Interface Signals:** Records signals from data pins on the breakout board.

Misc button

To generate an additional binary file at the end of recording:

Step 1 Select the **Misc button** to display the General: Miscellaneous dialog box.

Step 2 Select the Store into Raw Data Debug file checkbox.

The file is stored in the root (c:\) directory. The file name is **BusEngineRawTracexxxx.dat**, where xxxx is the serial number of the analyzer. Use the file to provide additional information if you want to report a problem to LeCroy Technical Support.

Warning! :The Raw Data Debug binary file can have a very large size.

Buffer Size

The program records the entire trace and stores it in the analyzer buffer before uploading it to the host PC. The buffer size determines the maximum size of a recording.

Use the Buffer Size slide bar to set the recording buffer size from 1.6 MB to 2048 MB (Figure 7.2).

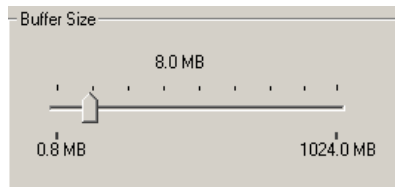


Figure 7.2 Recording Options Window: Buffer Size Slider

Trigger Position

The program uses Trigger Position when the recording type is **Manual Trigger** or **Event Trigger**.

Use the Trigger Position slide bar to set the percentage of the buffer size used for post-trigger recording (Figure 7.3).

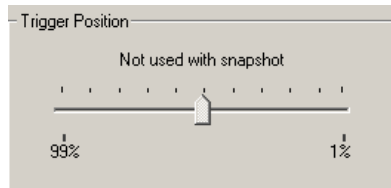


Figure 7.3 Recording Options Window: Trigger Position Slider

This action sets the location of the trigger within the buffer. For example, if the buffer size is 16 MB and the trigger position slide bar is at 75%, 12 MB of the buffer (75%) is post-trigger and 4 MB is pre-trigger. If the buffer size is 16 MB and the trigger position slide bar is at 5%, 0.8 MB of the buffer (5%) is post-trigger and 15.2 MB is pre-trigger.

When a trigger occurs in a recording, recording continues until the post-trigger buffer is full. The complete trace contains the most recent pre-trigger information up to the pre-trigger buffer size, followed by the post-trigger information up to the post-trigger buffer size.

Options Name

You can name the current set of recording options in the Options Name field.

By default, the UWBTracer™ application uses the `default.rec` recording options file located in the application directory. You can save the current recording options in an options file in the application directory or save the recording options as the default file by replacing the `default.rec` file.

To create a new recording options file:

Step 1 Click the **Save** button to display the Save As dialog box.

Step 2 Enter a file name. You can use the same name or a different name than the name in the Options Name field. Do not add a file name extension. The program automatically appends a `.rec` extension.

To save the current options as the default file:

- Click the **Save as Default** button.

Trace Filename and Path

You can save the trace file recording in the Trace Filename and Path box.

To create a trace file:

Step 1 Click **Change Default Location** to display the Specify Trace File Name dialog box.

Step 2 Browse to or enter a trace file path and name, then click **Save**.

7.2 Recording Options: RF & MPI

You set RF and MPI recording options on the RF & MPI page (Figure 7.4).

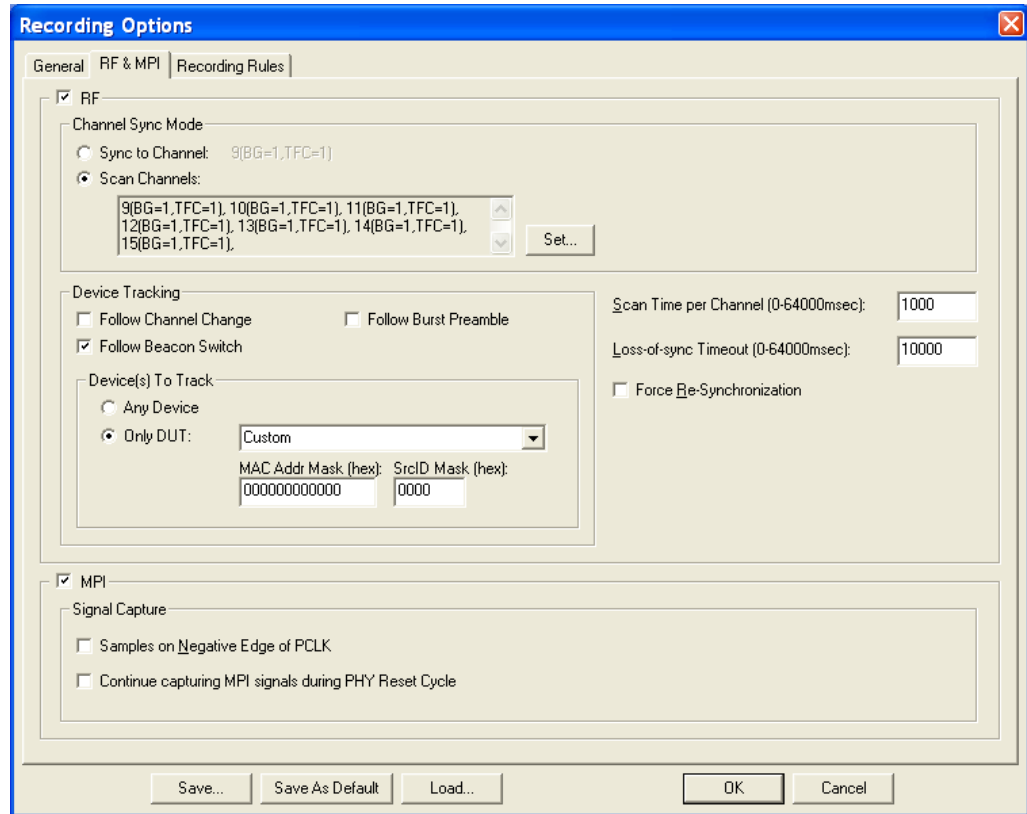


Figure 7.4 Recording Options Window: RF & MPI Page

RF

The RF section controls the RF recording channel. To turn on RF recording, check the **RF checkbox** in the upper left of the window.

Channel Sync Mode

For the analyzer to capture RF traffic, you must synchronize the RF transmission of at least one device under test (DUT). Use the Channel Sync Mode section to set the parameters required for synchronizing to a device.

Two modes of operation can be set:

- **Sync to Channel:** Directs the analyzer to attempt to synchronize to a specific channel. In this mode, you can only select a single channel in the Select Sync Channel window displayed after you click the Set button.
- **Scan Channels:** Directs the analyzer to scan the first of multiple channels and synchronize to the transmission on that channel for a specified period of time, then repeat for the remaining channels. In this mode, you can select multiple channels in the Select Sync Channel window displayed after you click the Set button. The system stops recording automatically after all selected channels have been scanned.

To select the channel or channels, click **Set** to display the Select Sync Channel(s) dialog box:

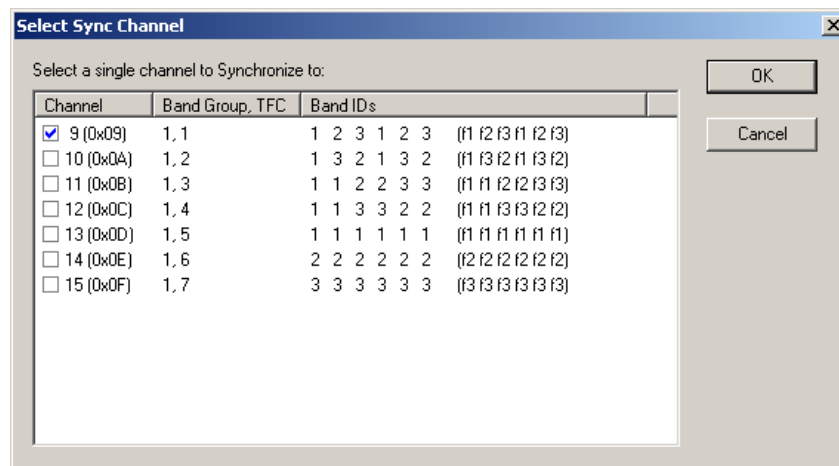


Figure 7.5 Select Sync Channels Dialog Box

The dialog box lists the Channel, Band Group/TF Code, and Band IDs.

Select a checkbox on the left to select a channel. When you are finished selecting channels, click **OK**.

Device Tracking

After the analyzer is initialized/synchronized to a device or a channel, if the DUT changes channels, the analyzer can follow a specific DUT or it can stay on the same channel and follow a beacon switch or a burst preamble of the DUT(s). The device tracking options are:

- **Follow Channel Change:** The analyzer follows the DUT if it changes to a different channel.
- **Follow Beacon Switch:** The analyzer follows a beacon switch of the DUT(s).
- **Follow Burst Preamble:** The analyzer follows a burst preamble of the DUT(s).

Devices to Track

Several DUTs may share the same channel to which the analyzer is synchronized. You can set the analyzer to follow one or a subset of those DUTs.

To select a subset of the devices, you can select from a list of DUTs. Alternatively, you can filter a subset from the set of devices by setting the MAC Address Mask and the SrcID (Source ID) Mask. Only the devices matching the properties you set will be in the subset of devices.

To set the devices to track, select **Any Device** or **Only DUT**. If you select Only Device, select the device from the list of devices. The MAC Addr (Address) Mask and the SrcID (Source ID) Mask are listed in hexadecimal.

MPI

For MPI recording, select the **MPI checkbox** at the top left of the MPI section in the lower left corner of the window.

By default, a trigger occurs on the negative edge of the PCLK clock pulse. If recording data is corrupt, you can set a trigger to occur on the positive edge of the PCLK clock pulse by deselecting the **Samples on Negative Edge of PCLK** checkbox in the Signal Capture section in the lower left corner of the window.

To continue recording during reset, select the **Continue capturing MPI signals during PHY Reset Cycle** checkbox in the Signal Capture section in the lower left corner of the window.

Other Options

Scan Time per Channel

Set the scan period for each channel. The range is 0 to 64,000 milliseconds. The default is 1000 milliseconds. You can set this option only when the Channel Sync Mode is set to "Scan Channels."

Loss-of-Sync Timeout

Set the timeout period to use when out-of-synchronization occurs. The range is 0 to 64,000 milliseconds. The default is 10,000 milliseconds.

Force Resynchronization

Resynchronizes the analyzer receiver PHY with the signal from the devices under test.

If the RF channel is already synchronized to transmitted data from a DUT, this setting forces the analyzer to terminate the synchronization and then try to resynchronize when a new recording begins.

Note: If the analyzer is in "Scan Channels" Channel Sync Mode and you modify the channel setting, the software sets the Force Resynchronization flag internally.

7.3 Recording Options: Recording Rules

Use the Recording Rules page (Figure 7.6) to set triggers and filters.

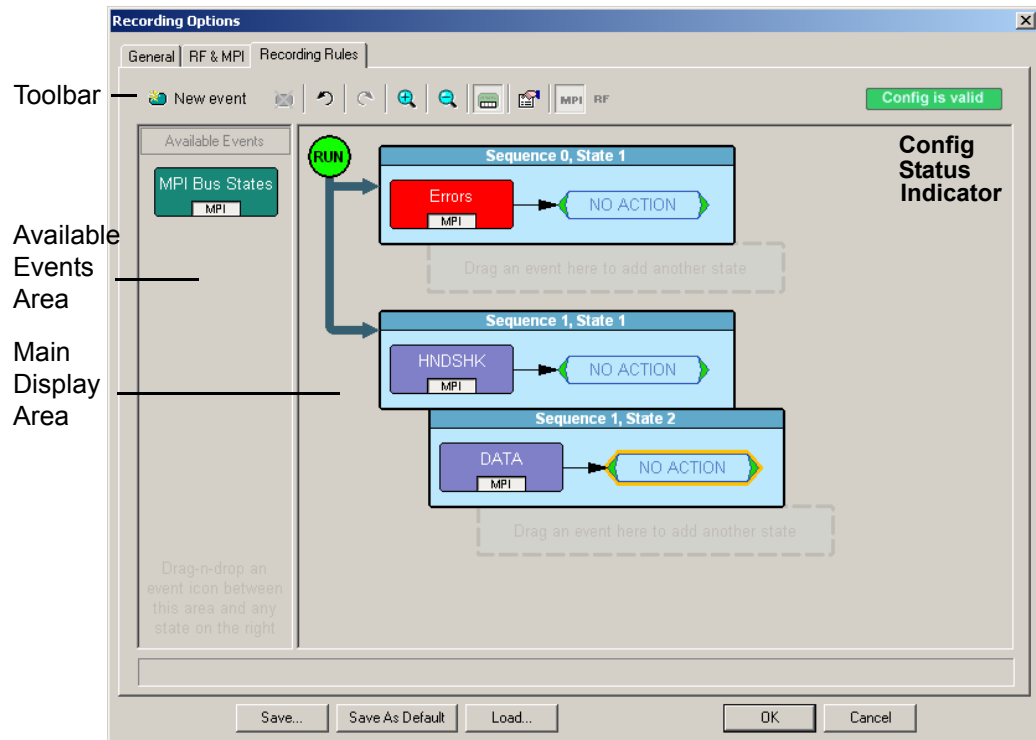


Figure 7.6 Recording Options Window: Recording Rules Page

The page has the following areas:

- **Toolbar:** Contains buttons that control the Recording Rules page.
- **Available Events Area:** Area where you can park Event buttons that you intend to use in the Main Display area.
- **Main Display Area:** Area where you configure trigger and filter rules. You configure rules by dragging Event buttons from the Available Events area and then assigning actions to those buttons.
- **Config Status Indicator:** A button that indicates if the rule is valid or invalid. If a trigger or filter rule is configured correctly, the button is green and indicates Config is Valid. If a rule is not configured correctly, the button is red and indicates Config is Invalid.
- **Pop-Up Menus (not shown):** When you right-click a button or area in the Recording Rules page, a context-sensitive pop-up menu appears that lets you do operations that relate to that button or area.













Recording Rules Toolbar

The Recording Rules toolbar (Figure 7.7) buttons (Table 7.1) control the Recording Rules page.



Figure 7.7 Recording Rules Toolbar

Table 7.1 Recording Rules Buttons

	New Event. Creates a new event in the Available Events area.		Zoom Out. Makes the display appear smaller.
	Delete Event. Deletes the selected event.		Show/Hide Channels. Shows or hides the channel icon on the Event button.
	Undo. Undoes the change made to Recording Rules page. The Undo buffer has unlimited size.		Show/Hide Properties Dialog. Shows or hides the properties dialog of the selected event, action, or state.
	Redo. Restores changes done to the Recording Rules page.		This display appears when the current Recording Rules configuration can be executed by the hardware.
	Zoom In. Enlarges the display (see note). There are five zoom levels. The default level is the middle one.		This display appears when the current Recording Rules configuration cannot be executed by the hardware.
	Apply Recording Rules to MPI Recording Channel		Apply Recording Rules to RF Recording Channel

Note: If you have a wheel on the mouse, you can zoom by holding down the CTRL key and rolling the mouse wheel.

Recording Rules Page: How It Works

You can think of the Recording Rules page as a workspace for creating recording rules (rules that determine how the analyzer records traces). Recording rules are combinations of events and actions.

In *UWBTracer* terms, an event and the action or actions associated with it form a rule state. One or more states are encapsulated in a sequence.

Note: There can be from one to 512 states within a sequence. You can associate one or more events with each state, and you assign each event a different action or the same action.

A sequence that has only one state is called a single-state sequence. The analyzer continuously watches for each event in the sequence and executes the corresponding action if the event is detected.

A sequence that has multiple states is a multi-state sequence. The states are arranged in a hierarchy, with a top state and successively lower states. Only one state in a multi-state sequence is active at a time. The analyzer does not go to a successive state unless it is directed to do so by the previous state.

Sequences are described in detail in "Using Sequences" later in this chapter.

Briefly, creating a rule involves the following steps:

- Step 1** Creating Event buttons in the Available Events area.
- Step 2** Drag-and-drop of Event buttons to the appropriate areas (cells) in the Main Display area.
- Step 3** Assigning an action or actions to each Event button.

Creating Event Buttons

To create a rule, first create one or more Event buttons. As you create Event buttons, they appear in the Available Events area. You then can drag-and-drop them into the Main Display area.

To create event buttons:

Step 1 Click the **New Event** button at the left side of the toolbar to display the New Event pop-up menu (Figure 7.8).

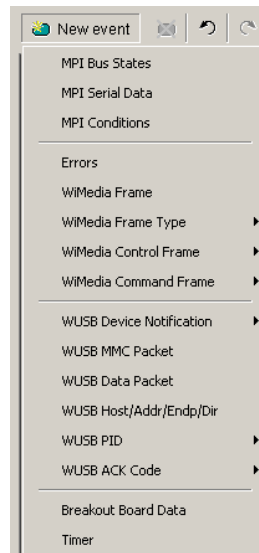


Figure 7.8 Creating a New Event

Step 2 Select an event (Figure 7.9).

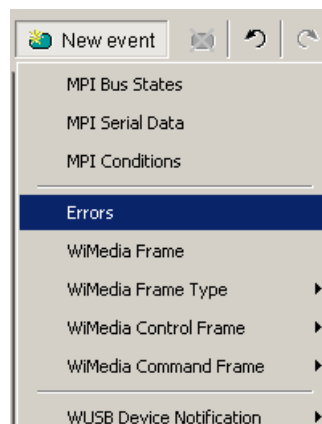


Figure 7.9 Selecting Event Type

The event appears in the Available Events area (Figure 7.10).

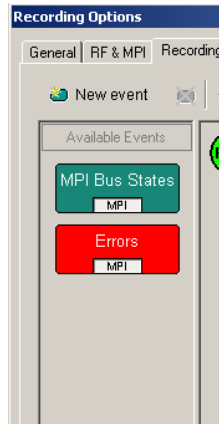


Figure 7.10 Event Button Appears in Available Events Area

Dragging a Button to the Main Display Area

After you create an Event button in the Available Events area, you can drag the button to the Main Display area and drop it in the appropriate cell (a cell is a grayed-out rectangle with a dashed line around it). You can think of each cell as a target for drag-and-drop of an Event button.

There are two types of cell that might appear: Sequence cell and State cell. In the Main Display area, they are labelled as follows:

- **Sequence cell:** Drag an event here to add a new sequence.
- **State cell:** Drag an event here to add another state.

If there currently are no events in the Main Display area, a single sequence cell appears at the top of the area (Figure 7.10).

To drag-and-drop the Event button:

Step 1 Place the mouse cursor on the Event button in the Available Events area. Click the left mouse button.

Step 2 Drag the button to the cell. When the button is in the cell, a dashed highlight line appears around the cell (Figure 7.11).

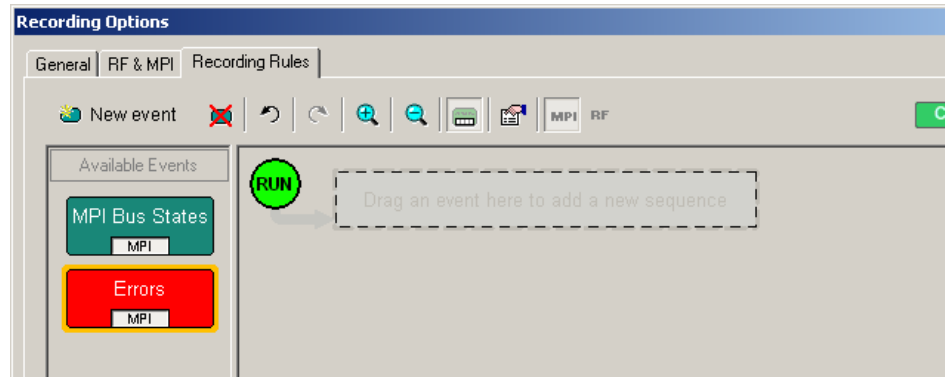


Figure 7.11 Drag-and-Drop Event Button to Cell

Step 3 Drop the button in the cell (release the left mouse button). The Event button appears in the cell (Figure 7.12).

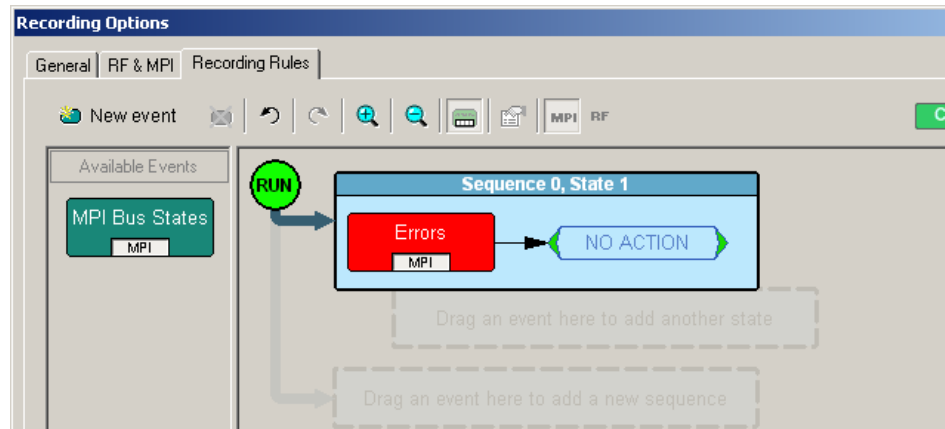


Figure 7.12 Event Button in Cell

As shown in Figure 7.12, the default label for the first cell is "Sequence 0, State 1." As described later in this section, you can change that label using the Properties pop-up for that cell.

As Figure 7.12 also shows, two new cells appear under the first cell. The first of these new cells is a state cell that allows you to create another state in rule Sequence 0 (to make Sequence 0 a multi-state sequence).

The second of the new cells is to create a separate sequence, which would be labelled Sequence 1.

Assigning an Action

After you have dropped the Event button in a cell in the Main Display area, you can assign an action to the event.

Note: If you do not assign an action to an Event button, the analyzer ignores the event.

To assign an action to an Event button:

Step 1 Right-click the Event button to display a pop-up menu (Figure 7.13).

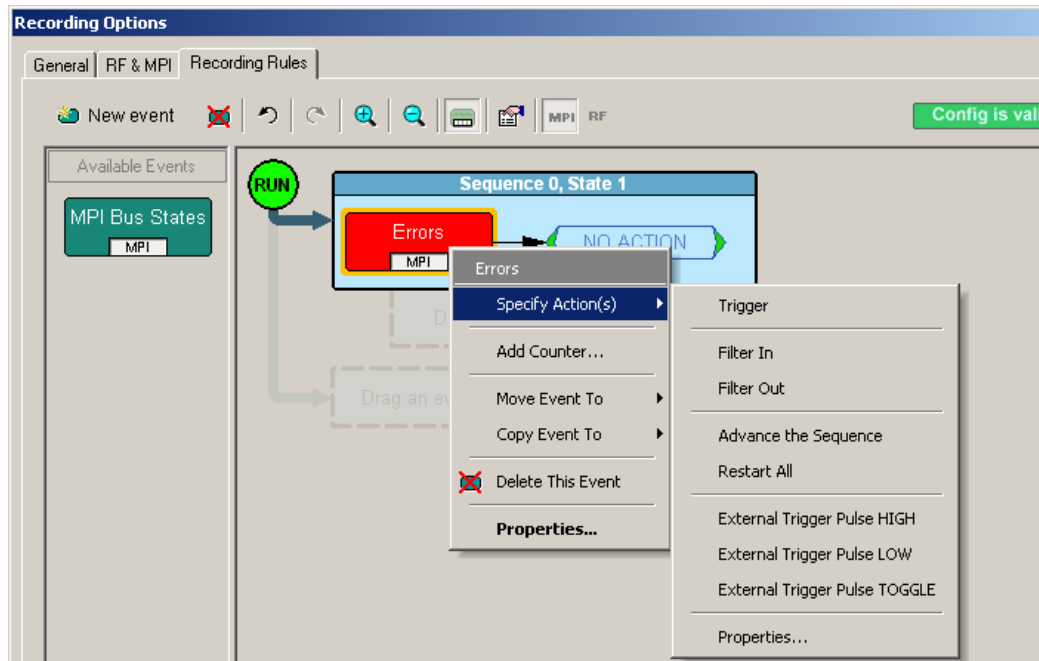


Figure 7.13 Selecting Action From Event Button Pop-Up

Step 2 Select Specify Action, and then choose an action from the submenu. The menu closes, and the action is assigned (Figure 7.14).

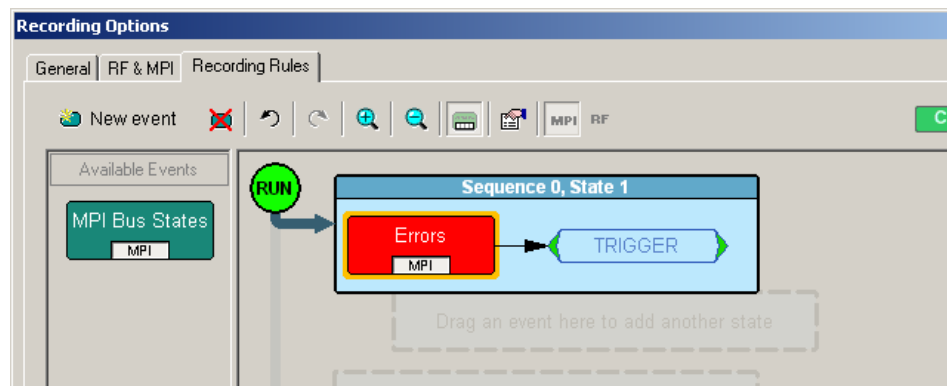


Figure 7.14 Action Assigned to Event

Note: You can also set actions within the Properties dialog for each event. Double-click the Event button to open the Properties dialog, then select the Actions tab and set your actions.

Recording Rules Pop-Up Menus

The Recording Rules window has context-sensitive pop-up menus that are associated with the following types of object: cells, events, and actions.

Cell Pop-up Menu

If you click a cell in the Main Display area that has an Event button contained in it, the Cell pop-up menu appears (Figure 7.15).

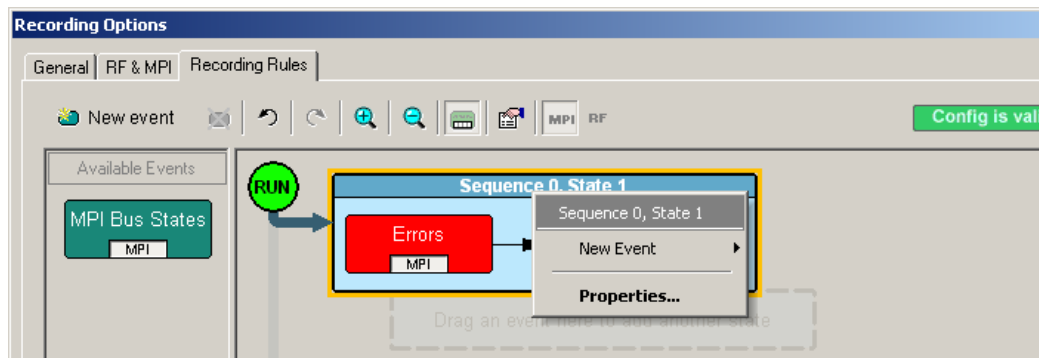


Figure 7.15 Sequence Pop-Up Menu

The Cell pop-up menu has the following options.

- **New Event:** Displays the same menu that you get when you click the New Event button on the toolbar.
- **Properties:** Displays the Properties dialog for the selected cell.

Action Pop-up Menu

If you click an Action button in the Main Display area, the Action pop-up menu appears (Figure 7.16).

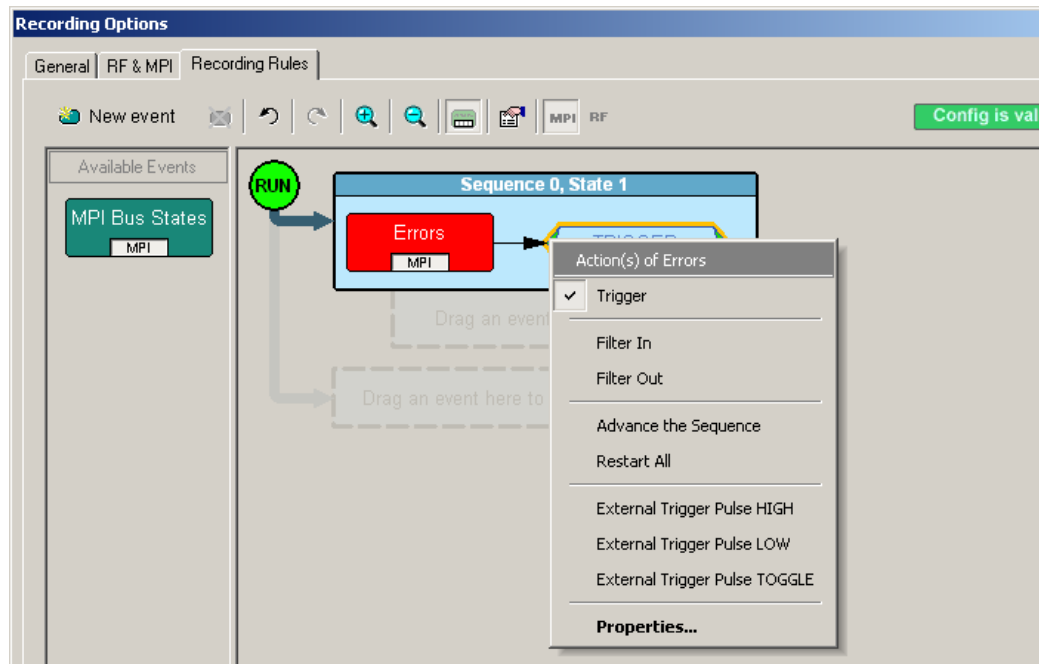


Figure 7.16 Action Pop-Up Menu

The Action pop-up menu has the following trigger and filter options:

- **Trigger:** Sets or clears Trigger action.
- **Filter In:** Sets or clears Filter In action. If Filter In is set, you cannot use Filter Out (it is disabled).
- **Filter Out:** Sets or clears Filter Out action. If Filter Out is set, you cannot use Filter In (it is disabled).

Note: Examples that show use of filters are provided later in this chapter.

Advance the Sequence: Creates an event sequence consisting of the event you clicked on and an event in a successive state of the sequence. A thick arrow appears from the selected event and points downward.

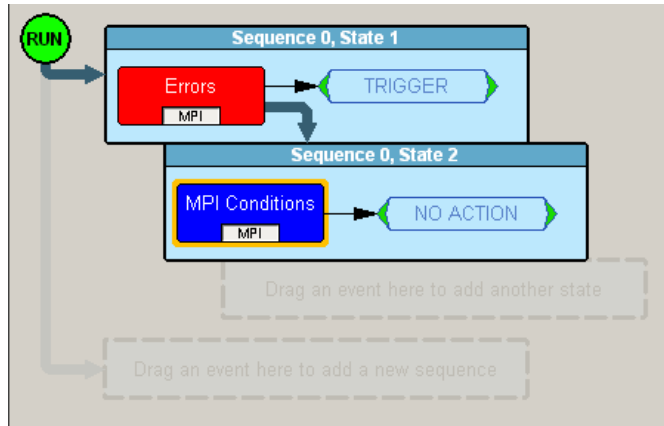


Figure 7.17 Advance the Sequence

In other words, the **Advance the Sequence** button is the link between two states in a multi-state sequence. The **Advance the Sequence** arrow tells the analyzer to go to the next state if it detects the event at the tail (origin) of the arrow.

The Action pop-up menu has the following restart and trigger options:

- **Restart the Sequence (not shown):** Restarts the sequence. Note that this option is context-sensitive and only appears if you have created a multi-state sequence. A thick arrow appears from the selected event and point upward towards the first event in the sequence.
- **Restart All:** Restarts all rules in all sequences and in the global state and displays an arrow and a Restart All button. This action precludes selecting Advance the Sequence and Restart the Sequence.
- **External Trigger Pulse HIGH:** Sends an output signal with a Pulse High format through the output ports on the back of the UPAS. Pulse High is the default format. Pulse High causes the analyzer to transmit a 5-volt, 40-nanosecond signal.
- **External Trigger Pulse LOW:** Sends an output signal with a Pulse Low format through the output ports on the back of the UPAS. Pulse Low causes the analyzer to transmit a 0-volt, 40-nanosecond signal.
- **External Trigger Pulse TOGGLE:** Causes the analyzer to transmit a signal that toggles at a trigger event between a continuous 5 volt signal and a continuous 0 volt signal.
- **Properties:** Displays the Action Properties dialog for the selected action.

Event Pop-up Menu

If you click an Event button in the Main Display area, the Event pop-up menu appears (Figure 7.18).

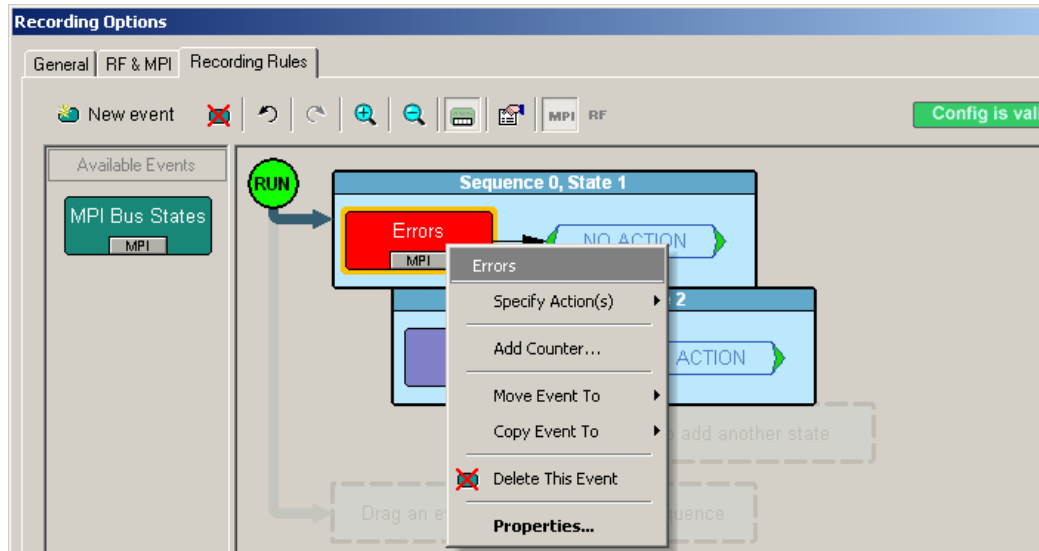


Figure 7.18 Event Pop-up Menu

The Event pop-up menu has the following options:

- **Specify Action(s):** Opens the Actions submenu, allowing you to assign an action to the event. Options on this submenu are the same as those on the Action pop-up, described previously.
- **Add Counter:** Adds a counter to count a specified number of times the event occurs before the analyzer executes the corresponding action.
- **Move Event to:** Moves the selected event to a different position in the Recording Rules window.
- **Copy Event to:** Copies the selected event to a different position in the Recording Rules window.
- **Delete This Event:** Deletes the selected Event. Alternatively, you can use the Delete button on the toolbar or keyboard to delete events.
- **Properties:** Displays the Event Properties dialog for the selected event.

Events and Event Properties

Recording rules are associations between events and actions. These associations determine how trace recording occurs.

Table 7.2 lists UWBTracer supported events.

Table 7.2 UWBTracer Events

Event	Description
MPI Bus States	Occurrence of state transitions in the PHY.
WiMedia Serial Data	Occurrence of serial data passed between MAC and PHY.
WiMedia Conditions	Occurrence of empty frames.
Errors	Occurrence of RX frame errors, aborted frames, FCS, errors, or length mismatch.
WiMedia Frame	Occurrence of a customizable frame pattern.
WiMedia Frame Type	Occurrence of specified WiMedia frame type: Beacon, Control, Command, Data, Aggregated Data.
WiMedia Control Frame	Occurrence of specified WiMedia Control frame: Imm-ACK, B-ACK, RTS, CTS, UDA, UDR, App Specific.
WiMedia Command Frame	Occurrence of specified WiMedia Command frame: DRP Rsv Req, DRP Rsv Resp, Probe, PTK, GTK, Range, App Specific.
WUSB Device Notification	Occurrence of specified WUSB Device Notification: DN_Connect, DN_Disconnect, DN_EPRdy, DN_RemoteWakeup, DN_MASAvailChanged, DN_Sleep, DN_Alive.
WUSB MMC Packet	Occurrence of WUSB MPC packet.
WUSB Data Packet	Occurrence of WUSB Data packet.
WUSB Host/Addr/Endp/Dir	Occurrence of any combination of the following fields: HOST, ADDR, ENDP, DIR.
WUSB PID	Occurrence of DATA, IDATA, HNDSHK, DN.
WUSB ACK Code	Occurrence of ACK, NAK, STALL.
Breakout Board Data	Occurrence of signal on breakout board data pins.
Timer	Occurrence of timer expiration.

Actions and Action Properties

Table 7.3 lists UWBTracer supported actions.

Event	Description
Trigger	Start recording.
Filter In	Include in the trace file the event specified (and no others).
Filter Out	Exclude from the trace file the event specified.
Advance the Sequence	Go to the next state in this sequence (sequence in which this action is located).
Restart All	Restart all sequences.
External Trigger Pulse HIGH	Send HIGH pulse on external trigger output.
External Trigger Pulse LOW	Send LOW pulse on external trigger output.
External Trigger Pulse TOGGLE	Send HIGH-LOW pulse on external trigger output.
Properties	Opens the Event Properties dialog box.

Using a Single-State Sequence

As described previously, a sequence can be single-state or multi-state. A single-state sequence is a simple combination of events and actions. You cannot create looping or branching conditions with this type of sequence.

A multi-state sequence allows you to branch successively to (advance to) lower states in the sequence or to loop to the front of the sequence (restart the sequence).

Following are four typical examples of single-state sequences.

Example 1: Creating a Simple Event Trigger

In this example, recording is triggered by detection of a WUSB ACK code.

Step 1 Click the **New Event** button. From the drop-down menu, select **WUSB ACK Code > ACK** (Figure 7.19).

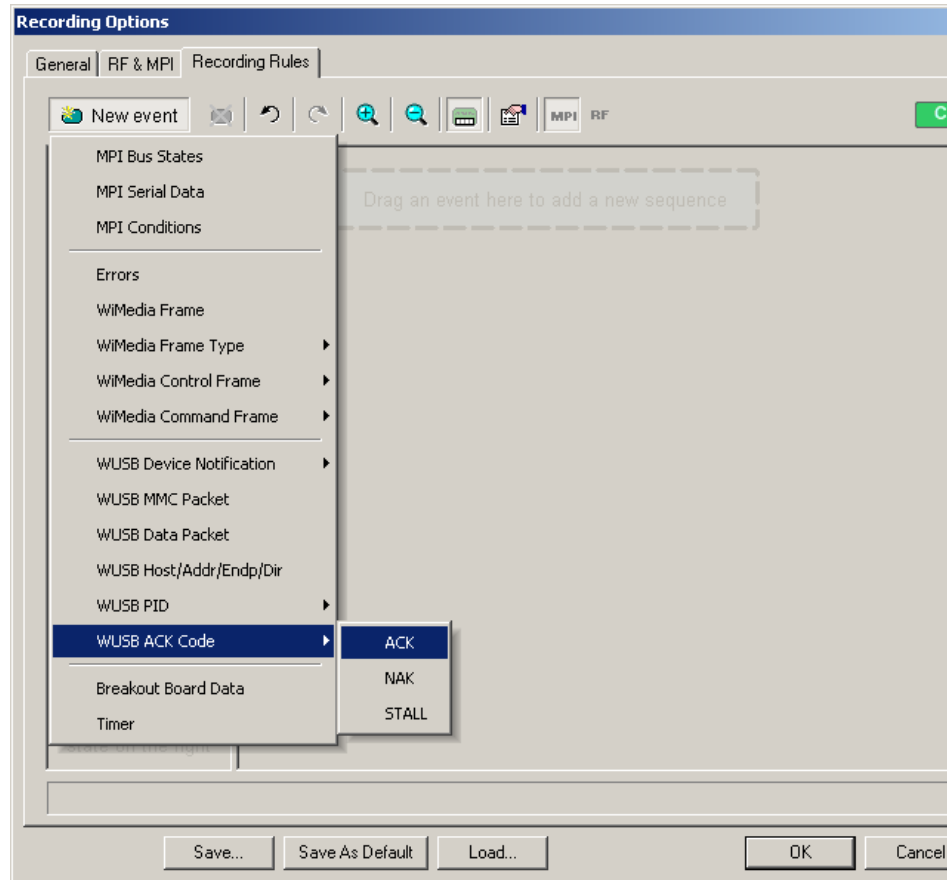


Figure 7.19 Example 1: Creating the Event

Step 2 An ACK Event button appears in the Available Events area.

Step 3 Drag the button to the sequence cell at the top of the Main Display area.

Step 4 Right-click the button. From the Action pop-up menu, select **Trigger** (Figure 7.20).

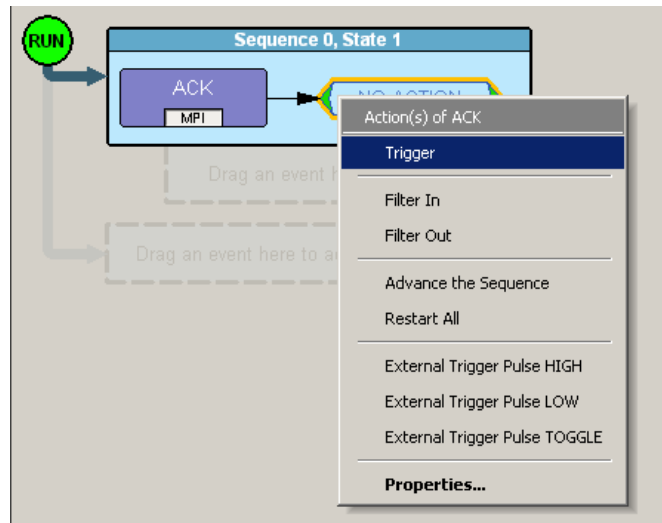


Figure 7.20 Example 1: Assigning the Action

Figure 7.21 shows the completed event-action sequence.

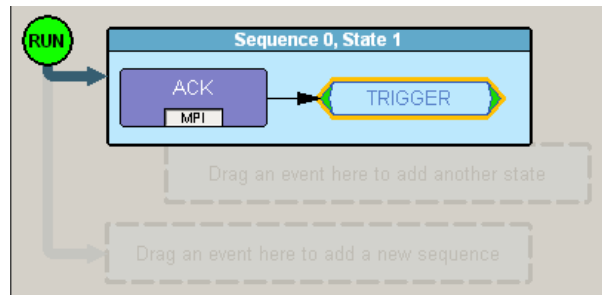


Figure 7.21 Example 1: Complete Rule

Example 2: Creating an Event Counter

In addition to setting triggers and filters, you can set counters. A counter is an action that lets you set a trigger based on a count of events. To continue the previous example, for instance, you can create a rule that triggers on the tenth occurrence of a WUSB ACK.

Step 1 From example 1, the ACK is the first event in the state (Figure 7.21).

Step 2 Right-click the **ACK** event button in the cell. The Event pop-up menu appears.

Step 3 From the Event pop-up menu, select the **Add Counter** option (Figure 7.22).

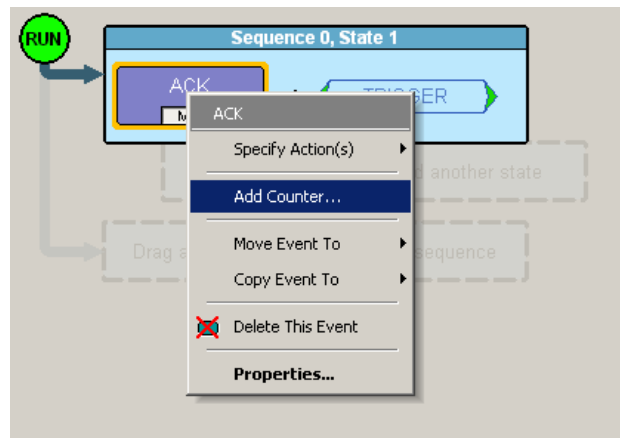


Figure 7.22 Example 2: Adding a Counter

The Event properties dialog box appears (Figure 7.23). The set counter box is at the lower left (see cursor).

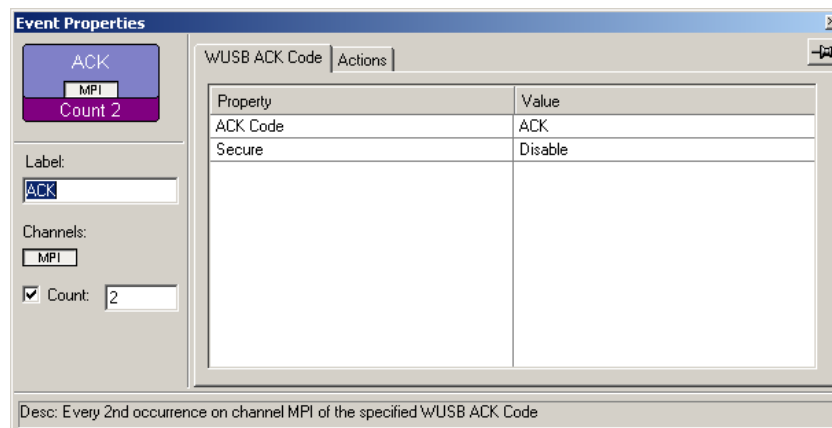


Figure 7.23 Example 2: Setting the Counter

Step 4 By default, the counter box is set to a value of 2. For this example, reset the box to 10.

- Step 5** Close the Event properties dialog box. The counter value 10 now appears in the ACK Event button (Figure 7.24). The trigger occurs after the analyzer detects the tenth occurrence of an ACK.

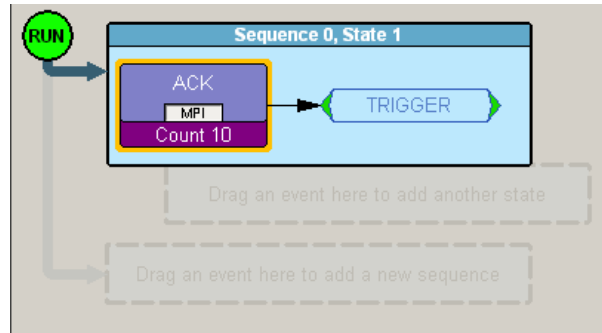


Figure 7.24 Example 2: Complete Rule

Example 3: Creating an OR Condition

When you assign two or more Event buttons in state cell to the same action, the analyzer watches for all the events and does the action for the event that the analyzer sees first. Neither event has precedence over the other. There is a logical OR association among the events.

The following example assumes you want to trigger when the analyzer detects a WUSB NAK or the tenth occurrence of a WUSB ACK.

- Step 1** From example 2, the ACK with counter is the first event in the state (Figure 7.24).
- Step 2** Click the **New Event** button. From the drop-down menu, select **WUSB ACK Code > NAK**.
- Step 3** A NAK Event button appears in the Available Events area. Drag the button to the first cell and drop it below the ACK button (Figure 7.25).

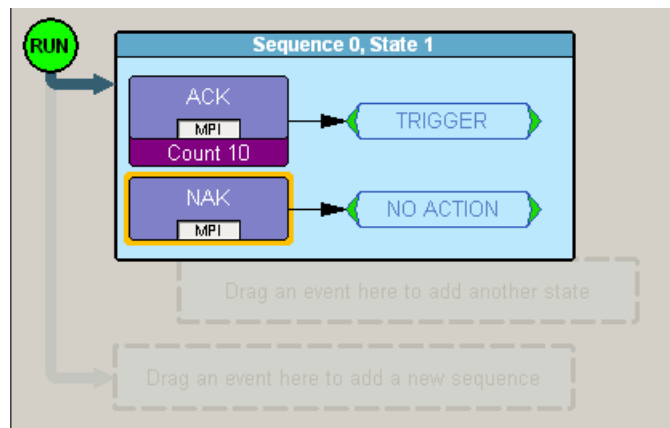


Figure 7.25 Example 3: Creating a Second Event

Step 4 Right-click the **NAK** button. From the Action pop-up menu, select **Trigger** (Figure 7.26).

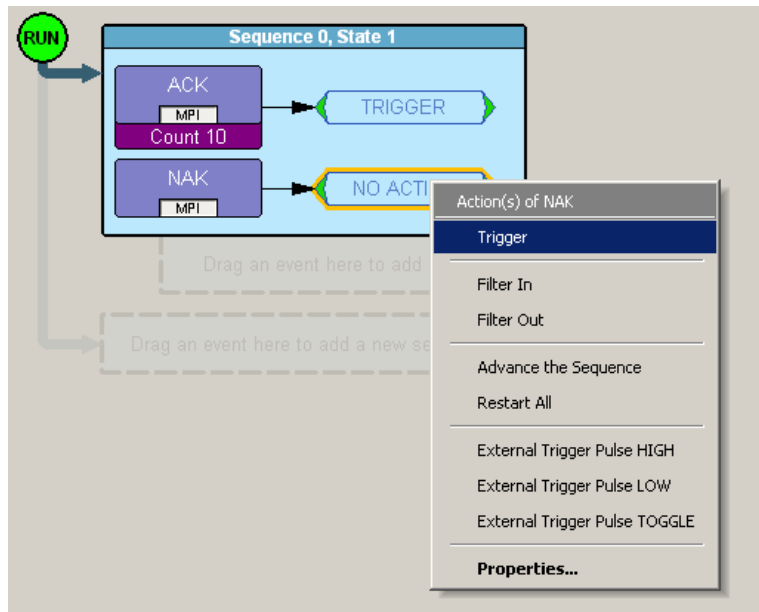


Figure 7.26 Example 3: Assigning the Action

Figure 7.27 shows the completed event-action sequence.

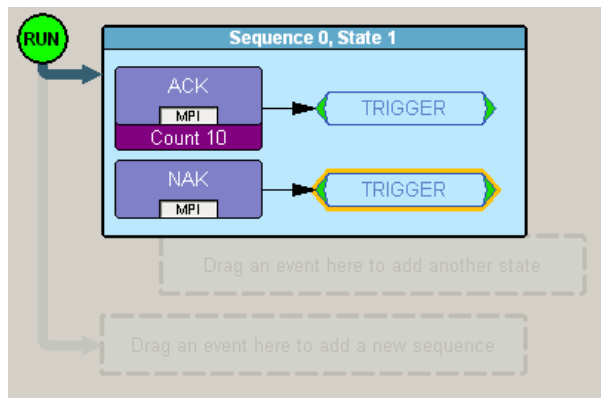


Figure 7.27 Example 3: Complete Rule

Example 4: Creating an Event Filter

A filter causes the analyzer to filter in or filter out specified events from the recording. By default, all events are filtered in. However, you might want to preserve recording memory so that you can extend recording session time. To do so, you can filter out events that do not interest you (or filter in only those events that interest you).

Note: Keep in mind that when you filter out events, they are not recorded in the trace file. It is not the case that the events are present in the file but hidden.

The following example assumes you want recording to occur only if the analyzer detects an MPI error.

- Step 1** Click the **New Event** button. From the drop-down menu, select **MPI Errors** to create an MPI Errors button in the Available Events area.
- Step 2** Drag-and-drop the MPI Error button into the first cell in the Main Display area.
- Step 3** Right-click in the **Action** box to the right of the MPI Error button. The Action pop-up menu appears (Figure 7.28).

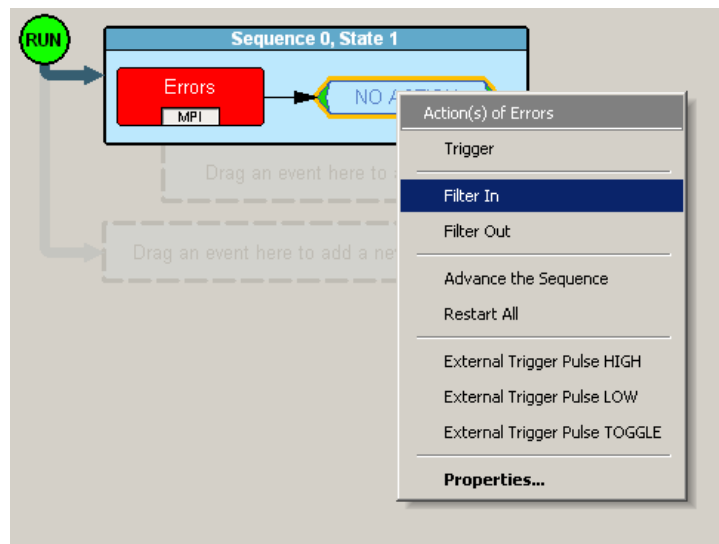


Figure 7.28 Example 4: Assigning the Action

Step 4 From the Action pop-up menu, select the **Filter In** option.

Recording is now set to only record frames with MPI errors (Figure 7.29).

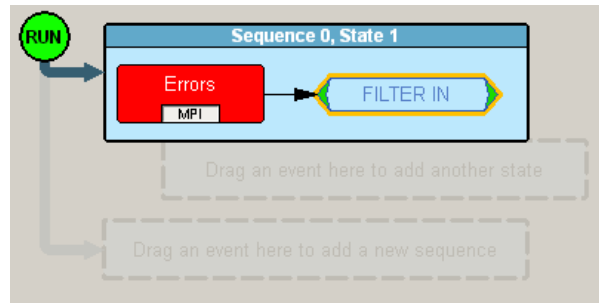


Figure 7.29 Example 4: Complete Rule

Using a Multi-State Sequences

Multi-state sequences allow you to create conditions that branch down to successive states or loop back to the beginning of the sequence. They are more complex than single-state sequences but very powerful.

Example 5: Creating a Looping Sequence

Following is a typical example of a multi-state sequence. In this example, the analyzer waits for a WUSB Data packet (first state). When it detects a Data packet, the analyzer waits for a corresponding ACK packet and starts a timer (second state).

If an ACK is received before the timer expires, the sequence restarts. If an ACK is not received before the timer expires, recording is triggered.

Step 1 Click the **New Event** button. From the drop-down menu, select **WUSB PID > DATA** to create a Data button in the Available Events area.

Step 2 Drag-and-drop the Data button into the first cell in the Main Display area.

Step 3 Right click in the **Action** box to the right of the Data button. The Action pop-up menu appears (Figure 7.30).

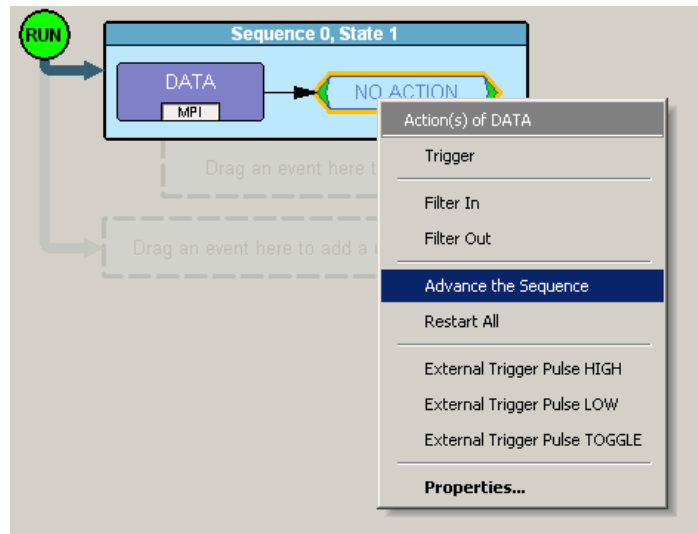


Figure 7.30 Example 5: Advancing the Sequence

Step 4 From the Action pop-up, select **Advance the Sequence**.

Step 5 An arrow appears next to the Data button (Figure 7.31). The arrow points to the cell for the second state in this sequence.

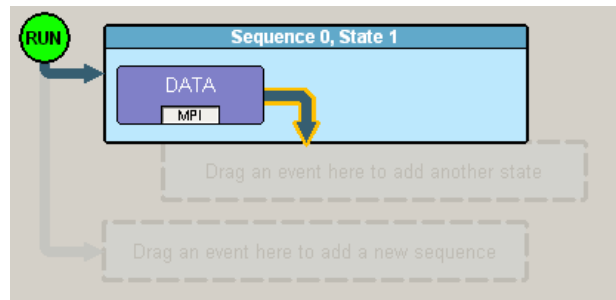


Figure 7.31 Example 5: First State Complete

Step 6 Click the **New Event** button. From the drop-down menu, select **Timer** to create a Timer button in the Available Events area (Figure 7.32).

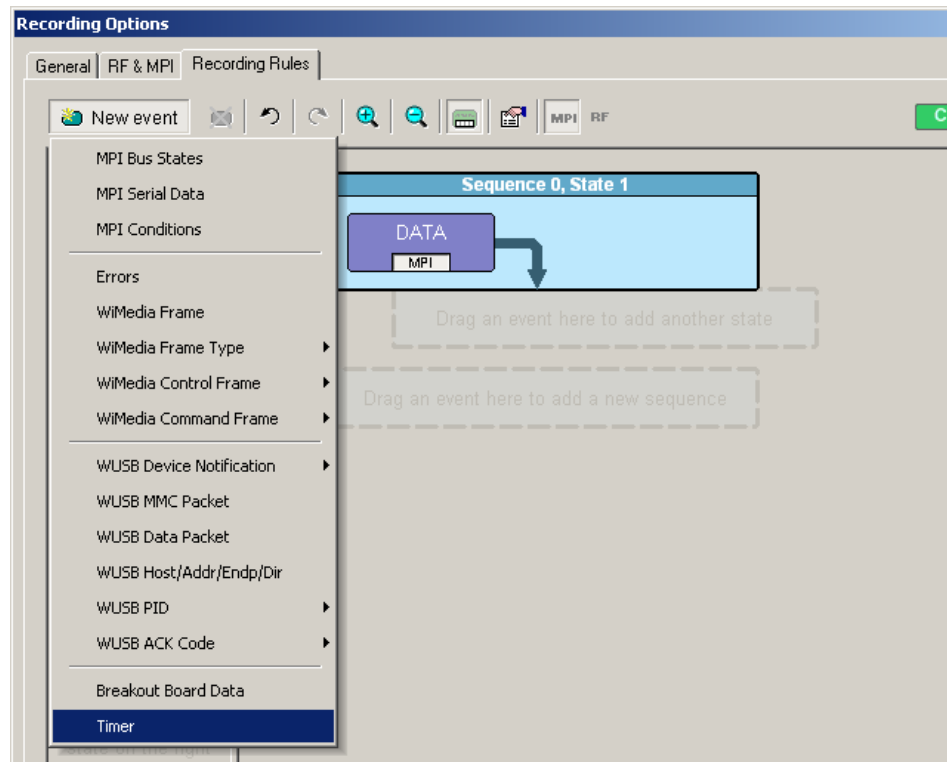


Figure 7.32 Example 5: Creating an Event, Second State

Step 7 Drag-and-drop the Timer button into the second cell in the Main Display area (Figure 7.33).

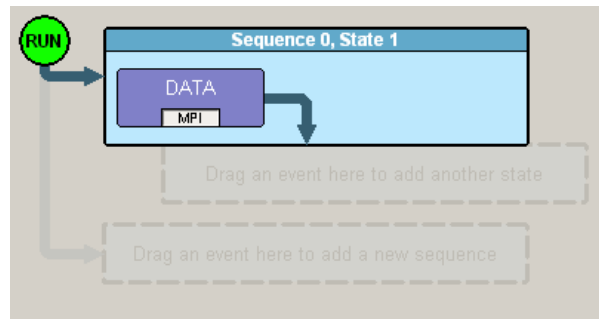


Figure 7.33 Example 5: Dragging to the Second State Cell

Step 8 Right-click the **Timer** event to open its Properties dialog box (Figure 7.34).

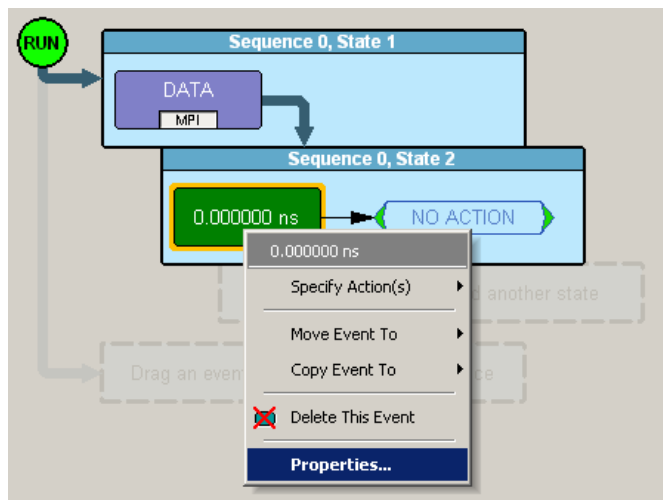


Figure 7.34 Example 5: Bringing Up the Timer Dialog Box

Step 9 In the Properties dialog box for the timer, set the timer to 100 microseconds (Figure 7.35).

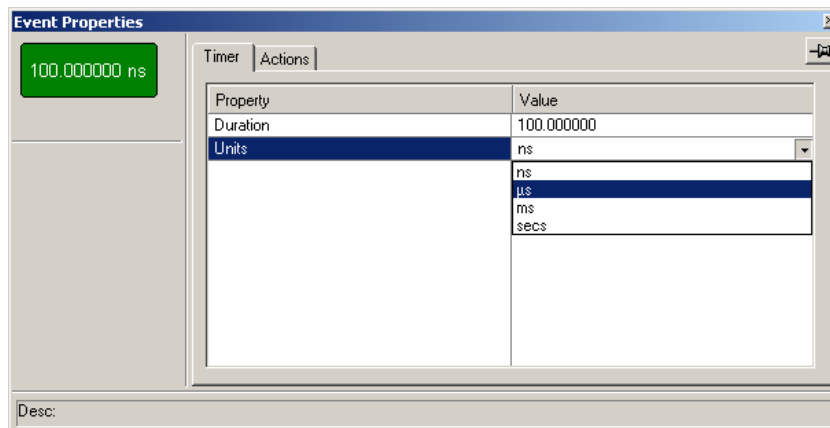


Figure 7.35 Example 5: Setting the Timer

Step 10 Click the **New Event** button. From the drop-down menu, select **WUSB ACK Code > ACK** to create an ACK button in the Available Events area (Figure 7.36).

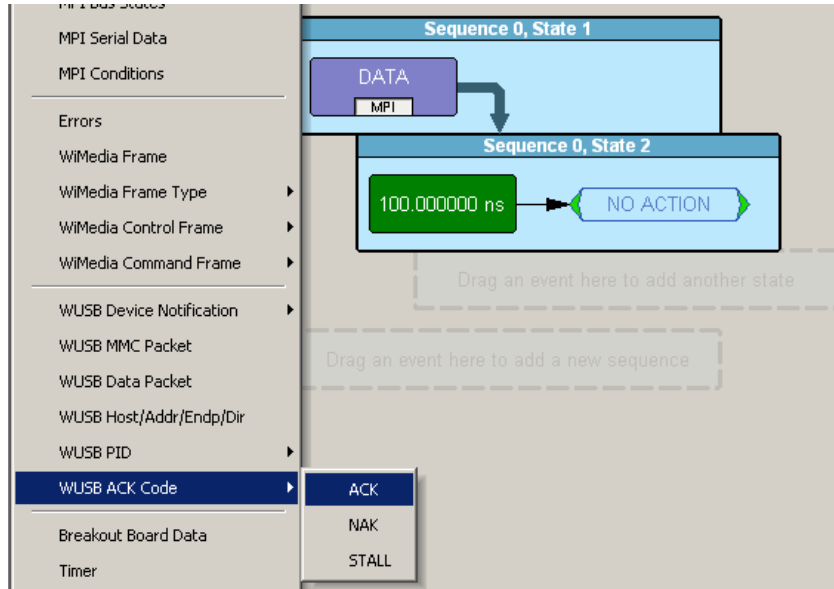


Figure 7.36 Example 5: Creating Another Event, Second State

Step 11 Drag-and-drop the ACK button into the second cell in the Main Display area.

Step 12 Assign **Restart the Sequence** as the action for the ACK event. An arrow appears that points from the ACK back to the Data event.

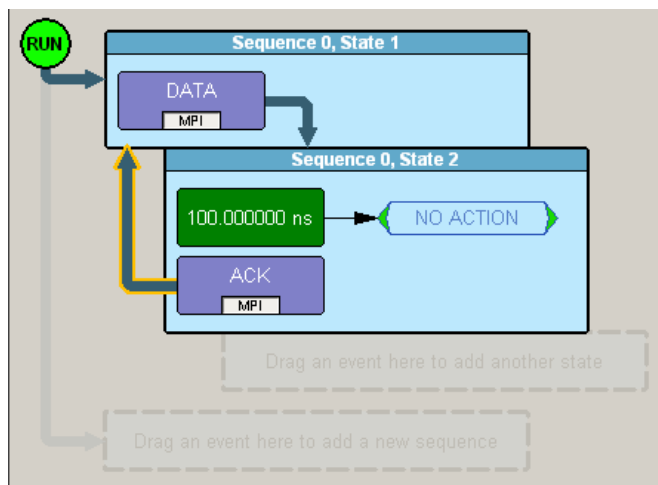


Figure 7.37 Example 5: Complete Rule

Using Independent Sequences

UWBTracer supports up to two independent sequences. By default, they are labeled Sequence 0 and Sequence 1.

The two sequences operate in parallel and have no effect on each other with the following exception. Either of the two sequences can contain the action Restart All. This action restarts both sequences in the Main Display area.

Example 6: Creating Independent Sequences

The following example adds a second sequence to Example 6. The second sequence triggers recording if any MPI error is detected.

In this example, there are two conditions that trigger recording. The first condition is defined by sequence 0. The second condition is defined by sequence 1.

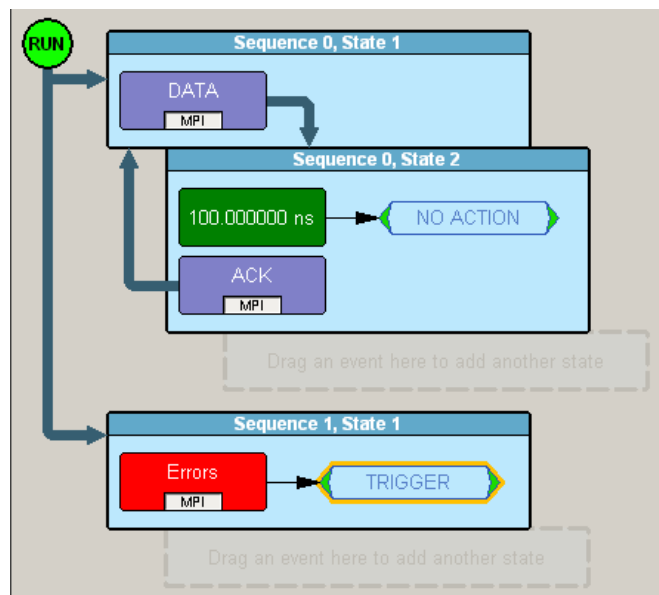


Figure 7.38 Example 6: Two Independent Sequences

Chapter 8: Decoding USB/WUSB Requests

8.1 Class and Vendor Definition Files

LeCroy analyzers use script files to decode class and vendor requests. The script files are read when the application is initialized.

Decoding uses **.dec** decoder files, which describe Class or Vendor requests in a C-like language. The **.dec** files are in the **Scripts** directory under the application directory. Each **.dec** file stores an endpoint or request decode. When the application starts, these files are loaded dynamically. Subdirectories are supported.

The following **.dec** files are provided:

- Hid
- Mass Storage Class
- SCSI Bulk Protocol
- UFI CBI Protocol
- PTP Still Image Class Requests
- Smart Card
- Standard Requests
- Video Class Requests
- Virtual
- Wire Adapter Class Requests and Radio Control Request

You can create your own **.dec** file for a Class or Vendor Request. For more information on the format of these Script Decoder files and the Script Decoding language, read the *Script Decoder Manual*.

8.2 Class/Vendor Decoding Options

You can permanently assign a class or vendor decoding for an address and/or endpoint or interface in a trace file. Once assigned, the decoding occurs automatically when you display transactions.

Mapping Request Recipient to Class/Vendor Decoding

To assign a decoding group to a request recipient:

Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Left-click the **Control Transfer** field to display the USB/WUSB Device Request menu.

Step 2 Select **Map Request Recipients to Class/Vendor Decoding** to display the Request Recipient and Endpoints dialog box:

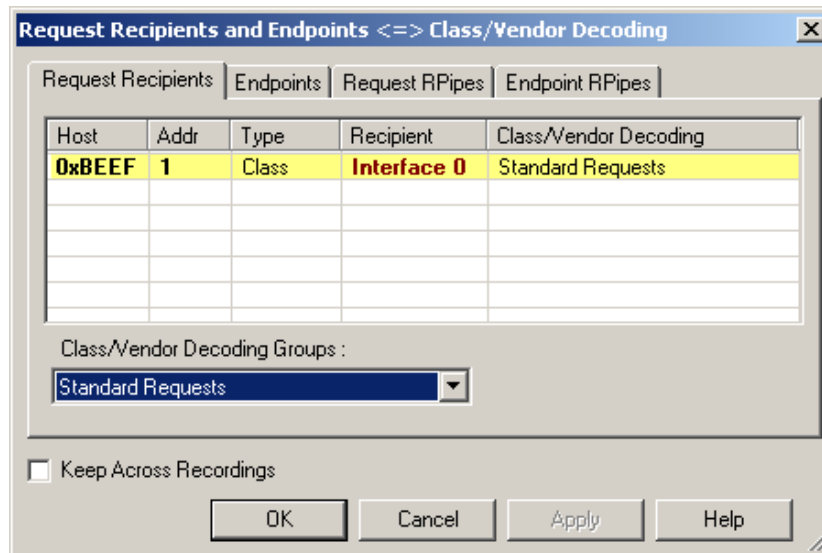


Figure 8.1 Request Recipient and Endpoints Dialog Box

The Recipient field shows all Class and Vendor Request Recipients found in the trace file. The display shows the Host, Address, and Type (Class or Vendor) for the recipient. On the right are the names of Class/Vendor Decoding groups currently assigned to recipients. If blank, no decoding is assigned for a recipient.

Step 3 Select a recipient.

Step 4 Display the **Class/Vendor Decoding Groups** drop-down menu.

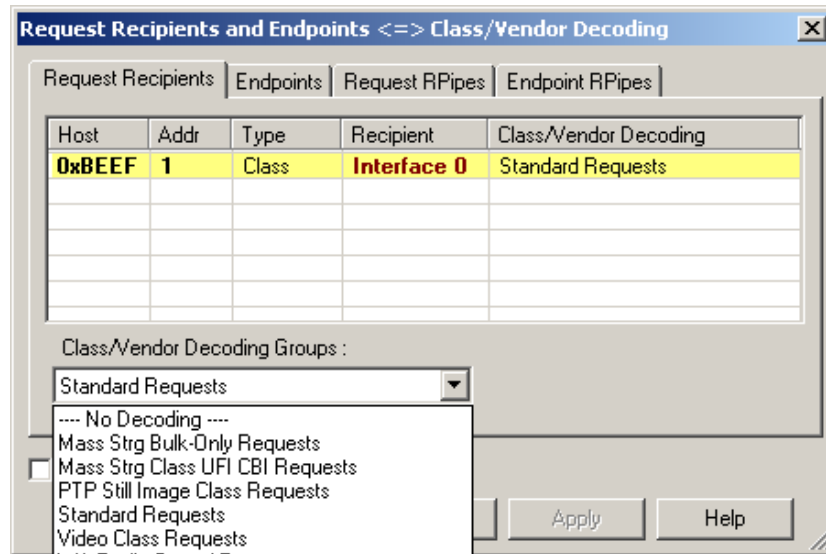


Figure 8.2 Class/Vendor Decoding Groups Menu

The drop-down menu lists the defined Class/Vendor request decoding groups. The Class/Vendor Decoding Groups are:

- No Decoding
- Mass-Strg Bulk-only Requests
- Mass-Strg Class UFI CBI Requests
- PTP Still Image Class Requests
- Standard Requests
- Video Class Requests
- Wire Adapter Radio Control Requests
- Wire Adapter Class Requests

Step 5 Select a decoding group.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 6 Repeat the previous steps for additional recipients.

Step 7 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 8 Click **OK**.

Mapping Endpoint to Class/Vendor Decoding

To assign a Class/Vendor Endpoint decoding:

Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Left-click the **Bulk/Int Transfer** field to display the USB/WUSB Device Request menu.

Step 2 Select **Map Endpoint to Class/Vendor Decoding** to display the Request Recipients and Endpoints dialog box.

Step 3 Click the **Endpoints** tab to display the Endpoints dialog box:

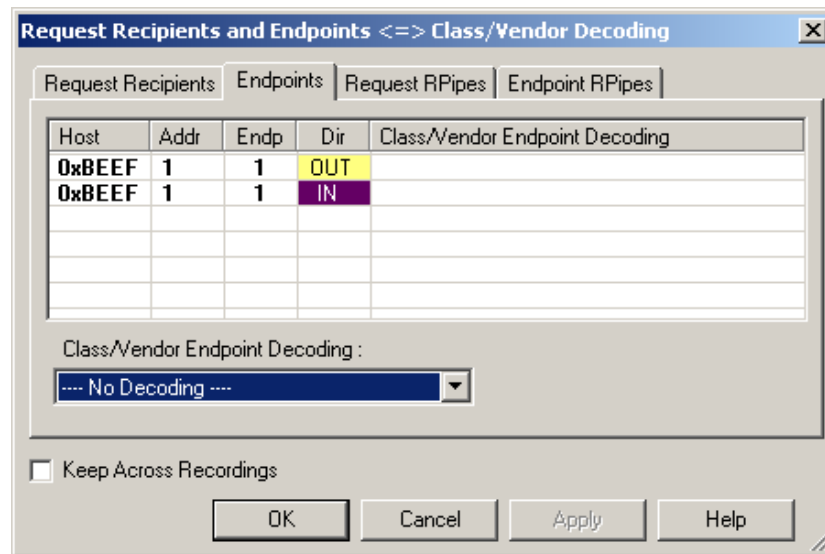


Figure 8.3 Endpoints Dialog Box

The Endpoint field (Endp) shows all Endpoints found in the trace file. The displays shows the Host, Address, and Direction for the recipient. On the right are the names of Class/Vendor Endpoint Decoding groups currently assigned to endpoints. If blank, no decoding is assigned for a recipient.

Step 4 Select an endpoint.

Step 5 Display the **Class/Vendor Endpoint Decoding** drop-down menu:

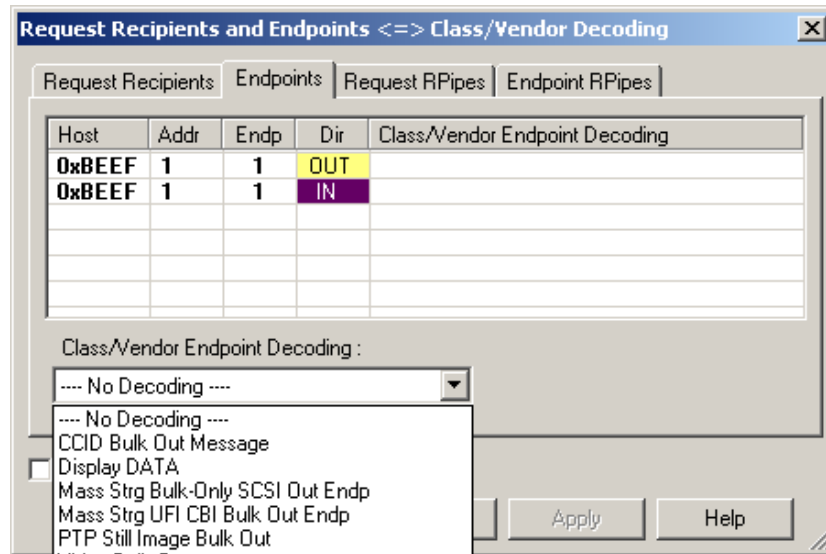


Figure 8.4 Class/Vendor Endpoint Coding Menu

The Class/Vendor Endpoint Decoding options for an OUT endpoint are:

- No Decoding
- CCID Bulk Out Message
- Display DATA
- Mass Strg Bulk-Only SCSI Out Endp
- Mass Strg UFI_CBI Bulk Out Endp
- PTP Still Image Bulk Out
- Video Bulk Out
- Video Isoch Out
- Virtual UART
- Wire Adapter Data Transfer Out Endp

The Class/Vendor Endpoint Decoding options an IN or Interrupt endpoint are:

- No Decoding
- CCID Bulk In Message
- Display DATA
- HID In Endp
- Mass Strg Bulk-Only SCSI In Endp
- Mass Strg CBI Interrupt Endp
- Mass Strg UFI_CBI Bulk In Endp
- Mass Strg UFI_CBI Interrupt Endp
- PTP Still Image Bulk In
- PTP Still Image Interrupt
- Video Bulk In
- Video Interrupt
- Video Isoch In
- Virtual UART
- Wire Adapter Radio Notif Endp
- Wire Adapter Data Transfer In Endp
- Wire Adapter Notif Endp

Step 6 Select the type of decoding.

OR

Select **No Decoding** if you do not want any specific decoding.

Step 7 Repeat the previous steps for any additional endpoints you would like to map.

Step 8 To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.

Step 9 Click **OK**.

Mapping Request RPipe to Class/Vendor Decoding

Before mapping Request RPipes to Class/Vendor Decoding, you must first assign the following endpoint decoders:

- Wire Adapter Data Out
- Wire Adapter Data In
- Wire Adapter Notif

To assign a decoding group to a Request RPipe:

Step 1 Click the **Apply Decoding Scripts** button on the Toolbar.

OR

Left-click the **Control Transfer** field to display the USB/WUSB Device Request menu.

Step 2 Select **Map RPipe to Class/Vendor Decoding** to display the Request Recipient and Endpoints dialog box.

Step 3 Click the **Request RPipes** tab to display the Request RPipes dialog box:

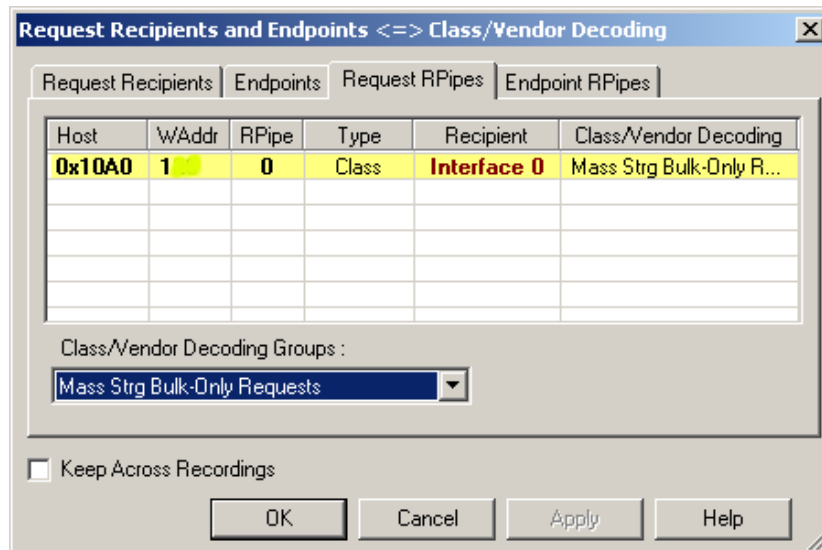


Figure 8.5 Request RPipes Dialog Box

The Recipient field shows all Class and Vendor Request recipients found in the trace file. The RPipe field shows all Class and Vendor Request RPipes found in the trace file. The displays shows the Host, WAddress, and Type (Class or Vendor) for the recipient. On the right are the names of Class/Vendor Decoding groups currently assigned to recipients. If blank, no decoding is assigned for a recipient.

Step 4 Select a recipient.

Step 5 Display the **Class/Vendor Decoding Groups** drop-down menu. The Class/Vendor Decoding Groups are the same as for Request Recipients.

- Step 6** Select a decoding group.
OR
Select **No Decoding** if you do not want any specific decoding.
- Step 7** Repeat the previous steps for additional recipients.
- Step 8** To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.
- Step 9** Click **OK**.

Mapping Endpoint RPipe to Class/Vendor Decoding

To assign a Class/Vendor Endpoint R Pipes decoding:

- Step 1** Click the **Apply Decoding Scripts** button on the Toolbar.
OR
Left-click the **Bulk/Int Transfer** field to display the USB/WUSB Device Request menu.
- Step 2** Select **Map Endpoint RPipe to Class/Vendor Decoding** to display the Request Recipients and Endpoints dialog box.
- Step 3** Click the **Endpoint R Pipes** tab to display the Endpoint R Pipes dialog box:

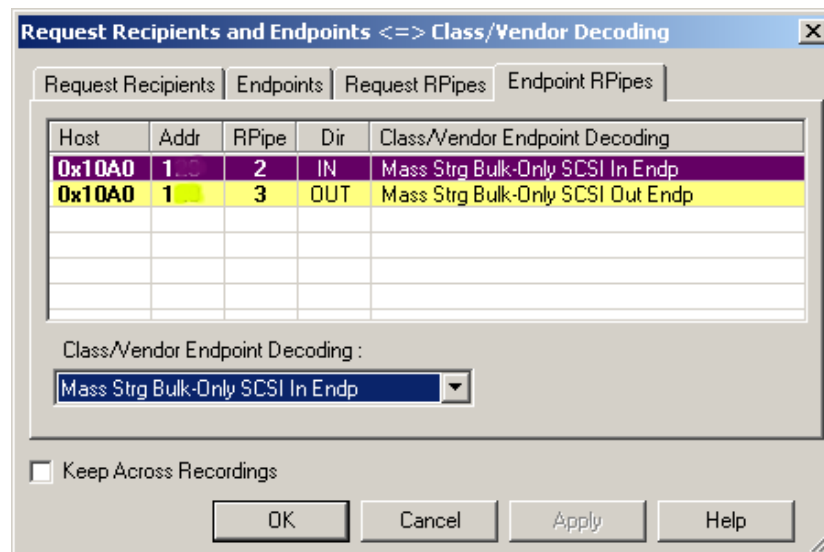


Figure 8.6 Endpoint R Pipes Dialog Box

The RPipe field shows all R Pipes found in the trace file. The displays shows the Host, Address, and Direction for the recipient. On the right are the names of Class/Vendor Endpoint Decoding groups currently assigned to endpoints. If blank, no decoding is assigned for a recipient.

- Step 4** Select an endpoint R Pipe.

- Step 5** Display the **Class/Vendor Endpoint Decoding** drop-down menu. The Class/Vendor Endpoint Decoding options are the same as for Endpoints.
- Step 6** Select the type of decoding.
OR
Select **No Decoding** if you do not want any specific decoding.
- Step 7** Repeat the previous steps for any additional RPipes you would like to map.
- Step 8** To retain a mapping from trace to trace DURING an application session, select the **Keep Across Recordings** checkbox.
- Step 9** Click **OK**.

8.3 General Options

Decoding uses control transfers called USB/WUSB Device Requests. Device Requests depend on the Device Class and Vendor specifications.

Decoding USB/WUSB Device Requests

To decode a USB/WUSB Device Request:

- Step 1** Left-click the **Control Transfer** field of the USB/WUSB Device Request to display the USB/WUSB Device Request menu:

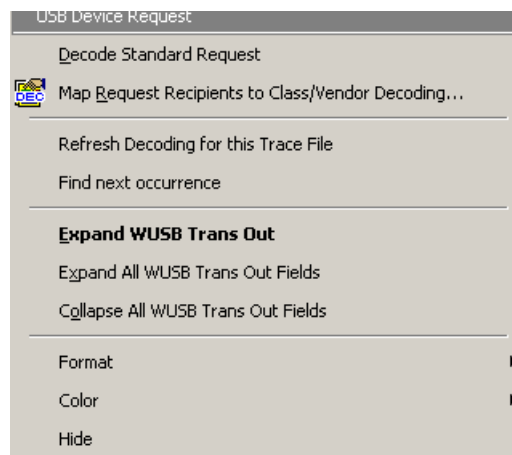


Figure 8.7 UWB Device Request menu

Note The menus shown in this section are context-sensitive. You may see slightly different menus.

- Step 2** To refresh decoding, click **Refresh Decoding for this Trace File**. Use this option to reanalyze all transactions.
- Step 3** To move to the next Control Transfer field, click **Find Next Occurrence**.

- Step 4** To expand data fields for one row, use **Expand WUSB Trans Out**, **Expand WUSB Trans In**, **Expand This WUSB Transfer**, or **Expand WUSB Xfer**.
- Step 5** To collapse data fields for one row, use **Collapse WUSB Trans Out**, **Collapse WUSB Trans In**, **Collapse This WUSB Transfer**, or **Collapse WUSB Xfer**.
- Step 6** To expand all data fields of the same type, use **Expand All WUSB Trans Out Fields**, **Expand All WUSB Trans In Fields**, **Expand All WUSB Transfers**, or **Expand All WUSB Xfer**.
- Step 7** To collapse all data fields of the same type, use **Collapse All WUSB Trans Out Fields**, **Collapse All WUSB Trans In Fields**, **Collapse All WUSB Transfers**, or **Collapse All WUSB Xfer**.

Note: You can also change the format, color, and hidden status of fields, using the same methods as in Display Options. (See Chapter 6, Display Options.)

Decoding Standard Requests

To decode a standard request:

Step 1 From the USB/WUSB Device Request menu, select **Decode Standard Request** to display the View Fields for Standard Request text box:

REQUEST SUMMARY

Setup Data	80 06 00 01 00 00 40 00
Direction	Host-to-device
Type	Standard
Recipient	Device
bRequest	GET_DESCRIPTOR
wValue	DEVICE
wIndex	0x0000
wLength	0x0040

DECODING INFORMATION

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bRequest	8	8	GET_DESCRIPTOR	0x06	bRequest HexVal: 0x0006
wValue	16	16	DEVICE type	0x0100	Type of Descriptor
wIndex	16	32	0x0000	0x0000	index info

DEVICE Descriptor

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bLength	8	0	0x12	0x12	Descriptor size is 18 bytes
bDescriptorType	8	8	0x01	0x01	DEVICE Descriptor Type
bcdUSB	16	16	0x0250	0x0250	Device compliant to the USB specification version 2.00
bDeviceClass	8	32	0xEF	0xEF	The device belongs to the Miscellaneous Device Class
bDeviceSubClass	8	40	0x02	0x02	The device belongs to the Common Class Subclass
bDeviceProtocol	8	48	0x02	0x02	The device uses the Wire Adapter Multifunction Peripheral Protocol
bMaxPacketSize0	8	56	0xFF	0xFF	The Maximum packet size 255 for endpoint zero is invalid! (Only 8, 16, 32, or 64 are valid)
idVendor	16	64	0x1461	0x1461	Vendor ID is 5217: Staccato Communications
idProduct	16	80	0x0500	0x0500	Product ID is 1280
bcdDevice	16	96	0x0100	0x0100	The device release number is 1.00
iManufacturer	8	112	0x01	0x01	The manufacturer string descriptor index is 1
iProduct	8	120	0x02	0x02	The product string descriptor index is 2
iSerialNumber	8	128	0x00	0x00	The device doesn't have the string descriptor describing the serial number
bNumConfigurations	8	136	0x01	0x01	The device has 1 possible configurations

Figure 8.8 Standard Request Text Box

Step 2 To find a word in the text box, click the **Find** button. Enter the word in the Find What field. To use a case-sensitive search, check **Match Case**. To find only the exact word, check **Match Whole Word Only**. You can search **Up** or **Down**. To search, click **Find Next**.

Step 3 To save the View Fields text box as an HTML file, click the **Save As** button, enter a file name in the Save As dialog box, then click **Save**.

Step 4 To view the previous or next Transfer Control field request of the same request type, click **Previous** or **Next**.

The View Fields for Standard Request dialog box displays field definitions and values of the Standard Request.

For field definitions, please refer to the *Universal Serial Bus Specification, version 2.0*. The USB specification is available from the USB Implementers Forum (USB-IF) at:

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

Decoding Class Requests

Examples of a class request are Mass-Strg Class UFI CBI Requests, PTP Still Image Class Requests, Video Class Requests, and Wire Adapter Class Requests.

To decode a class request:

Step 1 From the USB/WUSB Device Request menu, select **Decode ... Request** to display the View Fields for ... Class Requests text box.

Figure 8.9 shows a Wire Adapter Class Requests decoding:

REQUEST SUMMARY

Setup Data	25 07 00 22 00 00 1C 00
Direction	Device-to-host
Type	Class
Recipient	RPipe
bRequest	SET_DESCRIPTOR
wValue	0x2200
wIndex	0x0000
wLength	0x001C

DECODING INFORMATION

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bRequest	8	8	SET_DESCRIPTOR	0x07	bRequest HexVal: 0x0007
wValue	16	16	RPIPE type	0x2200	Type of Descriptor
wIndex	16	32	0x0000	0x0000	index info

RPIPE Descriptor

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
bLength	8	0	28	0x1C	Descriptor size is 28 bytes
bDescriptorType	8	8	0x22	0x22	RPIPE Descriptor Type
wPipeIndex	16	16	0	0x0000	Number of the RPipe.
wRequests	16	32	2	0x0002	The number of concurrent requests that can be assigned to this RPipe.
wBlocks	16	48	2	0x0002	The number of buffer blocks assigned to this RPipe.
wMaxPacketSize	16	64	8	0x0008	Maximum packet size that this RPipe will use.
bHSHubAddress	8	80	0x00	0x00	The address of the attached device's parent high speed hub.
bHSHubPort	8	88	0x00	0x00	Device index where the device information buffer is present.
bSpeed	8	96	53.3 Mbs	0x00	The speed of device to be targeted by RPipe.
bDeviceAddress	8	104	1	0x01	Address to be used with attached device.
bEndpointAddress	8	112	0 OUT	0x00	Endpoint Address to be used with this RPipe.
bDataSequence	8	120	0	0x00	Current data sequence.
dwCurrentWindow	32	128	00000000	0x00000000	Reserved and must be set to zero.
bMaxDataSequence	8	160	0x00	0x00	Reserved and must be set to zero.
bInterval	8	168	0	0x00	Polling interval to be used by this RPipe.
bOverTheAirInterval	8	176	0	0x00	the interval at which the upstream wireless endpoint is polled.
bmAttribute	8	184	CTRL	0x00	bmAttribute field.
bmCharacteristics	8	192	CTRL	0x01	Transfer types supported on this RPipe.
bmRetryOptions	8	200	0x00	0x00	The maximum number of times a transaction must be retried.
wNumTransactionErrors	16	208	0	0x0000	wNumTransactionErrors field.

Figure 8.9 View Fields for Wire Adapter Class Requests Request Text Box

Figure 8.10 shows a Mass Storage Bulk-only Request:

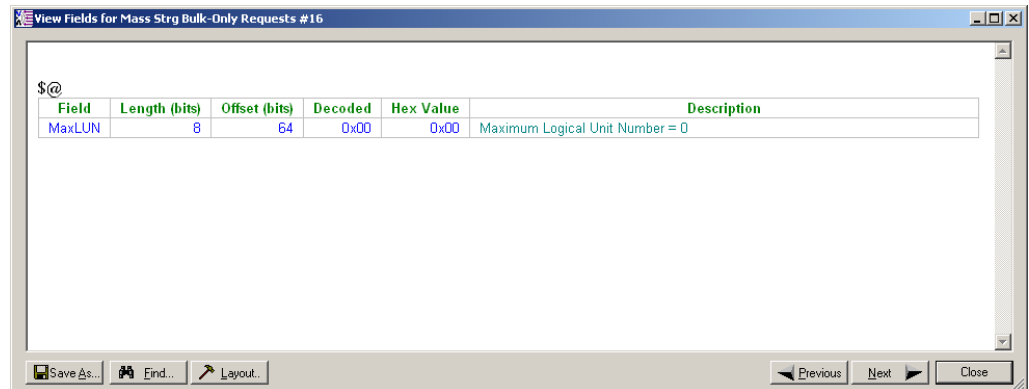


Figure 8.10 View Fields for Mass Storage Bulk-only Class Requests Text Box

Decoding Vendor Requests

To decode a vendor request:

- Select **Decode ... Request** to display the View Fields for ... Vendor Requests text box.

An example of a vendor request is UWBTracer™ Command Set.

Decoding Undefined USB/WUSB Device Requests

A Decoding Request may not belong to any of the defined decoding groups (Standard, Class, or Vendor).

Decoding using Endpoint Information

To decode using the endpoint information:

- Step 1** Left-click the **Bulk/Int Transfer** field to display the Bulk/Int Transfer (IN/OUT transaction with data) menu.
- Step 2** Select **Decode as ... Endp** to open a View Fields for ... Endp text box.

Figure 8.11 shows a Wire Adapter Data Transfer In Endp decoding:

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
Length	8	0	16	0x10	
Result Type	8	8	0x83	0x83	Result Type 0x83 - RESULT_TYPE_TRANSFER
Transfer ID	32	16	0x00000000	0x00000000	Host-assigned ID for this transfer
Transfer Length	32	48	8	0x00000008	Amount of data following for an transfer
Seg Num	7	80	0	0x00	Segment number
Last Seg	1	87	0	0x0	Last Segment
Error	1	88	Not set	0x0	Indicates whether the status is error.
Warning	1	89	Not set	0x0	Indicates whether the status is warning.
Status	6	90	SUCCESS	0x00	Transfer Status. Value : 0(TRANSFER_STATUS_SUCCESS) Meaning : The transfer completed successfully.

Figure 8.11 View Fields for Wire Adapter Data Transfer In Endp Text Box

Figure 8.12 shows a Wire Adapter Data Transfer Out Endp decoding:

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
Length	8	0	24	0x18	
Request Type	8	8	0x80	0x80	Transfer Type 0x80 - REQUEST_TYPE_CONTROL
RPipe	16	16	0	0x0000	RPipe this transfer is targeted to
Transfer ID	32	32	0x00000000	0x00000000	Host-assigned ID for this transfer
Transfer Length	32	64	64	0x00000040	Amount of data following for an transfer
Last Seg	1	96	1	0x1	Last Segment
Seg Num	7	97	0	0x00	Segment number
RESERVED	7	104	0	0x00	Reserved, should be set to zero.
Xfer Dir	1	111	WRITE	0x1	Control Transfer direction
RESERVED	16	112	0	0x0000	Reserved, should be set to zero.

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
DATA_BLOCK	64	128	8 bytes	0x8006000100004000	Data Block containing 8 bytes

Figure 8.12 View Fields for Wire Adapter Data Transfer Out Endp Text Box

Figure 8.13 shows a Wire Adapter Data Transfer Out Endp decoding:

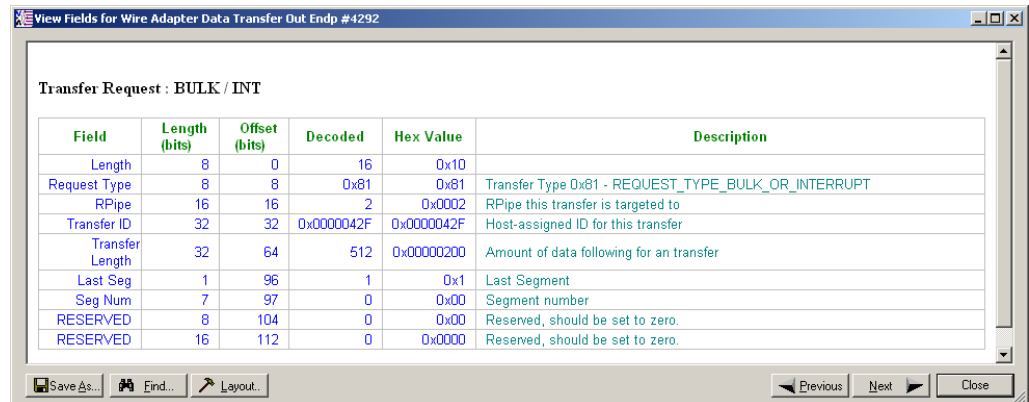


Figure 8.13 View Fields for Wire Adapter Data Transfer Out Endp Text Box

Figure 8.14 shows a Wire Adapter Notif Endp decoding:

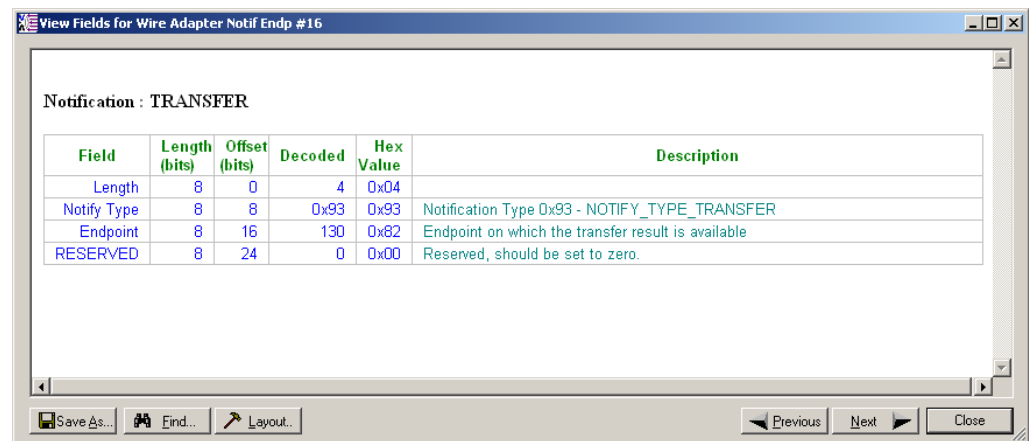


Figure 8.14 View Fields for Wire Adapter Notif Endp Text Box

Figure 8.15 shows a Mass Storage Bulk-only SCSI In Endpoint decoding:

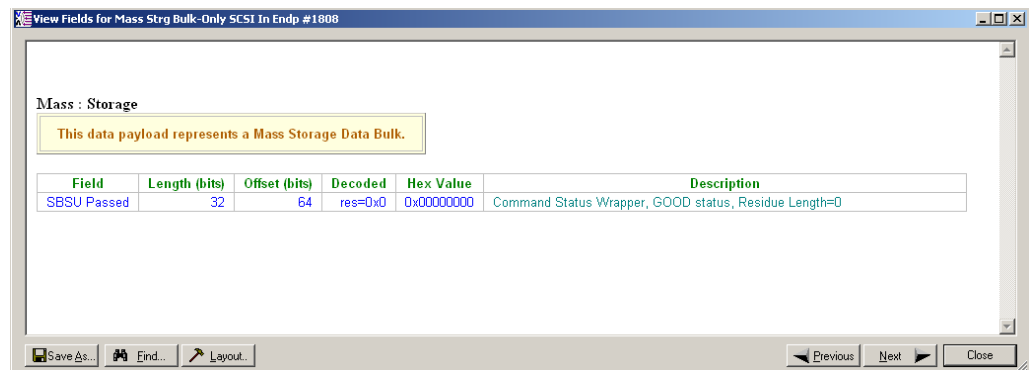


Figure 8.15 View Fields for Mass Storage Bulk-only SCSI In Endp Text Box

Figure 8.16 shows a Mass Storage Bulk-only SCSI Out Endpoint:

Mass : Storage

This data payload represents a Mass Storage Data Bulk.

Command Block Wrapper

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
Signature	32	0	43425355	0x43425355	Command Block Wrapper Signature: dCBWSignature
Tag	32	32	868FCF70	0x868FCF70	Command Block Tag: dCBWTag (in Hex)
XferLen	32	64	0x24	0x00000024	Data Transfer Length: dCBWDataTransferLength 36 bytes
Dir	8	96	In	0x80	bmCBWFlags: Data-In from Device to Host
Lun	8	104	0x0	0x00	Logical Unit Number: bCBWLUN
CB Len	8	112	0x06	0x06	Command Block Length = 6

SCSI CDB : INQUIRY

SCSI command : INQUIRY
SCSI CDB opcode : 0x12
SCSI Command Set : SPC.3

The INQUIRY command requests that information regarding parameters of the target and a component logical unit be sent to the application client.

Field	Length (bits)	Offset (bits)	Decoded	Hex Value	Description
OperCode	8	0	0x12	0x12	OPERATION CODE field. This field specifies format of SCSI command. GROUP CODE : 000b (6 byte CDB). COMMAND CODE : 0x12
RESERVED	6	8	0	0x00	Reserved, should be set to zero.
CMDDT	1	14	Not set	0x0	A command support data (CMDDT) bit of one specifies that the device server shall return the optional command support data specified by the PAGE OR OPERATION CODE field.
EVPD	1	15	Not set	0x0	An enable vital product data (EVPD) bit of one specifies that the device server shall return the vital product data specified by the PAGE OR OPERATION CODE field.
Page/OperCode	8	16	0x0	0x00	PAGE OR OPERATION CODE field.
RESERVED	8	24	0	0x00	Reserved, should be set to zero.
AllocLen	8	32	36	0x24	ALLOCATION LENGTH field.
CONTROL	8	40	0x00	0x00	The CONTROL byte field. Vendor : 0x0. Reserved : 0x0. NACA : Not set. Obsolete : Not set. LINK : Not set.

Figure 8.16 View Fields for Mass Storage Bulk-only SCSI Out Endp Text Box

Changing the Layout of Decode Requests

In the View ... Fields windows, the Decoding Information and the Descriptor information blocks (following the Request Summary information) have the following columns:

- **Field:** such as bRequest, wValue, wIndex, bLength, bDescriptorType, wTotalLength
- Length in bits
- Offset in bits
- **Decoded:** hex value typically equal to Hex Value
- **Hex Value:** hex value typically equal to Decoded
- **Description:** short description of field

To change the layout of decode requests display:

Step 1 Click **Layout** to display the View ... Fields Dialog Layout dialog box:

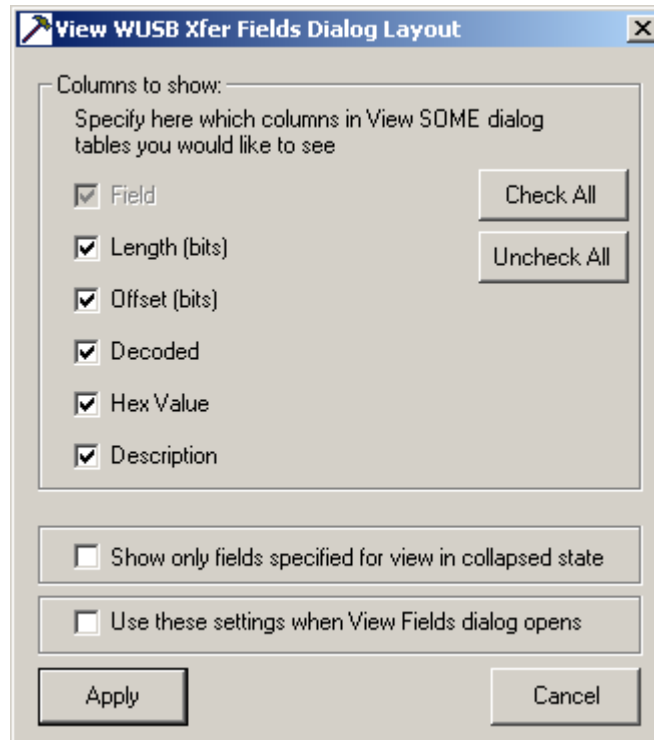


Figure 8.17 View WUSB Xfer Fields Dialog Layout Dialog Box

Step 2 To display the available columns of data, use the checkboxes for **Length**, **Offset**, **Decoded**, **Hex Value**, and **Description**.

You can **Check All** or **Uncheck All**.

Step 3 To show only the fields of Collapsed mode, check **Show only fields specified for view in collapsed mode**.

Step 4 To retain settings for future viewing of Decode Request fields, check **Use these settings when View Fields dialog opens**.

Chapter 9: Reports

Reports assist you in analyzing traffic recorded by the analyzer. The available reports are:

- **File Information:** To view general information about the trace file.
- **Error Summary:** To view a count of errors in a trace file.
- **Timing Calculations:** To view timing measured between two markers or counters set within the trace file.
- **Traffic Summary:** To view a summary of protocol-related information in the trace file summary information about a selected group of items in the trace file (such as a count of particular frame or packet types).

Reports are available from the Report menu and from buttons on the Tool bar.

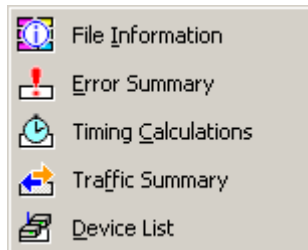


Figure 9.1 Report Menu

9.1 File Information

To view general trace information, such as time a trace was made, version of the analyzer firmware, and BusEngine™ used, select **Report > File Information** to display the File Information window (Figure 9.2).

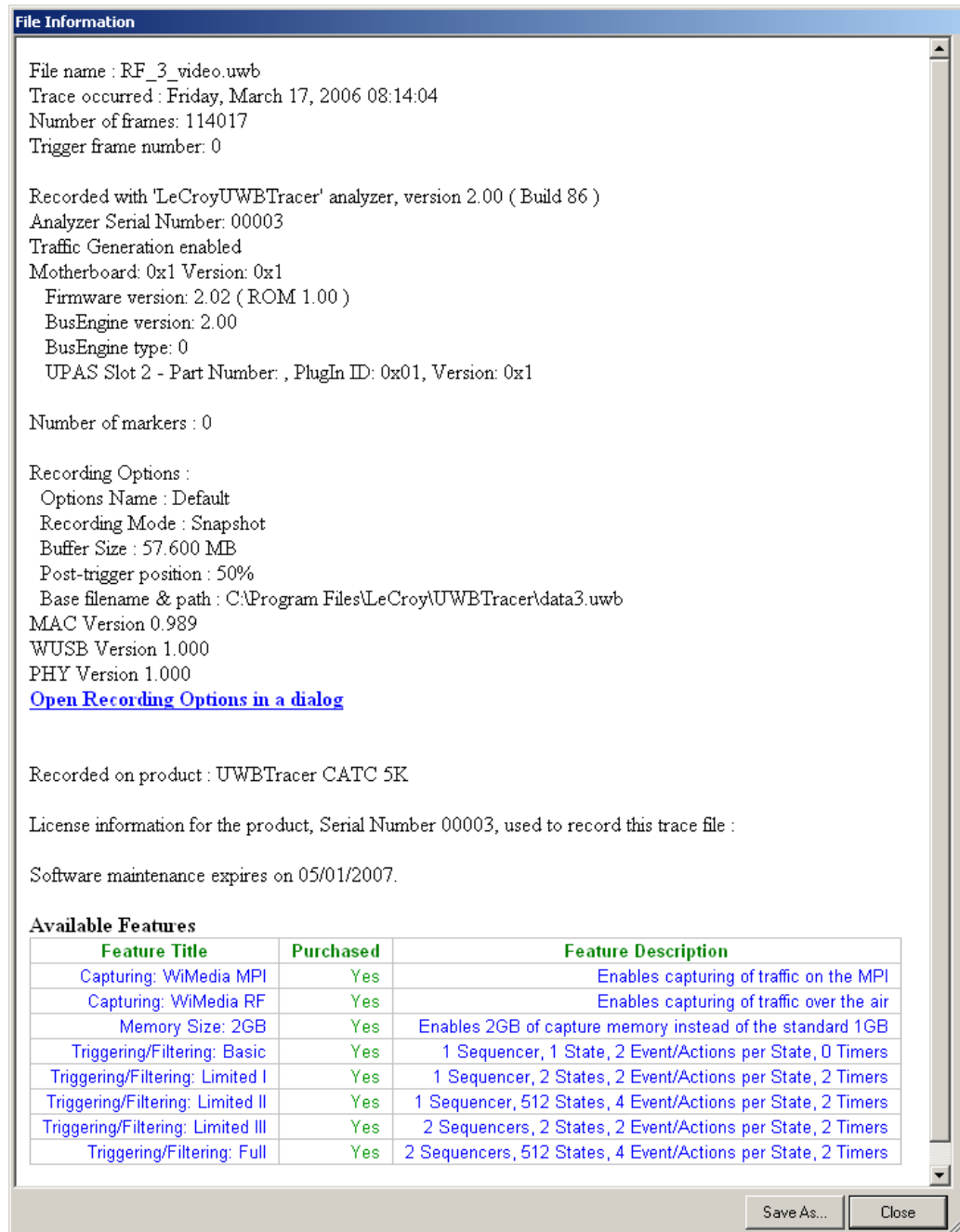


Figure 9.2 File Information Window

To view the Recording Options settings, select the **Open Recording Options in a dialog** link to display the Recording Options window.

9.2 Traffic Summary

To view a summary of protocol-related information, select **Report > Traffic Summary** to display the Traffic Summary window (Figure 9.3).

In the left pane, select or expand a report: MPI Frames, WUSB Packets, WUSB Transactions, WUSB Transfers, or Errors to display the items and counts of the report in the right pane.

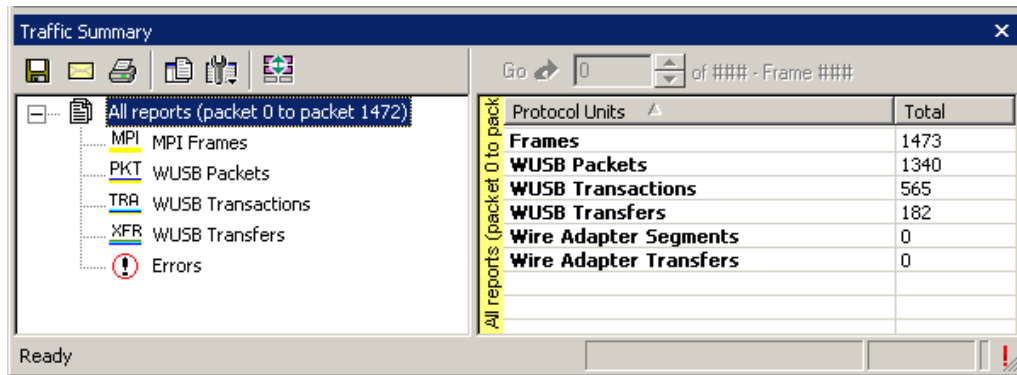


Figure 9.3 Traffic Summary Window

Traffic Summary Buttons

The Traffic Summary toolbar provides a shortcut to commands that control the traffic summary (Figure 9.4).

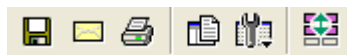








Figure 9.4 Traffic Summary Toolbar

Table 9.1 describes the Traffic Summary buttons.

Table 9.1 Traffic Summary Buttons

	Save. Saves the traffic summary to a file in HTML format.		Text. Displays the traffic summary in text format.
	Email/Send. Sends the traffic summary in HTML format via an email.		Options/View. Opens a menu that allows you to set the way trace file items are counted for the traffic summary.
	Print. Prints the traffic summary.		Select Range. Sets a range of items to be counted in the trace file.

Using the Traffic Summary

To use the traffic summary window, you need to know how to select the items for which you want a summary, to set a range for the summary, and to use navigational features.

Selecting Traffic Summary Items

As described, you use the left pane of the Traffic Summary window to select the item for which you want to show a summary in the right pane.

For example, suppose you want to show the count of all MPI Frames in the trace. To do so, select MPI frames in the left pane (Figure 9.5). A count of the number of MPI frames appears in the right pane. In this example, there are three MPI Control frames and three MPI Data frames.

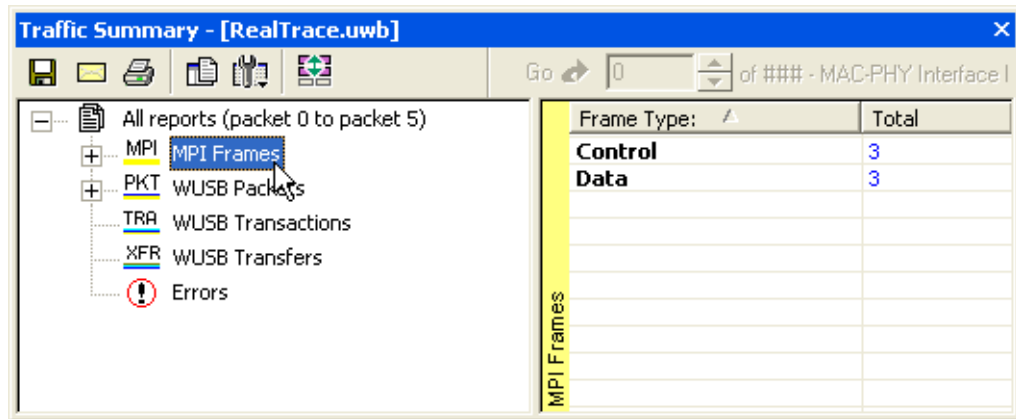


Figure 9.5 Selecting an Item for the Traffic Summary

You can select multiple items in the left pane, each resulting in a separate summary in the right pane (the summaries follow each other sequentially) (Figure 9.6). To select more than one item, hold down the CTRL key as you select items in the left pane.

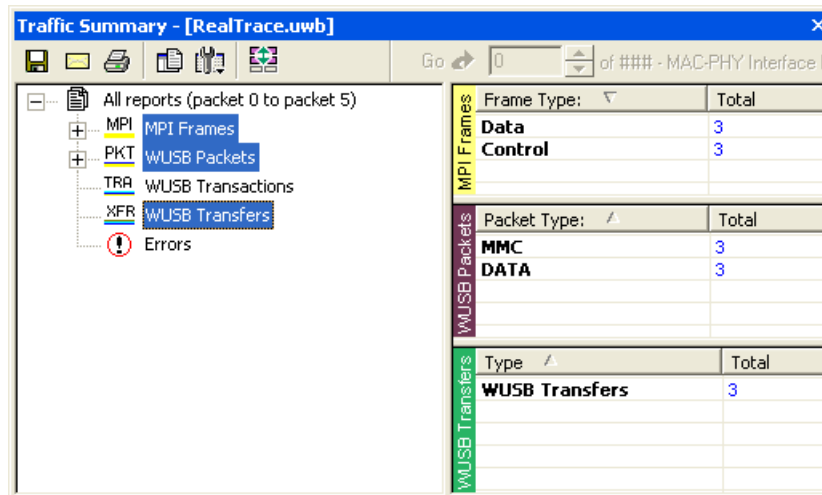


Figure 9.6 Selecting Multiple Items for the Traffic Summary

Setting Traffic Summary Display Options

You can control the appearance of the traffic summary display using the Options button on the Traffic Summary tool bar. When you click the button, the Options drop-down menu appears (Figure 9.7).

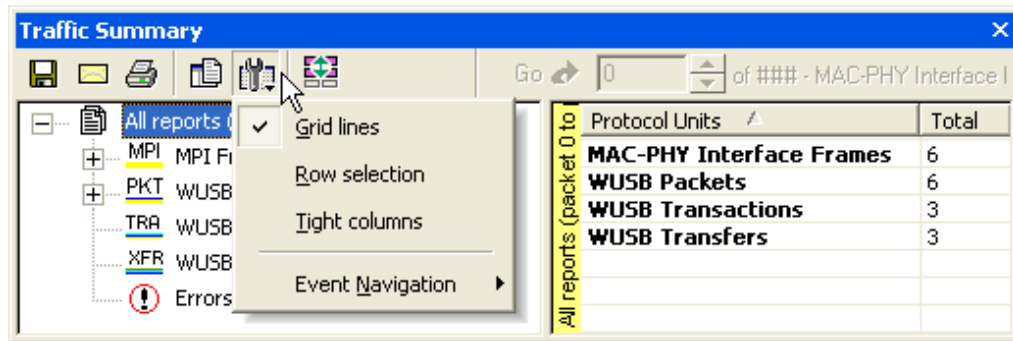


Figure 9.7 Traffic Summary Options Menu

Grid Lines: Enables/disables grid lines to the display.

Row Selection: Enables/disables row highlighting in the right pane.

Tight Columns: Enables/disables narrow columns in the display.

Event Navigation: Displays a menu that allows you to set parameters for using traffic summary to navigate in the trace (trace navigation is described later in this section) (Figure 9.8).

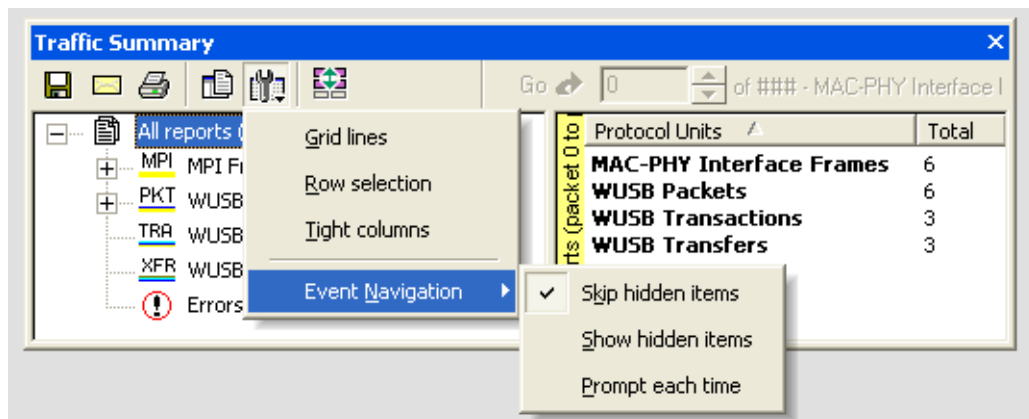


Figure 9.8 Event Navigation Submenu

In the Event Navigation menu, the **Skip hidden items** option means you cannot navigate to hidden items in the trace. **Show hidden items** means if you navigate to a hidden item, the item is shown in the trace. **Prompt each time** means you can navigate to a hidden item, but UWB Tracer™ prompts you to indicate whether or not you want the item to appear in the trace.

Setting Traffic Summary Range

You can select a range within the trace file for which items are displayed in the traffic summary. All occurrences of the item outside of the range are not included in the summary. You can set the range with respect to particular frame or packet types. Your choice of these types is context-sensitive and is determined by the current trace decode level (MPI trace level view, WUSB packet level view, and so on).

In the following example, suppose you have trace decode level set to WUSB packet level view and suppose the trace contains six MPI frames.

To collect statistics from the third through fifth MPI frames (inclusive):

- Step 1** With the trace file open, select **Traffic Summary** from the Report menu (or click the **Traffic Summary** button on the Main tool bar). The Traffic Summary window appears.
- Step 2** Select **MPI frames** in the left pane of the Traffic Summary window. The summary for MPI frames appears in the right pane.
- Step 3** Click the **Select Range** button on the Traffic Summary tool bar (Figure 9.9).

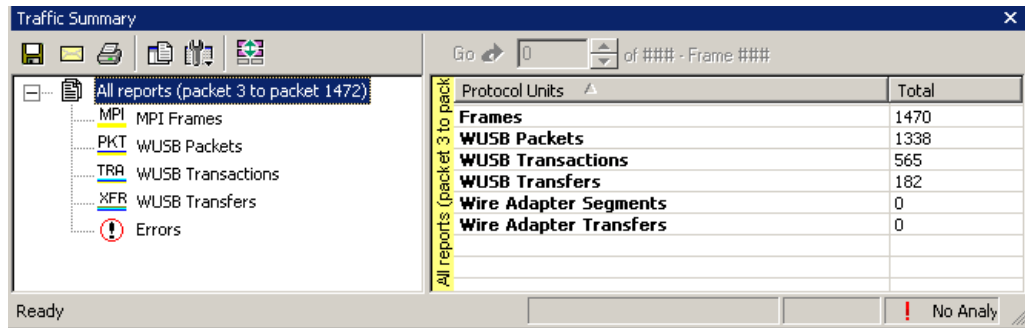


Figure 9.9 Selecting Traffic Summary Range

- Step 4** The Select Range dialog box appears (Figure 9.10).

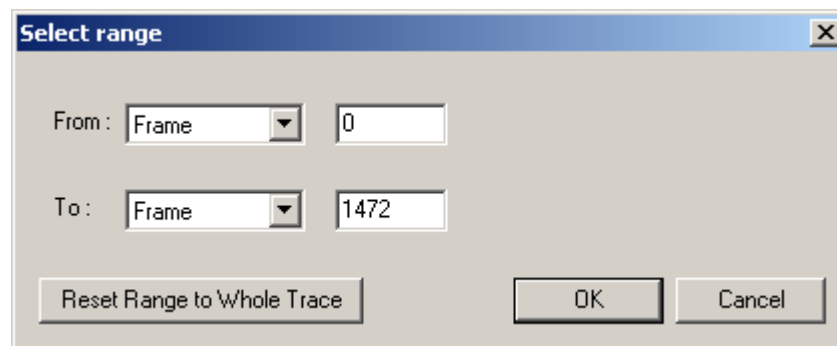


Figure 9.10 Select Range Dialog Box

Step 5 In the Select Range dialog box, select **Frame** as the protocol unit. Enter 3 as the start point of the range (Figure 9.11).

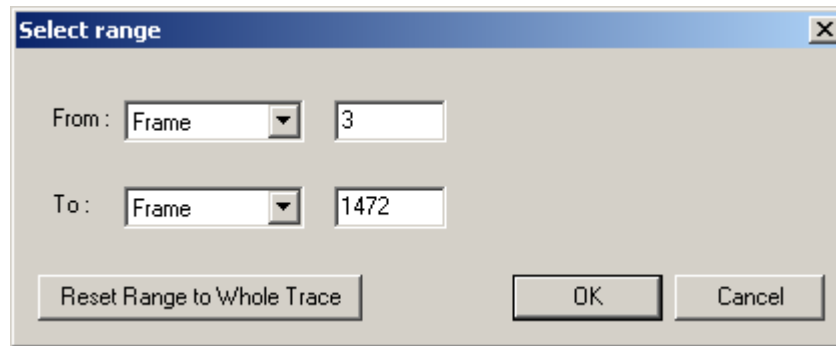


Figure 9.11 Setting Range to Start on Third Frame

Step 6 The Traffic Summary window now shows statistics for Frame 3 through Frame 1472 of the trace (Figure 9.12).

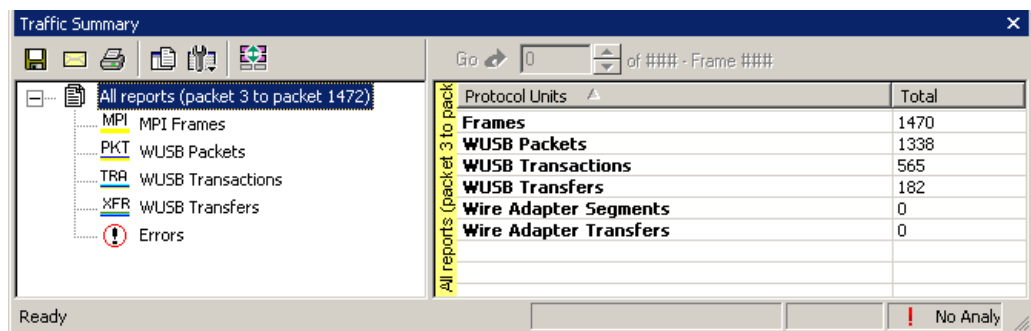


Figure 9.12 Traffic Summary for Three MPI Frames

Using the Display to Navigate Within the Trace File

You can use the Traffic Summary window to navigate to a specific frame or packet in the trace file. For example, suppose you want to go to the second MPI Data frame.

To navigate:

Step 1 With the trace file open, select **Traffic Summary** from the Report menu (or click the **Traffic Summary** button on the Main tool bar). The Traffic Summary window appears.

Step 2 Select **MPI** frames in the left pane of the Traffic Summary window. The summary for MPI frames appears in the right pane.

Note: In this example, the trace contains three MPI Control frames and three MPI Data frames.

Click the count in the total column for Data frames (Figure 9.13).

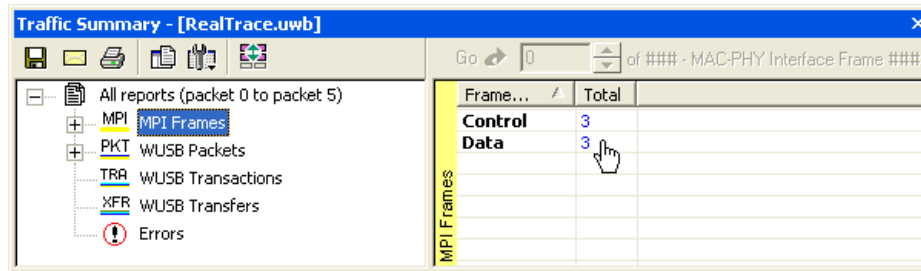


Figure 9.13 Selecting the Row for Data Frames

Step 3 The Go box becomes active at the top of the right pane (Figure 9.14). By default, it is set at the first MPI Data frame (MPI 1), shown at the top in the trace.

MPI	RX	PHY	Rate	Len	MAC	Data	Dest ID	Src ID	Payload	Frm Duration	PHY_ACT	Delta Time
MPI 1	RX	PHY	53Mbps	258	MAC	Data	0x0000	0xBEEF	258 bytes	45.000 µs	47.076 µs	40.114 ms
MPI 2	RX	PHY	53Mbps	36	MAC	Control	0x0088	0xBEEF	36 bytes	11.250 µs	13.316 µs	165.185 µs
MPI 3	RX	PHY	53Mbps	258	MAC	Data	0x0000	0xBEEF	258 bytes	45.000 µs	47.076 µs	39.916 ms
MPI 4	RX	PHY	53Mbps	36	MAC	Control	0x0088	0xBEEF	36 bytes	11.250 µs	13.338 µs	168.095 µs
MPI 5	RX	PHY	53Mbps	258	MAC	Data	0x0000	0xBEEF	258 bytes	45.000 µs	47.091 µs	2.451347

Figure 9.14 First MPI Data Frame at Top of Display

Step 4 In the Go box, enter 2 to indicate that you want to go to the second MPI Data frame in the trace (Figure 9.15).

Figure 9.15 Set Go Box to Second MPI Data Frame

The trace display adjusts so that the second MPI Data frame appears at the top of the display (MPI 3), shown at the top of the trace (Figure 9.16).

The screenshot shows a trace of MPI frames with the following data:

MPI	RX	PHY	Rate	Len	MAC	Data	Dest ID	Src ID	Payload	Frm Duration	PHY_ACT	Delta T
3			53Mbps	258		Data	0x0000	0xBEEF	258 bytes	45.000 μs	47.076 μs	39.91
4			53Mbps	36		Control	0x0088	0xBEEF	36 bytes	11.250 μs	13.338 μs	168.095
5			53Mbps	258		Data	0x0000	0xBEEF	258 bytes	45.000 μs	47.091 μs	2.4

The Traffic Summary window is open, showing a tree view of reports (packet 0 to packet 5) and a table of frame types:

Frame Type	Total
Control	3
Data	3

Figure 9.16 Set Go Box to Second MPI Data Frame

9.3 Error Summary

To view a count of errors, select **Report > Error Summary** to display the Traffic Summary window (Figure 9.17).

The screenshot shows the Error Summary window with the following error counts:

Type	Total
MPI: Unsupported Rate Error	0
MPI: Receive Payload	0
MPI: Frame Abort	0
MPI: HDR/RX Error Rsvd Bits	0
WiMedia Frame: FCS	0
WiMedia Frame: HCS	0
WiMedia Frame: Payload Length Mismatch	1011
WiMedia Frame: DRP Reservation Error	0
WiMedia Frame: Inter-Frame Spacing Error	0
WiMedia Frame: Reserved Field	14286
WiMedia Frame: Invalid Value	16877
WUSB: MMC Timing Error	7337
WUSB: CTA Timing Error	9539
WUSB: Reserved Field	11
WUSB: Invalid Value	16877
WUSB WA: Transfer Result Error	3

Figure 9.17 Error Summary Display

The right pane display the error counts.

Note: You cannot change the types of errors included in the summary.

9.4 Timing Calculations

The timing calculator measures timing between any two specified frames. To run the Timing Calculator:

Step 1 From the Report menu, select **Timing Calculations**.

Step 2 Select the range From MPI To MPI, and then click the **Calculate** button to display the results.

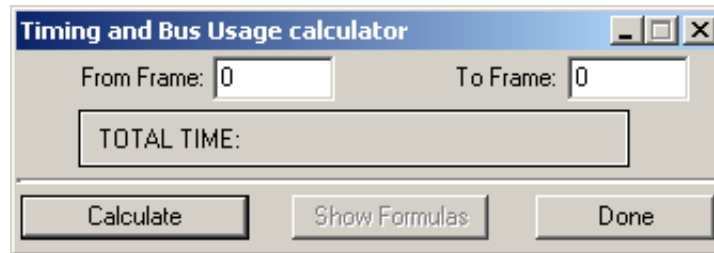


Figure 9.18 Timing and Bus Usage Calculator

9.5 Real-Time Statistics

To display a summary of the occurrence of various types of protocol units in a trace file, select **Report > Traffic Summary** from the Report menu. A Traffic Summary window appears, showing the traffic data (Figure 9.3).

To display information on links activity in real-time, select **Report > Real-Time Statistics** from the Report menu. The Real-Time Statistics window shows frames, errors, and events occurrences (Figure 9.19).

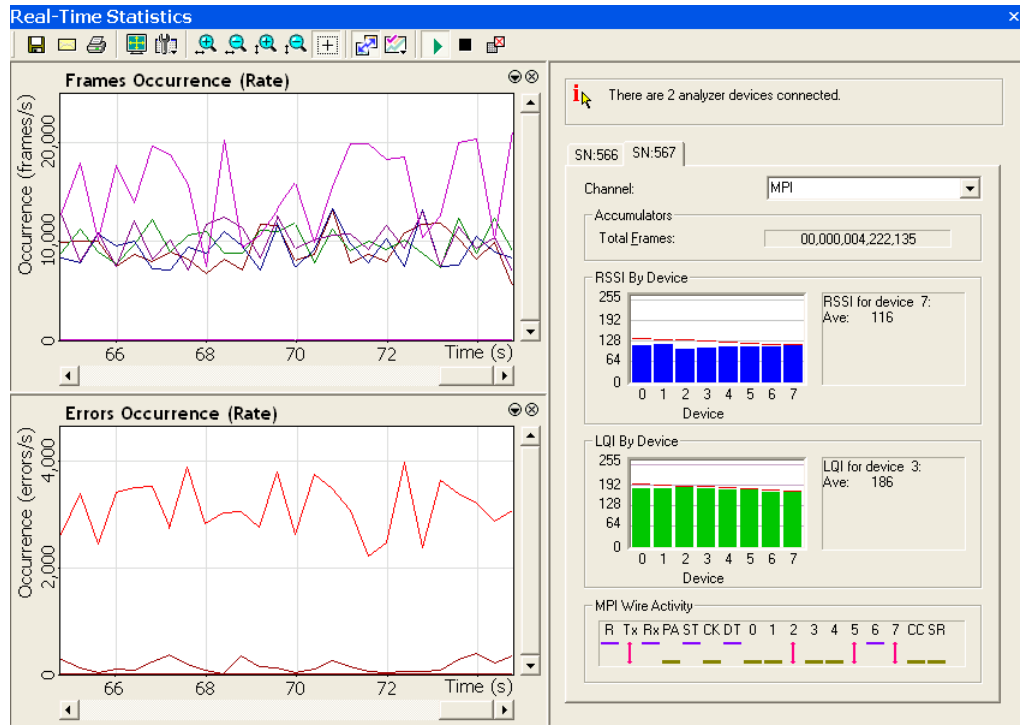


Figure 9.19 Real-Time Statistics window

The window has two areas:

- **Graph Area** (left side of window): Provides graphs that show occurrences of particular frames, errors, and events.
- **General Statistics Area** (right side of window): Provides displays that show signal strength, link quality, number of frames, and signal status. All data that is displayed is calculated as averages over a sampling period.

Changing Devices

The window can display information from multiple analyzer devices. You toggle displays for each device by clicking on tabs in the General Statistics area. For example, as shown in Figure 10.19, the SN566 tab is selected. The display currently shows information for the SN566 device. To switch the display to information for the SN567 device, click the **SN567** tab.

Changing Channels

The window can display information from the MPI or RF channel. In the Channel field at the top of a device tab, select **MPI** or **RF** from the drop-down list. Figure 9.19 shows the MPI channel of the SN566 device.

Tool Bar

The Real-Time Statistics window tool bar provides quick access to key functions of the window (Figure 9.20).

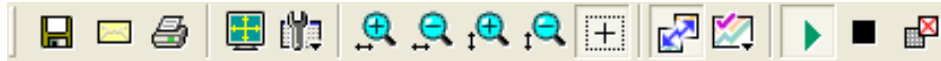

















Figure 9.20 Real-Time Statistics Tool Bar

Table 9.2 describes the Real-Time Statistics buttons.

Table 9.2 Real-Time Statistics Toolbar Buttons

	Save		Vertical Zoom out
	E-mail		"Click and Drag" Zoom Area
	Print		Synchronize Graph Areas
	Full Screen		Graph Areas
	View Settings		Start Real-Time Statistics
	Horizontal Zoom in		Stop Real-Time Statistics
	Horizontal Zoom out		Reset Graphs and Counters Display
	Vertical Zoom in		

Graph Area

The graph area displays two graphs: occurrences of frames and occurrences of errors. You can set the properties of each through a Graph Area Properties dialog box. To bring up the dialog box for either of the two graphs:

- Step 1** Put the mouse cursor in the area of the graph and click the right mouse button.
- Step 2** A pop-up menu appears (Figure 9.21).

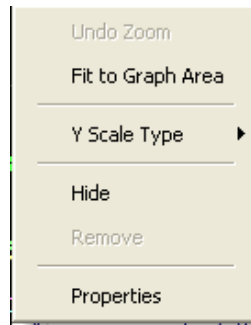


Figure 9.21 Real-Time Graphs Pop-Up Menu

- Step 3** Click **Properties** to bring up the Graph Area Properties dialog box for that graph.

Graph Properties for Frame Occurrences

Figure 9.22 shows the Graph Properties dialog box for the Frame Occurrences graph. You can select from a variety of graphs that show statistics about different frame types.

The left side of the dialog box shows a list of graphs associated with each analyzer in the analyzer network (SN566, SN567 and so on). When you add a new analyzer to the analyzer network, a new set of graphs is added to the list.

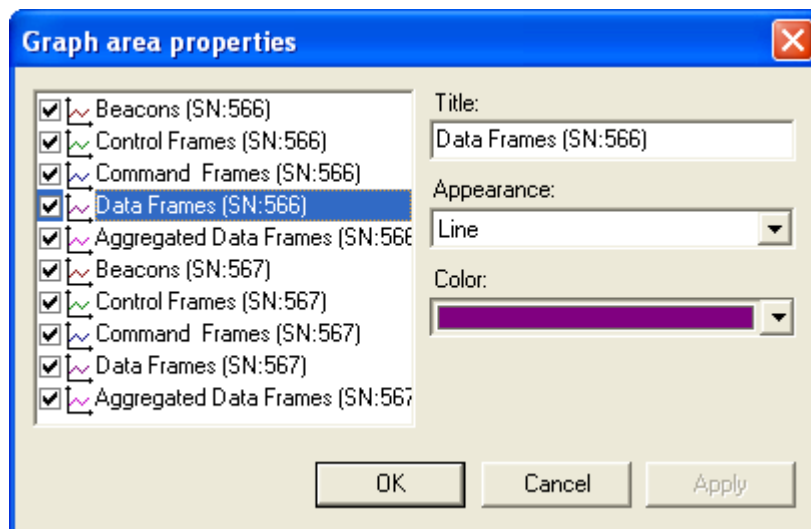


Figure 9.22 Graph Area Properties for Frames

Graph Properties for Error Occurrences

Figure 9.23 shows the Graph Area Properties dialog box for Error Occurrences graph. There are two types of error graphs: Device-specific Errors and General Errors.

Device-specific Errors

Device-specific Errors can be associated with specific UWB devices. The Device-specific Errors that you can monitor are:

- PHY Payload Error
- PHY Unsupported Rate

General Errors

General Errors cannot be associated with specific UWB devices. Currently, there is one General Error that you can monitor through this graph:

- Header Error

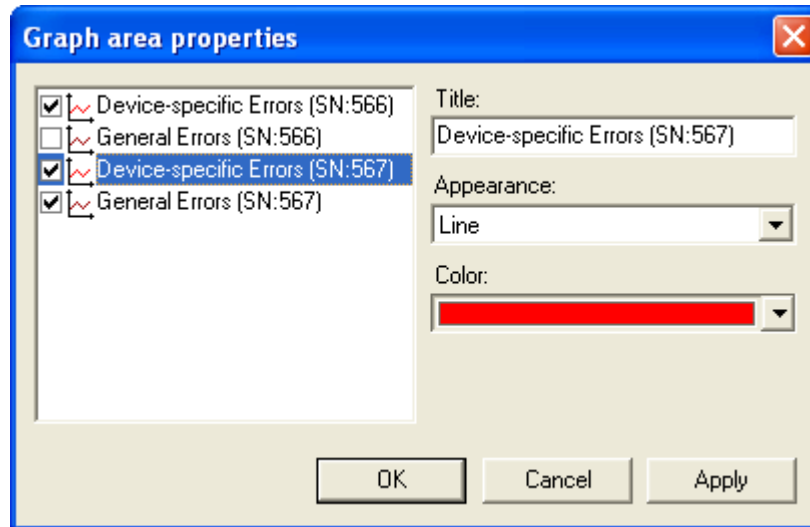


Figure 9.23 Graph Area Properties for Error Occurrences

General Statistics Area

The right side of the Real-Time Statistics window shows the General Statistics area. The following figure (Figure 9.24) shows MPI information.

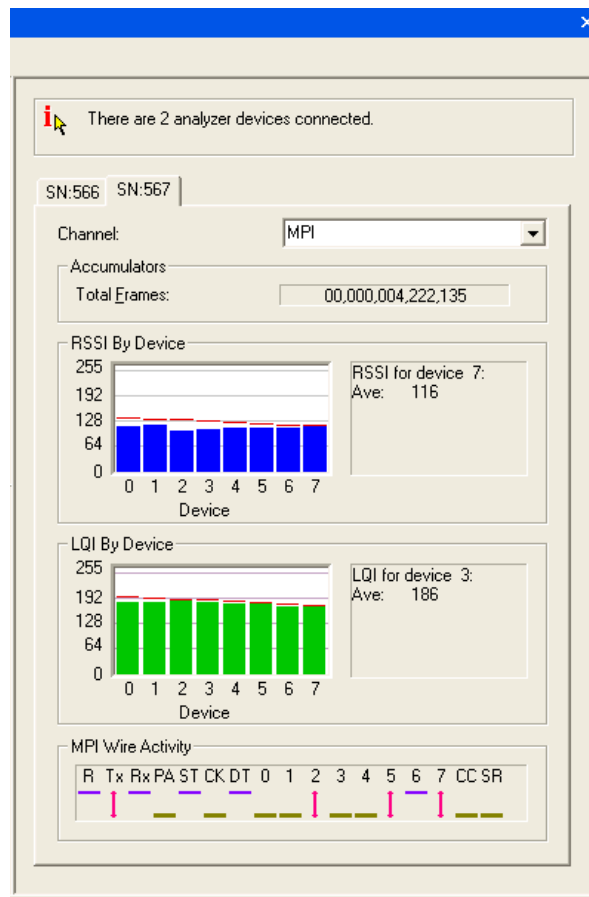


Figure 9.24 Real-Time Statistics Window: General Statistics Area for MPI Information

It has the following displays:

- Number of analyzer devices connected: Each one has a tab in the display.
- Channel: MPI or RF
- **Accumulators:** Running count of total frames displayed during the statistics collection period.
- **RSSI By Device:** Histogram showing received signal strength for UWB devices.
- **LQI By Device:** Histogram showing link quality for up to eight UWB devices.
- **MPI Wire Activity:** Signal state on the MPI bus:
 - Purple bar: Signal high
 - Green bar: Signal low
 - Red arrow: Signal toggled at least once during latest signal period

The following figure (Figure 9.25) shows MPI information.

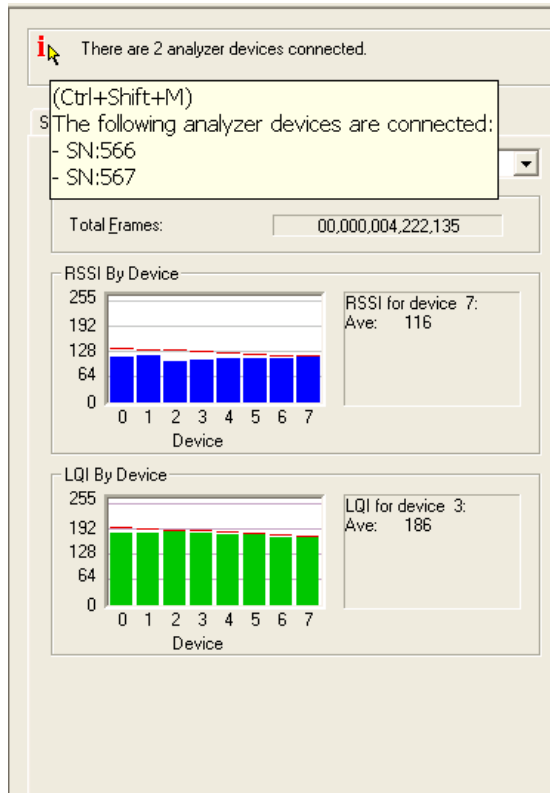



Figure 9.25 Real-Time Statistics Window: General Statistics Area for RF Information

It has the following displays:

- Number of analyzer devices connected: Each one has a tab in the display.
- Channel: MPI or RF
- **Accumulators:** Running count of total frames displayed during the statistics collection period.
- **RSSI By Device:** Histogram showing received signal strength for UWB devices.
- **LQI By Device:** Histogram showing link quality for up to eight UWB devices.

9.6 Bus Utilization

The **Bus Utilization** window displays information on bandwidth use for the the recording channels.

To open the Bus Utilization window, select **Report > Bus Utilization** or click the  button.

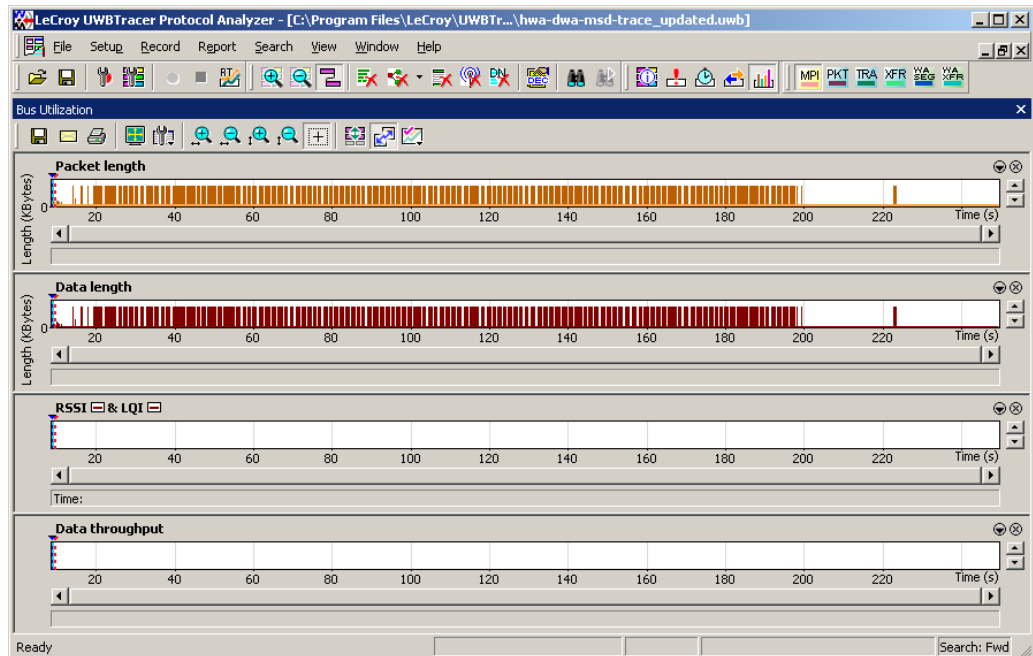


Figure 9.26 Bus Utilization Window














Bus Utilization Buttons

The Bus Utilization window has a row of buttons for changing the format of the displayed data and for exporting data:




Figure 9.27 Bus Utilization Buttons

The buttons have the following functions:

	Save As - Saves the graphs as a bitmap file (*.bmp)		Vertical zoom in
	Email - Creates an email with a *.bmp file attachment of the graphs		Vertical zoom out
	Print		"Click and Drag" zoom mode - Click diagonally to select and zoom in on part of the graph
	Full screen		Select Range
	View settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below.		Synchronize graph areas - If two or more graphs are displayed, this button synchronizes the graphs to one another. Once synchronized, the positioning slider of one graph moves the other graphs.
	Horizontal zoom in		Graph Areas - Presents options for displaying additional graphs of data lengths, packet lengths, and percentage of bus utilized.
	Horizontal zoom out		

View Settings Menu

Clicking the View settings button  causes a menu to open with options for formatting the display.

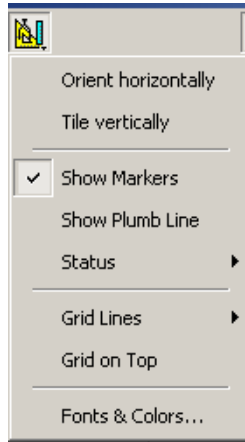


Figure 9.28 View Options: View Settings Menu

- **Orient Horizontally:** changes the orientation of bus usage to horizontal. After selecting this option, the menu has Orient Vertically.
- **Tile Vertically:** tiles the two graphs vertically (i.e., side by side). After selecting this option, the menu has Tile Horizontally.
- **Show Markers:** Places "tick" marks along the x axis of each graph.
- Show Plumb Line
- **Status:** Opens a submenu with the following options:
 - **Bar:** Displays a status bar at bottom of graph.
 - **Tooltip:** Causes a tooltip to appear if you position your mouse pointer over part of the graph and leave it there for a couple of seconds.
 - **None:** Turns off tooltips and the status bar.
- **Grid Lines:** Opens a submenu with the following options:
 - Both Axes: Displays both X and Y axis gridlines
 - X Axis: Displays X axis gridlines
 - Y Axis: Display Y axis gridlines
 - No Grid: Turns off gridlines
- **Grid on Top:** Moves the grid lines above the graph.

- **Fonts and Colors** - Opens a dialog box for setting the colors and fonts used in the graphs:

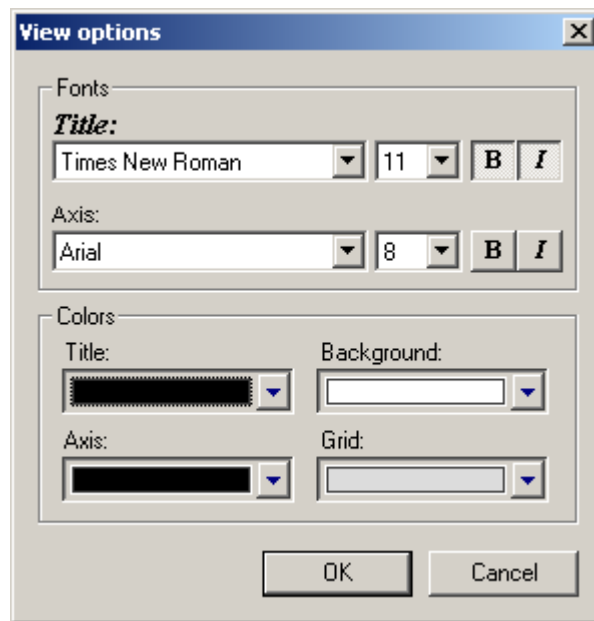



Figure 9.29 View Options: Fonts and Colors

Graph Areas Menu

The Graph Areas menu allows you to view different information types in the Bus Utilization window.

- Step 1** Click the  button to display the Graph Areas menu:

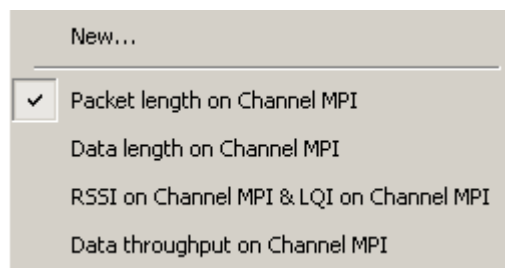


Figure 9.30 Graph Areas Menu

- Step 2** Select the data you want to appear in the Graph Areas window: Packet length, Data length, RSSI & LQI, and/or Data Throughput.

To change the properties in the Bus Utilizations graph:

Step 1 In the **Graph Areas** menu, click **New** to display the Graph Area Properties dialog box.

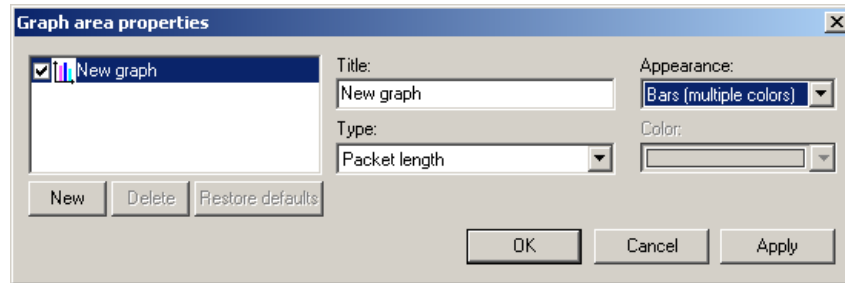


Figure 9.31 Graph Area Properties Dialog Box

Step 2 Select the graph or click **New** to make a new graph.

Step 3 Enter a graph title in the Title field.

Step 4 Select the Type: Packet length, Data Payload length, RSSI, LQI, or Data Throughput.

Step 5 Select the Appearance: single or multiple color bars or lines, or thick lines. If you selected bars, select the Color.

Step 6 Click **OK**.

9.7 Device List

The Device List window lists the DUTs, active devices, archive devices, and wireless USB by DUTs, Type, EUI-48, Address, Alias, Last Updated, and User Notes.

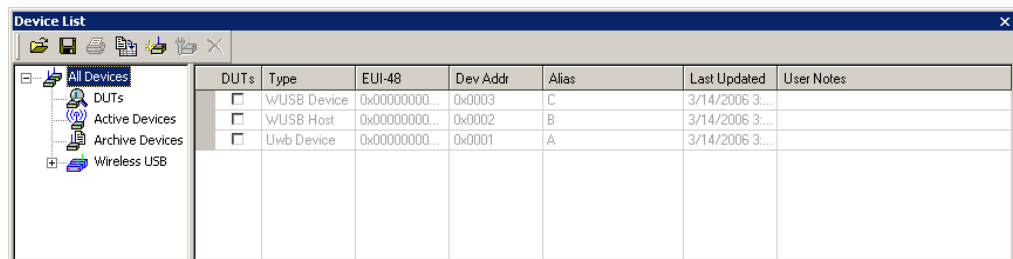



Figure 9.32 Device List Window

You can display the list in HTML View or Grid View using the  button.


If the Device List is displayed in HTML View, you can print the list. (Do not print from Grid View.)

You can import a UWB Device List Saved File (extension **.dl**).

You can save the Device List as an HTML file.

Add Device

To add device data:

Step 1 In the Device List window, click the **Add New Device**  button to display the Add New Device dialog box at the General Settings tab:

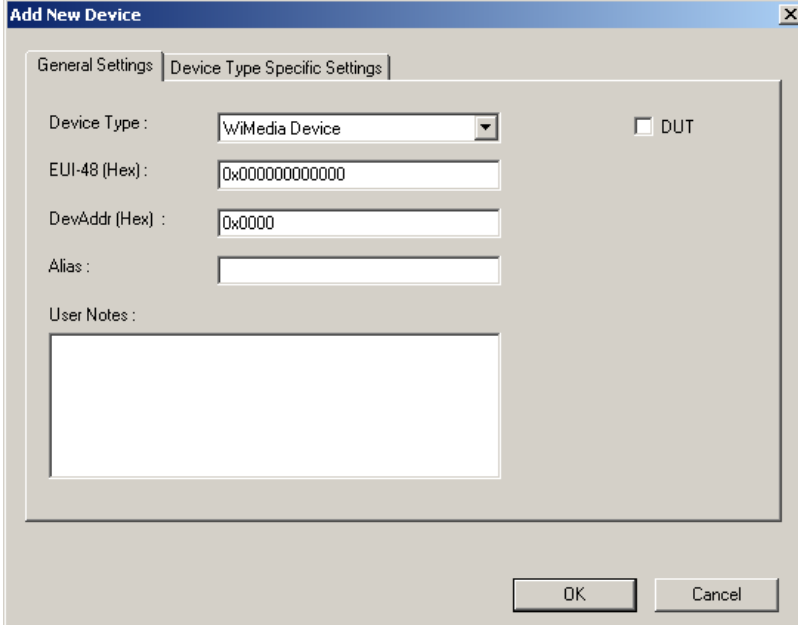


Figure 9.33 Add New Device Dialog Box General Settings Tab

Step 2 In the Add New Device dialog box, select the **Device Type** as WiMedia Device, Wireless USB Host, or Wireless USB Device.

Step 3 Enter the **EUI-48** in hexadecimal.

Step 4 Enter the **Device Address** in hexadecimal.

Step 5 (optional) Enter an **Alias**.

Step 6 (optional) Enter any **User Notes**.

Step 7 (optional) Select the **DUTs** checkbox if applicable.

Step 8 For a Wireless USB Host device, select the **Device Type Specific Settings** tab.

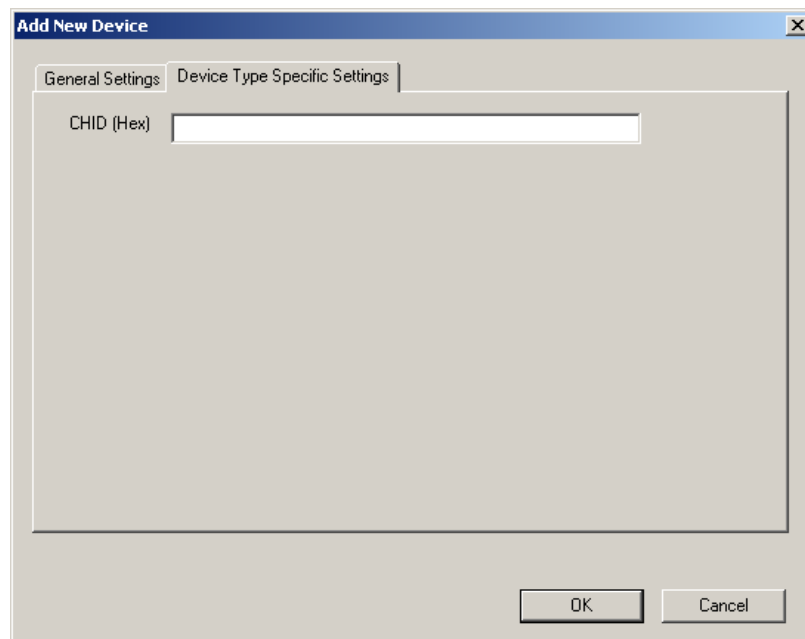


Figure 9.34 Add New Device Dialog Box Device Type Specific Settings Tab for Wireless USB Host

Enter the **CHID** (host ID) in hexadecimal.

Click **OK** to return to the Device Type Specific Settings tab.

Step 9 For a Wireless USB Device device, select the Device Type Specific Settings tab.

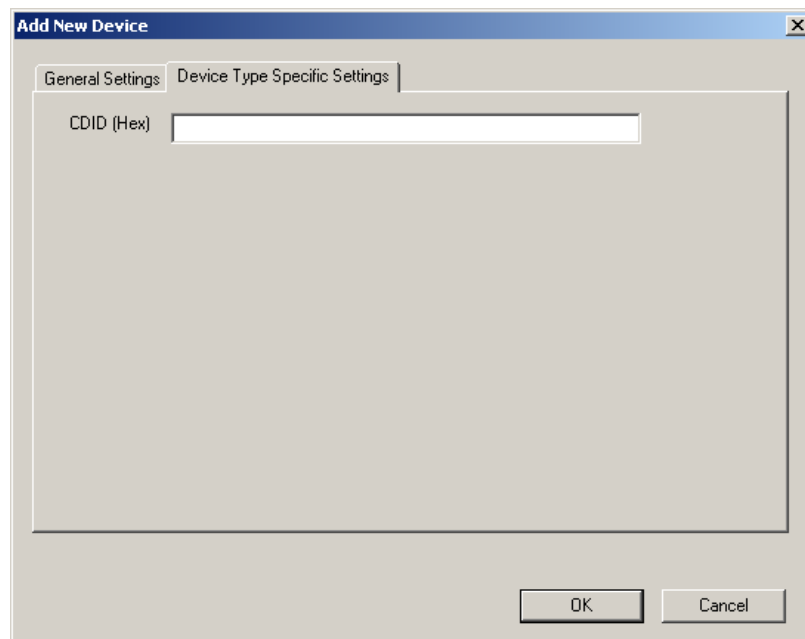


Figure 9.35 Add New Device Dialog Box Device Type Specific Settings Tab for Wireless USB Device

Enter the **CDID** (device ID) in hexadecimal.

Click **OK** to return to the Device Type Specific Settings tab.

Edit Device

To edit a device, select the device in the Device List, then click the **Edit Device** button.

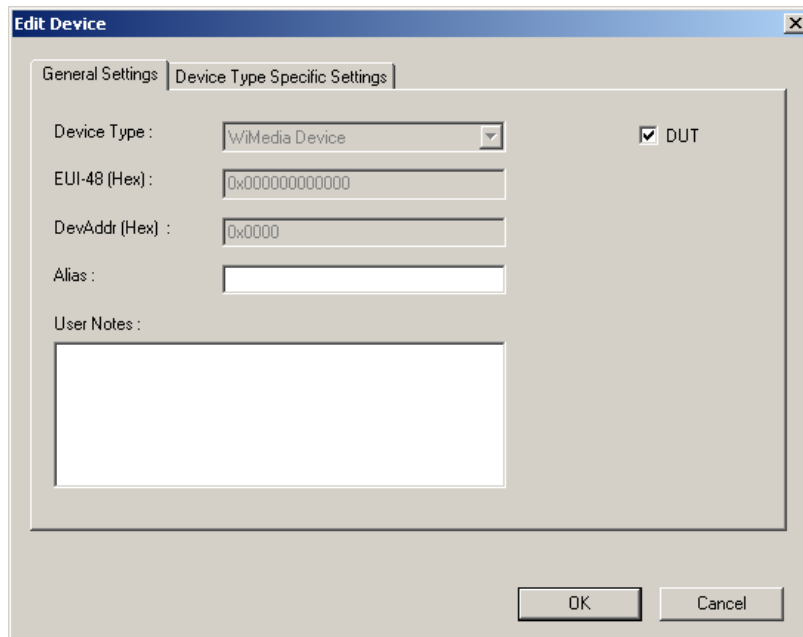


Figure 9.36 Edit Device Dialog Box

You can edit only the Alias, User Notes, and DUTs checkbox of the device data in the Edit Device dialog box General Settings tab.

You can edit only the list of hosts or devices in the Device Type Specific Settings tab.

Delete Device

To delete a device, select the row in the Device List, then click the **Delete Device** button.



Chapter 10: Updates and Licensing

This chapter describes how to update to UWB *Tracer*™ software and how to obtain a software license key from LeCroy.

10.1 Updates Overview

From time to time as modifications are made to the UWB *Tracer* Analyzer, it may become necessary to update the UWB *Tracer* software. You can obtain new software from the LeCroy website:

www.Lecroy.com

When you download new UWB *Tracer* software, the most recent firmware and BusEngine™ files are included in the software package. After software installation, you can compare the firmware and BusEngine version numbers against what is currently loaded on the analyzer. If those files do not match, you can download the latest versions using the manual or automatic process described later in this chapter.

Note: LeCroy analyzers include a Three-Year Investment Protection Agreement that entitles users to new software during that period. To update software after that period, you must renew the LeCroy Maintenance Agreement. Contact LeCroy for details.

10.2 Software, Firmware, and BusEngine Versions

The Readme file on the installation CD and on the installed directory on your hard drive gives last-minute information about the current release. As mentioned, the software package for each release includes the most recent downloadable images of the firmware and the BusEngine.

Once the UWBTracer Analyzer has completed the self diagnostics and is connected to the PC, you can check the latest version of the software and BusEngine.

To check information about the current software:

- Select **About UWBTracer...** from the **Help** menu to display the About UWBTracer window (Figure 10.1).



Figure 10.1 About UWBTracer Window

About UWBTracer details revisions of the following software and hardware:

- UWBTracer Software Version, Build Number
- UWBTracer Firmware Version
- BusEngine Version, Build Number
- Unit Serial Number

Note: When contacting LeCroy for technical support, please have available all the revisions reported in the **About UWBTracer** window.

10.3 Software Updates

When a new software release is available, it is posted on the Support page of the LeCroy website at www.LeCroy.com/support.html.

To update the software:

Step 1 Find the latest released software version on the LeCroy website under **Support**.

If you are running the latest version of the software, no further action is needed.

If you are **not** running the latest version, continue to Step 2.

Step 2 Download the Zip file from the website.

Step 3 Unzip the files into your choice of directory.

Step 4 Click **Start**, then **Run**, and browse to where you unzipped the files.

Step 5 Select the program named **Setup** and click **Open**.

Step 6 Click **OK** to run the Setup and begin the installation.

Step 7 Follow the on-screen instructions to complete the installation.

Step 8 Read the Readme file for important information on changes in the release.

10.4 BusEngine and Firmware Updates

Often you need to update BusEngine and firmware files when you update the UWBTracer software. The software Readme file indicates if BusEngine and/or firmware updates are necessary.

Note: Within a new software release, it might also be necessary to update the BusEngine hardware of the analyzer. The Readme file lets you know if this is necessary.

Automatic Update of BusEngine and Firmware

When you update UWBTracer software, the new version might not match (be compatible with) the BusEngine and firmware currently installed on the analyzer. As the software is loaded, it determines if there is a mismatch. If so, the software initiates automatic update of the firmware and BusEngine.

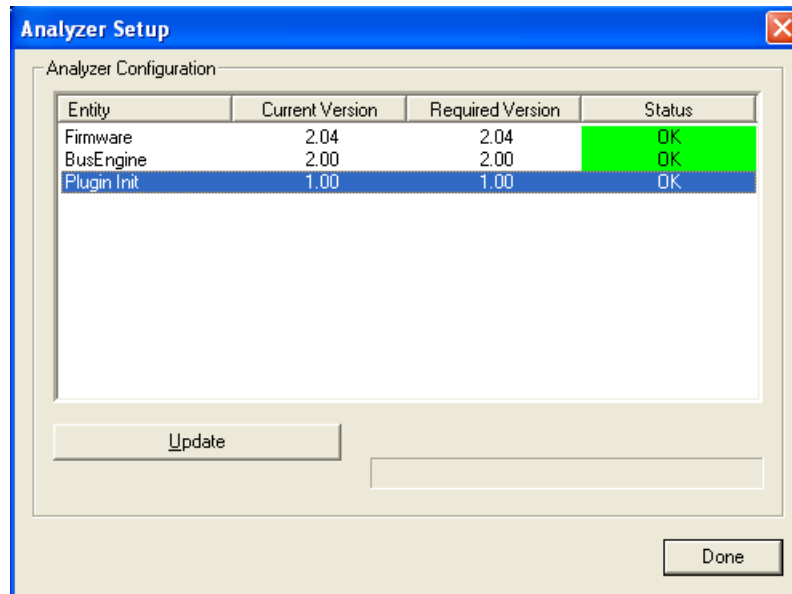
A dialog box appears to confirm that you want to proceed with the update. If so, click **OK**. The update is executed.

Manual Update of BusEngine and Firmware

You also can manually load firmware and BusEngine files using the Update BE/FW command on the Setup menu.

To update manually:

Step 1 From the Setup menu, select **Update BE/FW** to display the Analyzer Setup dialog box:



The Entity can be Firmware, BusEngine, and Plugin Init (PHY Initialization data). The Current Version, Required Version, and Status are listed.

Figure 10.2 Analyzer Setup Dialog Box

Step 2 Select whether to update Firmware, BusEngine, and/or Plugin Init, then click the **Update** button to display a dialog box.

Step 3 Click **OK** to confirm that you want to proceed with the update. The update is executed.

Update of Other Files

For the UWBTracer software, you may need to update the PHY initialization data.

To update manually, follow the instructions for "Manual Update of BusEngine and Firmware" on this page.

To update automatically, follow the instructions for "Automatic Update of BusEngine and Firmware" on this page.

10.5 License Information

You can view license information for UWBTracer by selecting **Display License Information** from the Help menu. The License window indicates the maintenance expiration data for UWBTracer. It also provides a list of the named features supported by the current software version.

Named features enabled on your PC are indicated by **Yes** in the Purchased column. Named features that are not enabled on your PC are indicated by **No** in the Purchased column. Whether or not named features are enabled depends on the license key stored in your analyzer.



Figure 10.3 License Window

10.6 Updating the Software License

A current license agreement with LeCroy entitles the analyzer owner to continued technical support and access to software updates as they are published on the LeCroy website.

If your license expires, you must obtain a license key from LeCroy (refer to the contact information at the back of this manual.)

After you obtain a license key, follow these steps to install it:

Step 1 From the Help menu, select **Update License**. The Update License dialog box appears.

Step 2 Enter the path and filename for the license key or use the Browse button to navigate to the directory that contains the license key.

Step 3 Select the *.lic file, and then click **Update Device**.

Appendix A: External Connectors

This chapter describes the Trigger Cable TRIG-IN/TRIG-OUT BNC Y-cable and Synchronization Cable included with the UWBTracer™ system and the External Data connector and SYNC IN and SYNC OUT connectors located on the UWBTracer rear panel.

A.1 External Triggering Connector

With each analyzer, LeCroy includes a TRIG-IN/TRIG-OUT BNC Y-cable (Figure A.1) that allows you to export a trigger signal to, and receive a trigger signal from, external equipment.



Figure A.1 Trigger Cable

The Trigger Cable connects to the EXT DATA connector (Figure A.2) located on the UWBTracer rear panel.

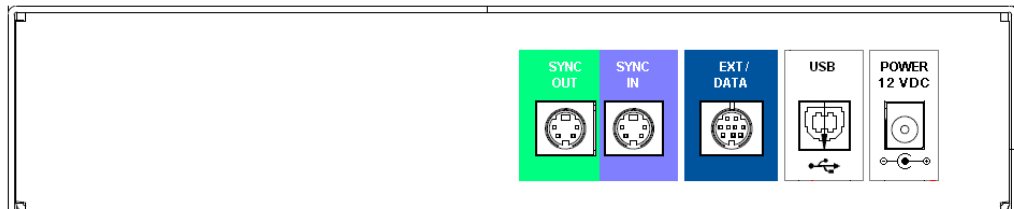


Figure A.2 EXT DATA Connector

A.2 SYNC Connectors

The Synchronization Cable (Figure A.3) connects to the SYNC IN and SYNC OUT connectors located on the UWBTracer rear panel (Figure A.2).



Figure A.3 Synchronization Cable

Table B.1 Adapter Pin Assignments: 68-Pin Probe Cable

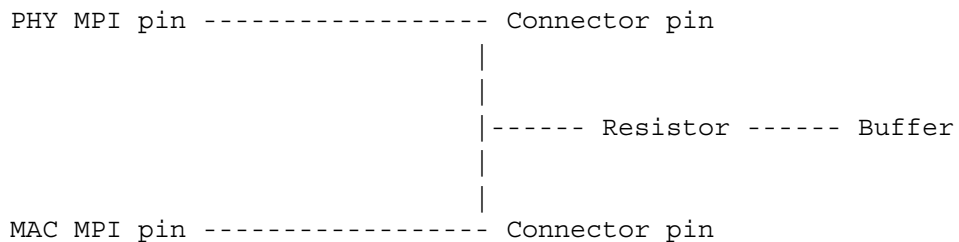
PIN#	Definition	PIN#	Definition
A1	N/C	B1	N/C
A2	GND	B2	GND
A3	DATA[0]	B3	PHY_RESET
A4	GND	B4	GND
A5	DATA[1]	B5	N/C
A6	GND	B6	GND
A7	DATA[2]	B7	MCTL
A8	GND	B8	GND
A9	DATA[3]	B9	SERIAL_DATA
A10	GND	B10	GND
A11	DATA[4]	B11	CCA_STATUS
A12	GND	B12	GND
A13	DATA[5]	B13	CCA_REQ
A14	GND	B14	GND
A15	DATA[6]	B15	N/C
A16	GND	B16	GND
A17	DATA[7]	B17	N/C
A18	GND	B18	GND
A19	PCLK	B19	N/C
A20	GND	B20	GND
A21	N/C	B21	N/C
A22	GND	B22	GND
A23	TX_EN	B23	N/C
A24	GND	B24	GND
A25	RX_EN	B25	N/C
A26	GND	B26	GND
A27	FSYNC	B27	N/C
A28	GND	B28	GND
A29	PHY_ACTIVE	B29	N/C
A30	GND	B30	GND
A31	DATA_EN	B31	+5V
A32	GND	B32	GND
A33	EOF	B33	+V5
A34	GND	B34	GND

Table B.2 Adapter Pin Assignments: 40-Pin Probe Cable

PIN#	FUNCTION	PIN#	FUNCTION
1	RESET	2	GND
3	DATA0	4	NC
5	DATA1	6	PWR
7	DATA2	8	PWR
9	DATA3	10	PWR
11	DATA4	12	PWR
13	DATA5	14	PWR
15	DATA6	16	PWR
17	DATA7	18	NC
19	GND	20	KEY
21	PCLK	22	GND
23	TX_EN	24	GND
25	RX_EN	26	GND
27	PHY_ACT	28	NC
29	DATA_EN	30	GND
31	CCA_ST	32	GND
33	SE_DAT	34	GND
35	STOP_C	36	GND
37	RSVD1	38	GND
39	RSVD2	40	GND

B.2 Input Load of UWBTracer MPI

Each MPI signal pin has a 220 ohm tapping resistor followed by a CMOS buffer with 10pF of input capacitance. The resistor and buffer are within 2 inches of the connector on the Cable Adapter or Board Adapter.



Appendix C: Specifications

The following specifications describe a combined CATC 5K Analyzer and UWB Analyzer Plug-in.

Package

Dimensions	<p>CATC 5K: 9.8 x 6.5 x 2.0 inches (24.9 x 16.5 x 5.1 cm)</p> <p>UWB Analyzer Plug-in: 4.0 x 5.0 x 1.3 inches (10.2 x 12.7 x 3.3 cm)</p>
Connectors	<p>CATC 5K: 12 VDC power connection External I/O and trigger connection (Mini DIN-9) External Sync IN connection (Mini DIN-4) External Sync OUT connection (Mini DIN-4) Antenna RF SMA Connector PC connection (USB2.0, type "B")</p> <p>UWB Analyzer Plug-in: MPI Adapter port</p>
Weight	<p>CATC 5K: Approximately 2 lbs. 9 oz. (1.2 kg)</p> <p>UWB Analyzer Plug-in: Approximately 3 oz. (0.1 kg)</p>

Power Requirements

12 VDC, 60 W maximum

Environmental Conditions

Operating Range	0 to 40°C (32 to 104°F)
Storage Range	-20 to 80°C (-4 to 176°F)
Humidity	10 to 90%, non-condensing

How to Contact LeCroy

Type of Service	Contact
Call for technical support...	US and Canada: 1 (800) 909-2282
	Worldwide: 1 (408) 727-6600
Fax your questions...	Worldwide: 1 (408) 727-6622
Write a letter...	LeCroy Customer Support 3385 Scott Blvd. Santa Clara, CA 95054
Send e-mail...	support@catc.com
Visit LeCroy's web site...	http://www.lecroy.com/

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