

# LeCroy UWBTracer<sup>TM</sup>

## Ultra-Wideband Protocol Analyzer User Manual

Manual Version 1.10



**For Software Version 1.10**

14 October, 2005

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# 1. Overview

This chapter describes the UWBTracer™ product and Ultra-Wideband technology in general. It also provides UWBTracer specifications.

## 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 UWBTracer MPI analyzer is designed to connect to the MAC-PHY Interface (MPI) bus between the MAC and the PHY sub-systems 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](http://www.LeCroy.com).

Table 1.1 summarizes key UWBTracer features.

**Table 1.1 UWBTracer Features**

Feature	Benefit
Two types of MPI probe connectors	Suitable for popular connector types used in UWB WiMedia systems to connect between MACs and PHYs.
Trace View	Robust capability to control real-time triggering, filtering, and 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	(2GB) Captures long time-windows for analysis and problem-solving.

## 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. It is already used in other commercial communications systems, including Wi-Fi 802.11a/g, WiMAX 802.16a and others. 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, which is composed of the MBOA (Multi-band OFDM Association) and the WiMedia group, 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:

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



## 2. General Description

This chapter describes UWBTracer™ MPI product components and general physical features.

### 2.1 System Components

- One UPAS 10K base platform.
- One MPI Module Plug-In to be plugged into Slot #1 (left-side slot).
- One Cable Adapter.
- One Cable Adapter connector cable.
- One 68-pin MPI probe cable.
- One 40-pin MPI probe cable.
- Breakout board with cable.

### 2.2 UWBTracer Front Panel Description

When powered ON, the UWBTracer MPI activates user-accessible controls and LEDs on front and rear panels of the UPAS base platform. This section covers front panel features. The next section covers rear panel features.



#### WARNING

Do not open the UPAS enclosure. There are no operator serviceable parts inside. Refer servicing to LeCroy.



Figure 2.1 UWBTracer Front Panel

## Front Panel LEDs

*UPAS LEDs* (Figure 2.1, from left to right)

**Power indicator LED:** Lights when the unit power is switched ON.

**System Status indicator LED:** Lights during initialization/power up of UPAS base unit. Blinks if a self-test fails.

**Recording LED:** Lights when the unit is recording.

**Triggered LED:** Lights when the unit triggers on an event.

**Synchronized LED:** Lights when the analyzer is synchronized and can record traffic.

*UWBTracer MPI Module*

**Status LED:** OFF if Cable Adapter cable is not attached or PCLK is not detected. Blinks every one second as soon as PCLK is detected. Blinks continuously as soon as PHY\_ACTIVE is detected (RX or TX frame is in progress).

## Front Panel Pushbutton

**Manual Trigger push-button:** Forces a trace trigger when recording options are set to “Manual Trigger.”

## 2.3 UWBTracer Rear Panel Description

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



Figure 2.2 UWBTracer Rear Panel

**USB Type "B" Host Computer Connector:** This connector links the analyzer to the Host PC (PC running the UWBTracer software application). It allows the PC to transmit commands to the analyzer and to upload traces from the analyzer recording memory to UWBTracer software for viewing and analysis.

**RS-232 25 pin "Data Input/Output" Connector:** This connector links a 40-pin RS-232 cable to an external breakout board.



The breakout board allows signals to be sent from the analyzer to an external device such as an oscilloscope or from an external device to the analyzer for the purpose of triggering on external input. You set input/output signalling through the Recording Options window.

**BNC Connectors "Ext. In" and "Ext. Out":** These BNC connectors allow the analyzer to transmit or receive external signals.

**AC Connector Module:** The connector module is located on the right side of the rear panel. Key features are:

- Power socket.
- Power ON/OFF switch.
- Enclosed 5x20 mm 2.0A 250 V fast-acting glass fuse.

**WARNING**

For continued protection against fire, replace fuse only with the type and rating specified above.

---



## 3. Installation

This chapter describes how to install the UWBTracer™ MPI System.

### 3.1 Analyzer PC Requirements

Please see the Readme file on the installation CD for the latest information on PC requirements.

### 3.2 Installing the UWBTracer Software

To install UWBTracer software on its PC host.

- Step 1** On the PC, select **Install Software** from the installation window and follow the on-screen instructions.
- Step 2** The UWBTracer software will install on the PC hard disk.
- Step 3** To start the application, launch the **LeCroy UWBTracer** program from the **Start** menu:  
Programs > LeCroy > UWBTracer  
The UWBTracer program opens.

**Note:** You can use the software with or without the analyzer. When used without the analyzer connected to the computer, the program functions as a trace viewer to view, analyze, and print trace files.

### 3.3 Setting Up the Analyzer

To set up the system:

- Step 1** Remove the UWBTracer/UPAS from its shipping container.
- Step 2** Connect the analyzer unit to a 100-volt to 240-volt, 50 Hz to 60 Hz, 120W power outlet using the provided power cord.
- Step 3** Turn ON the power switch on the rear of the UPAS.

**Note:** At power-on, the analyzer initializes itself in approximately 10 seconds and does an exhaustive self-diagnostic that lasts about 5 seconds. The Status LED of the UPAS base unit turns red on power up/initialization. The LED remains on approximately 25 seconds while the analyzer performs its self-diagnostic testing. If the diagnostics fail, the Status LED blinks red, indicating a hardware failure. If this occurs, call LeCroy Customer Support for assistance.

**Step 4** Connect the USB cable between the USB port on the back of the analyzer and a USB port on the PC.

The host operating system detects the analyzer and begins to install the USB driver.

**Step 5** Follow Windows on-screen Plug-and-Play instructions for the automatic installation of the analyzer as a USB device on the Host PC (the required USB files are included on the *UWBTracer* CD).

Step through the Windows hardware wizard. The wizard will automatically install *UWBTracer* as a USB device on the PC.

When the wizard prompts you for driver information, point it to the CD, which should be in your disk drive, and install `ctcupa10.sys` and `uwbttrace.sys`.

## 3.4 Connecting the Analyzer to the Device Under Test

Assuming you are using an MPI cable adapter, following are *UWBTracer* MPI components used in the installation:

- UPAS 10K system with the *UWBTracer* MPI plug-in module.
- Cable Adapter with connector cable.
- One of the probe cables: the 68-pin version or the 40-pin version (depending on the available connector on the device under test).

## 3.5 Installing the Cable Adapter

To install the cable adapter:

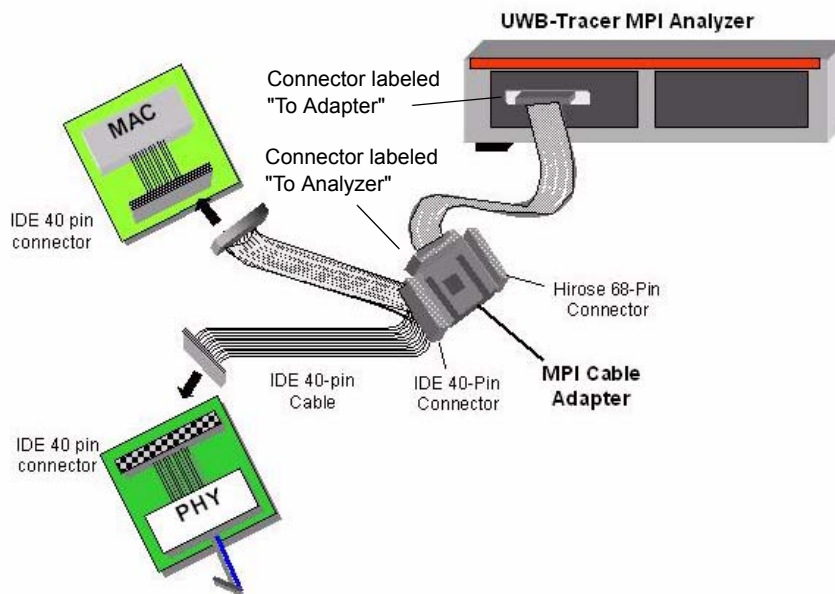
**Step 1** If not already powered OFF, power OFF the UPAS 10K analyzer and the device under test (DUT).

**Step 2** Connect one side of the adapter cable to the MPI plug-in connector labeled **TO ADAPTER** (Figure 3.1).

- Step 3** Connect the other side of the adapter cable to the cable adapter cable connector labeled **TO ANALYZER**.
- Step 4** Connect the middle connector of the chosen probe cable to the respective connector in the cable adapter (either labeled **68 PIN INPUT** or **40 PIN INPUT**). Figure 3.1 shows a 40-pin probe cable connected to the 40-pin connector.
- Step 5** Connect one side of the probe cable to the connector at your PHY system. Connect the other side of the probe cable to the connector at the MAC system.

## 3.6 Cable Adapter Pin Assignments

Table 3.1 and Table 3.2 show connector pin assignments for the 68-pin and 40-pin probe cables.



**Figure 3.1** UWBTracer Device Connections

**Table 3.1 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 3.2 Adapter Pin Assignments: 40-Pin Probe Cable**

<b>PIN</b>	<b>FUNCTION</b>	<b>PIN</b>	<b>FUNTION</b>
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

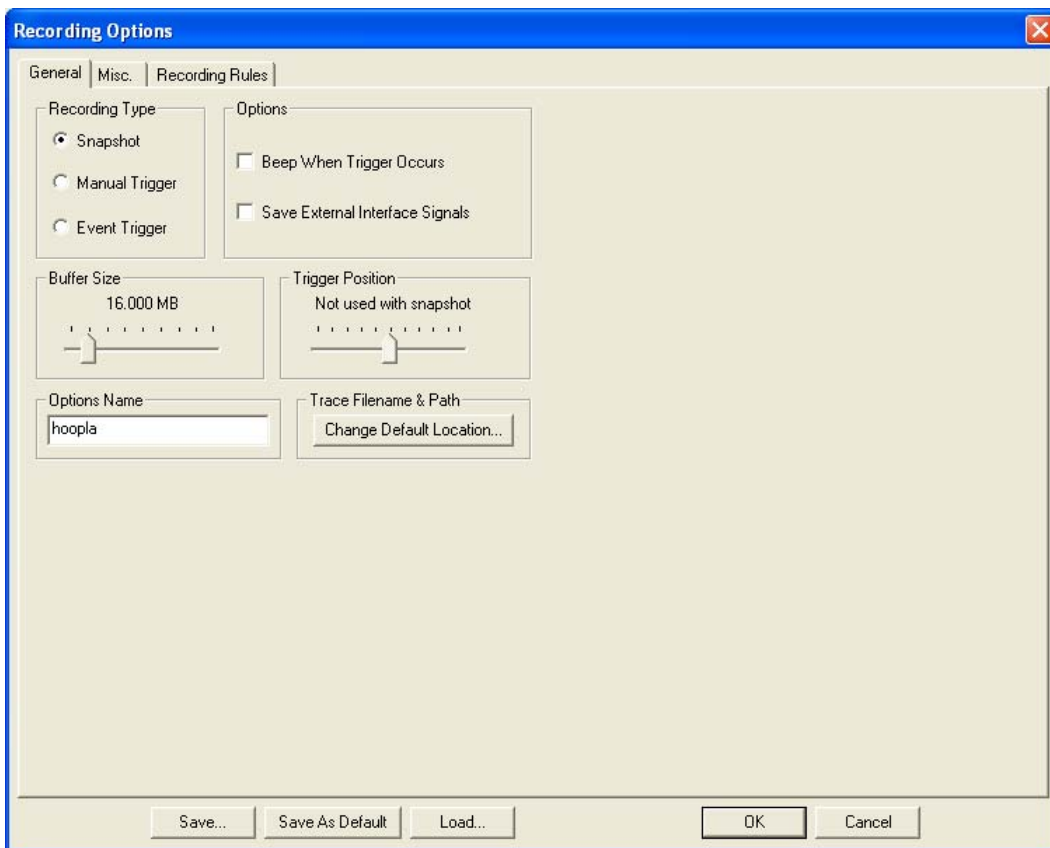
## 3.7 Making a Recording

After installation, the software is configured by default for a 16-MB snapshot recording of your traffic.

### Starting Recording

To start recording:

- Step 1** Check that the analyzer is properly connected to the Cable Adapter and host PC. Check that the Cable Adapter is properly connected to the DUT.
- Step 2** From the Setup menu, select **Recording Options**. The Recording Options window appears (Figure 3.2).




**Figure 3.2** Recording Options Window: General Settings




**Step 3** Select the **General** tab.


The General page of the window appears. It displays the default settings for items like Recording Type and Buffer Size. For your first recording, you can leave these settings unchanged.

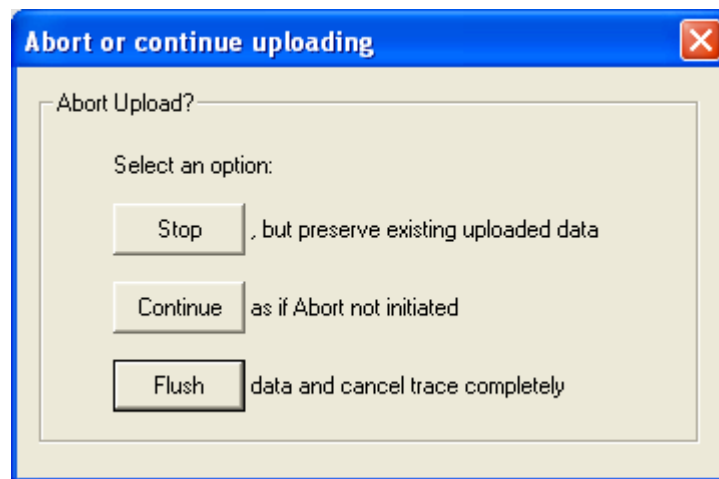
**Step 4** Click  on the Tool bar. After 16 MB of traffic is recorded, the UWBTracer analyzer uploads the data and displays the frames.

### Stopping Recording

You can stop the recording at any time by pressing the Stop Button . Afterwards, the trace will automatically upload from the analyzer to the PC.

### Interrupting the Upload Process

You can interrupt the upload process by pressing the Stop  button. Pressing Stop will cause the Abort or continue uploading dialog box to appear (Figure 3.3).



**Figure 3.3** Adjust Uploading Dialog Box

This dialog presents the following options for stopping, continuing, or aborting the recording.

**Stop:** Stop upload but keep the data that has been uploaded to this point.

**Continue:** Continue with the upload process.

**Flush:** Abort the upload process and flush the data uploaded to this point.

### Saving the Trace

When the recording session is finished, traffic is uploaded to the PC and is automatically saved to the hard drive as a file named **data[sn].uwb**, where [sn] is the serial number of the UPAS 10K chassis (or the name you assign as the default filename).

WUSB Packet 1	IN	Dir <--	Host Id 0x0080	DATA 0	Addr 10	Endp 0	Data 3 bytes	PHY_ACT 2.473 μs	Idle 1.002 μs	Time Stamp 0.000013750		
WUSB Packet 2	IN	Dir <--	Host Id 0x0080	DATA 0	Addr 10	Endp 0	Data 3 bytes	PHY_ACT 2.473 μs	Idle 1.002 μs	Time Stamp 0.000017225		
WUSB Packet 3	MMC	Dir -->	Host Id 0x0080	Chan TS 0:022	IE Id WCTA	CTA 0 DT	Addr 10	Endp 0	EDir IN	Start Blank	bvDINAck 0x00000003	PHY_ACT 2.947 μs

**Figure 3.4 Trace Display**

To save the trace:

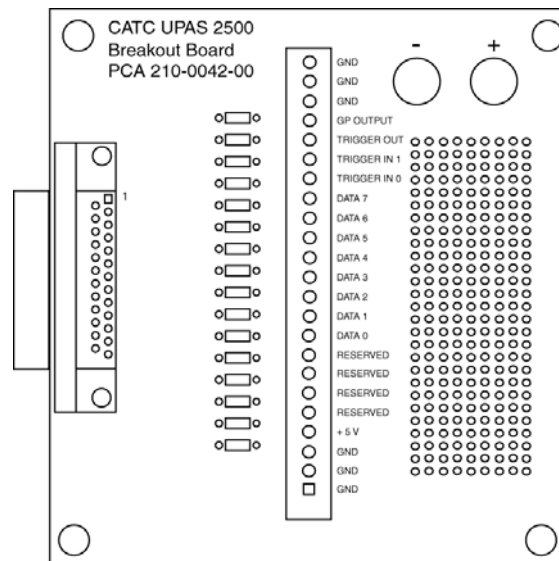
- Step 1** To save a current recording for future reference, select **Save As** from the **File** menu.
- Step 2** Give the recording a unique name and save it to the appropriate directory.

## 4. External Interface Breakout Board

This chapter describes the Breakout Board included with *UWBTracer*.

### 4.1 Breakout Board Overview

With each analyzer, LeCroy includes an External Interface Breakout Board (Figure 4.1). The board provides analyzer access to several potentially useful standard, LV TTL output and input signals. The breakout board also provides a simple way to connect logic analyzers or other tools to the *UWBTracer* analyzer. Six ground pins and one 5-volt pin are provided.



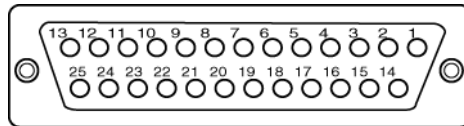
**Figure 4.1 External Interface Breakout Board**

The Breakout Board contains a prototype rework area for making custom circuits for rapid development. You can use the rework area to insert custom components and wire-wrap their respective signal, power, and ground pins.

The prototype rework area consists of plated-through holes, 20 columns wide by 27 rows long. The top row of holes is connected to GND and the bottom row is connected to +5V. The remaining holes are not connected.

## 4.2 Data In/Out Connector

The Breakout Board connects via a cable to the Data In/Out connector located on the UWBTracer rear panel. Each signaling pin is isolated by a 100 $\Omega$  series resistor and a buffer inside the analyzer.



**Figure 4.2 Breakout Board Data In/Data Out Connector**

Table 4.1 lists pin-outs for the 25-pin Data In/Out connector.

**Table 4.1 Pin-Outs for Data In/Out Connector**

Pin	Signal	Description
1	RSV	Reserved
2	GND	Ground
3	GP OUT	General Purpose Output
4	TRG IN 1	Trigger In 1
5	GND	Ground
6	DATA 6	Data 6
7	DATA 4	Data 4
8	DATA 3	Data 3
9	DATA 1	Data 1
10	GND	Ground
11	RSV	Reserved
12	RSV	Reserved
13	+5V	+5 Volts, 250 mA DC Source
14	RSV	Reserved
15	GND	Ground
16	TRG OUT	Trigger Out
17	TRG IN 0	Trigger In 0
18	DATA 7	Data 7
19	DATA 5	Data 5
20	GND	Ground
21	DATA 2	Data 2
22	DATA 0	Data 0
23	GND	Ground
24	RSV	Reserved
25	RSV	Reserved

**Note:** Pins 4 and 17 have the same function: To allow external signals to be used to cause triggering or recording.

Pins 3 and 16 are used to transmit output signals.

Pins 6, 7, 8, 9, 18, 19, 21, and 22 (data pins) are used to define data patterns for external input signals.



## 5. Software Overview

This chapter describes key features of *UWBTracer* software.

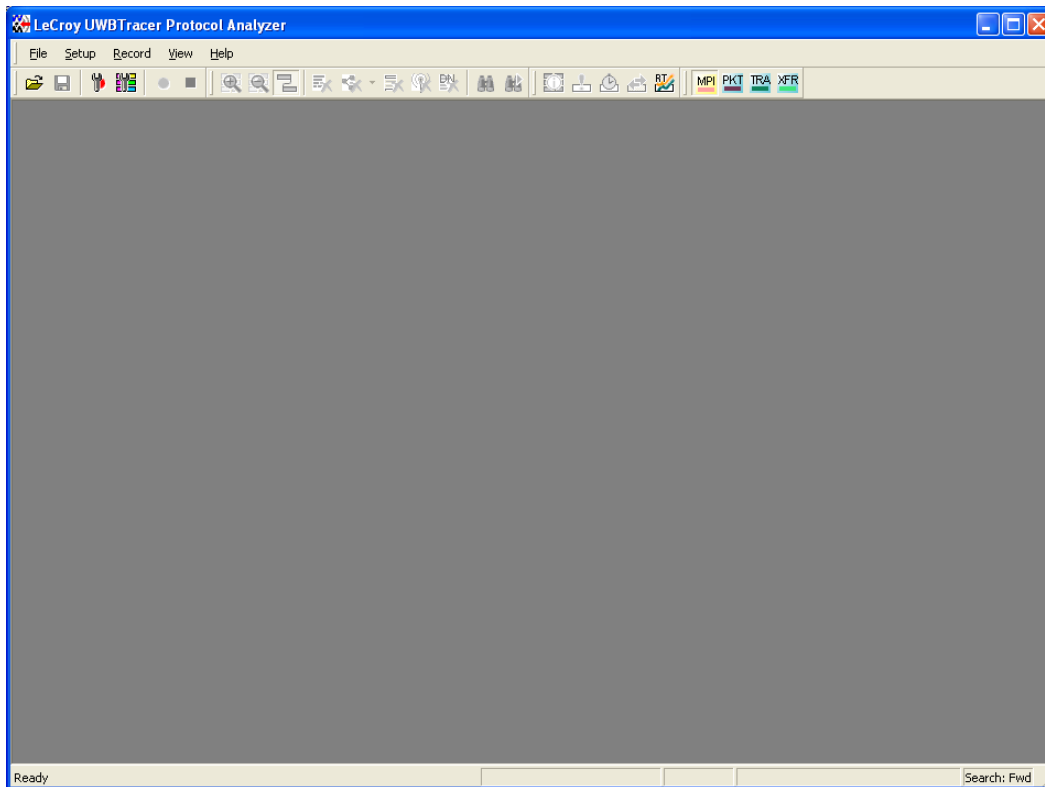
### 5.1 Starting the *UWBTracer* Program

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 Click **Start**.
- Step 2 Select **Programs**.
- Step 3 Select **LeCroy**.
- Step 4 Click **LeCroy UWBTracer**.

The application display appears (Figure 5.1).



**Figure 5.1** UWBTracer Main Window

## 5.2 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.

## 5.3 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 user will be prompted to convert the file to the current software version.

## 5.4 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 5.2).

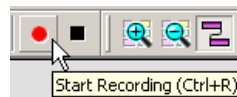


Figure 5.2 Tool Tip

## 5.5 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 5.3).

MPI	RX	PHY	Rate	Len	MAC	Control	Dest ID	Src ID	Payload	Frm Du
0	RX	PHY	53Mbps	36	MAC	Control	0x0088	0xBEEF	36 bytes	11.25
1	RX	PHY	53Mbps	258	MAC	Data	0x0000	0xBEEF	258 bytes	45.0

Figure 5.3 Trace Tool Tip



## 5.6 Menu Bar

Table 5.1 lists menus available from the Main window menu bar.

**Table 5.1 Menu Bar Menus**

Menu/Option	Function
<b>File</b>	
<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 from the current file 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 up your 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. Useful for saving traces to floppy disk and for e-mailing.
<u>E</u> xit	Exits the UWBTracer program.
<b>Setup</b>	
<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...	
Analyzer <u>N</u> etwork ...	Opens a dialog box for browsing to local and networked analyzers. Within the dialog, click <b>Add</b> 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 <b>Select</b> 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.
<b>Record</b>	
<u>S</u> tart	Causes the Analyzer to begin recording.
<u>S</u> top	Causes the Analyzer to stop recording.
<b>Report</b>	
<u>F</u> ile Information	Displays information about the recording such as the number of frames and triggering setup.
Timing <u>C</u> alculations	Calculates timing between two frames.
<b>Search</b>	
Go to <u>T</u> rigger	Positions the display to show the triggering event at the top.
Go to <u>P</u> LCP/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.

**Table 5.1 Menu Bar Menus (Continued)**

<b>Menu/Option</b>	<b>Function</b>
<u>G</u> o to	Positions the display to the specified item.
Find ...	Allows searches by multiple criteria.
Find <u>N</u> ext	Looks for the next instance of an event specified with Goto or Find.
Search Direction	Allows the search direction to be changed from forward to backwards or backwards to forward.
<b>View</b>	
<u>T</u> oolbars	Displays list of available Tool bars.
Analyzer Network Chat 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.
Unhide Cells	Unhides cells hidden by Display Options.
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.
Real-Time Statistics	Displays trace statistics.
<b>Window</b>	
<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.
<b>Help</b>	
<u>H</u> elp Topics ...	Opens online help.
Update License ...	Opens a dialog box for entering license key information for the analyzer.
Display License Information ...	Opens a dialog box with information about the current status of the analyzer's license
<u>A</u> bout UWBTracer	Displays version information about UWBTracer.

## 5.7 Tool Bar












The Main window Tool bar provides quick access to most UWBTracer 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 5.4 Main Window Toolbar**

**General Buttons**

**Table 5.2 Main Toolbar Buttons: General**

	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		






**Hide Buttons**

**Table 5.3 Main Toolbar Buttons: Hide**

	Hide Unassociated Traffic		Hide Beacon Frames
	Hide Devices		Hide Empty DN Frames
	Hide Empty Super Frame		

## Reports Buttons

**Table 5.4 Main Toolbar Buttons: Reports**

	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.		Real-Time Statistics. Opens a window that shows realtime information on links activity.
	Timing and Bus Usage Calculations. Opens a calculator for measuring timing between frames		

## Decode Buttons

**Table 5.5 Main Toolbar Buttons: Decode**

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

## 5.8 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 will arrange the decode buttons so they reflect their hierarchical order.



**Figure 5.5 Decode Toolbar in Hierarchal Arrangement**

## 5.9 Pop-Up Menus

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

### Left Mouse Button

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 5.6 shows three examples.

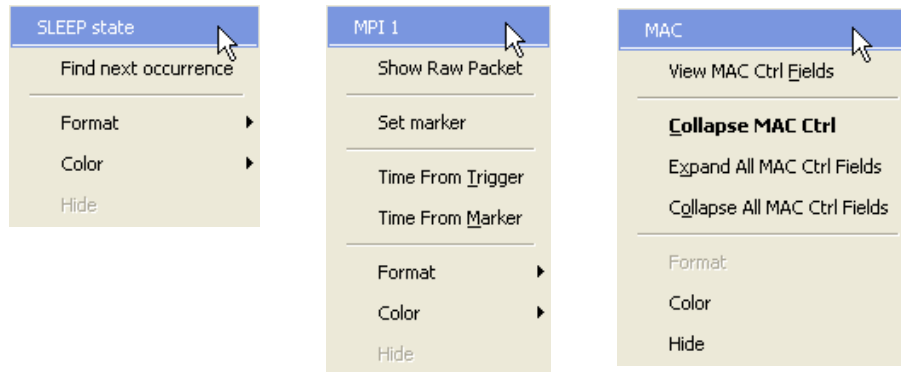


Figure 5.6 Trace Pop-Up Menus

Following are common options that 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.

### Right Mouse Button

If you click a cell in the trace with the right mouse button, a pop-up menu appears and shows the options for zooming in or out, wrapping the display, and other formatting options (Figure 5.7).

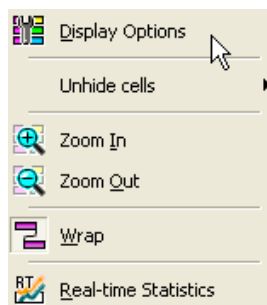


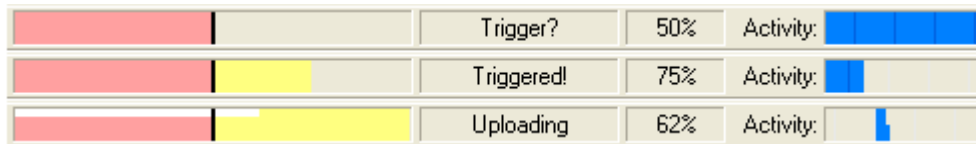
Figure 5.7 Trace Cell Pop-Up Menu

## 5.10 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.

### Recording Progress

When you begin recording, the left-most segment of the Status bar displays a recording Progress Indicator (left side of Figure 5.8).



**Figure 5.8 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.sas**. You can also create a file name of your choice by specifying one 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).

## 5.11 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.

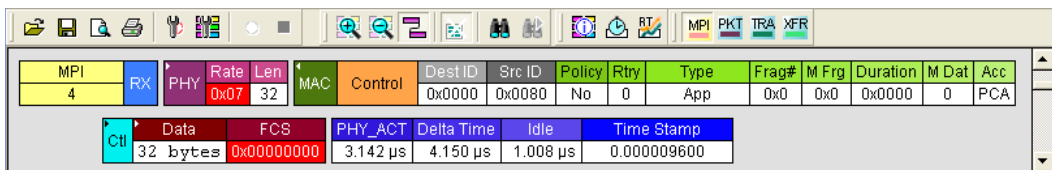
Click  on the Tool bar.



MPI	RX	PHY	Rate	Len	MAC	Control	Dest ID	Src ID	Policy	Rtry	Type	Frag#	M Frg	Duration	M Dat	Acc
4			0x07	32			0x0000	0x0080	No	0	App	0x0	0x0	0x0000	0	PCA

**Figure 5.9 Trace With Wrap Turned OFF**

In Figure 5.9, the timestamp extends off the right edge of the screen.



MPI	RX	PHY	Rate	Len	MAC	Control	Dest ID	Src ID	Policy	Rtry	Type	Frag#	M Frg	Duration	M Dat	Acc
4			0x07	32			0x0000	0x0080	No	0	App	0x0	0x0	0x0000	0	PCA
Ctl		Data	FCS	PHY_ACT	Delta Time	Idle	Time Stamp									
		32 bytes	0x00000000	3.142 µs	4.150 µs	1.008 µs	0.000009600									

**Figure 5.10 Trace With Wrap Turned ON**

In Figure 5.10, the entire frame appears in the window.



## 5.12 Adding Comments to the Trace

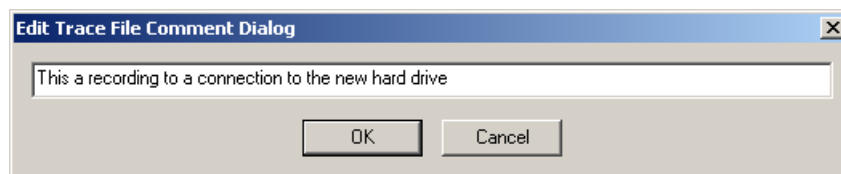
You can create, view, or edit the 100-character comment field associated with each Trace file.

**Step 1** From the **File** menu, select **Edit Comment**.

The **Edit Trace Comment Dialog** box appears.

**Step 2** Create, view, or edit the comment.

**Step 3** Click **OK**.



**Figure 5.11** Edit Trace File Comment Dialog Box

## 5.13 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** Click on **Frame #** for the frame you wish to mark.

**Step 2** From the pop-up menu that appears, Select **Set Marker** (**Figure 5.12**).

**Step 3** The **Edit Market for Frame #** dialog box appears (**Figure 5.13**).

**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 5.14**).

The screenshot shows a table of MPI events with a context menu open for MPI 1. The table has columns for MPI ID, State, Delta Time, and Time Stamp. The context menu includes options like 'Show Raw Packet', 'Set marker', 'Time From Trigger', 'Time From Marker', 'Format', 'Color', and 'Hide'. Below the table, there are several colored blocks representing packet fields like MAC, Control, FCS, PHY\_ACT, Data, and PHY\_A.

MPI	State	Delta Time	Time Stamp
0	RESET State	2.400 $\mu$ s	0.000000000
1	SLEEP state	2.400 $\mu$ s	0.000002400
2	state	2.400 $\mu$ s	0.000004800
3	state	2.400 $\mu$ s	0.000007200
4			

MAC	Control	Dest ID	Src ID	Policy	Rtry	Type	Frag#
0x0000	0x0080	No	0	App	0x0		

FCS	PHY_ACT	Delta Time	Idle	Time Stamp
0x00000000	3.142 $\mu$ s	4.150 $\mu$ s	1.008 $\mu$ s	0.000009600

Figure 5.12 Setting a Frame Marker

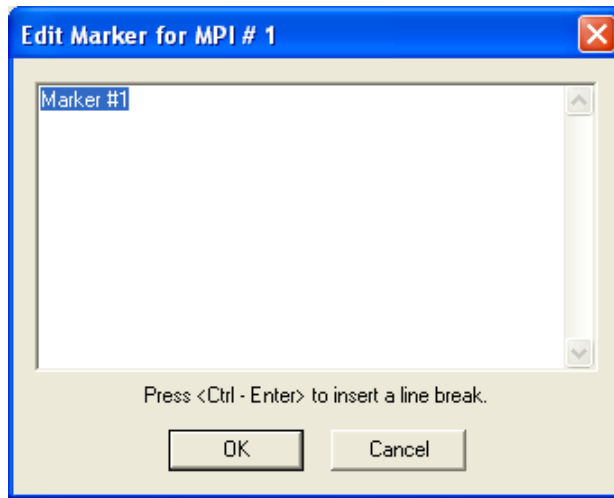


Figure 5.13 Edit Marker for Frame Dialog Box

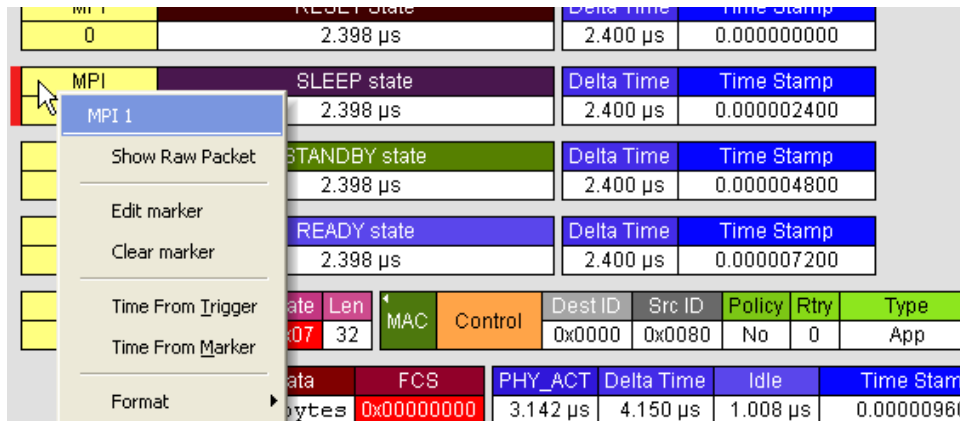
MPI	State	Delta Time	Time Stamp
1	SLEEP state	2.400 $\mu$ s	0.000002400

Figure 5.14 A Marked Frame

## 5.14 Edit or Clear Marker

To clear or edit comments associated with a Frame marker,

**Step 1** Click on **Frame #** for the chosen packet.



**Figure 5.15** Editing a Frame Marker

**Step 2** A pop-up menu appears (Figure 5.15). To edit the marker comment, select **Edit Marker**.

The **Edit Marker for Frame #** comment window appears (Figure 5.13).

**Step 3** Edit the comment as desired.

**Step 4** Click **OK**.

**Step 5** To clear a marker, click **Clear marker** in the frame pop-up menu (Figure 5.15). The vertical red Marker bar disappears.

## 5.15 Timing Calculations on Markers

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

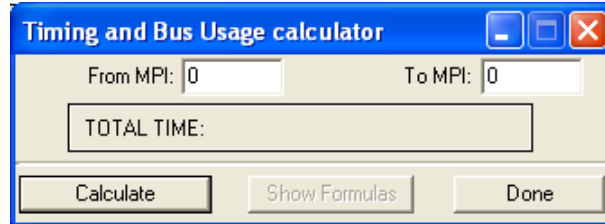
**Step 1** Click on the frame # that you want to use as the first point of reference in the time calculation (from MPI).

**Step 2** In the pop-up that appears, select **Time from Marker** (Figure 5.15). The following appear:

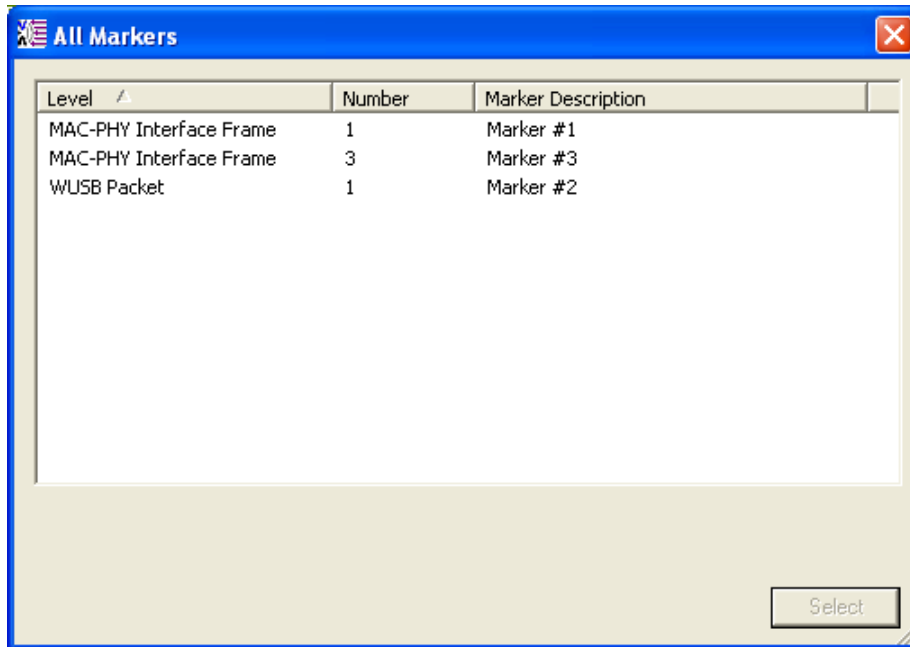
Timing Calculator dialog box (Figure 5.16)

All Markers window (Figure 5.17).

- Step 1** In the All Markers window, select the marker that you want to use as the second point of reference in the time calculation (To MPI).
- Step 2** The time between the two markers appears in the Timing Calculator dialog box.



**Figure 5.16 Timing Calculator Dialog Box**



**Figure 5.17 All Markers Window**

## 6. Display Options

This chapter describes how to use the Display Options window.

### 6.1 Display Options Overview

You can use the Display Options window to specify how the *UWBTracer* software displays trace information. The window has two tabs, the General tab, and the Color, Formatting, and Hiding tab. Each tab brings up a separate page of the window:

**General:** To set general characteristics of a trace view, including zoom level, whether or not tool tips are displayed, and use of timestamps.

**Color, Formatting, and Hiding:** To customize the colors and formats associated with each field in the trace view or to hide fields within a trace.

To go to the Display Options window:

**Step 1** From the Setup menu, select **Display Options**.

**Step 2** The Display Options window appears (Figure 6.1).

**Note:** When the Display Options window appears, the General page is on top (it is the default page).

Fill out the various areas of the window as described in following sections.

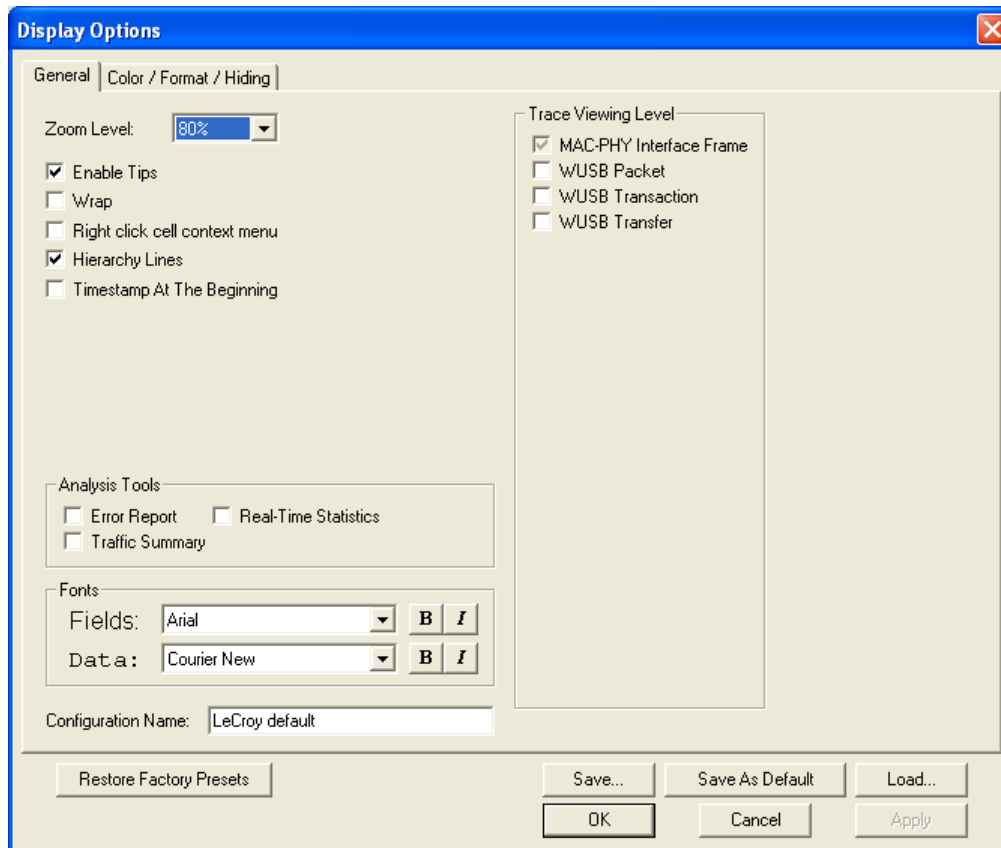


Figure 6.1 Display Options Window: General Page

## 6.2 Display Options: General

You set general options on the General page. The page is divided into a general setting area on the left (for zoom level, enable tips, etc.) and a Trace Viewing Level area on the right. The options available in these areas are:

**Zoom Level:** Adjustable in discrete increments from 10% to 200% percent.

**Enable Tips:** Select to enable Tool Tips with explanation text to pop up when you position your cursor over various fields in the Trace View.

**Wrap:** Causes packets to wrap within the window if their length exceeds the width of the window.

**Right click cell context menu:** Activates the right mouse button for opening cell context menus.

**Hierarchy Lines:** Adds faint lines (to the left side of the trace that show the hierarchical relationship of the frames, transactions, etc. within the trace (Figure 6.2). When this option is enabled, the lines display any time you cascade higher level decodes.

0	Setup+IN	0x0080	10	0	0x00000003	2
WUSB Packet	MMC	Dir	Host Id	Chan TS	IE Id	CTA
0	-->	0x0080	0:022	WCTA	DT	
WUSB Packet	IN	Dir	Host Id	DATA	Addr	Endp
1	<--	0x0080	0	10	0	3
MPI	RX	PHY	Rate	Len	MAC	Data
5		0x07	5			Dest
WUSB Packet	IN	Dir	Host Id	DATA	Addr	Endp
2	<--	0x0080	0	10	0	3

Figure 6.2 Trace Hierarchy Lines

**Timestamp At The Beginning:** Moves the timestamp from the end of the frame to near the beginning.

**Analysis Tools:** Opens the error report, traffic summary, or real-time statistics displays (you can also open the displays via tool bar buttons).

**Fonts:** Controls the appearance of fonts in the trace display.

**Configuration Name:** Comment field associated with the \*.opt file containing the current display options values. You can also create and store your unique display options for future use.

To create a new Display Options file:

- Step 1 Enter a comment for the new file in the **Display Configuration Name** field.
- Step 2 Click **Save...**
- Step 3 Specify a filename (\*.opt).
- Step 4 Click **Save**.

**Trace Viewing Level:** Allows you to select the hierarchical level at which traffic is displayed.

## 6.3 Display Options: Color, Formatting, and Hiding

Use the Color, Formatting, Hiding page to customize the colors and formats associated with each field in the trace view or to hide fields within a trace (Figure 6.3).

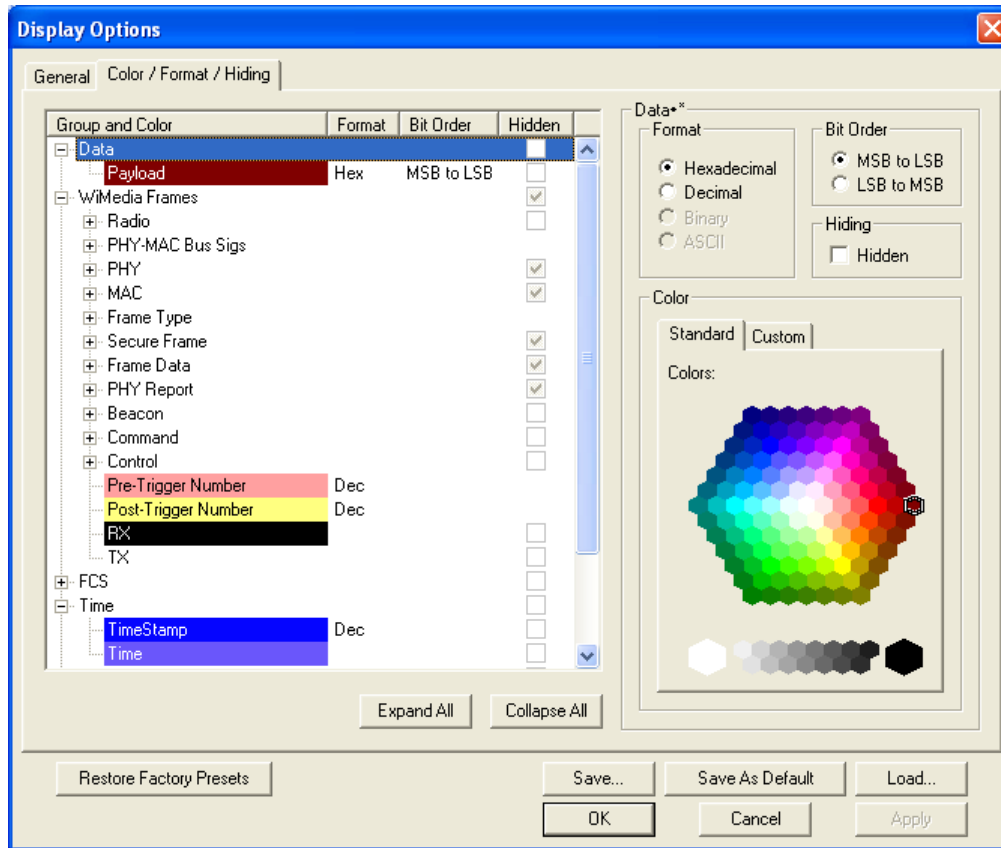


Figure 6.3 Display Options Window: Color, Formatting, and Hiding Page

### Setting Colors

Use the Group and Color pane to customize the colors associated with each field in the trace. You can experiment to achieve the color combination best suited to a particular graphic system.

To change the colors of elements in the trace, select an item in the Group and Color pane and use the color pallet area to make the desired changes. The color pallet area is located to the right of the Group and Color pane.

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

### Changing Field Formats

To change field formats, select an item in the Group and Color pane. This action enables the Formats radio buttons on the right. The format types change with respect to the item selected under the Group and Color pane.



For example, select Display Units in the Group and Color pane as shown in Figure 6.4. The Formats radio buttons appear as shown in Figure 6.5.

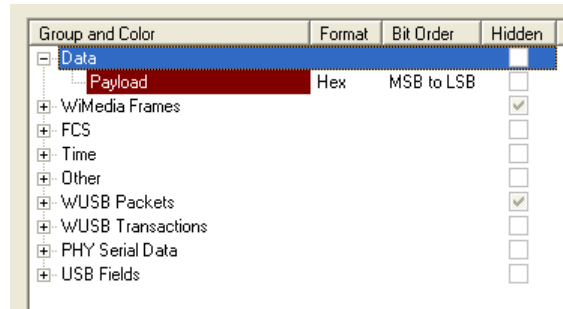


Figure 6.4 Group and Color Pane: Display Units Selected

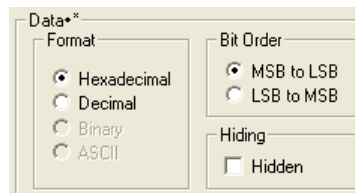


Figure 6.5 Formats for Display Units

### Hiding Fields

To hide one or more fields in the trace, select the appropriate item from the Group and Color pane, click the **Hidden** checkbox (Figure 6.6), and click the **Save** button.

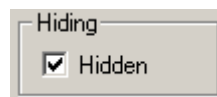


Figure 6.6 Hidden Check Box

## 6.4 Saving Display Options

To complete your display options settings, use the features at the bottom of the Display Options window. These features remain the same no matter which of the four Display Options windows you are working in.

- Click **Save** to save the currently specified display options for use in future sessions. Any file name can be specified, but you must use the .opt extension. If no extension is specified, .opt is added by default.

- Click **Load** to load a previously saved \*.opt file, thus restoring a previous set of display options.
- The Save as Default function is equivalent to the Save function, specifying the file name default.opt. Whenever you start up the Analyzer, it automatically loads the default.opt file if one exists.
- Click **OK** to apply any changes you have made to display options and close this dialog box.
- Click **Cancel** to cancel any immediate changes you have made and exit the Display Options menu.
- Click **Apply** to apply your changes while keeping the Display Options window open.

## 7. Recording Options

This chapter describes how to use the Recording Options window.

### 7.1 Recording Options Overview

You can use the Recording Options window to set recording features. The window has two tabs: the General tab and Misc. (miscellaneous) tab. Each tab brings up a separate page of the window. The pages are:

**General:** To set general recording characteristics, including buffer size, recording type, and Trace filename and path.

**Misc:** To set other recording characteristics.

To go to the Recording Options window:

**Step 1** From the Setup menu, select **Recording Options**.

**Step 2** The Recording Options window appears (Figure 7.1).

Fill out the various areas of the window as described in following sections.

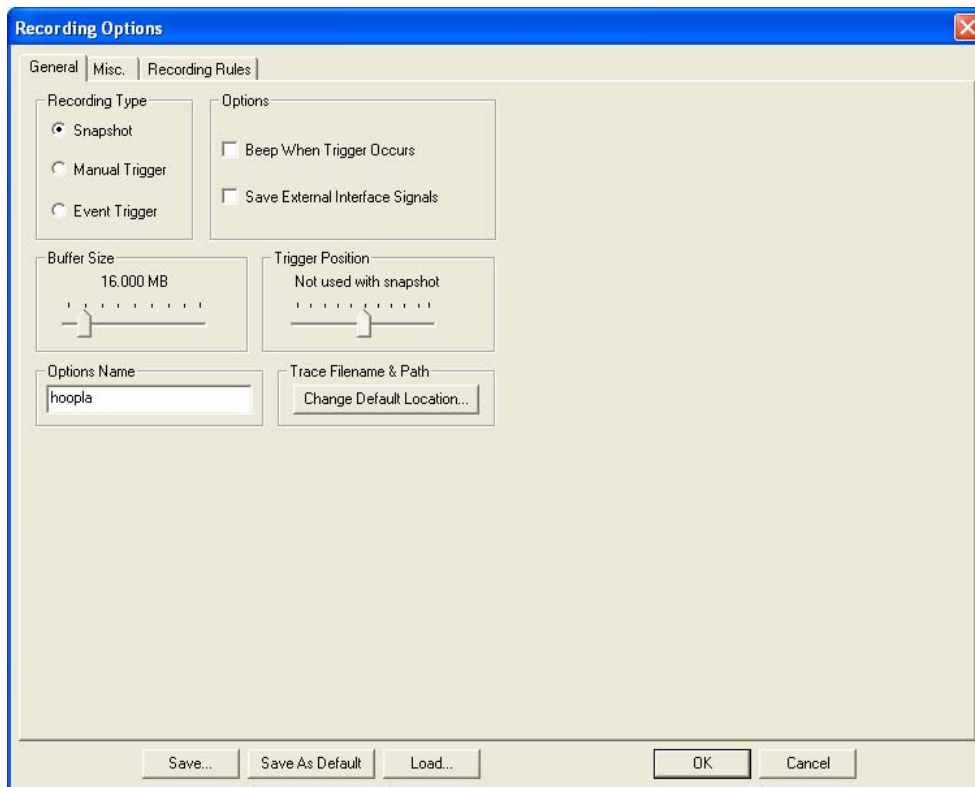


Figure 7.1 Recording Options Window: General Page

**Note:** The settings you configure in the Recording Options window apply to all recordings made by the analyzer.



## 7.2 Recording Options: General

You set general options on the General page. The page has areas (boxes) for Recording Type, Options, Options Name, and Trace Filename and Path.



### Recording Type


The Recording Type box presents three options that control how UWBTracer begins and ends a recording. The options are Snapshot, Manual Trigger, and Event Trigger:

**Snapshot:** A Fixed-length recording. A Snapshot is a recording whose size is set via the Buffer Size box. Recording begins when the Start

Recording button  is clicked and ends when either the selected buffer size is filled or the Stop Recording button  is pressed.

**Manual Trigger:** A recording whose ending is triggered by pressing the Trigger button on the front panel.

Recording begins when the Record button  is pressed on the Tool bar. Recording continues in a circular manner within the limits set by the buffer size. Recording ends following depression of the Trigger button on the front panel. Once the Trigger button has been pressed, recording continues until the post-trigger buffer has been filled or the Stop button  is clicked on the Tool bar.

**Event Trigger:** A recording whose ending is triggered by user-defined events. Recording begins when the Record button  is clicked on the Tool bar. Recording continues in a circular manner within the limits set by the buffer size until a trigger event is detected and the defined amount of data has been recorded after the Trigger event.

**Note:** Please see the Readme file on the software installation CD for the most current information on triggering support.

### Options

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

**Beep When Trigger Occurs:** When this checkbox is selected, the computer connected to the UWBTracer beeps three times when a Trigger condition is first detected.

**Save External Interface Signals:** Records signals from data pins on breakout board.

### Buffer Size

In a recording, the entire trace is recorded and stored in the analyzer buffer before it is uploaded to the host PC. Recordings are thus limited in size to the size of the analyzer buffer.

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

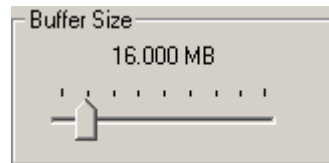


Figure 7.2 Recording Options Window: Buffer Size Slider

### Trigger Position

The Trigger Position slide bar sets the amount of pre- and post-trigger recording (Figure 7.3). You also can use it to adjust the location of the trigger within the defined buffer. You can adjust the triggering position between 1 and 99% post-Trigger. Trigger Position is available only when you select **Manual Trigger** or **Event Trigger** as recording type.

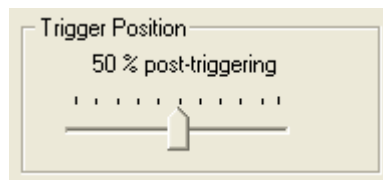


Figure 7.3 Recording Options Window: Trigger Position Slider

As an example, if the buffer size is set to 16MB, then for the following Trigger Position settings, the amount of pre- and post-Trigger data is

- 95% post-triggering: 0.8MB pre-trigger, 15.2MB post-trigger
- 75% post-triggering: 4MB pre-trigger, 12MB post-trigger
- 50% post-triggering: 8MB pre-trigger, 8MB post-trigger
- 25% post-triggering: 12MB pre-trigger, 4MB post-trigger
- 5% post-triggering: 15.2MB pre-trigger, 0.8MB post-trigger

**Note:** When a Trigger occurs, recording continues until the post-Trigger amount of the buffer is filled.

### Options Name

You can save the recording options to an options file. The file is stored in the same directory as the application. To save as an options file, press the **Save** button. A dialog box comes up that lets you name the file (a `.rec` extension is appended automatically).

When you launch the *UWBTracer* application, by default it loads the recording options file named `default.rec`. To save your options as the default file, press the **Save as Default** button.

### Trace Filename and Path

This allows you to set the name of the trace file and the location where the file is stored.

## 7.3 Recording Options: Miscellaneous

You set miscellaneous recording options on the Misc. page (Figure 7.4). Currently that page has checkboxes for two options.

### Debug

Select the checkbox to generate an additional binary file at the end of recording. The file is stored in the root (c:\) directory. The file name is `BusEngineRawTracexxxx.dot`, where `xxxx` is the serial number of the analyzer. The file is useful if you want to report a problem to LeCroy Technical Support and are asked to provide additional information.

### Advanced

Click the Advanced button to go to the advanced settings window. This window holds recording settings that should not be modified in most cases.

**Note:** Currently, this window only contains one setting, the sample timing for capturing data.

**Capturing:** By default, trigger is set to occur on the negative edge of the PCLK clock pulse. If the recording data is corrupted, you might want to uncheck this box, which sets trigger to occur on the positive edge of the PCLK clock pulse instead.

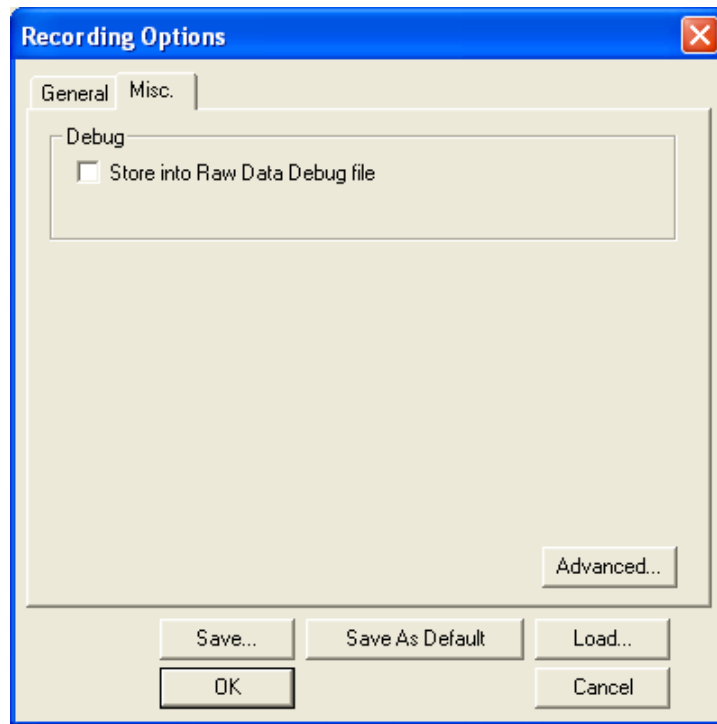


Figure 7.4 Recording Options Window: Miscellaneous Page

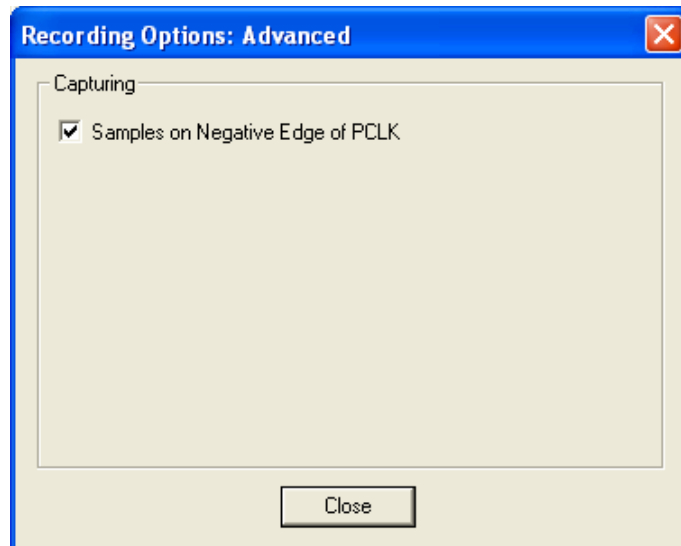


Figure 7.5 Recording Options Window: Advanced

## 7.4 Recording Options: Recording Rules

Use the Recording Rules page to set triggers and filters. The page has the following areas (Figure 7.6):

**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.

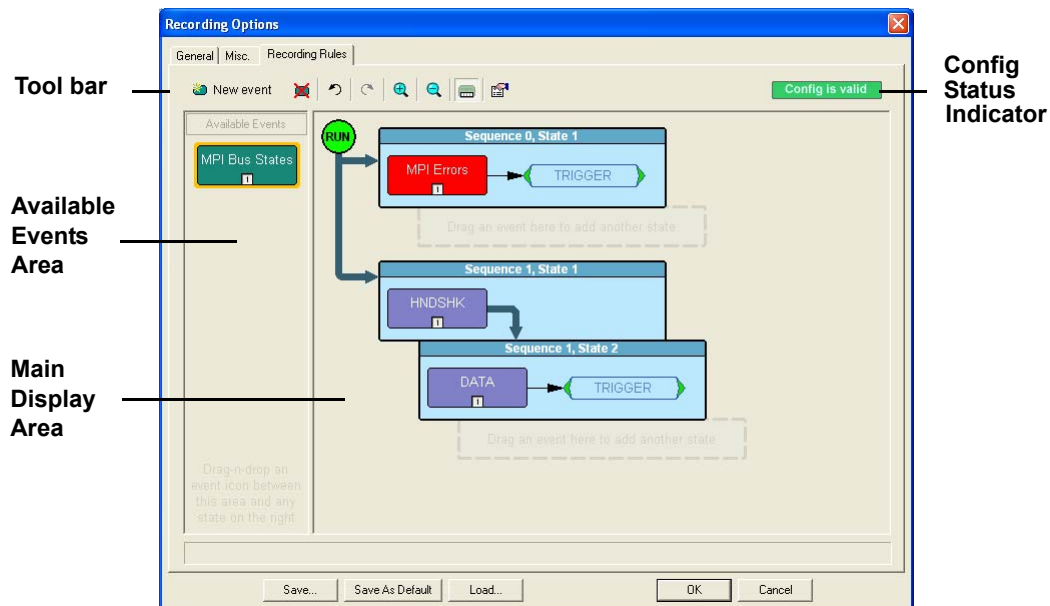


Figure 7.6 Recording Options Window: Recording Rules Page










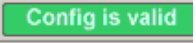


## Recording Rules Toolbar

The Recording Rules toolbar has buttons that let you control the Recording Rules page (Figure 7.7 and Table 7.1).



Figure 7.7 Recording Rules Toolbar

Table 7.1 Recording Rules Toolbar Buttons

 New event	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 <sup>1</sup> . There are five zoom levels. The default level is the middle one.		This display appears when the current Recording Rules configuration can not be executed by the hardware.

1. If you have wheel mouse, you can also zoom by holding down the CTRL key and then operating 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:

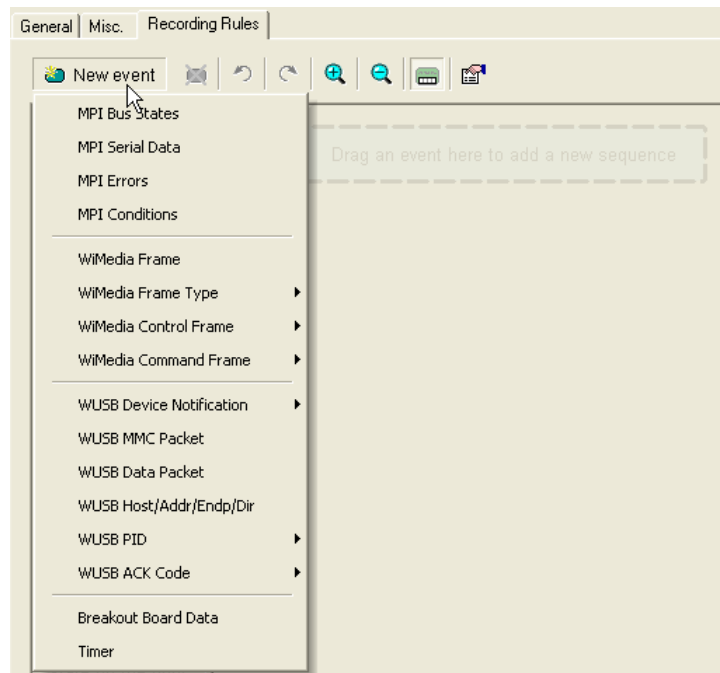
- Step 1** Creating Event buttons in the Available Events area.
- Step 2** Drag-and-drop of Event buttons to the appropriate areas (cells) in the Main Display area.
- Step 3** Assigning an action or actions to each Event button.

### *Creating Event Buttons*

To create a rule, you start by creating 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.

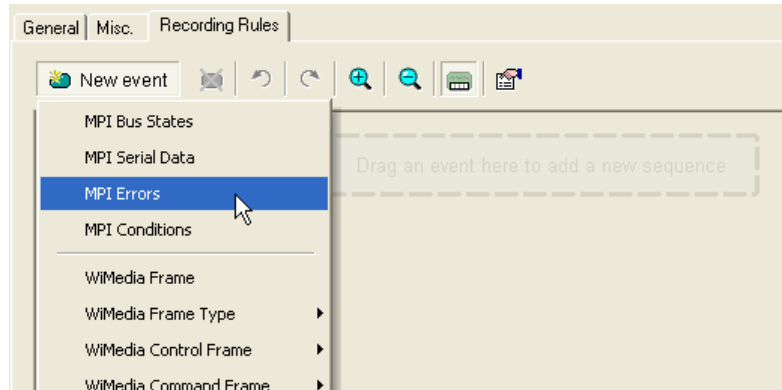
The following steps summarize the process:

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



**Figure 7.8** Creating a New Event

- Step 2** Select the event from the pop-up menu (Figure 7.9). The event appears in the Available Events area (Figure 7.10).



**Figure 7.9** Selecting Event Type



**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."

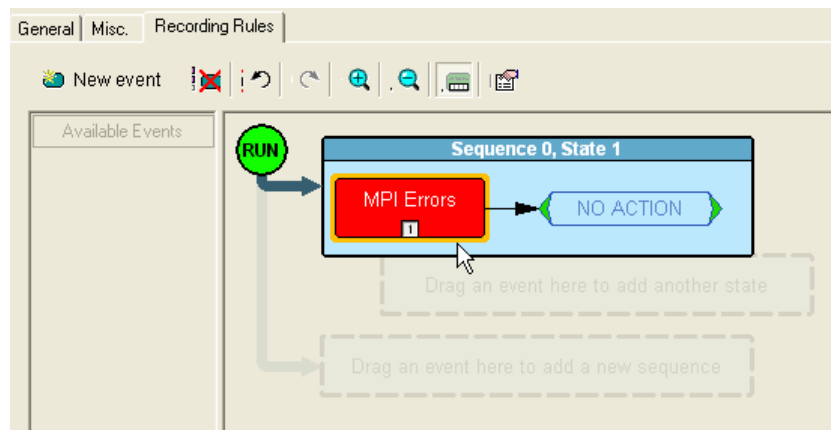
If there currently are no events in the Main Display area, a single sequence cell appears at the top of the area (Figure 7.10).

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



**Figure 7.11 Drag-and-Drop Event Button to Cell**



**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.

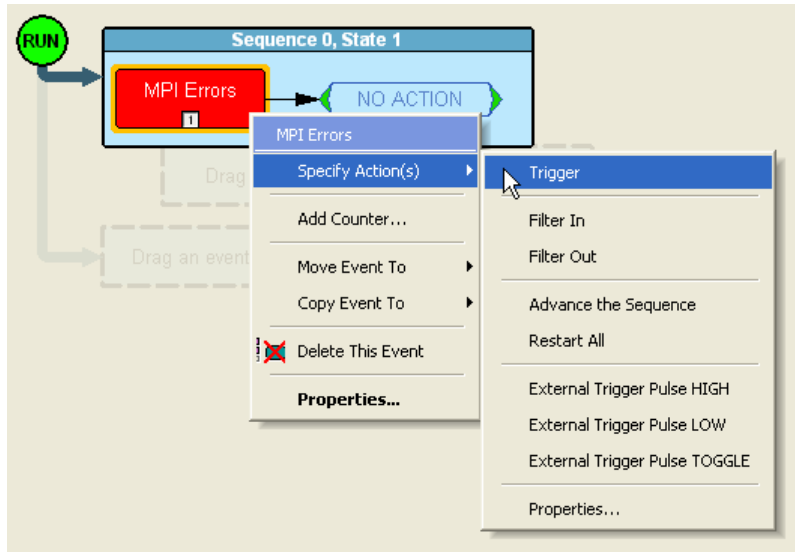
### *Assigning an Action*

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

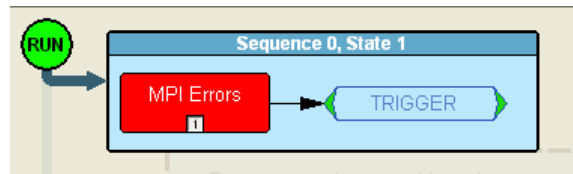
**Note** If you do not assign an action to an Event button, the analyzer ignores the event.

To assign an action to an Event button:

- Step 1** Right-click on the Event button. A pop-up menu appears (Figure 7.13).
- 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 7.13 Selecting Action From Event Button Pop-Up**



**Figure 7.14 Action Assigned to Event**

**Note** You can also set actions within the Properties dialog for each event. Double-click on 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, actions.

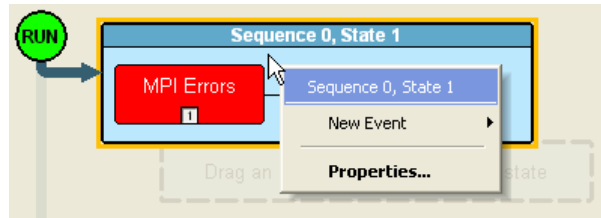
#### *Cell Pop-up Menu*

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

The Cell pop-up menu has the following options.

**New Event:** Brings up the same menu that you get when you click the New Event button on the toolbar.

**Properties:** Brings up the Properties dialog for the selected cell.



**Figure 7.15** Sequence Pop-Up Menu

### Action Pop-up Menu

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

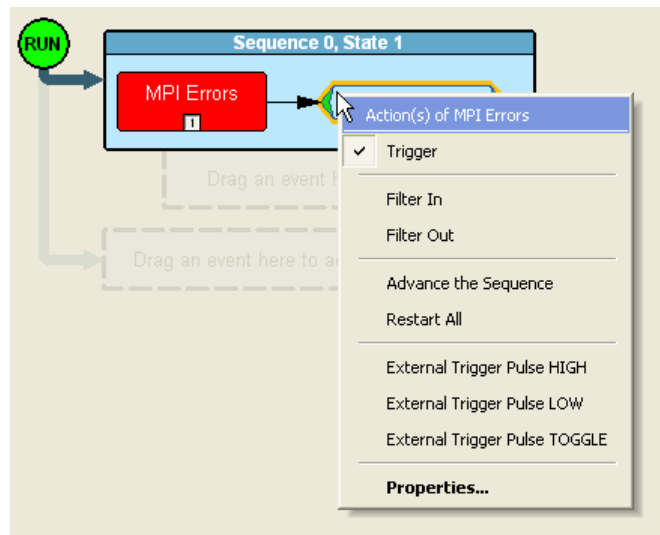
The Action pop-up menu has the following options.

**Trigger:** Sets or clears Trigger action.

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

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

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



**Figure 7.16 Action Pop-Up Menu**

**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.

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.

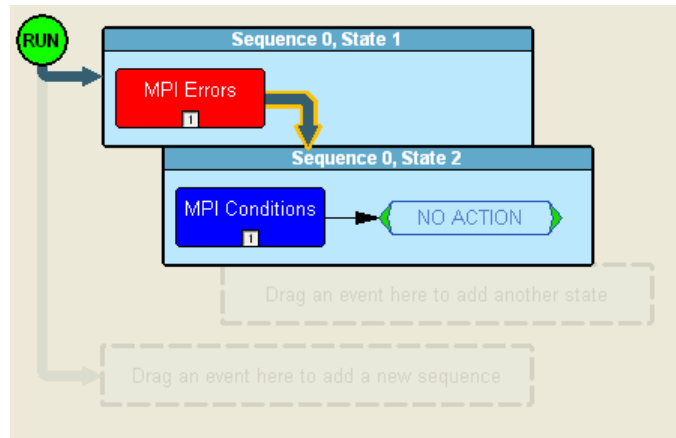


Figure 7.17 Advance the Sequence

**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. When you select this option, an arrow and Restart All button will appear. 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.

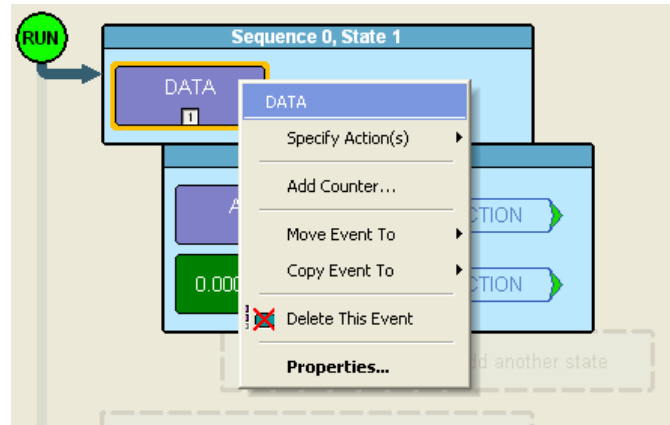
**External Trigger Pulse TOGGLE:** This format causes the analyzer to transmit a signal that will toggle with each trigger event between a continuous 5 volt signal and a continuous 0 volt signal.

**Properties:** Displays the Action Properties dialog for the selected action.



### Event Pop-up Menu

If you click on 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.
MPI Serial Data	Occurrence of serial data passed between MAC and PHY.
MPI Errors	Occurrence of RX frame errors, aborted frames, FCS, errors, or length mismatch.
MPI Conditions	Occurrence of empty frames.
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.

**Table 7.3 UWBTracer 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 the Sequence	Restart 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.

### 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 can not 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).
- 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 on the button. From the Action pop-up menu, select Trigger (Figure 7.20).

Figure 7.21 shows the completed event-action sequence.

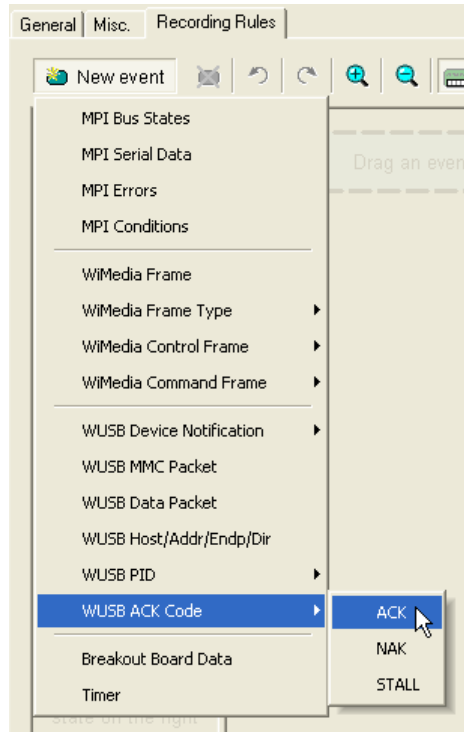


Figure 7.19 Example 1: Creating the Event

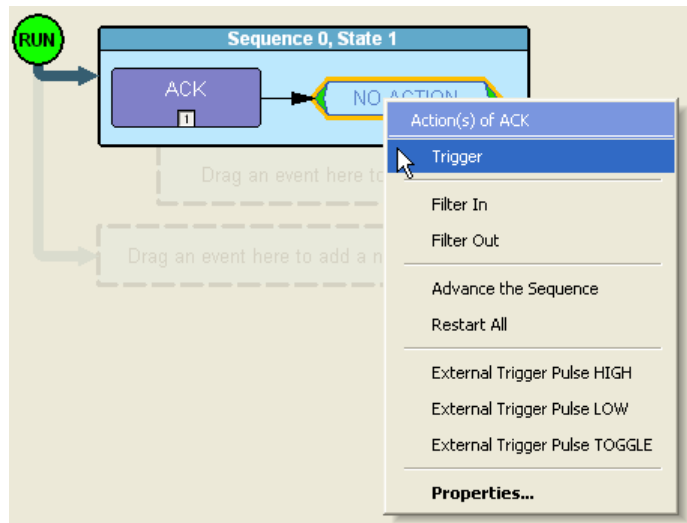
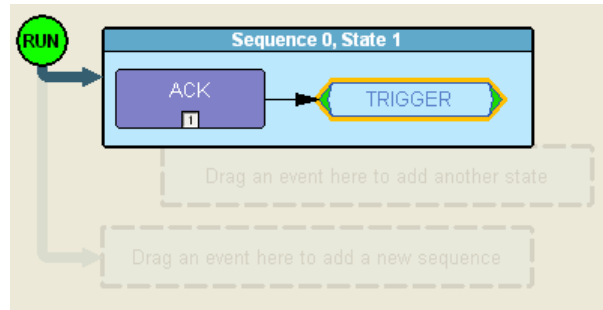


Figure 7.20 Example 1: Assigning the Action



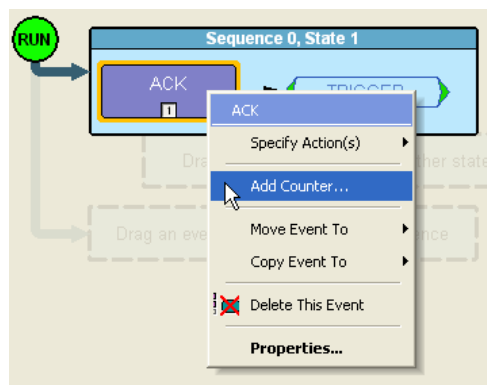
**Figure 7.21 Example 1: Complete Rule**

*Example 2: Creating an Event Counter*

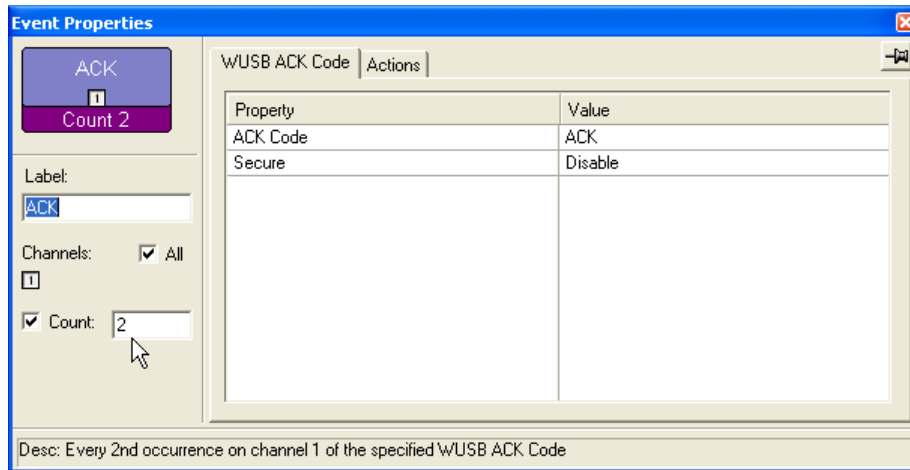
In addition to setting triggers and filters, you can set counters. A counter is an action that lets you set a trigger based on a count of events. To continue the previous example, for instance, you can create a rule that triggers on the tenth occurrence of a WUSB ACK.

- Step 1** From example 2, the ACK is configured as the first event in the state (Figure 7.21).
- Step 1** Right click on the ACK event button in the cell. The Event pop-up menu appears.
- Step 2** From the Event pop-up menu, select the Add Counter option (Figure 7.22).

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

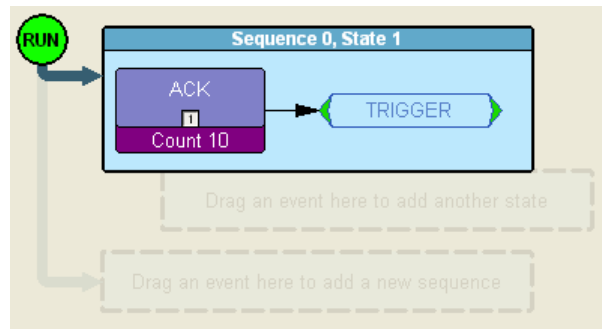


**Figure 7.22 Example 2: Adding a Counter**



**Figure 7.23 Example 2: Setting the Counter**

- Step 3** By default, the counter box is set to a value of 2. For this example, reset the box to 10.
- Step 4** 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 3, the ACK with counter is configured as the first event in the state (Figure 7.24).
- Step 1 Click the New Event button. From the drop-down menu, select WUSB ACK Code > NAK.
- Step 2 An 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).
- Step 3 Right-click on the NAK button. From the Action pop-up menu, select Trigger (Figure 7.26).

Figure 7.27 shows the completed event-action sequence.

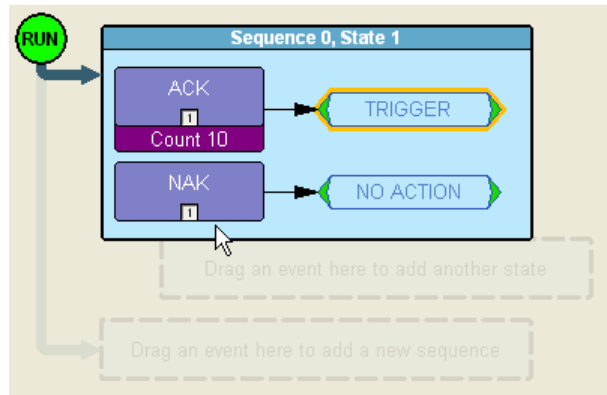


Figure 7.25 Example 3: Creating a Second Event

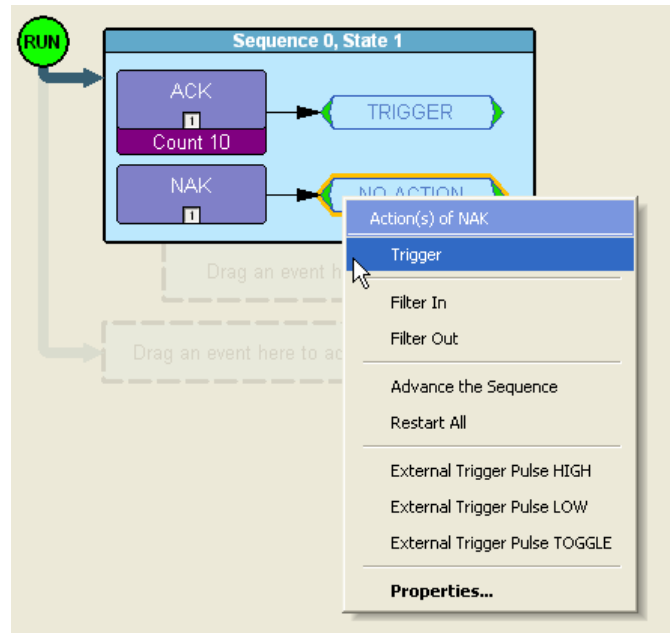


Figure 7.26 Example 3: Assigning the Action

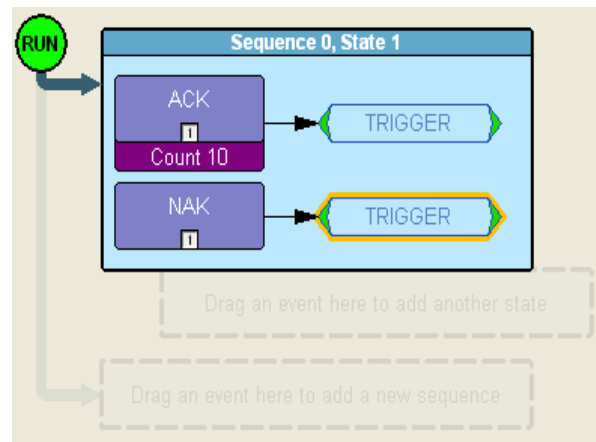


Figure 7.27 Example 3: Complete Rule

*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).

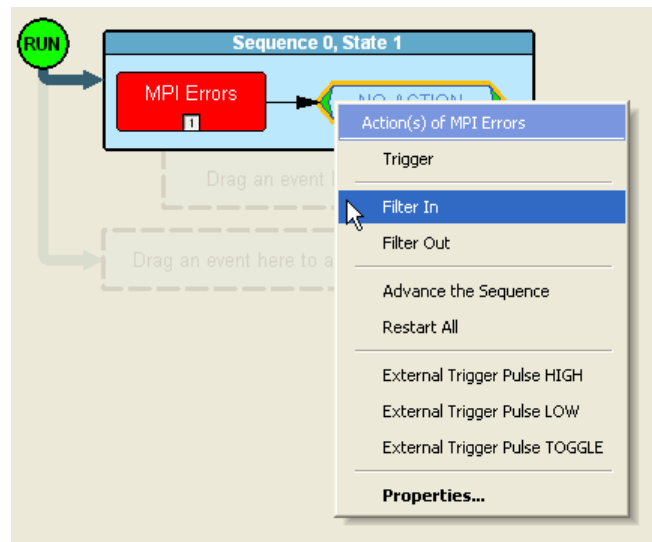


**Note:** Keep in mind that when you filter out events, they are not recorded in the trace file. It is not the case that the events are present in the file but hidden.

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 1** Drag-and-drop the MPI Error button into the first cell in the Main Display area.
- Step 2** Right click in the Action box to the right of the MPI Error button. The Action pop-up menu appears (Figure 7.28).
- Step 3** 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 7.28 Example 4: Assigning the Action**

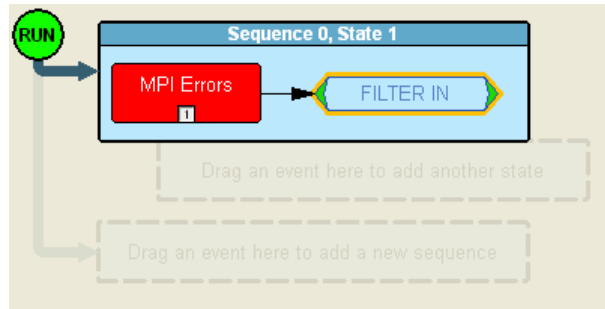


Figure 7.29 Example 4: Complete Rule

### Using a Multi-State Sequence

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 1** Drag-and-drop the Data button into the first cell in the Main Display area.
- Step 2** Right click in the Action box to the right of the Data button. The Action pop-up menu appears (Figure 7.30).
- Step 3** From the Action pop-up, select Advance the Sequence.
- Step 4** An arrow appears next to the Data button (Figure 7.31). The arrow points to the cell for the second state in this sequence.
- Step 1** 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).
- Step 1** Drag-and-drop the Timer button into the second cell in the Main Display area (Figure 7.33).

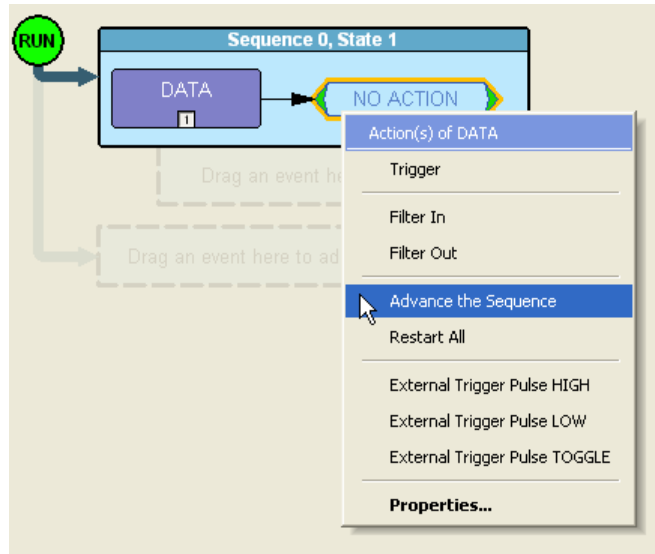


Figure 7.30 Example 5: Advancing the Sequence

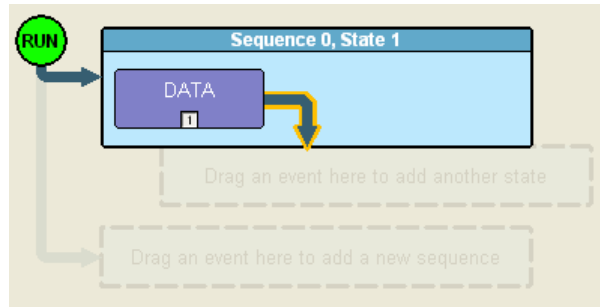


Figure 7.31 Example 5: First State Complete

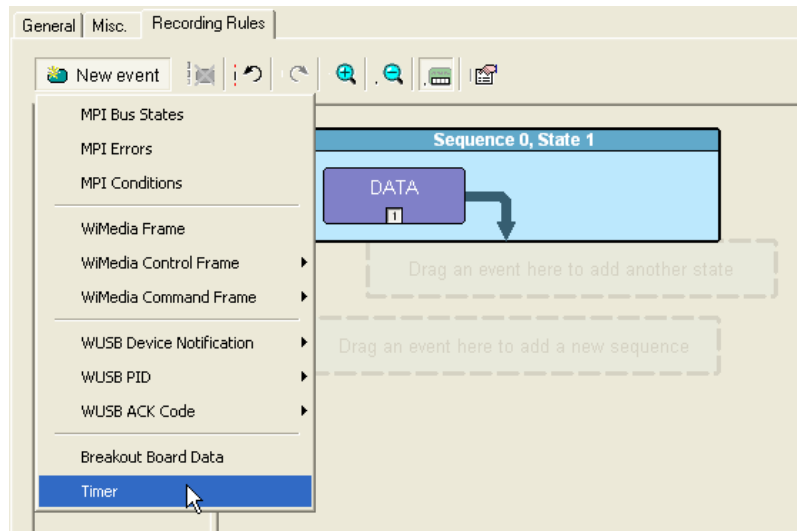


Figure 7.32 Example 5: Creating an Event, Second State

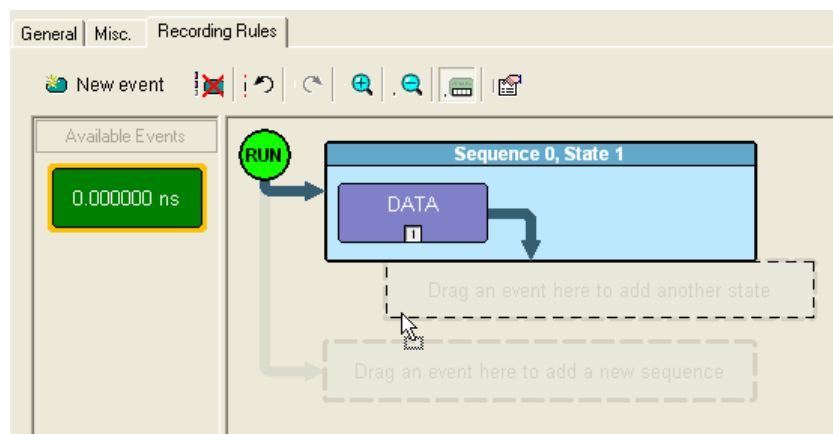


Figure 7.33 Example 5: Dragging to the Second State Cell

- Step 2** Right click on the Timer event to open its properties dialog Box (Figure 7.34).
- Step 3** In the properties dialog box for the timer, set the timer to 100 microseconds (Figure 7.35).

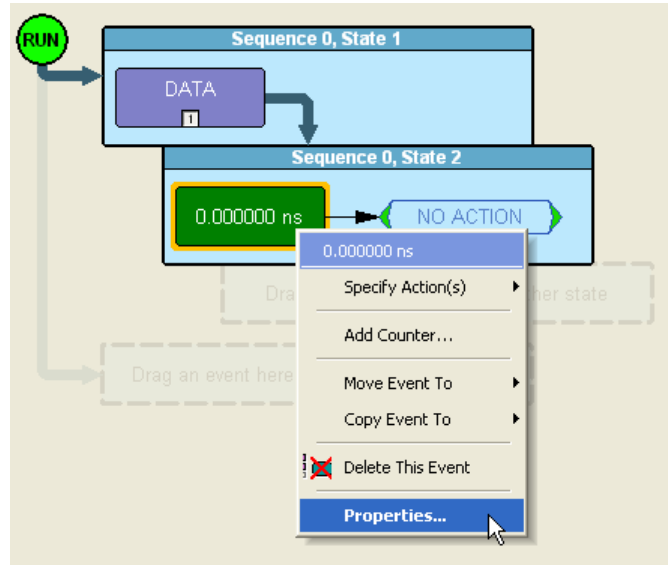


Figure 7.34 Example 5: Bringing Up the Timer Dialog Box

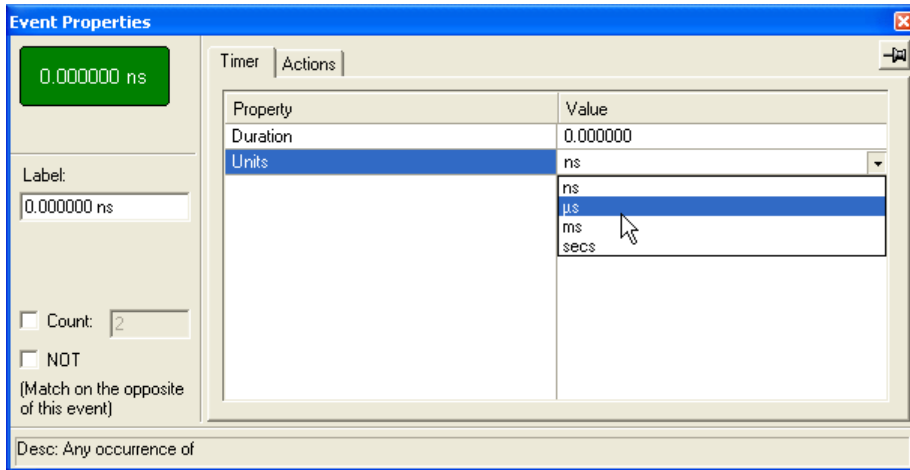
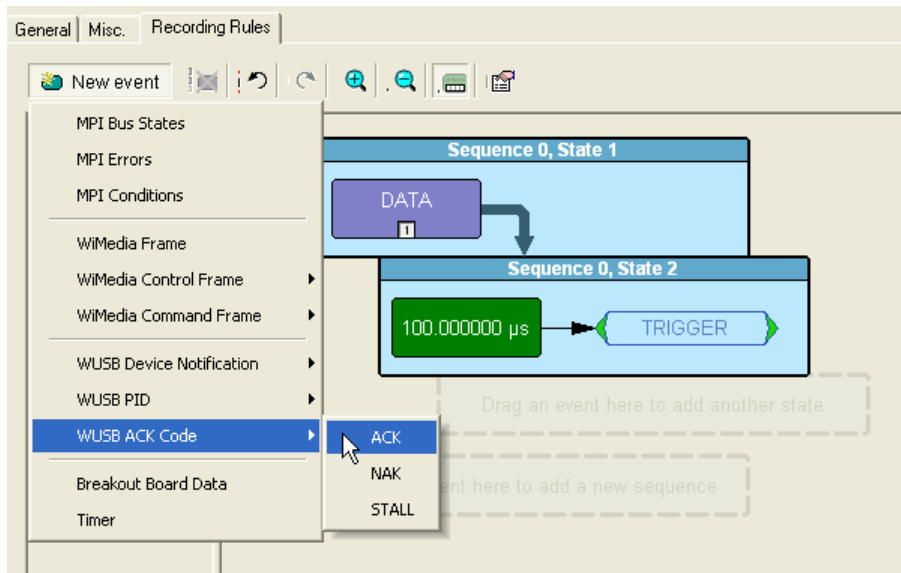
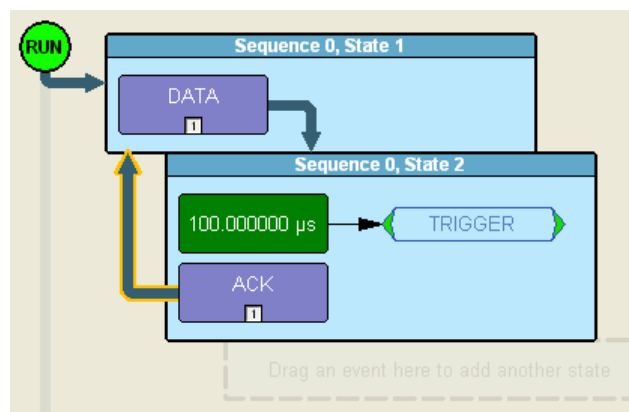


Figure 7.35 Example 5: Setting the Timer

- Step 1** Click on 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).
- Step 1** Drag-and-drop the ACK button into the second cell in the Main Display area.
- Step 2** 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 7.36 Example 5: Creating Another Event, Second State**



**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 the 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.

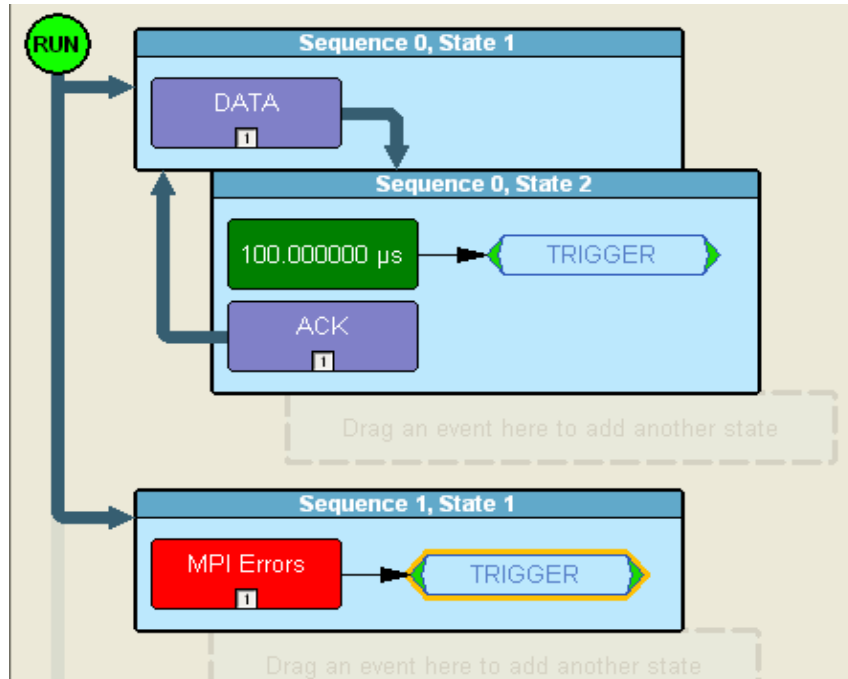


Figure 7.38 Example 6: Two Independent Sequences





## 8. Reading Traces

This chapter describes how to read and manipulate trace displays.

### 8.1 Trace Display Overview

UWBTracer trace viewing software makes extensive use of color and graphics to fully document the captured (decoded) traffic (Figure 8.1).

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.

WUSB Packet 1	IN	Dir	Host Id	DATA	Addr	Endp	Data	PHY_ACT	Idle	Time Stamp		
	<--		0x0080	0	10	0	3 bytes	2.473 µs	1.002 µs	0.000013750		
WUSB Packet 2	IN	Dir	Host Id	DATA	Addr	Endp	Data	PHY_ACT	Idle	Time Stamp		
	<--		0x0080	0	10	0	3 bytes	2.473 µs	1.002 µs	0.000017225		
WUSB Packet 3	MMC	Dir	Host Id	Chan TS	IE Id	CTA 0	Addr	Endp	EDir	Start	bvDINAck	PHY_ACT
	-->		0x0080	0:022	WCTA	DT	10	0	IN	Blank	0x00000003	2.947 µs

**Figure 8.1 Trace Display Example**

### 8.2 Trace Level Views

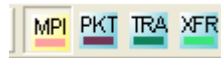
You can display traces in any of four views:

- MPI Frame-Level view (MPI).
- WUSB Packet-Level view (PKT).
- WUSB Transaction-Level view (TRA).
- WUSB Transfer-Level view (XFR).

MPI Frame-Level view is the default display.

#### Changing Trace Level Views

To switch between the Frame, Packet, Transaction, and Transfer views, click the respective buttons on the Tool bar (Figure 8.2).



**Figure 8.2 Trace View Buttons**

*Frame Level*

The MPI Frame-Level view is the default decode level. It displays traffic as shown in (Figure 8.3).

MPI	RESET State	Delta Time	Time Stamp
0	2.398 $\mu$ s	2.400 $\mu$ s	0.000000000
MPI	SLEEP state	Delta Time	Time Stamp
1	2.398 $\mu$ s	2.400 $\mu$ s	0.000002400
MPI	STANDBY state	Delta Time	Time Stamp
2	2.398 $\mu$ s	2.400 $\mu$ s	0.000004800
MPI	READY state	Delta Time	Time Stamp
3	2.398 $\mu$ s	2.400 $\mu$ s	0.000007200

**Figure 8.3 Trace View: MPI Frame Level**

*Packet Level*

Click the **PKT** button to show the WUSB Packet-Level view. The packet level is decoded and presented as shown in (Figure 8.5). To see packet-level transactions, you may need to scroll through the trace or use the **Find** command (under Search).

WUSB Packet	OUT	Dir	Host Id	IDATA	Addr	Endp	Data	PHY_ACT	Idle	Time Stamp
5	OUT	-->	0x0080	1	20	2	2 bytes	2.571 $\mu$ s	100.004 $\mu$ s	0.001027700
WUSB Packet	OUT	Dir	Host Id	IDATA	Addr	Endp	Data	PHY_ACT	Idle	Time Stamp
6	OUT	-->	0x0080	1	20	2	2 bytes	2.571 $\mu$ s	1.004 $\mu$ s	0.001130275
WUSB Packet	OUT	Dir	Host Id	IDATA	Addr	Endp	Data	PHY_ACT	Idle	Time Stamp
7	OUT	-->	0x0080	1	20	2	2 bytes	2.571 $\mu$ s	100.004 $\mu$ s	0.001133850

**Figure 8.4 Trace View: WUSB Packet Level**

*Transaction Level*

Click the **TRA** button to show the WUSB Transaction-Level view. The transaction level is decoded and presented as shown in (Figure 8.5). To see transaction-level transactions, you may need to scroll through the trace or use the **Find** command (under Search).

WUSB Xaction	Control	Host Id	Addr	Endp	bvAckCode	ACK'd Pkts	Xact Len	Seq #	Data Len	Seq #	Data Len
4	Setup+OUT	0x0080	10	0	0x0000000C	2	6	2	3	3	3
5	Setup+NoData	0x0080	30	0	0x00000000	0	0				
6	Status	0x0080	40	0	0x00000000	0	0				

**Figure 8.5 Trace View: WUSB Transaction Level**

*Transfer Level*

Click the **XFR** button to show the WUSB Transfer-Level view. The transfer level is decoded and presented as shown in (Figure 8.6). To see transfer-level transactions, you may need to scroll through the trace or use the **Find** command (under Search).

WUSB Xfer	Control Transfer	ACK'd Pkts	Xfer Len
2	Write	2	6
3	No Data	0	0

**Figure 8.6 Trace View: WUSB Transfer Level**



## 9. Searching Traces

This chapter describes how to search for trace events.

### 9.1 Trace Search Overview

UWBTracer 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 9.1).

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

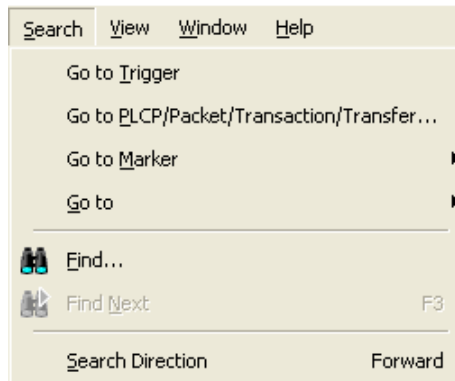


Figure 9.1 Search Menu

### 9.2 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.

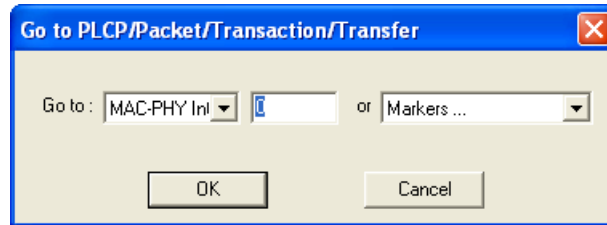
### 9.3 Go to PLCP/Packet/Transaction/Transfer...

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

**Step 1** From the Search menu, select

**Go to PLCP/Packet/Transaction/Transfer...**

The corresponding dialog box appears (Figure 9.2).



**Figure 9.2 Go To PLCP/Packet/Transaction/Transfer Dialog Box**

**Step 2** Use the dialog box drop-down lists and text box, identify the feature you want to find.

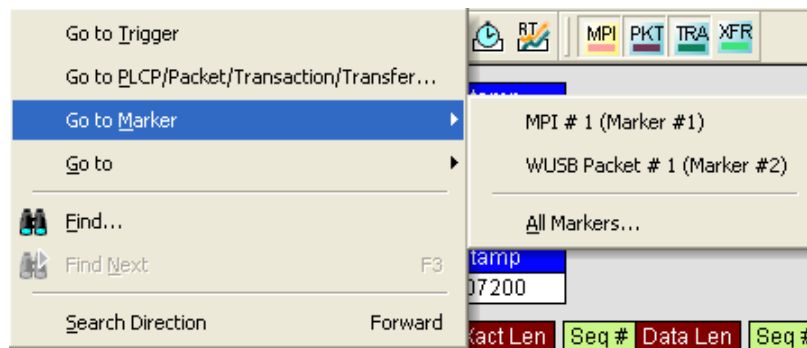
**Step 3** Click **OK**.

The trace view is repositioned with the selected item at the top of your screen.

## 9.4 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 9.3)**.



**Figure 9.3 Selecting Go to Marker**

**Step 2** Select the desired frame from the list displayed.

The Trace View is repositioned with the selected item at the top of your screen.

Selecting **Search > Go to Marker > All Markers** will cause a dialog box to open with a list of all markers in the trace. The dialog box offers options for editing, deleting, and copying markers.

**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.

## 9.5 Go to


The **Go to** feature takes you directly to an item in the trace. When you select Go to, a drop-down menu appears that allows you to select the item.

## 9.6 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.

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 9.4).

### Areas in Find Window

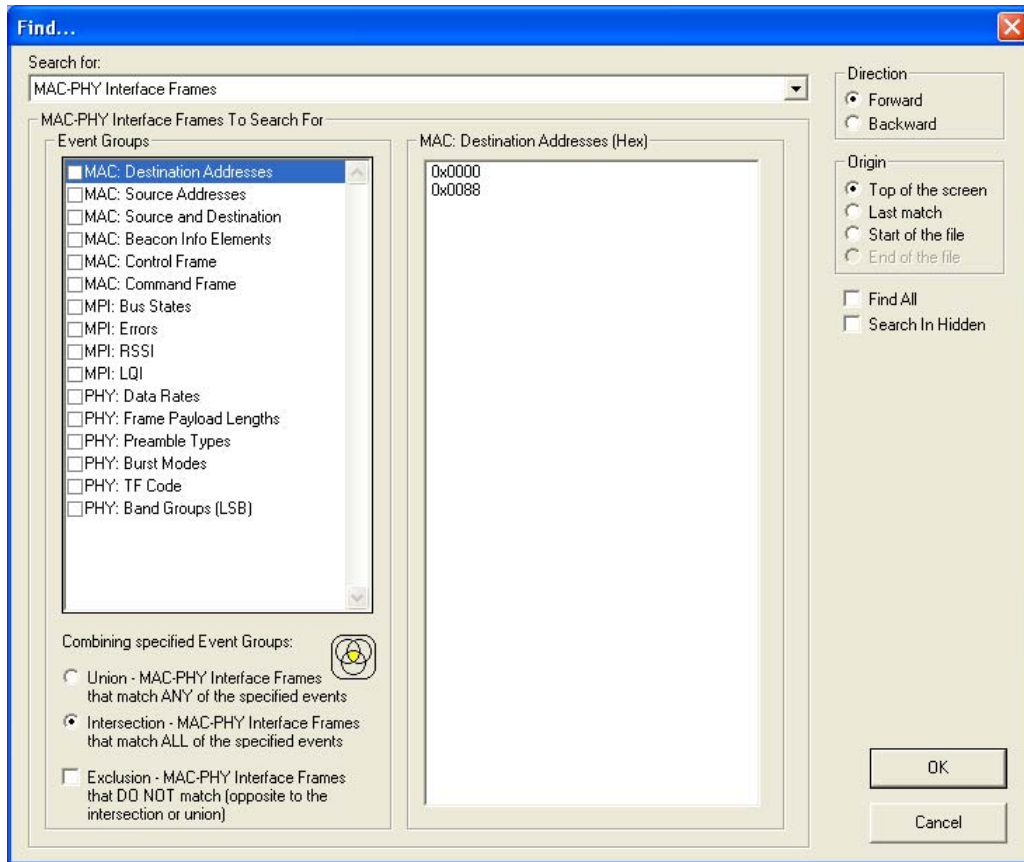
The **Find** window has three areas: Event Groups pane, a context area to the right of the Event Groups pane (whose contents vary depending on items in the pane), and a Direction/Origin area at the right in the window.

**Event Groups Pane:** Left area that allows you to specify the events to find in the search. You can select as many check boxes 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. The Find operation will search for frames that include any of the items selected in the Event Groups pane.

**Intersection:** The Find operation will search for only those frames that match all the items selected in the Event Groups pane.

**Exclusion:** NOT relationship. The Find operation will search for frames that do not match any of the items selected in the Event Groups pane.



**Figure 9.4 Find Events Window**

**Context area:** Provides further selection criteria for the Event Group active in the Event Groups pane. For example, in Figure 9.4, the MAC Destination Addresses Event Group is currently active (selected). The context area lets you select a range of MAC addresses. In Figure 9.5, the PHY Data Rates is the active Event group. A different display appears in the context area.



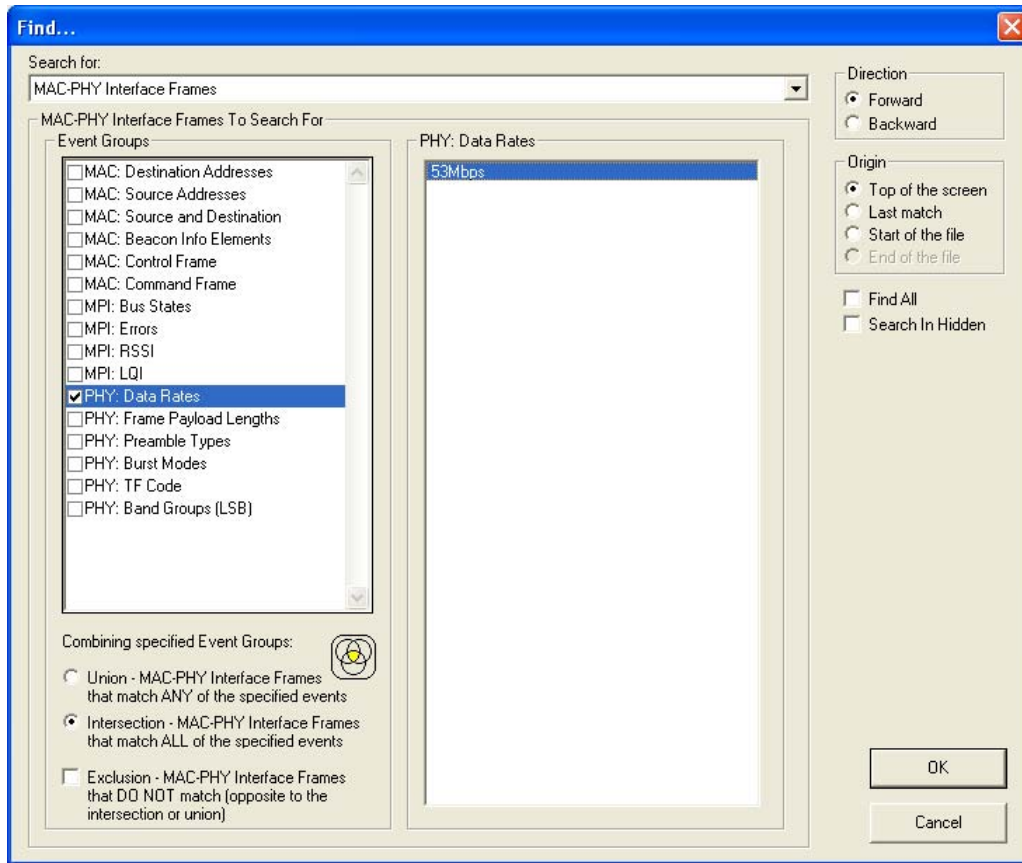


Figure 9.5 Find Events Window: MPI Bus States Active

### Direction/Origin

The radio buttons and check boxes 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 find every instance of the search criteria.

**Search in Hidden:** You can search in frame elements that are hidden in the display as well as frame elements that are visible.



# 10. Reports

This chapter describes how to use the Report menu.

## 10.1 Trace Reports Overview

You bring up the Report menu from the application Main menu. The Report menu provides several reports to assist you in analyzing traffic recorded by the analyzer. Those reports include:

**File Information:** To view general information about 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).

**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.

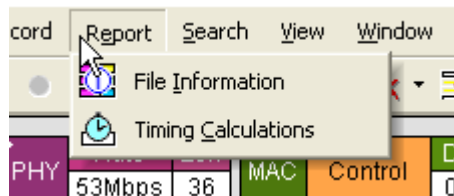
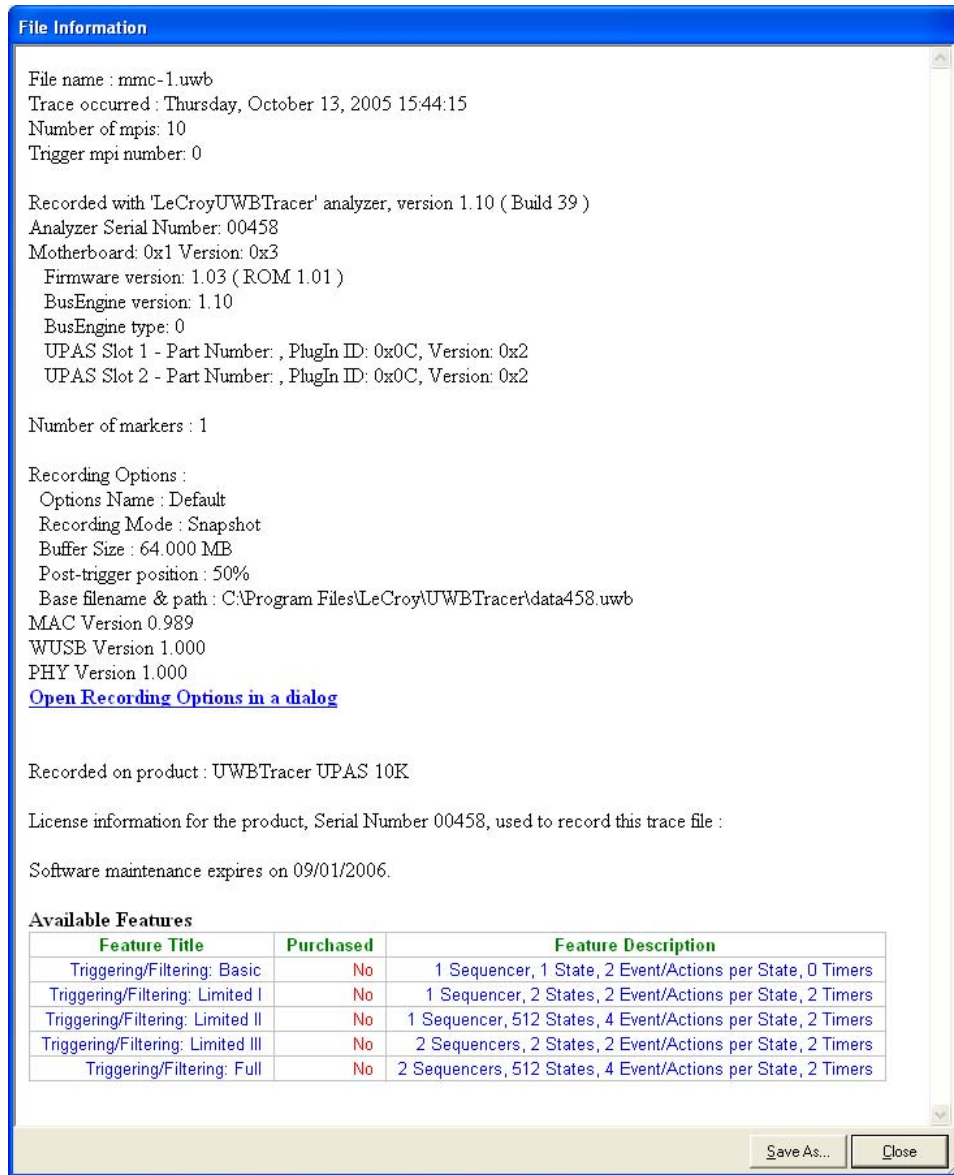


Figure 10.1 Report Menu

## 10.2 File Information

To view general information about the trace file, select **Report >File Information** from the Report menu. A File Information window appears, showing the information (Figure 10.2).

The File Information window provides general information about the recording, such as when it was made and the version of the analyzer firmware and BusEngine used.



**Figure 10.2 File Information Window**

The window also has a link to the Recording Options settings used to create the trace. The link is marked with the text **Open Recording Options in a dialog**. Clicking the link opens the Recording Options window and shows the settings used to create the trace.

## 10.3 Traffic Summary

To view a summary of protocol-related information in the trace file, select **Report > Traffic Summary** from the Report menu. A Traffic Summary window appears, showing the information (Figure 10.3).

The traffic summary window has two panes. The left pane is a tree view of the protocol items you can select for the summary. The right pane shows the summary itself, in most cases a count of occurrences of the selected item.

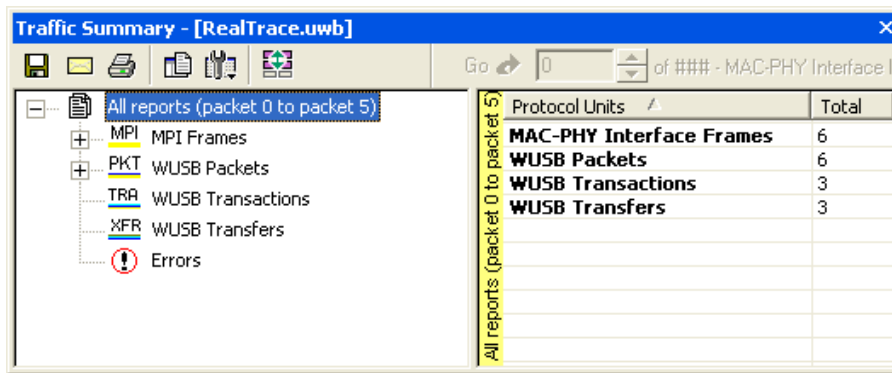


Figure 10.3 Traffic Summary Window

### Traffic Summary Buttons

The Traffic Summary toolbar provides a shortcut to commands that control the traffic summary (Figure 10.4).

You can learn the function of each tool bar button by passing the mouse cursor over the button. A tool tip appears above the button, describing its function.

Table 10.1 describes the Traffic Summary buttons.

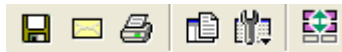








Figure 10.4 Traffic Summary Toolbar

**Table 10.1 Traffic Summary Buttons**

	Save. Saves the traffic summary to a file in HTML format.		Text. Displays the traffic summary in text format.
	Email. Sends the traffic summary in HTML format via an email.		Options. 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.

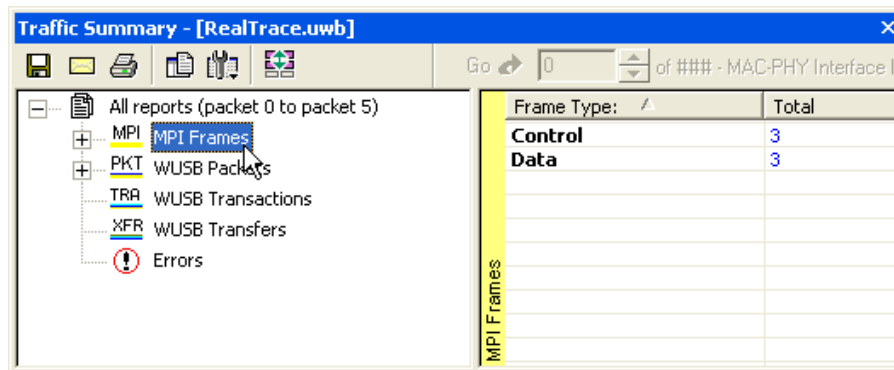
### Using the Traffic Summary

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 10.5). 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 10.5 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 10.6). To select more than one item, hold down the CTRL key as you select items in the left pane.

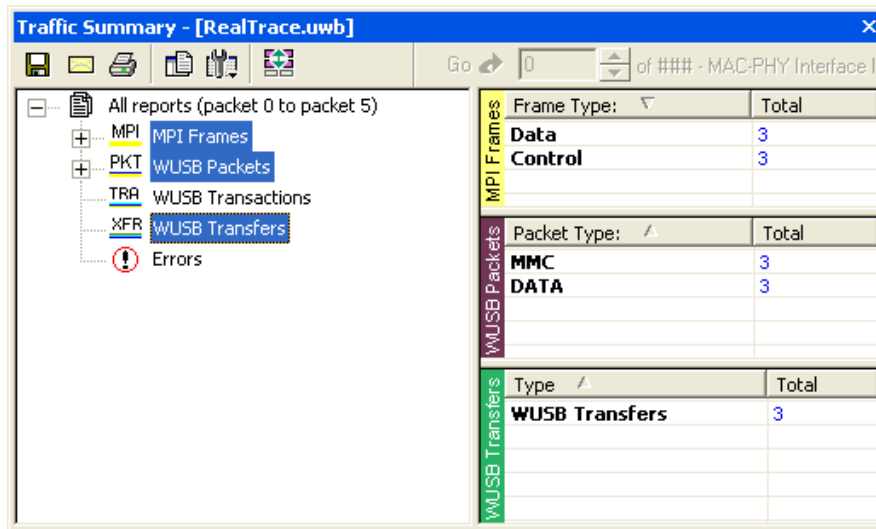


Figure 10.6 Selecting Multiple Items for the Traffic Summary

### 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 on the button, the Options drop-down menu appears (Figure 10.7).

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

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

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

**Event Navigation:** Brings up 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 10.8).

In the Event Navigation menu, the **Skip hidden items** option means you can not navigate to hidden items in the trace. **Show hidden items** means if you navigate to a hidden item, the item will appear in the trace (be shown for purposes of the navigation). **Prompt each time** means you can navigate to a hidden item, but UWBTracer will prompt you to indicate whether or not you want the item to appear in the trace.

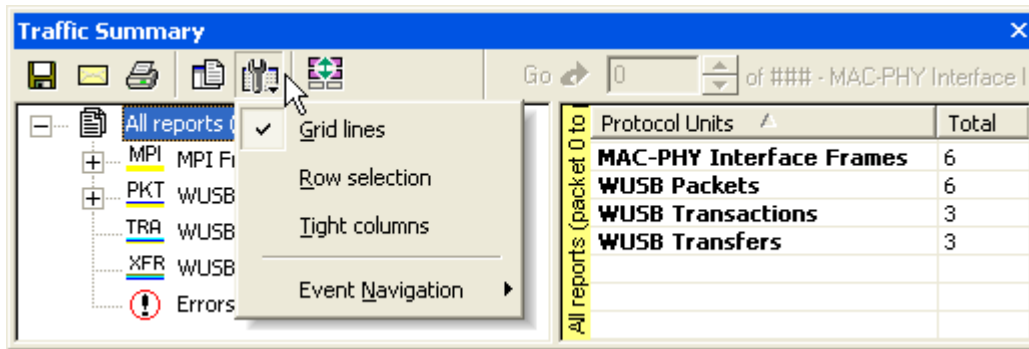


Figure 10.7 Traffic Summary Options Menu

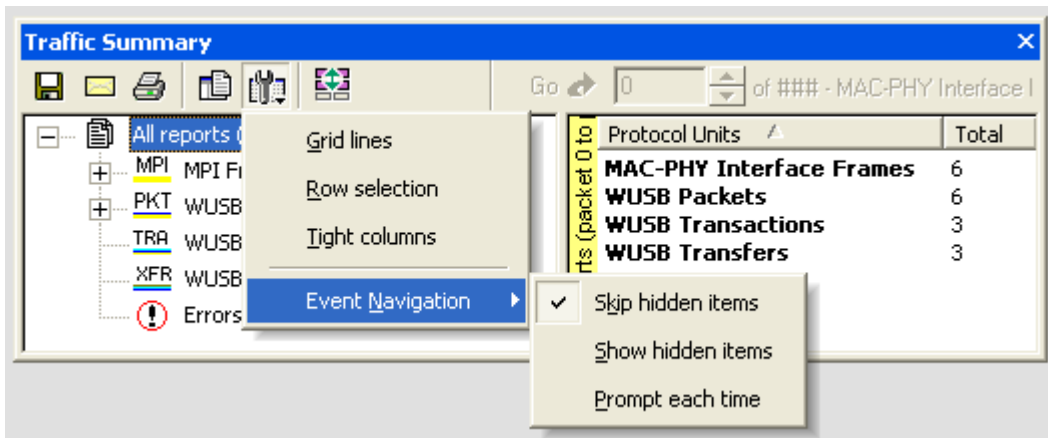


Figure 10.8 Event Navigation Submenu

### Setting Traffic Summary Range

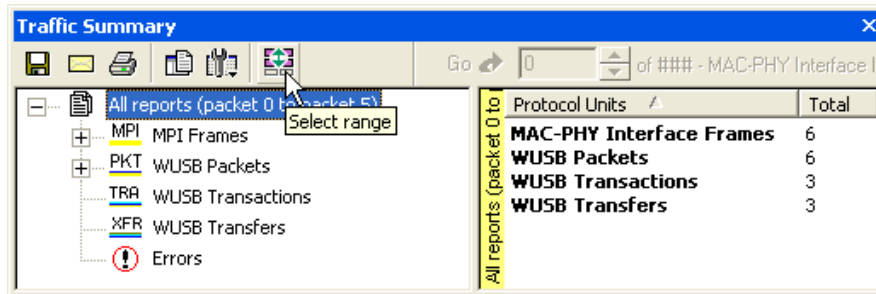
You can select a range within the trace file for which items are displayed in the traffic summary. All occurrences of the item outside of the range are not included in the summary. You can set the range with respect to particular frame or packet types. Your choice of these types is context-sensitive 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), do these steps:

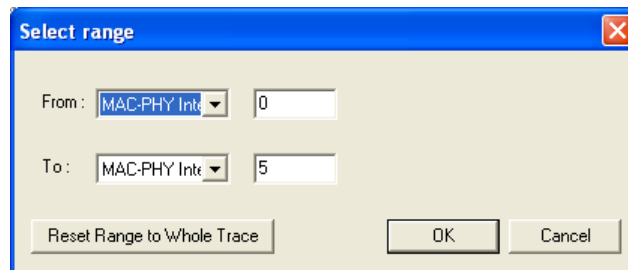
- Step 1** With the trace file open, select Traffic Summary from the Report menu (or click on the Traffic Summary button on the Main tool bar). The Traffic Summary window appears.



- 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 on the Select Range button on the Traffic Summary tool bar (Figure 10.9).
- Step 4** The Select Range dialog box appears (Figure 10.10).



**Figure 10.9** Selecting Traffic Summary Range

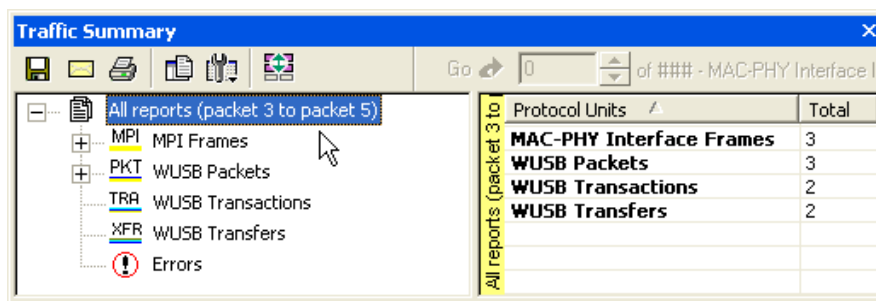


**Figure 10.10** Select Range Dialog Box

- Step 5** In the Select Range dialog box, MAC-PHY Interface (MPI) Frame as the protocol unit for which you are going to set range. Enter 3 as the start point of the range (Figure 10.11).
- Step 6** The Traffic Summary window now shows statistics for MPI frame 3 through MPI frame 5 of the trace (Figure 10.12).



**Figure 10.11 Setting Range to Start on Third Frame**



**Figure 10.12 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 do so, follow these steps:

- Step 1** With the trace file open, select Traffic Summary from the Report menu (or click on 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.

- Step 3** Click on the count in the total column for Data frames (Figure 10.13).

- Step 4 The Go box becomes active at the top of the right pane (Figure 10.14). By default, it is set at the first MPI Data frame (MPI 1, shown at the top in the trace).
- Step 5 In the Go box, enter 2 to indicate that you want to go to the second MPI Data frame in the trace (Figure 10.15). When you do so, 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 10.16)).

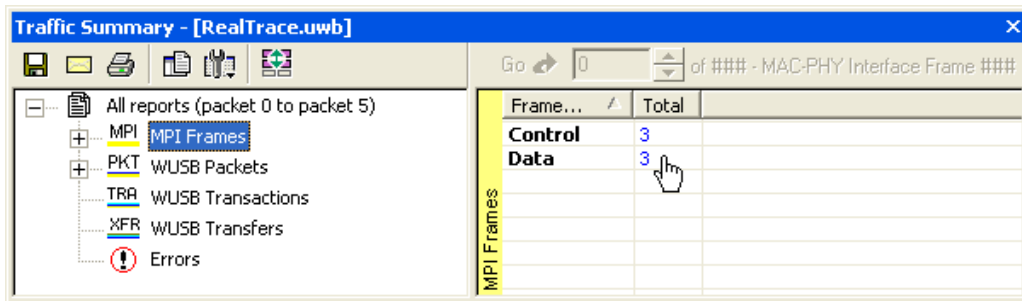


Figure 10.13 Selecting the Row for Data Frames

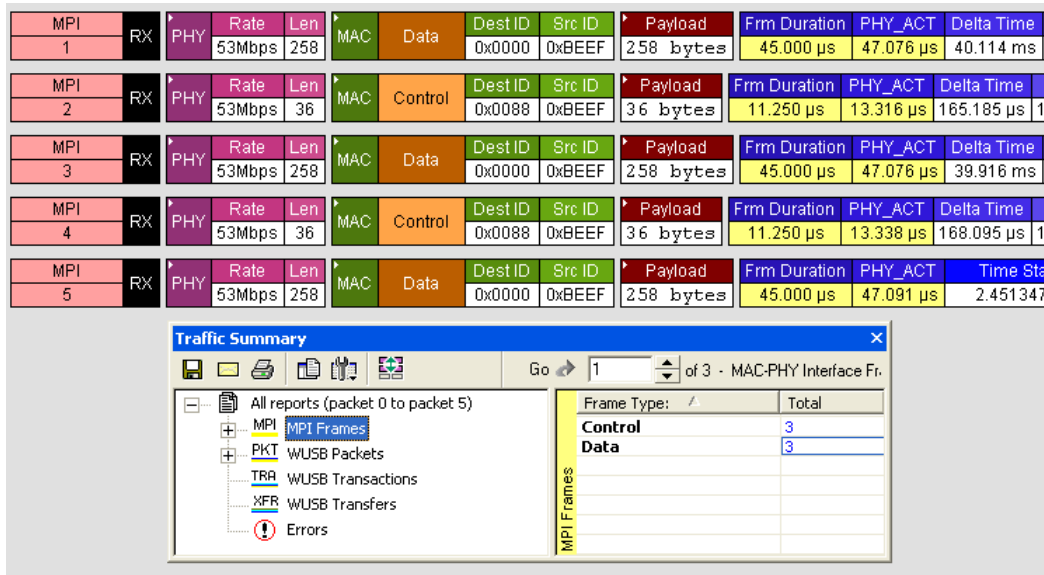


Figure 10.14 First MPI Data Frame at Top of Display

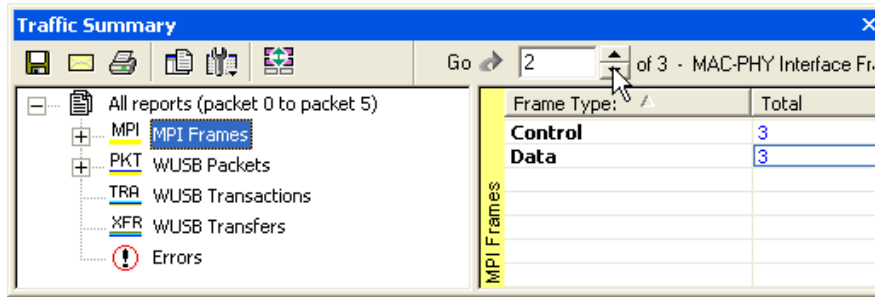


Figure 10.15 Set Go Box to Second MPI Data Frame

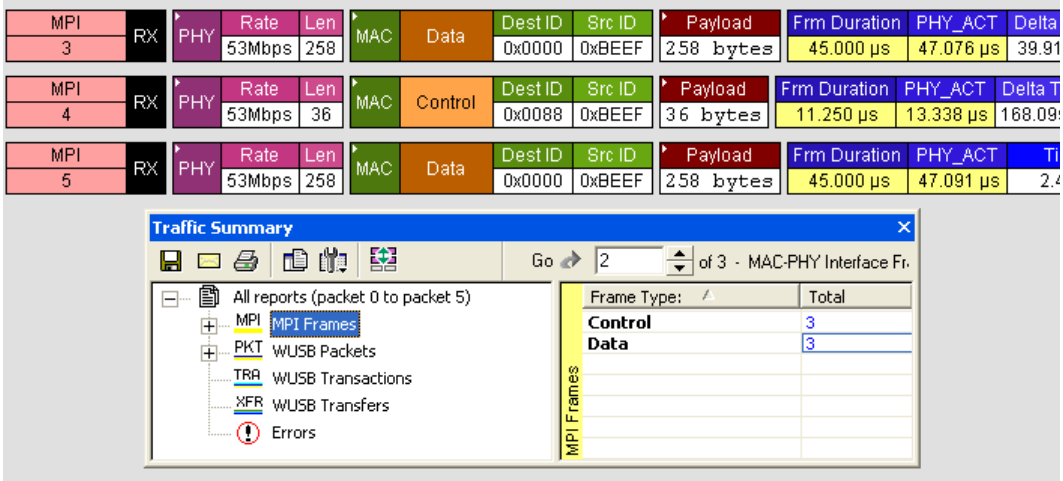
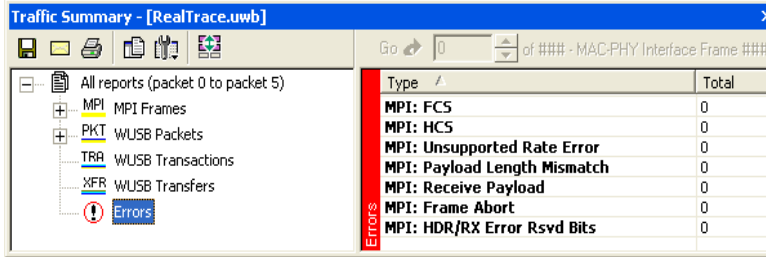


Figure 10.16 Second MPI Data Frame at Top of Display

## 10.4 Error Summary

To view a count of errors in the trace file, select **Report >Error Summary** from the Report menu (or click on the Error Report button on the Main tool bar). The Traffic Summary window appears. The right pane is set to display error count (Figure 10.17).

**Note:** The types of errors that are displayed is static (you can not change the types of errors to be included in the summary).



The screenshot shows a window titled "Traffic Summary - [RealTrace.uwb]". On the left is a tree view with categories: All reports (packet 0 to packet 5), MPI MPI Frames, PKT WUSB Packets, TRA WUSB Transactions, XFR WUSB Transfers, and Errors. The Errors category is selected. On the right is a table with a red header "Errors".

Type	Total
MPI: FCS	0
MPI: HCS	0
MPI: Unsupported Rate Error	0
MPI: Payload Length Mismatch	0
MPI: Receive Payload	0
MPI: Frame Abort	0
MPI: HDR/RX Error Rsvd Bits	0

Figure 10.17 Error Summary Display

**Note:** The types of errors included in the summary are static (you can not change the types of errors that are reported on).

## 10.5 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, and click the **Calculate** button. The results will then display in the window.

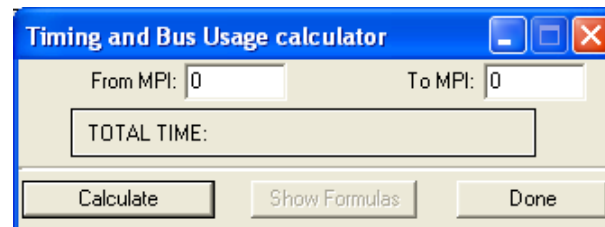


Figure 10.18 Timing and Bus Usage Calculator

## 10.6 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 10.3).

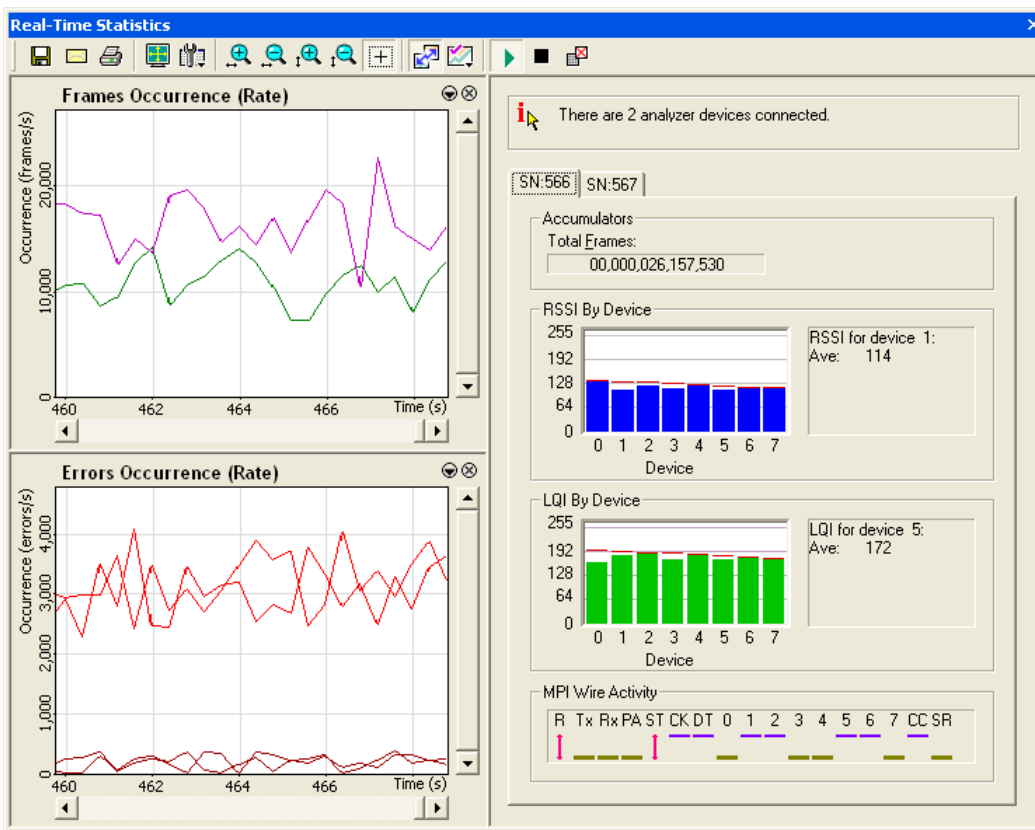
The Real-Time Statistics window provides information on links activity in real-time (Figure 10.19). The window has two areas:

**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.

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 on the SN567 tab.



**Figure 10.19 Real-Time Statistics Window**

The Real-Time Statistics window tool bar provides quick access to key functions of the window (Figure 10.20). You can learn the function of each tool bar button by passing the mouse cursor over it. A tool tip will appear above the button and the command name will appear in the Main window status bar.

Table 10.2 describes the Real-Time Statistics buttons.

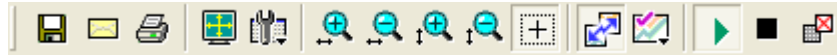

















Figure 10.20 Real-Time Statistics Tool Bar

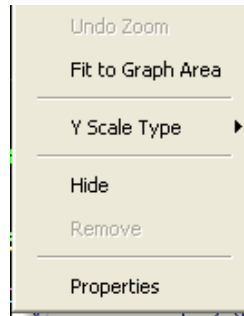
Table 10.2 Real-Time Statistics Toolbar Buttons

	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 10.21).
- Step 3 Click on **Properties** to bring up the Graph Area Properties dialog box for that graph.

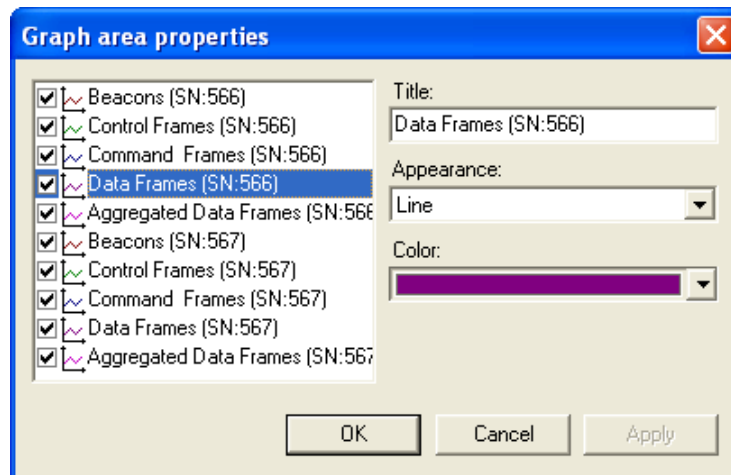


**Figure 10.21 Real-Time Graphs Pop-Up Menu**

*Graph Properties for Frame Occurrences*

Figure 10.22 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 10.22 Graph Area Properties for Frames**

*Graph Properties for Error Occurrences*

Figure 10.23 shows the Graph Properties dialog box for Error Occurrences graph. There are two types of error graphs: Device-specific errors and general errors.



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

PHY Payload Error

PHY Unsupported Rate

General errors are errors that can not be associated with specific UWB devices. The general errors that you can monitor are Header Errors.

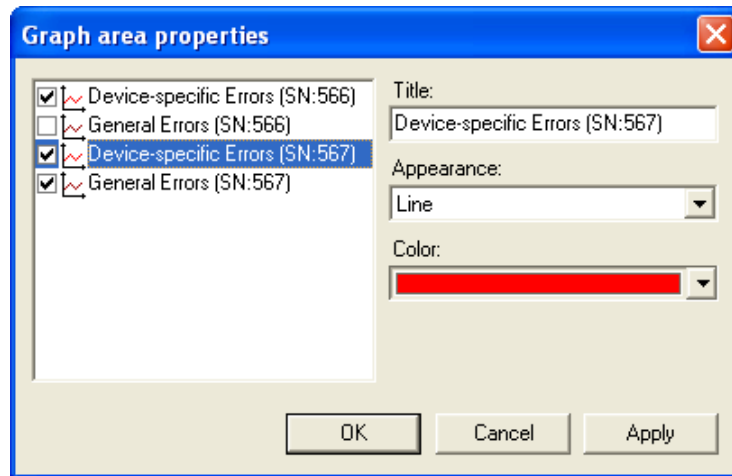


Figure 10.23 Graph Area Properties for Errors

### General Statistics Area

The right side of the Real-Time Statistics window shows the General Statistics area (Figure 10.24). It has the following displays:

**Accumulators:** A running count of total frames displayed during the statistics collection period.

**RSSI By Device:** A histogram that shows received signal strength for UWB devices for up to eight devices.

**LQI By Device:** A histogram that shows link quality for UWB devices for up to eight devices.

**MPI Wire Activity:** A visual display of the state of signals on the MPI bus.

- Purple bar is signal high.
- Green bar is signal low.
- Red arrow marks that the signal toggled at least once during the last signal period.

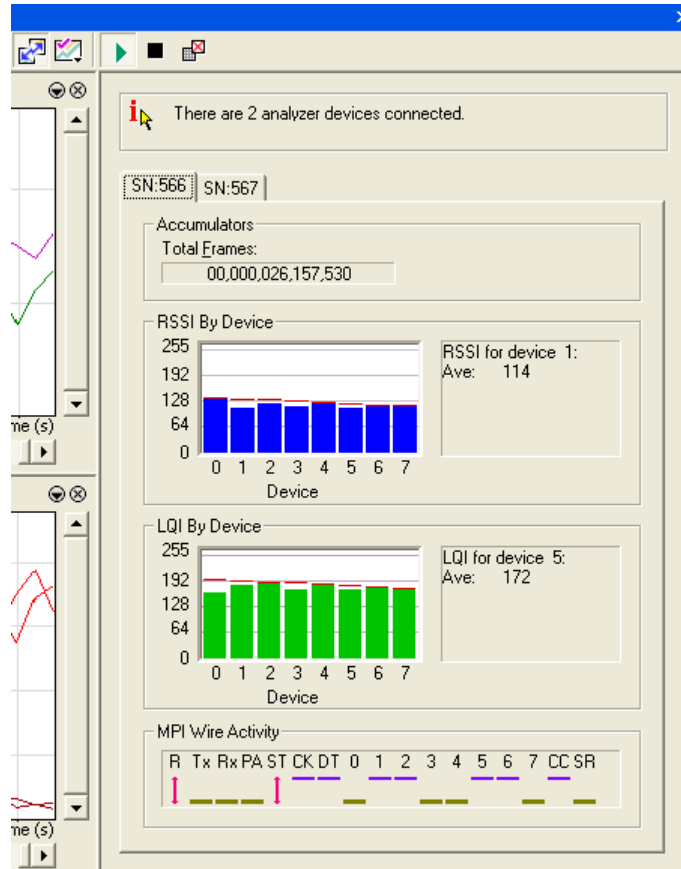


Figure 10.24 Real-Time Statistics Window: General Statistics Area

# 11. Updates and Licensing

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

## 11.1 Updates Overview

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

**[www.Lecroy.com](http://www.Lecroy.com)**

When you download new *UWBTracer* 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.

## 11.2 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.

The About *UWBTracer* window appears (Figure 11.1).

**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.



Figure 11.1 About UWBTracer Window

## 11.3 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](http://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.

## 11.4 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 or firmware update 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 do so:

- Step 1 From the Setup menu, select **Update BE/FW**.
- Step 2 A dialog appears that allows you to select whether you want to update firmware, BusEngine, or both. Make your selection and click the **Update** button.
- Step 3 A dialog box appears to confirm that you want to proceed with the update. If so, click **OK**. The update is executed.

## 11.5 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.

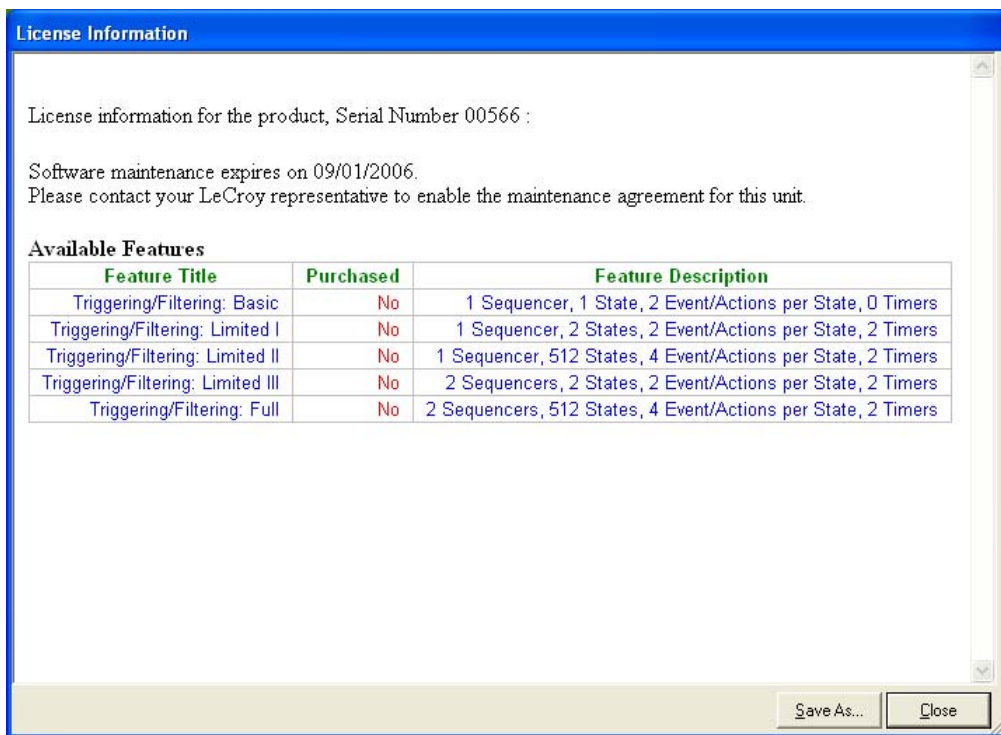


Figure 11.2 License Window

## 11.6 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**.





## A. Specifications

The following specifications describe a combined UWBTracer™ MPI and Universal Protocol Analyzer System.

### Package

Dimensions:	<u>UPAS 10000:</u> 12.2 x 12.2 x 3.5 inches (31.1 x 31.1 x 8.9 cm) <u>UWBTracer MPI Plug-in:</u> 4.5 x 6.7 x 1.3 inches (11.3 x 17.0 x 3.2 cm)
Connectors:	<u>UPAS 10000:</u> UPAS AC power connection External trigger connection (DB-25, BNC) PC connection (USB2.0, type "B") Break-out board (type "D") <u>UWBTracer MPI Plug-in:</u> MPI Adapter port
Weight:	<u>UPAS 10000:</u> 9.5 lbs. (4.3 kg) <u>UWBTracer MPI Plug-in:</u> 1 lb. 11 oz. (0.77 kg)

### Power Requirements

90-254 VAC, 47-63 Hz, 100 W minimum (universal input)

### 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

### Switches

Power:	On/Off
Manual Trigger:	When pressed forces a trigger event.

## Indicators (LEDs) - UPAS

Power (PWR):	Illuminated during Power-On Self-Test (POST)
Recording (REC):	Illuminated when the analyzer is actively recording traffic data.
Triggered (TRG):	Illuminated when the 40-pin input is in use.
Sync-ed (SYNC):	Illuminated when the analyzer is synchronized to the date.

## Indicators (LEDs) - UWBTracer MPI Plug-In

Status:	Illuminated when the analyzer in Slot 1 is recording.
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## Indicators (LEDs) - Cable Adapters

Power (POWER):	Illuminated when power is provided to the adapter.
68 PIN INPUT:	Illuminated when the 68-pin input is in use.
40 PIN INPUT:	Illuminated when the 40-pin input is in use.

## Recording Memory Size

2 GB for trace capture, timing, and control information.

## 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...	<a href="http://www.lecroy.com/">http://www.lecroy.com/</a>

## Limited Hardware Warranty

So long as you or your authorized representative ("you" or "your"), fully complete and return the registration card provided with the applicable hardware product or peripheral hardware products (each a "Product") within fifteen days of the date of receipt from LeCroy or one of its authorized representatives, LeCroy warrants that the Product will be free from defects in materials and workmanship for a period of three years (the "Warranty Period"). You may also complete your registration form via the internet by visiting <http://www.catc.com/support/register/>. The Warranty Period commences on the earlier of the date of delivery by LeCroy of a Product to a common carrier for shipment to you or to LeCroy's authorized representative from whom you purchase the Product.



### What this Warranty Does Not Cover

This warranty does not cover damage due to external causes including accident, damage during shipment after delivery to a common carrier by LeCroy, abuse, misuse, problems with electrical power, including power surges and outages, servicing not authorized by LeCroy, usage or operation not in accordance with Product instructions, failure to perform required preventive maintenance, software related problems (whether or not provided by LeCroy), problems caused by use of accessories, parts or components not supplied by LeCroy, Products that have been modified or altered by someone other than LeCroy, Products with missing or altered service tags or serial numbers, and Products for which LeCroy has not received payment in full.

**Coverage During Warranty Period**

During the Warranty Period, LeCroy or its authorized representatives will repair or replace Products, at LeCroy's sole discretion, covered under this limited warranty that are returned directly to LeCroy's facility or through LeCroy's authorized representatives.

**How to Obtain Warranty Service**

To request warranty service, you must complete and return the registration card or register via the internet within the fifteen day period described above and report your covered warranty claim by contacting LeCroy Technical Support or its authorized representative.

You can reach LeCroy Technical Support at 800-909-7112 or via email at [support@catc.com](mailto:support@catc.com). You may also refer to the LeCroy website at <http://www.lecroy.com> for more information on how to contact an authorized representative in your region. If warranty service is required, LeCroy or its authorized representative will issue a Return Material Authorization Number. You must ship the Product back to LeCroy or its authorized representative, in its original or equivalent packaging, prepay shipping charges, and insure the shipment or accept the risk of loss or damage during shipment. LeCroy must receive the Product prior to expiration of the Warranty Period for the repair(s) to be covered. LeCroy or its authorized representative will thereafter ship the repaired or replacement Product to you freight prepaid by LeCroy if you are located in the continental United States. Shipments made outside the continental United States will be sent freight collect.

Please remove any peripheral accessories or parts before you ship the Product. LeCroy does not accept liability for lost or damaged peripheral accessories, data or software.

LeCroy owns all parts removed from Products it repairs. LeCroy may use new and/or reconditioned parts, at its sole discretion, made by various manufacturers in performing warranty repairs. If LeCroy repairs or replaces a Product, the Warranty Period for the Product is not extended.

If LeCroy evaluates and determines there is "no trouble found" in any Product returned or that the returned Product is not eligible for warranty coverage, LeCroy will inform you of its determination. If you thereafter request LeCroy to repair the Product, such labor and service shall be performed under the terms and conditions

of LeCroy's then current repair policy. If you chose not to have the Product repaired by LeCroy, you agree to pay LeCroy for the cost to return the Product to you and that LeCroy may require payment in advance of shipment.

### **General Provisions**

THIS LIMITED WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE ADDITIONAL RIGHTS THAT VARY BY JURISDICTION. LECROY'S RESPONSIBILITY FOR DEFECTS IN MATERIALS AND WORKMANSHIP IS LIMITED TO REPAIR AND REPLACEMENT AS SET FORTH IN THIS LIMITED WARRANTY STATEMENT. EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY STATEMENT, LECROY DISCLAIMS ALL EXPRESS AND IMPLIED WARRANTIES FOR ANY PRODUCT INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF AND CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES THAT MAY ARISE FROM ANY COURSE OF DEALING, COURSE OF PERFORMANCE OR TRADE USAGE. SOME JURISDICTIONS MAY NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE PRECEDING LIMITATION MAY NOT APPLY TO YOU.

LECROY DOES NOT ACCEPT LIABILITY BEYOND THE REMEDIES SET FORTH IN THIS LIMITED WARRANTY STATEMENT OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, ANY LIABILITY FOR THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES, PRODUCTS NOT BEING AVAILABLE FOR USE, OR FOR LOST DATA OR SOFTWARE. LECROY'S LIABILITY TO YOU MAY NOT EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT THAT IS THE SUBJECT OF A CLAIM. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE PRECEDING EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

The limited warranty on a Product may be transferred for the remaining term if the then current owner transfers ownership of the Product and notifies LeCroy of the transfer. You may notify LeCroy of the transfer by writing to Technical Support at LeCroy, 3385 Scott Blvd., Santa Clara, CA 95054 USA or by email at: support@catc.com. Please include the transferring owner's name and address, the name and address of the new owner, the date of transfer, and the Product serial number.

