Computer Access Technology Corporation

3385 Scott Blvd., Santa Clara, CA 95051-3115 Tel: +1/408.727.6600 Fax: +1/408.727.6622

CATC IB*Tracer* 4X™

InfiniBand Protocol Analyzer

User's Manual

Manual Version 1.2

For Software SW Version 2.2

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1. Overview

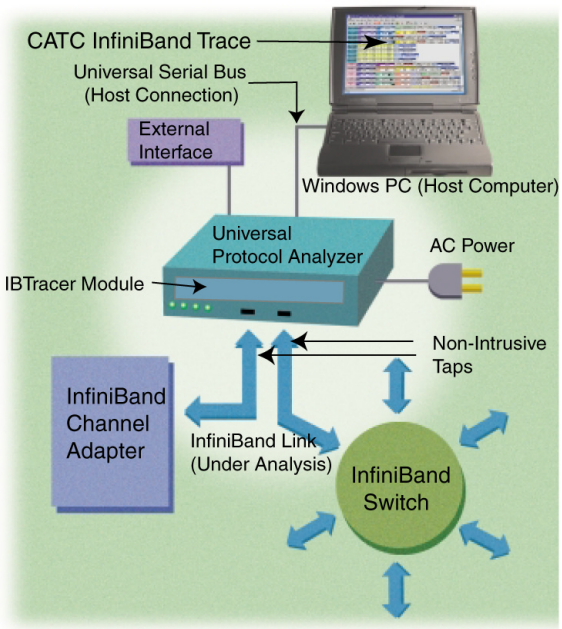
The CATC IB*Tracer*™ 4X Protocol Analyzer is the ideal tool for analyzing InfiniBand link data. Development Engineers will rely on IB*Tracer* 4X Analyzer to resolve software, firmware, and hardware problems encountered in the development of InfiniBand host channel adapters, switches, and other devices. Test and Quality Assurance Engineers will use IB*Tracer* to verify the correct operation of InfiniBand products and compliance to the standard. Anyone involved with InfiniBand can use IB*Tracer* software as a stand-alone viewer to understand the InfiniBand protocol and to facilitate system level discussions and problem resolution of applications employing InfiniBand technology.

Please refer to the *InfiniBand Specification, version 1.0* for details on the InfiniBand protocol. The InfiniBand specification is available from the InfiniBand TA at its web site **http://www.infinibandta.org/**

1.1 General Description

IB*Tracer* 4X hardware module installs into the CATC Universal Protocol Analyzer System (UPAS) 10000. The UPAS 10000 is a base system designed to accommodate different protocol modules.

Together, IB*Tracer* and the UPAS connect to a portable or desktop PC. This PC runs the user interface for administering the Analyzer and displaying traces.



IB*Tracer* 4X is a non-intrusive testing tool for the InfiniBand architecture providing traffic capture and analysis. Hardware triggering allows real-time events to be captured. Hardware filtering allows the different types of packets to be filtered in or out of the recording. Filtering allows users to focus recordings on events of interest and to preserve recording memory so that the recording time can be extended.

Recorded data is presented in colored graphics in a trace viewer application. This application has advanced search and viewing capabilities that allow the user to quickly locate specific data, errors, and other desired conditions, thereby focussing the user's attention on events of interest.

IB*Tracer* 4X Protocol Analyzer functions with any personal computer using the Windows 98SE, Window 2000, Windows ME, or Windows XP operating systems and equipped with a functional USB interface.

IB*Tracer* 4X provides on-the-fly detection of and triggering on such events as Packet Headers and Errors. Whether recording manually or with a specified trigger condition, IB*Tracer* continuously records the link data in a wrap-around fashion until manually stopped or until the Trigger Event is detected and a specified amount of post-Trigger link data is recorded.

Upon detection of a triggering event, the analyzer continues to record data up to a point specified by the user. Real-time detection of events can be individually enabled or disabled to allow triggering on events as they happen. This includes predefined exception or error conditions and a user-defined set of trigger events. The unit can also be triggered by an externally supplied signal. An external DB-25 connector provides a path for externally supplied data or timing data to be recorded along with traffic.

This DB-25 connector also provides a path for IB*Tracer* 4X to transmit externally two control, timing, or recovered signals for purposes of probing and use by other circuitry.

The IB*Tracer* software provides powerful search functions that enable investigation of particular events and allow the software to identify and highlight specific events. In addition to immediate analysis, you can print any part of the data. Use the **Save As** feature to save the data on disk for later viewing. The program also provides a variety of timing information and data analysis reports.

1.2 Features

General

- Upgradeable firmware and recording engine
- Software operates stand-alone on any Microsoft Windows 98SE or later computer as a "Trace Viewer"
- Link and data packets are displayed and fully decoded
- Training sequences are displayed
- Transport level functions are fully decoded with a graphical illustration of the comprised packets and messages
- Errors at the physical, link, and transport levels are highlighted in red
- Online help

Physical Components

- IB*Tracer* 4X plug-in module
- UPAS/IB*Tracer* 4X can be administered by any desktop or portable Microsoft Windows-based computer with USB capability
- Convenient Plug-and-Play USB installation
- Taps non-intrusively between two 10 Gbit/sec InfiniBand ports using two standard cables
- External interface for probing and monitoring auxiliary digital signals and for cross triggering between other test instruments

Recording Options

- Record up to 2 Gbyte of InfiniBand data, timing and control information
- Three recording modes: Snapshot, Manual Trigger, and Event Trigger
- Selectable recording buffer size and trigger position
- Record the full data rate of a single 4X, 10 Gbit/sec InfiniBand link
- Trigger on InfiniBand conditions like link training sequences or power off disconnect events
- Trigger on a comprehensive list of error conditions, such as running disparity, bad packets, or bad variant or invariant CRCs
- Trigger on a sequence of packets to capture messages and transport level events
- Optionally filter captured data
- Breakout board data
- Counters

Display Options

- Extensive use of color and graphics within the trace
- Packet errors and protocol violations are highlighted in red
- Packet color clearly indicates position before or after the trigger point
- Packets can be marked with text annotations that become tool-tips for future reference
- Tool-tips with complete definitions of most fields
- Search, show, or hide only the data of interest using InfiniBand-specific criteria
- Packets are accurately time-stamped (1 symbol time or 4 ns resolution)
- Measure time, throughput, or responsiveness between packet markers or relative to the trigger position

IB*Tracer BusEngine*

CATC's BusEngine™ Technology is at the heart of the new IB*Tracer* 4X Analyzer. The revolutionary BusEngine core uses state-of-the-art Field Programmable Gate Array (FPGA) technology and incorporates both the real-time recording engine and the configurable building blocks that implement data/state/error detection, triggering, capture filtering, external signal monitoring and event counting and sequencing. Like the flash-memory-based firmware that controls its operation, all BusEngine logic is fully field upgradeable, using configuration files that can be downloaded from the CATC website.

1.3 Specifications

IB*Tracer* is a hardware module that installs into the Universal Protocol Analyzer System. The following specifications describe a combined IB*Tracer* 4X Universal Protocol Analyzer System.

Package

Connectors:	AC power connection
	Host connection (USB2.0, type "B")
	Recording Channel

Power Requirements

90-254 VAC, 47-63 Hz, 165W maximum (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

LEDs

Status:	Illuminated when the analyzer is powered on.

Probing Characteristics

Connection:	receptacles
	Standard cables

Recording Memory Size

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

Basic Trigger Events

Conditions:	Training sequences, Link Packets, Data Packets
	Cable disconnect/connect
Packet Patterns:	VLT, LID, Opcode, QP, AETH, LRM, BTM, Data,
	Immediate data, Sixteen aligned data bytes, MAD types
Errors:	Invalid 10b codes
	Wrong running disparity of 10b codes
	End of bad packet
	Packet delimiters violations

Certification

FCC (Class A), CE Mark

2. Quick Installation

IB*Tracer* 4X is a factory-installed hardware module that is sold as part of the CATC Universal Protocol Analyzer System 10000 (UPAS).

The UPAS 10000 together with the IB*Tracer* 4X module and associated software are easily installed on most Windows-based personal computer systems. You can begin making InfiniBand™ recordings after following these initial steps. However, if you are unsure about what to do after reading the Quick Installation instructions, or if your analyzer does not work after you follow these instructions, read through the sections in this manual.

2.1 PC Requirements

IB*Tracer* 4X is administered by a PC. This PC needs to have the following features in order to be able to communicate with the Analyzer:

- A USB port (USB 2.0 recommended). All communications between the PC and the analyzer pass across a USB cable. If the PC is being used only as a trace viewer, then the USB port is not necessary.
- Microsoft Windows 98SE, Windows ME, Windows 2000, or Windows XP for recording and viewing traffic.
- Physical RAM should be a minimum of 128 MB. The amount you use should be at least equal to the amount of your largest recording. For example, if you plan to make 2-Gbyte recordings, then your PC should have 2048 MB of RAM.

2.2 Setting Up the Analyzer

Step 1 Remove the IB*Tracer* 4X/UPAS from its shipping container.

The IB*Tracer* 4X module will already be installed in the UPAS.

Step 2 Connect the AC power cable to the rear of the UPAS.

Step 3 Connect the USB cable between the USB port on the back of the Analyzer and a USB port on the PC.

Step 4 Turn on the power switch located on the rear of the Analyzer.

Step 5 Insert the IB*Tracer* 4X CD into the PC that will be controlling the analyzer.

Step 6 Follow on-screen Plug-and-Play instructions for the automatic installation of the IB*Tracer* Analyzer as a USB device on your PC (the IB*Tracer* CD includes the required USB files).

2.3 Installing the Software

Step 1 Run the **setup** program (for example**, Start > Run > d:\setup**) and follow the on-screen instructions to install the IB*Tracer* application on the analyzing PC hard disk.

Step 2 To start the application, launch the **CATC IB*Tracer* 4X** program from the **Start Menu: Start>Programs>CATC>IB*Tracer***.

2.4 Your First InfiniBand Recording

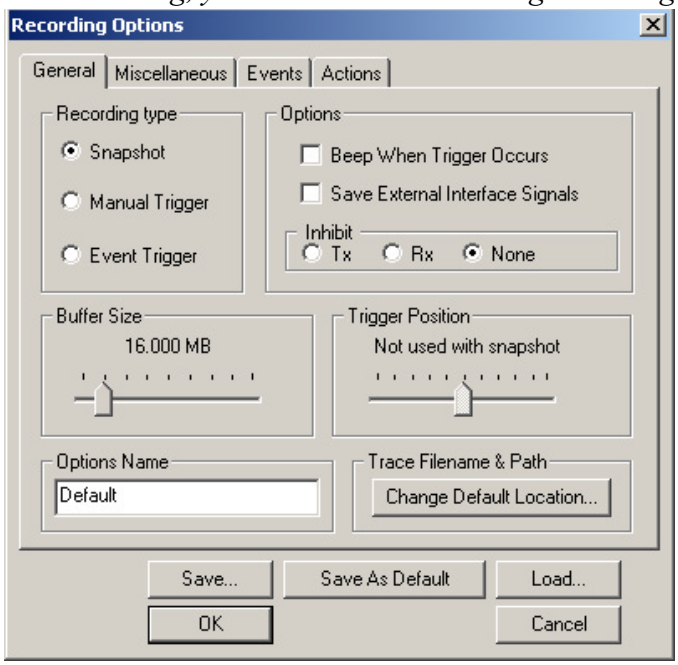
After installing and launching the software, you can test IB*Tracer* 4X by following these steps:

Step 1 Plug in a InfiniBand cable to each of the two ports on the IB*Tracer* 4X module, and then connect the other ends to the device under test.

Step 2 Select **Recording Options** under **Setup** on the Menu Bar.

Step 3 Select the **General** tab.

The following dialog box will open showing factory default settings such as "Snapshot" and 16 Mbytes buffer size. For your first recording, you can leave these settings unchanged.



Step 4 Click OK to activate the recording options you selected.

Step 5 Turn on the InfiniBand devices that are to be tested and cause them to generate InfiniBand traffic.

Step 6 Click on the Tool Bar.

IBTracer 4X starts to record the InfiniBand traffic immediately. After 4 Mbytes of traffic is recorded, the analyzer will upload the data and display the packets in the trace window.

Step 7 If you wish to terminate the recording before the snapshot automatically completes, click on the Tool Bar.

When the recording session is finished, the traffic is uploaded from the Analyzer to the hard drive on your PC as a file named ***data.ibt*** *or whatever name you assigned as the default filename. While the file is being uploaded, you should see a white progress bar at the bottom of the screen. When the bar disappears, it indicates that the data has been uploaded to disk.*

Step 8 To save a current recording for future reference, select **File > Save As** on the Menu Bar.

OR

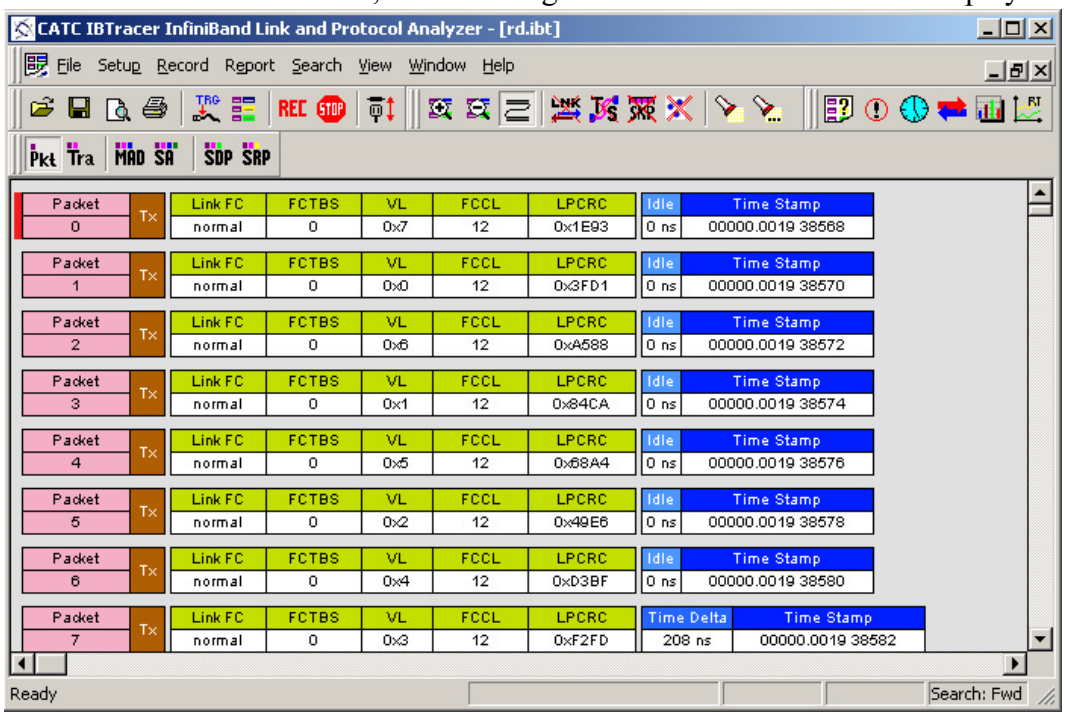
Click on the Tool Bar.

You see the standard ***Save As*** *screen.*

Step 9 Give the recording a name and save it to the appropriate directory.

Capturing Your First CATC Trace

After a few moments, the recording will end and the results will display.



Packet		Link FC	FCTBS	VL	FCCL	LPCRC	Idle	Time Stamp
0	Tx	normal	0	0x7	12	0x1E93	0 ns	00000.0019 38568
1	Tx	normal	0	0x0	12	0x3FD1	0 ns	00000.0019 38570
2	Tx	normal	0	0x6	12	0xA588	0 ns	00000.0019 38572
3	Tx	normal	0	0x1	12	0x84CA	0 ns	00000.0019 38574
4	Tx	normal	0	0x5	12	0x68A4	0 ns	00000.0019 38576
5	Tx	normal	0	0x2	12	0x49E6	0 ns	00000.0019 38578
6	Tx	normal	0	0x4	12	0xD3BF	0 ns	00000.0019 38580
7	Tx	normal	0	0x3	12	0xF2FD	Time Delta 208 ns	Time Stamp 00000.0019 38582

Trace View Features

- The IB*Tracer* packet view display uses color and graphics extensively to fully document the captured traffic.
- Packets are shown on separate rows, with their individual fields both labeled and color coded.
- Packets are numbered sequentially, as recorded and time-stamped with a resolution of 1 symbol time or 4 ns.
- Display formats can be named and saved for later use.
- Pop-up Tool Tips annotate packet fields with detailed information about their contents.
- Data fields can be collapsed to occupy minimal space in the display (which can in turn be zoomed in and out to optimize screen utilization).
- The display software can operate independent of the hardware and thus can function as a stand-alone Trace Viewer that can be freely distributed.

3. Detailed Installation

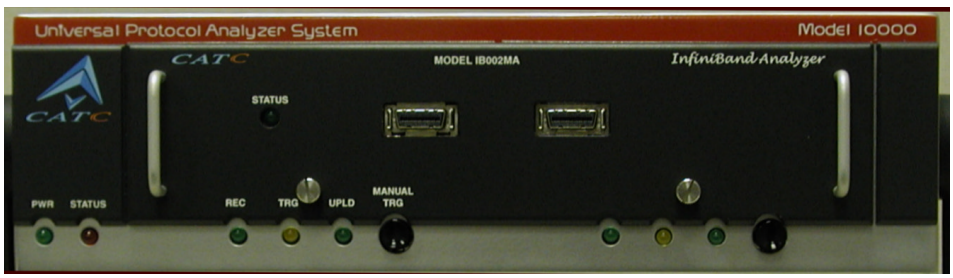
3.1 System Components/Packing List

- One stand-alone IB*Tracer* 4X Analyzer module
- One Universal Protocol Analyzer System 10000 Chassis
- One USB cable
- One 6-foot (2-meter) 4x to 4x cable
- Two 6-foot (2-meter) Infiniband 4x to 1x cables
- One DB-25 parallel cable
- One UPAS External Breakout Board
- IB*Tracer* 4X software program installation CD-ROM
- Product documentation

3.2 The Installed IB*Tracer* 4X Unit

If you purchased an IB*Tracer* 4X module with a UPAS, the IB*Tracer* 4X module will arrive inserted into the UPAS. Upon power up, the installed IB*Tracer* 4X Analyzer will activate the user-accessible controls and LEDs on the front and rear panels of the UPAS.

Figure 1: Front Panel



LED and Button Descriptions

If you look at the front panel, you will see LEDs, buttons, and connectors.

Left-most LEDs

- Green **PWR** (power) indicator LED for UPAS (lights when the unit power is switched on).
- Red **Status** indicator LED for UPAS (lights during the boot up).

Center-most LEDs and Button

The LEDs and button on the UPAS enclosure function in conjunction with the IB*Tracer* 4X module inserted above it.

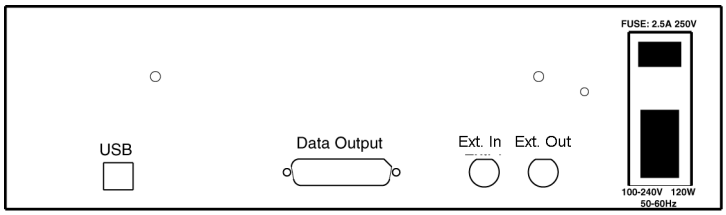
- Green **REC** (recording) LED (lights when the unit is recording).
- Orange **TRG** (triggered) LED (lights when the unit triggers an event).
- Green **UPLD** (Upload) (lights when unit is uploading data to PC).
- **MANUAL TRG** (Manual Trigger) push-button (allows a manual Trace capture).

Right-most LEDs and Button

The LEDs and button under the right module slot are reserved for future releases of hardware modules.

- Green **REC** (recording) LED (lights when the unit is recording).
- Orange **TRG** (triggered) LED (lights when the unit triggers an event TRG also lights during power-on testing and will be turned off at the end of the power on cycle. If the LED blinks at the end of this cycle, the hardware is faulty).
- Green **UPLD** (Upload) LED (lights when unit is uploading data to PC).
- **MANUAL TRG** push-button (allows a manual Trace capture).

Figure 2: Universal Protocol Analyzer Rear Panel and its connectors



- Wide range AC connector module
  - — Power socket
  - — 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.

  - — Power on/off switch
- Two External Ports marked **Ext. In** and **Ext. Out**
- USB 2.0 type B host computer connector
- **Data In/Out** DB-25 (25-pin) external interface connector

Warning: Do not open the UPAS enclosure. There are no user-serviceable parts inside. Refer servicing to CATC.

3.3 IB*Tracer* 4X System Setup

IB*Tracer* 4X and UPAS are connected via USB to a desktop or laptop PC. The PC, in turn, is used to administer the Analyzer and display traces.

To set up the Analyzer and PC,

Step 1 If needed, insert the IB*Tracer* 4X module into the UPAS.

Step 2 Connect the UPAS to an AC power source.

Step 3 Connect the Analyzer to the analyzing PC via USB.

Step 4 Connect InfiniBand cables to the devices under test.

Step 5 Install IB*Tracer* software.

Step 6 Create a recording.

3.4 AC Power Source

Step 1 Connect the Analyzer box to a 100-volt to 240-volt, 50 Hz to 60 Hz, 165 W power outlet using the provided power cord.

Note The Analyzer is capable of supporting supply voltages between 100-volt and 240-volt, 50 Hz or 60 Hz, thus supporting all known supply voltages around the world.

Step 2 Use the power switch located on the rear panel to turn the analyzer unit on and off.

Note At power-on, the Analyzer initializes itself in a few seconds and then performs an exhaustive self-diagnostic that lasts about 20 seconds. The Status LED illuminates during the power-on testing and turns off when testing is finished. If the diagnostics fail, the Status LED blinks, indicating a hardware failure. If this occurs, call CATC Customer Support for assistance.

3.5 PC Connection

Use the USB cable provided to connect the host computer to the UPAS.

- At least 20 MB hard disk space is required, plus additional memory for recordings (as much as 2 Gbytes or more when recording a full buffer size).
- Monitor resolution is at least 800x600 with thousands of colors.

3.6 InfiniBand Cable Connection

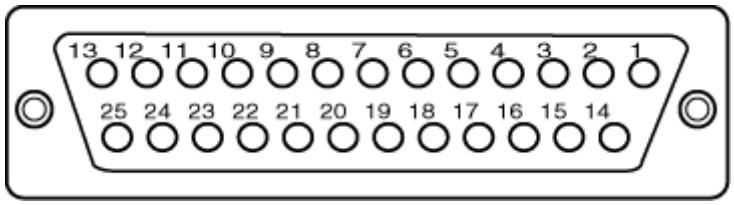
CATC provides two 1x-to-4x InfiniBand cables and one 4x InfiniBand cable. The 1x-to-4x cables are actually 1x cables with 4x connectors. These cables allow you to connect 1x devices to IB*Tracer* 4x.

3.7 External Interface Breakout Board

The External Interface Breakout Board is an accessory that allows convenient access to several potentially useful standard, LVTTL output and input signals. It also offers a simple way to connect logic analyzers or other tools to the IB*Tracer* 4X Analyzer unit. Six ground pins and one 5-volt pin are provided.

The Breakout Board connects via a cable to the **Data In/Out** connector located on the rear of the analyzer box. Each signaling pin on the breakout board is isolated by a 100Ω series resistor.

Figure 3: Data In/Out Cable Connector



Pin-Outs for the Data In/Out Connector

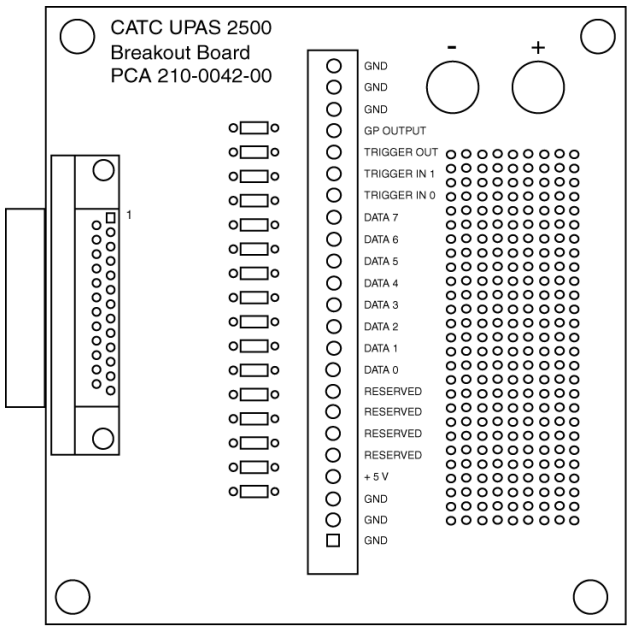
The following table lists the pin-out and signal descriptions for the **Data In/Out** connector. This pin-out is for a cable connector that connects to the breakout board.

Data In/Out Connector – Pin-Out

Pin	Signal Name	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: they allow external signals to be used to cause triggering or recording. Pins 3 and 16 are used to transmit output signals.

Figure 4: External Interface Breakout Board



Prototype Rework Area

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

3.8 IB*Tracer* Program Installation

The CATC IB*Tracer* software is provided on CD-ROM and requires a Windows 98SE, Windows 2000, Windows ME, or Windows XP operating system.

Note The USB*Tracer* program can be installed on any Windows 98SE or later operating system (including NT 4.0) as a "Trace Viewer." That is, it may be used to view, analyze, and print data that was collected and saved on another system even if it does not have an Analyzer attached.

Loading the USB*Tracer* USB Drivers

Step 1 Insert the USB*Tracer* program CD-ROM into your PC.

Step 2 Power-on the USB*Tracer* Analyzer.

Step 3 Connect the USB cable to the rear of the analyzer and to the personal computer.

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

Note When Windows prompts you for a file, browse to the CATC CD. If this is a first time installation, the ctcupa10.sys (UPAS) and ib4trcer.sys (USB) drivers must also be installed.

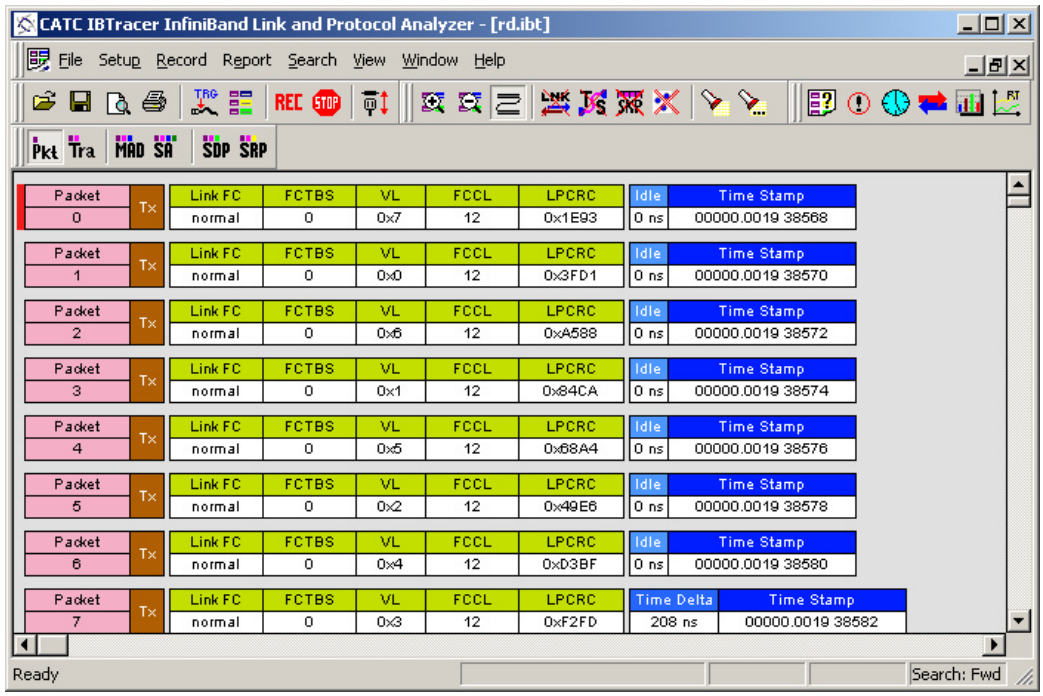
Installing the USB*Tracer* Application Program

Run **setup.exe** from the USB*Tracer* CD-ROM.

The CATC USB*Tracer* Install Wizard automatically installs the necessary files to the computer's hard drive. USB*Tracer* software is installed in the **C:\Program Files\CATC\IBTracer** directory unless you specify otherwise. Follow the installation instructions on your screen.

3.9 IB*Tracer* Program Startup

You can start the IB*Tracer* program from the desktop or from the installed directory. The program always begins with its main screen active:



When the program is used with the USB*Tracer* Protocol Analyzer attached to the computer, you can set trigger conditions, record, monitor, and analyze the activity of your InfiniBand device or fabric. When used without the Analyzer, the software serves as a Trace Viewer for viewing traces made on other systems.

3.10 Making a Recording

After installation, the software is configured to make a Snapshot recording of InfiniBand traffic.

To make your first recording of this traffic,

Step 1 Connect InfiniBand cables to both InfiniBand connectors on the front panel of the IB*Tracer* 4X module and plug the other ends into the device under test.

Step 2 Cause the device under test to generate InfiniBand traffic.

Step 3 Click

on the Tool Bar.

After 16 Mbytes of traffic is recorded, the analyzer will upload the data and display the packets.

To terminate the recording before Inquiry timeout occurs,

Step 4 Click

on the Tool Bar at any time before recording automatically terminates.

When the recording session is finished, the traffic is saved to the hard drive as a file named ***data.ibt*** *or whatever name you assign as the default filename.*

To save a current recording for future reference,

Step 5 Select **Save As** under **File** on the Menu Bar.

OR

Click *on the Tool Bar.*

You see the standard ***Save As*** *screen.*

Step 6 Give the recording a unique name and save it to the appropriate directory.

4. Updates

As modifications are made to the IB*Tracer* Analyzer, it is necessary to update the IB*Tracer* software, firmware, and/or BusEngine optimal performance. Updates can be performed either automatically or manually. This chapter describes both procedures.

4.1 Software, Firmware, and BusEngine Revisions

The **Readme.txt** file on the first installation disk or CD-ROM and in the installed directory gives last-minute updates about the current release. Included with each release are the most recent downloadable images of the Firmware and the BusEngine. The **Readme.txt** file lists the latest versions and informs you if new Firmware or a new BusEngine needs to be updated in your hardware.

Once the Analyzer has completed the self diagnostics and is connected to the PC, you can check the latest revision of the software and BusEngine by selecting **About IBTracer** from the Help menu:

About IB*Tracer* details revisions of the following software and hardware:

- IB*Tracer* Software Version
- IB*Tracer* Firmware & ROM Versions
- BusEngine Version
- Unit Serial Number

Note When contacting CATC for technical support, please have available all the revisions reported in the **About IBTracer...** window.

4.2 Software Updates

When a new IB*Tracer* software release is available, it is posted on the Support page of the CATC website at **www.catc.com/support.html**.

To update the IB*Tracer* software,

Step 1 In the **About IBTracer** screen, verify which version of IB*Tracer* Software you are currently running.

Step 2 Find the latest released software version on the CATC website under **www.catc.com/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 3.*

Step 3 Click on the first link to download the zipped Disk 1 files for your operating system.

Step 4 Unzip the files into your choice of directory.

Step 5 Click **Start**, then **Run**, and browse to where you unzipped the files.

Step 6 Select the program named **Setup** and click **Open**.

Step 7 Click **OK** to run the Setup and begin the installation.

Step 8 Follow the on-screen instructions to complete the installation.

Step 9 Read the Readme file for important information on changes in the release.

4.3 License Information

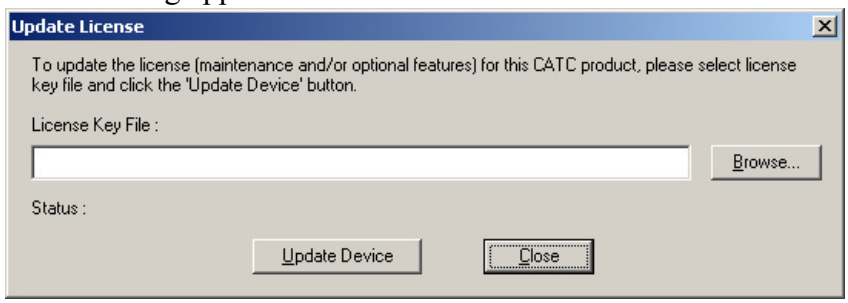
Licensing information for IB*Tracer* can be viewed by selecting Display License Information from the Help menu. The License window provides maintenance expiration and features data for IB*Tracer*.

Updating the Software License

License keys are necessary to enable software maintenance and SDP and SRP decoding. If they are not enabled, a message appears if an attempt is made to access these features, stating that a license key is necessary to in order to use the features.

To access these tools, a License Key must be obtained by CATC. Once the License Key is obtained, follow these steps to install it:

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

4.4 BusEngine and Firmware Updates

BusEngine and Firmware updates often need to be performed when you update the IB*Tracer* software. These updates can be performed automatically or manually. Both processes are described.

Updating the BusEngine

The BusEngine core is the heart of the IB*Tracer* Analyzer. Using FPGA technology, the BusEngine incorporates both the high speed recording engine and the configurable building blocks that implement data/state/error detections, triggering, capture filtering, external signal monitoring, and event counting and sequencing. Both the BusEngine program and the Firmware that manages the internal microcontroller are fully field updateable.

Within a new software release, it may be necessary to update the Analyzer's BusEngine hardware for proper operation. The Readme file lets you know if this is necessary.

Updating the Firmware

Within a new software release, it may also be necessary to update the Analyzer's firmware for proper operation. The Readme file informs you if this is necessary.

Automatic Updates

When the IB*Tracer* software is updated, the software may become incompatible with the BusEngine and Firmware. If a recording is attempted, IB*Tracer* displays a warning message and then automatically begins an update process for the BusEngine and Firmware. If preferred, you can abort this update and do the steps manually, as described later in this chapter.

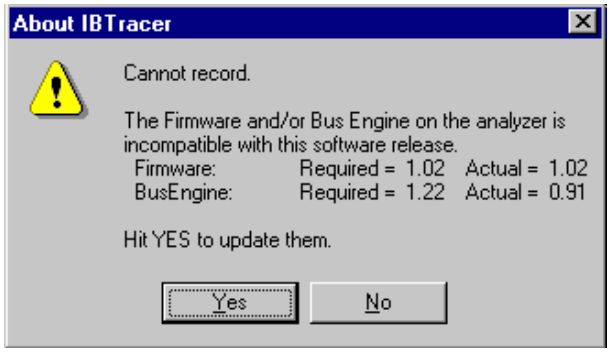
To automatically update the BusEngine and Firmware,

Step 1 If needed, update the IB*Tracer* software using the steps outlined in "Software Updates" described above.

Step 2 Turn on the Analyzer.

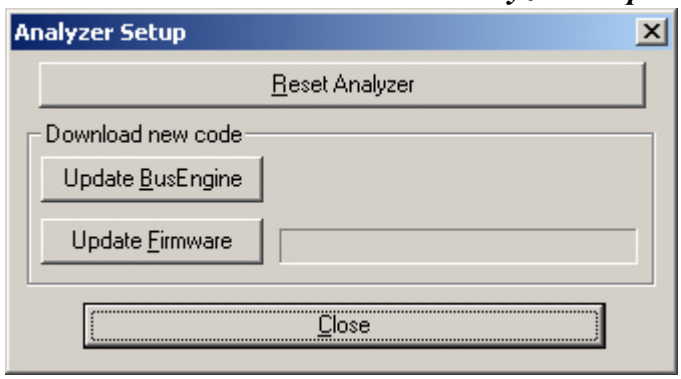
Step 3 On the toolbar, click the REC button.

Because the BusEngine and/or the Firmware are incompatible with the current IBTracer software version, an error message will appear displaying your current versions and indicating what versions you need to install.



Step 4 Click Yes.

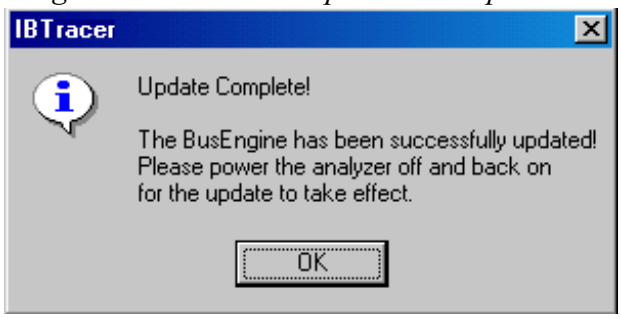
*The above window closes and the **Analyzer Setup** window opens.*



Step 5 Click **Update BusEngine** or **Update Firmware** on the **Analyzer Setup** screen.

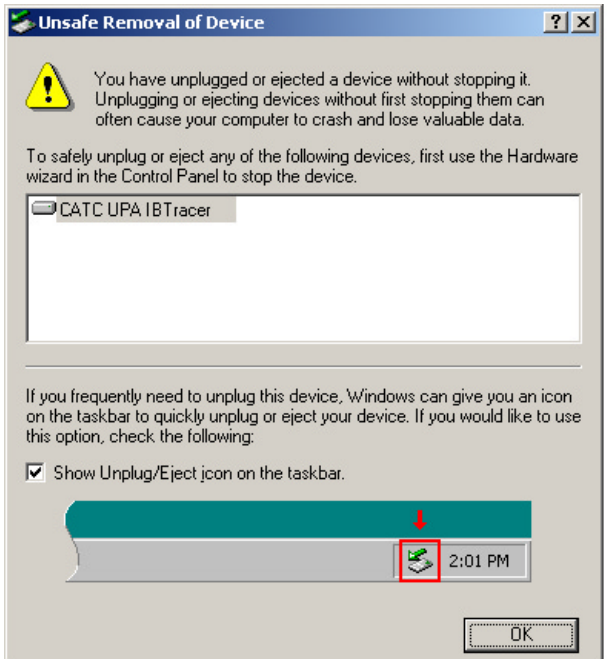
You can select only one item at this point. If both the BusEngine and the Firmware need to be updated, the update will complete for the first item and then return to the above screen so the second update can be performed.

If you are running Windows 98SE, you will get the following message when the second update is completed:



Step 6 Power cycle IB*Tracer* to complete the update.

Note You must power cycle the analyzer for all BusEngine updates.

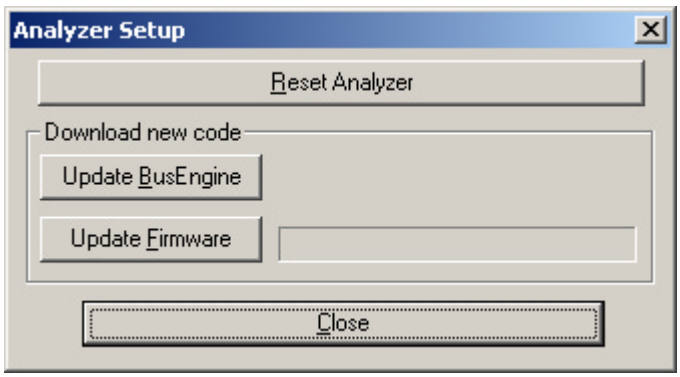


Manual Updates

You can manually update the IB*Tracer* BusEngine by following these steps:

Step 1 Select **Analyzer** under **Setup** on the Menu Bar.

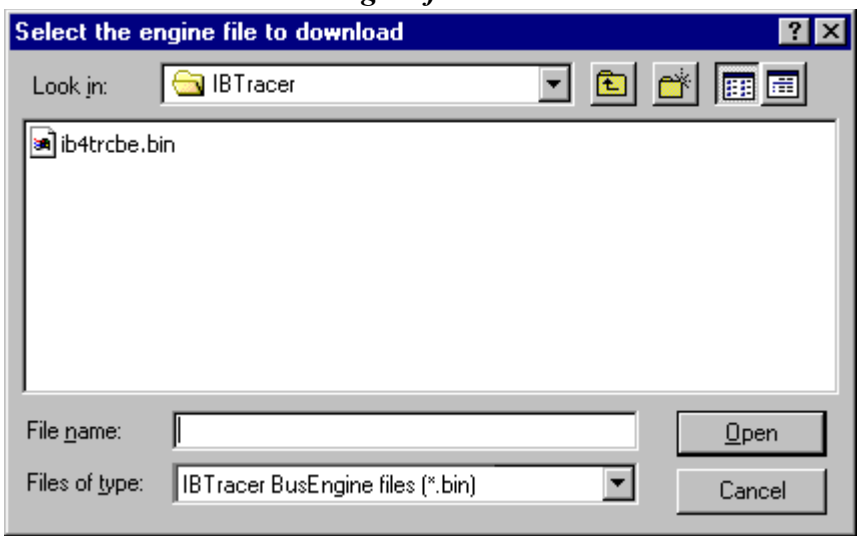
*You see the **Analyzer Setup** screen:*



To update the BusEngine,

Step 2 Click **Update BusEngine** on the **Analyzer Setup** screen.

*You see the **Select engine file** window:*



*The program has already automatically searched for the correct file and displays it in the **File name** field.*

Note The most current BusEngine file (**ib4trcrbe.bin**) was copied to your **\CATC\IBTracer** directory when you installed the program.

Step 3 Click **Open**.

Step 4 Power cycle the Analyzer.

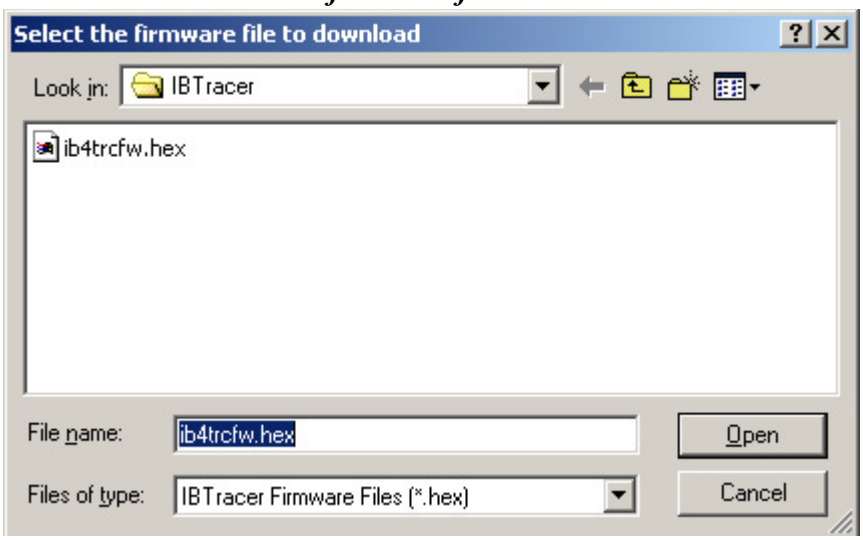
Re-initialization takes a couple of minutes.

Manually Updating the Firmware

To manually update the firmware,

Step 1 Click **Update Firmware** on the **Analyzer Setup** screen.

*You see the **Select firmware file** window:*



*The program has already automatically searched for the correct file and displays it in the **File name** field.*

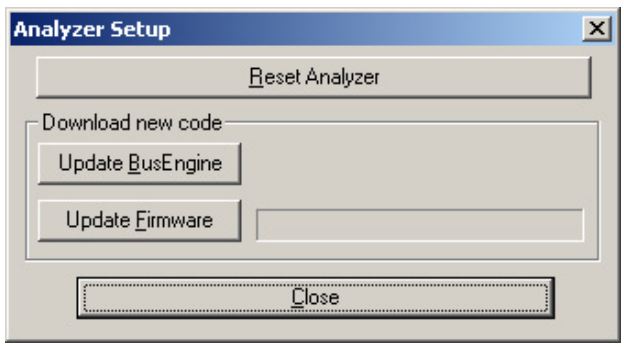
Step 2 Click **Open**.

The Analyzer updates the Firmware.

Step 3 Unplug the USB cable from the back of the Analyzer unit and then reinsert it so the new Firmware update can take effect.

4.5 Resetting the Analyzer

The Analyzer Setup window contains a reset button at the top of the window. Its function is the equivalent of power cycling the Analyzer.



It is not necessary to restart the Bus & Protocol Analyzer Analyzer. The Bus & Protocol Analyzer Analyzer takes approximately 25 seconds to reinitialize. During this time the UPAS Status LED is on, indicating that power-on diagnostics are being run. If there is a hardware failure, the Trigger LED will blink after initialization is complete. If this occurs, contact CATC for customer support.

5. Software Overview

5.1 The Main Display Menus

While some of the analyzer's Main Display window options are familiar, many contain options specific to the analyzer program.

Table 1: Main Display Pull-Down Menus

Menu	Function
File	
Open...	Opens a trace file.
Close	Closes the current file.
Save As...	Saves all or a specified range of packets from the current file with a specified name.
Print...	Prints part or all of the current trace file.
Print Preview	Displays an on-screen preview before printing.
Print Setup...	Sets up your current or new printer.
Edit Comment...	Creates or edits the Trace file comment field.
Export>>	Saves all or part of a trace to a text file or to a.dat file.
Last File	Lists the last files that were opened.
Exit	Exits the IB*Tracer* program.
Setup	
Display Options...	Provides the control of various display options such as color, formats, and filters.
Recording Options...	Provides setup options for recording, triggering events, and filtering events.
Analyzer...	Allows the operator to reset the Analyzer or update the BusEngine and Firmware.
Record	
Start	Causes the Analyzer to begin recording InfiniBand activity.
Stop	Causes the Analyzer to stop recording InfiniBand activity.
Report	
File Information	Summarizes key facts, such as the number of packets and triggering setup.
Error Summary	Displays an error summary of the current trace file and allows you to go to a specific packet, and save the error file to a uniquely named file.
Timing Calculation	Starts the calculator dialog for calculating various timing and bandwidth parameters in the recording file.
Traffic Summary	Summarizes in table format the number and types of packets that were transferred during the recording.
Bus Utilization	Opens a window with graphs of bus usage for the open trace.

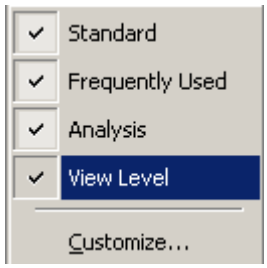
Menu	Function
Search	
Go to Trigger	Positions the display to the first packet following the trigger event.
Go to Packet/Operation/ MAD...	Positions the display to the indicated packet, Operation, or MAD.
Go to Marker »	Positions the display to a previously marked packet.
Go to »	Enables searching for specific events using a cascade of pop-up menus.
Find	Allows complex searches.
Find Next	Repeats the previous Find operation. Also use F3 to find next.
Search Direction	Allows you to specify a forward or backward search of a trace file.
View	
Toolbars	Displays list of available toolbars. Has a customize command for creating.
Status Bar	Switches display of the Status Bar on or off.
Real-Time Statistics	Allows viewing of statistical data as it happens.
Expand	Allows field headers to be expanded.
Collapse	Allows packet headers to be collapsed.
Show/Hide	Allows different types of packets to be hidden or displayed.
Compound Show/Hide	Lets you selectively show or hide multiple items from the trace.
Zoom In	Zoom in increases the size of the displayed elements.
Zoom Out	Zoom out decreases the size of the displayed elements.
Wrap	Allows the display to wrap.
Decoding Assignments	Opens a dialog box for creating or editing protocol assignments to connections.
Resolve Reliable Connections	Opens a dialog box for resolving Unresolved Reliable connections within the open trace.
Packets Level	View packet level.
Transport Functions Level	View/Hide Transports Functions Level.
MADs Level	View/Hide MADs Level.
SADM Level	View/Hide Subnet Administration Level.
SDP Level	View/Hide Sockets Direct Protocol Level.
SRP Level	View/Hide SCSI RDMA Level.

Menu	Function
Window	
New Window	Switches display of the Tool Bar on or off.
Cascade	Displays all open windows in an overlapping arrangement.
Tile	Displays all open windows in a side-by-side arrangement.
Arrange Icons	Arranges minimized windows at the bottom of the display.
Windows	Displays a list of open windows.

Help	
Help Topics	Displays online help.
Update License	Displays a dialog box for entering updated license information.
Display License Information	Displays version information about IB*Tracer* 4X, its firmware, and BusEngine.
About IB*Tracer*	Displays version information about IB*Tracer*.

5.2 View Options

You can hide, display or reset toolbars by selecting **View > Toolbars** from the menu bar.



Resetting the Toolbar

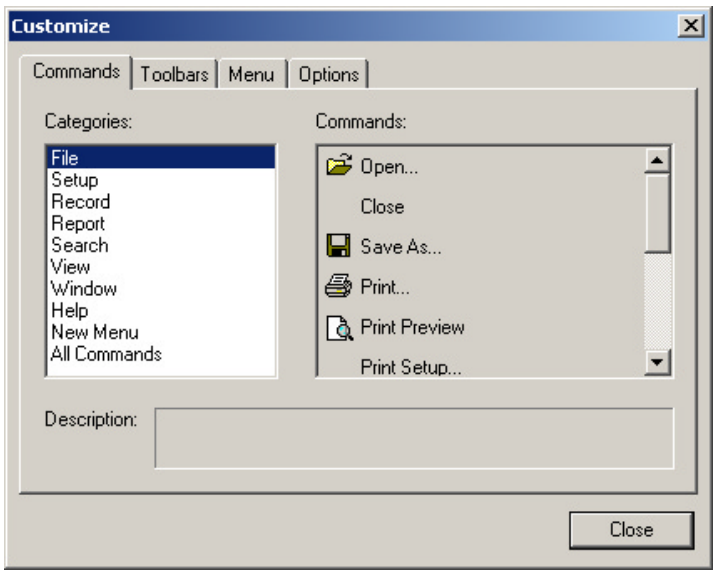
From time to time (such as following a software upgrade) it is possible for the buttons on the toolbar to not match their intended function.

To reset the toolbar,

Step 1 Select **View >Toolbars** from the menu bar.

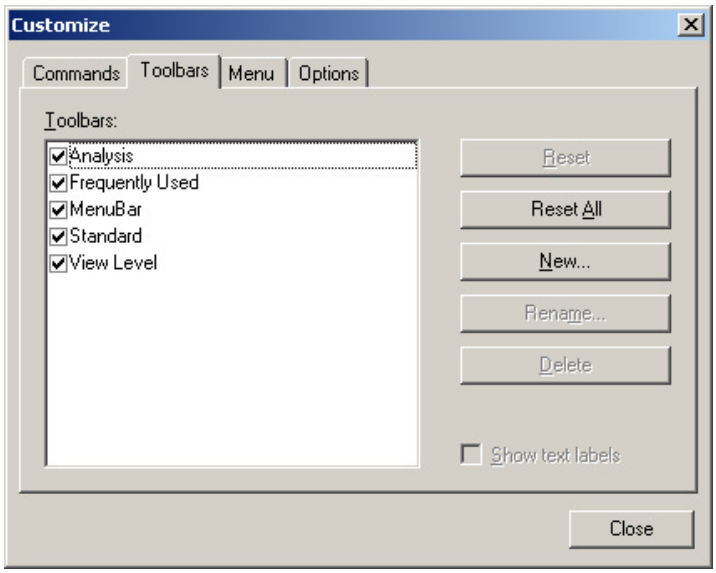
Step 2 Select **Customize** from the sub-menu.

The following dialog box will open.



Step 3 Select the **Toolbars** tab.

The following dialog box will open.



Step 4 Click the **Reset All** button.

The toolbar resets to the factory defaults.

Tool Bar

The Tool Bar provides access to the most popular program functions. Tool tips describe icon functionality as the mouse arrow is moved over the icon/item.

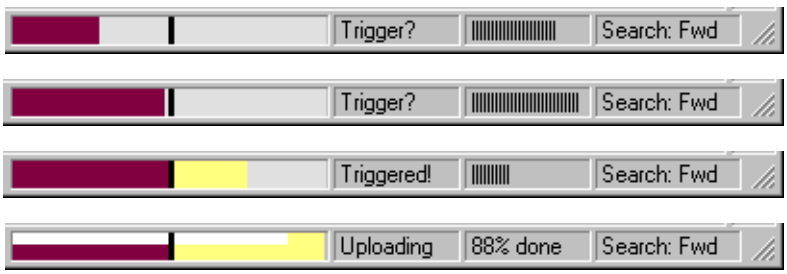
	Open file		Apply User Defined Hiding
	Save As		Find
	Preview		Find Next
	Print…		Error Summary
	Setup Record Options		Timing Calculations
	Setup Display Options		Traffic Summary
	Start Recording		Bus Utilization
	Stop Recording		Display Real-Time Statistics
	Break and Restore IB Link		File Information Report
	Zoom In		View Packet Level
	Zoom Out		View/Hide Transport Functions Level
	Wrap		View/Hide MAD Level
	Hide Link Packets		View/Hide Subnet Administration Level
	Hide Training Sequences		View/Hide Sockets Direct Protocol Level
	Hide Skips		View/Hide SCSI RDMA Level

5.3 Status Bar

The Status Bar is located at the bottom of the main display 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:



As recording progresses, the Progress Indicator changes to reflect the recording progress graphically:

- In the Progress Indicator, a black vertical line illustrates the location of the Trigger Position you selected in Recording Options.
  - — Pre-Trigger progress is displayed in the field to the left of the Trigger Position in the before-Trigger color specified in the Display Options.
  - — 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 Position fills in the post-Trigger color specified in the Display Options.
  - — 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.

You should be aware of two exceptional conditions:

- 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 Bar adjusts accordingly to begin uploading the most recently recorded data.

If you wish to abort an upload that is in progress, click the **Stop** button again.

The Progress Bar 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 activity, the current Recording Status is temporarily displayed in the next segment. When you activate the **Record** function, this segment flashes one of the following messages (depending on the selected Recording Options):

— Trigger?

— Triggered!

— Uploading

After recording stops,

— The flashing message changes to **Uploading data–*x*% done** (**x%** indicates the percentage completion of the data uploading process).

— The traffic data is copied to disk (overwriting any previous version of this file) using the default file name **data.ibt** or a new name specified in the Recording options.

To abort the upload process,

Press **Esc** on your keyboard

OR

Again click in the Tool Bar.

You are prompted to choose whether to keep the partially uploaded data or to throw it away.

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 packet following the Trigger (or the packet 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 packet in the traffic file.

Analyzer Status

The third segment in the status bar displays analyzer status. During uploading, this segment displays the percent of the upload process completed.

Note If packets are filtered from the recording or data are truncated, the recording activity is reduced.

Search Status

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

Zoom In

Zoom In increases the size of the displayed elements, allowing fewer (but larger) packet fields per screen.

Click on the Tool Bar.

Zoom Out

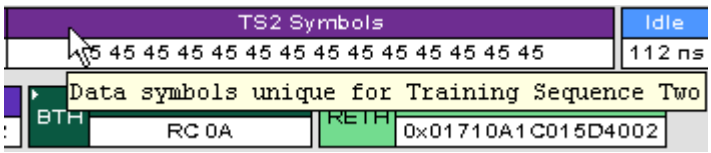
Zoom Out decreases the size of the displayed elements, allowing more (but smaller) packet fields per screen.

Click on the Tool Bar.

5.4 Tool Tips

Throughout the application, tool tips provide useful information.

To display a tool tip, position the mouse pointer over an item. The tool tip displays in a short moment if present. Tool tips can also be found over the Tool Bar and in areas of the packet view screen.



5.5 IB*Tracer* Analyzer Keyboard Shortcuts

The following table shows the keyboard shortcuts available in IB*Tracer.*

Table 2: Keyboard Shortcuts

Key Combination	Operation
Ctrl+O	Open the file
Ctrl+P	Print
Ctrl+S	Save the file
Ctrl+Home	Jump to first packet
Ctrl+End	Jump to last packet
F3	Find Next
F6	Next Pane
Shift+F6	Previous Pane
Ctrl+B	Search Backward
Ctrl+F	Search Forward
Shift+Insert	Paste
Ctrl+Home	Jump to first packet
Ctrl+R	Start recording
Ctrl+T	Stop recording

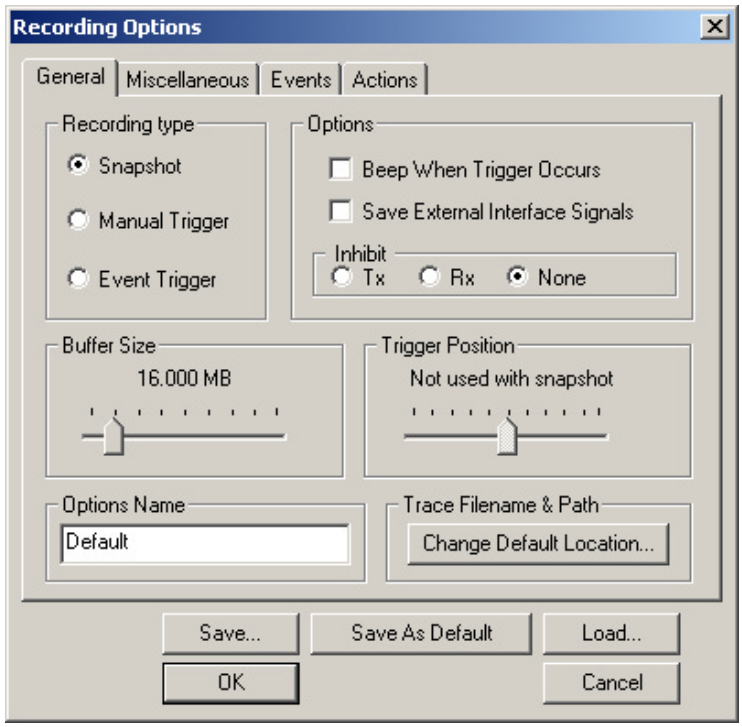
6. Recording Options

The **Recording Options** dialog box controls how IB*Tracer* records InfiniBand data. At the top of the Recording Options dialog box are four tabs that provide access to dialog boxes called General, Miscellaneous, Events, and Actions. Using these dialog boxes, you can configure IB*Tracer* to create event triggers, increase or decrease memory allocation for recording, and interact with other InfiniBand devices in different ways.

6.1 Opening the Recording Options Dialog Box

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

The **Recording Options** window appears displaying the General tab.



The **Recording Options** window has four tabs marked

- **General**
- **Miscellaneous**
- **Events**
- **Actions**

6.2 Recording Options - General

The General tab opens a window shown in the previous illustration made up of four main boxes marked *Recording Type, Buffer Size, Trigger Position,* and *Options*.

Recording type

The **Recording Type** box presents three options that allow you to set how IB*Tracer* begins and ends a recording. The options are: *Snapshot, Manual Trigger,* and *Event Trigger.*

Snapshot

Fixed-length recording whose size is determined by the "Buffer Size" box in the Recording Options dialog or by a manual click of the Stop button. Recording begins by clicking REC on the Tool Bar and ends when either the selected buffer size is filled or you press the Stop button.

Manual Trigger

Recording whose Trigger point is caused by pressing the Trigger button on the front panel.

Recording is begun by pressing REC on the Tool Bar. Recording continues in a circular manner within the limits set by the buffer size. Recording ends when STOP is clicked on the Tool Bar or the Trigger button is pressed on the analyzer's front panel. If you press the Trigger button, recording will continue until the post-trigger memory has been filled.

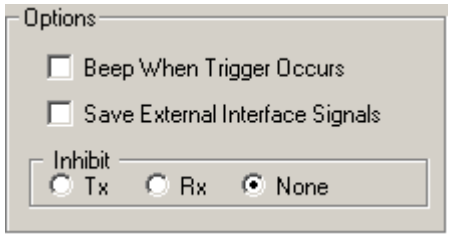
Event Trigger

Recording whose Trigger is defined by a specific event or events. Before recording begins, you define the event trigger in the Events Recording Options dialog box (accessible by selecting **Setup> Recording Options >Event**s from the menu). You begin the recording by clicking REC on the Tool Bar. Recording continues in a circular manner within the limits set by the buffer size. Once the trigger event occurs, some post-trigger recording occurs, then the recording ends.

Note In this mode, the recording can be stopped manually in the same way as for "manual trigger" mode.

Options

The Options box contains the following:



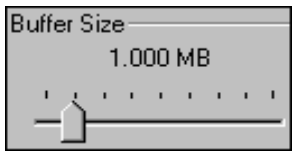
Beep When Trigger Occurs
Causes the PC to beep when a trigger event has occurred.

Save External Interface Signals
Causes the analyzer to save external interface signals from a break-out board as fields in the trace.

Inhibit
Allows you to block the IB*Tracer* reception of transmit and/or receive link activity. When a direction is inhibited, none of the other recording events will be detected.

Buffer Size

The Buffer Size box has a slide bar for adjusting the recording buffer size from 1.6 megabytes to 2048 MB.



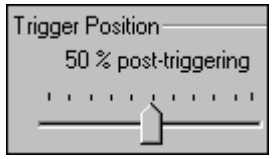
The Recording Type option determines how this buffer is used. Although there are 2048 MB of physical memory in the Analyzer, the efficiency of the recording ranges from 2:1 to 4:1 ratios of physical memory to actual InfiniBand traffic. Shorter InfiniBand packets yield a less efficient recording. The non-traffic portion of physical memory is utilized for control and timing information.

You must have an equivalent amount of physical memory on the computer controlling the IBTracer analyzer.

Note The scale is not linear and affords more granularity in the smaller buffer sizes.

Trigger Position

The Trigger Position slide bar sets the amount of pre- and post-trigger recording. It also allows adjustment of 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 **Manual Trigger** or **Event Trigger** is selected as **Recording type**.



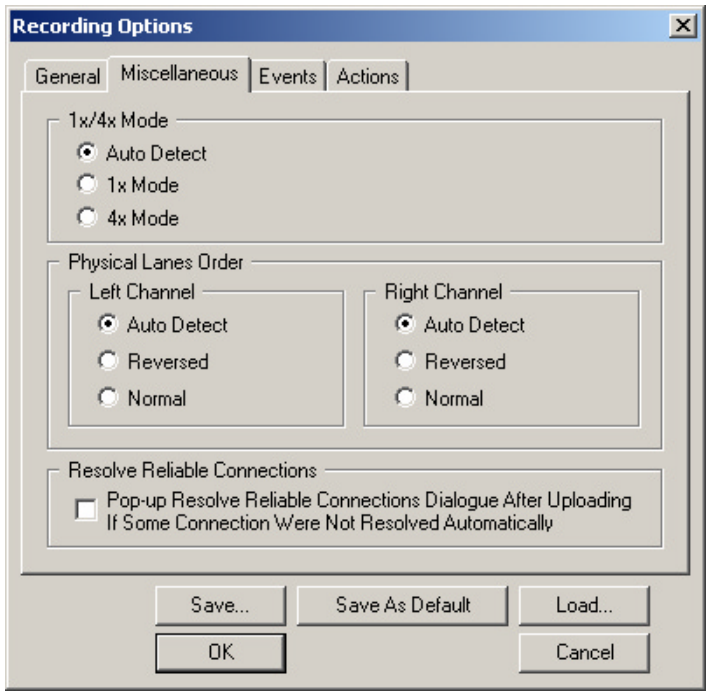
As an example, if the buffer size is set to 16MB, then for the following Trigger Position settings, the amount of pre- and post-Trigger data is

- 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.

6.3 Recording Options - Miscellaneous

The **Miscellaneous** tab presents options for setting the recording speed and the Resolve Reliable Connections dialog box.



1x/4x Mode

This setting lets you configure the recording speed. The selection you make forces a change in the physical layer. There are three choices: **Autodetect**, **1x Mode**, and **4x Mode**.

Note To change from one mode to another, first press the **Disconnect/Connect Link** button. The analyzer can only switch modes after it has detected a Disconnect event on the link.

Auto Detect - This option causes the analyzer determine the speed of traffic and record it accordingly.

Note When in Auto Detect mode, if the link becomes disconnected for any reason (for example, by unplugging the connector, by clicking the Disconnect/Connect button, or by the polling process), the analyzer will produce a "hybrid" recording. The first part of this hybrid recording will always be in 1x mode. If the analyzer detects a 4x link, it will eventually switch to 4x mode recording.

Note When the analyzer switches from 1x to 4x in Autodetect mode, the packet before and/or after the transition might include errors due to the transition itself.

1x Mode - Forces the analyzer to record traffic at 1x speed. This option activates only one physical lane. If used with a 4x device, 1x Mode will force the device to downgrade its link to1x and record the resulting 1x traffic.

4x Mode - Forces the analyzer to record traffic at 4x speed. When 4x is selected, all four lanes are physically active.

Physical Lane Order

Physical Lane Order options let you set the way the analyzer view lane order in a 4x link. **These options do not affect the link itself.** There are three settings for each channel:

Auto-detect - Allows the analyzer to determine lane order and to record accordingly.

Normal - Forces the analyzer to record traffic as normal.

Reversed - Forces the analyzer to record traffic as reversed.

Note If a link is forced into an incorrect state (for example, if a normal link is configured as reversed), then only skips will be recorded. Skips are recorded because, from a lane order perspective, they are symmetrical in composition.

Note To change the lane order, select one of the Lane Order options, then click OK. Afterwards, press the Disconnect/Connect Link button to break the link. The analyzer can only switch lane order after has detected a Disconnect event on the link.

Resolve Reliable Connections

This option causes the Resolve Reliable Connections dialog box to open automatically any time traffic is recorded where the analyzer is not able to resolve connections by itself - for example, if a recording were begun after connections were already established. The Resolve Reliable Connections dialog box lets you manually assign connections.

6.4 Recording Options - Events

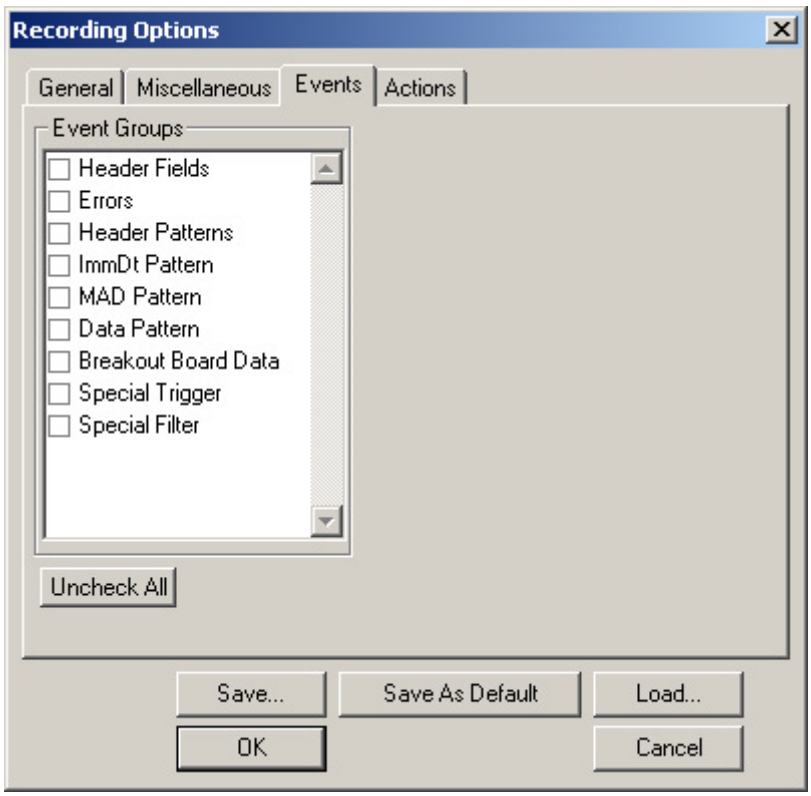
If you have selected **Event Trigger** mode under the **General** tab in the Recording Options screen, you can now select specific InfiniBand events using the **Events** tab on the **Recording Option** Screen. You can also use the **Actions** tab to define specific event sequences that will trigger IB*Tracer* 4X to record an InfiniBand session.

In addition, the **Events** and **Actions** screens allow you to specify which packets you want to include or exclude from the recording.

Events Options

Click the **Events** tab on the **Recording Options** screen.

*You see the **Event Groups** window:*

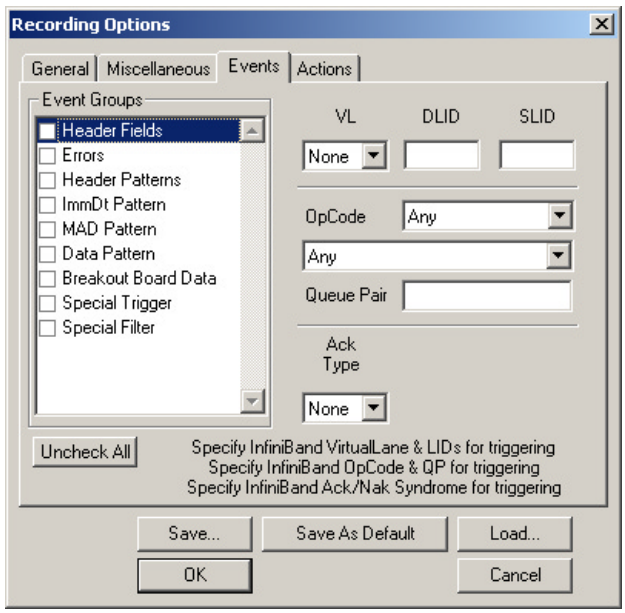


The **Events** window allows you to set event conditions for errors and/or a variety of packet characteristics.

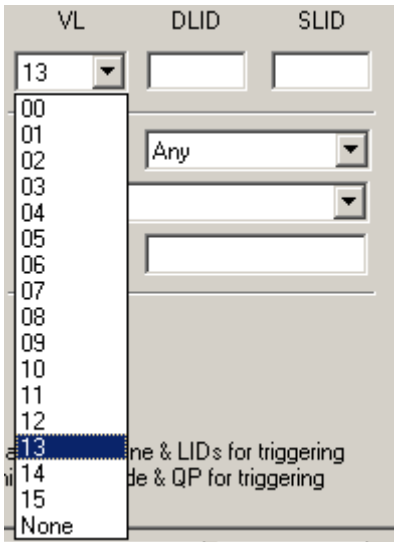
Clicking a check box causes further options to display in the right side of the window.

Header Fields

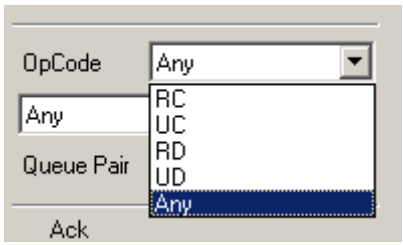
Clicking "Header Fields" causes edit fields to appear for setting conditions for Virtual Lanes (VL), DLID, SLID, Queued pairs and pull down menus for OpCode and Ack types.



Step 1 Select a Virtual Lane number from VL the drop-down list:

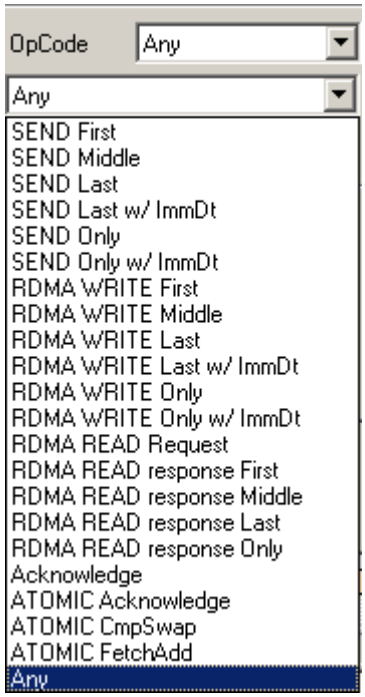


Step 2 From the OpCode list, choose RC, UC, RD, UD, or Any:



RC = Reliable Connection
UC = Unreliable Connection
RD = Reliable Datagram
UD = Unreliable Datagram
Any = Any connection/datagram

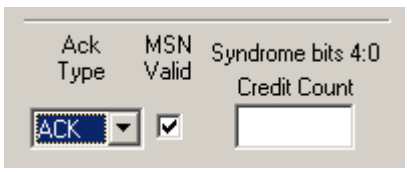
Step 3 From the second list, select one of the available choices:



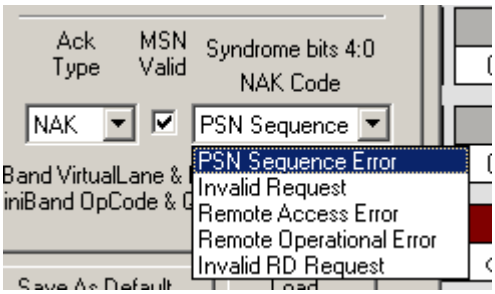
Step 4 Choose and ACK type:

ACK = Acknowledged
NAK = Negative Acknowledged
RNR NAK = Receiver not ready

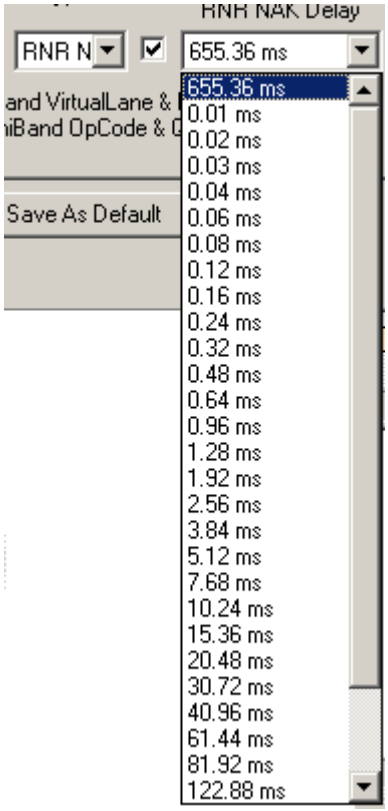
Step 5 For ACK, enter information in the Syndrome bits field and optionally check the "MSN Valid" (Message Sequence Number) box:



Step 6 For NAK, select an item in the NAK code drop-down list:

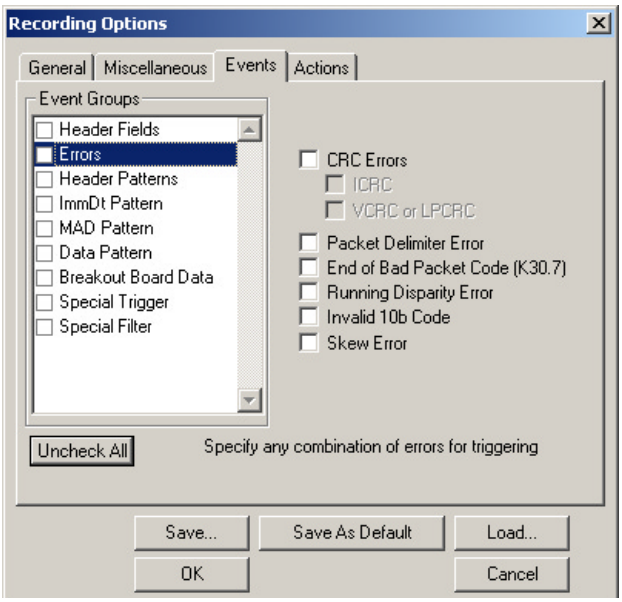


Step 7 For RNR, select a delay from the drop-down list:



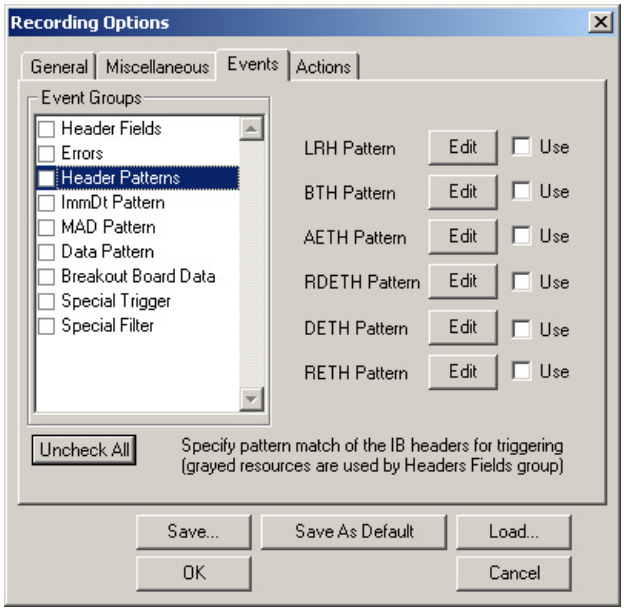
Errors

Clicking "Errors" causes the checkboxes to appear for setting conditions for triggering based on packet/signaling/protocol errors. You can select one or a combination of errors.

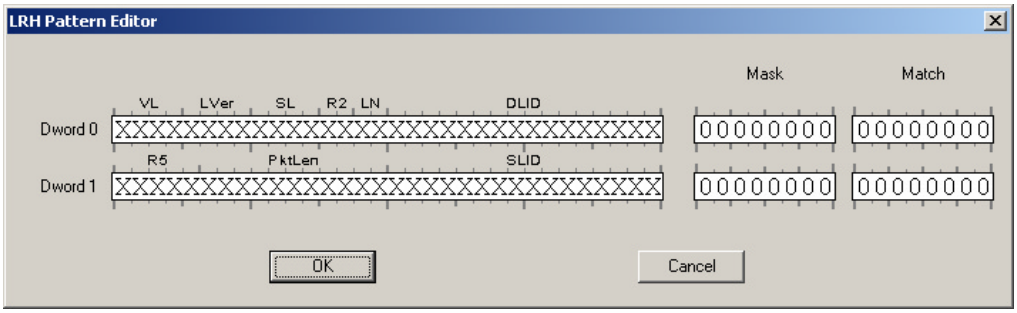


Header Patterns

Clicking "Header Patterns" causes fields to appear for setting conditions for signalling based on header patterns.

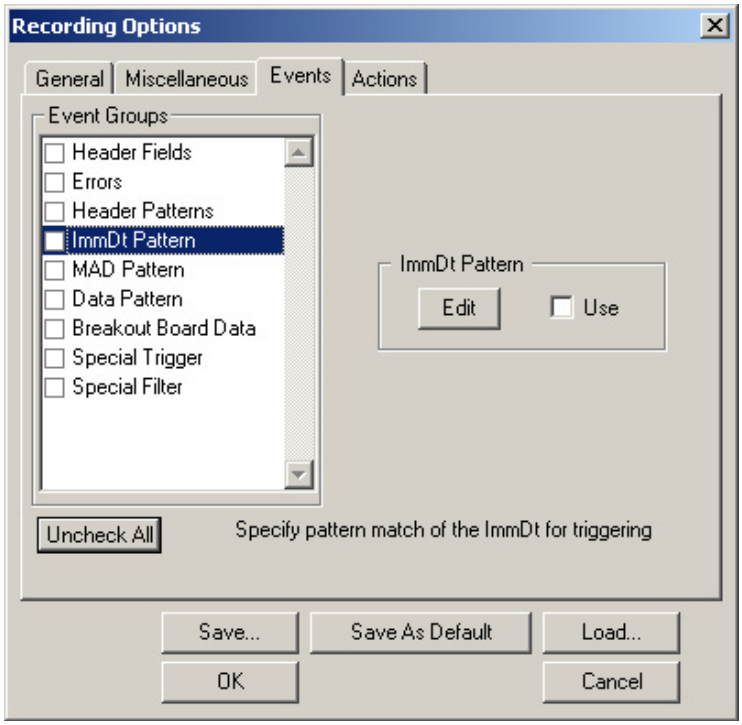


When you click an Edit button, a window opens that allows you to edit the patterns on a bit-by-bit or a hex mask and match basis. The following example is for LRH patterns, the edit windows are different from one pattern to another.

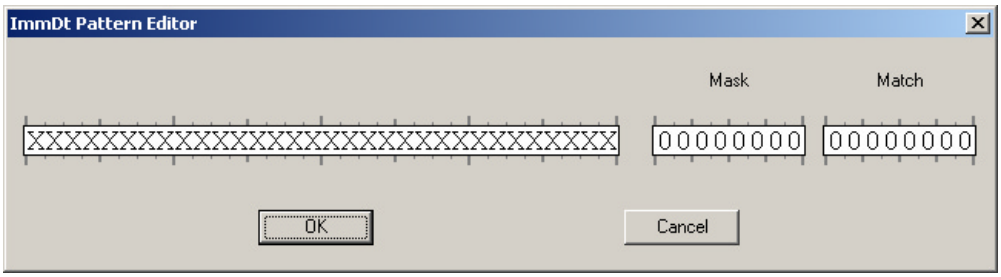


ImmDt Pattern

Clicking "ImmDt Pattern" causes an button to appear that allows you to edit the ImmDt Pattern bit by bit.

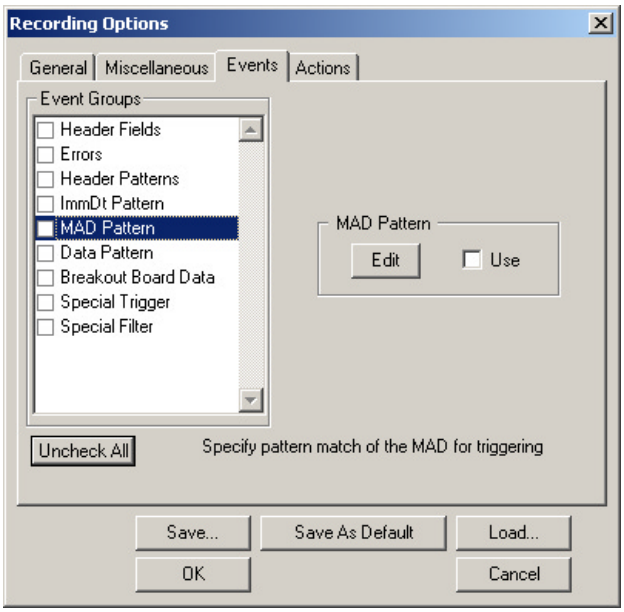


When you click the Edit button, a window opens that allows you to enter patterns on a bit-by-bit or hex mask and match basis.



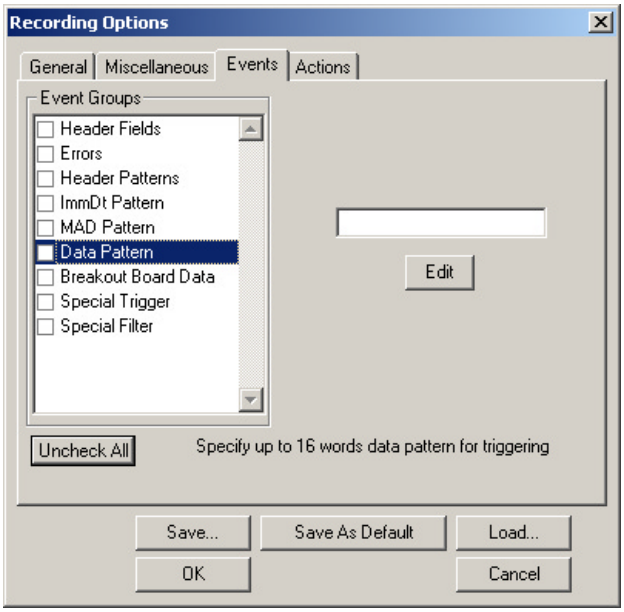
MAD Pattern

Clicking "MAD Pattern" allows you to edit the MAD Pattern on a bit-by-bit basis.



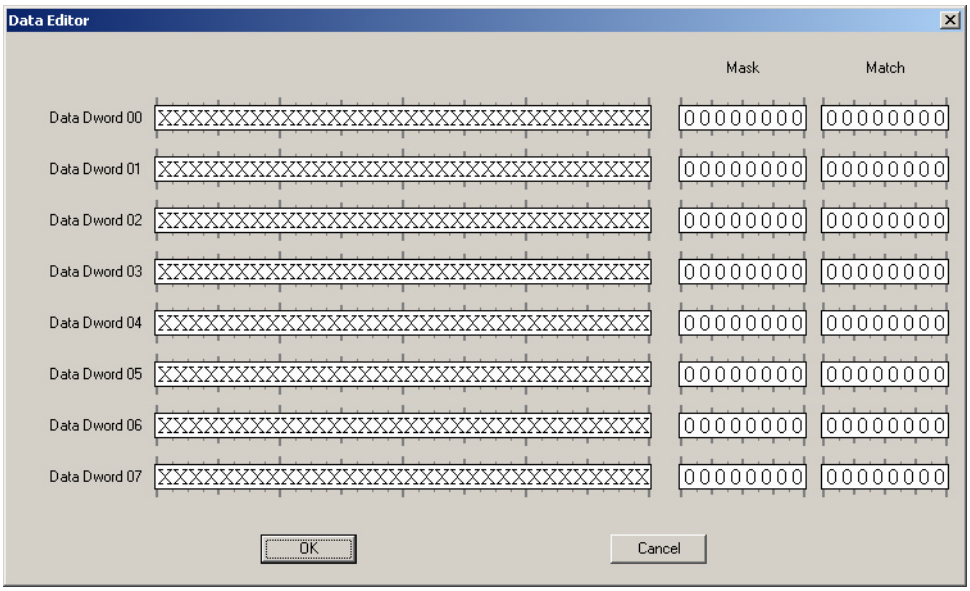
Data Pattern

Clicking Data Pattern allows you to edit the Data Pattern on a bit-by-bit basis.



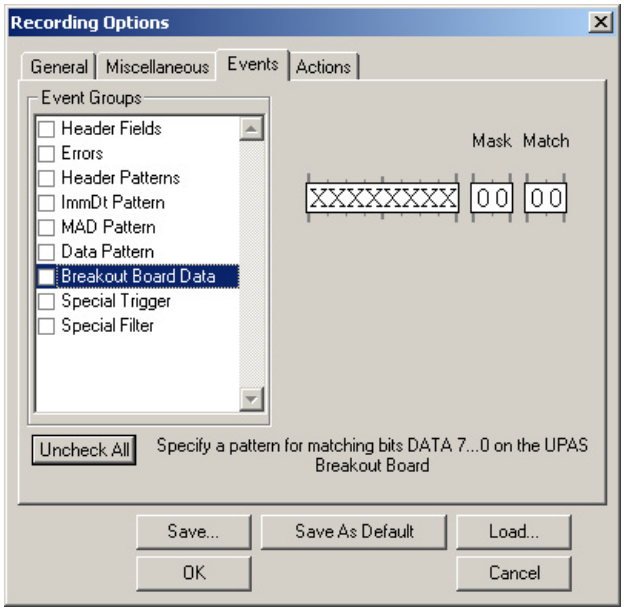
Enter a pattern of up to 16 words (256 bits) in the box located above the **Edit** button. This will set the Analyzer to trigger on the first instance of the pattern anywhere within the first 256 bits of the payload.

To define one or more patterns in specific locations within the payload, click the **Edit** button. A pattern editor will open that will let you enter data patterns on a bit by bit basis for up to eight dwords.



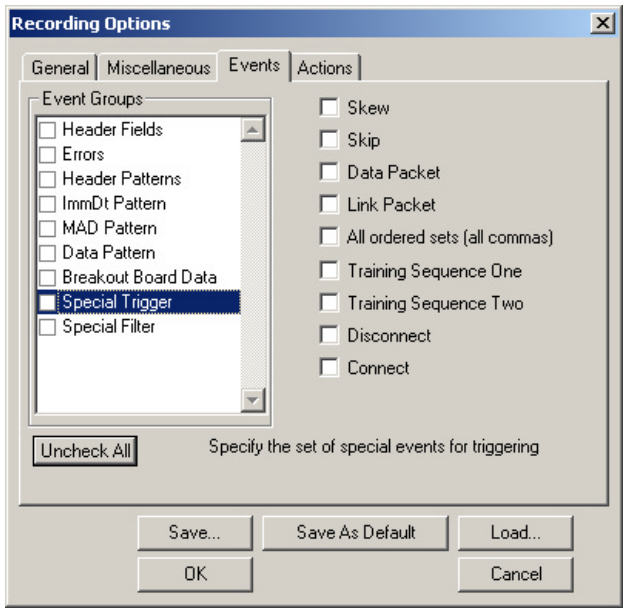
Breakout Board Data

Clicking "Breakout Board Data" causes a text field to appear that allows you to specify a pattern for the matching bits for the pins marked Data0 through Data7 on the UPAS breakout board. To use the breakout board, you will need to connect a DB-25 RS-232 cable to the connection marked Data In/Out on the back of the UPAS. Then use alligator clips to connect the data pins on the breakout board to the RS 232 cable.



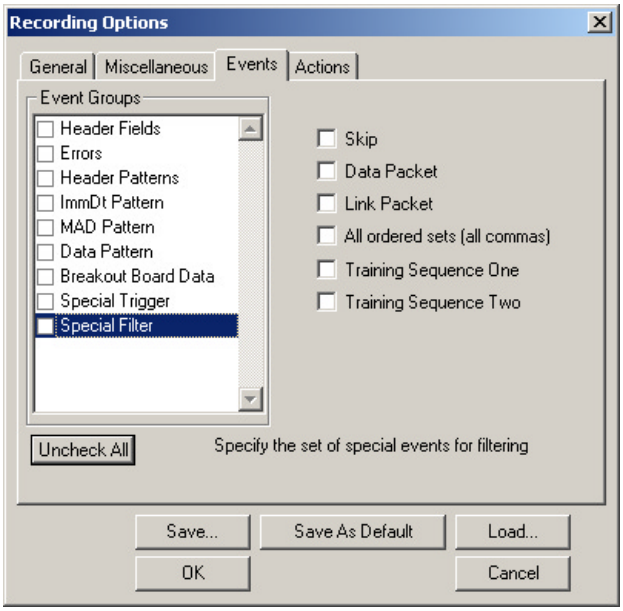
Special Trigger

Clicking "Special Trigger" causes check boxes to appear on the right for setting triggers on special types of events such as Data Packets and Link Packets. You can select one or a combination of events.



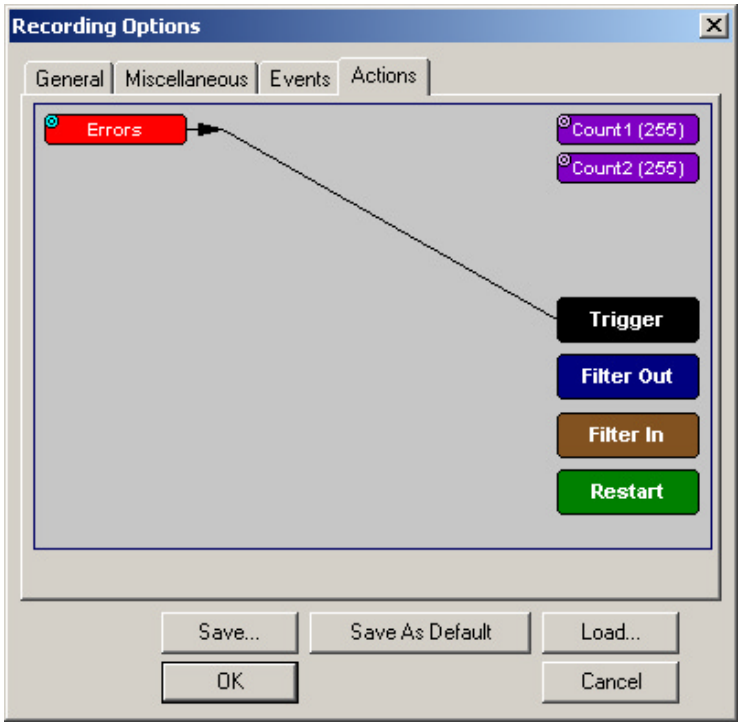
Special Filter

Clicking "Special Filter" causes check boxes to appear on the right for setting filters on special types of events such as Data Packets and Link Packets. You can select one or a combination of events to remove from trace recording.



6.5 Recording Options - Actions

The **Actions** screen is used to configure the type of action that the analyzer will perform when key events are encountered in the trace. The Actions window is like a chalk board - it graphically displays events and actions as buttons, and lets you establish relationships between them.

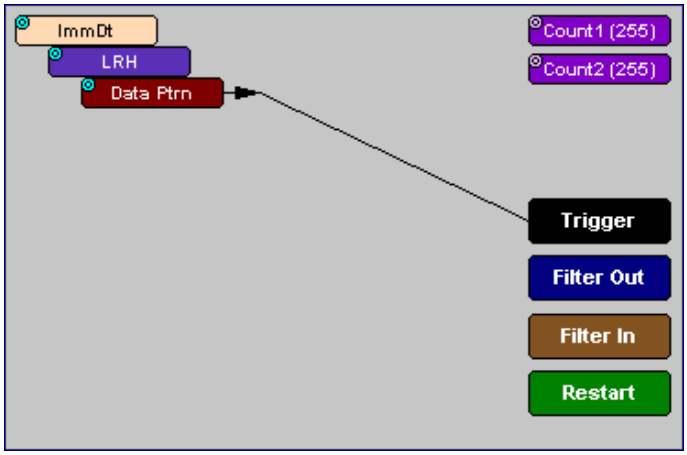


You can create simple or complex configurations in the **Actions** window. Simple configurations involve a single event and action - such as the example above. This example reads: "Trigger when the specified error occurs."

Complex configurations involve multiple events. Multiple events can be combined in different ways to create *event sequences* and *event counts*.

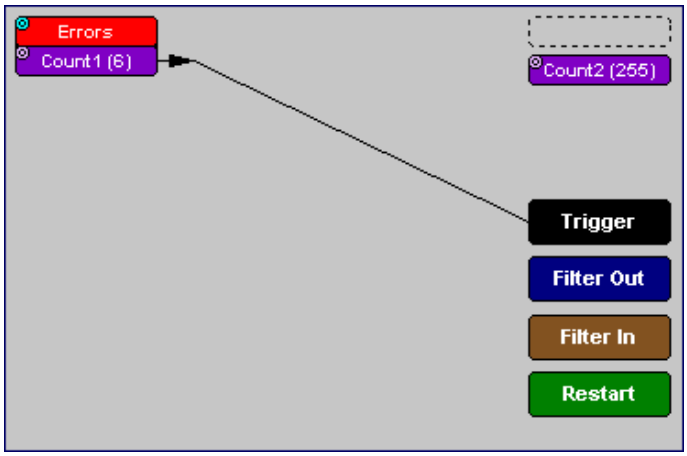
Event Sequences

An *event sequence* is two or more events (up to six) that are strung in a series to a trigger button.



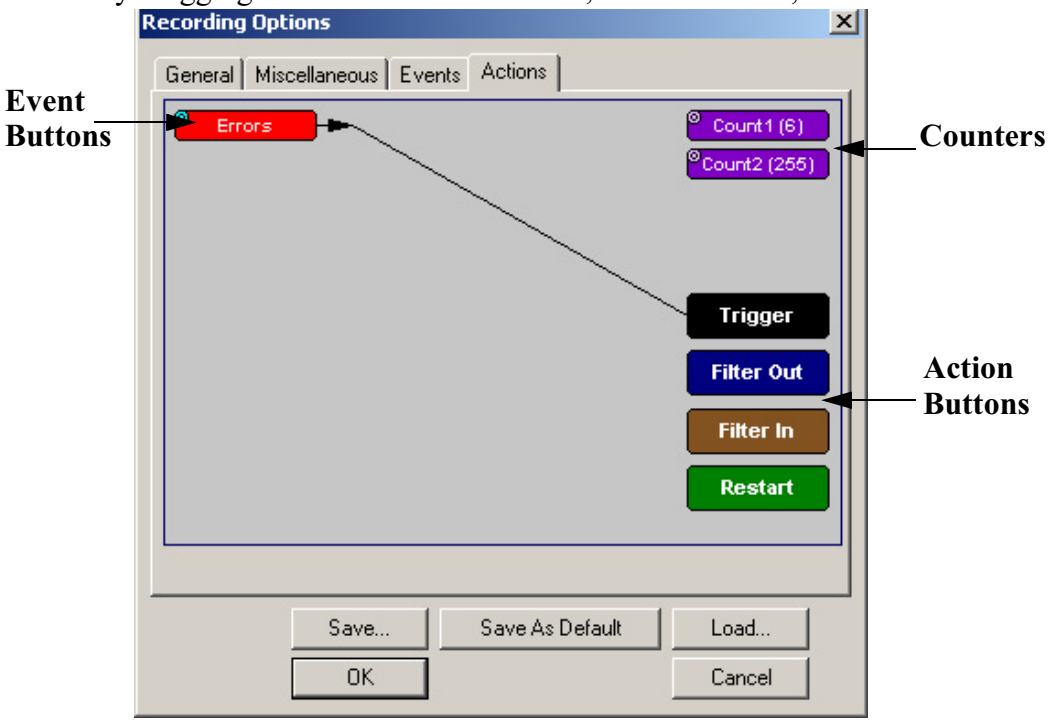
Event Counts

An *event count* is an Event button connected to a Counter button. An event count is a search for multiple instances of an event - such as six Errors. To create an Event count, you click on an Event button and then click on one of the counters on the right side of the window. As soon as you click on the counter, the Counter button repositions itself directly below the associated Event button. To set the counter to a particular value, click the blue dot in the corner of the button and enter a value (for details see "Counting Events" on page 60.)



Actions Window Layout

The Actions window displays three groups of buttons that can be connected by dragging the mouse: Event buttons, Action buttons, and Counters.



Event Buttons

Event buttons represent the events you selected in the Events window. These buttons are created automatically when you make your choices in the Events window. If no events are selected, no Event buttons will appear.

By default, Event buttons are connected to the Trigger button.

Action Buttons

Buttons marked **Trigger, Filter In, Filter Out,** and **Restart** are Action buttons. These buttons determine the outcome of an event.

Trigger Button - Triggers the end of the recording when an event occurs.

Filter In and Filter Out Buttons - Tells the Analyzer to filter in or out events from the recording. Filtering lets you exclude unwanted traffic so that you can preserve recording memory and thereby increase amount of desired traffic in your trace.

Restart - This button is used to restart *Counts* and *Event Sequences.* See below for an explanation of Counts and Event Sequences.

Counter Buttons

Buttons marked **Count1** and **Count2** are counters. Counters are used to create triggers based on several occurrences of the same packet type. Counters let you create configurations such as "Trigger following the 6th Error."

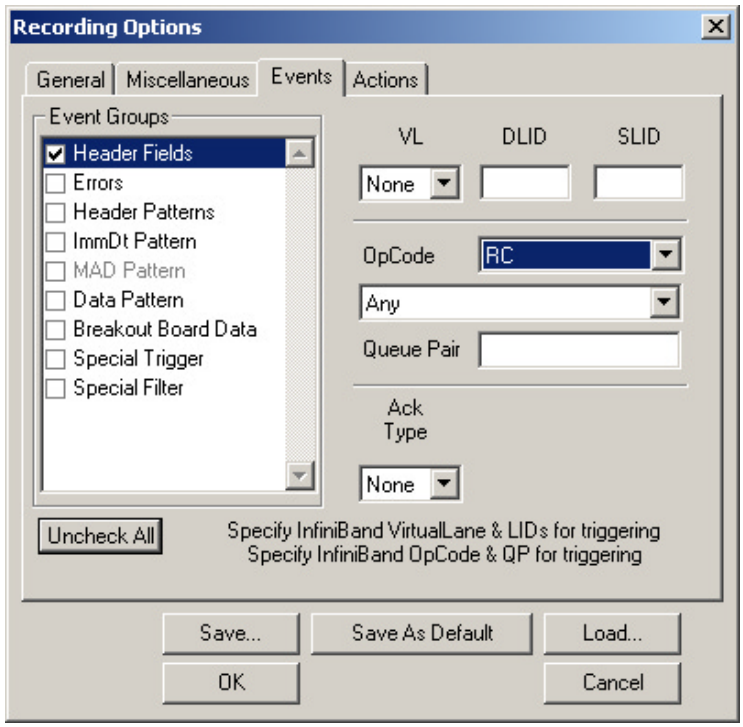
Counters only work with triggers. You cannot connect a counter to the **Filter In** or **Filter Out** buttons or to the **Restart** button.

6.6 Connecting Events to Actions

Event buttons can be linked to Action buttons by clicking on an Event button and then clicking on an Action button. A line will join the newly associated buttons.

The following steps show how to connect Event and Action buttons:

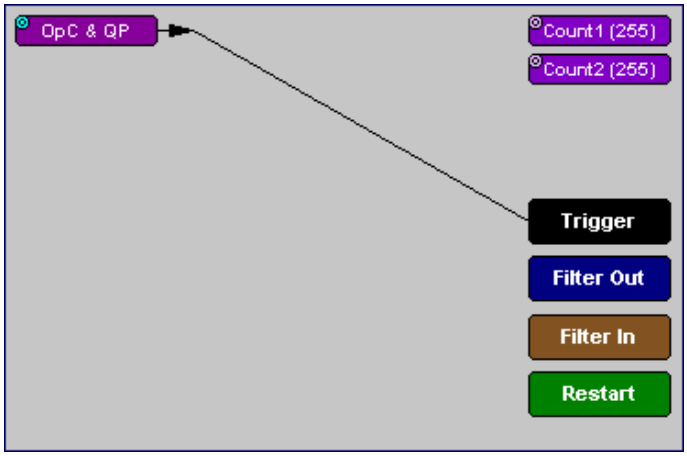
Step 1 Open the **Events** tab and select a single event.



Step 2 Click the **Actions** tab.

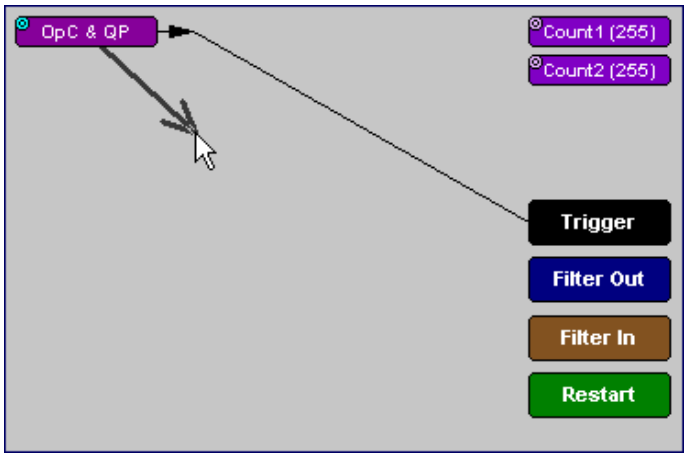
The Event you selected will display as a button on the left side of the Actions window. By default, this button will be connected to

the Trigger button. The configuration below reads "Trigger when a a packet with the specified header pattern occurs."

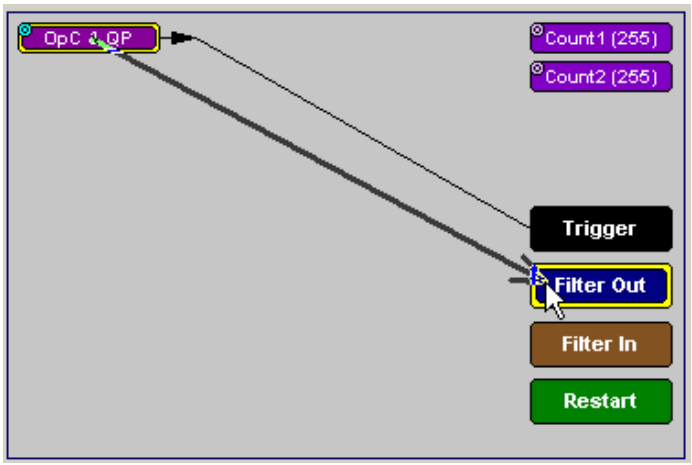


Step 3 Click on the Event button.

The elastic arrow appears.



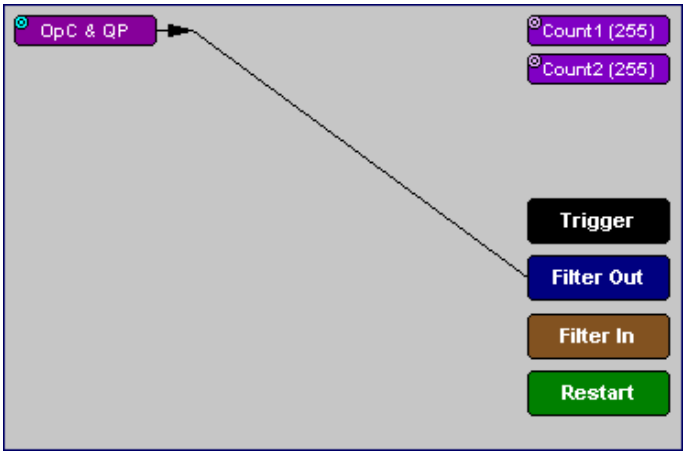
Step 4 Drag the arrow to the desired Action button.



Step 5 With the pointer over the desired Action button, click the left mouse button again.

The arrow is replaced with a black line, and the Event button is now connected to the Action button.

Note: Not all events can be connected to the Filter or Restart buttons (for example, Errors).

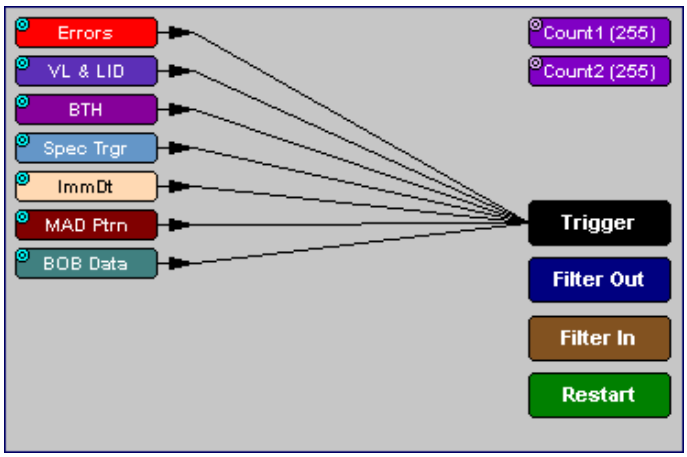


If an Event button is linked to a counter and then to a Trigger, it indicates that the analyzer should trigger following a count of several instances of the event. The number of times that the analyzer should count the event is determined by the number visible in the counter button. You set this number by clicking the blue dot in the counter and entering a value.

6.7 Triggering from an Event in a Set

When you select several events in the Events window, the Actions window will display the events as shown below. Each Event button will have its own connection to the Trigger button. In this configuration, the Analyzer will trigger a recording from any one of these events.

See the following example:



To trigger on an event in a set, follow these steps:

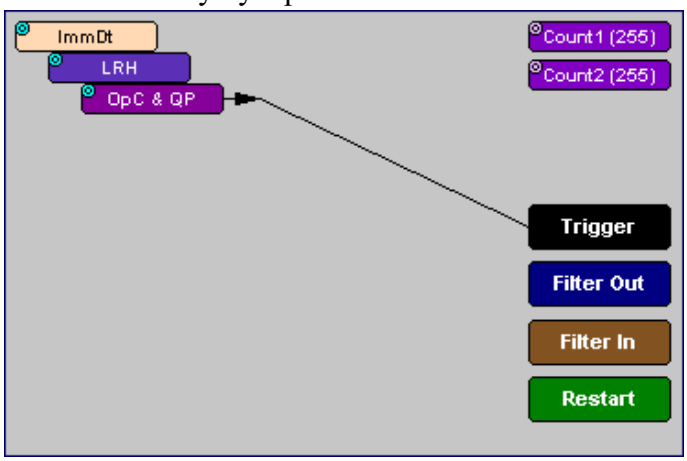
Step 1 From the Events window, select two or more events.

Step 2 Open the Actions window. The events will display as shown above.

6.8 Creating an Event Sequence

When multiple events are selected in the Events window, you create what is called an *event sequence*. An event sequence is the stringing together of events so that the analyzer triggers on the selected sequence in the specified order.

In the following example, the Analyzer is told to trigger when a packet occurs with an Immediate Data Pattern, followed by a packet with an LRH pattern, followed finally by a packet with a Header Pattern:



To create an event sequence, follow these steps:

Step 1 From the Events window, select two or more events.

Step 2 Click the Actions tab. The events you selected appear in the Actions window with separate lines connecting to the Trigger button.

Step 3 To sequence the buttons, click an event button. An elastic arrow appears.

Step 4 Point the arrow to another Event button. The Event buttons move next to each other in sequence, as shown in the example above.

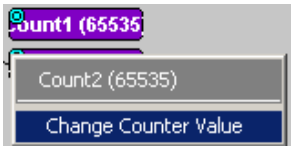
6.9 Counting Events

Counters count multiple occurrences of an event. When the analyzer is configured for counting, it searches for multiple occurrences of an event such as an error and triggers when the last event in the count occurs.

When a counter is in use in the Actions window, the counter button will be relocated below its associated Event button and then connected by a line to the Trigger button. The Counter will display a number that indicates the number of events that the Counter is set to look for.

The buttons marked **Count1** and **Count2** provide a way of triggering after a number of events have passed, such as "Trigger after the 20th error."

Counters have blue dots in their top left corner that provide access to pop-up menus. The menus provide the means of setting the counter value. The counter can be set between 1 and 65,535.



To connect an event to a counter, follow these steps:

Step 1 Click the **Event** tab and select an Event such as **Error**.

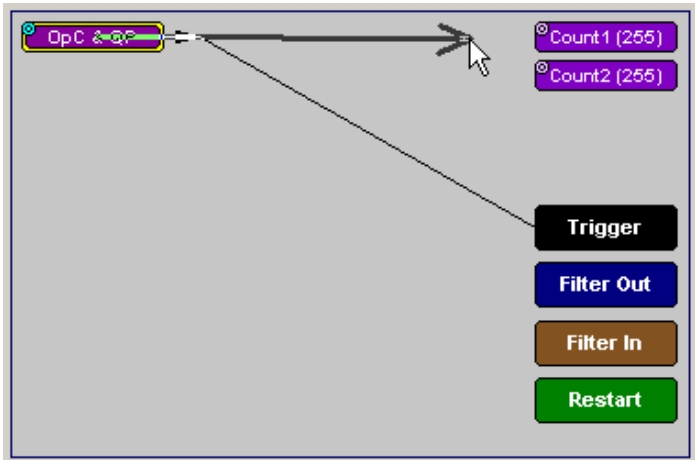
*Selecting an event causes an Event button to automatically appear in the **Actions** tab.*

Step 2 Click the **Actions** tab.

The tab displays an event button that is connected to the Trigger button on the right.

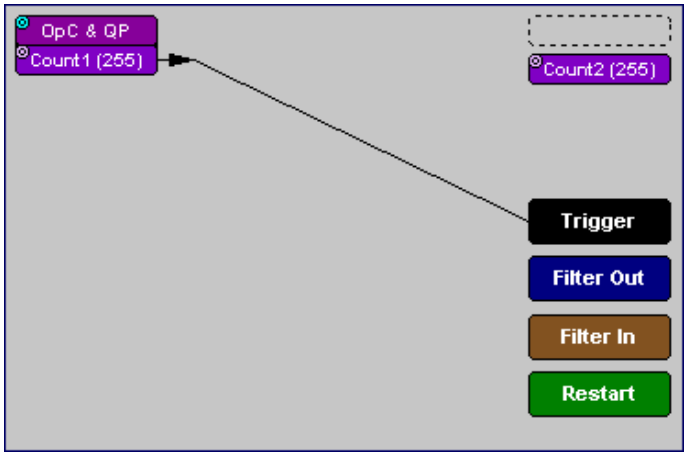
Step 3 Click the Event button.

An arrow appears that connects the Event button to your mouse pointer.



Step 4 Click one of the two counters.

The event automatically connects to the Counter button and then connects to the Trigger button.



Step 5 Click the blue dot in top right corner of your selected counter.

A pop-up menu opens. This menu lets you configure the counter.

Step 6 Choose **Change Counter Value**.

Step 7 Set the counter to a value of your choice, and click **OK**.

6.10 Triggering External Output

The Actions window has options enabling the analyzer to send an output signal through a BNC cable or an RS-232 cable and breakout board to an external device such as an oscilloscope.

Cabling

To set up the analyzer for signal output, you will first need to connect the analyzer to the external device using a BNC or RS-232 cable.

Using a BNC Cable

If using a BNC cable, connect the external device to one end of the cable and connect the other end of the cable to the output connector marked "Ext. 2" on the back of the analyzer.

Using an RS-232 25 pin Cable

If using an RS-232 cable, you will also need to use a CATC breakout board and alligator cables. Connect alligator cables from the external device to one or more Data pins on a breakout board. Then connect a 25-pin RS-232 cable from the breakout board to the 25-pin connector on the back of the analyzer marked "DATA IN/OUT."

Once the analyzer is connected, you will need to configure the Recording Options so the analyzer will send an output signal.

Setting External Output Options

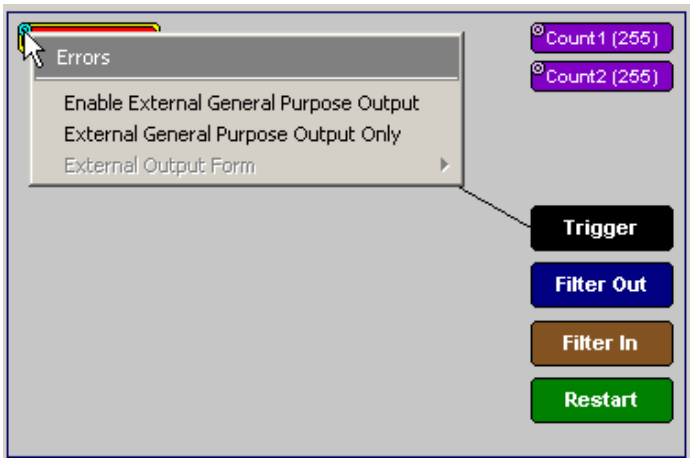
To configure the analyzer for signal output, perform the following steps:

Step 1 If it is not already open, open the Actions window.

You should see Event buttons on the left side of the screen representing the events you selected in the Events window.

Step 2 Click the blue dot on an event button representing the event you wish to cause an output signal. For example, if you want the analyzer to send an output signal when it sees an error, to trigger an output signal based on an error, click on the blue dot in the Error button.

The following menu appears:



The menu offers three choices:

Enable External General Purpose Output - This option causes an output signal to be generated *AND* triggers the end of the recording. When selected, a small arrow appears on the event button, indicating that output signalling has been enabled. Also present is a line between the event button and the trigger button. This line indicates that the analyzer is set to trigger the end of its recording.

Enable External General Purpose Output Only - This option causes an output signal to be generated without triggering the end of the recording. When enabled, a small arrow on the event button indicates that the analyzer is configured to send an output signal. You will see that the no line between the selected event button to the trigger button - this indicates that the analyzer will continue recording without triggering.

External Output Form - This option presents a menu with options for setting the form of the output signal. Your choices are:

- **Pulse Low -** Causes the Analyzer to transmit a 0.2-volt, 67-nanosecond signal.
- **Pulse High -** Causes the Analyzer to transmit a 3.2-volt, 67-nanosecond signal. This is the default format.
- **Toggle -** Causes the Analyzer to send a signal that toggles with each trigger event between a continuous 3.2-volt signal and a continuous 0.2-volt signal.

Step 3 Choose "Enable External General Purpose Output" or "Enable General Purpose Output."

A small arrow will appear on the selected event button.

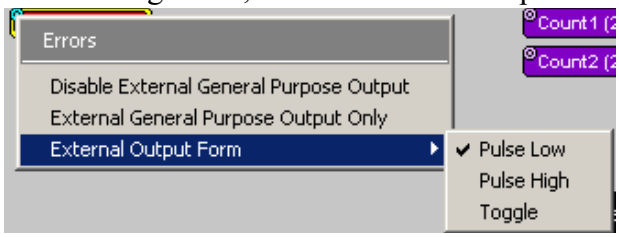
Specifying Pulse Signal Outputs

Once Output signalling has been enabled, you can configure the output signal to **Pulse Low**, **Pulse High**, or **Toggle**.

To configure the output signal, follow these steps:

Step 1 Click the blue dot on an event button that has a small arrow attached.

Step 2 In the resulting menu, choose External Output Form.



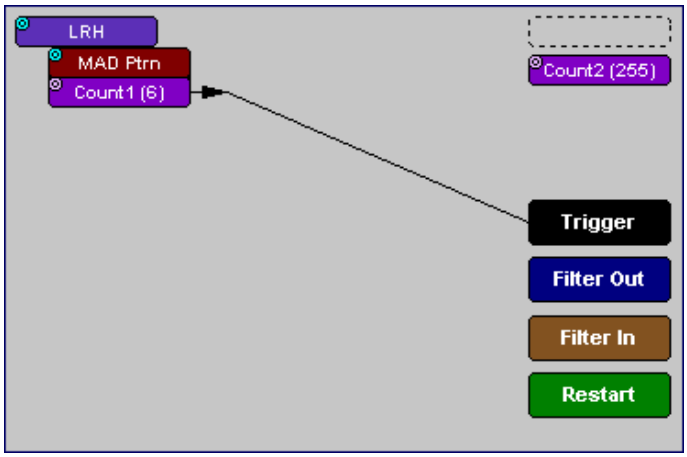
Step 3 Choose Pulse Low, Pulse High, or Toggle.

6.11 Setting Multiple Conditions with Counters

You can create multiple event conditions by linking a counter to multiple events or by linking two counters to two or more events.

Sequencing with Counters

When two or more Events are connected together and then to a counter, a condition is created such as the one shown below. This example reads: "When a packet occurs with a Local Routing Header (LRH) followed by six MADs with data patterns, trigger the end of the recording."



To link two or more Events to a counter,

Step 1 Select two or more events in the Events window (Recording Options > Events).

Step 2 Click the Actions tab.

Step 3 Click one of the event buttons. An elastic arrow will appear on your mouse pointer.

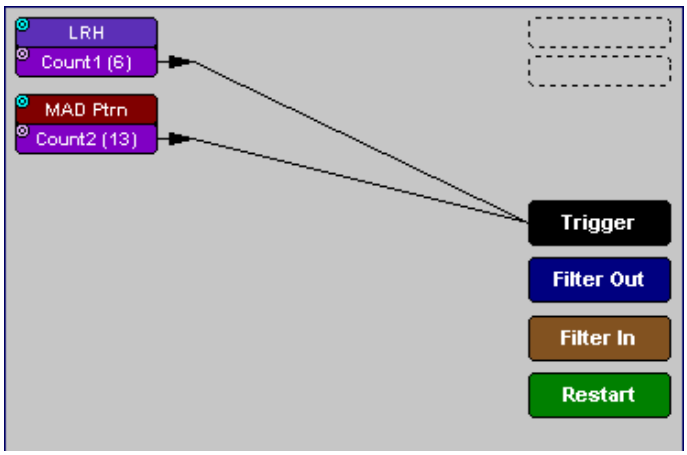
Step 4 Click one of the Counters. The Counter button will move directly under the Event button.

Step 5 Click another Event button. An elastic arrow will appear on your mouse pointer.

Step 6 Click the Counter button that is below the first Event button.

Linking Two Events to Two or More Counters

If an Event is linked to **Count1** and a second event is linked to **Count2**, it creates an "or" condition. The example below reads "Trigger when Count1 OR Count2 has reached their specified values."



6.12 Filtering Traffic

Filtering lets you exclude unwanted traffic so you can preserve recording memory and increase the amount of desired traffic in the trace. You have two options: **Filter In**, which lets you filter traffic *into* the recording and thereby exclude other traffic, and **Filter Out**, which lets you filter traffic out of the recording.

Note: Some events, such as errors, cannot be filtered.

How Filtered Out Traffic Is Indicated in the Trace

When traffic is filtered out, a horizontal line appears in the trace where the item was removed.

How to Use Filters

To filter an event in or out from a recording, follow these steps:

Step 1 From the Events window, select one or more events.

Step 2 Click the Actions tab to open the Actions window.

Step 3 Click an Event button, then click the button marked **Filter In** or **Filter Out**.

A line will connect the Event button to the Filter In or Filter Out button.

The selected event will now be set for filtering.

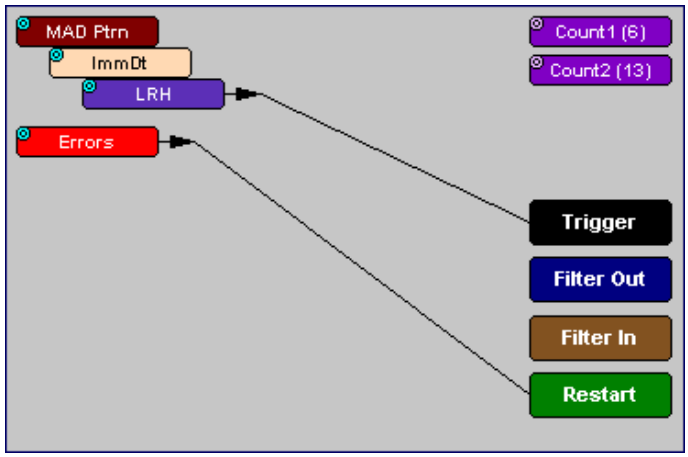
6.13 Restarting Sequences and Counters

The **Restart** button is used to create conditional statements with sequences and counts.

When an event is linked to the Restart button, the Analyzer restarts any counting or sequencing it is performing if that event is found.

Restarting a Sequence

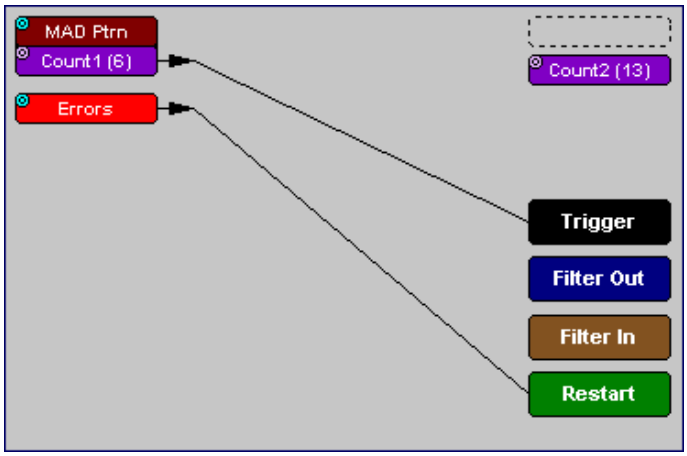
For example, in the illustration below the Analyzer is told: "Trigger following a sequence of a MAD, a packet with an Immediate Data pattern, followed by a packet with a Local Routing Header (LRH). However, if an error occurs during the sequence, restart the search."



Restarting a Count

The Restart button can be used to restart counting. If an Event count has been defined, adding a link between another event and the Restart button tells the analyzer to restart the count any time the Restart event has been found. This is best explained with an example. In the screenshot below, the

analyzer is configured to trigger following the sixth MAD with a user-defined data pattern, but if an error occurs anywhere during the count, restart the count.



6.14 Saving Recording Options

To complete your Recording Options settings, use the features at the bottom of the **Recording Options** screen. These features remain the same no matter which of the three Recording Options screens you are working in.

- Click **Save** to save the currently specified Recording Options for use in future recording sessions. Any file name can be specified, though use of the **.rec** is recommended. If no extension is specified, **.rec** is added by default.
- Click **Load** to load a previously saved ***.rec** file, thus restoring a previous set of Recording Options.
- The **Save as Default** function is equivalent to the **Save** function, specifying the file name **default.rec**. Whenever you start up the Analyzer, it automatically loads the **default.rec** file if one exists.
- Click **OK** to apply any changes and close this dialog box.
- Click **Cancel** to cancel any immediate changes you have made and exit the Recording Options menu.

6.15 Recording InfiniBand Traffic

To start recording InfiniBand traffic once the appropriate Recording Options have been set,

Step 1 Select **Record >Start** from the Menu Bar

OR

Click on the Tool Bar.

Your recording session can continue until it has finished naturally or you may need to stop manually by clicking on the Tool Bar, depending on how you set the Recording Options.

To manually stop recording,

Step 2 Select **Record >Stop** from the Menu Bar

OR

Click on the Tool Bar.

Note The manual Stop Recording feature is primarily of use when recording low-volume traffic, which can take a long time to fill the recording buffer.

When the recording is finished, the traffic is uploaded to the hard drive and then saved as a file named **data.ibt** or whatever name you assign as the default filename.

To save a current recording for future reference,

Step 3 Select **File >Save As** from the Menu Bar.

OR

Click on the Tool Bar.

*You see the standard **Save As** screen.*

Step 4 Give the recording a unique name and save it to the appropriate directory.

6.16 Training Retry

To initiate a training retry, click the button. Use this feature when you are unable to establish a connection or an active link. You should also use this feature when changing the recording speed (Recording Options > Miscellaneous > 1x/4x Mode). The analyzer can only switch modes after has detected a Disconnect event on the link.

7. Display Options

Use the **Display Options** menu to specify the way CATC Trace information is displayed.

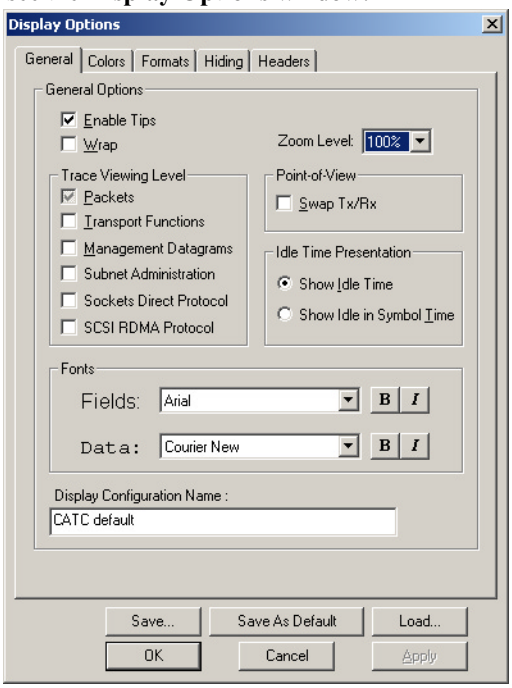
To open the **Display Options** menu,

- Select **Display Options** under **Setup** on the Menu Bar

  OR

- Click on the Tool Bar

  You see the **Display Options** window:



The **Display Options** window always opens with the screen for the **General** tab displayed.

7.1 General Display Options

Use the General Display Options to specify the basic appearance of a Trace View.

- **Zoom Level**: Adjustable in discrete increments from 10% to 200% percent.
- **Enable Tool 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**: Inhibits carriage returns in packets when they exceed the width of the window.
- **Idle Time Presentation**: Causes IB*Tracer* to display Idle Time in one of two formats:
  - Show Idle Time
  - Show Idle in Symbol Time (1 symbol = 4ns)
- **Point-of-View**: Allows you to swap the transmit and receive directions in a trace (packets labeled as 'Transmit' will become labeled as 'Receive' and vice versa).¨ Swapping is also allowed in the Tx/Rx cell in the Trace View.
- **Fonts**: Lets you define the appearance of Field and Data text.
- **Trace Viewing Level**: Lets you display the following elements in the CATC trace: Packets, Transport functions, Management Datagrams, Subnet Administration, Sockets Direct Protocol, SCSI RDMA Protocol.

7.2 Saving and Loading Display Options

To save your Display Options settings for future use,

Step 1 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.

Step 2 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.
- 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.

To load Display Options,

Step 1 Click **Load**.

A dialog box will open with a list of previously saved Display Options.

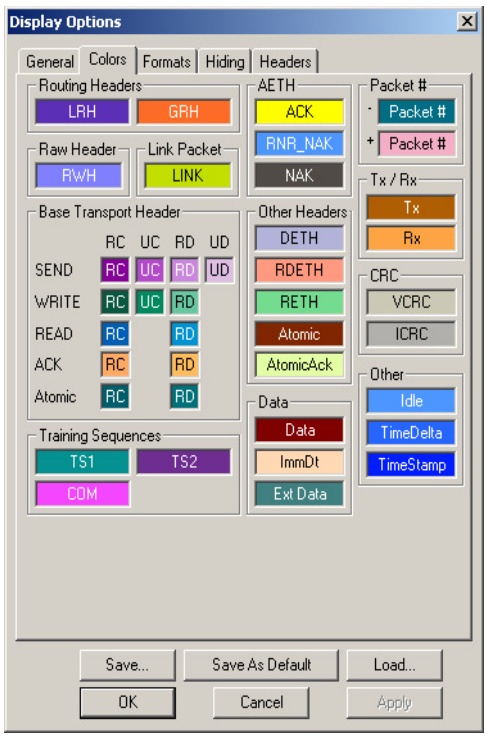
Step 2 Select a previously saved ***.opt** file.

Step 3 Click **Apply** to apply your changes.

7.3 Color Display Options

- Click the **Colors** tab on the Display Options screen.

*You see the **Colors** screen:*



Use this menu to customize the colors associated with each field in the Trace View. You can experiment with this option to achieve the color combination best suited to a particular graphic system. A brighter color might be appropriate for a specific field that should stand out in the display (e.g. the Packet Types).

Note The colors of the following packet types cannot be changed: Invalid Data (packet error) field (red) and Softbit Errors (yellow.)

Two color fields are provided for packet number displays to differentiate between pre-Trigger traffic and post-Trigger traffic.

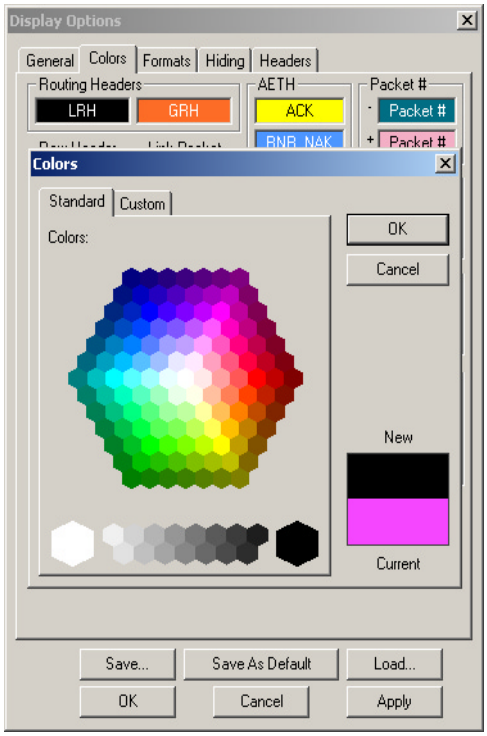
- The packet that causes the Trigger and all the packets before it are colored with the **-** color.
- The packet that follows a Trigger is colored with the + color.
- All packets are colored with a + color when there is no Trigger.

Use the color buttons labeled + and - under the **Packet #** section of the Colors screen to select a Trigger color.

To select or change a color,

- Click the appropriate color button.

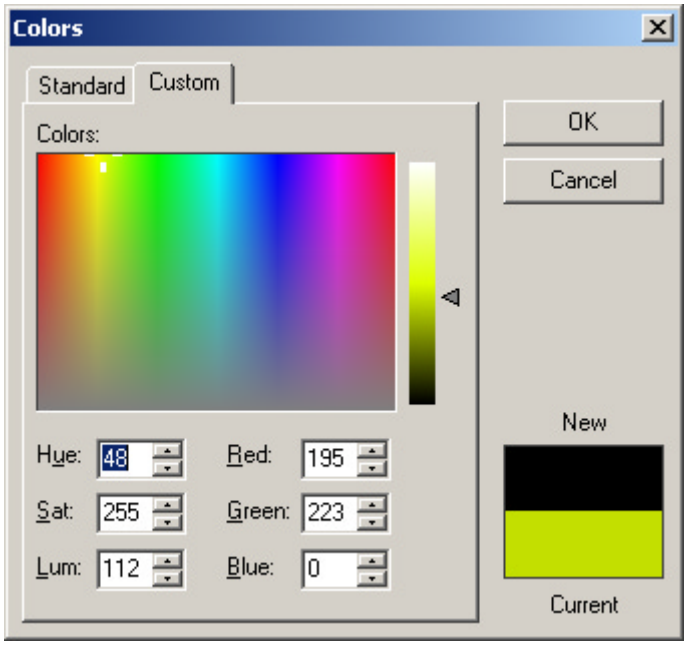
You see the color palette:



Use this palette to choose the desired color for fields within the trace such as Routing Headers, Base Transport Headers, CRC, and Packet #.

You can also customize colors.

Step 1 Click the **Custom** tab.



Step 2 Click your mouse pointer in the color spectrum on the desired color.

Step 3 Drag the triangle on the vertical bar to the desired shade.

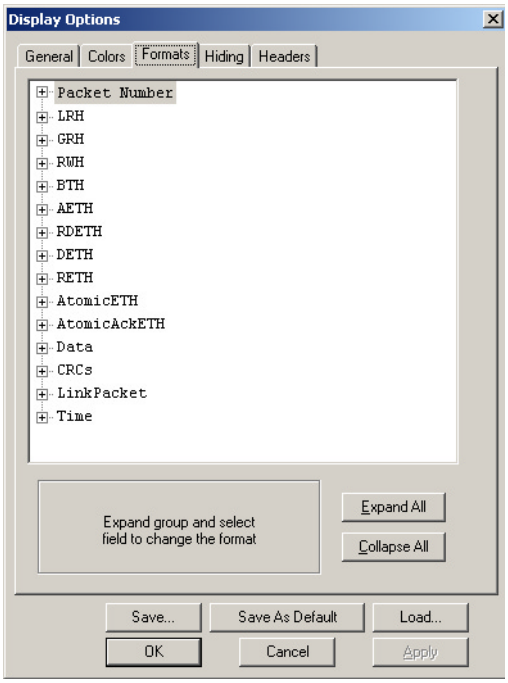
Step 4 Click **OK**.

7.4 Formats Display Options

The Formats tab allows numerical data to be displayed in different formats. For example, you can change the format of a field from hexadecimal to binary.

- Click the **Formats** tab on the **Display Options** screen.

*You see the **Formats** window:*



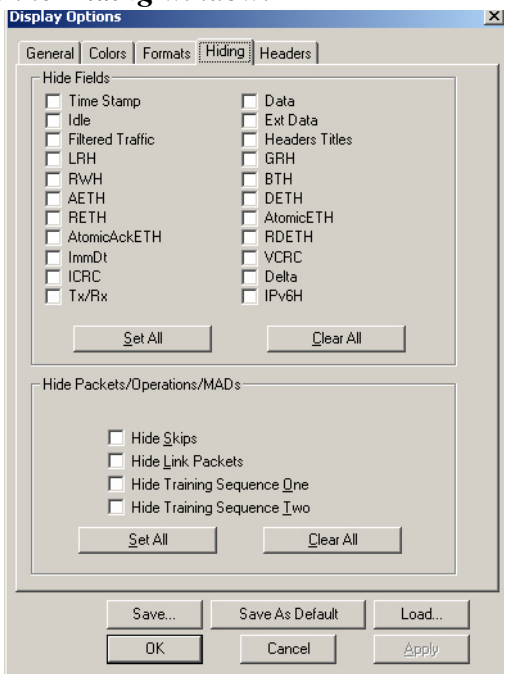
Click an item to display its current format characteristics and to display formatting buttons. Use the formatting buttons to change the format of the selected item.

7.5 Hiding

Use the Hiding window to hide various fields, packets, messages, and protocols from the Trace View screen. The Hiding tab in the Display Options window offers added advantage of hiding specific fields, by default, for all recordings. Use the Show/Hide option under the View menu to hide specific fields for the active recording.

- Click the **Hiding** tab on the **Display Options** screen.

*You see the **Hiding** window:*



Hiding Skips

The "Hide Skips" checkbox allows you to hide skips in a trace.

Hiding Link Packets

The "Hide Link Packets" checkbox allows you to hide link packets in a trace.

Hiding Training Sequences

The "Hide Training Sequences 1 and 2 checkboxes allow you to hide training sequences in a trace.

Note Once Display Options have been set, they can be saved for future use with the **Save** command described in "Saving and Loading Display Options" on page 72.

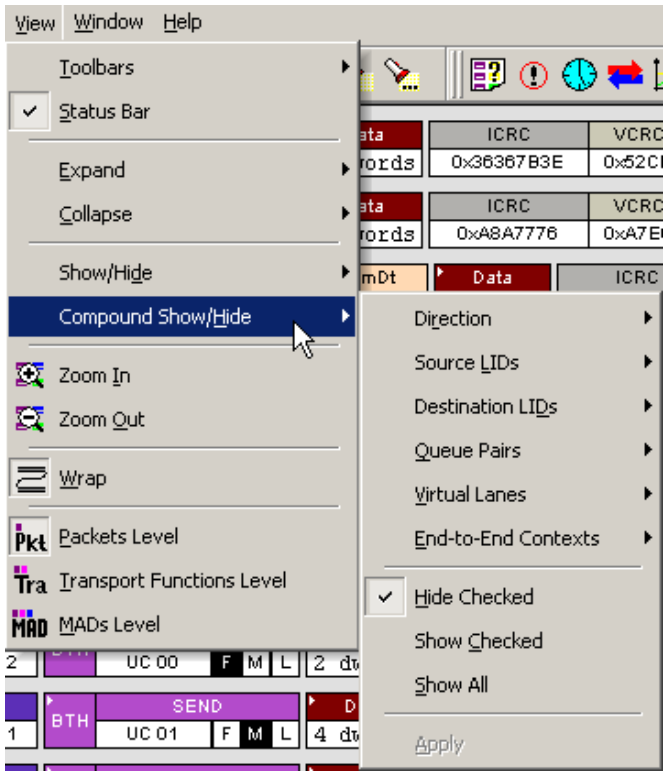
7.6 Compound Hiding

The **Compound Show/Hide** command lets you selectively show or hide multiple items from the trace.

This command is accessible from the menu bar:

Step 1 Select **View > Compound Show/Hide**.

A context-sensitive menu will open presenting a list of all the Infiniband elements in the trace.



*The menu will remain open and allow you to select multiple items. It will not close until you select **Apply**.*

Note Select as many fields and packet types from the fly-out sub-menus as needed.

Step 2 Select the type of action that you want performed:

- **Hide Checked** - This option will cause all selected items to be hidden from the trace.
- **Show Checked** - This option will cause all selected items to be displayed and all unselected items to be hidden from the trace.
- **Show All** - This option will display all items in the trace.

Step 3 Click **Apply**. At that point, the menu will close and the packet types you have selected will be hidden or displayed.

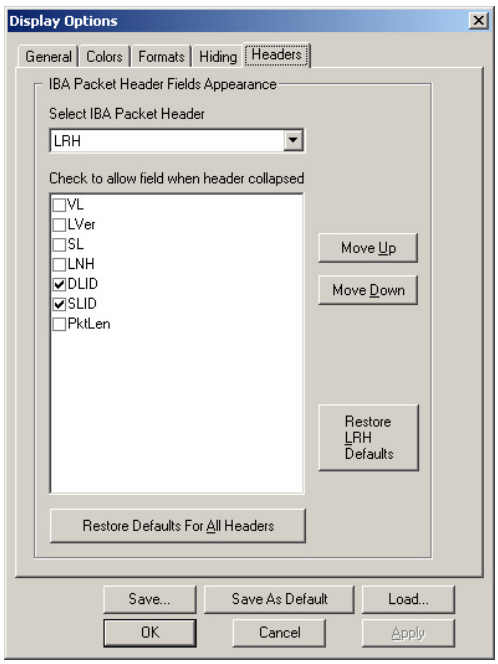
Note You can show or hide these selected fields at any point by clicking the button (**Apply Compound Hiding**) on the toolbar.

To hide or show Link Packets, click in the toolbar.

To hide or show Training Sequences, click in the toolbar.

7.7 Headers

The Headers tab in the **Display Options** dialog box allows you to select the types of fields that are displayed in headers.



A pull-down menu marked **Select IBA Packet Header** will let you select the type of header you wish to configure. When you select a header type, checkboxes will appear representing the fields within the header. Selecting a checkbox and then clicking **OK** will cause those fields to display in the trace. For example, if you select LRH from the menu, then select the checkboxes marked DLID and SLID, the DLID and SLID fields will display in the LRH headers (shown below left). If you select all of the checkboxes, all fields within the header will display (shown bottom right).

LRH	DLID	SLID
	0x0003	0x0006

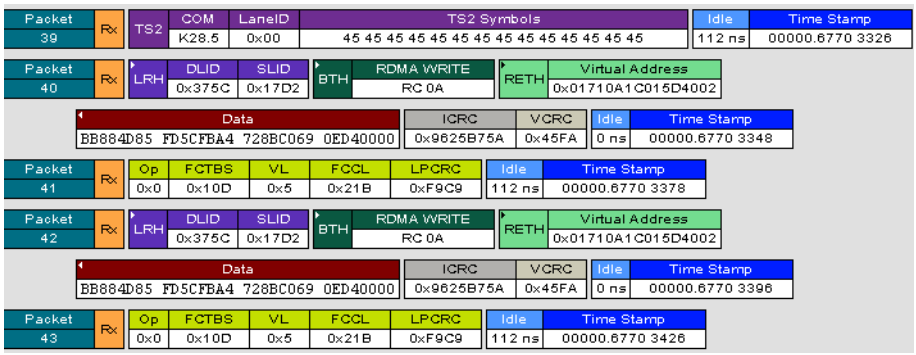
LRH	VL	LVer	SL	LNH	DLID	SLID	PktLen
	0x6	0x1	0x3	local	0x0003	0x0006	19

Two views of the same header. In the left example, only two fields are displayed. In the right, all fields are displayed.

The **Move Up** and **Move Down** buttons will let you change the order of the selected headers.

The **Restore LRH Headers** and **Restore Defaults for All Headers** buttons allows you to restore the headers the default display.

8. Reading a CATC Trace



8.1 Trace View Features

- The IB*Tracer* packet view display uses color and graphics extensively to fully document the captured traffic.
- Packets are shown on separate rows, with their individual fields both labeled and color coded.
- Packets are numbered (sequentially, as recorded), time-stamped, and highlighted to show the device status (master or slave).
- Display formats can be named and saved for later use.
- Pop-up Tool Tips annotate packet fields with detailed information about their contents.
- Several fields such as Data fields can be collapsed to occupy minimal space in the display.
- The display software can operate independent of the hardware and so can function as a stand-alone Trace Viewer that may be freely distributed.

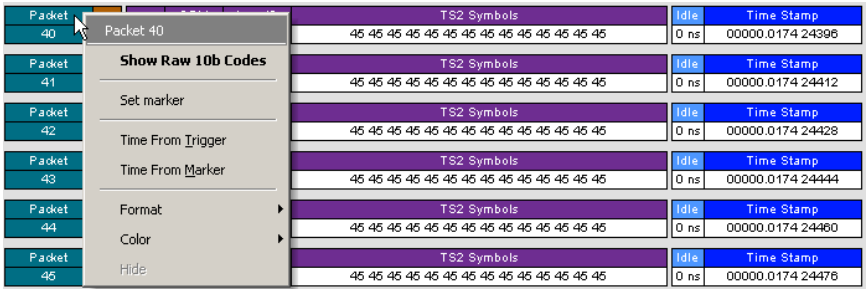
8.2 Set Marker

You can define a unique Marker for each packet operation on a MAD.

To place a marker on a packet,

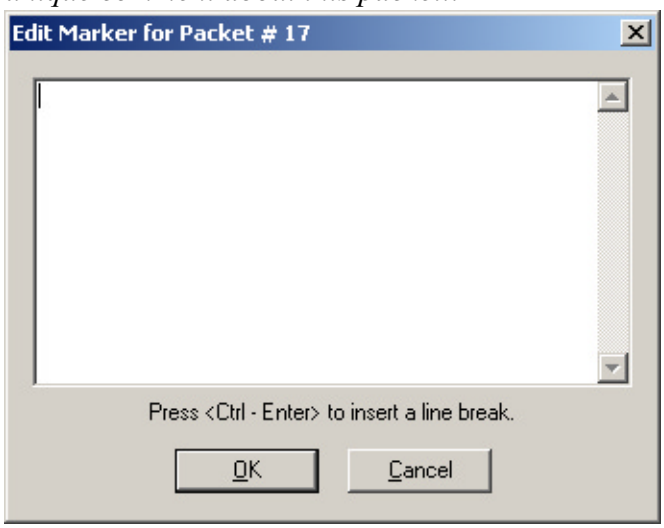
Step 1 Left-click on **Packet #** for the packet you wish to mark.

*You see the **Packet** menu:*



Step 2 Select **Set Marker**.

*You see the **Edit Marker Comment** window where you can enter a unique comment about this packet.:*



Step 3 Enter your comment.

Step 4 Click **OK**.

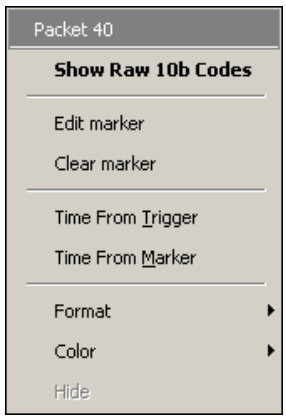
A marked packet is indicated by a vertical red bar along the left edge of the packet # block:

8.3 Edit or Clear Marker

To clear or edit the comments associated with a packet marker,

Step 1 Left-click on **Packet #** for the chosen packet.

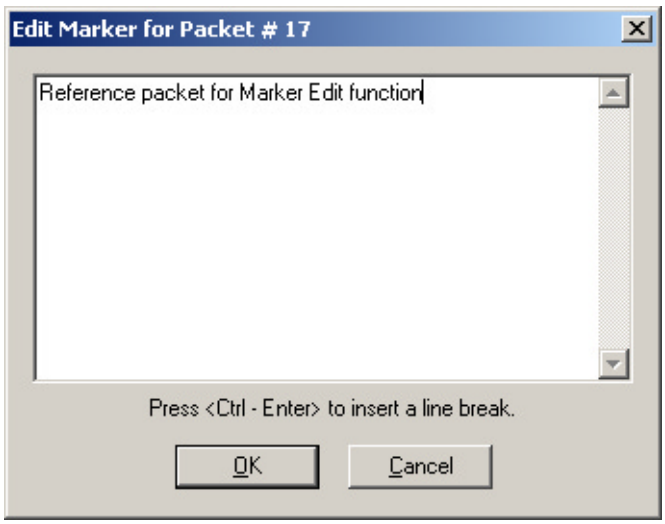
*You see the **Packet** menu:*



To edit the Marker Comment,

Step 2 Select **Edit marker**.

*You see the **Edit marker comment** window:*



Step 3 Edit the comment as desired.

Step 4 Click **OK**.

To clear a Marker,

Step 5 Click **Clear marker**.

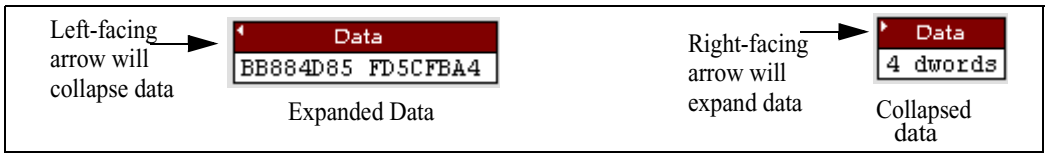
The vertical red Marker bar disappears.

8.4 Expanded and Collapsed Field Formats

Fields that have small triangles in their top left corners can be expanded to display greater detail or collapsed to a compact view. There are three ways to toggle between the two views.

Left-clicking the Small Arrows in the Header and Data Fields

Some fields have small arrow in their top-left corners that allow the field to be expanded or collapsed.



Double-Clicking

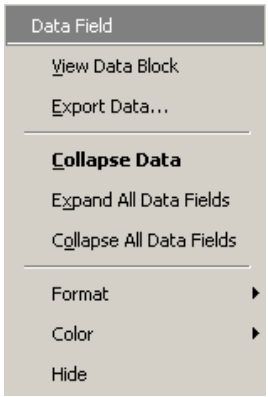
You can also expand or collapse a header or data field by double-clicking anywhere in the field.

Using the Shortcut Menu

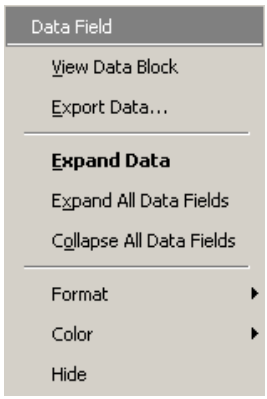
If you left-click on a data or header field, a menu will open for expanding or collapsing data fields.

Step 1 Left-click on **Data** in the Data packet you want to expand or collapse.

*If your Data Trace View is currently expanded, you see the **Collapse Data** menu:*



If your Data Trace View is currently collapsed, you see the **Expand Data** menu:



Note You can choose to expand or collapse **only** the Data in the selected Data packet OR **All** Data Fields in the Trace View.

Step 2 Select the desired Expand Data or Collapse Data menu item.

The Trace View is repositioned with the selected packet(s) adjusted in the format you have specified.

Note For headers, the same mechanism works for groups of cells. Vertical arrows are used for expanding and collapsing transport functions and higher level units. Click and hold applies to collapse and expand actions for elements in all views.

9. Decoding Traffic

IB*Tracer* has six decode levels: Packets, Transport Functions, Management Datagrams, Subnet Administration transaction level, Sockets Direct Protocol level, and SCSI RDMA Protocol level. The first two decode levels have a hierarchical relationship: Transport Functions are composed of packets.

The IB*Tracer* default decode/display level is *packet*, which means that InfiniBand packets will be displayed when you first view a trace.

9.1 Decoding and Displaying Traffic

You can decode and display traffic through the toolbar or by selecting a decode level from the Display Options dialog box.

Decoding Via the Toolbar

The decode buttons on the toolbar perform the following functions:

Pkt	**Pkt** (Display Packets)
Tra	**Tra** (Display Transport Functions)
MAD	**MAD** (Display Management Datagrams)
SA	**Subnet Administration** (Display Packet Level)
SDP	**Socket Direct Protocol** (Display Packet Level)
SRP	**SCSI RDMA Protocol** (Display Packet Level)

To display, for example, Transport Functions, click Tra.

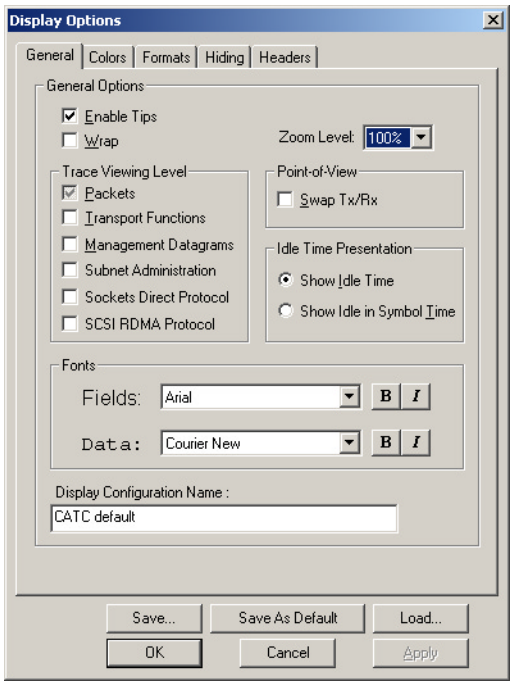
Note Once a decode has been performed, it might be necessary to scroll through the display to find the decoded MADs or Transport Functions. You can shorten your search by first clicking the **Hide Link** and **Hide Training Sequences** buttons.

Decoding Via the Display Options Dialog Box

The Display Options dialog box has options for issuing decode commands. To issue a command,

Step 1 From the menu bar, select

Setup>Display Options.

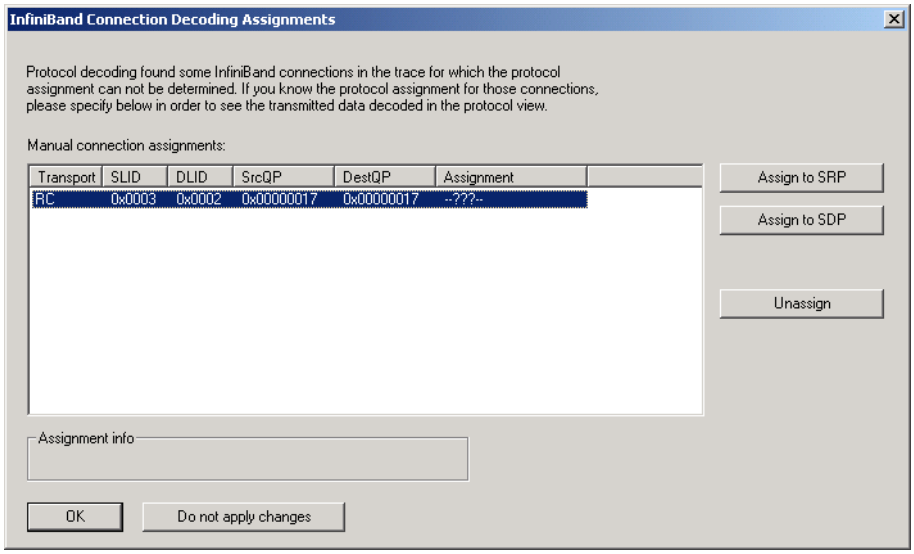


Step 2 From the checkboxes under **Trace Viewing Level**, select the the desired level of decoding. Your choices are:

- **Packets**
- **Transport Functions**
- **Management Datagrams**
- **Subnet Administration**
- **Sockets Direct Protocol**
- **SCSI RDMA Protocol**

9.2 Decoding Assignments

When opening trace files that contain unrecognized connections, IB*Tracer* will open the decoding assignments dialog. This dialog allows users to assign vendor unique or proprietary connections to a higher level protocol for proper display in the CATC Trace protocol view.

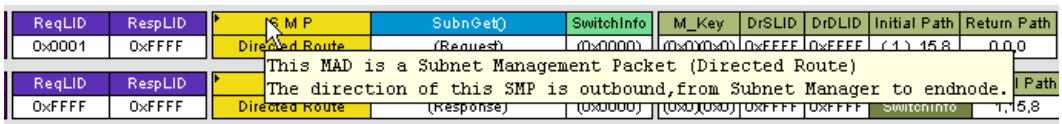


To see these events as SRP/SDP operations within your trace, select each connection and assign to either the **SDP** or **SRP** protocol by pressing the appropriate assignment button. Choose **Unassign** to keep the connection undefined.

Note: The Unrecognized Connections dialog will continue to appear until you have manually removed the --???-- from the right-hand column. Manually assigning SDP, SRP or Unassigned to all the unrecognized connections appearing within this window removes the --???-- from the right-hand column.

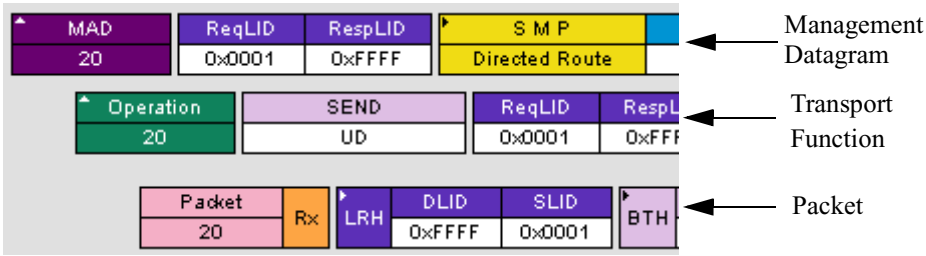
9.3 Tool Tips

Additional information about fields can be attained by positioning your mouse pointer over a field of interest. A tool tip will appear that will provide details about the field. In some cases, there can be a considerable amount of information available.



9.4 Expanding & Collapsing Traffic

Management Datagrams and Transport Functions can be "opened" to reveal their constituent packets by double-clicking the first cell in of a Transport Function or MAD or by clicking once on the small arrow on that same cell. The packets will then display below the message. The following screenshot shows an example of a message and its packets.



9.5 MAD Formats

Management datagrams are displayed as a separate decode level - this fact needs some explanation. Because a MAD is an unreliable datagram composed of a single packet, CATC could have elected to display MADs as a decode within the packet level or as a decode within the Transport Function level. CATC chose to display MADs as their own level in order to present MAD data more clearly.

9.6 MAD, SA and SRP Decoder Script Files

IB*Tracer* uses decoder script files to decode MADs, Subnet Administration transactions, and SCSI RDMA protocol transactions. Decoder script files are automatically read when the IB*Tracer* software is started. Thereafter, when MAD, SA, or SRP traffic is encountered, the Analyzer software is able to decode the traffic.

Decoder script files are shipped with IB*Tracer* and located in the IBTracer\Scripts directory.

Users may edit the decoder scripts or create new ones to decode vendor-and application-specific classes and attributes.

NOTE: Details about how to edit CATC decoder scripts or write your own are provided in the manual ***CATC Scripting Language Reference Manual for IBTracer and MAD Decoders*** available from CATC.

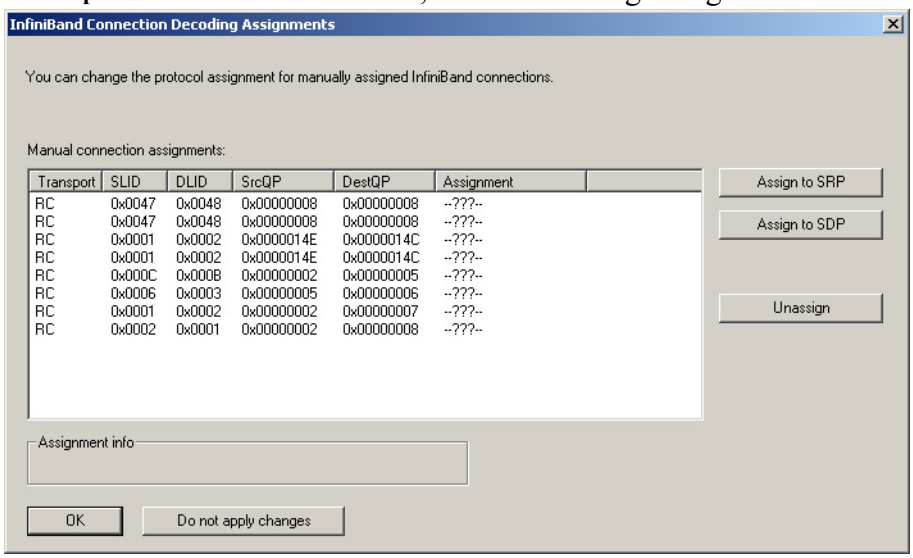
Hiding/Displaying Fields via Decoder Script Files

IB*Tracer* MAD decoder script files control how MADs, SA transactions, and SCSI RDMA transactions are displayed as a CATC Trace. The view settings in the scripts may be edited to either reveal or hide particular fields when the header cells are expanded or collapsed. For instance, it may be desirable to have a field visible even when its header cell is collapsed; on the other hand, cells can also be defined so that they are revealed only when the header cell is expanded.

9.7 Decoding Assignments

The **Decoding Assignments** dialog box allows you to change the protocol assignments for manually assigned SDP and SRP connections. SDP and SRP decoding are licensed options that are included with IB*Tracer* 4x.

Step 1 From the **View** menu, select Decoding Assignments.



Step 2 Select a connection from the list.

Step 3 Click the appropriate button on the right.

Step 4 Repeat Step 2 and Step 3 as many times as it is necessary.

Step 5 Click OK.

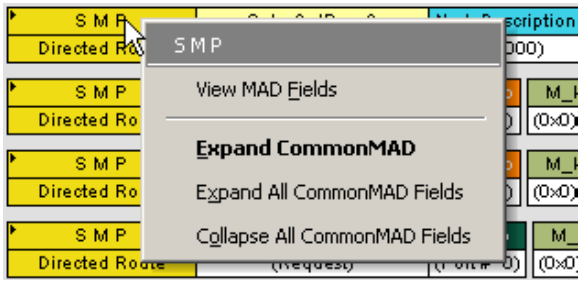
9.8 Viewing Details about MAD, Subnet Administration and SRP Fields

You can get details about MADs, Subnet Administration transactions, and SRP transactions, by clicking on a transaction within the trace and selecting **View MAD fields**, **View SADM Transaction Fields**, or **View SRP Operation fields** from the pop-up menu. A dialog box will open with details about the selected transaction. This dialog box will let you search, save, and reformat the displayed data.

Viewing MAD or SRP Fields

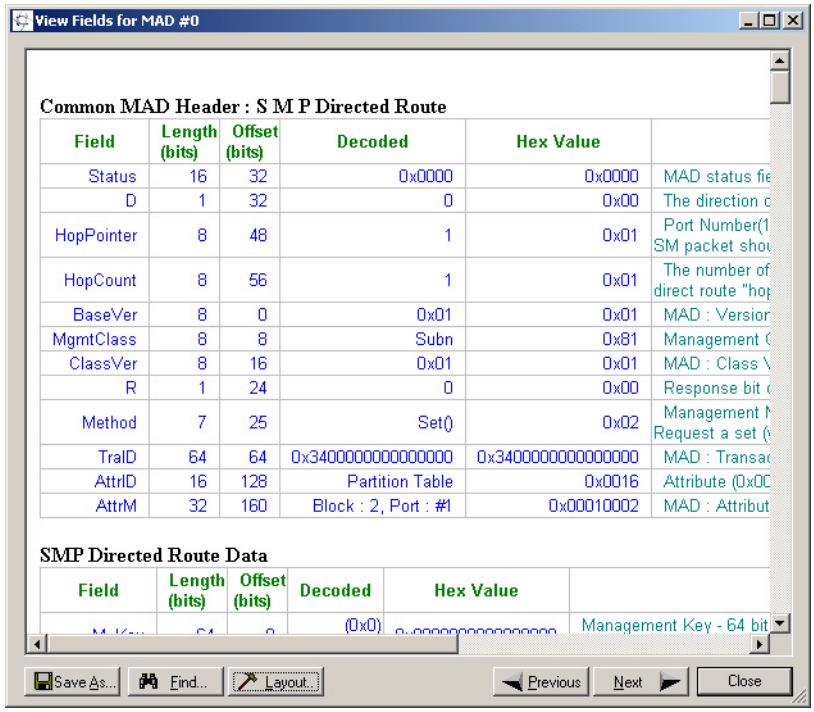
The dialog boxes for viewing details about MADs and SRP transactions are the same. The following steps describe viewing details about MADs.

Step 1 Click on a MAD to open a pop-up menu:



Step 2 Select **View MAD Fields**.

The following screen appears:



The **View MAD fields** window displays details about the selected MAD. Field information is displayed vertically in sections. To see all of the fields in the selected MAD, you need to scroll down through the window.

The bottom of the window has six buttons with the following functions:

Save As - Saves the current configuration in an HTML file.

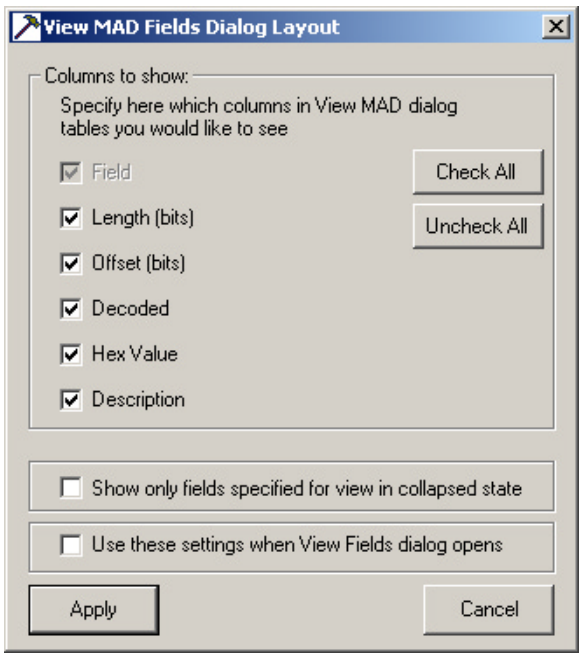
Find - Opens a dialog box that allows you to search the window.

Previous - Displays the last table containing MAD data.

Next - Displays the next table containing MAD data.

Close - Closes the window.

Layout - Opens a dialog box that allows you to set the columns that you want to display in the **View MAD fields** window:



The options at the bottom of the dialog box have the following functions:

- **Show only fields specified for view in collapsed state** - This option works in conjunction with the Decoder Script files. Decoder Script files are editable files that affect how MADs are displayed in the trace.

  The decoder files contain options for displaying MAD attribute fields when the MAD is in a collapsed state. By default, MAD attribute fields are hidden when the MAD is in collapsed state.

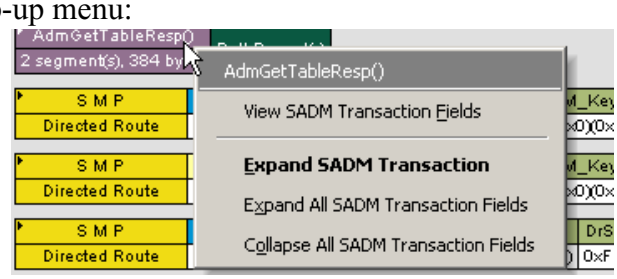
  The option **Show only fields specified for view in collapsed state** looks at the View Settings options you set in the Decoder Script files and transfers the settings to the **View MAD fields** window. If, for example, you specified in the Decoder Script file that Field X should display when the MAD is in collapsed state, *AND* if you checked the box marked **Show only fields specified for view in collapsed state**, then only Field X will display in the View MAD fields dialog box.

- **Use these settings when View Fields dialog opens** - This option saves the current settings.

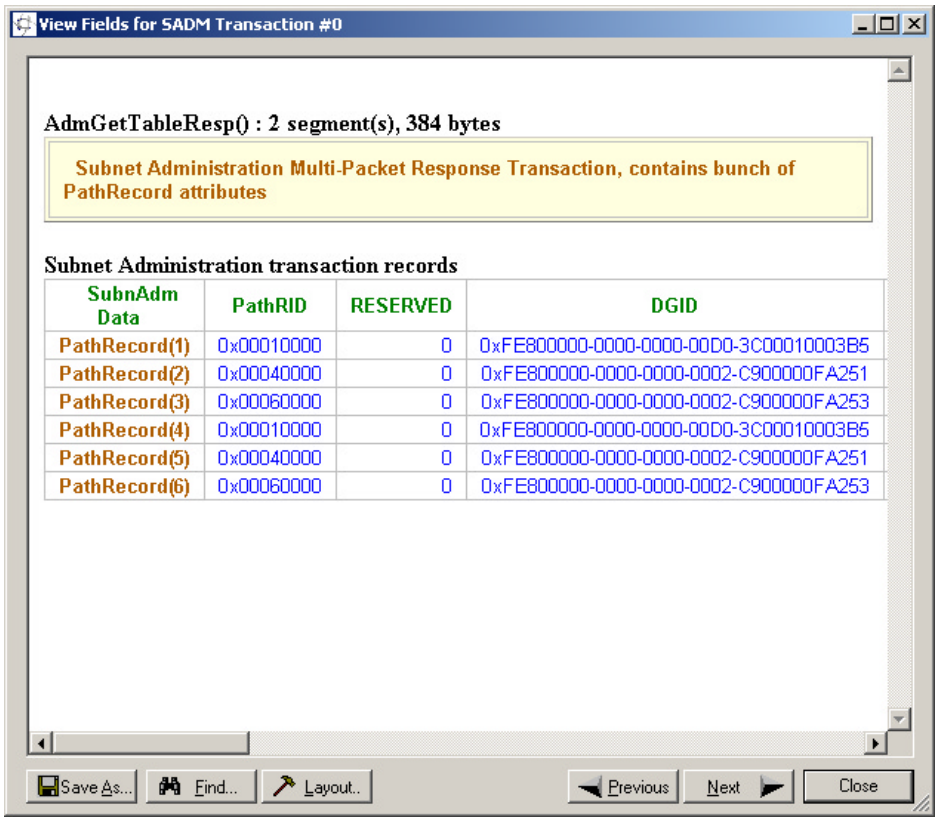
Viewing Subnet Administration fields

Subnet Administration transactions can be "opened" to reveal details.

To view SA field details, click on the SA and select **View SA fields** from the pop-up menu:



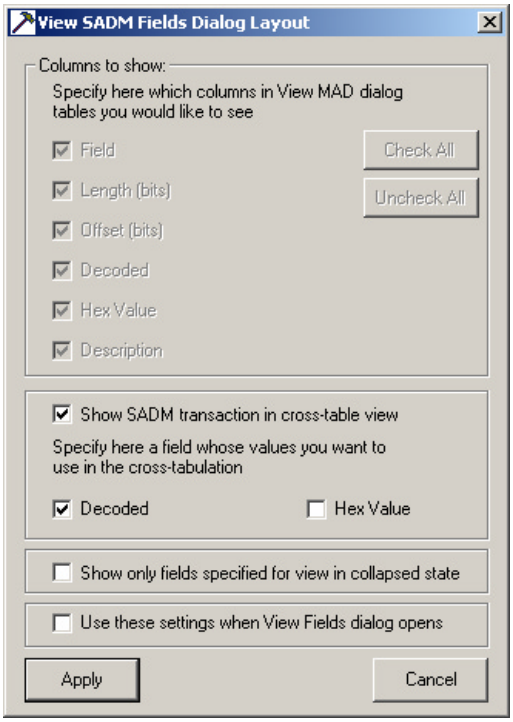
The following screen appears:



This window displays details about the fields within the selected Subnet Administration transaction. Field information is displayed horizontally in sections.

At the bottom of the window are six buttons with functions described above in "Viewing MAD or SRP Fields" on page 92.

One of the options is **Layout**. The **Layout** button opens a dialog box for defining what columns should display in the **View SADM fields** dialog:



This dialog box has the following options:

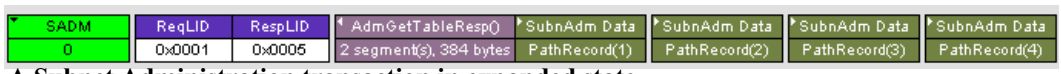
- **Show SADM transaction in cross-table view** - Changes the layout of the table so that fields run vertically down the window.
- **Decoded** and **Hex Value** - Displays values in cross-table view as decoded text or as Hex values (for example, "No," vs. "0x00").
- **Show only fields specified for view in collapsed state -** See the description given above for MADs.
- **Use these settings when View Fields dialog opens** - This option saves the current settings.

Viewing SA Attributes

To see details about attribute fields within Subnet Administration transactions perform the following steps:

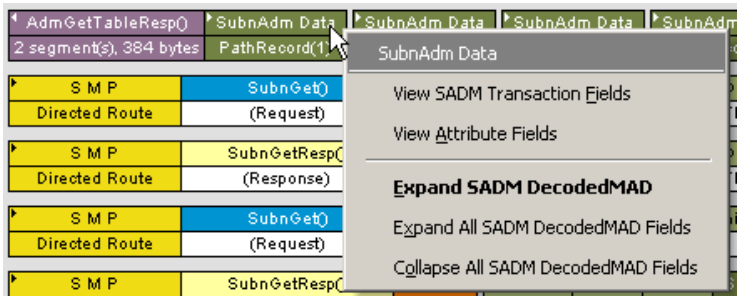
Step 1 Click on the triangular button on the header of a Subnet Administration transaction so that the transaction expands. The Subnet Administration attribute fields will display:

A Subnet Administration transaction in collapsed state. To expand, click the triangular button in the fourth cell. The cell will expand and show SA Attributes.

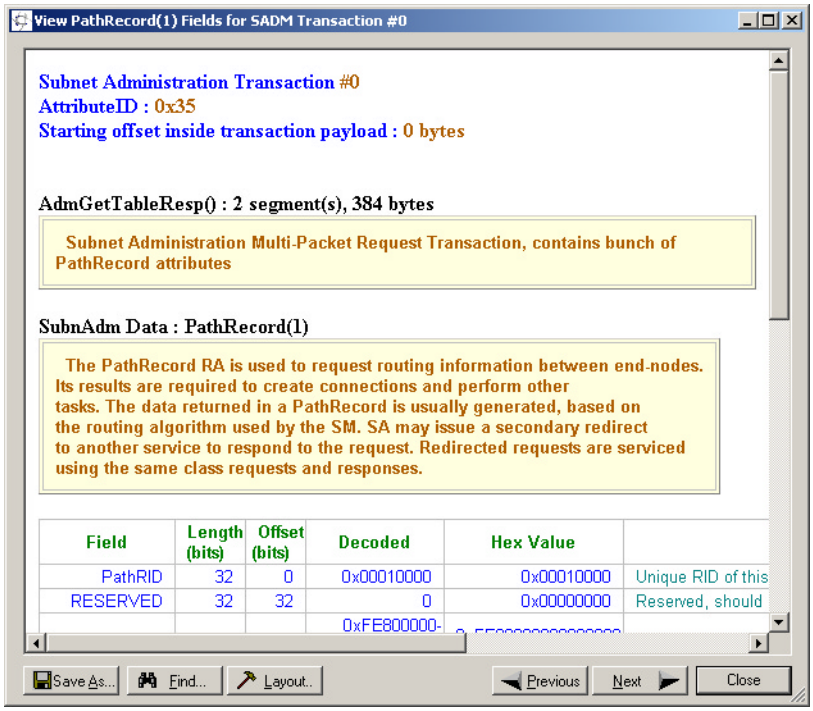


A Subnet Administration transaction in expanded state.

Step 2 Click in one of the SA Attribute cells. A pop-up menu appears:



Step 3 Select **View Attribute Fields**. The following window displays:



At the bottom of the window are buttons for saving, searching, and reformatting the layout of the window.

Note: the **Previous** and **Next** buttons are for navigating through the SA attributes within the current transaction.

10. Other Features

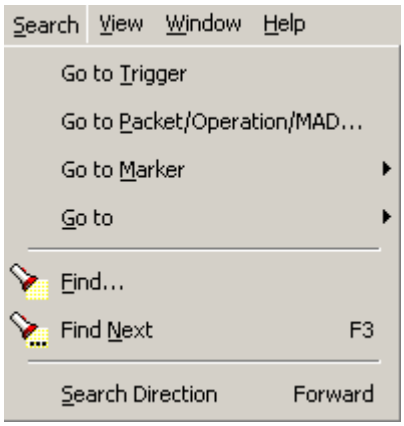
10.1 Search

The Search feature provides several options for searching through recorded traffic, allowing you to find specific packets based on triggering status, packet number, marking, or content.

To view the Search options,

- Click **Search** in the Menu Bar.

  You see the Search drop-down menu:



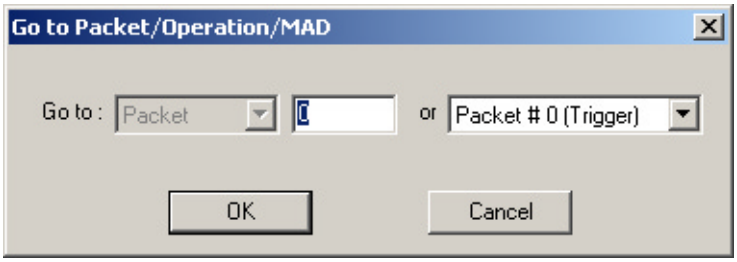
Go to Trigger

To display a triggering event, select **Go to Trigger** under **Search** on the Menu bar. The **Trace Viewer** display will reposition the trace to show the triggering event at the top of the screen.

Go to Packet

To display a specific packet,

Step 1 Select **Go to Packet/Operation/MAD...** under **Search** on the Menu Bar.



Step 2 Enter the number of the packet you want to display.

Or

Select a value from the drop-down list.

Step 3 Click **OK.**

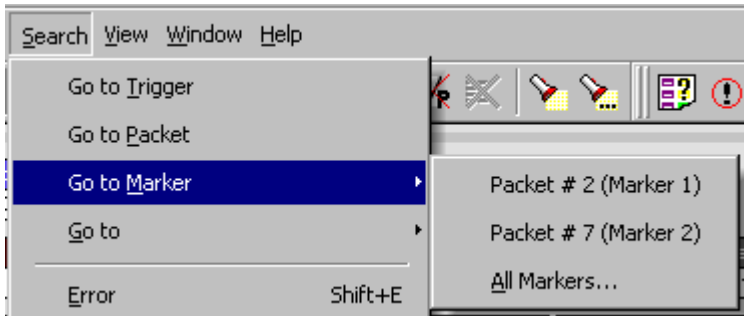
The Trace repositions to show the packet at the top of the screen.

Go to Marker

To instruct the analyzer to display a marked packet,

Step 1 Select **Go to Marker** under **Search** on the Menu Bar.

You see a menu listing the marked packets in that Trace View:



Step 2 Select the desired packet from the displayed list.

The Trace repositions to show the packet at the top of your screen.

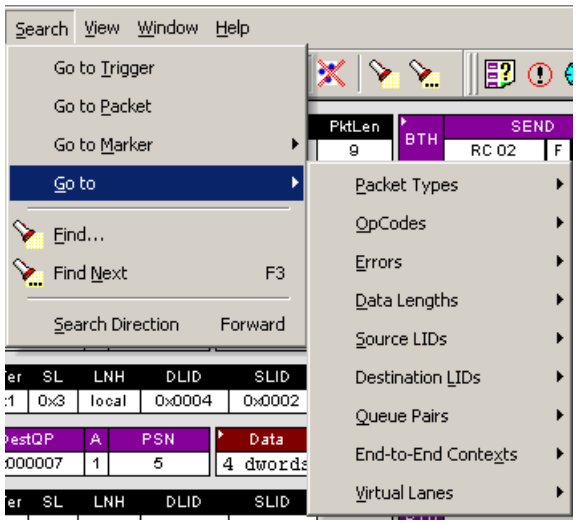
Note The **Go to Marker** feature functions in conjunction with the **Set Marker** feature. The comments within the parentheses following each marked packet are added or edited with the **Set Marker** feature.

Go to

The **Go To** feature takes you directly to an event in a Trace.

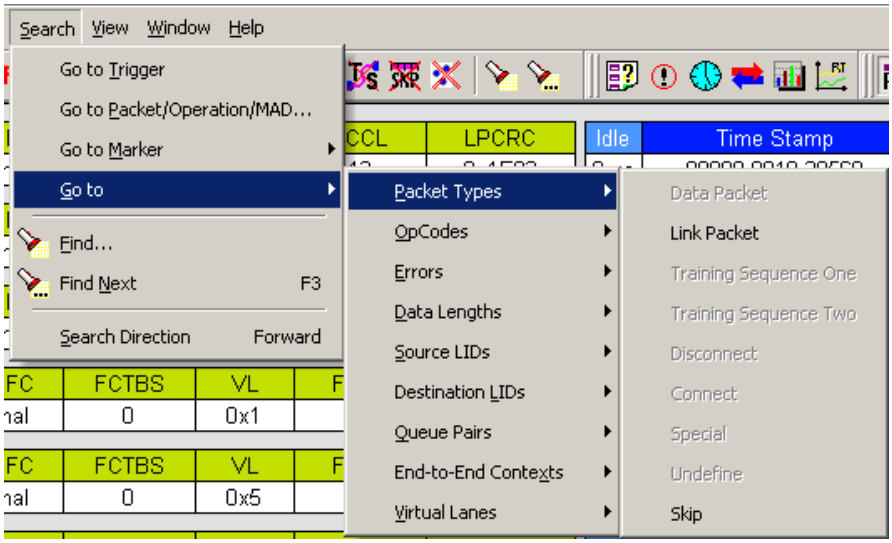
Step 1 Select **Go To** under **Search** on the Menu Bar.

*You see the **Go To** drop-down menu:*



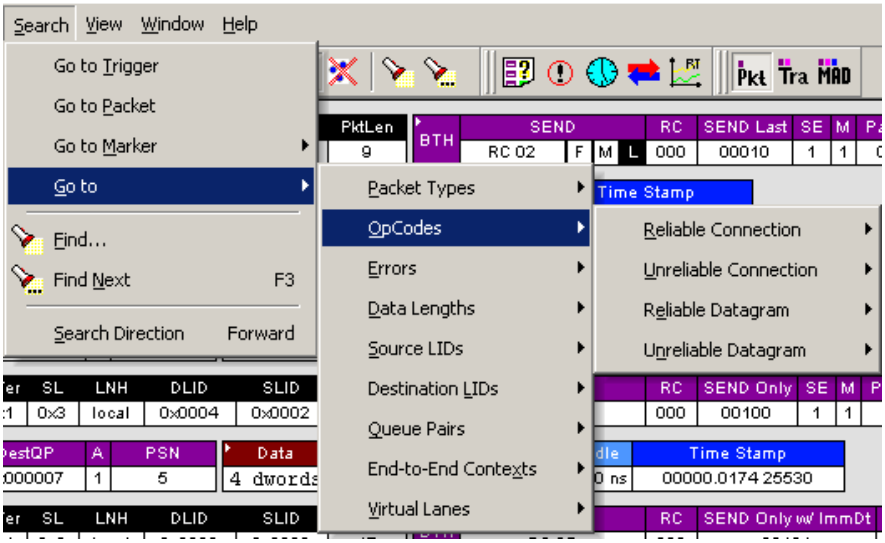
Step 2 Select the event you want to go to and enter the necessary data.

Packet Types



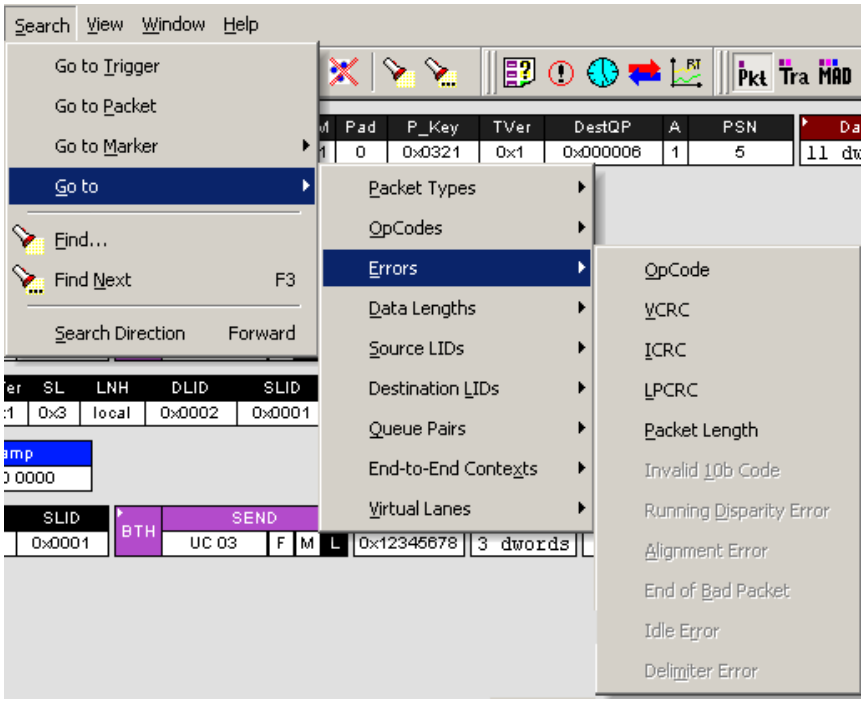
Select the type of Packet Type you want to go to.

OpCodes



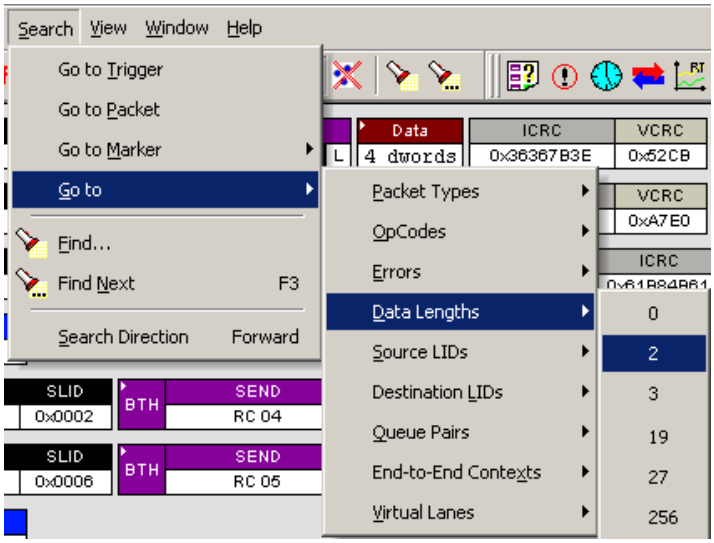
Select the type of Opcode you want to go to.

Errors



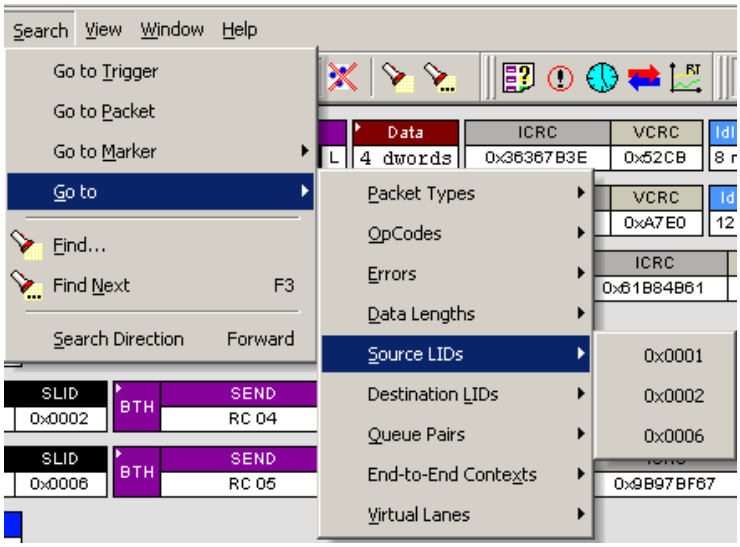
Select an Error from the list. This sub-menu is context-sensitive. The choices are derived from the errors present in the trace.

Data Lengths



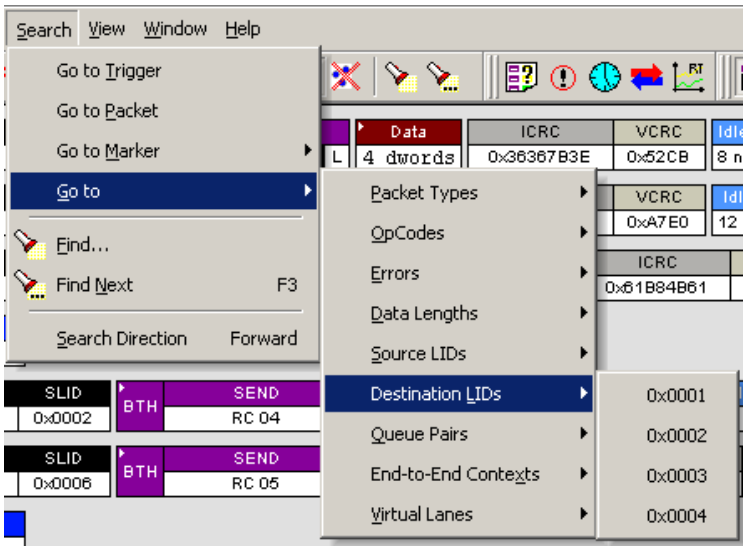
Select the Data Length that you want to go to. This sub-menu is context-sensitive. The choices presented are derived from the data in the trace.

Source LIDs



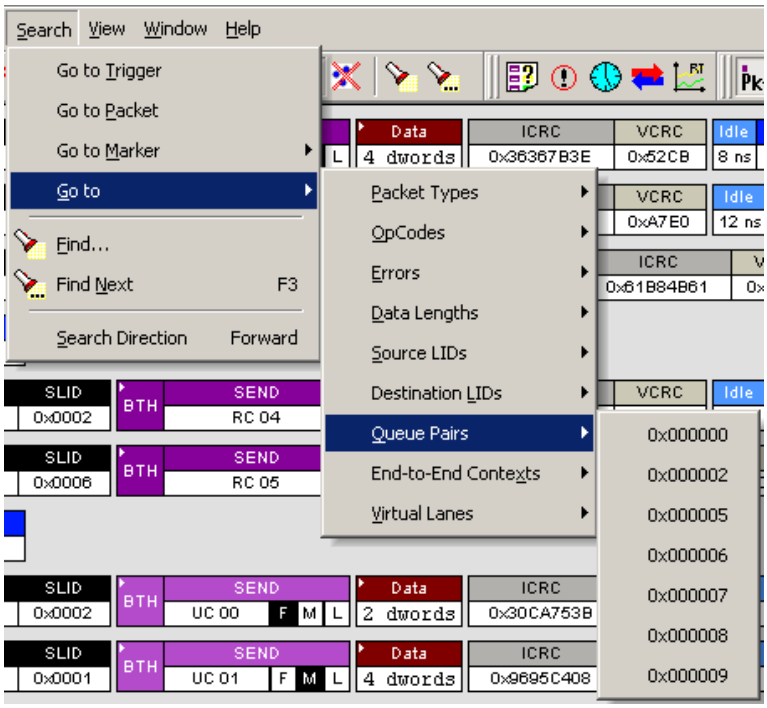
Select the Source LID that you want to go to. This sub-menu is context-sensitive. The choices presented are derived from the trace.

Destination LIDs



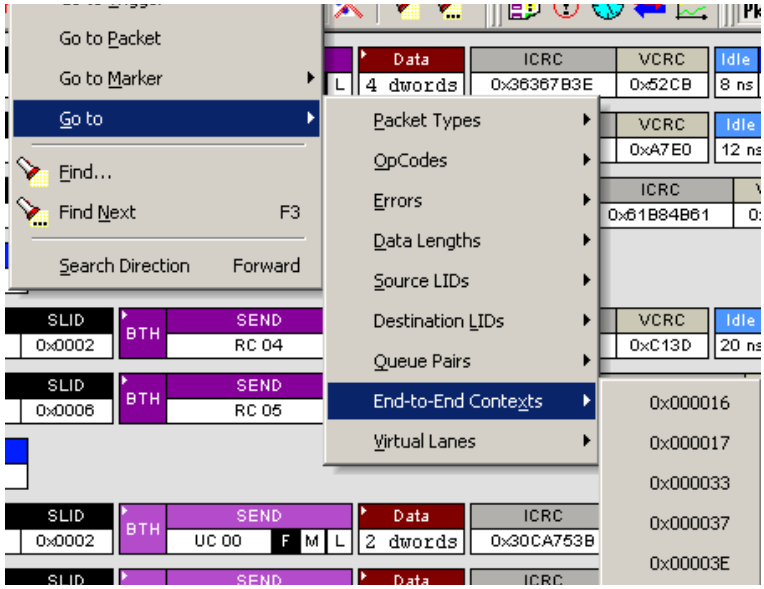
Select the Destination LID that you want to go to. This sub-menu is context-sensitive. The choices presented are derived from the fields displayed in the trace.

Queue Pairs



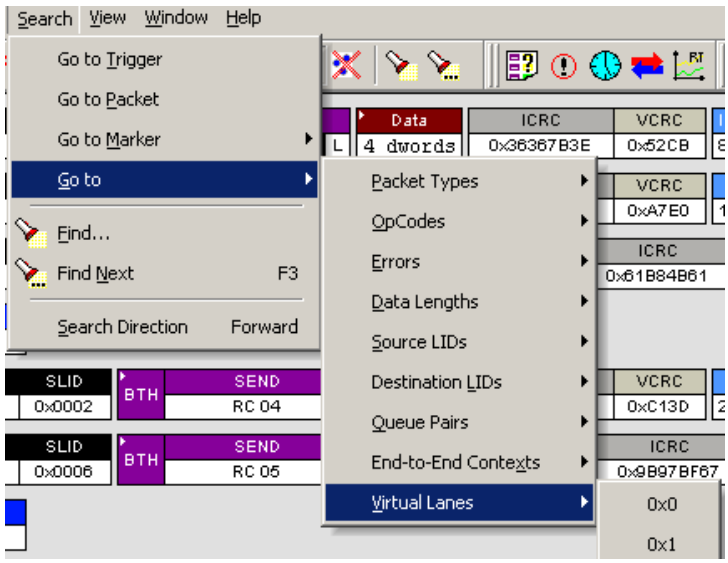
Select the Queue Pair that you want to go to. This sub-menu is context-sensitive. The choices presented are derived from the trace.

End-to-End Contexts



End-to-End Contexts are characteristics of reliable datagram service. To search through End-to-End Contexts, make a selection from the context-sensitive sub-menu. The choices presented are derived from the trace.

Virtual Lanes



Select the Virtual Lane that you want to go to. This sub-menu is context-sensitive. The choices presented are derived from the trace.

Find

Find allows searches to be conducted on an open trace using one or more criteria. You can search by packet, transactions, split transaction, transfer, by packet type and by fields within packets.

Find is run by selecting **Search >Find** or by clicking on the toolbar.

Searches can combine criteria using the options **Intersection** and **Union**. **Intersection** creates AND statements such as "Find all packets with *x* and *y*." **Union** creates OR statements such as "Find all packets with *x* OR *y*."

You can also perform searches whereby packets or events are excluded from a trace. The **Exclusion** allows searches to be conducted.

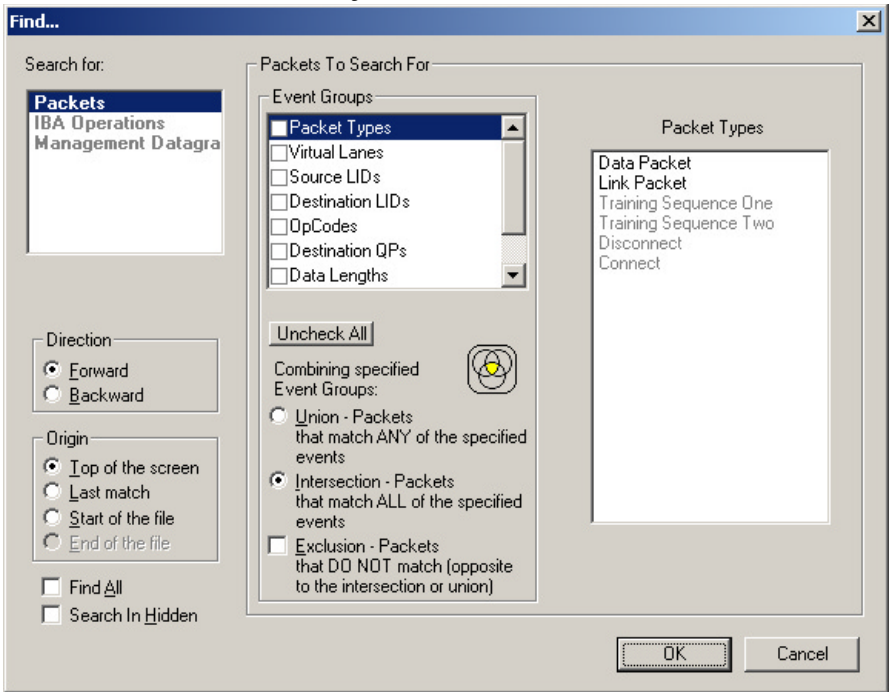
To perform a search,

Step 1 Select **Find...** under **Search** on the Menu Bar

OR

Click *in the Tool Bar.*

You see the ***User-Defined Find Events*** *screen:*



Step 2 Select **Packet**, **Transaction**, **Split Transaction**, or **Transfer** from the top left list box.

Your choice will affect options presented in the Events Group box.

Step 3 Select one or more events from the **Events Group** box.

Step 4 Select one of the following options:

- **Union:** Find all packets matching ANY of the specified events.

- **Intersection:** Find all packets matching ALL of the specified events.

- **Exclusion:** Exclude packets matching any of the specified events.

  Exclusion works with the other two options. You select **Union** *AND* **Exclusion** to exclude packets with ANY of the selected fields; or choose **Intersection** *AND* **Exclusion** to exclude packets with ALL of the selected fields.

Step 5 If desired, set the search **Direction** and **Origin**.

Step 6 Click **OK**.

After the search finishes, the packets meeting the search criteria will display.

Select the **Find All** checkbox to find all instances of an event group.

Select the **Search in Hidden** checkbox to find an event group that is hidden.

Find Next

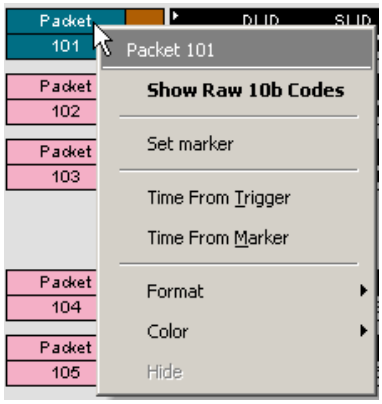
To apply the previous **Find** parameters to the next search,

- Select **Find Next** under **Search** on the Menu Bar

  OR

  Click on the Tool Bar.

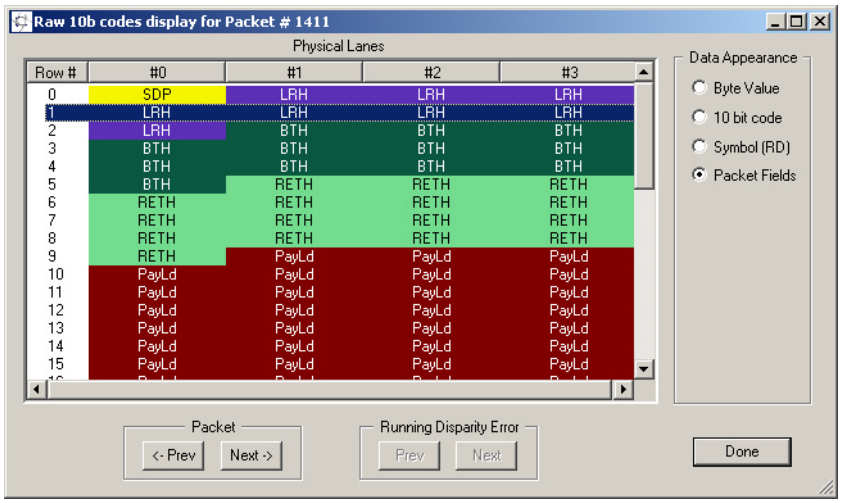
10.2 Displaying Raw 10b Codes



To view **Raw 10b Codes**, left-click on the first cell in a packet and select **Show Raw 10b Codes** from the pop-up menu shown on the right. After you have made your selection, one of two windows will display depending on whether the trace under review was created with IB*Tracer* 4x or IB*Tracer* (1x).

Raw 10b Codes on traces made by IBTracer 4x

In traces created by IB*Tracer* 4x, the **10b Codes** window is laid out with packets as rows and physical lanes as columns. In 4x recordings, all four lanes will show data. In 1x recordings, only one column will show data. The other columns will read "Not Used."



Data Appearance - Data format is configurable. To change data format, select from the four options:

- **Byte Value** - Click to show hex values.
- **10 bit code** - Click the to show hex values.
- **Symbol (RD) -** Click to show symbol RD fields.
- **Packet Fields -** Click to show packet fields.

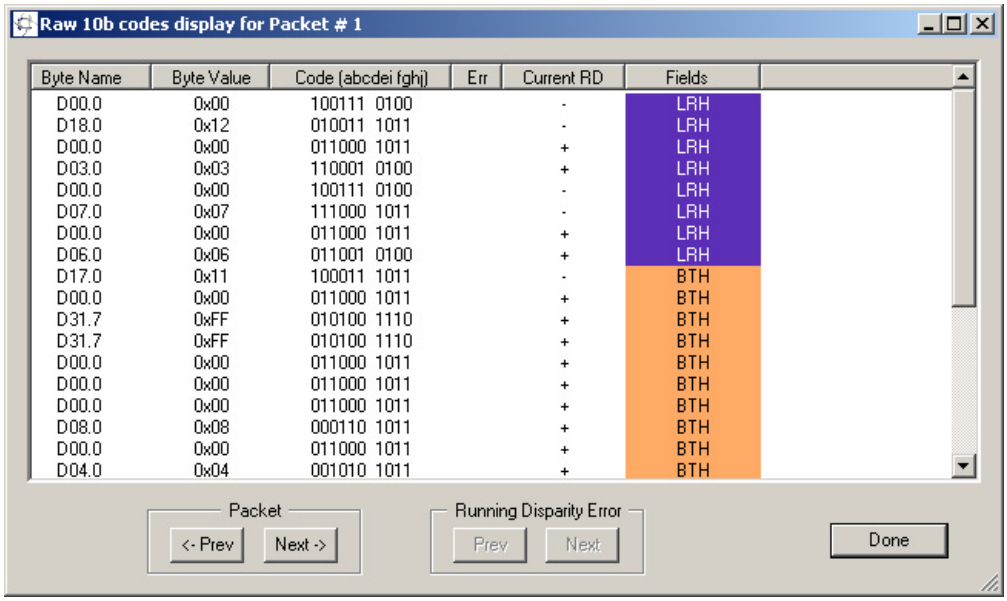
Navigation - To move to the previous or next packet in the trace, click one of the two **Packet** buttons at the bottom of the window:

- **Prev** - Displays data for the previous packet in the trace.
- **Next** - Moves to the next packet in the trace.

Running Disparity Error - If a trace has errors, Running Disparity Errors will display as a column in the window. Running Disparity is maintained within each of the four lanes.

Raw 10b Codes on traces made by IBTracer (1x)

In traces created by IB*Tracer* (1x), the **10b Codes** window displays the data for a packet within the window, and bytes from each packet as rows.



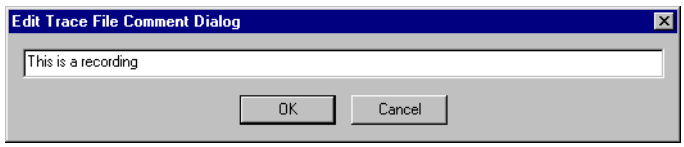
- **Byte Name** - Displays 10bit code byte name
- **Byte Value -** In hex or decimal. You can toggle the format of this column by double-clicking the column heading.
- **Code** - Displays the value in either bits or hex for the selected byte. You can toggle the format of this column from bits to hex or vice versa by double-clicking the column heading.
- **Error** - If present, errors will display as red X's. Use the buttons marked **Running Disparity Error** to scroll through the errors.
- **Current RD** - Shows current Running Disparity as + or -.
- **Fields** - Shows the fields for each byte.

10.3 Edit Comment

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

Step 1 Select **Edit Comment** under **File** on the Menu Bar.

*You see the **Edit comment for trace file** window:*



Step 2 Create, view, or edit the comment.

Step 3 Click **OK**.

10.4 File Information

The File Information report provides information about how the recording was made, what the buffer settings were, what the trigger options were, and what version of all the analyzer hardware was used to make the recording.

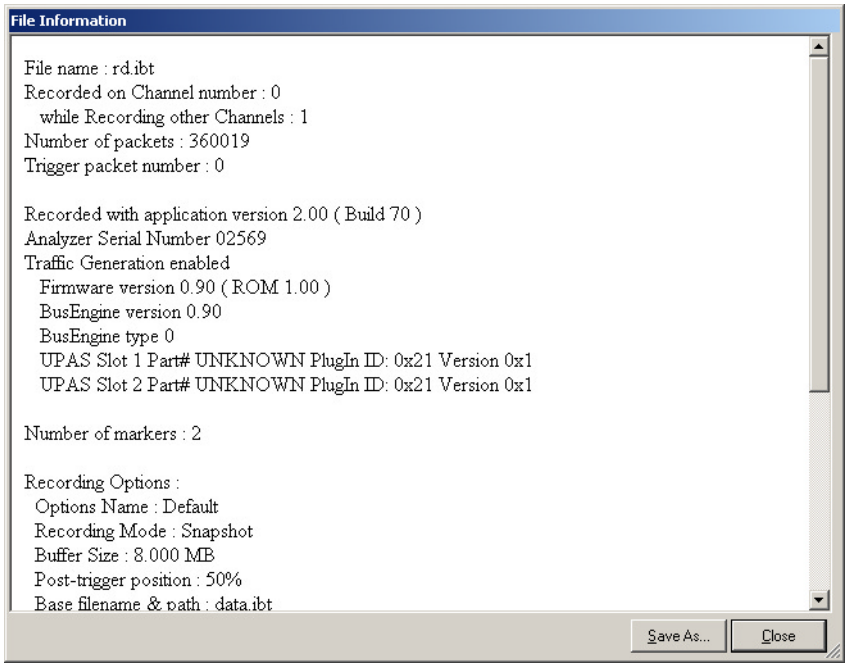
To display a File Information report,

- Select **File Information** under **Report** in the Menu Bar

  OR

  Click in the Tool Bar.

You see the File Information screen:



10.5 Error Summary

Error Summary displays a summary of errors in the current trace file and allows you to go to a specific packet, and save the error file to a file.

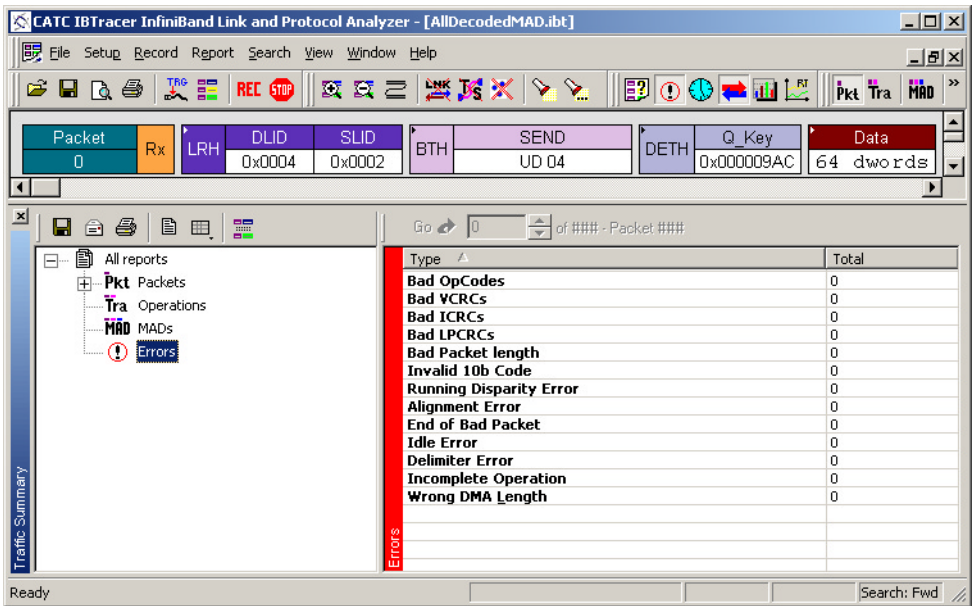
To display an Error Summary report,

- Select **Error Summary** under **Report** in the Menu Bar

  OR

  Click in the Tool Bar.

The Error Summary appears below the trace:



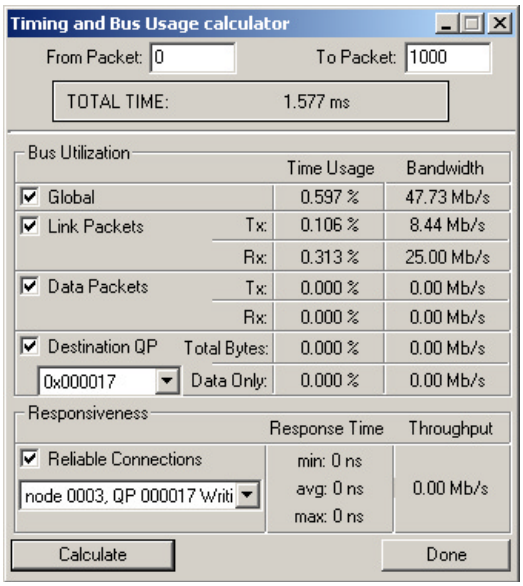
10.6 Timing Calculations

The Timing and Bus Usage Calculator calculates time between packets.

To calculate timing and bus usage,

Select **Report >Timing Calculations** from the Menu Bar or click in the Tool Bar.

You see the File Information screen:



To calculate bus usage and bit rate errors,

Step 1 Enter the range of packets to be examined in the text boxes marked "From packet" and "To packet."

Step 2 Click the "Calculate" button.

At this point, bus usage will be calculated.

Global:

Time Usage - sum of percentage used by all packets/ordered sets _on both directions of the link_. Can be 0-200%

Bandwidth - all the bits for all packets/ordered sets _on both directions of the link_ divided by the time for the range. Can be from 0-5000 MBits/second

Link Packets:

Time Usage - percentage used by all link packets on both directions of the link separately. Can be 0-100%

Bandwidth - all the bits for all link packets on both directions of the link divided by the time for the range, separately. Can be from 0-2500 MBits/second.

Data Packets:

Time Usage - percentage used by all Data packets on both directions of the link separately. Can be 0-100%

Bandwidth - all the bits for all Data packets on both directions of the link divided by the time for the range, separately. Can be from 0-2500 MBits/second

Destination QP:

Time Usage - percentage used by all packets directed to the specified QP on both directions of the link. Can be 0-200%. Displayed for total packet usage and usage just by the payload data

Bandwidth - all the bits for all packets directed to the specified QP on both directions of the link divided by the time for the range. Can be from 0-5000 MBits/second. Displayed for total packet BW and BW just for the payload data.

Reliable connection:

For the selected connection and operation type displays min, max and average response time (time between the last packet of the request message and the first packet of the response message), and also the effective data payload throughput (number of transferred payload bits divided by the range time.

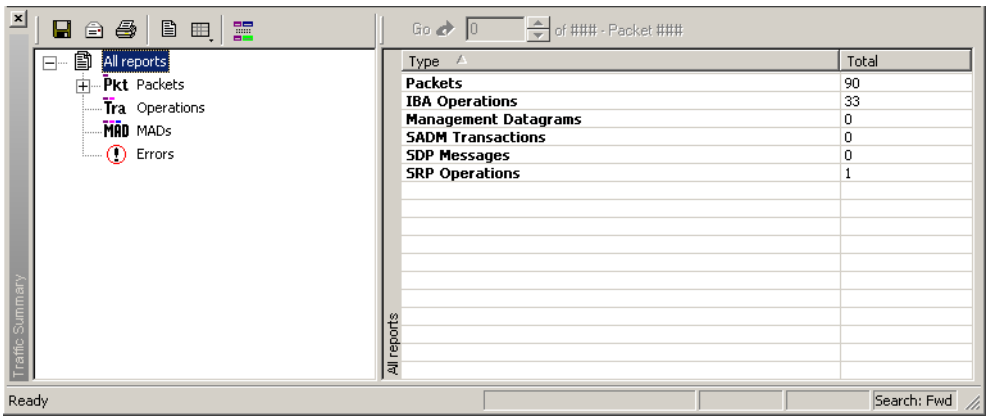
10.7 Traffic Summary

Traffic Summary displays a summary of the types of traffic that occurs in the current trace file and allows you to go to a specific packet.

To display an Traffic Summary report,

- Click in the Tool Bar or select **Report > File Information** from the Menu Bar

  The Traffic Summary screen appears below the trace:

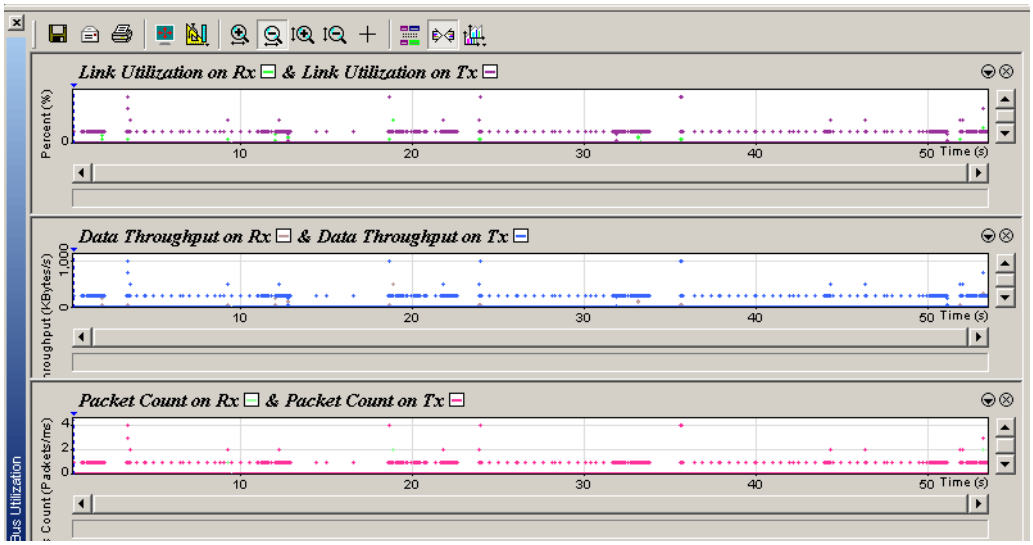


The left pane displays a tree of the different protocol levels. Click the plus symbol (+) to expand the tree. The example above is fully expanded. The right pane displays a summary of the traffic for the selected level.

10.8 Bus Utilization

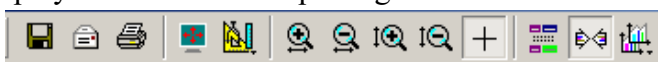
The **Bus Utilization** window displays a graph of bandwidth use within a displayed trace.

To open the Bus Utilization window, select **Report >Bus Utilization** or click the button marked . A window will open with graphs of Link Utilization, Data Throughput, and Packet Counts:



Bus Utilization Buttons

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



The buttons have the following functions:

Save As - Saves the graphs as a bitmap file (*.bmp)

Email - Creates an email with a *.bmp file attachment of the graphs

Print

Full Screen

View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below.

Vertical zoom in

Vertical zoom out

Click and Drag zoom - Click diagonally to select and zoom in on part of the graph

Select Range

Sync and Graph areas - If two or more graphs are displayed, this button will synchronize the graphs to one another. Once synchronized, the positioning slider of one graph will move the other graphs

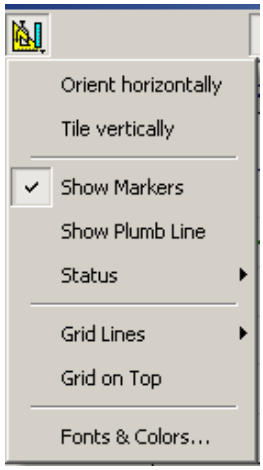
Horizontal zoom in

Graph Areas - Presents options for displaying additional graphs of data lengths, packet lengths, and percentage of bus utilized.

Horizontal zoom out

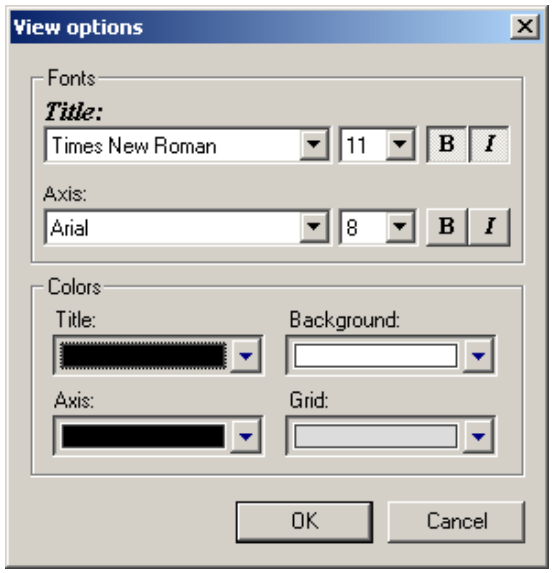
View Settings Menu

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



- **Orient Horizontally** - changes the orientation of bus usage to horizontal. After selecting this option, the menu will say "Orient Vertically."
- **Tile Vertically** - tiles the two graphs vertically (i.e., side by side).
- **Show Markers** - Places "tick" marks along the x axis of each graph.
- **Show Plumb Line** - Displays a vertical line that connects your cursor to the horizontal axis. As the mouse is moved, the status bar will show the packet and time frame to which the cursor is pointing.
- **Status** - Opens a sub-menu with the following options:
  - — Bar - Displays a status bar at bottom of graph.
  - — Tooltip - Causes a tooltip to appear if you position your mouse pointer over part of the graph and leave it there for a couple of seconds.
  - — None - Turns off tooltips and the status bar.
- **Grid Lines** - Opens a sub-menu with the following options:
  - — Both - Displays both X and Y axis gridlines.
  - — X Axis - Displays X axis gridlines.
  - — Y Axis - Display Y axis gridlines.
  - — None - Turns off gridlines.
- **Grid on Top** - Moves the grid lines above the graph.

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

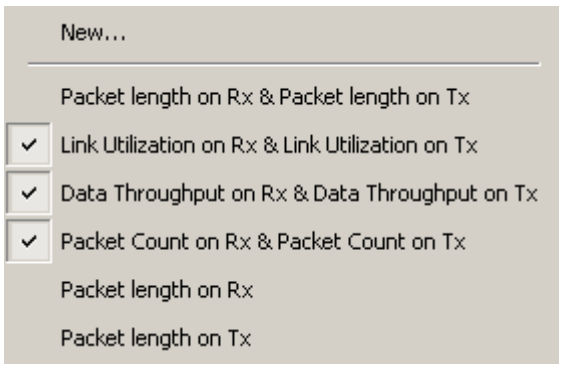


Graph Areas Menu

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

Step 1 Click the button.

The Graph Areas menu opens.



Step 2 Select the data you want to appear in the Graph Areas window.

To change the properties in the Bus Utilizations graph, follow these steps:

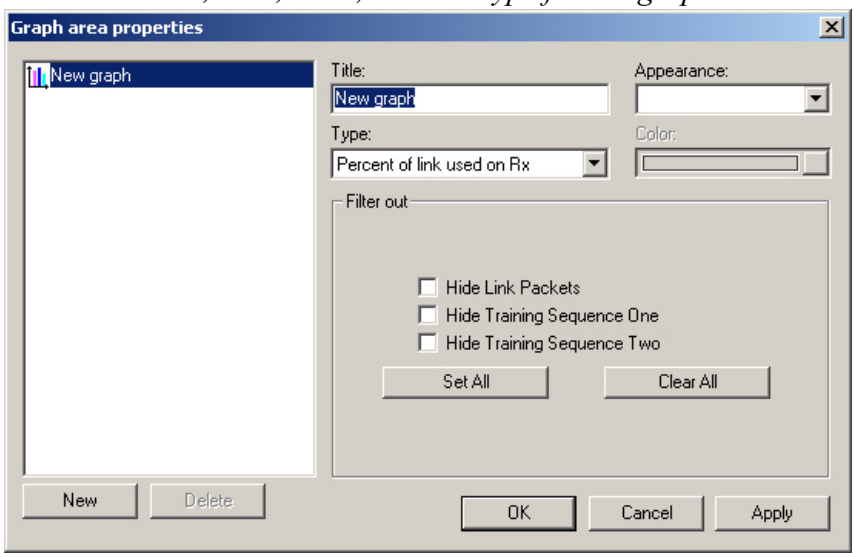
Step 1 In the **Graph Area**s menu, select the type of data to be displayed.

Step 2 Click **OK**.

Or

To make a new graph, click **New**.

The following dialog box will open. It will display options for setting the title, data, color, and line type for the graph.

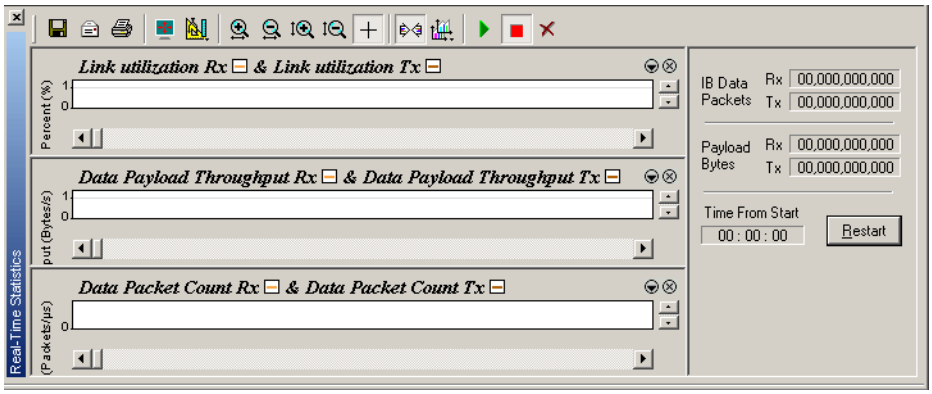


10.9 Real Time Statistics

Real Time Statistics displays a summary of the traffic currently being recorded by the analyzer.

To display the Real-Time Statistics window, click in the Tool Bar.

The Real Time Statistics window opens:



To see a graph of traffic, start InfiniBand link activity, then press to start the Real-Time statistics monitor. As traffic flows on the link, data will stream in real-time to this window in a format of your choice.

To stop the monitor, press .

Real-Time Statistics Buttons

The Real-Time Statistics toolbar has buttons for changing the format of the displayed data and for exporting data:

The buttons have the following functions:

Save As - Saves Real-Time graphs as bitmap files (*.bmp)

Email - Creates an email with a *.bmp file attachment of the graphs

Print

Full Screen

View Settings - opens a sub-menu with options for formatting the display. See "View Settings Menu" below

Horizontal zoom in

Horizontal zoom out

Vertical zoom in

Vertical zoom out

Click and Drag zoom - Click diagonally to select and zoom in on part of the graph

Select Range

Sync and Graph areas - If two or more graphs are displayed, this button will synchronize the graphs to one another. Once synchronized, the positioning slider of one graph will move the other graphs

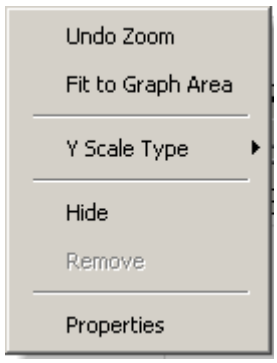
Graph Areas - Presents options for displaying additional graphs of data lengths, packet lengths, and bus utilization

Start. Starts the Real-Time Monitor

Stop Real-Time Monitoring

Reset. Resets the graphs

Real-Time Statistical Monitor Pop-up Menu



If you right-click a graph in the Real-Time window, a pop-up menu appears with the following options:

Undo Zoom - If you have zoomed in, this command will undo the zoom.

Fit to Graph Area - Redisplays graph so that the entire trace fits inside graph area.

Y Scale Type:

Linear - Converts display to linear format.

Logarithmic - Converts display to logarithmic format.

Hide - Hides the selected graph.

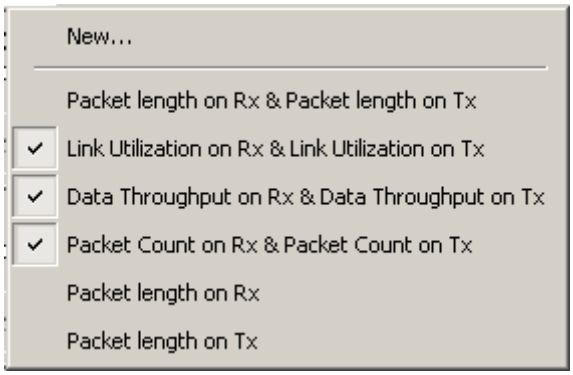
Properties - Opens a dialog box with options for changing the colors, titles and other features of the graphs.

Displaying Multiple Graphs

The Real Time Statistics window can display up to three separate graphing windows. The window gives you different graphing options:

- To view two or three graphs simultaneously, click the **Graph Areas** button.

The following menu opens.



The menu has the following options:

- **Link Utilization %** - Plots the percentage of Link utilization by non-idle traffic for both directions of the link.
- **Data Packet Count (Packets/s)** - Plots counts of InfiniBand Data Packets per second for both directions of the link.
- **Data Payload Throughput (MBytes) -** Plots data payload throughput for both directions of the link.
- **Packet Length on Rx** - Plots packet lengths on the Receive link.
- **Packet Length on Tx** - Plots packet lengths on the Transmit link.

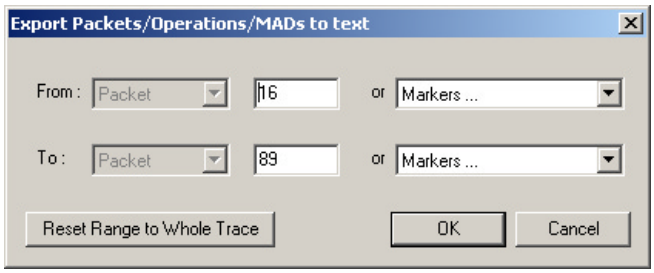
10.10 Exporting Packets and Data

IB*Tracer* allows you to export packets and data into text files.

To export packets to a text file,

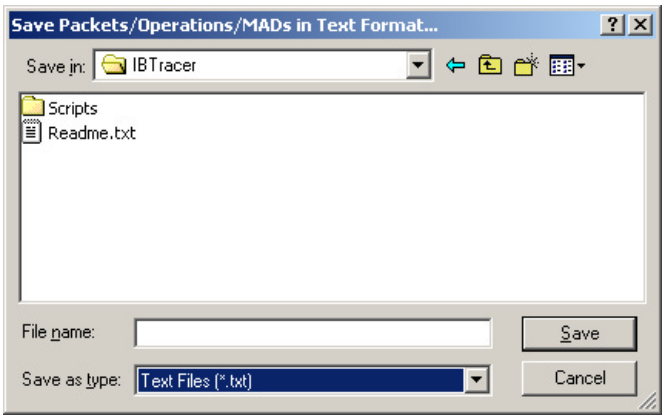
Step 1 From the File menu, select Packets to Text... under Export.

Step 2 In the **From** and **To** fields, enter the range.



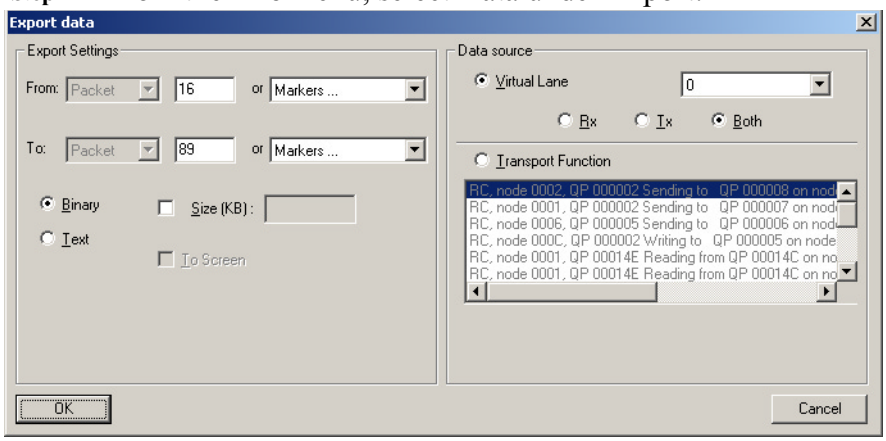
Step 3 Click OK.

Step 4 Specify a path and filename, and click **Save**.

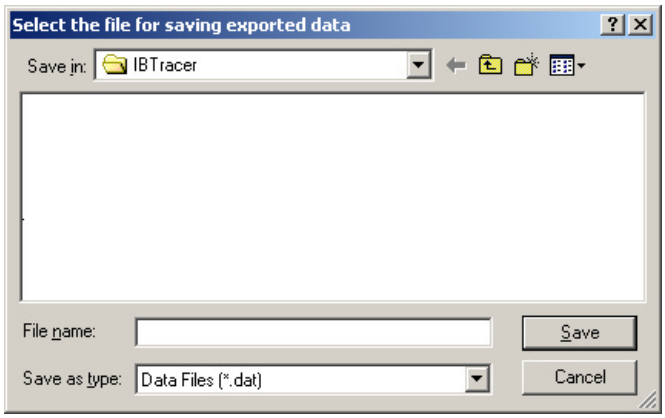


To export data,

Step 1 From the **File** menu, select Data under Export.



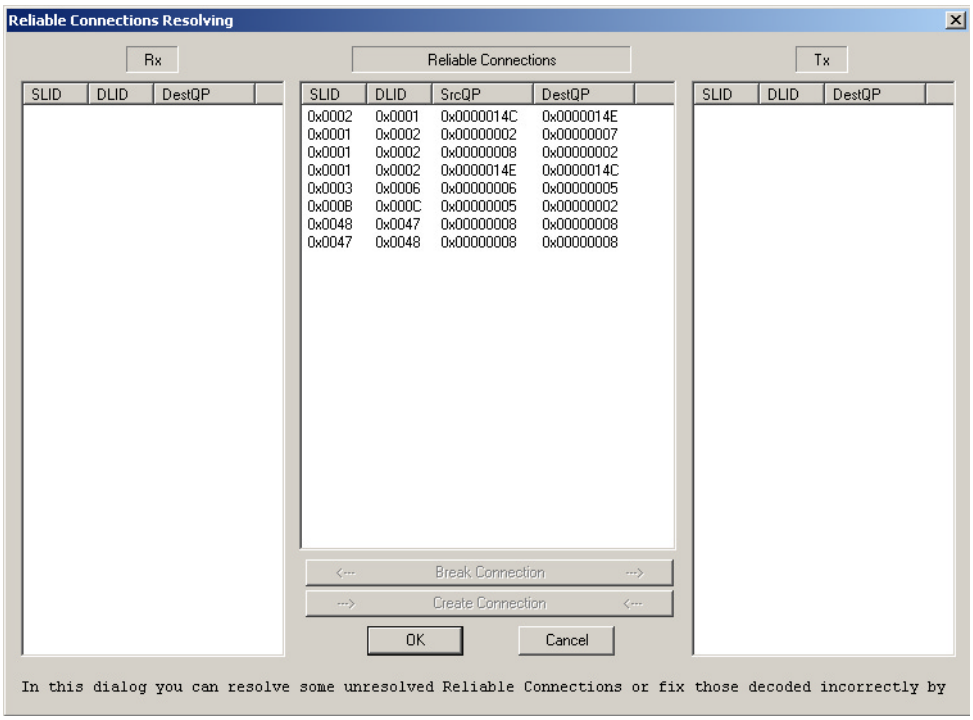
Step 2 Specify the export settings and the data source, and click **OK**.



Step 3 Specify a path and filename, and click **Save**.

10.11 Resolving Reliable Connections

The **Resolve Reliable Connections** dialog box allows you to assign unresolved **Reliable Connections** within the open trace. This dialog box will open immediately following a recording if there are unresolved connections. You can open this dialog any time by selecting R**esolve Reliable Connections** from the **View** menu.



Unresolved Reliable Connections occur if the recording does not capture key events in the traffic - for example, if a device is connected prior to beginning the recording. The Resolve Reliable Connections dialog can let you manually assign one half of a connection to another.

You can leave connections unresolved by clicking **OK**.

Breaking a Connection

To break a connection that you believe is incorrect, select it from the center column, then click the button marked **Break Connection**.

Creating a Connection

To connect two halves of a connection, select an entry from the Rx column, and then select an entry from the Tx column that you believe matches to it. If the DLID and SLID values match, the Create Connection button will become active. Click the button to make the connection.

10.12 Verification Scripts

IB*Tracer* supports the use of verification scripts, a tool for performing custom decodes and tests on traces that have already been created. A vendor, for example, can record some traffic that might have vendor-specific MADs and then afterwards use verification scripts to decode the vendor MADs, or perform custom compliance test on the traffic, or provide statistics on events not measured by Bus Utilization or Traffic Summary.

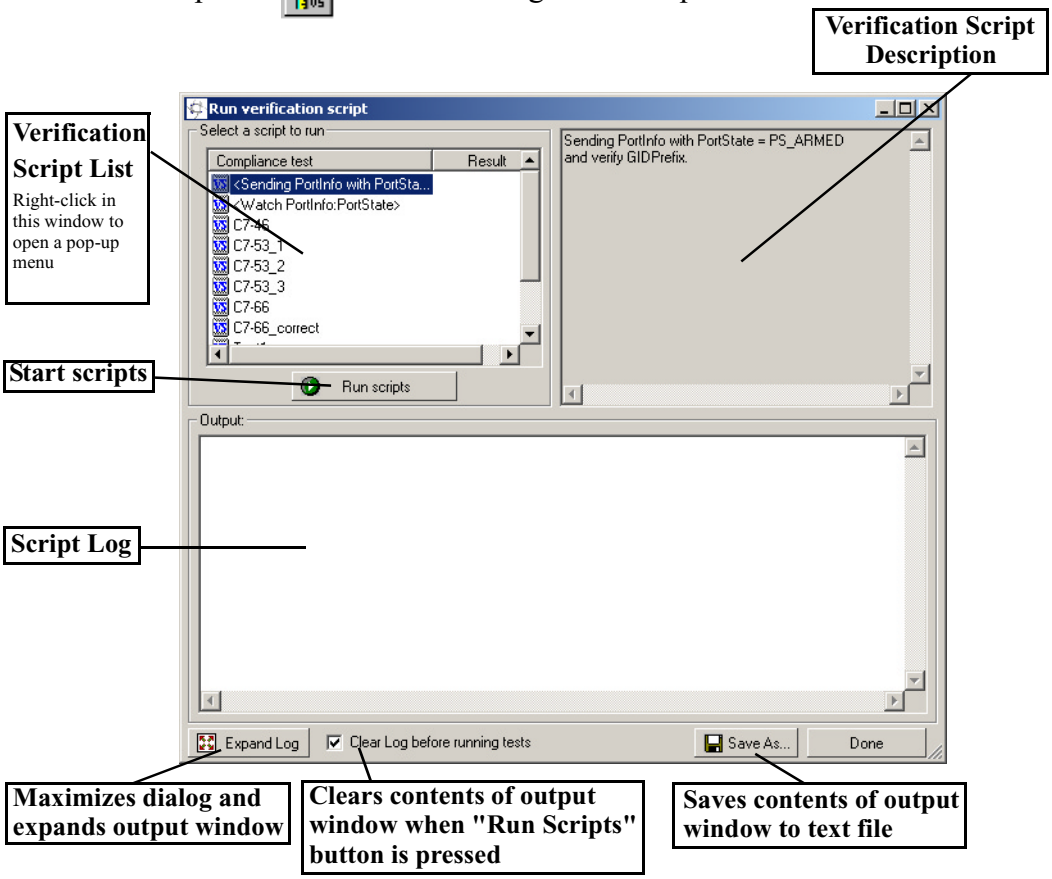
For more information on Verification Scripts, please see the *Verification Script Engine User Manual* available from CATC.

How to Run a Verification Script

CATC provides some sample scripts in the directory CATC\IBTracer\Scripts\VFScripts which you can run to see how the analyzer software handles them. These script files have a *.dec extension. These files are provided so that you can modify them or use them as models for new files.

To run a script, perform the following steps:

Step 1 Select **Reports** > **Run verifications scripts ...** from the menu or press . The following window opens:

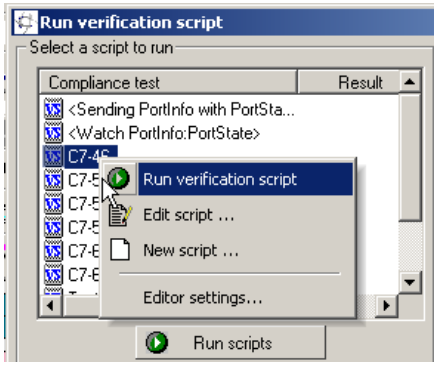


Step 2 To run an existing script, select a script from the **Verification Script List**, and then click the **Run Script** button. The script will execute and display a log of the results in the **Script Log** window.

Editing and Creating Scripts

If you right-click in the **Verification Script List**, a pop-up menu will appear with options for executing, editing, and creating scripts.

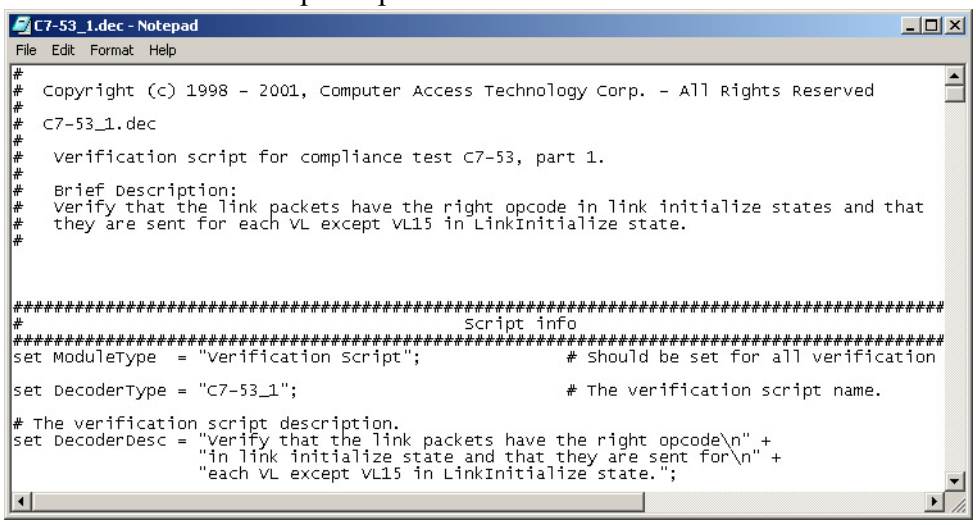
Step 1 In the **Verification Script List**, right-click to open a pop-up menu:



Four menu items display:

- **Run verification script -** Runs whatever script is selected in the **Script Verification List**.
- **Edit script ...** - Opens Notepad and displays the text of the selected script file so you can edit and save the script.
- **New script ...** - Opens Notepad and displays a blank screen so you can create a new script file from scratch.
- **Editor settings ...** - Opens a dialog box for configuring Notepad.

Step 2 To edit an existing script, select **Edit script ...** from the pop-up menu. Notepad opens.



Step 3 Edit or add text, then save the file. For help with your edits, refer to the ***Verification Script Engine User Manual*** available from CATC.

11. How to Contact CATC

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…	Computer Access Technology Corp. Customer Support 3385 Scott Blvd. Santa Clara, CA 95054-3115 USA
Send e-mail…	support@CATC.com
Visit CATC's web site…	http://www.CATC.com/

Warranty and License

Computer Access Technology Corporation (hereafter CATC) warrants this product to be free from defects in material, content, and workmanship, and agrees to repair or replace any part of the enclosed unit that proves defective under these terms and conditions. Parts and labor are warranted for one year from the date of first purchase.

The CATC software is licensed for use on a single personal computer. The software may be copied for backup purposes only.

This warranty covers all defects in material or workmanship. It does not cover accidents, misuse, neglect, unauthorized product modification, or acts of nature. Except as expressly provided above, CATC makes no warranties or conditions, express, implied, or statutory, including without limitation the implied warranties of merchantability and fitness for a particular purpose.

CATC shall not be liable for damage to other property caused by any defects in this product, damages based upon inconvenience, loss of use of the product, loss of time or data, commercial loss, or any other damages, whether special, incidental, consequential, or otherwise, whether under theory of contract, tort (including negligence), indemnity, product liability, or otherwise. In no event shall CATC's liability exceed the total amount paid to CATC for this product.

CATC reserves the right to revise these specifications without notice or penalty.

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