



User Guide

980 HDMI 2.0 Protocol Analyzer Module

Rev. A3



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1 About the 980 HDMI 2.0 Protocol Analyzer Module

This chapter provides an overview of features of the 980 HDMI 2.0 Protocol Analyzer module and the 980 GUI Manager. The 980 HDMI 2.0 Protocol Analyzer module is an analyzer for HDMI 2.0 source devices operating up to 600MHz TMDS character rate. It provides visibility into the HDMI protocol to help resolve common interoperability problems in HDMI systems. The 980 GUI Manager is a PC application to manage and use the 980 HDMI 2.0 Protocol Analyzer module and other 980 modules.

The module can be equipped in either of two 980 Advanced Test Platforms:

- 1) The 980B Advanced Test Platform – 5-slot chassis with a 15 inch touch display
- 2) The 980R Advanced Test Platform - 5-slot rack mountable chassis with a 7 inch touch display

The 980 HDMI 2.0 Protocol Analyzer module is able to parse HDMI streams from source devices with a TMDS clock and pixel clock up to 600MHz.

The 980 HDMI 2.0 Protocol Analyzer enables you to specify the type of data that you want to capture. This could be:

- Data Analysis (Audio, Video, Data Island) - The 980 will capture all the audio packets, video data and the data islands, timing data and auxiliary data.
- Data Analysis (Only Data Islands) - The 980 will only capture the data islands (not the video packets).
- Protocol Analysis – The 980 will capture the protocol data such as the preamble and guard band data. You will not be able to see the details of the data island, video or audio data.



1.1 What makes the 980 HDMI 2.0 Protocol Analyzer Module Unique?

The 980 HDMI 2.0 Protocol Analyzer module for HDMI source devices provides visibility into the HDMI protocol, timing, control and auxiliary data. It captures and decodes encrypted or unencrypted metadata (audio sample, infoframes and other data packets) as well as HDMI DDC transactions and HDMI CEC messages (future).

The 980 HDMI 2.0 Protocol Analyzer module supports selected HDMI source protocol compliance tests in Sections 7.2, 7.4 and 7.7 of the HDMI 2.0 CTS.

1.2 Scope of this User Guide – What is not covered in this User Guide

This User Guide documents the operation of the 980 HDMI 2.0 Protocol Analyzer module as installed in the 980B or 980R Advanced Test Platforms. It is intended to be used with the 980 Advanced Test Platform Quick Start Guide.

The User Guide describes the features and functions of the 980 HDMI 2.0 Protocol Analyzer module as operated through the standalone PC application, i.e. the 980 Manager. The screen shots used are usually from the most current release of the 980 GUI Manager. In some cases there are functions of the embedded 980 GUI Manager that will be covered in detail as well. These include: 1) Provisioning the IP address of the 980. 2) Viewing the incoming video content from a source device. 3) Viewing the incoming HDMI video metadata and DDC transactions in real time.

This User Guide **does not include start up procedures** for the 980 platform. The start-up procedures are covered in the *980 Advanced Test Platform Quick Start Guide*:

The following are the high level steps you will need to follow to get your 980 platform up and running:

1. Remove the 980 platform from the shipping box.
2. Connect the 980 platform power cable (provided) to a suitable outlet (110-240V 50/60Hz) and apply power to the 980.
3. Download and install the latest 980 GUI Manager software.
4. Determine how you are going to connect to the 980 platform from the external 980 GUI Manager in order to operate the instrument:
 - Put the 980 on your corporate network and enable DHCP using an available Ethernet patch cable, or...
 - Connect directly with a host PC or laptop using the Ethernet crossover cable provided.
5. Assign an IP address to the 980 platform either directly or by enabling DHCP.
6. Download the latest 980 GUI Manager application from the Quantum Data website:
www.quantumdata.com/downloads/index.asp.
7. Install the 980 Manager application on your host PC.
8. Establish a connection to the 980 from the 980 Manager resident on your host PC.
9. Through the 980 Manager “Add” the 980 as an Instrument.

This User Guide **does not include description or procedural information for any of the compliance test** options available with the 980 HDMI 2.0 Protocol Analyzer module. Procedures for running the HDMI 2.0 source compliance tests are covered in the HDMI Method of Implementation documents (MOIs).

The following is a list of the User Guides available for the 980 systems:

- 980 HDMI Protocol Analyzer Gen 3 System – Covers source analysis testing for HDMI and MHL source devices as well as various transmitter features. This user guide is specifically for the functions of the 980 HDMI Protocol Analyzer Gen 3 system sold through 2012.

- 980 Advanced Test Platform Quick Start Guide – Covers startup procedures for the 980 platform. Used in conjunction with the 980 HDMI 2.0 Protocol Analyzer Module User Guide for purchases in 2013.
- 980 HDMI Protocol Analyzer module – Covers source analysis testing for HDMI and MHL source devices as well as various transmitter features. This user guide is specifically for the functions of the 980 HDMI 2.0 Protocol Analyzer module equipped in one of the 980 Advanced Test Platform slots (980 Gen 3 or 980B). Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Protocol Analyzer HDMI Source Compliance Test – Covers source compliance testing for both MHL and HDMI sources. These compliance test applications are provided by the 980 HDMI 2.0 Protocol Analyzer module or the 980 HDMI 2.0 Protocol Analyzer Gen 3 system. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Protocol Analyzer HDMI Sink Compliance Test – Covers sink compliance testing for both MHL and HDMI sinks (and MHL dongles). These compliance test applications are provided by the 980 HDMI 2.0 Protocol Analyzer module or the 980 HDMI 2.0 Protocol Analyzer Gen 3 system. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Protocol Analyzer HDMI HDCP Source Compliance Test – Covers HDMI HDCP compliance tests on source devices. These compliance test applications are provided by the 980 HDMI 2.0 Protocol Analyzer module.
- 980 MHL CBUS Compliance Test Module - Covers MHL CBUS compliance testing for both MHL sources as well as sinks and dongles. This compliance test applications are provided by the 980 CBUS Compliance Test module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI 2.0 Video Generator module – Covers the features and functions offered by the 980 HDMI 2.0 Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Video Generator module – Covers the features and functions offered by the 980 HDMI Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI 2.0 Protocol Analyzer module (This User Guide) – Covers HDMI 2.0 protocol analysis on source devices operating at TMDS character rates up to 600MHz.

1.3 What options are available with the 980 HDMI 2.0 Protocol Analyzer Module?

The following options can be purchased with the 980 HDMI 2.0 Protocol Analyzer module. You must have a license to use the option(s):

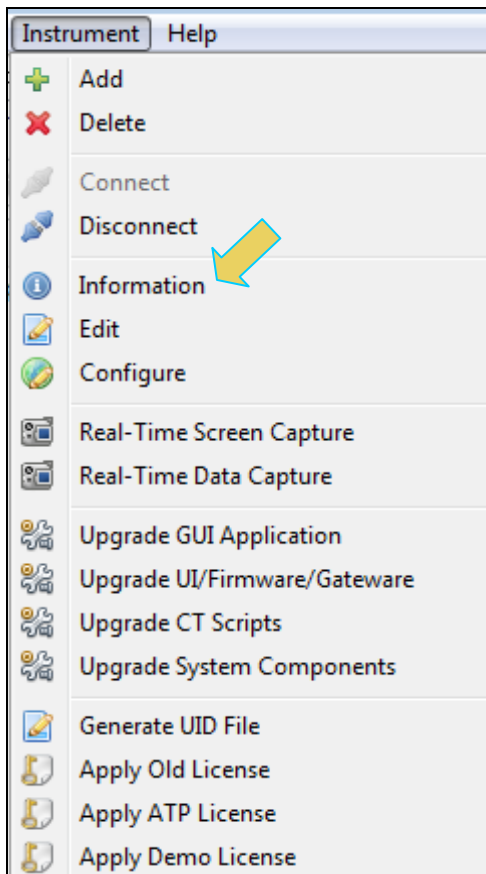
HDMI 2.0 Source Compliance option package #3 which includes the following MOIs:

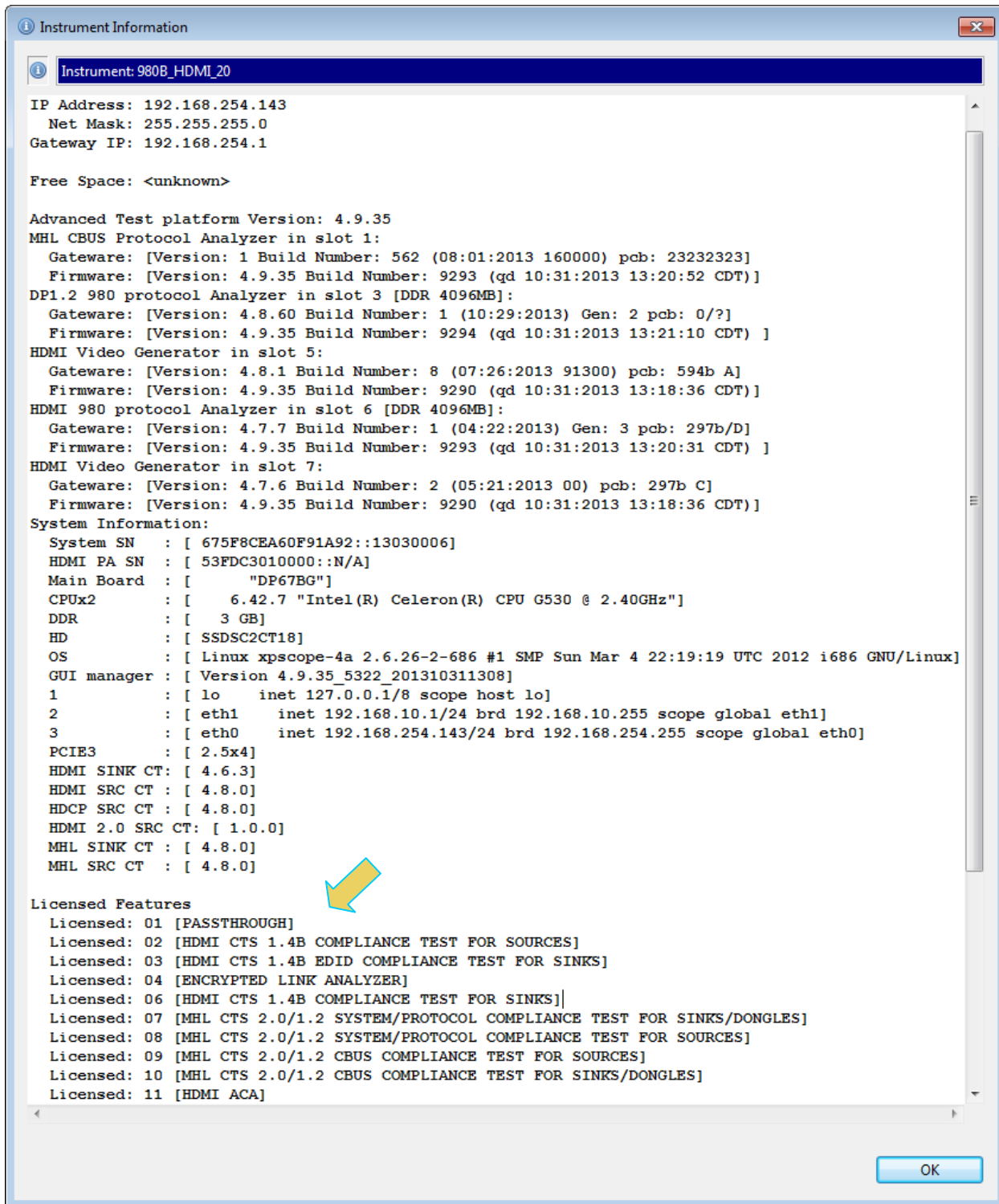
- HF1-11 (Source TMDS Protocol – 6G – Legal Codes)
- HF1-12 (Source TMDS Protocol – 6G – Basic Protocol& Scrambling)
- HF1-13 (Source TMDS Protocol – 6G – Scrambling < 3.4 Gbps)
- HF1-14 (Source TMDS Protocol – 6G – 2160p 24-bit color depth)
- HF1-15 (Source TMDS Protocol – 6G – Deep Color)
- HF1-16 (Source TMDS Protocol – 6G – 2160p 3D)
- HF1-18 (AVI Infoframe – 6G)
- HF1-21 (Source TMDS Protocol – 6G – Legal Codes – Other video timings)

- HF1-22 (Source TMDS Protocol – 6G – Basic Protocol& Scrambling – other video timings)
- HF1-24 (Video Timing – 6G – Other 24-bit color depth)
- HF1-25 (Video Timing – 6G – Other Deep Color)
- HF1-28 (AVI Infoframe – 6G – Other video timings)
- HF1-35 (Video Timing – 21:9 (64:27))

You can determine what options the 980 is provisioned with by looking at the label on the bottom of the 980 or by accessing the Instrument Information screen on either the built-in or external 980 GUI manager. When using the external 980 GUI Manager you must be connected to the 980 in order to read the Instrument Information.

Select **Information** to view the **Instrument Information** panel. Refer to the following screen.





1.4 Changes to this User Guide

This is a new User Guide.

Note: Please be sure to check the Quantum Data website for updates to this User Guide.

1.5 980 User Interface

The 980 provides a graphical user interface (980 GUI Manager) for operation. This GUI can run both on the 980 itself through the built-in color touch screen display (embedded 980 GUI Manager) or as a standalone application running on a PC (external 980 GUI Manager). The look and feel and functions are similar but not identical.

1.5.1 980 GUI Manager

The external 980 GUI Manager provides easy access to the captured data on your PC for sharing with others. Also the external 980 GUI Manager enables you to operate the 980 through a larger interface which allows you to use multiple panels at the same time.

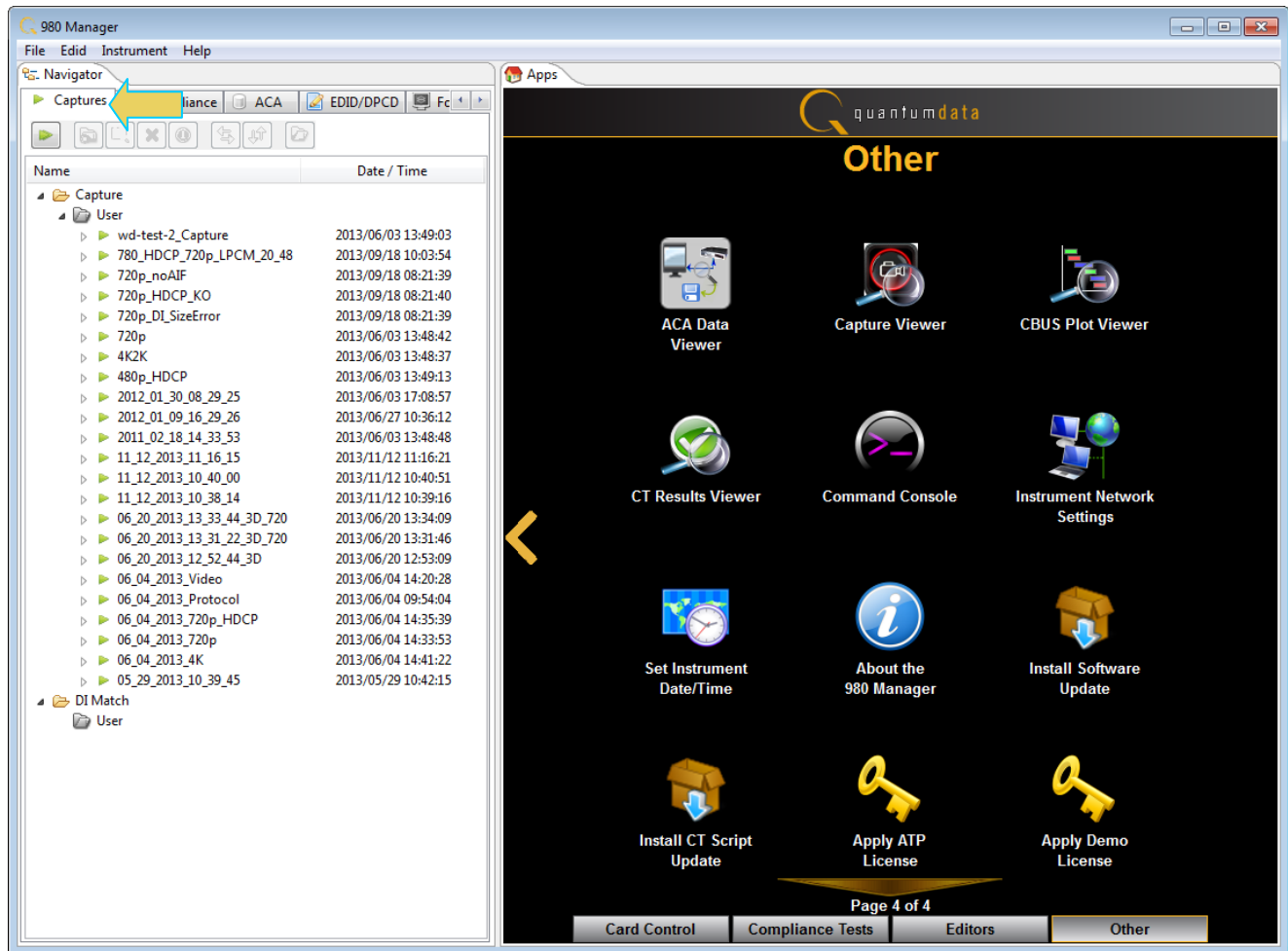
1.5.2 Embedded 980 GUI Manager – Real Time Monitoring

You can operate the 980 HDMI 2.0 Protocol Analyzer module fully through the built-in color touch screen display.

You can transfer data captures taken from the built-in touch display to your PC where they can be viewed through the external 980 GUI Manager and also disseminated to others for analysis.

1.5.3 Embedded 980 GUI Manager and External GUI Manager layout differences

Aside from the “Real Time” mode using the receiver there are a few other differences in the layouts between the embedded 980 GUI Manager and the External 90 GUI Manager. The primary difference is the Navigator panel which enables you to access the data elements and test results from an instrument. In the External 980 GUI Manager, the **Navigator** panel is always present on the left side of the 980 GUI Manager application window as shown below.



In the Embedded 980 GUI Manager, the **Navigator** panel must be opened. You can access it either from the Other Page of the Apps window, refer to the first screen example below or you can access the Navigator from the Real Time window as shown in the second screen example. Finally you can also access the Navigator from any window in the embedded GUI using the activation key at the bottom of any screen as shown below.

quantumdata

Other

- Navigator
- Capture Viewer
- CBUS Plot Viewer
- CT Results Viewer
- Command Console
- Instrument Network Settings
- About the 980 Manager
- Calibrate the LCD
- Apply ATP License
- Apply Demo License

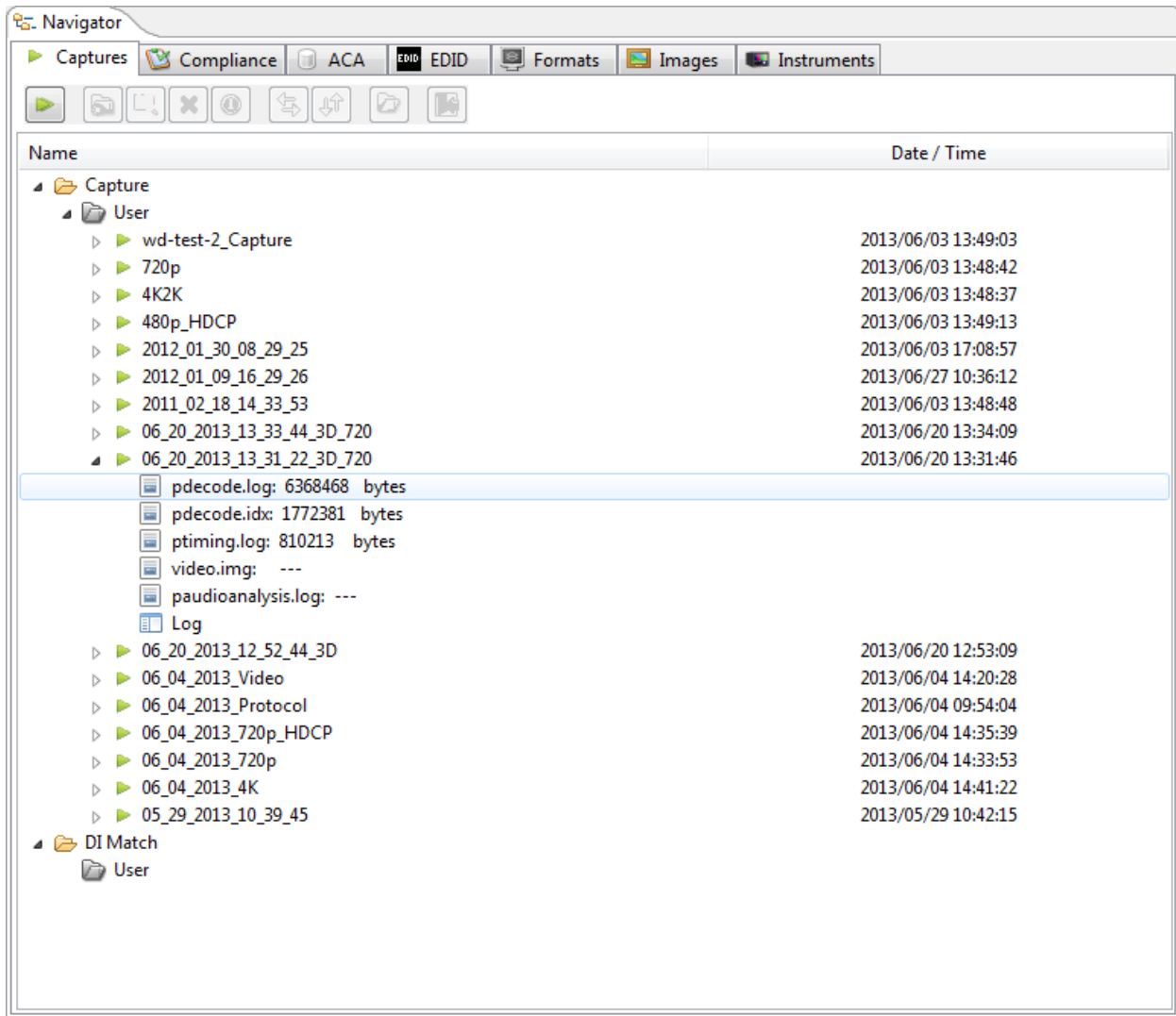
Page 4 of 4

Card Control | Compliance Tests | Editors | **Other**

Back | Navigator | DHCP: 192.168.254.160 | ATP Version: 4.8.15 (3 cards detected) | X



When you access the **Navigator** it will appear in the window as shown below.



1.6 What kinds of data does the 980 HDMI 2.0 Protocol Analyzer module allow you to view?

By providing visibility into the HDMI and MHL protocol, metadata, video, audio and auxiliary data, the 980 HDMI 2.0 Protocol Analyzer module enables you to detect changes and identify anomalies in the HDMI signal. The following is a list of the data types you can view (currently):

- Video
 - Timing parameters
 - Pixel values
- Data Islands, including:
 - Infoframes (AVI, Audio, Source Product Descriptor, etc.)
 - General Control Packet (GCP)
 - Audio Clock Regeneration (ACR)
 - Audio Sample Packet Header including Channel Status Blocks
- Hot plug events

- DDC, transactions, including:
 - HDCP
 - EDID
- Control data (vsync, hsync, encryption enable)
- HDMI CEC transactions

2 Getting Started

This chapter explains what is involved in getting your 980 HDMI 2.0 Protocol Analyzer up and operating to capture data. Detailed Getting Started procedures are provided in the 980 Advanced Test Platform Quick Start Guide. This User Guide should be used in conjunction with the Quick Start Guide.

2.1 What is shipped with the 980 HDMI 2.0 Protocol Analyzer module?

If you order the 980 HDMI 2.0 Protocol Analyzer module option with the purchase of the 980B or 980R Advanced Test Platforms, the module will be pre-installed in the chassis and the following items will be provided:

- HDMI cable (P/N 30-00146) – used for connecting to the 980 to the device under test.

2.2 Operational workflow for Source Analysis Testing

The following are the high level steps you will need to follow to get your 980 HDMI 2.0 Protocol Analyzer module up and running. Note the first set of these procedures are covered in the 980 Quick Start Guide and not in this User Guide.

2.2.1 Procedures covered in 980 Advanced Test Platform Quick Start Guide:

1. Remove the 980 from the shipping box.
2. Assemble the source device under test into your lab area and power it up. When using the optional pass-through feature to monitor between an HDMI source and an HDMI sink, assemble the display device as well.
3. Connect the 980 HDMI 2.0 Protocol Analyzer power cable (provided) to a suitable outlet (110-240V 50/60Hz) and apply power to the 980.
4. (Optional – not required if using the built-in display) Select a suitable PC to host the 980 GUI Manager application. A minimum of 512MB of RAM is recommended. (Note that you do not need a PC because you can use the built-in Front Panel display; however the external 980 GUI Manager provides you with a larger viewing area).
5. (Optional – not required if using the built-in display) Determine how you are going to connect to the 980 HDMI 2.0 Protocol Analyzer from the external 980 GUI Manager in order to operate the instrument:
 - Put the 980 on your corporate network and enable DHCP using an available Ethernet patch cable, or...
 - Connect directly with a host PC or laptop using the Ethernet crossover cable provided.
6. (Optional – not required if using the built-in display) Assign an IP address to the 980 platform either directly or by enabling DHCP.
7. (Optional – not required if using the built-in display) Download the latest 980 GUI Manager application from the Quantum Data website:
www.quantumdata.com/downloads/index.asp.
8. (Optional – not required if using the built-in display) Install the 980 Manager application on your host PC.
9. (Optional – not required if using the built-in display) Establish a connection to the 980 from the 980 Manager resident on your host PC.
10. (Optional – not required if using the built-in display) Through the 980 Manager “Add” the 980 platform as an Instrument.

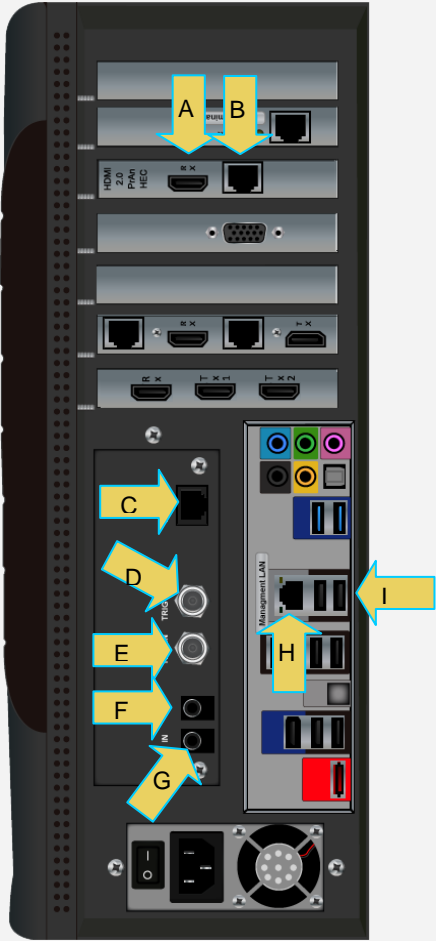
2.2.2 Procedures covered in this User Guide:

1. Connect the source device under test to the HDMI Rx port on the 980 HDMI 2.0 Protocol Analyzer module.
3. Set the capture trigger criteria and the pre-capture filtering criteria.
4. Initiate the capture.
5. View and analyze the captured data.
6. (Optional) If you have purchased the HDMI source compliance test option you can run this test series as well. However you will have to refer to the User Guide for Compliance Tests for these procedures.

2.3 Connector Description

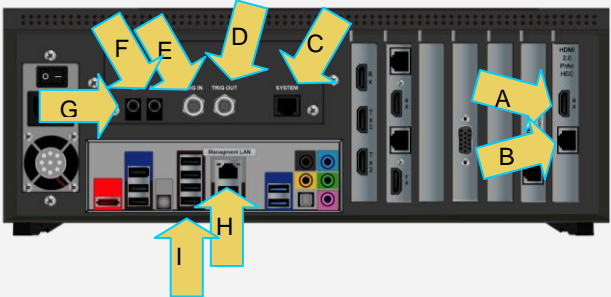
This User Guide covers three configurations of the 980 rear panels with the HDMI 2.0 Protocol Analyzer module installed. Each illustration shows a single 980 HDMI 2.0 Protocol Analyzer module installed in the 980B and 980R along with an auxiliary bus board.

Use the following table to identify the connector function and descriptions on your 980B and 980R system configuration.

980B Configurations	Information / Function
<p>Protocol Analyzer in 980B</p> 	<p>The following is a description of each connector:</p> <p>980 HDMI 2.0 Protocol Analyzer module:</p> <ul style="list-style-type: none"> ▪ A – HDMI Rx port for analyzing HDMI and MHL sources or for running HDMI or MHL compliance tests on sources. ▪ B – Ethernet Rx connector use for HEAC function. Ethernet can be injected into the HDMI 1.4 outgoing stream (not currently supported). <p>Note: HDMI 2.0 Protocol Analyzer module may be equipped in slots 1, 3 or 6 in the 980B ATP.</p> <p>QD Bus Board (99-000631):</p> <ul style="list-style-type: none"> ▪ C – Ethernet Tx connector use for HEAC function. Extracted Ethernet can be connected to a NIC card. ▪ D – BNC Trig OUT connector. Not used in this configuration. ▪ E – BNC Trig IN connector. Not used in this configuration. ▪ F – RCA OUT connector for SPDIF function. Extracted SPDIF from HDMI 1.4 ARC can be connected to external instrument (future). ▪ G – RCA IN connector for SPDIF function. SPDIF audio can be injected into HDMI 1.4 ARC function (future). <p>Lower Panel:</p> <ul style="list-style-type: none"> ▪ H – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line

980B Configurations	Information / Function
	control and FTP for transferring files. <ul style="list-style-type: none"> I – Various USB ports for transferring files and restoring system.

Use the following table to identify the connector function and descriptions on your 980R system configuration.

980B Configurations	Information / Function
<p>HDMI Protocol Analyzer module – 980R</p> 	<p>The following is a description of each connector:</p> <p>980 HDMI 2.0 Protocol Analyzer module:</p> <ul style="list-style-type: none"> A – HDMI 2.0 Rx port for analyzing HDMI 2.0 sources or for running HDMI 2.0 compliance tests on sources. B – Ethernet Rx connector use for HEAC function. Ethernet can be injected into the HDMI 2.0 outgoing stream. <p>Note: HDMI 2.0 Protocol Analyzer module may be equipped in slots 1, 3 or 6 in the 980R ATP.</p> <p>980R QD Bus Board:</p> <ul style="list-style-type: none"> C – Internal Ethernet Tx connector; not used. D – BNC Trig OUT connector. Not used for this module. E – BNC Trig IN connector. Not used for this module (future). F – RCA OUT connector for SPDIF function. Not used for this module (future). G – RCA IN connector for SPDIF function. Not used for this module. <p>980R Lower Panel:</p> <ul style="list-style-type: none"> H – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line control and FTP for transferring files. I – Various USB ports for transferring files and restoring system.

2.4 980 HDMI 2.0 Protocol Analyzer Module Operational Modes

The 980 HDMI 2.0 Protocol Analyzer module can be operated in one of two operational modes: 1) Capture and Store for Analysis and 2) Real Time Monitoring (future).

2.4.1 Capture, Store and Post Analysis

The Capture and Post Analysis mode is the typical mode of operation and the mode used to analyze HDMI data and is available both through the built-in touch display GUI and the external 980 GUI Manager. You can capture

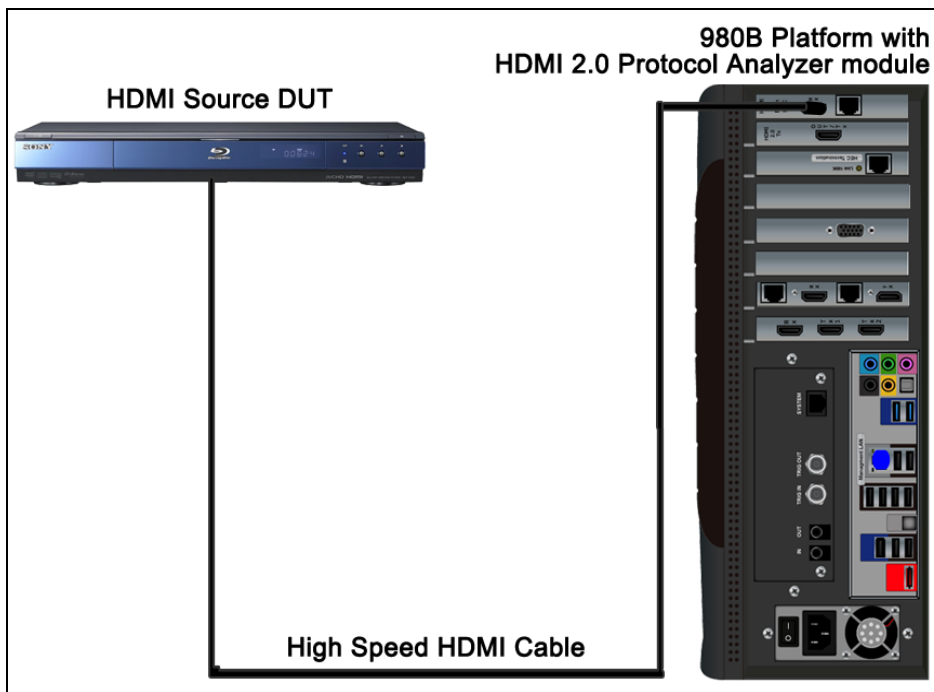
various sets of data: 1) Data islands, 2) Data islands with video and audio, 3) Control data and 4) DDC transactions.

2.4.2 Real Time Monitoring

The Real Time Monitoring mode is used to provide at-a-glance insights into the incoming video. You can view the incoming video even when the video encrypted with HDCP content protection. You can also view the incoming HDMI video/audio metadata and HDMI DDC transactions. The Real Time mode enables you to collect data in real time and compare incoming data over time to “reference” data collected earlier. The Real Time mode is available only through the built-in touch display GUI.

2.5 980 HDMI 2.0 Protocol Analyzer Module Analysis Configurations

The 980 HDMI 2.0 Protocol Analyzer module uses sink emulation with its HDMI Rx port connected directly to the source device under test. In the sink emulation mode you monitor the HDMI transactions between the source device under test and the 980 HDMI 2.0 Protocol Analyzer module's Rx port.



HDMI 2.0 Source Analysis Configuration – 980B ATP

2.6 980 Data Analysis Capture Modes

The 980 HDMI 2.0 Protocol Analyzer module can be configured to view different types of data in a capture and store application. These are described below.

2.6.1 Data Analysis (Audio, Video, Data Island)

The 980 HDMI 2.0 Protocol Analyzer module will capture all the audio packets, video data and the data islands. When you select this option you can then refine your selection to include or exclude Timing data and Video data. This mode is useful when you want to see all the video, audio, timing and metadata. In this mode the data island, audio sample packets and video component values for each pixel are visible. This mode requires more time for a capture.

2.6.2 Data Analysis (Only Data Islands)

The 980 HDMI 2.0 Protocol Analyzer module will only capture the data islands. It will not capture the video or audio sample packets. This mode enables you to capture more frames of specific types of data islands. For example if you wish to capture only infoframe packets, you can use this mode and capture thousands of frames of data depending on which types of infoframes you capture.

2.6.3 Protocol Analysis

The Protocol Analysis mode will capture the protocol data such as the preamble and guard band data. You will not be able to see the details of the data island, video or audio data. This data is especially useful in debugging failures in the HDMI or MHL source compliance tests for the Protocol tests.

2.7 Getting Started Procedures

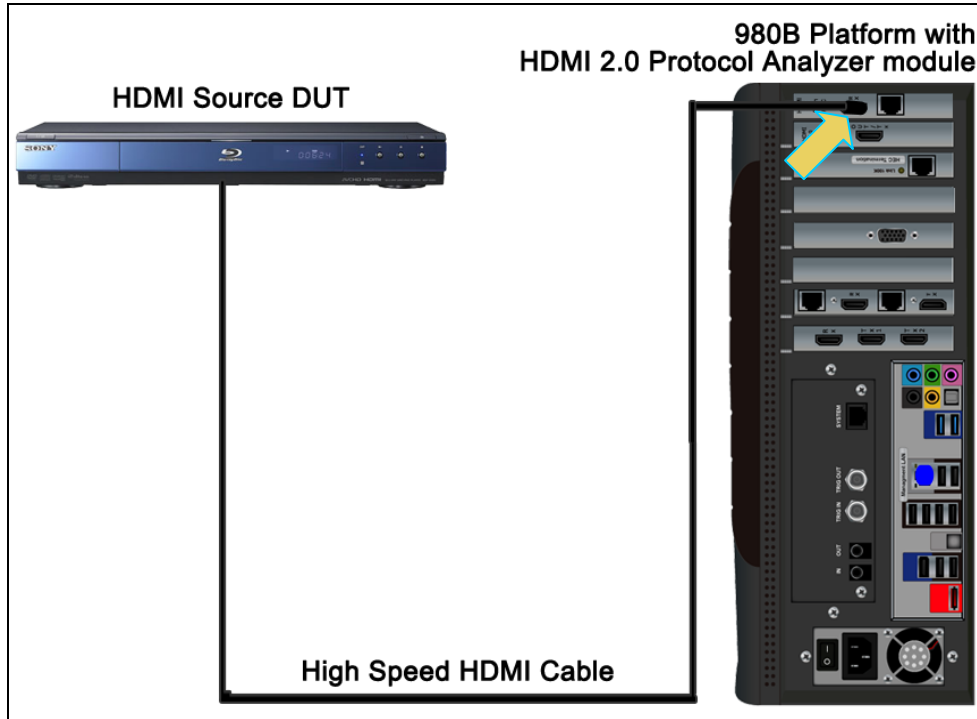
The getting started procedures involve the following tasks:

- Downloading, unzipping and launching the 980 GUI Manager application to allow you to operate the 980. (Not required if using the embedded 980 GUI Manager on the built-in display exclusively.)
- Powering up the 980 platform.
- Establishing a physical connection from the HDMI source device you wish to test and the 980 platform.
- (Not required if using the built-in display exclusively) Changing the IP address of the 980 platform so that it is compatible with your PC and or corporate LAN.
- (Not required if using the built-in display exclusively) Establishing an initial IP connection from the 980 Manager (residing on your host PC) and the 980 platform.

2.7.1 Establishing a physical HDMI connection from an HDMI 2.0 source device to the 980

Use the following procedures to connect your HDMI source device to the 980 HDMI 2.0 Protocol Analyzer module.

1. Connect the HDMI-to-HDMI cable provided from your HDMI source device under test to the top-most HDMI connector on the back of the 980 HDMI 2.0 Protocol Analyzer (labeled Rx). Refer to the picture below.



HDMI 2.0 sink emulation for source analysis – 980B ATP

3 Overview of the 980 GUI Manager (External)

3.1 Overview

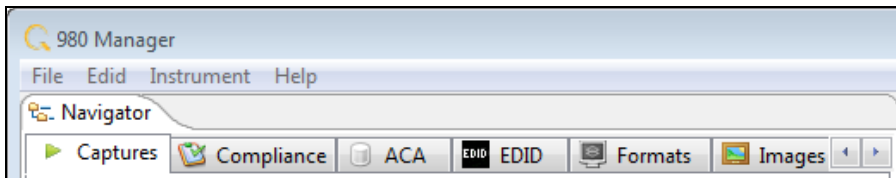
This chapter describes the 980 GUI Manager panels on the external 980 GUI Manager. The 980 GUI Manager is an application that runs on your local PC. It enables you to examine the data captured by the 980 HDMI 2.0 Protocol Analyzer through a user friendly graphical interface.

Note: The embedded 980 GUI Manager through the touch panel display works almost identically.



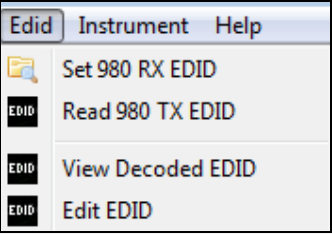







The main window of the 980 GUI Manager has a **Top Level menu** and two panels: 1) **Navigator** panel and 2) **Apps** panel.

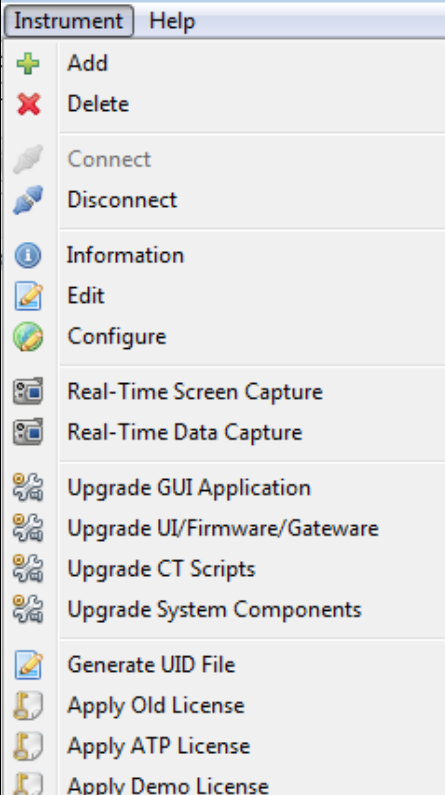






3.2 Top Level Menu









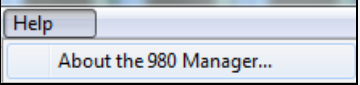
The Top level menu is shown in the figure below. There are several tabs which are described in the table below the figure.



Top Level Menu Items	Selection	Function
	Open...	Opens a capture or whatever data file type (examples: compliance data, format or image list, EDID, ACA file, etc.) is highlighted in the GUI. You must select a data file type for this option to be available.
	View Info/Text	Enables you to view the information related to a the selected data file that the Navigator/Data view.
	Rename	Enables you to rename a data file.
	Delete	Enables you to delete a data file from the 980 Manager application.
	Import...	Enables you to import a file that resides on the 980 Manager host into the 980 Manager application. This can be a capture, ACA data, EDID, or any compliance result. The file must be a zip file.
	Export...	Enables you to export a file that you have highlighted in the 980 Manager. The file is compressed to a zip file. This can be a capture, ACA data, EDID, or any compliance result.

Top Level Menu Items	Selection	Function
	Refresh List... 	Enables you to refreshes the list of captures to remove captures that you have marked for deletion. Also resets the list to the default unexploded view.
	Switch Workspace... 	Browse to store captures in a different capture directory other than the default.
	Exit	Enables you to exit out of the 980 Manager application.
EDID  <p>Note: This menu is context sensitive. Its contents depend on whether the EDID Editor Panel is open and being used.</p>	Set 980 RX EDID 	Configures the 980 Rx port with the specified EDID.
	Read 980 TX EDID 	Loads an EDID from the HDMI sink device connected to the 980 Tx port.
	View Decoded EDID	Enables you to view the human readable text of the selected EDID
	Add Data	Enables you to add an EDID data element such as a CEA extension block or a Video or Data block to the CEA extension block.
	Delete EDID Block	Deletes a selected EDID block.
	Delete Selected CEA Data Block or Timing	Deletes a selected CEA data block.
Instrument	Add 	Clicking on this item will open up the Add Instrument dialog box which enables you to define a 980. Note that you can have multiple 980s defined in the 980 GUI Manager. This action is required before connecting to a 980.
	Delete 	Enables you do delete the selected 980 instrument.
	Connect 	Clicking on this item will initiate a connection to the 980 that is selected in the list. This item will not be highlighted if you have not selected a 980.
	Disconnect 	Clicking on this item will initiate a disconnection from the 980 that is selected in the list that you are currently connected to. This item will not be highlighted if you have not selected a 980.
	Information 	Provides information about the 980 that the 980 Manager is currently selected. This information

Top Level Menu Items	Selection	Function
		includes: <ul style="list-style-type: none"> ○ 980 Name ○ IP address of the 980 ○ Netmask ○ Gateway IP address ○ Hardware revisions of the 980 circuit boards ○ Firmware/Gateware version of the release applied to the 980 ○ Serial number of the 980 ○ OS version ○ Licensed options applied to the 980
	Edit [the Instrument Entry] 	Enables you to edit certain information about the 980 that you have selected. You can edit the name and IP address.
	Configure [Instrument Network] 	Allows you to view and set the network information such as the 980 IP address, netmask and gateway IP address.
	Real Time Screen Capture 	Enables you to make a capture of the current Real Time screen contents of the 980 platform. When activated you will be prompted with a dialog box to save the captured bitmap file on your host PC.
	Real Time Data Capture 	Enables you to text file of the current data panels of the Real Time mode on the 980 platform. When activated you will be prompted with a dialog box to save the captured text file on your host PC.
	Upgrade UI Firmware/Gateware 	Upgrade GUI Firmware/Gateware - Enables you to apply an upgrade of the 980 built-in GUI as well as the firmware and gateware of a 980 ATP. You can download new GUI release and firmware and gateware from the Quantum Data website on the downloads page.
	Upgrade CT Scripts 	Upgrade CT Scripts - Enables you to apply an upgrade to the 980 compliance test application scripts. You can download new releases from the Quantum Data website on the downloads page.
	Upgrade System	Upgrade System Components - Enables you to

Top Level Menu Items	Selection	Function
	Components 	apply an upgrade to the 980 HDMI Source Compliance Test application or any other optional application. You can download new releases from the Quantum Data website on the downloads page.
	Generate UID File 	This enables you to activate a license for an optional feature you have purchased. When you click on this item, a text file will appear showing a license key that you will send to Quantum Data Customer Support in order to activate an option on the 980 system and module(s).
	Apply Old License 	No longer used.
	Apply ATP License 	This is a license key file (QDATP.lic) that enables you to activate a license key obtained from Quantum Data Customer Support for an option.
	Apply Demo License 	This is a license key file that enables you to activate a license key temporarily for an optional feature.
	Apply Old License 	No longer used.
	Apply ATP License 	This is a license key file (QDATP.lic) that enables you to activate a license key obtained from Quantum Data Customer Support for an option.
	Apply Demo License 	This is a license key file that enables you to activate a license key temporarily for an optional feature.
Help 	About the 980 Manager	Provides release and version information about the 980 Manager software components.

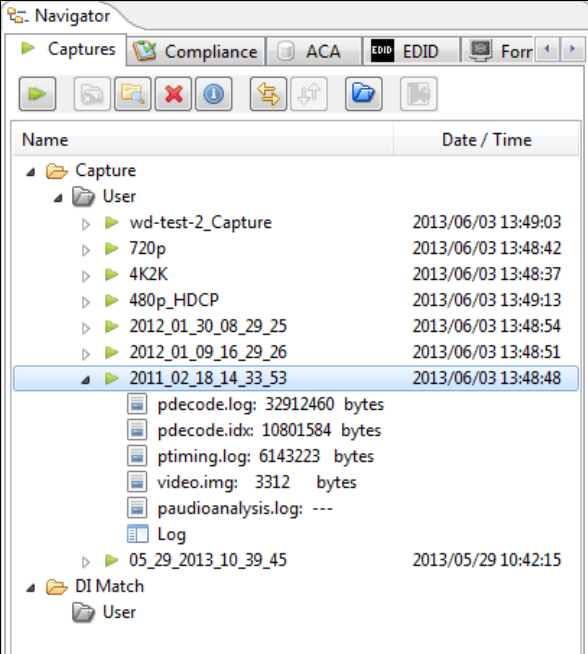







3.3 Navigator Panel

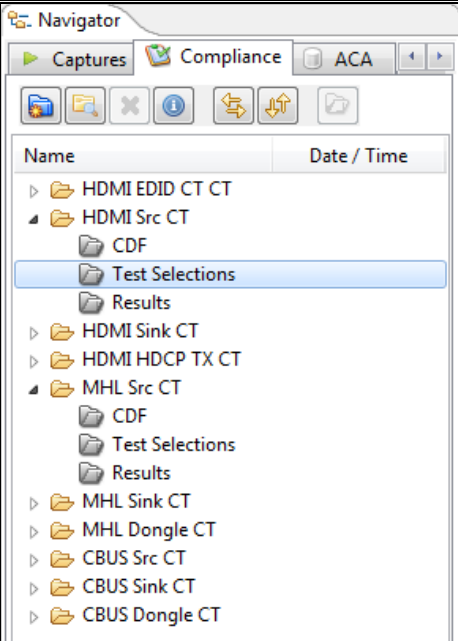





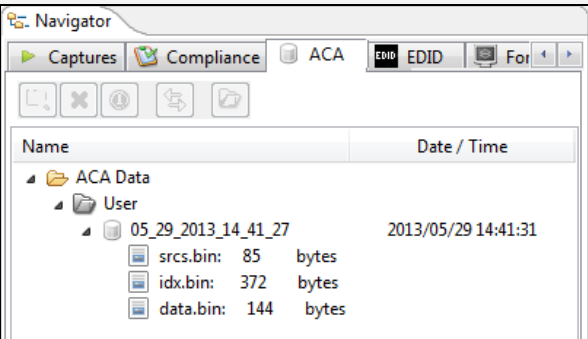


The **Navigator** panel is shown in the figure below. There are a set of sub-tabs which provide access to data associated with each type of tab.



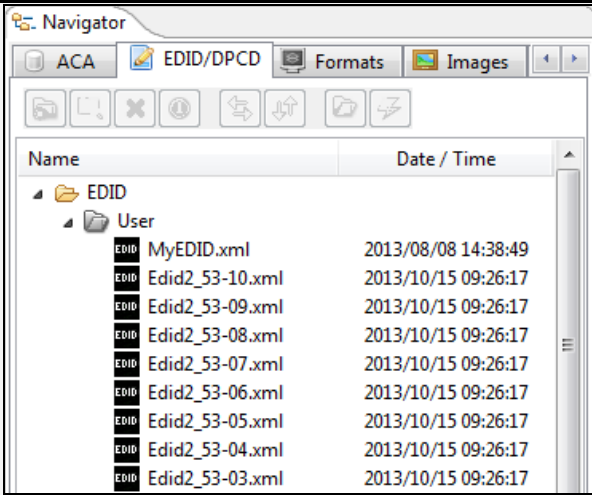
3.3.1 980 Navigation Panels and their Icons

The 980 **Navigator** panel provides a set of tabs to access a variety of data sets and panels as shown in the screen examples in the table below. The icons associated with these **Navigator** tabs are described in the table that follows these screens. These icons also appear on the right click menus of the directories where the various data types are stored or the data items themselves.

Navigator Tab	Associated Icons
<p>Captures</p> <p>Provides access to the list of captures.</p> 	<ul style="list-style-type: none"> ▪ Connect  – Enables you to connect to the selected 980, if you have not already established a connection to it. This item will not be available if you have already connected to the selected device. Only appears when the Navigator/Instrument tab is selected. ▪ Disconnect  – Enables you to disconnect from the selected 980, if you have already established a connection to it. This item will not be available if you are not already connected to the selected device. Only appears when the Navigator/Instrument tab is selected. ▪ Add a 980  - Enables you to add or define a 980 instrument in the 980 Manager application. This is required before connecting to a 980. Only appears when the Navigator/Instrument tab is selected.
<p>Compliance</p> <p>Provides access to the data for the various compliance tests.</p>	<ul style="list-style-type: none"> ▪ Edit Instrument Information  - Enables you to edit name and IP address of the 980 that you have selected. Only appears when the Navigator/Instrument tab is selected. ▪ Instrument Network Information  - Allows you to view and set the network information such as the 980 IP address, subnet mask and gateway IP address. Only appears when the Navigator/Instrument tab is selected. ▪ Execute a Capture  - Initiates a capture on the selected 980 device. This requires that your source device is connected to the 980 and that it is sending video. Only appears when the Navigator/Capture tab is selected. ▪ Transfer data to/from instrument  - Opens up

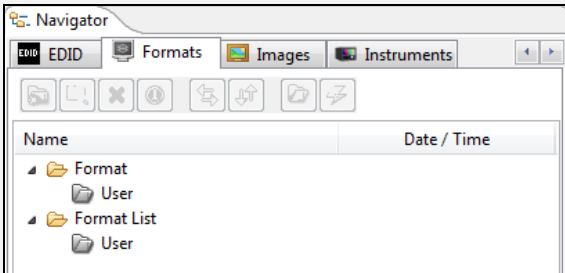
Navigator Tab	Associated Icons
 <p>ACA</p> <p>Provides access to ACA trace files that have been saved. You can open a trace file through the right click menu or the icon associated with it. When you</p>	<p>the FTP browser enabling you to transfer data to and from the host PC and the 980 instrument. Available for all Navigator tabs except Instruments tab.</p> <ul style="list-style-type: none">  - Enables you to create a folder under the highlighted directory. Available for all Navigator tabs except Instruments and ACA tab.  - Opens up the FTP browser enabling you to transfer data between locations on the host PC. Available for all Navigator tabs except Instruments and ACA tab.  - Opens up a window to the folder location of the selected file. Available for all Navigator tabs except Instruments tab.
<p>ACA</p> <p>Provides access to ACA trace files that have been saved. You can open a trace file through the right click menu or the icon associated with it. When you</p>	<ul style="list-style-type: none">  - Deletes a data item that you have selected. Available for all Navigator tabs except Instruments tab.  - Provides information about the selected data type and the 980 used to capture the data. Available for all Navigator tabs except Instruments tab.
 <p>EDID</p> <p>Provides access to EDID files that have been saved.</p>	<ul style="list-style-type: none">  - Loads the selected data item into the 980 Manager for viewing and analysis. Available for all Navigator tabs except Instruments tab.  - Applies the selected data item into the 980 instrument. Available only for the EDID, Formats and Images tabs.

Navigator Tab **Associated Icons**



Formats

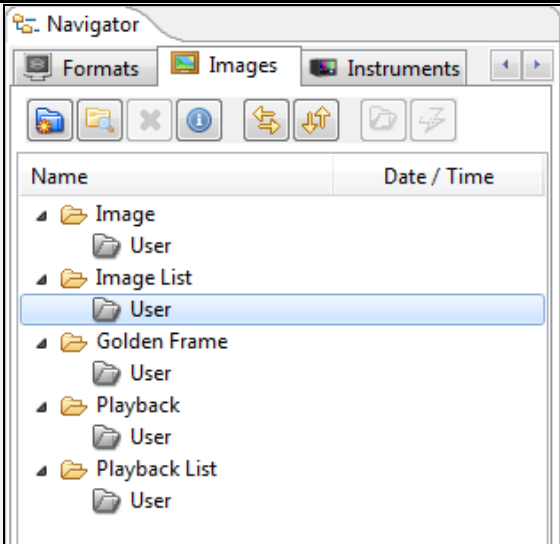
Provides access to format files that have been saved and format library lists that have been configured.



Images

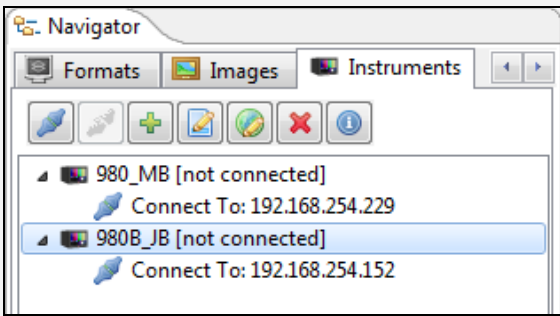
Provides access to bitmap image files that have been saved and image library lists that have been configured.

Navigator Tab **Associated Icons**



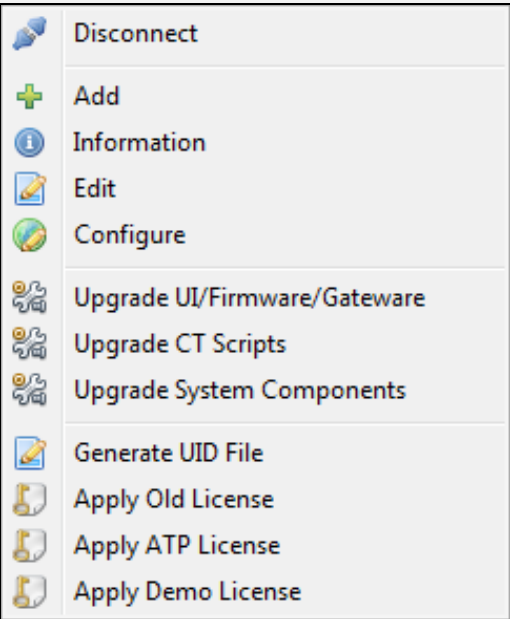






Instruments







Provides access 980s that have been configured through the 980 GUI Manager.



3.3.2 980 Navigation Instruments Panel and Right-Click items



The 980 **Navigator Instruments** panel provides a set of right click functions when a specific 980 instrument is selected. These are described in the following table.

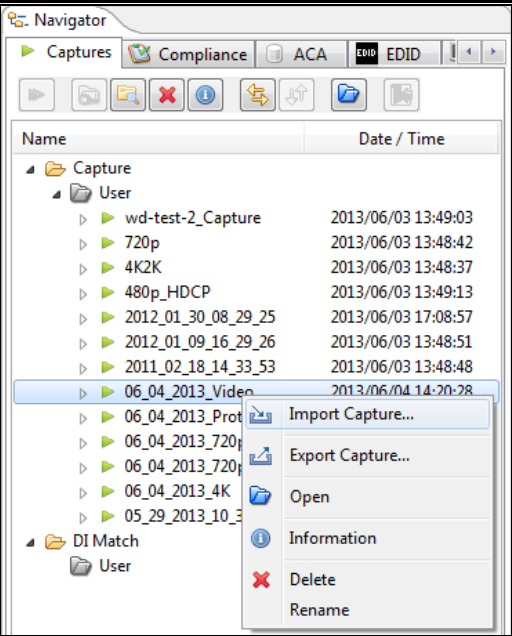



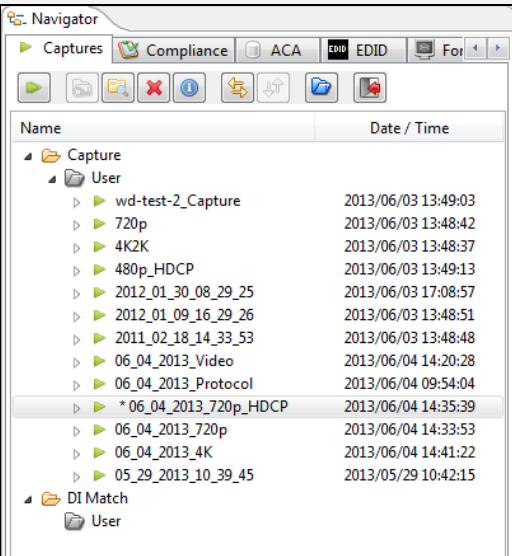

Navigator Panel - Item	Function
<p>Right click on a 980 Instrument</p> 	<ul style="list-style-type: none"> ▪ Connect/Disconnect  – Enables you to connect or disconnect to the selected 980, if you have not already established a connection to it. This item will not be available if you have already connected to the selected device. ▪ [Instrument] Information  - Provides information about the 980 that the 980 Manager is currently connected to. This information includes: <ul style="list-style-type: none"> ○ 980 Name ○ IP address of the 980 ○ Netmask ○ Gateway IP address ○ Hardware revisions of the 980 circuit boards ○ Firmware/Gateware version of the release applied to the 980 ○ Serial number of the 980 ○ OS version ○ Licensed options applied to the 980 ▪ Edit Instrument Entry  - Enables you to edit certain information about the 980 that you have selected. ▪ [Instrument Network] Configure  - Allows you to view and set the network information such as the 980 IP address, subnet mask and gateway IP address. ▪ Upgrade GUI Application  - Upgrade GUI Application - Enables you to apply an upgrade of the 980 built-in GUI. You can download new GUI release from the Quantum Data website. ▪ Upgrade Firmware/Gateware  - Enables you to apply an upgrade of the 980 built-in GUI as well as the firmware and gateware of a 980 ATP. You can download new GUI release and firmware and gateware from the Quantum Data website

Navigator Panel - Item	Function
	<p>on the downloads page.</p> <ul style="list-style-type: none"> ▪ Upgrade HDMI CT Scripts  - Enables you to apply and upgrade to the optional HDMI Compliance Test application. You can download new releases from the Quantum Data website. ▪ Upgrade System Components  - Enables you to apply an upgrade to the 980 HDMI Source Compliance Test application or any other optional application. You can download new releases from the Quantum Data website. ▪ Generate UID File  - This enables you to activate a license for an optional feature you have purchased. When you click on this item, a text file will appear showing a license key that you will send to Quantum Data Customer Support in order to activate an option on the 980 system and module(s). ▪ Apply Old License  - No longer used. ▪ Apply ATP License  - This is a license key file (QDATP.lic) that enables you to activate a license key obtained from Quantum Data Customer Support for an option. ▪ Apply Demo License  - This is a license key file that enables you to activate a license key temporarily for a specific feature option.

3.3.3 980 Navigation Captures Panels and Right-Click items

The 980 **Navigator Capture** panel provides a set of right click functions when a specific 980 instrument is selected. These are described in the following table.

Navigator Panel - Item	Function
Right click on 980 Capture	<ul style="list-style-type: none"> ▪ Import Capture Data  - Enables you to import a zipped capture file that resides on the 980 Manager host PC. You can then disseminate this file to other colleagues who can view the captured data using the 980 GUI Manager, i.e. they do not need the 980 Protocol Analyzer. ▪ Export Capture Data  - Enables you to export a capture file that resides on the 980 Manager host PC. All captured

Navigator Panel - Item	Function
	<p>data is zipped up into a single file.</p> <ul style="list-style-type: none"> ▪ Open [the Selected Capture]  - Loads the selected capture into the 980 Manager for viewing and analysis. The capture that is currently loaded has an asterisk next to it. ▪ [Capture] Information  - Provides information about the selected capture and the 980 used to capture the data: <ul style="list-style-type: none"> ○ Creation date and time of the capture. ○ Status of the capture, i.e. was it successful or were there errors. ○ Configuration of the triggering and pre-capture filtering. ○ All information shown above for the Instrument Information. ▪ Rename - Enables you to rename a capture file. A useful practice might be to rename the file to include the device tested. ▪ Delete [a Capture]  - Enables you to delete a capture from the 980 Manager application. ▪ Rename – Rename the capture file.
<p>Capture Listing (Status)</p> 	<ul style="list-style-type: none"> ▪ Capture Valid  - Indicates that the capture completed successfully and all data was saved. ▪ Active Capture * - Indicates that this is the capture that is currently loaded.

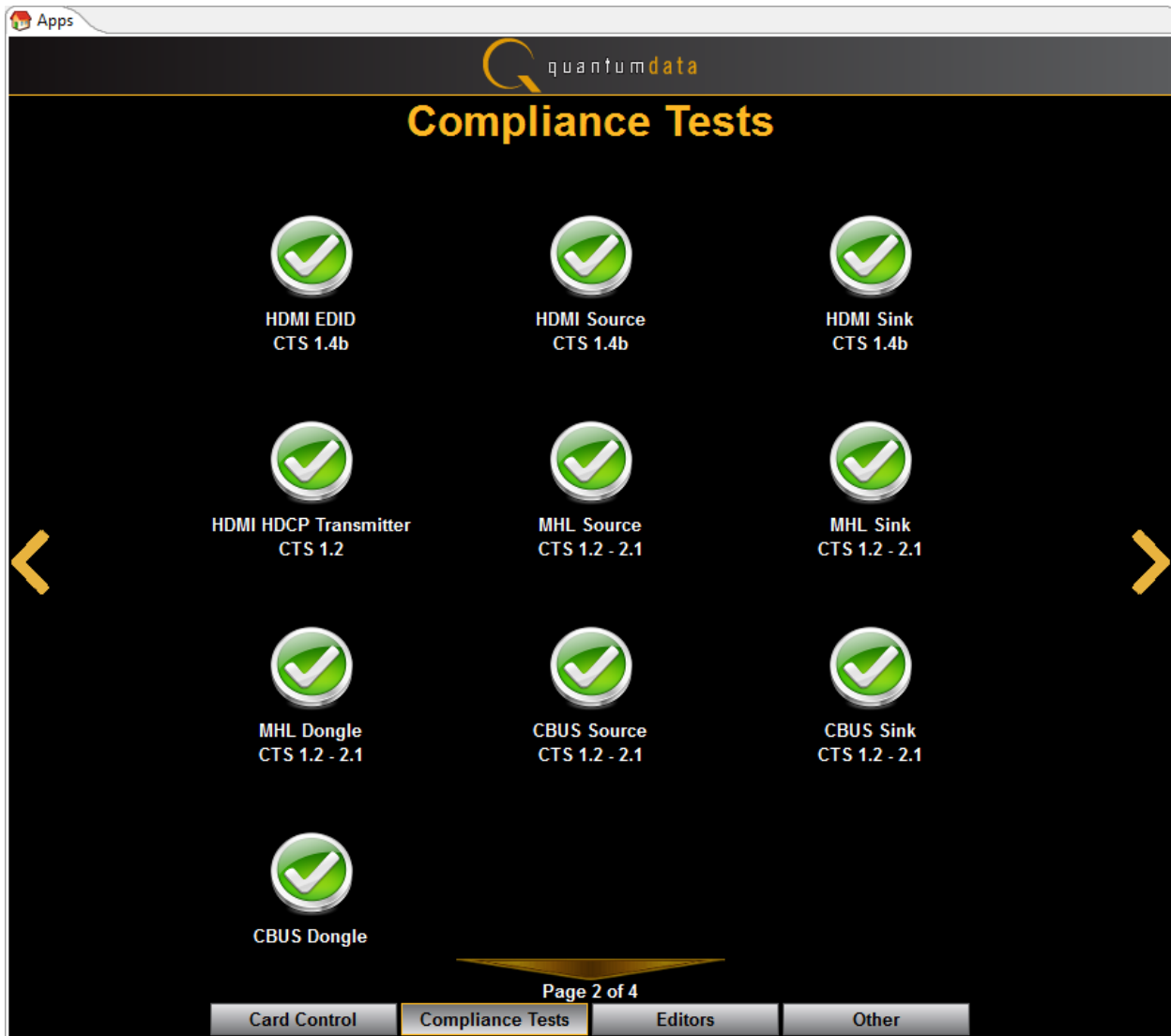
3.4 Apps Panels

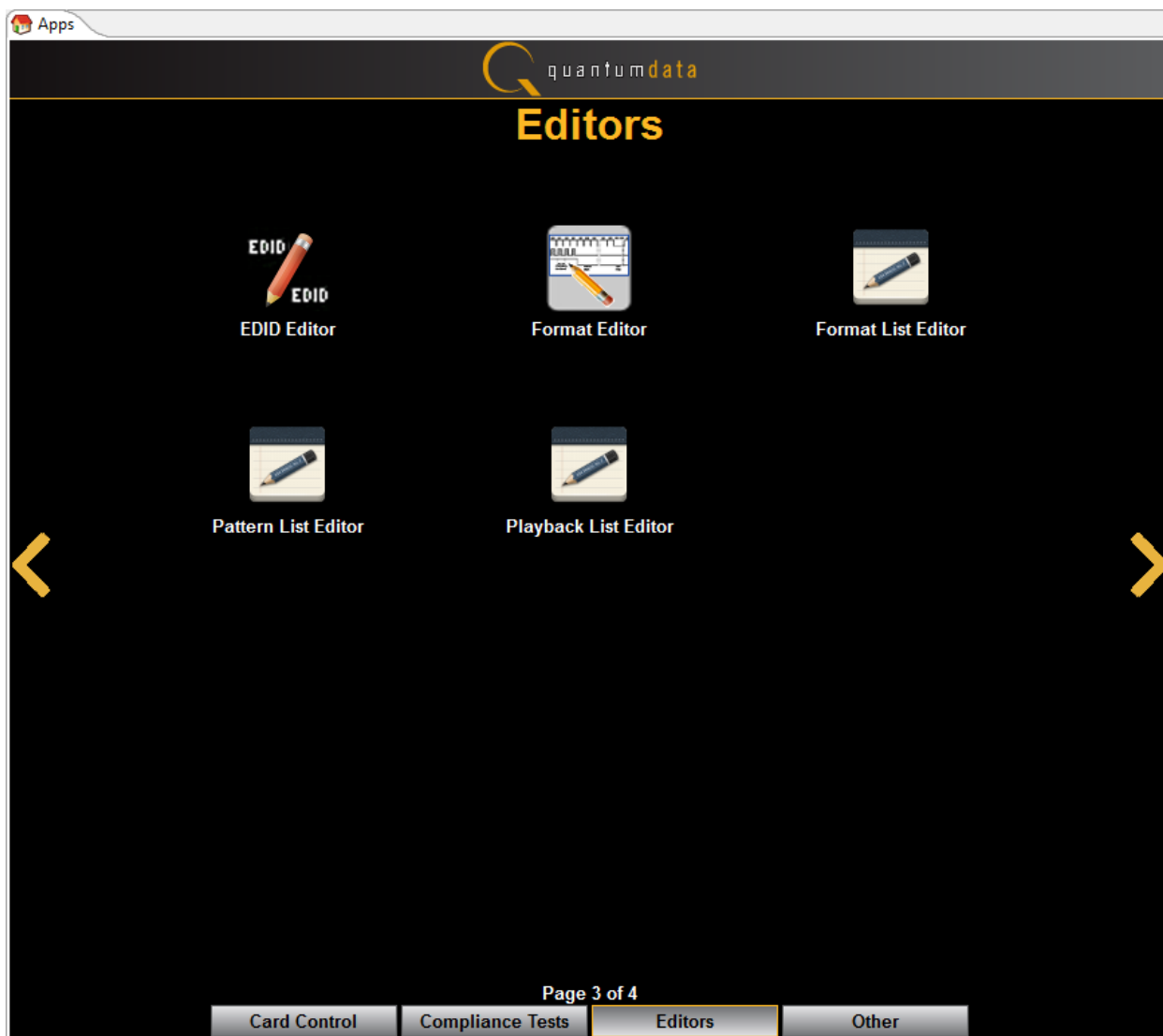
The **Apps** panel is shown in the figure below. The **Apps** panel provides access to all the capture related applications, compliance tests and various other utilities. There are four pages to the **Apps** panel:

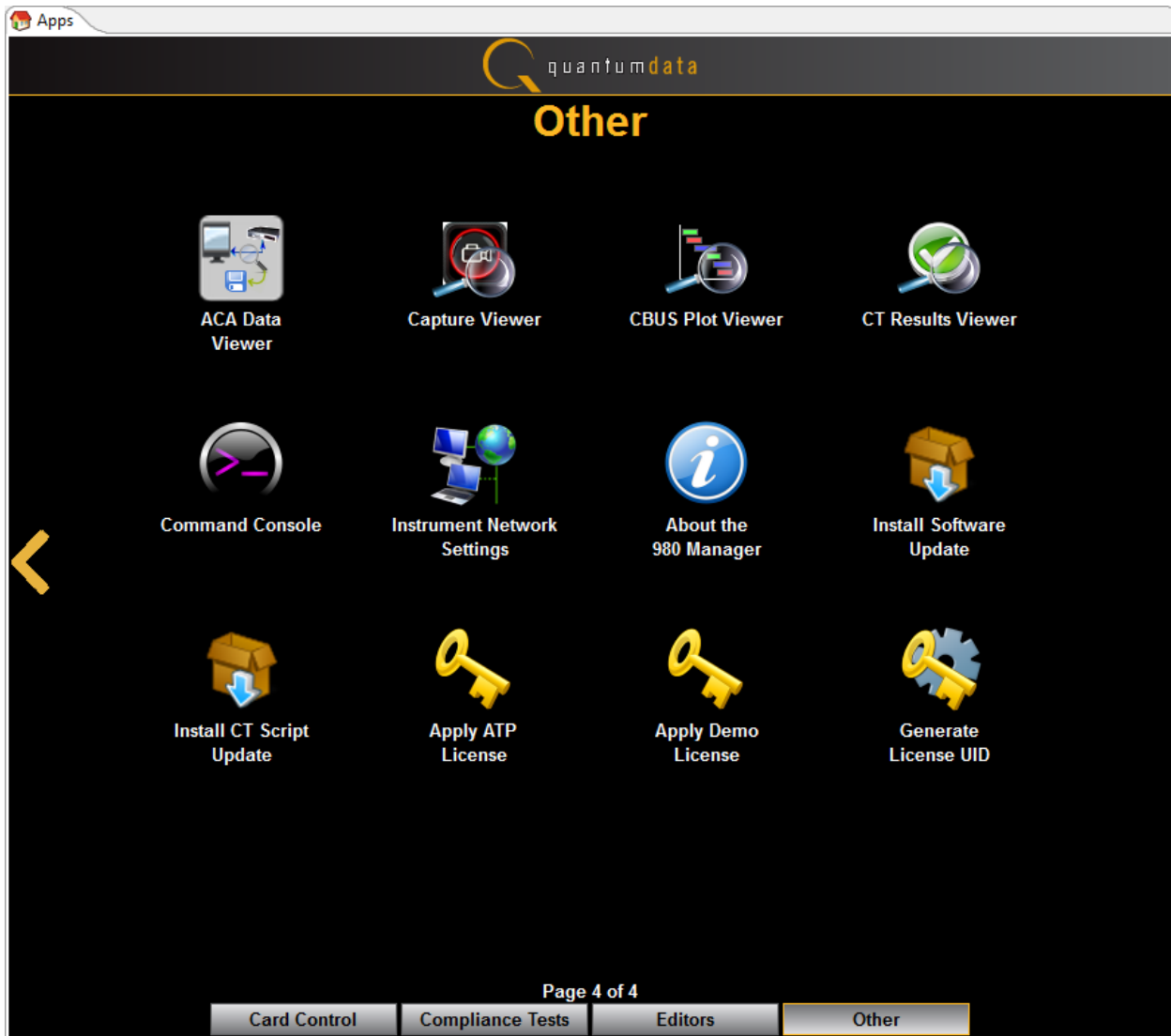
- Page 1 of 4 - **Card Control**
 - Generator
 - Capture Control
 - HEAC
- Page 2 of 4 - **Compliance Tests**
 - EDID CTS 1.4b
 - HDMI Source CTS 1.4b
 - HDMI Sink CTS 1.4b
 - HDMI Source CTS 2.0
 - HDMI Sink CTS 2.0
 - HDMI HDCP Transmitter CTS 1.2
 - MHL Source 1.2 – 2.1
 - MHL Sink CTS 1.2 – 2.1
 - MHL Dongle CTS 1.2 – 2.1
 - CBUS Source CTS 1.2 – 2.1
 - CBUS Sink CTS 1.2 – 2.1
 - CBUS Dongle CTS 1.2 – 2.1
 - HEAC
- Page 3 of 4 - **Editors**
 - EDID Editor
 - Format Editor
 - Format List Editor
 - Pattern List Editor
 - Playback List Editor
 - DPCD Editor (DisplayPort)
- Page 4 of 4 - **Other**
 - ACA Data Viewer
 - Capture Viewer
 - CBUS Plot Viewer
 - CT Results Viewer
 - Command Console
 - Instrument Network Settings
 - Set Instrument Date/Time
 - About the 980 Manager
 - Install Software Update
 - Install CT Script Update
 - Apply ATP License
 - Apply Demo License
 - Generate License UID.

The first of those panels, the **Card Control** panel is shown in the example below. You can navigate from page to page either with the forward and backward arrows on the side or the tab buttons on the bottom.



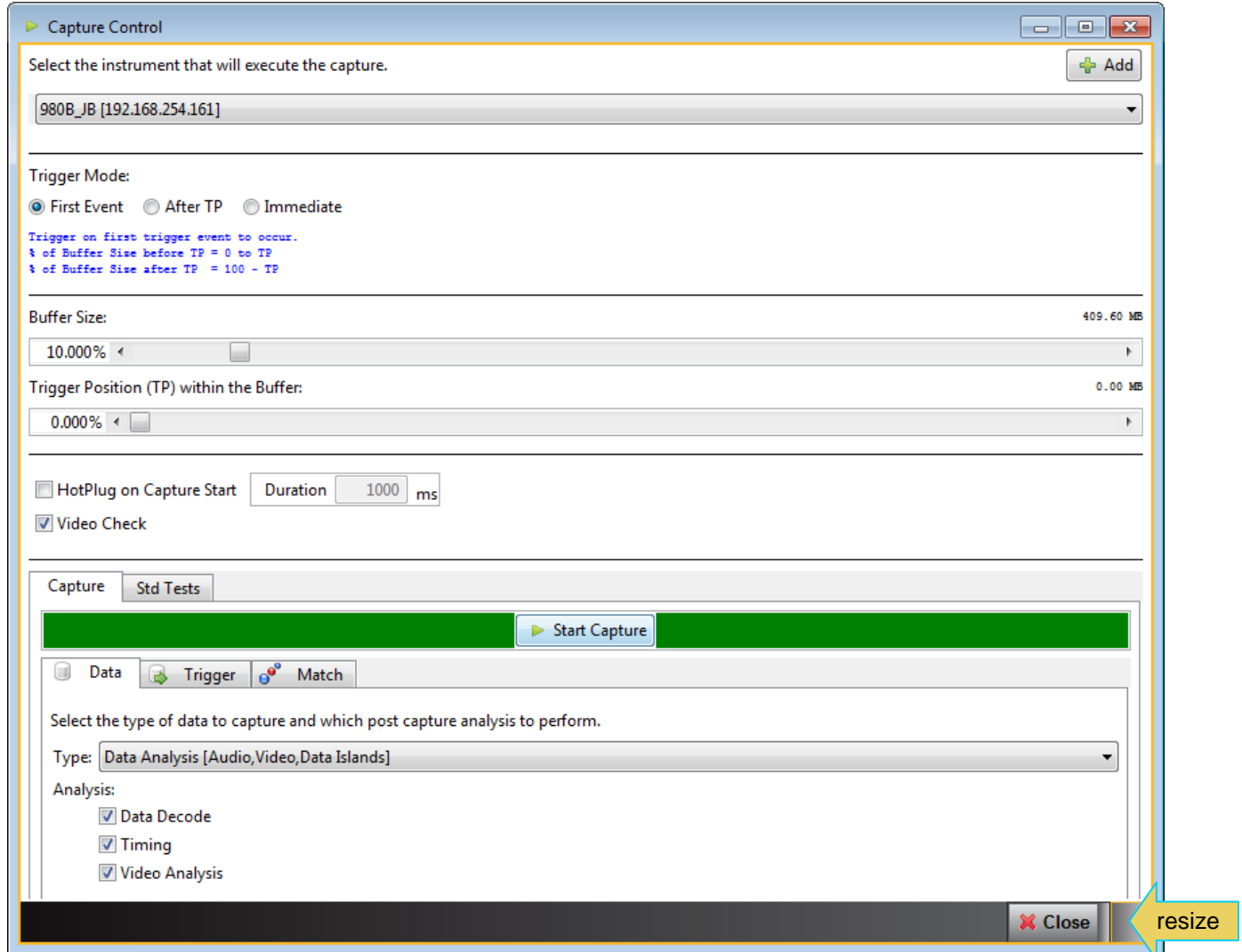




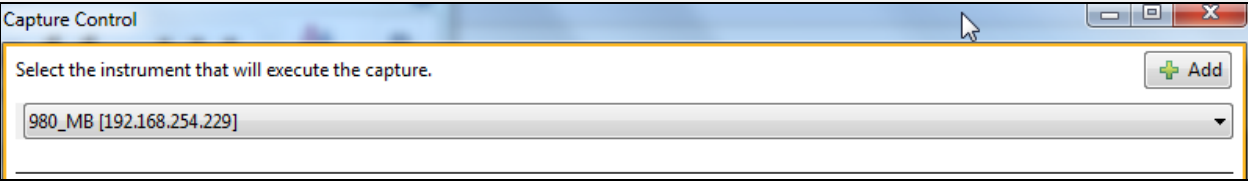
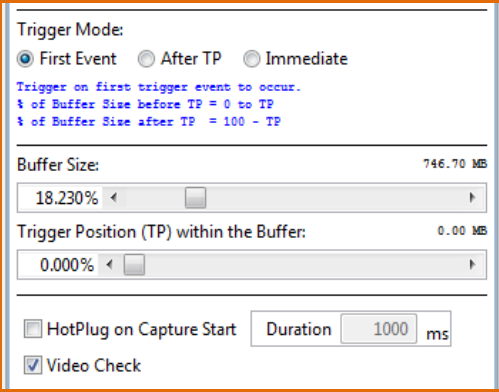


3.5 Capture Control Panel

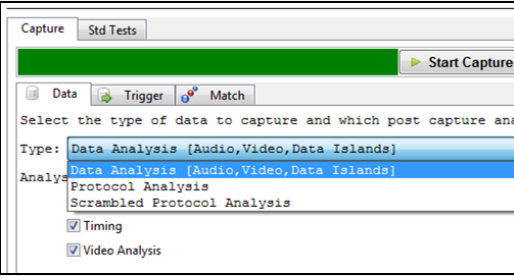
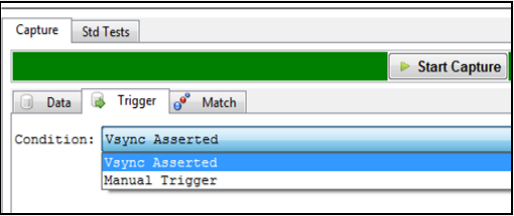
The **Capture Control** panel enables you to setup the capture parameters. The figure below shows the **Capture Control** panel and its control and selection items. You can resize the window with the box on the lower right corner of the panel indicated by the arrow below.



The following table describes the functions of the **Capture Control** panel.

Capture Control Panel - Function	Item - Description	
<p>Instrument Selection</p> 	<p>Pull-down menu above, enables you to select the 980 that you want to use for a capture. Note that in some cases you might have more than one 980 defined in the 980 Manager.</p> <p>Add button enables you to add a new 980 Protocol Analyzer.</p>	
<p>Capture Trigger Configuration</p>	<p>Enables you to define the capture trigger criteria. Use the information below.</p>	
	<p>Trigger Mode</p>	<p>First Event – The trigger occurs on the first event—first occurrence—of the trigger condition defined in the Trigger Type pull-down menu (Vsync, encryption Enabled, Encryption Disabled, External Trigger, Manual Trigger, TMDS Clock Change). Depending on the setting of the Trigger Position slide bar, you may have some of the captured data in the buffer that accumulated prior to the trigger condition and some of the captured data in the buffer that accumulated after the trigger condition. At the left most position there will be no data in the capture buffer that occurred prior to the trigger event. At the right most position, all the data in the capture buffer will be data that accumulated prior to the trigger event. Because the trigger condition could be met quite quickly, the capture buffer may not be filled to the amount specified in Buffer Size.</p> <p>After TP (Trigger Position) – In this setting the trigger condition specified in the Trigger Type pull-down menu will be ignored until data has accumulated in the capture buffer up to the point where the Trigger Position slide-bar is set. Once the data has accumulated to the setting of the Trigger Position, any event matching the Trigger Type specified will cause a trigger condition and data accumulation will begin. Some of the data in the capture buffer will be</p>

Capture Control Panel - Function	Item - Description	
		<p>data that has accumulated prior to the trigger condition being met and some of the data in the capture buffer will be data that has accumulated after the trigger condition was met. This setting will ensure that the capture buffer is filled to the Buffer Size setting.</p> <p>Immediate – Data capture begins accumulating immediately when the Start Capture button is activated. Data capture halts when buffer is filled. This setting will not provide any capture history, i.e. none of the captured data accumulated in the capture buffer will be data that occurred prior to the capture trigger event (activating the Start Capture button).</p> <p>Note: You will not be able to select a Trigger Type with the Immediate setting.</p>
	[Capture] Buffer Size Slidebar	Enables you to set the size of the captured data in percent. This is a slidebar that provides an indication (on the left) of the percent of the total possible size to be captured. A lower value will require less time for the captured data to accumulate.
	[Capture] Trigger Position within Buffer Slidebar	<p>Enables you to set the position of the trigger event within the captured data. This slidebar determines how much of the data that has accumulated in the capture buffer has occurred before the trigger event. The slidebar has an indication (on the left) of the location of the trigger event within the captured data. The value is expressed as a percent. A value of 0% indicates that the trigger event occurs at the beginning of the resulting captured data and 100% indicates that the trigger event occurs at the end of the resulting captured data. A value of 50% indicates that the trigger event is in the middle of the captured data.</p> <p>Note: The Buffer Position Slidebar is not applicable when you select Vsync as the trigger condition.</p>
	Generate HotPlug on Captured Start	Causes a hot plug event when the data capture begins, in other words when you click on the Start Capture activation button. Enables you to specify the length of the hot plug pulse in milliseconds. A hot plug pulse, issued by the

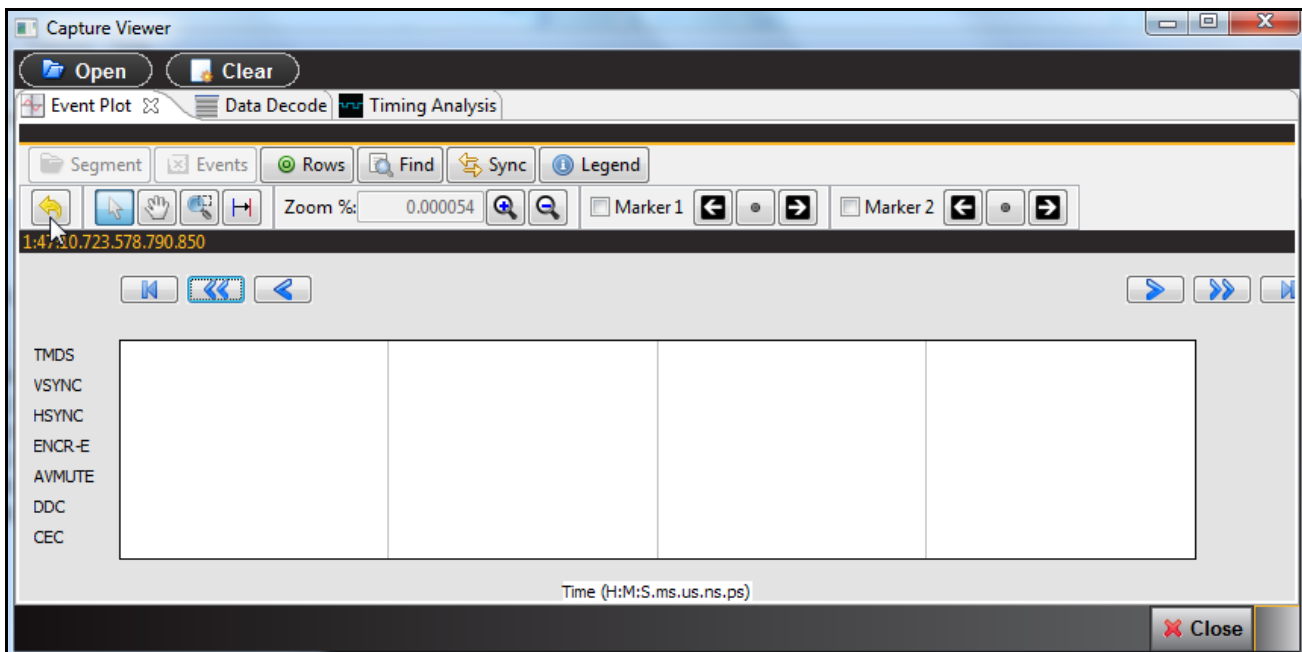
Capture Control Panel - Function	Item - Description	
 <p>The screenshot shows the 'Data' tab of the Capture Control Panel. It includes a 'Start Capture' button, a 'Data' dropdown menu, and a 'Match' dropdown menu. Below these are checkboxes for 'Timing' and 'Video Analysis', both of which are checked.</p>		<p>980, will reinitiate HDCP authentication if the video content from the source is content protected.</p>
	<p>Video Check</p>	<p>Verifies that there is incoming video prior to a capture.</p>
	<p>Start Capture (Capture Tab)</p>	<p>Initiates a capture using the criteria defined in the Data, Trigger and Match tabs below.</p>
	<p>Data Tab (Capture Tab)</p>	<p>Enables you to specify the type of data that you want to capture. This could be:</p> <ul style="list-style-type: none"> • Data Analysis (Audio, Video, Data Island) - The 980 will capture all the audio packets, video data and the data islands. If you select this option you can then refine your selection to include or exclude Timing data and Video data using the associated check boxes under the Analysis heading. • Protocol Analysis - The 980 will capture the protocol data such as the preamble and guard band data. You will not be able to see the details of the data island, video or audio data. • Scrambled Protocol Analysis - The 980 will capture the protocol data such as the preamble and guard band data when scrambling is active.
 <p>The screenshot shows the 'Trigger' tab of the Capture Control Panel. It includes a 'Start Capture' button and a 'Condition' dropdown menu with options for 'Vsync Asserted', 'Vsync Asserted', and 'Manual Trigger'.</p>	<p>Trigger Tab (Capture Tab)</p>	<p>Enables you to specify the trigger condition that you want to use for the capture. This could be:</p> <ul style="list-style-type: none"> • Vsync Asserted - Capture begins when a vsync control is detected. • Manual Trigger – Enables you trigger manually. Typically this would be used when you are observing the behavior of a connected sink and then manually initiate the trigger when a particular symptom exhibits itself.

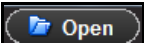
3.6 Capture Viewer Panel

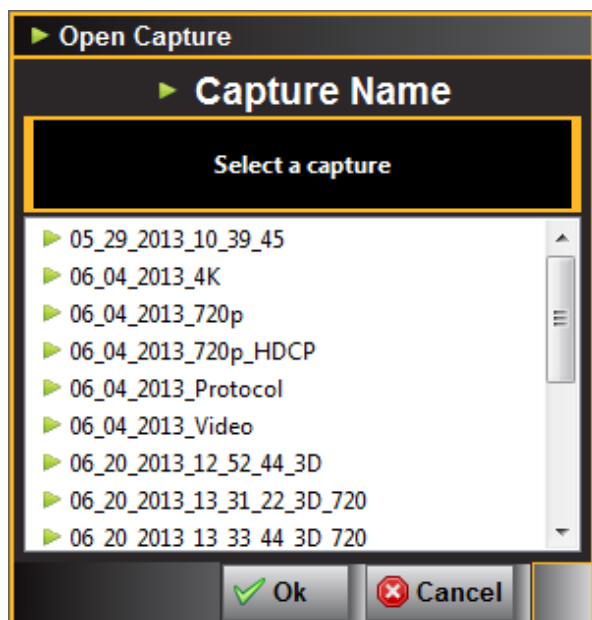
The Capture Viewer Panel is on the 4th page **Other** of the Apps panel. It provides access to the following windows for viewing captured data:

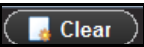
- Event Plot – Provides graphical view of metadata.
- Data Decode – Provides tabular view of metadata.
- Video Analysis – Provides thumbnails of captured video frames.
- Timing Analysis – Provides timing data for captured video frames.

When you open up a capture the **Event Plot** and **Data Decode** windows will always be shown. The **Video Analysis** and **Timing Analysis** windows will be shown only if you had indicated that you wanted to capture video and timing data when setting up the capture.



You can open a capture for viewing in the **Event Plot** or **Data Decode** window either from the **Navigator** panel or the **Open**  button on the top of the window. When you select Open a dialog box appears enabling you to select a capture:



You can clear the capture using the **Clear**  button.

3.7 Data Decode Panel

The **Data Decode** panel (shown below) is the primary panel for examining data at the detail level. The example shows data captured in the Data Analysis mode where the audio, video and data islands are captured.

The screenshot shows the 'Data Decode' panel in the Capture Viewer. It features a table of captured packets and a detailed view of the selected packet (Packet 6).

Packet	Time (H:M:S.ms.us.ns.ps)	Frame	Line	Pixel	Type	SubType	Info
2	4:54:8.750.749.710.000	0	0	0	TMDS	VSYNC	VSYNC 8250 clocks
3	4:54:8.750.749.780.000	0	0	11	TMDS	GCP	General Control Packet (GCP)
4	4:54:8.750.749.995.000	0	0	43	TMDS	AVI IF	AVI InfoFrame
5	4:54:8.750.750.211.000	0	0	75	TMDS	AUD IF	Audio InfoFrame
6	4:54:8.750.750.426.000	0	0	107	TMDS	VEN	Vendor-Specific InfoFrame
7	4:54:8.750.751.170.000	0	0	217	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
8	4:54:8.750.753.150.000	0	0	512	TMDS	ENCR_EN	CTL3 Pulse ENC_EN 016 clocks
9	4:54:8.750.760.820.000	0	1	0	TMDS	HSYNC	HSYNC 40 clocks
10	4:54:8.750.771.930.000	0	2	0	TMDS	HSYNC	HSYNC 40 clocks
11	4:54:8.750.772.000.000	0	2	11	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
12	4:54:8.750.783.040.000	0	3	0	TMDS	HSYNC	HSYNC 40 clocks
13	4:54:8.750.792.830.000	0	3	1454	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
14	4:54:8.750.794.150.000	0	4	0	TMDS	HSYNC	HSYNC 40 clocks
15	4:54:8.750.805.260.000	0	5	0	TMDS	HSYNC	HSYNC 40 clocks
16	4:54:8.750.813.660.000	0	5	1248	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
17	4:54:8.750.816.370.000	0	6	0	TMDS	HSYNC	HSYNC 40 clocks


```

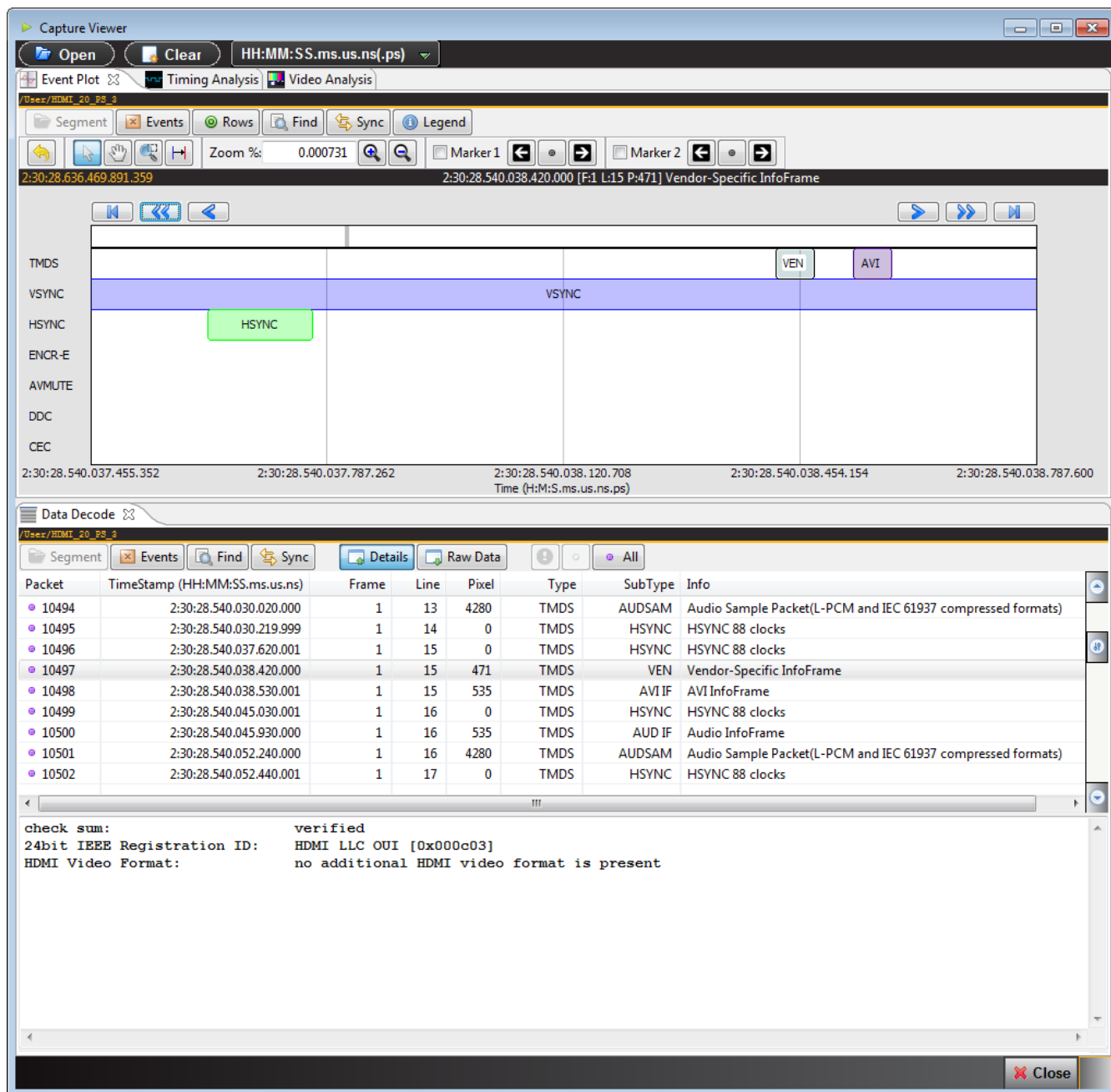
Length: 0x05
check sum: 0x2a
24bit IEEE Registration ID: HDMI Licencing LLC [0x000c03]
HDMI Video Format: 3D video indication present
3D Structure: frame packing
3D Meta Data: not present
    
```



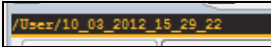
```

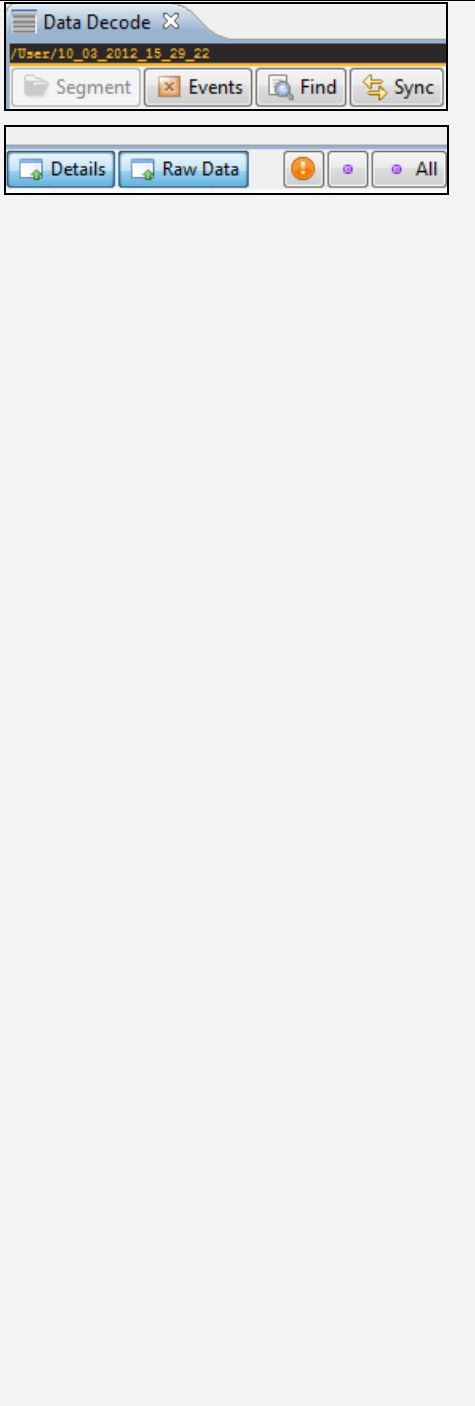

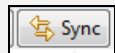

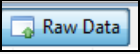


HB: 81 01 05 f4 |
SP0: 2a 03 0c 00 00 00 ff |*...@...|
SP1: 00 00 00 00 00 00 00 |.....|
SP2: 00 00 00 00 00 00 00 |.....|
SP3: 00 00 00 00 00 00 00 |.....|
    
```




When you select a packet in the **Data Decode** panel that packet is highlighted in the **Event Plot** panel. It is only visible if the **Event Plot** is zoomed to show each distinct packet. Refer to the screen shot below.



The following table describes the activation buttons available through the **Data Decode** panel. In some cases clicking on these buttons opens up dialog box. These dialog boxes are described in detail following the table.

Data Decode Status Icons	Function
Icons – Navigator / Data	<ul style="list-style-type: none"> <li data-bbox="641 1766 1463 1829">User path status  – shows the name of the capture file and its location.

Data Decode Status Icons	Function
	<ul style="list-style-type: none"> ▪ Segment – Large captures are broken into smaller distinct sections called segments to make them more manageable and to improve speed and performance. When you click on the Segment activation button, a dialog box appears enabling you to select and load another segment. This dialog box is described further below. ▪ Events – The Events activation button enables you to filter the captured data by type. When you click on the Events button a dialog box appears enable you do select or deselect data types individually or a page at a time. This dialog box is described further below. ▪ Find  – The Find activation button enables you to locate captured data by type. When you click on the Find button a dialog box appears enable you do specify a data type to search on. individually or a page at a time. This dialog box is described further below. ▪ Sync  – The Sync activation button enables you to synchronize the Event Plot and the Timing Analysis panels to the data in the Data Decode panel. ▪ Details  – The Details activation button enables you to toggle the view of the Details subpanel. The Details subpanel provides human readable text description of the data of the record that is highlighted. ▪ Raw Data  – The Raw Data activation button enables you to toggle the view of the hex data on and off. ▪ Marker icon  – The Marker icon enables you to flag certain important records for easy identification. You can also flag a record by double clicking on the record. ▪ Clear Marker icon  – The Clear Marker and Clear All icons enable you to clear the flags on specific records or all records. You can also clear the flag on a record by double clicking on the record.

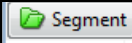
There is a vertical scroll bar available on the right side of the **Data Decode** panel. This enables you to browse through the **Data Decode** records. The   buttons enable you to advance downward or upward one record at a time. The  button is a scroll button that you can slide up or down.

The screenshot displays the 'Data Decode' window of a protocol analyzer. The window title is 'Data Decode' and the file path is '/User/HDMI_20_PS_10'. The interface includes a toolbar with buttons for 'Segment', 'Events', 'Find', 'Sync', 'Details', 'Raw Data', and 'All'. Below the toolbar is a table of packets. The table has the following columns: Packet, TimeStamp (HH:MM:SS.ms...), Frame, Line, Pixel, Type, SubType, and Info. Packet 6 is selected and highlighted. A yellow arrow points to the 'Info' column of packet 6. Another yellow arrow points to a button on the right side of the table. Below the table is a text area showing YCC quantization range and other parameters.

Packet	TimeStamp (HH:MM:SS.ms...)	Frame	Line	Pixel	Type	SubType	Info
0	0:29:13.825.436.130.000	0	0	0	TMDS	PXR	TMDS clock 148.498857 MHz
2	0:29:13.806.274.560.000			0	TMDS	TRIG	Capture Trigger Event
1	0:29:13.825.436.130.000				MATCH	TMDS	TMDS clock detected 148.498857 MHz
3	0:29:13.825.436.130.000		0	0	TMDS	HSYNC	HSYNC 40 clocks
4	0:29:13.825.436.130.000		0	0	TMDS	VSYNC	VSYNC 8250 clocks
5	0:29:13.825.436.210.000		0	11	TMDS	GCP	General Control Packet (GCP)
6	0:29:13.825.436.425.490	0	43		TMDS	AVIF	AVI InfoFrame
7	0:29:13.825.436.640.980		0	75	TMDS	AUD IF	Audio InfoFrame
8	0:29:13.825.436.856.470		0	107	TMDS	VEN	Vendor-Specific InfoFrame
9	0:29:13.825.447.240.000		1	0	TMDS	HSYNC	HSYNC 40 clocks
10	0:29:13.825.454.930.000		1	1142	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
11	0:29:13.825.458.360.000		2	0	TMDS	HSYNC	HSYNC 40 clocks

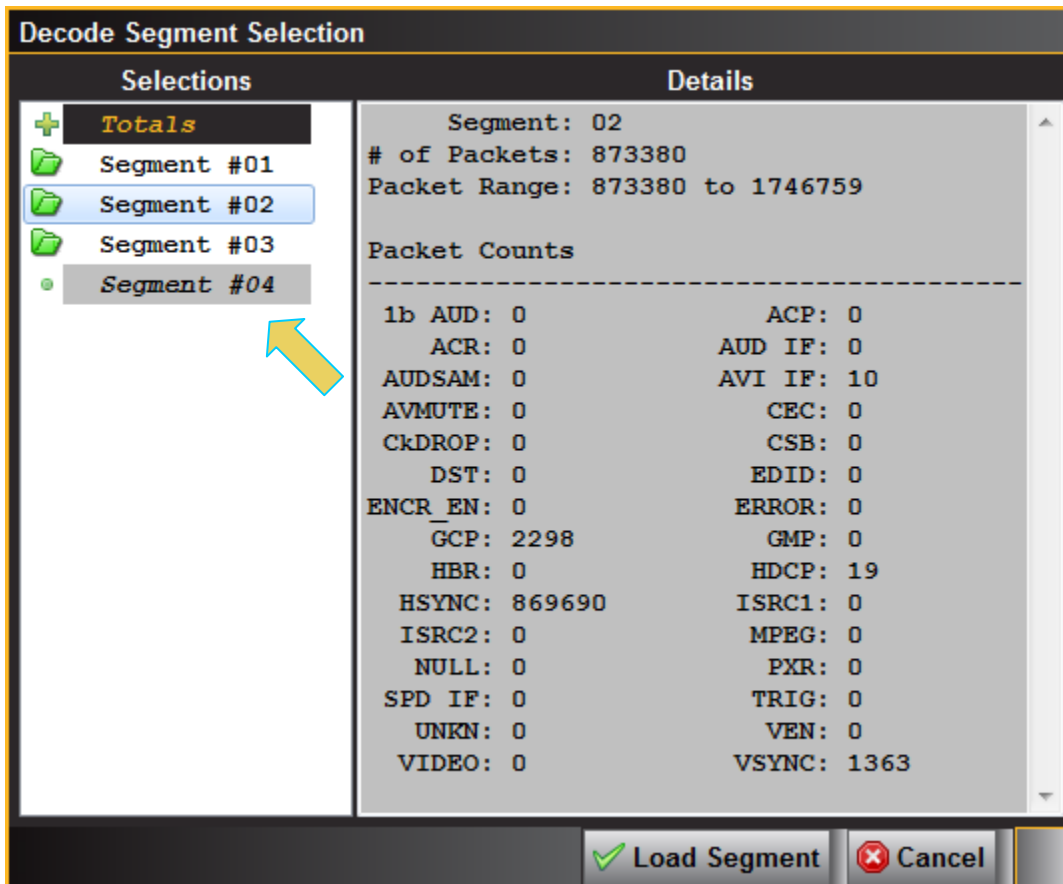
YCC quantization range: limited range Not used - Y bit (Y) bit is set to 0
 pixel repetition: none
 line number of end of top bar: 0
 line number of start of bottom bar: 1471
 pixel number of end of left bar: 0
 pixel number of start of right bar: 1281

3.7.1 Working with Segments in the Data Decode Panel


Large captures are broken into smaller distinct sections called segments to make them more manageable and to improve speed and performance. When you click on the Segment activation button , a dialog box appears (shown below) enabling you to select and load another segment. This dialog box is shown below. The Selections section on the left lists the segments in the capture. The Details section on the right shows you the packet makeup of the segment as well as the number of packets and the range of packets in the overall capture.

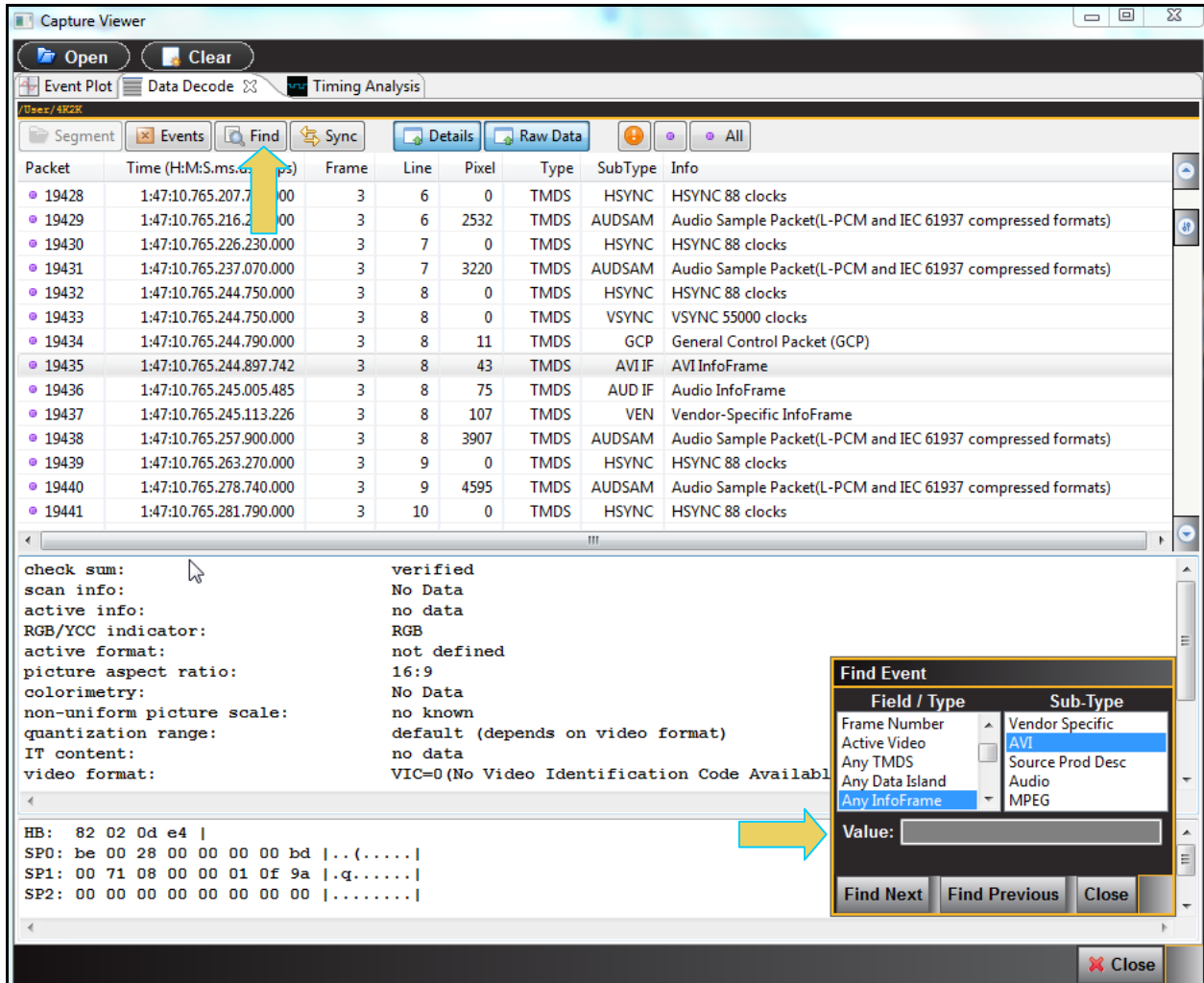
From the Selections panel you can select and load a different segment by highlight a segment and then clicking on the Load Segment activation button on the bottom right. You can also select any segment to view its packet contents in the Details panel. If you wish to view the total packets of all segments simply highlight the Totals

 button.



3.7.2 Searching for Data in the Data Decode Panel

You can search for data in the **Data Decode** panel using the search function. The search function is accessible using the magnifying glass icon  on the upper left of the **Data Decode** panel. In the example below, a search for the next occurrence of an AVI infoframe is being initiated. You can specify a search forward (**Find Next**) or backward (**Find Previous**).



The screenshot shows the Capture Viewer application with the Data Decode panel active. A search function is being used to find an AVI infoframe. The search results table is as follows:

Packet	Time (H:M:S.ms.µs)	Frame	Line	Pixel	Type	SubType	Info
19428	1:47:10.765.207.700.000	3	6	0	TMDS	HSYNC	HSYNC 88 clocks
19429	1:47:10.765.216.200.000	3	6	2532	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
19430	1:47:10.765.226.230.000	3	7	0	TMDS	HSYNC	HSYNC 88 clocks
19431	1:47:10.765.237.070.000	3	7	3220	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
19432	1:47:10.765.244.750.000	3	8	0	TMDS	HSYNC	HSYNC 88 clocks
19433	1:47:10.765.244.750.000	3	8	0	TMDS	VSYNC	VSYNC 55000 clocks
19434	1:47:10.765.244.790.000	3	8	11	TMDS	GCP	General Control Packet (GCP)
19435	1:47:10.765.244.897.742	3	8	43	TMDS	AVIF	AVI InfoFrame
19436	1:47:10.765.245.005.485	3	8	75	TMDS	AUD IF	Audio InfoFrame
19437	1:47:10.765.245.113.226	3	8	107	TMDS	VEN	Vendor-Specific InfoFrame
19438	1:47:10.765.257.900.000	3	8	3907	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
19439	1:47:10.765.263.270.000	3	9	0	TMDS	HSYNC	HSYNC 88 clocks
19440	1:47:10.765.278.740.000	3	9	4595	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
19441	1:47:10.765.281.790.000	3	10	0	TMDS	HSYNC	HSYNC 88 clocks

The search function overlay is open, showing the following options:

Field / Type	Sub-Type
Frame Number	Vendor Specific
Active Video	AVI
Any TMDS	Source Prod Desc
Any Data Island	Audio
Any InfoFrame	MPEG

The search results also show the following information:

```

check sum: verified
scan info: No Data
active info: no data
RGB/YCC indicator: RGB
active format: not defined
picture aspect ratio: 16:9
colorimetry: No Data
non-uniform picture scale: no known
quantization range: default (depends on video format)
IT content: no data
video format: VIC=0 (No Video Identification Code Available)
    
```

At the bottom of the interface, the hex dump shows:

```




HB: 82 02 0d e4 |
SP0: be 00 28 00 00 00 00 bd |..(.....|
SP1: 00 71 08 00 00 01 0f 9a |.q.....|
SP2: 00 00 00 00 00 00 00 00 |.....|
    
```

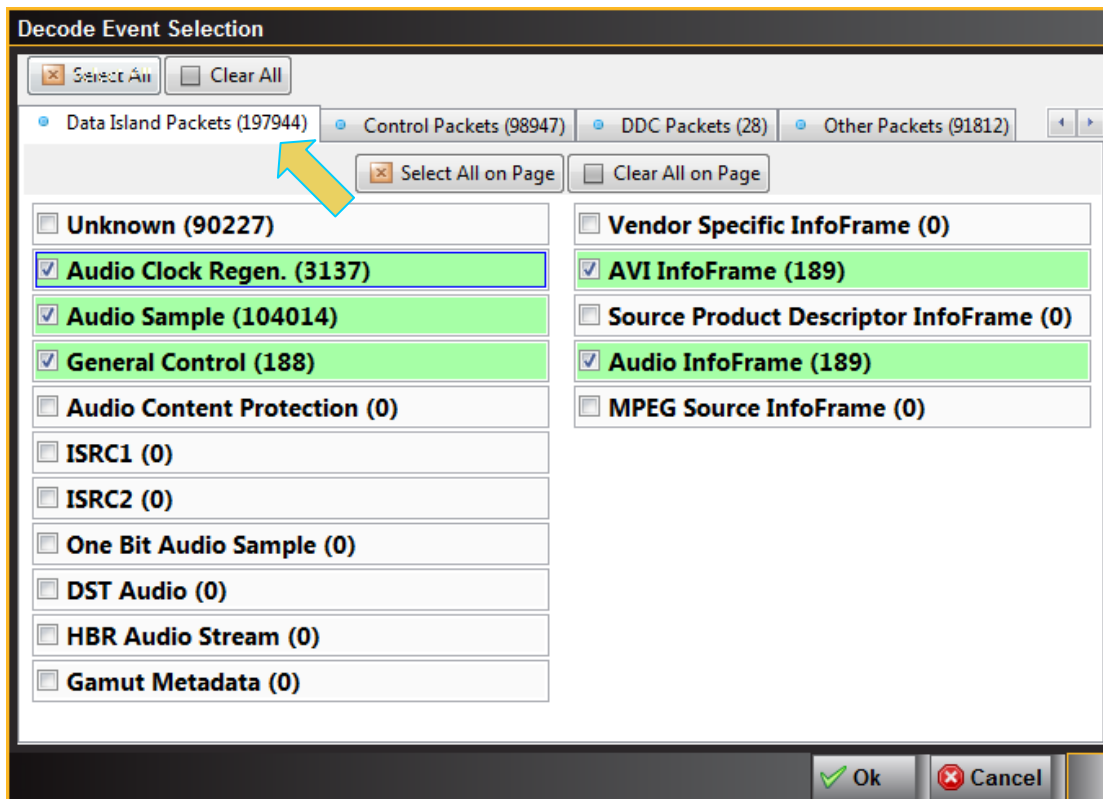
3.7.3 Post-Capture Filter Selection tab

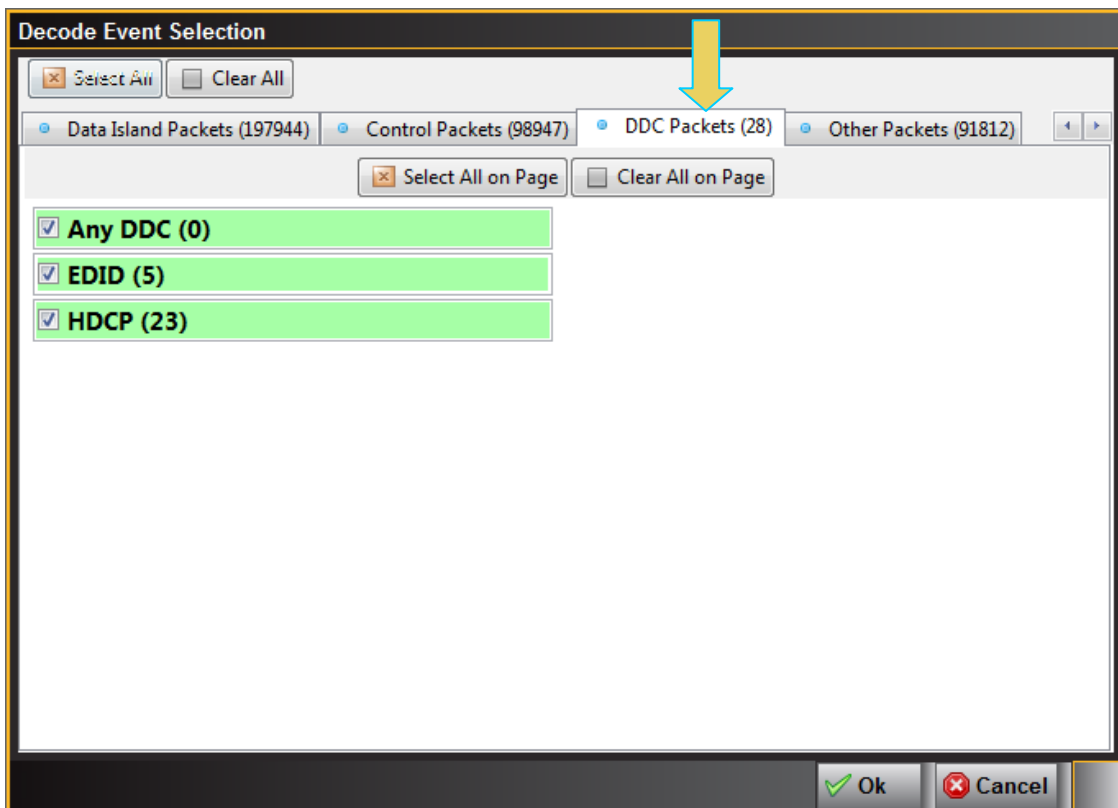
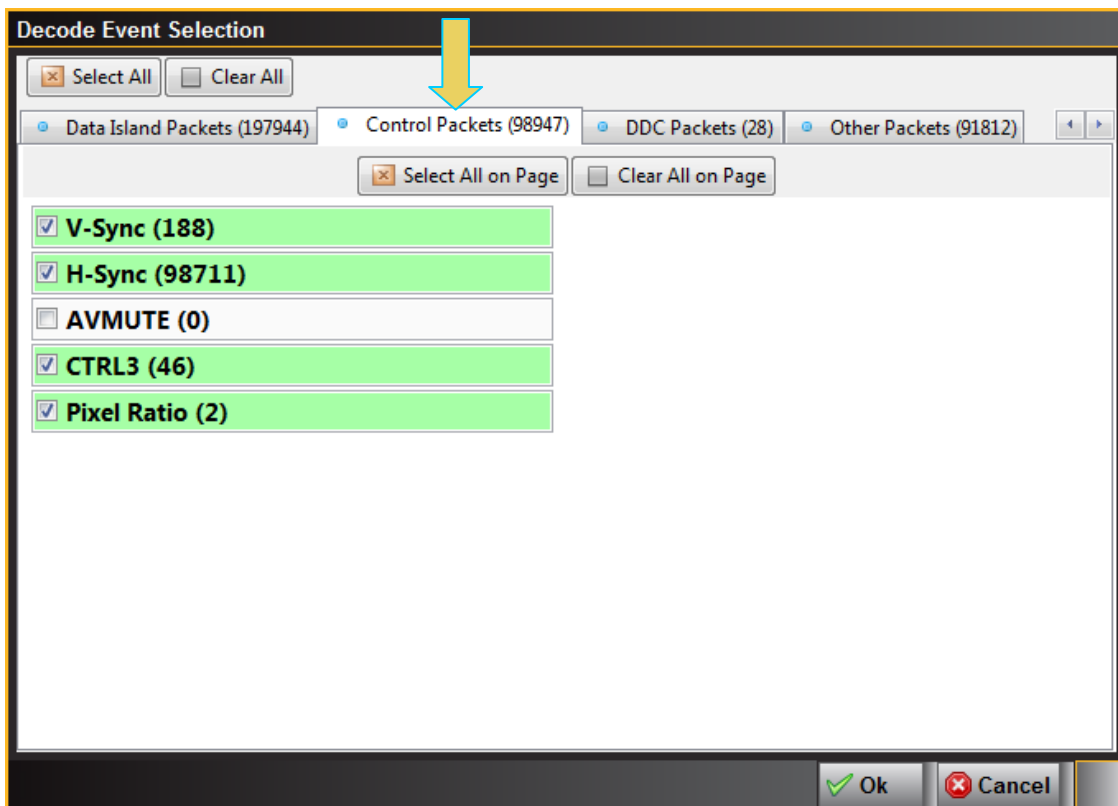
The **Post-Capture Events** button  on the **Data Decode** panel enables you to do the following:

- Specify the data that you want to view in the **Event Plot** and **Data Decode** panels.
- View the number of packets for each data type and each category of data type. These are shown in parentheses after each data type or on the tab for each category.

The screens below show the **Post-Capture Decode Event Selection** panel and its control and selection items. In this example all items are checked meaning that the **Data Decode** panel will show all the data captured.

Note that you can select or deselect all items on a page with the **Select All on Page**  or **Clear All on Page**  buttons or you can individually select an item. There is a pair of navigation buttons  on the right to enable you to see all the tabs in the panel. You can also select and deselect all items on all pages with the **Select All** and **Clear All** buttons.





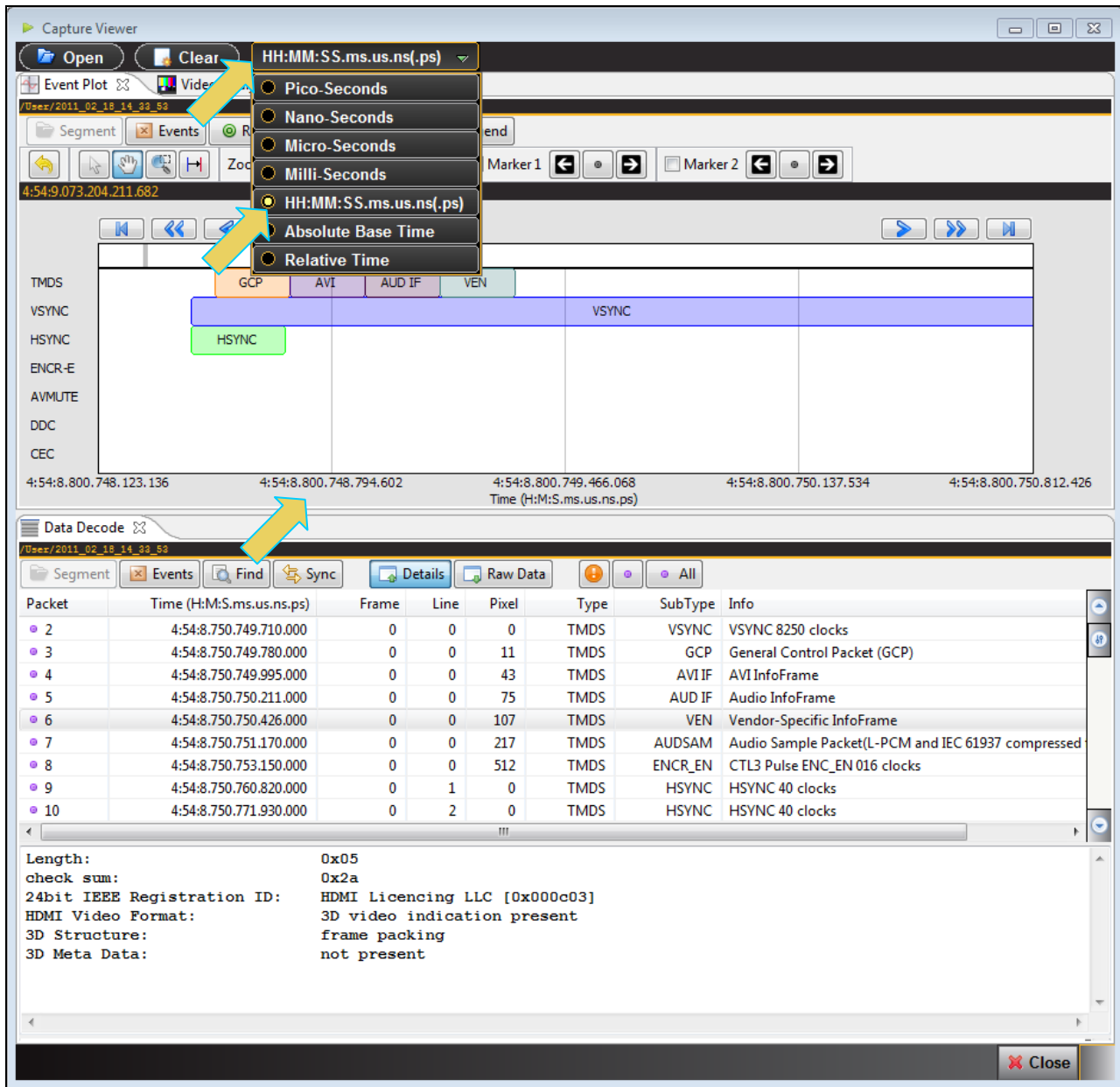
3.7.4 Data Decode Record Field Descriptions

The **Data Decode** panel enables you to select the individual protocol transactions (records). When you highlight a transaction, the details for the selected transaction, are shown in the lower panels: There are two lower panels: top and bottom. The top lower panel shows the data for the selected transaction parsed out in human readable form. The bottom panel shows the data for the selected transaction parsed out in hex form. The following table describes the information on the **Data Decode** panel.

Field	Function
Packet	Lists the packet numbers in sequential order beginning from the first packet captured.
Timestamp	Timestamp – Provides the timestamp in nanoseconds for each transaction since the beginning of the captured data.
Frame	Lists the frame number of the record. The frame count begins when the capture begins and they are counted sequentially.
Line	Lists the line number of the particular frame.
Pixel	Lists the pixel number in the particular line
Type	The type of data of the selected record. This could be one of: TMDS or DDC.
SubType	The sub type of the data for a selected record. This is a more specific designation of the type of data. For example for a Type of TMDS this could be a data island such as an audio sample, infoframe, control signal, etc.
Info	A description of the data of a selected line.

3.7.5 Data Decode Timing mode

The **Capture Viewer** provides a pull-down menu to define how the timestamps are displayed on the **Data Decode** records. This is shown below. The table that follows the screen image defines each option:



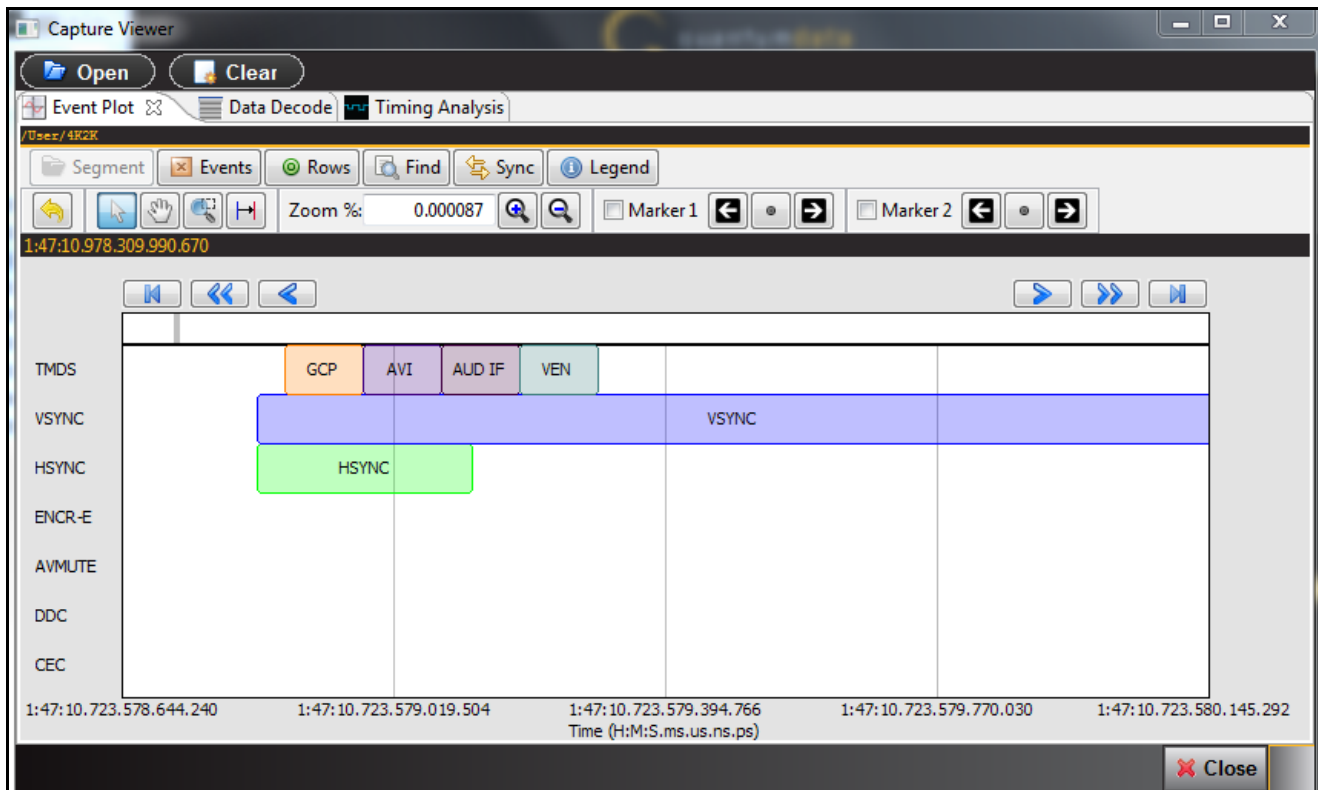
Right click option	Description
Nano-Seconds [HHMMSSmsusns]	Time is shown in nanoseconds. The baseline time is the time from the time of the last boot of the 980.
Micro-Seconds [HHMMSSmsusns]	Time is shown in microseconds. The baseline time is the time from the time of the last boot of the 980.

Right click option	Description
HH:MM:SS.ms.us.ns	Time is shown in relative time meaning the time from the previous event listed.
Absolute Base Time	Time for each item is shown from the time of the beginning of the capture.
Relative Time	Time is shown in relation to the previous item.
Milli-Seconds [HHMMSSms.usns]	Time is shown in milliseconds. The baseline time is the time from the time of the last boot of the 980.

3.8 Event Plot Panel

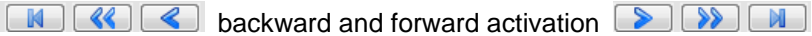

The **Event Plot** panel (shown below) is the primary panel for locating the data for high level navigation to the detail level provided by the **Data Decode** panel. The vertical axis is the data types. The **Event Plot** panel provides a set of data types labeled on the left of the panel that inform you of the type of data for that layer. (You can change this configuration.) The horizontal axis is time. The scale along the bottom of the **Event Panel** shows the timestamp for each point in time.

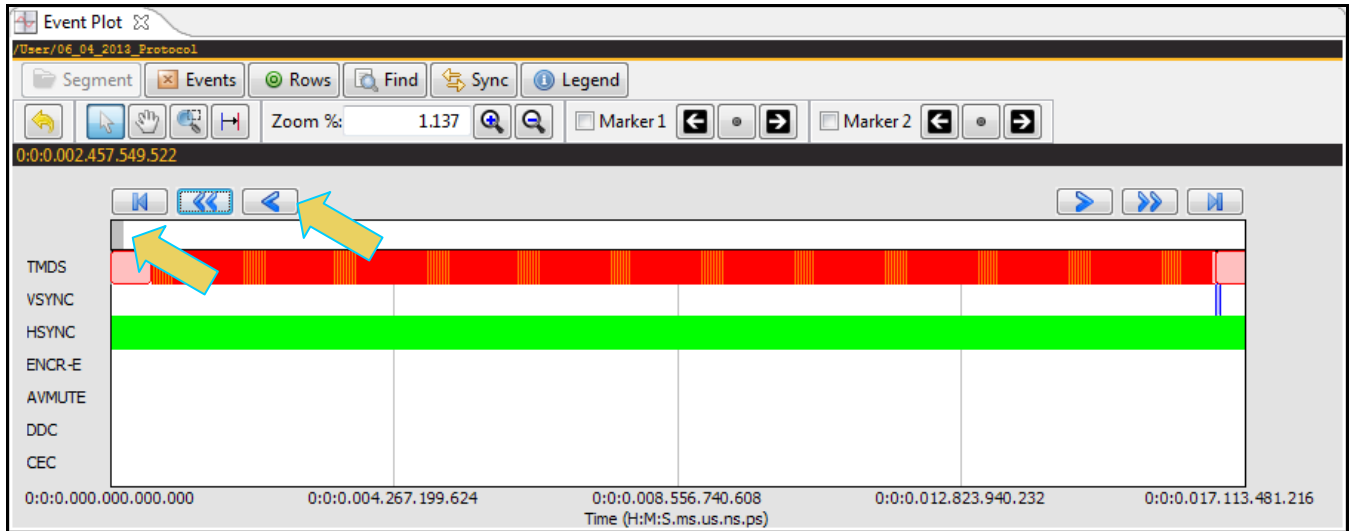
The example shows data captured in the Data Analysis mode where the audio, video and data islands are captured.



3.8.1 Locating Data in the Event Plot Panel

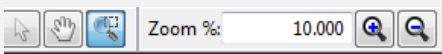




The **Event Plot** enables you to locate data by searching for specific data types, panning, scrolling and zooming using various techniques. You can filter the data by type to limit the amount of data to sift through. You can synchronize the **Data Decode** and **Timing** panels to the **Event Plot** or you can synchronize the **Event Plot** to the **Data Decode** panel.


A scroll bar is provided to enable you to quickly browse through the data. The scroll bar is under the set of function icons just above the data panel where the data is displayed. You can also scroll to the end, scroll by page or scroll incrementally in either direction using the  backward and forward activation  buttons. See the screen shot below.



3.8.2 Zooming in the Event Plot Panel

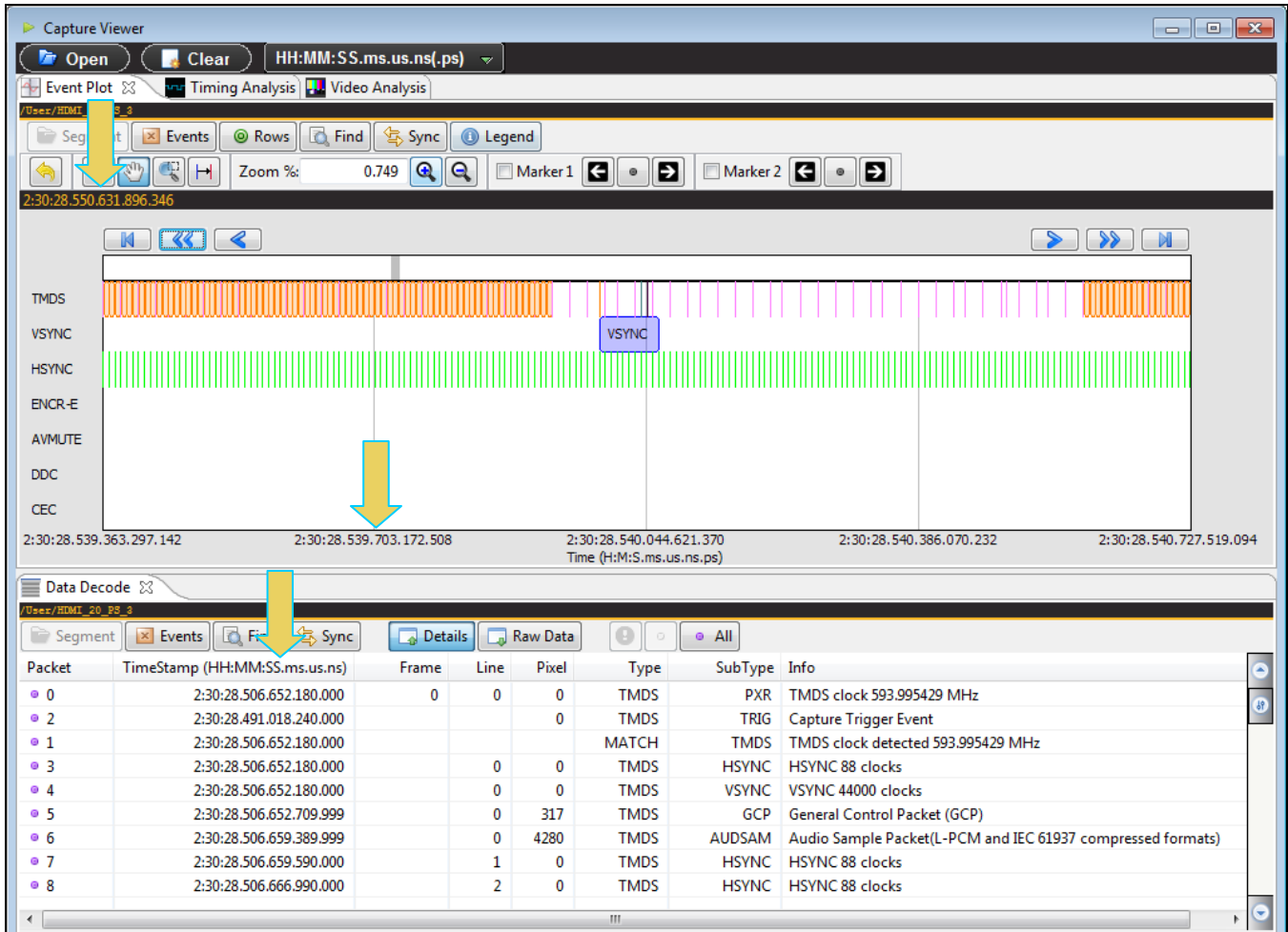
You can zoom in and zoom out and pan across the data using the slide bars provided. You can also zoom by surrounding a specific section of the captured data. These functions are described in the following table.

Even Plot Zoom & Panning Icons	Function
<p>Icons – Zoom and Panning</p> 	<ul style="list-style-type: none"> Surround  activation button – You can select an area of the Event Plot by clicking and dragging across. When you do this the new view will be limited to the horizontal range that you selected. The midpoint of the selection will become the new center of the data displayed. Zoom % – The Zoom % function enables you to enter a specific zoom amount in the associated field provided. Zoom In/Out icons   – The Zoom In/Out function buttons enables you to zoom in and zoom out by clicking on the activation button. The centered point will remain the same. Panning  – The panning function enables you scan across the data quickly by clicking and dragging.


Even Plot Zoom & Panning Icons	Function
	<ul style="list-style-type: none"><li data-bbox="641 233 1469 375">▪ Pointer  – The pointer icon enables you to click on any point and obtain information such as the data packet type and the timestamp, about that data packet. The information is displayed in a dark panel just above the scroll bar and below the icons.

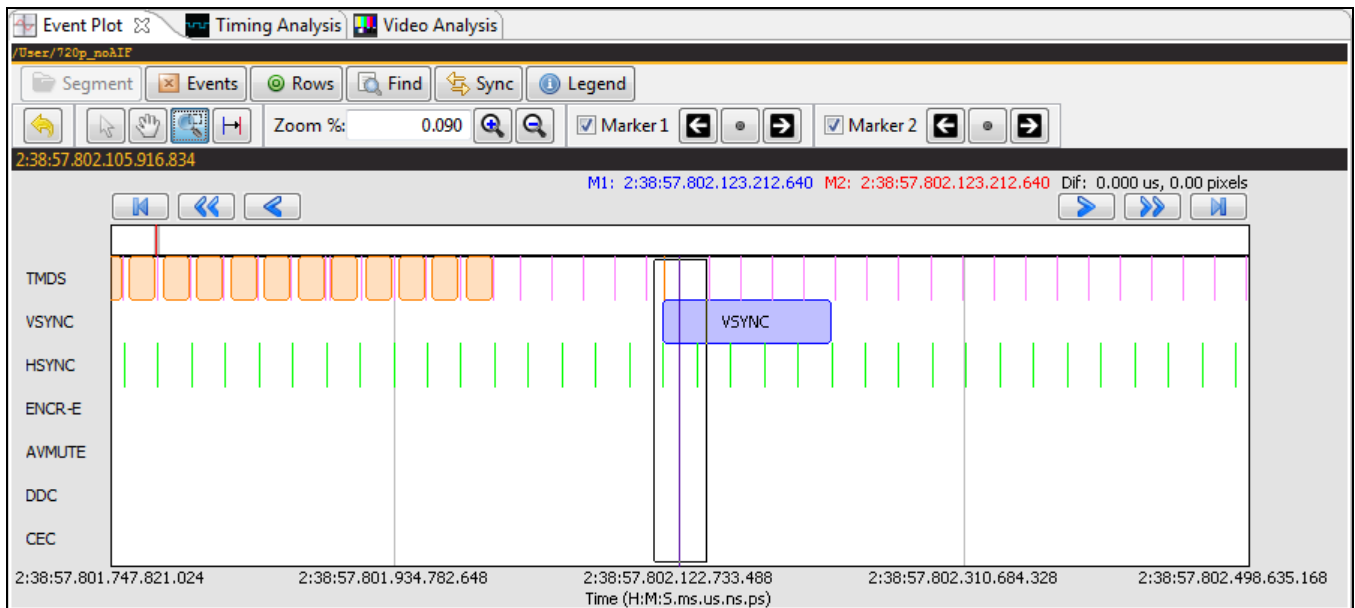
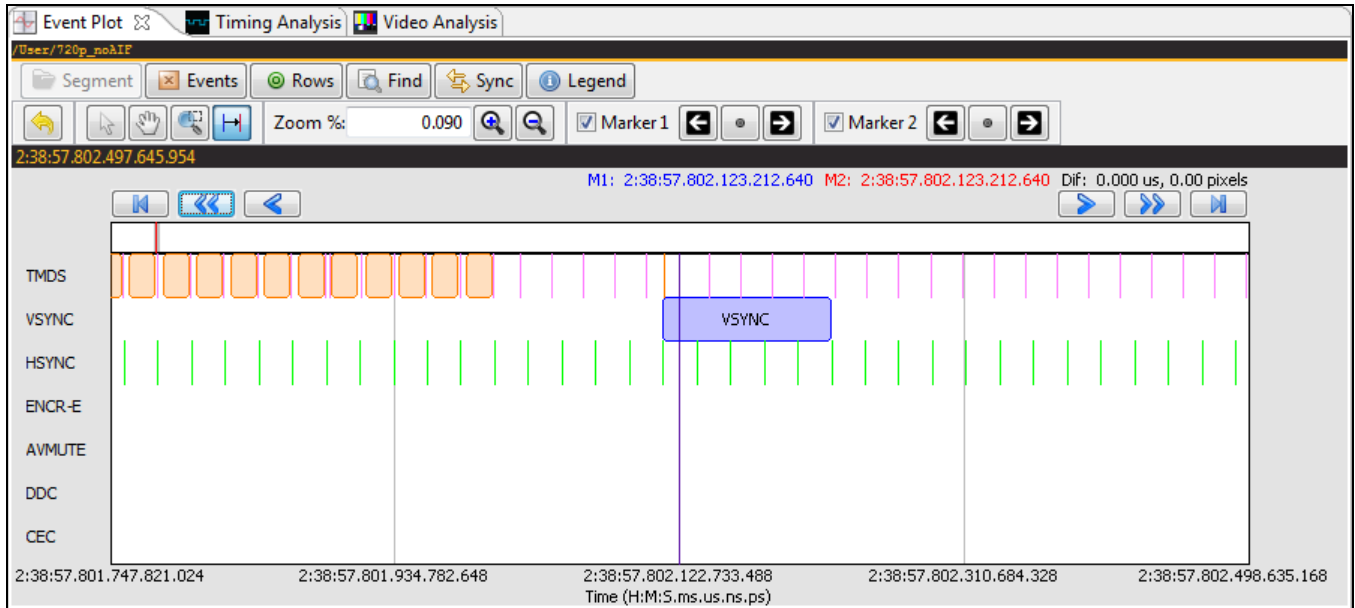
3.8.3 Viewing the Timestamps of the Data

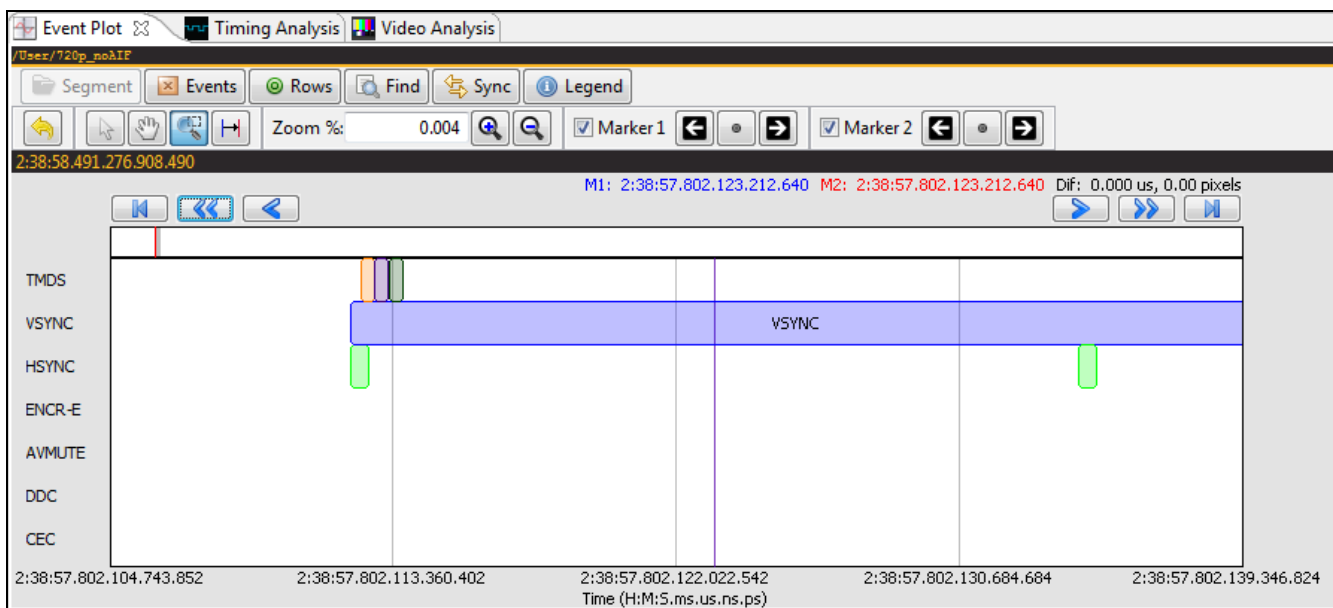
The timestamp indicated on the dark status panel just below the icons indicates the location of the scroll bar. When you scroll or pan through the data, the timestamps are shown in the status panel. If you use the pointer tool to select a particular point, the timestamp and data element will be shown in the center of the dark status panel. In the example below, a selection has been made on an AVI infoframe either with the pointer tool or in the **Data Decode** panel.



3.8.4 Surrounding and Zooming

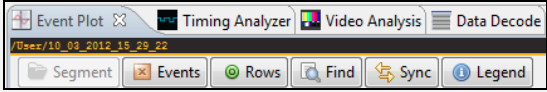
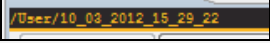

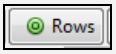

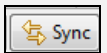
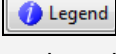
The **Event Plot** provides a Range Zoom tool . You can select an area of the **Event Plot** by clicking and dragging across. When you do this the new view will be limited to the horizontal range that you selected. The midpoint of the selection will become the new center of the data displayed. The two screens below show an example of surrounding a segment of data. The dotted indicates the resultant section that is surrounded. The second view shows the resulting view.



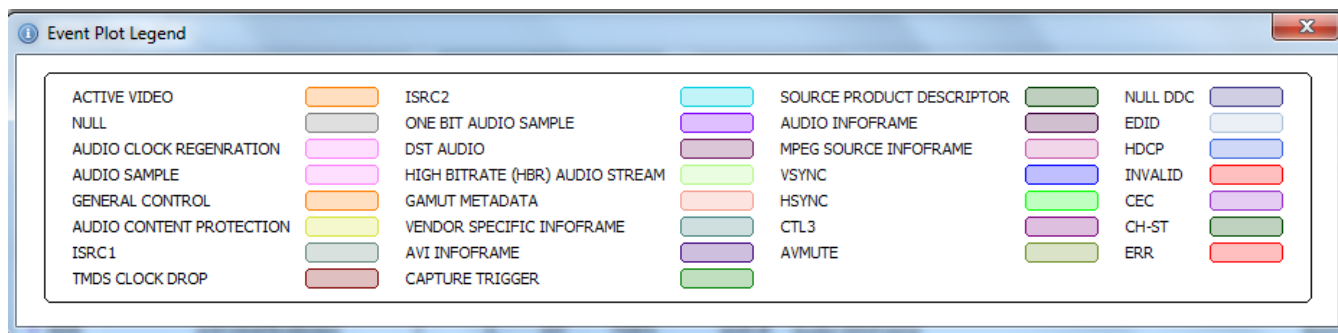


3.8.5 General Controls – Event Plot

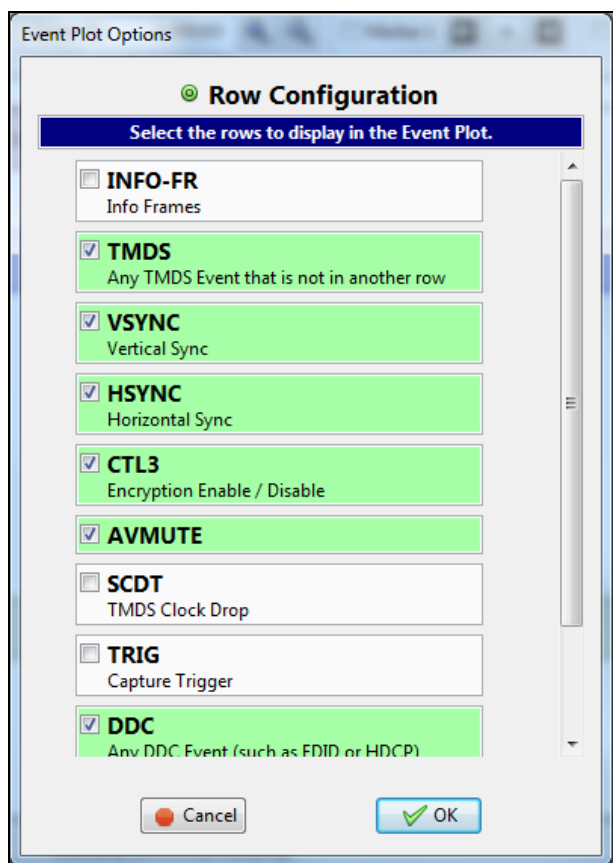
The various other icons and controls in the **Event Plot** are described in the tables and screens that follow.

Even Plot Icons	Function
<p>Icons – General Control</p> 	<ul style="list-style-type: none"> ▪ User path status  – shows the name of the capture file and its location. ▪ Segment – Large captures are broken into smaller distinct sections called segments to make them more manageable and to improve speed and performance. When you click on the Segment activation button, a dialog box appears enabling you to select and load another segment. In the example to the left, there are no segments to the button is grayed out. This dialog box is described further below. ▪ Events  – The Events activation button enables you to filter the captured data by type. When you click on the Events button a dialog box appears enable you do select or deselect data types individually or a page at a time. This dialog box is described further below. ▪ Rows  – The Rows activation button enables you to configure the data types that appears in the Event Plot window. When you click on this icon a dialog box appears enabling you to configure the rows. This dialog box is described further below. ▪ Find  – The Find activation button enables you to locate captured data by type. When you click on the Find button a dialog box appears enable you do specify a data type to search on. This dialog box is described further below. ▪ Sync  – The Sync activation button enables you to synchronize the Data Decode and the Timing Analysis panels to the data in the Event Plot panel. ▪ Legend  – The Legend activation button enables you to view the color coding for the data packets appearing in the Event Plot. When you click on this icon a panel appears enabling you to view the color codes. This panel is shown below.


The **Event Plot** legend panel is shown in the screen shot below.



The **Event Plot** Row configuration dialog panel is shown in the screen shot below. The default configuration is shown below. Simply check the time items that you wish to show in the **Event Plot**. Then click OK.

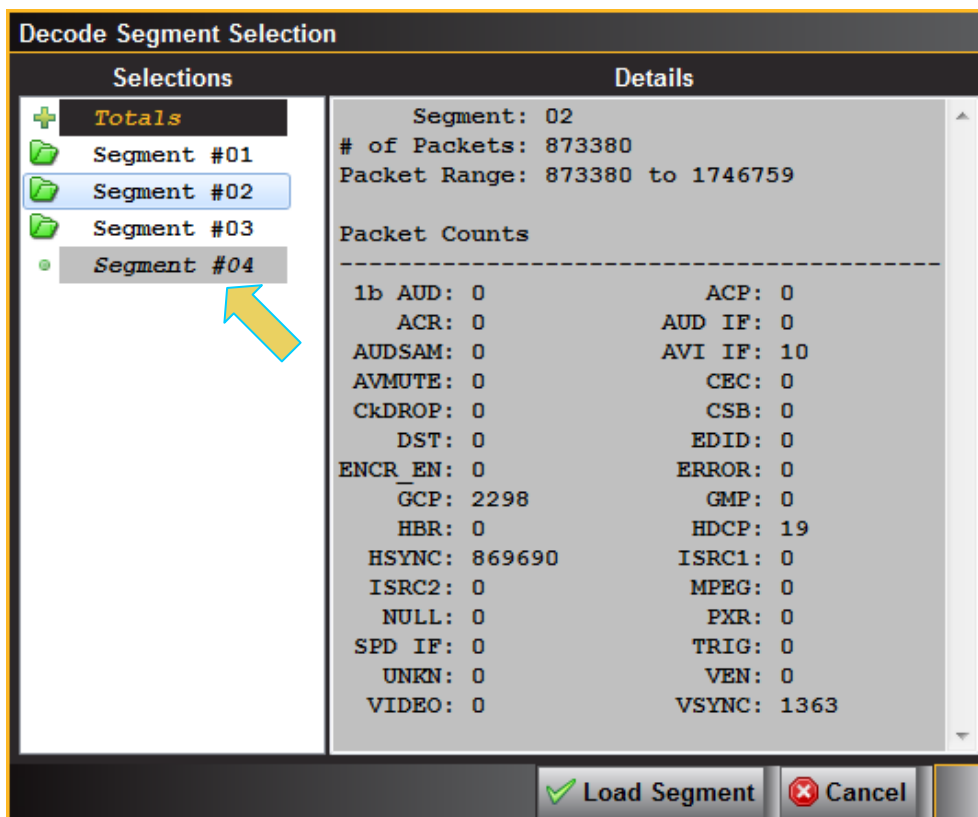


3.8.6 Working with Segments in the Event Plot Panel

The Segments in the **Event Plot** panel work the same way they do as the **Data Decode** panel. Large captures are broken into smaller distinct sections called segments to make them more manageable and to improve speed and performance. When you click on the Segment activation button , a dialog box appears (shown below) enabling you to select and load another segment. This dialog box is shown below. The Selections section on the left lists the segments in the capture. The Details section on the right shows you the packet makeup of the segment as well as the number of packets and the range of packets in the overall capture.



From the Selections panel you can select and load a different segment by highlight a segment and then clicking on the Load Segment activation button on the bottom right. You can also select any segment to view its packet contents in the Details panel. If you wish to view the total packets of all segments simply highlight the Totals

 **Totals** button.

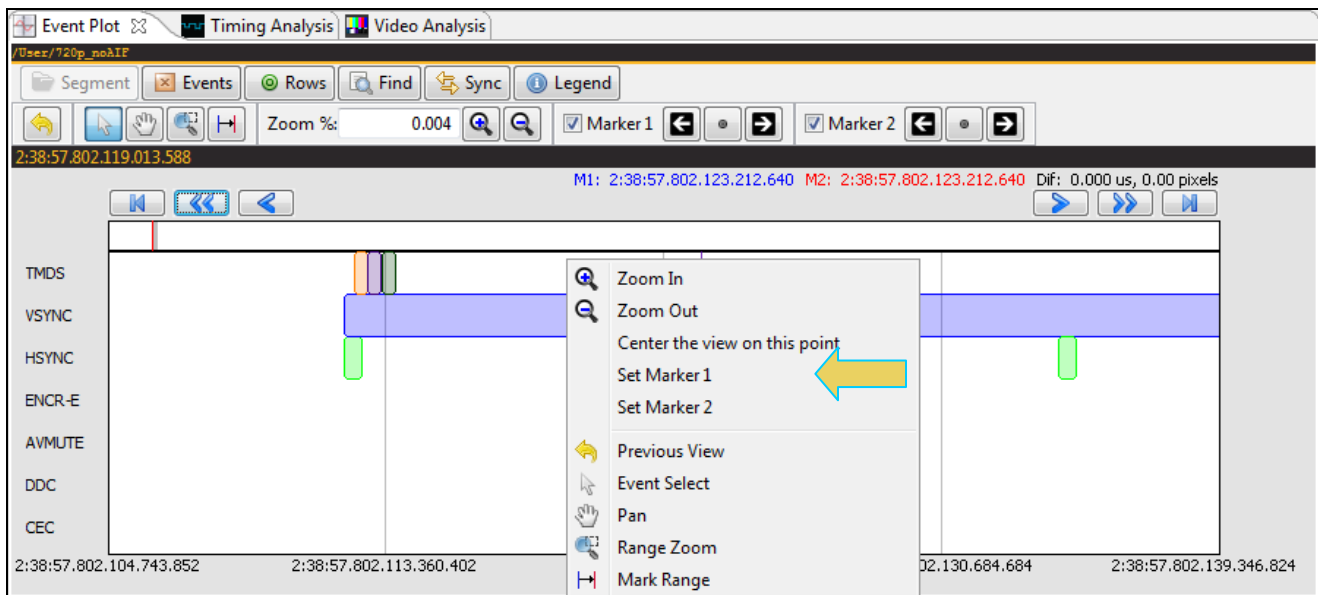


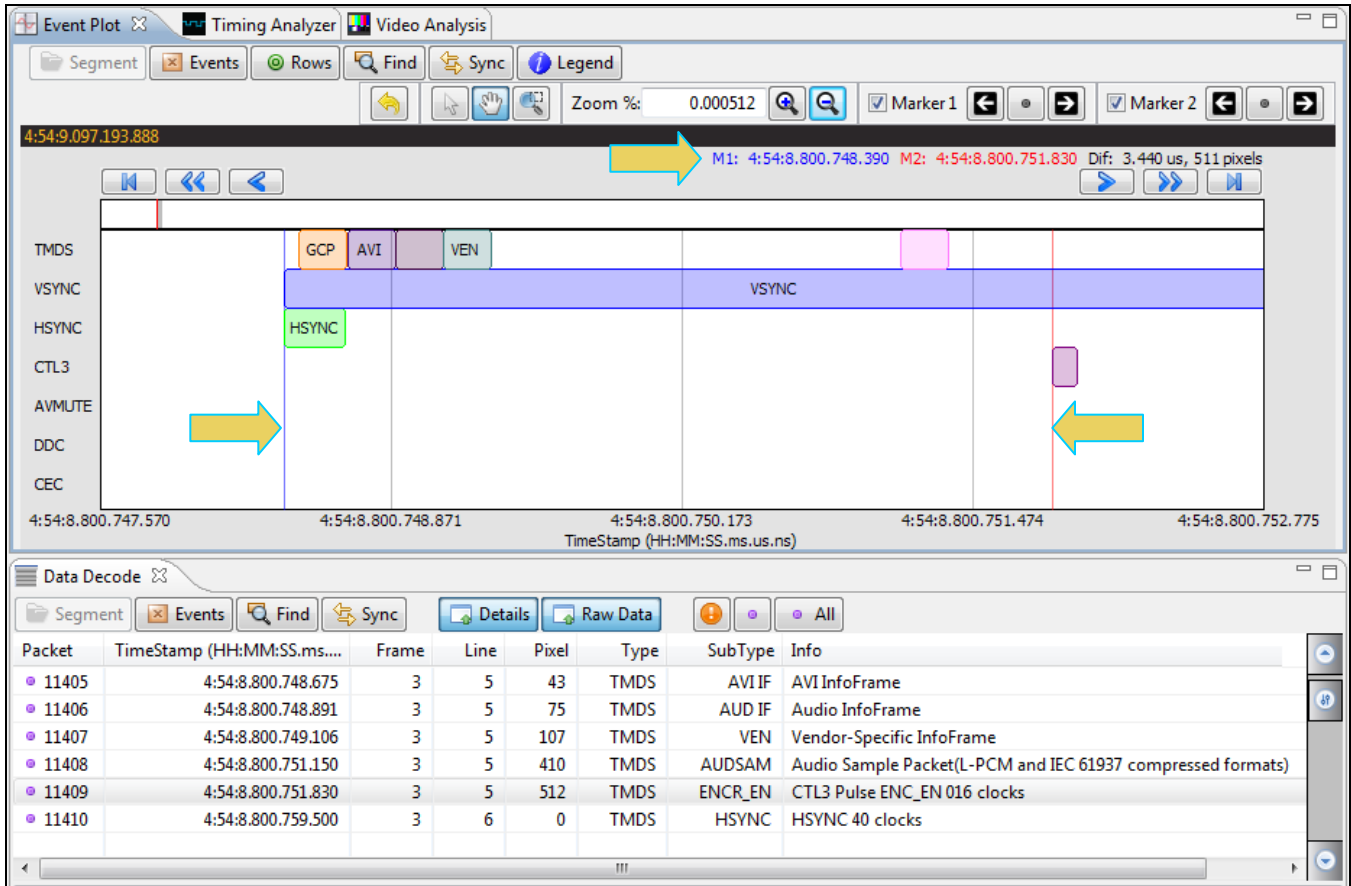
3.8.7 Working with Markers

The **Event Plot** panel enables you to view the data at a high level and identify points of interest for further analysis. You can set two cursors or "markers" in the **Event Plot** panel at particular points of interest. The **Event Plot** will show you the time difference between the two cursors. You can fine tune the position of the cursors with the left

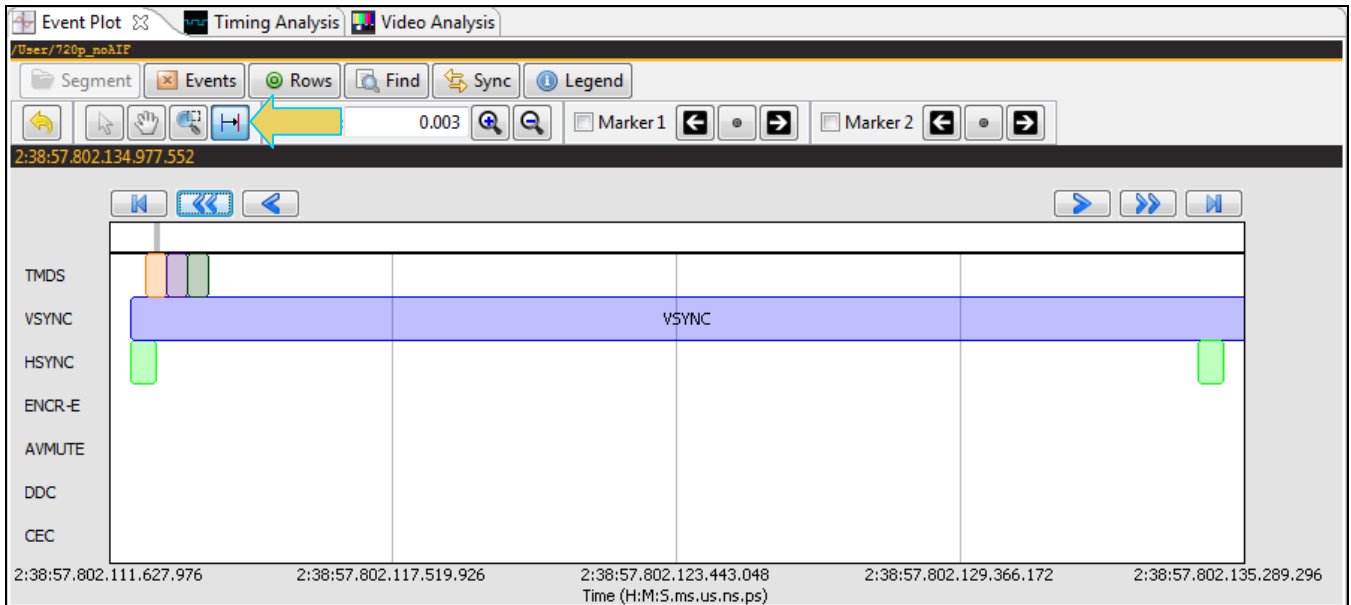
and right arrows associated with each marker . The  center icon allows you to center the particular marker on the Event Plot window. The screens below show the markers being set and the resulting markers placed in the **Event Plot** panel. Note that you can also set the markers using the right click menu also shown below and this is the preferred method because the markers will appear exactly where you right click.


You can see the timestamp associated with each marker which are color coded (blue and red) just above the area where the data is shown. The dark text to the right shows the difference in microseconds and pixels between the two markers.

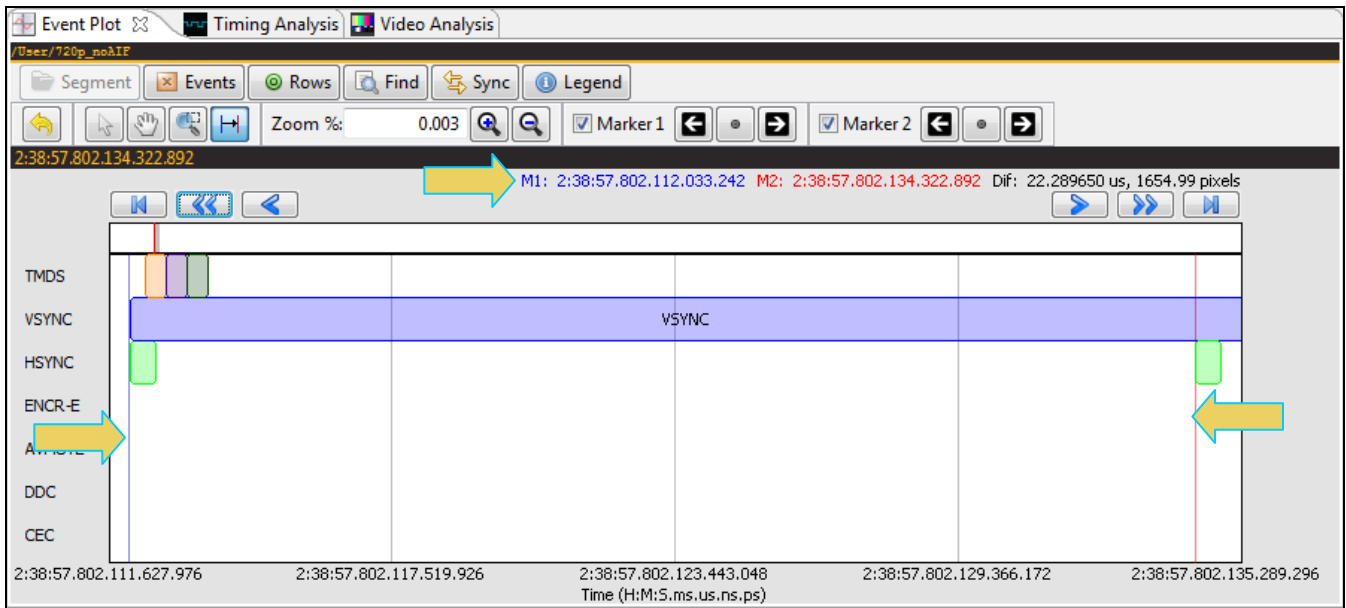




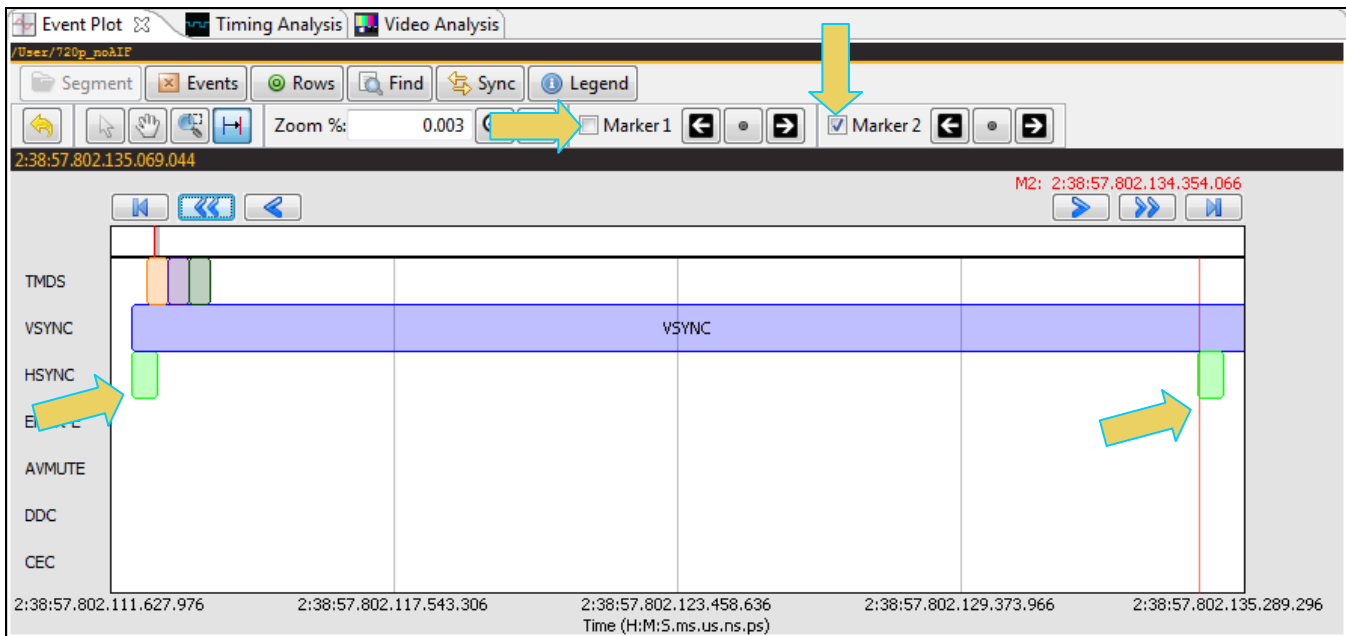
You can also set the markers with the Marker tool as shown below.




When you begin the sweep the Marker tool cursor will appear as the icon  shown in the menu bar.

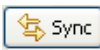


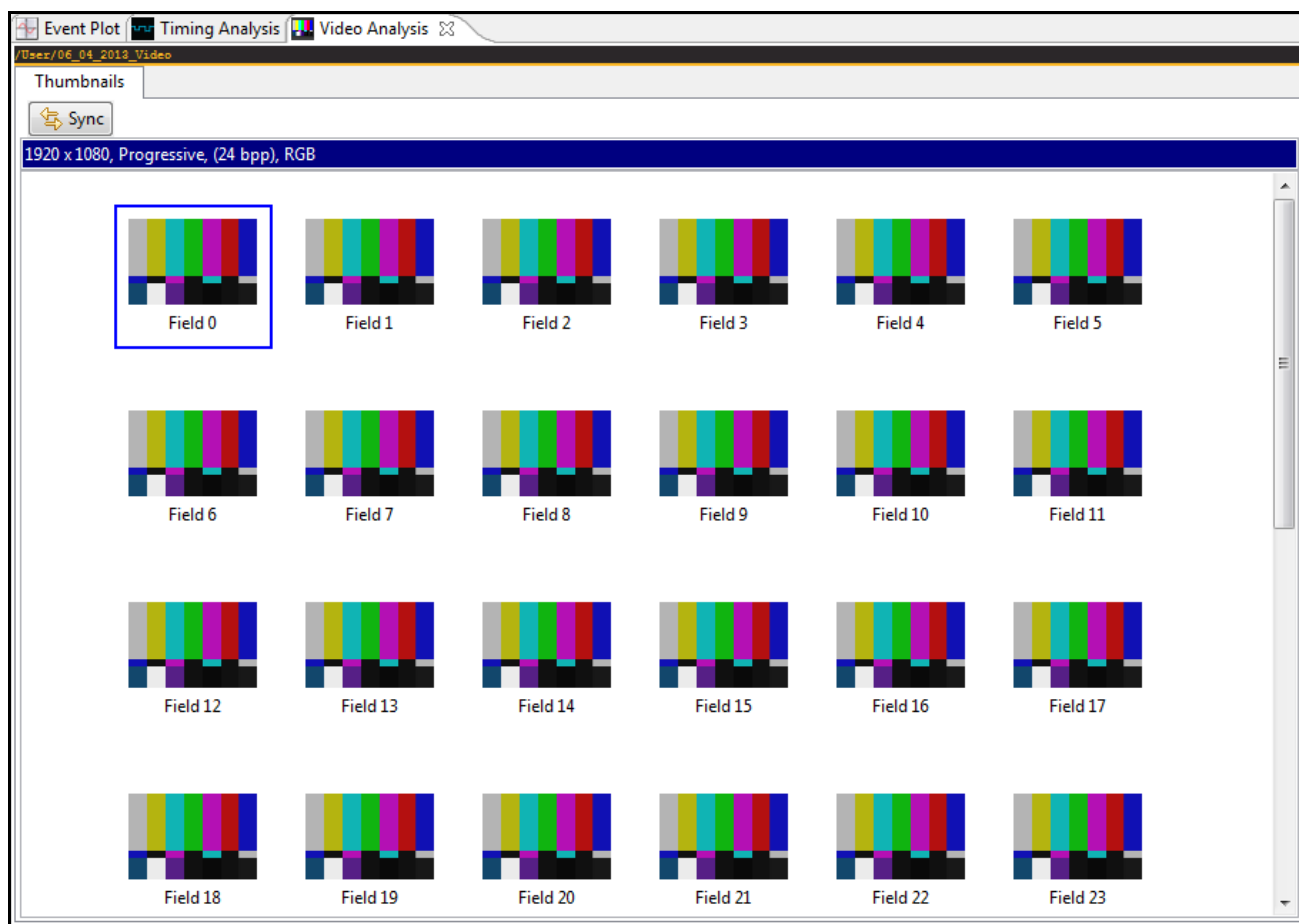
You can remove the marker using the checkboxes associated with each Marker on the top menu bar. Refer to the screens example below.



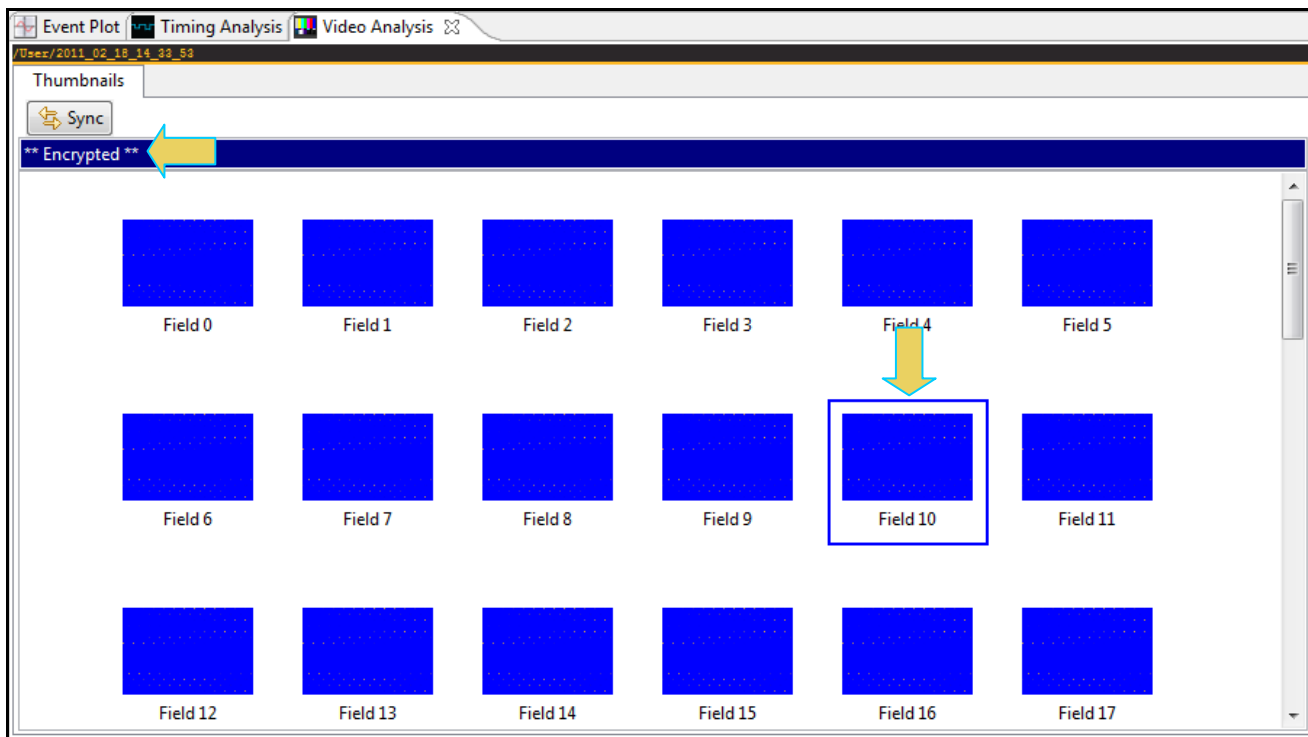
3.9 Video Analysis Panel

The **Video Analysis** panel enables you to view the captured video images. It provides thumbnails of each captured frame. It also enables you to navigate to the **Data Decode** panel to view the transactions for that frame. You can synchronize the **Data Decode** panel to the **Video Analysis** panel by pressing the ALT key and clicking on a frame. You can also synchronize by activating the sync button  on the upper left side of the **Data Decode** panel. Once you synchronize the **Data Decode** panel to a frame you can view the transactions for that frame in the **Data Decode** panel.

You can also perform this action in reverse, i.e. from a particular record in the **Data Decode** panel you can to that frame in the **Video Analysis** panel by ALT clicking on the transaction or by activating the synchronization button  on the top, right portion of the **Data Decode** panel. The **Video Analysis** panel is shown in the screen image below.

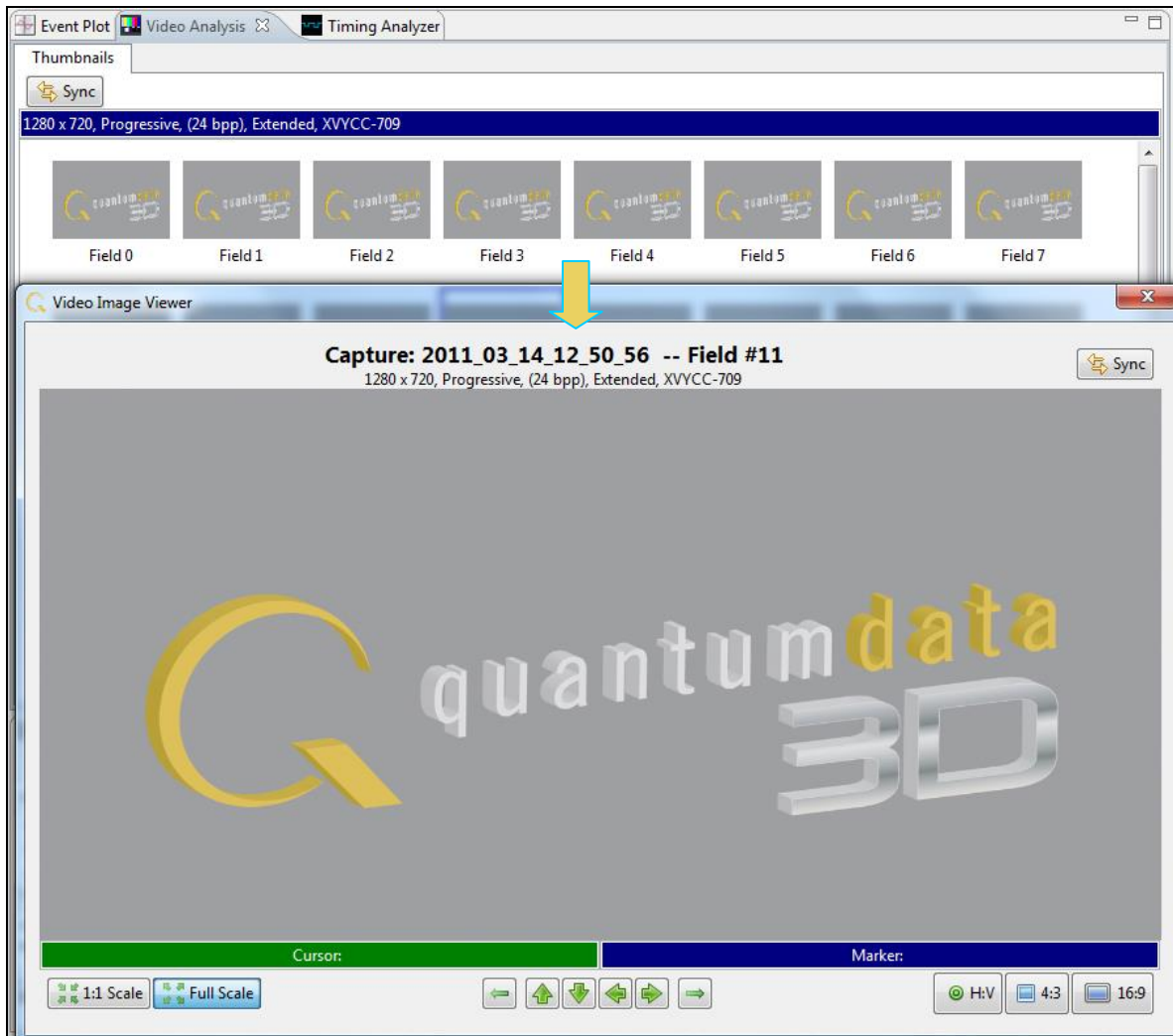


Note: You cannot view frames of video that are encrypted with HDCP. The **Video Analysis** panel will show blue thumbnails and the word “Encrypted” will be shown in the upper left corner of the panel as shown below.



3.9.1 Image Viewer

The **Video Analysis** panel enables you view the video pattern or content for a frame in full size by simply double clicking on a frame. The screen below shows the **Video Image Viewer** for a specific frame.




Once you have activated the full view of a frame in the **Video Image Viewer** panel you can view the pixel values for any pixel by moving your mouse over the pattern. There are two values given:

Cursor – Pixel values for where the cursor is currently located.


Marker – Pixel values for where you have last clicked on the image.

In the example below the Cursor pixel is (x=186, y=136) with hex RGB values of B4,B4,10 and the Marker pixel is (x=493, y=245) with hex RGB values of 10, B4, B4. If the color space is YCbCr the Video Image Viewer will show these values and indicate the color space. Deep color values are also shown in either YCbCr or RGB color space.

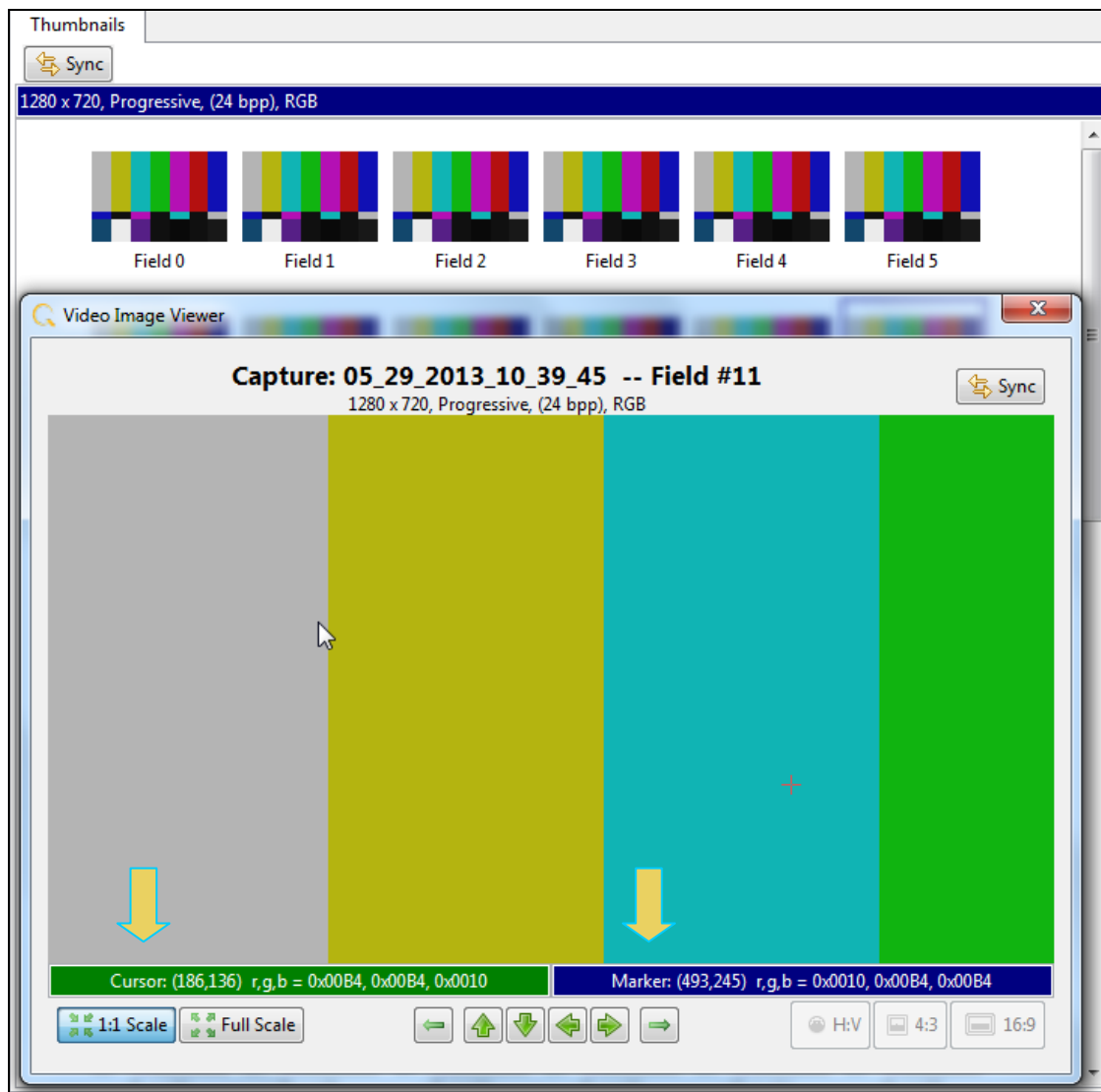
You can advance to an adjacent pixel (up/down or left/right) using the thick green arrow buttons

 on the bottom of the **Video Image Viewer** panel.

You can advance to the image of an adjacent frame (earlier or later) using the thin green arrow buttons

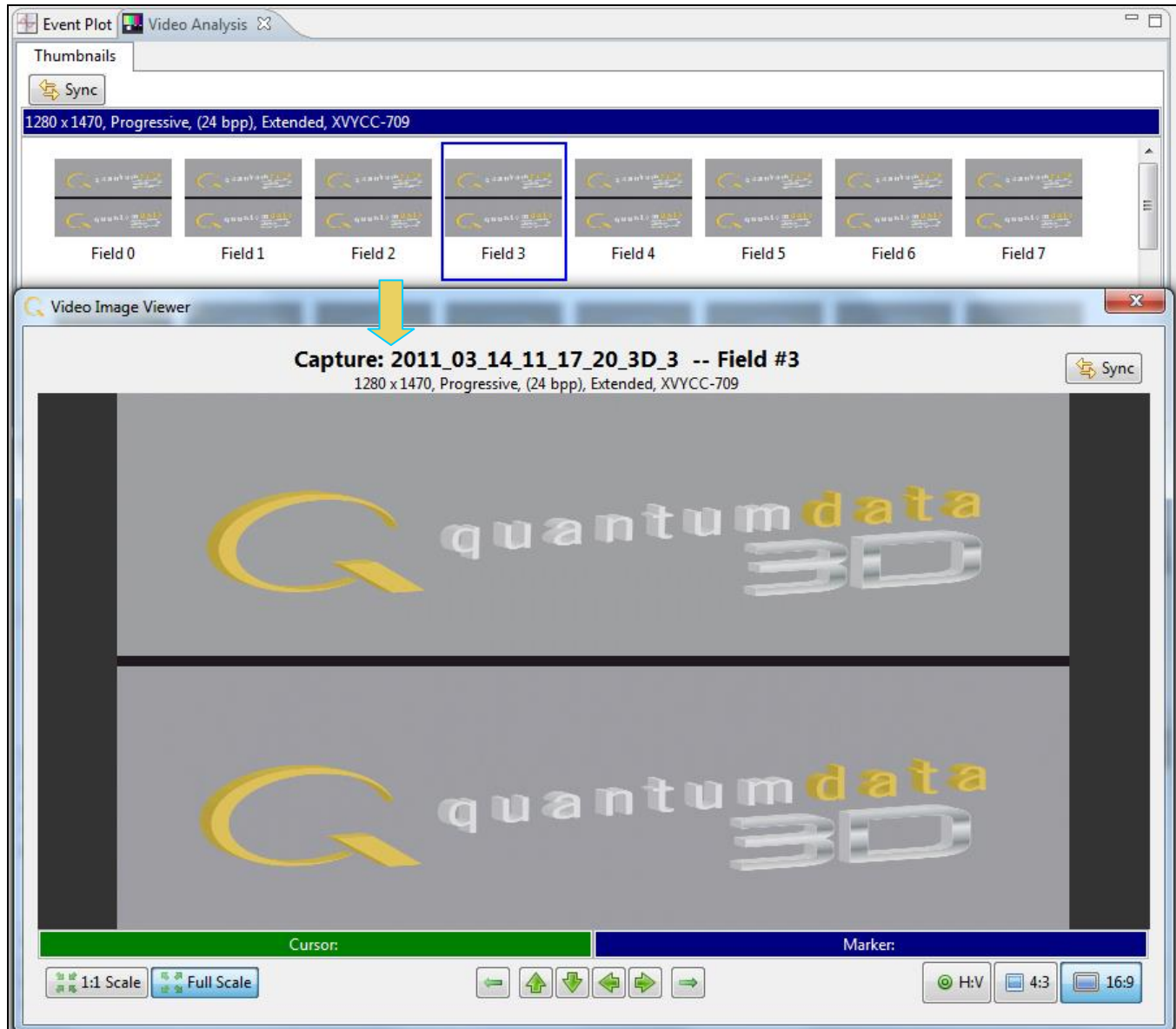
 on the bottom of the **Video Image Viewer** panel.

These are shown in the screen image below.



3.9.2 Viewing 3D Images


You can view captured 3D images in the **Video Analysis** panel. The 3D images appear adjacent to one another in the window, either side by side or one on top and the other below it for the left and right eyes depending on the 3D structure used. The screen shot below shows an example of a 3D image in the Frame Packing format at 720p60. Note the vertical timing (1470 lines) shown in the heading area just above the top image.





3.10 Timing Analysis Panel

The **Timing Analysis** panel provides timing information about a particular frame and line or for all frames and lines. It tells you if the incoming data is compliant with a known-standard timing.

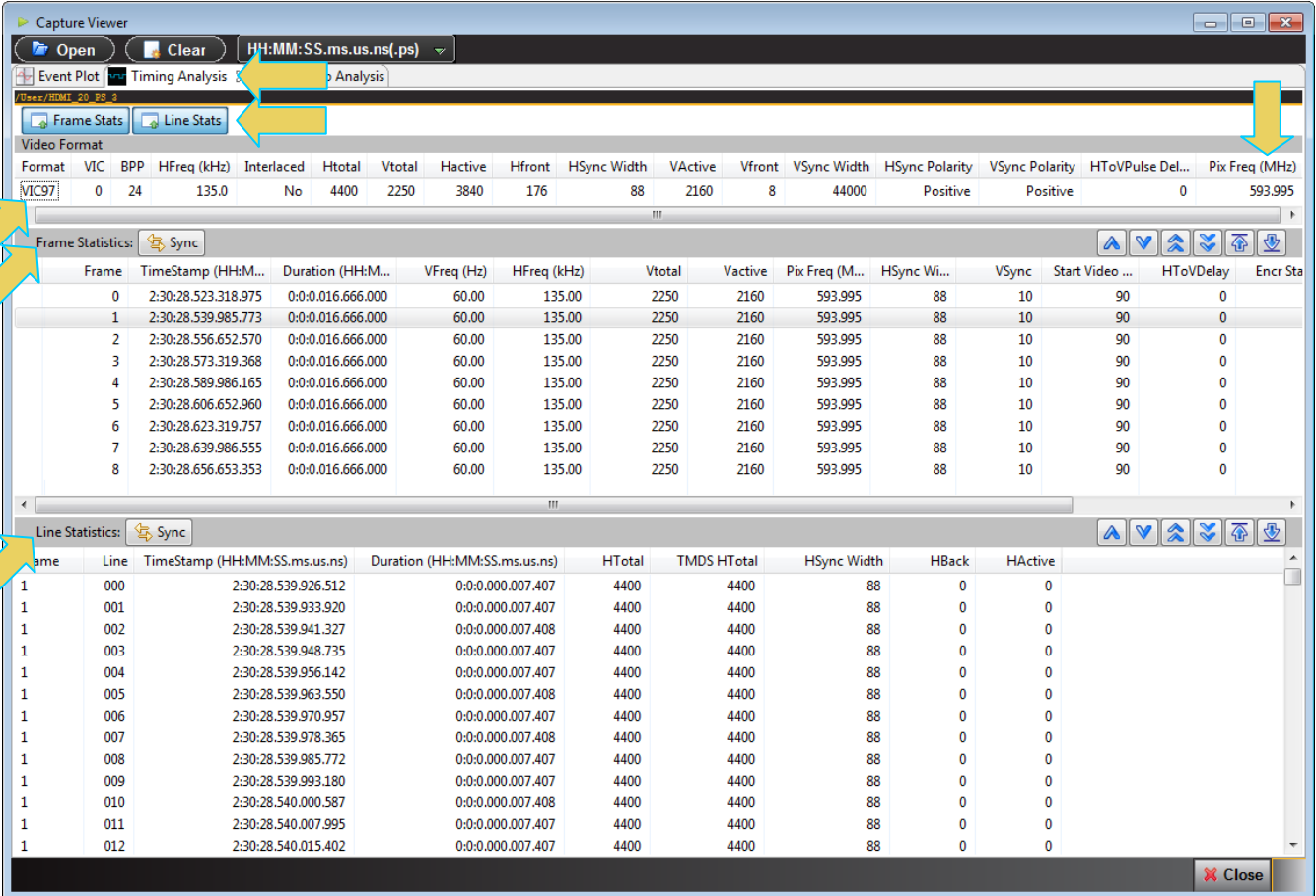
You can toggle the viewing of either the Frame Statistics panel or the Line Statistics panel to show/hide using the **Frame Stats** **Frame Stats** and **Line Stats** **Line Stats** activation buttons.

The **Timing Analysis** panel can be synchronized with the other panels such as the **Event Plot** panel and **Data Decode** panel by activating the synchronization button  on the top, left portion of the Frame and Line Statistics panels of the **Timing Analysis** panel. There are several quick navigation buttons on the right side of the panel.

 These enable you to: 1) Move up one line, 2) Move down one line, 3) Move up one page, 4) Move down one page, 5) Move to the top of the capture, 6) Move to the bottom of the capture.

The key icon  beside a frame indicates that that frame is encrypted.

You can sort on any frame or line column in either ascending or descending order by clicking on the column name heading. An up arrow or a down arrow will appear indicating the direction of the sort as show below.



The screenshot shows the 'Capture Viewer' application window. At the top, there are buttons for 'Open', 'Clear', and a file name field. Below that are tabs for 'Event Plot', 'Timing Analysis', and 'Analysis'. The 'Timing Analysis' tab is active, showing 'Frame Stats' and 'Line Stats' sub-tabs. A 'Video Format' table is displayed, followed by a 'Frame Statistics' table with a 'Sync' button and navigation icons. Below that is a 'Line Statistics' table, also with a 'Sync' button and navigation icons. Yellow arrows point to various UI elements: the 'Sync' buttons, the 'Frame Stats' and 'Line Stats' sub-tabs, the 'Video Format' table, the 'Frame Statistics' table, and the 'Line Statistics' table.

Format	VIC	BPP	HFreq (kHz)	Interlaced	Htotal	Vtotal	Hactive	Hfront	HSync Width	VActive	Vfront	VSync Width	HSync Polarity	VSync Polarity	HToVPulse Del...	Pix Freq (MHz)
MPEG	0	24	135.0	No	4400	2250	3840	176	88	2160	8	44000	Positive	Positive	0	593.995

Frame	TimeStamp (HH:M...	Duration (HH:M...	VFreq (Hz)	HFreq (kHz)	Vtotal	Vactive	Pix Freq (M...	HSync Wi...	VSync	Start Video ...	HToVDelay	Encr Sta
0	2:30:28.523.318.975	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
1	2:30:28.539.985.773	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
2	2:30:28.556.652.570	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
3	2:30:28.573.319.368	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
4	2:30:28.589.986.165	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
5	2:30:28.606.652.960	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
6	2:30:28.623.319.757	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
7	2:30:28.639.986.555	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	
8	2:30:28.656.653.353	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	

Name	Line	TimeStamp (HH:MM:SS.ms.us.ns)	Duration (HH:MM:SS.ms.us.ns)	HTotal	TMDS HTotal	HSync Width	HBack	HActive
1	000	2:30:28.539.926.512	0:0:0.000.007.407	4400	4400	88	0	0
1	001	2:30:28.539.933.920	0:0:0.000.007.407	4400	4400	88	0	0
1	002	2:30:28.539.941.327	0:0:0.000.007.408	4400	4400	88	0	0
1	003	2:30:28.539.948.735	0:0:0.000.007.407	4400	4400	88	0	0
1	004	2:30:28.539.956.142	0:0:0.000.007.407	4400	4400	88	0	0
1	005	2:30:28.539.963.550	0:0:0.000.007.408	4400	4400	88	0	0
1	006	2:30:28.539.970.957	0:0:0.000.007.407	4400	4400	88	0	0
1	007	2:30:28.539.978.365	0:0:0.000.007.408	4400	4400	88	0	0
1	008	2:30:28.539.985.772	0:0:0.000.007.407	4400	4400	88	0	0
1	009	2:30:28.539.993.180	0:0:0.000.007.407	4400	4400	88	0	0
1	010	2:30:28.540.000.587	0:0:0.000.007.408	4400	4400	88	0	0
1	011	2:30:28.540.007.995	0:0:0.000.007.407	4400	4400	88	0	0
1	012	2:30:28.540.015.402	0:0:0.000.007.407	4400	4400	88	0	0

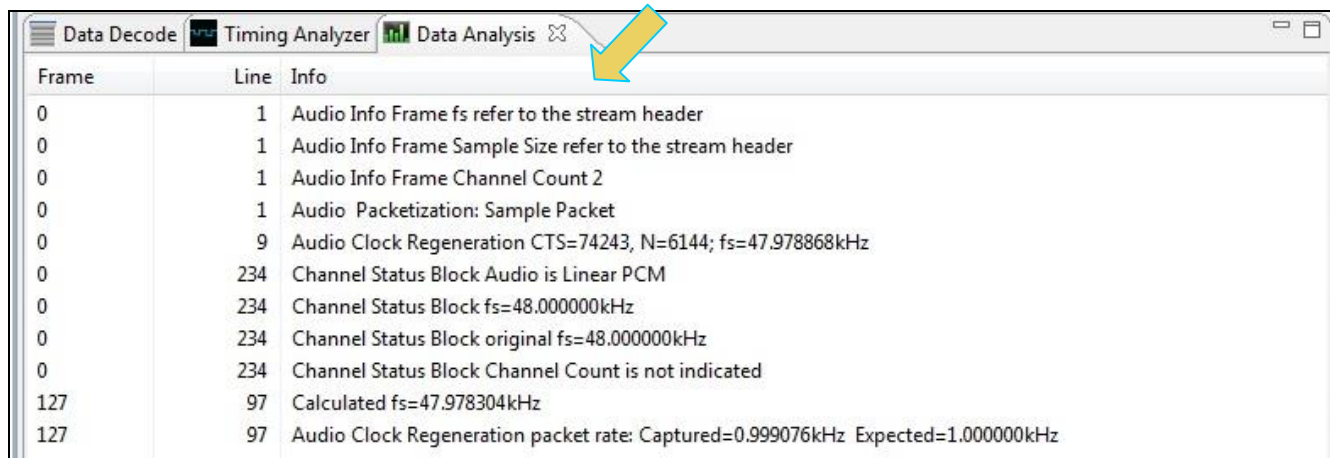
The following table describes the information on the **Timing Analysis** panel.

Panel	Item - Column	Description
Video Format	CEA Name	The CEA name of the format that the 980 has detected based on the timing parameters.
	VIC	The CEA Video Identification Code.
	BPP	Number of bits per pixel.
	HFreq	The horizontal rate of the format timing.
	Interlaced	The scan type: No = progressive; Yes = interlaced.
	Htotal	The number of pixels in the line including active and blanking.
	Vtotal	The total number of lines in a frame including active and blanking.
	Hactive	The number of active pixels in the line excluding active and blanking.
	Hfront	The number of pixels in the front porch portion of blanking.
	Hsync Width	The number of pixels in the horizontal sync pulse width.
	VActive	The number of lines in the active region.
	Vfront	The number of lines in the vertical front porch, i.e. the number of lines that occur before the vertical sync pulse.
	Vsync Width	The number of pixels within the vertical sync pulse.
	Hsync Polarity	The polarity of the horizontal sync pulse: Negative; Positive.
	Vsync Polarity	The polarity of the vertical sync pulse: Negative; Positive.
HToVPulse Delay	The number of lines after the active video (leading edge of vertical blanking) before the leading edge of the vertical sync pulse.	
Pix Freq (MHz)	The pixel rate in Megahertz.	
Frame Statistics	CEA Format	The CEA name of the format that the 980 has detected based on the timing parameters.
	Frame	Indicates the frame number.
	Time Stamp	Timestamp for the beginning of the frame. Provided in nanoseconds in HH:MM:SS:ms:us:ns. Example: 2:0:29:803:393:350 2 Hours; 0 Minutes; 29 seconds; 803 milliseconds; 393 microseconds; 350 nanoseconds.
	Duration	The duration of the frame in nanoseconds. Same format as that shown for Time Stamp above.
	Vfreq (Hz)	The rate that a frame is rendered.

Panel	Item - Column	Description
	Hfreq (kHz)	The rate that a line in a frame is rendered.
	Vtotal	The total number of lines in the vertical frame.
	Vactive	The number of lines in the vertical resolution.
	Pix Freq (MHz)	The pixel rate of the format.
	Hsync Width	The number of pixels in the horizontal sync pulse.
	Vsync (width)	The number of lines in the vertical sync pulse.
	Start Video Line	The line that the active video begins on.
	HToVDelay	The delay in pixels between the horizontal and vertical sync pulse.
	Encryp Start Pixel	The pixel in the line that the encryption enable pulse begins on.
	Encryp Pulse Line	The line that the encryption enable pulse occurs on.
	Encryp Length	The length of the encryption enable pulse in pixels.
Line Statistics	Frame	The frame number in the captured data.
	Line	The number of a particular line in the frame.
	Time Stamp	Timestamp for the beginning of the frame. Provided in nanoseconds in HH:MM:SS:ms:us:ns. Example: 2:0:29:807:126:843 2 Hours; 0 Minutes; 29 seconds; 807 milliseconds; 126 microseconds; 843 nanoseconds.
	Duration	The duration of the frame in nanoseconds. Same format as that shown for Time Stamp above.
	Htotal	The total number of pixels in a line including blanking.
	TMDS HTotal	The total number of clock cycle in a line including blanking.
	Hsync Width	The number of pixels in the horizontal sync pulse.
	Hback	Horizontal back porch delay.
	HActive	The total number of pixels in the active video.

3.11 Audio Analysis Panel

The **Audio (Data) Analysis** panel enables you to assess the consistency of the audio metadata. The audio test is a special test. It is executed from the **Std Tests** tab of the **Capture Control** panel.



Frame	Line	Info
0	1	Audio Info Frame fs refer to the stream header
0	1	Audio Info Frame Sample Size refer to the stream header
0	1	Audio Info Frame Channel Count 2
0	1	Audio Packetization: Sample Packet
0	9	Audio Clock Regeneration CTS=74243, N=6144; fs=47.978868kHz
0	234	Channel Status Block Audio is Linear PCM
0	234	Channel Status Block fs=48.000000kHz
0	234	Channel Status Block original fs=48.000000kHz
0	234	Channel Status Block Channel Count is not indicated
127	97	Calculated fs=47.978304kHz
127	97	Audio Clock Regeneration packet rate: Captured=0.999076kHz Expected=1.000000kHz

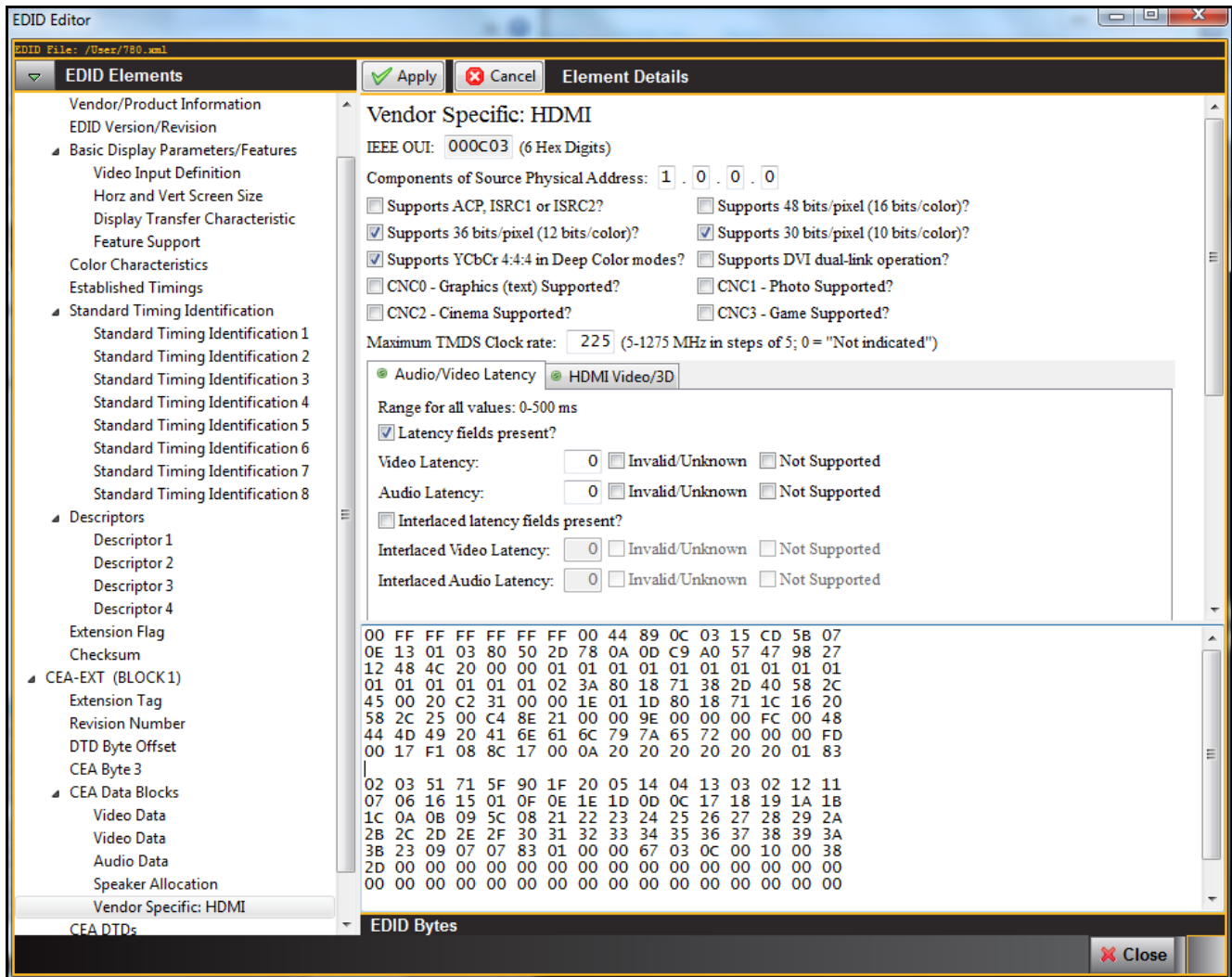
The information included in the **Audio Analysis** listing is defined in the table below.

Field	Function
Audio InfoFrame Sampling Freq (Fs)	The sampling frequency or rate provided in the audio infoframe.
Audio InfoFrame Sample Size	The sample size that is provided in the audio infoframe.
Audio InfoFrame Channel Count	The channel count that is provided in the audio infoframe.
Audio Packetization	The sample packets in the audio sample.
Audio Clock Regeneration	The CTS and N values in the ACR packet and the sampling frequency or rate that is calculated using those CTS and N values.
Channel Status Block Audio [type]	The audio format read from the channel status bits.
Channel Status Block Sampling Freq (Fs)	The audio format provided in the audio sample packet headers.
Channel Status Block Original Sampling Freq (Fs)	The sampling frequency or rate that is provided in the channel status bits.
Channel Status Channel Count	The channel count that is provided in the channel status block.
Calculated Sampling Freq (Fs)	The sampling frequency or rate that is calculated based on the audio sample packets captured.
Audio Clock Regeneration packet rate	The rate at which the ACR packets are arriving. Both the values captured and the expected rate based on the calculation with the pixel rate and the sampling rate.

3.12 EDID Editor Panel

The **EDID Editor** panel enables you to modify existing EDIDs or create new ones through a graphical interface. You can import .xml-based EDID files from your PC for use on the 980 HDMI 2.0 Protocol Analyzer Rx port. In this

way you can emulate any EDID at the 980 HDMI 2.0 Protocol Analyzer Rx port to ensure that your source responds correctly to it. A sample screen shot of the **EDID Editor** is shown below.



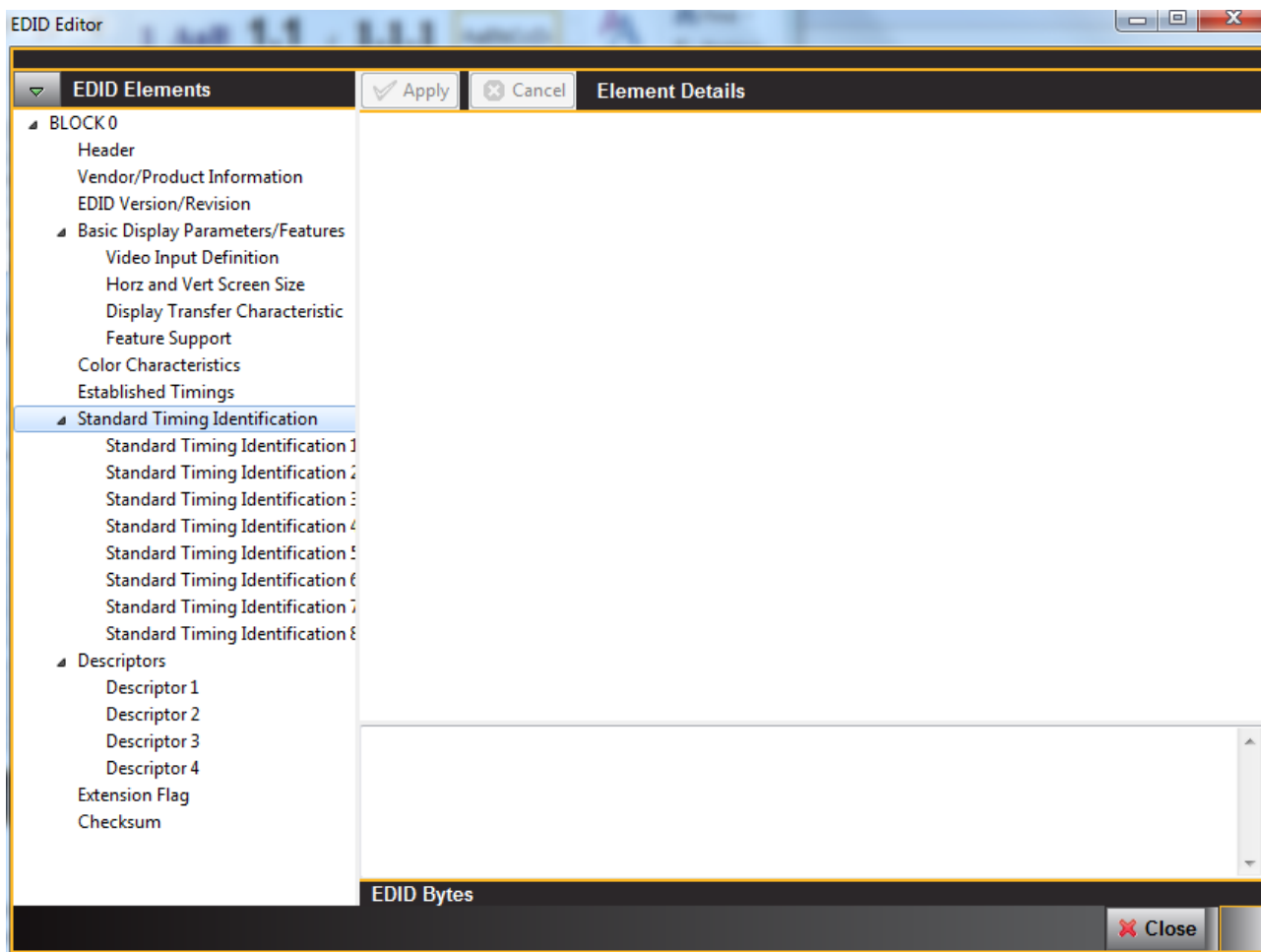
3.13 Opening up the EDID Editor

You may have many EDIDs stored in the EDID directory of the external GUI Manager suite of directories. You can open any one of these EDIDs, modify it and resave it under a different name.

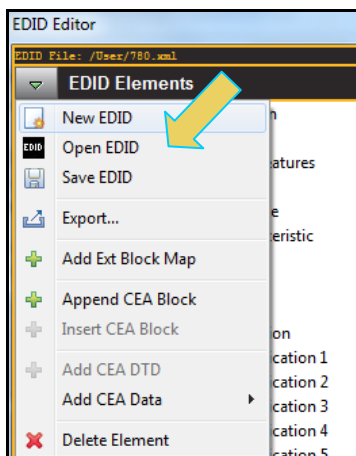
To open an EDID stored on your host PC:

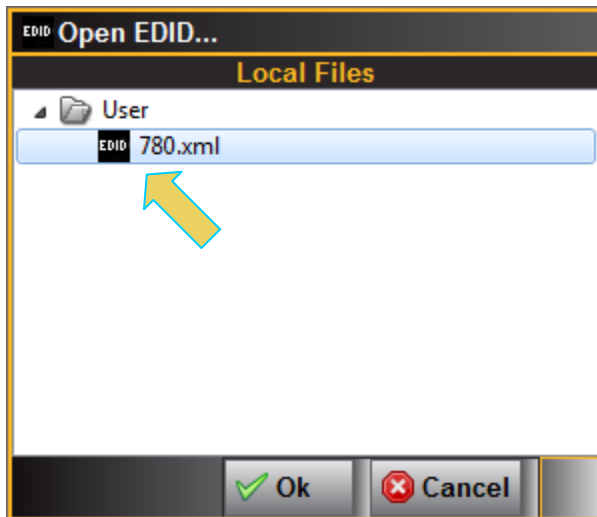
1. Open the EDID Editor from the **Editors** page on the **App** panel.

The EDID Editor opens without an EDID loaded as shown below.



2. Open up an EDID stored on the PC using the pull-down menu and selecting **Open EDID**.

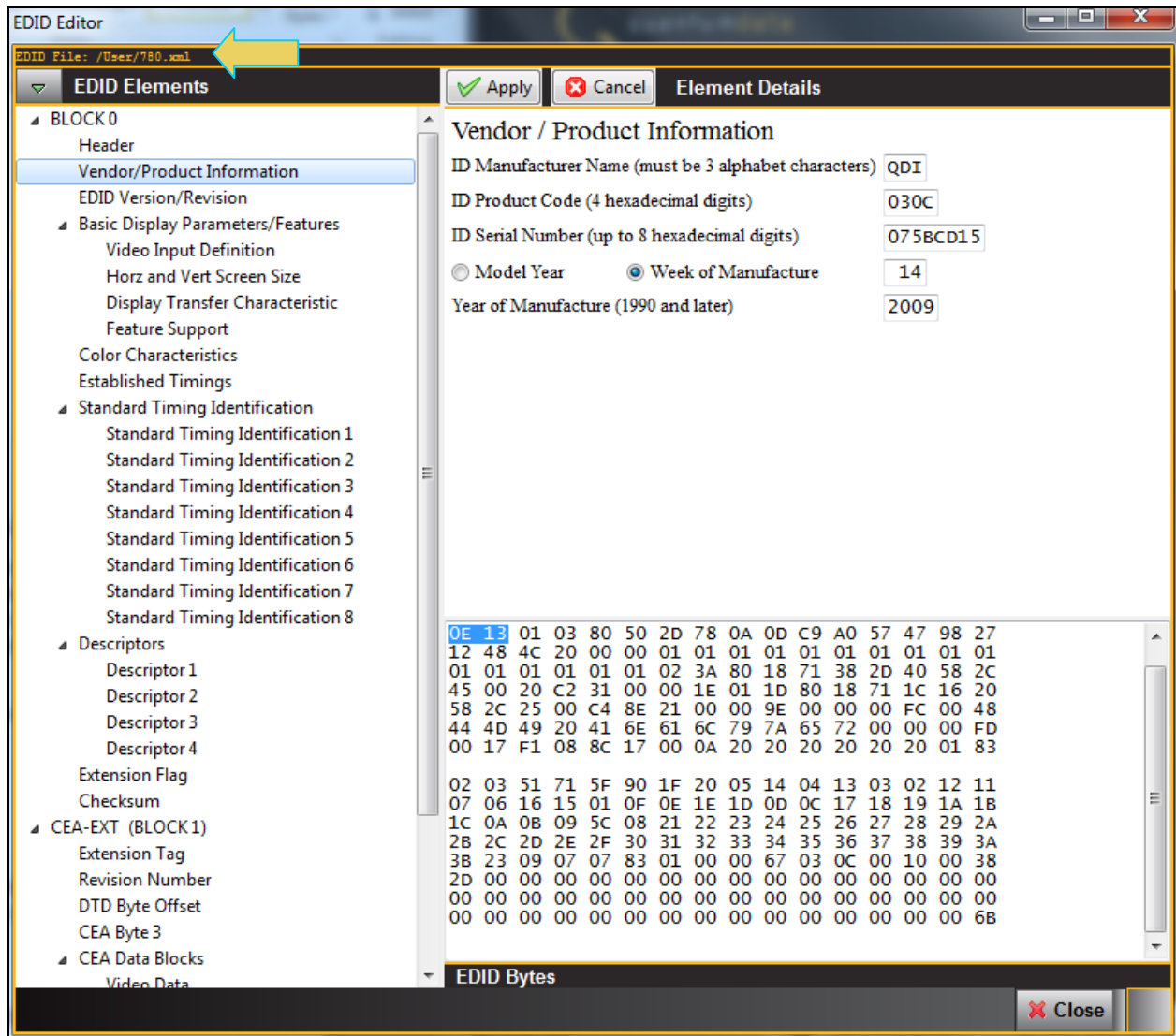




3. Select the EDID and click on the **OK** activation button. Click **Cancel** if you cannot find an appropriate EDID.

Note: You must have downloaded EDIDs or saved EDIDs into the EDID directory in order to see them in the EDID navigator tab shown above. You can use the Quantum Data [EDID Library](#) to obtain these EDIDs. The EDID Library which uses a naming convention for all its EDIDs; these are represented in the screen shot above. Also note that there is a [980 EDID Library Application Note](#) available on the EDID Library website which describes how to use the EDID Library with the 980 HDMI 2.0 Protocol Analyzer.

Once you load an EDID the name appears on the status strip on the top of the panel as shown below.

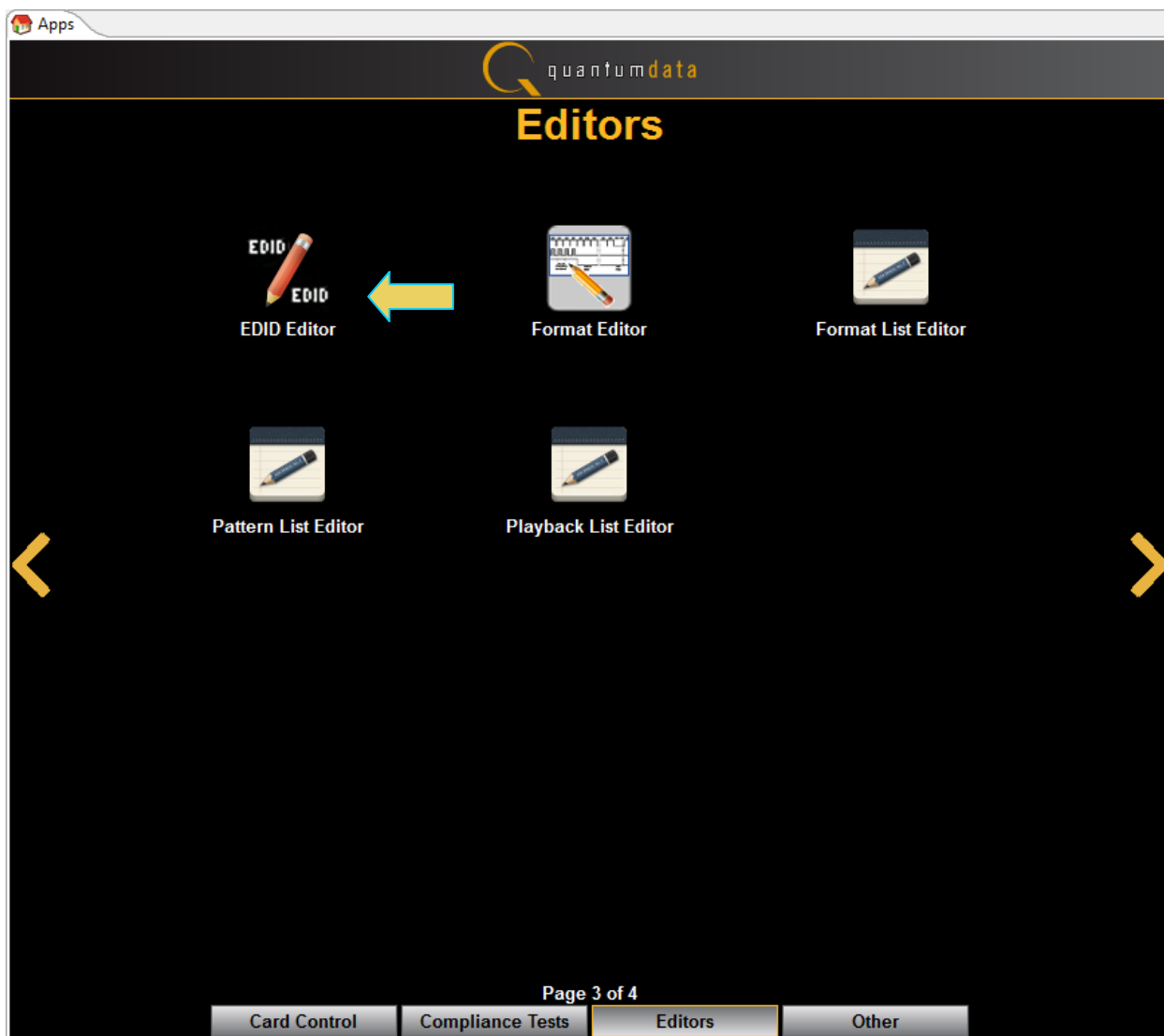


3.14 Loading an EDID into the EDID Editor

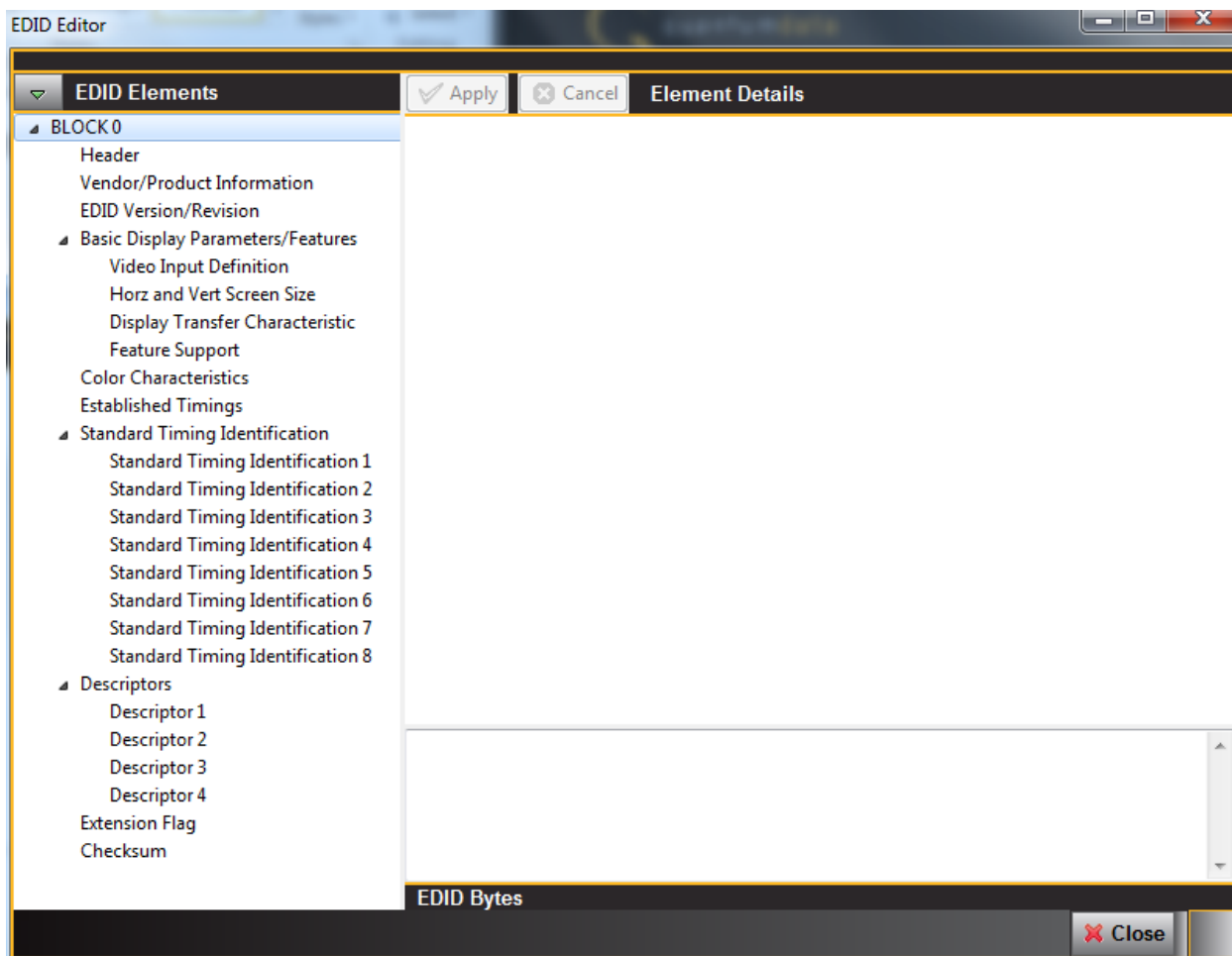
You can either load a new EDID or modify an existing EDID. In the latter case, you may have many EDIDs stored in the EDID directory of the external GUI Manager suite of directories. You can open any one of these EDIDs, modify it, and resave it under a different name.

To open up the EDID Editor:

1. Open the **EDID Editor** from the **Editors** page on the **App** panel. Click on the **EDID Editor** icon.

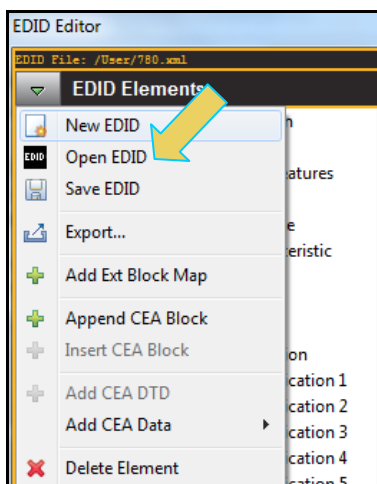


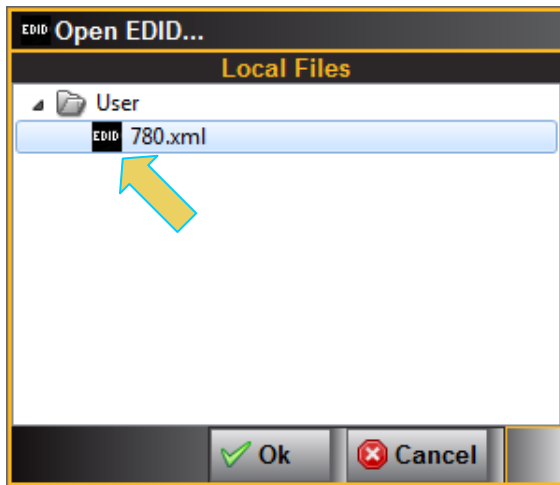
The EDID Editor opens up without and EDID loaded as shown below.



To open up an EDID stored on your PC.

1. Open up an EDID stored on the PC using the pull-down menu as shown below. Select **Open EDID**.

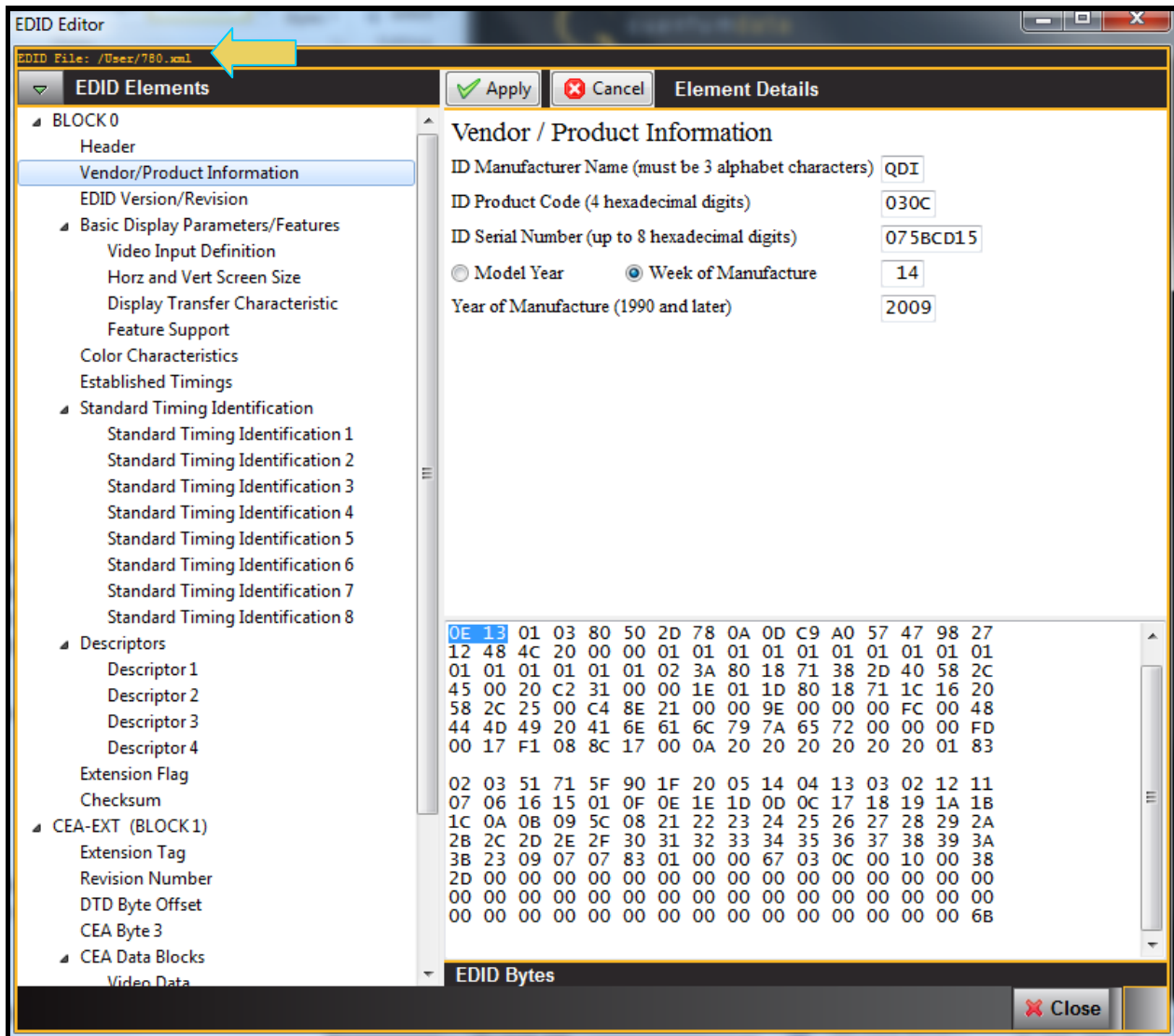




2. Select the EDID and click on the **OK** activation button. Click **Cancel** if you cannot find an appropriate EDID.

Note: You must have downloaded EDIDs or saved EDIDs into the EDID directory in order to see them in the EDID navigator tab shown above. You can use the Quantum Data [EDID Library](#) to obtain these EDIDs. The EDID Library which uses a naming convention for all its EDIDs; these are represented in the screen shot above. Also note that there is a [980 EDID Library Application Note](#) available on the EDID Library website which describes how to use the EDID Library with the 980 HDMI 2.0 Protocol Analyzer.

Once you load an EDID the name appears on the status strip on the top of the panel as shown below.



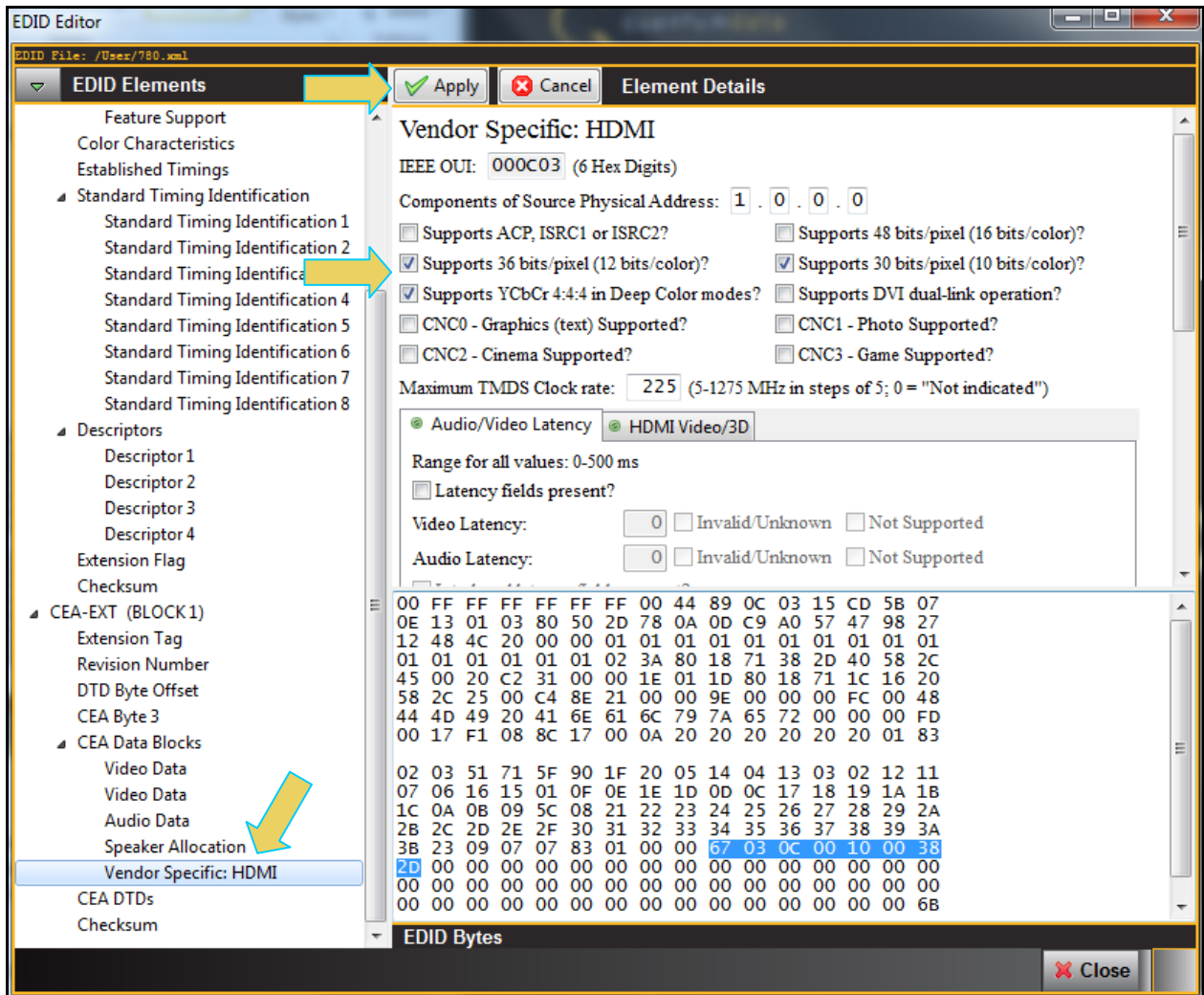
3.15 Making Modifications to an EDID with the EDID Editor

Once you have loaded an EDID you can make changes to individual field values, add data blocks, delete data blocks, add or delete timings or audio formats supported, etc. You can enable or disable parameters using radio buttons or check boxes and you can change values through pull-down menus or text field boxes.

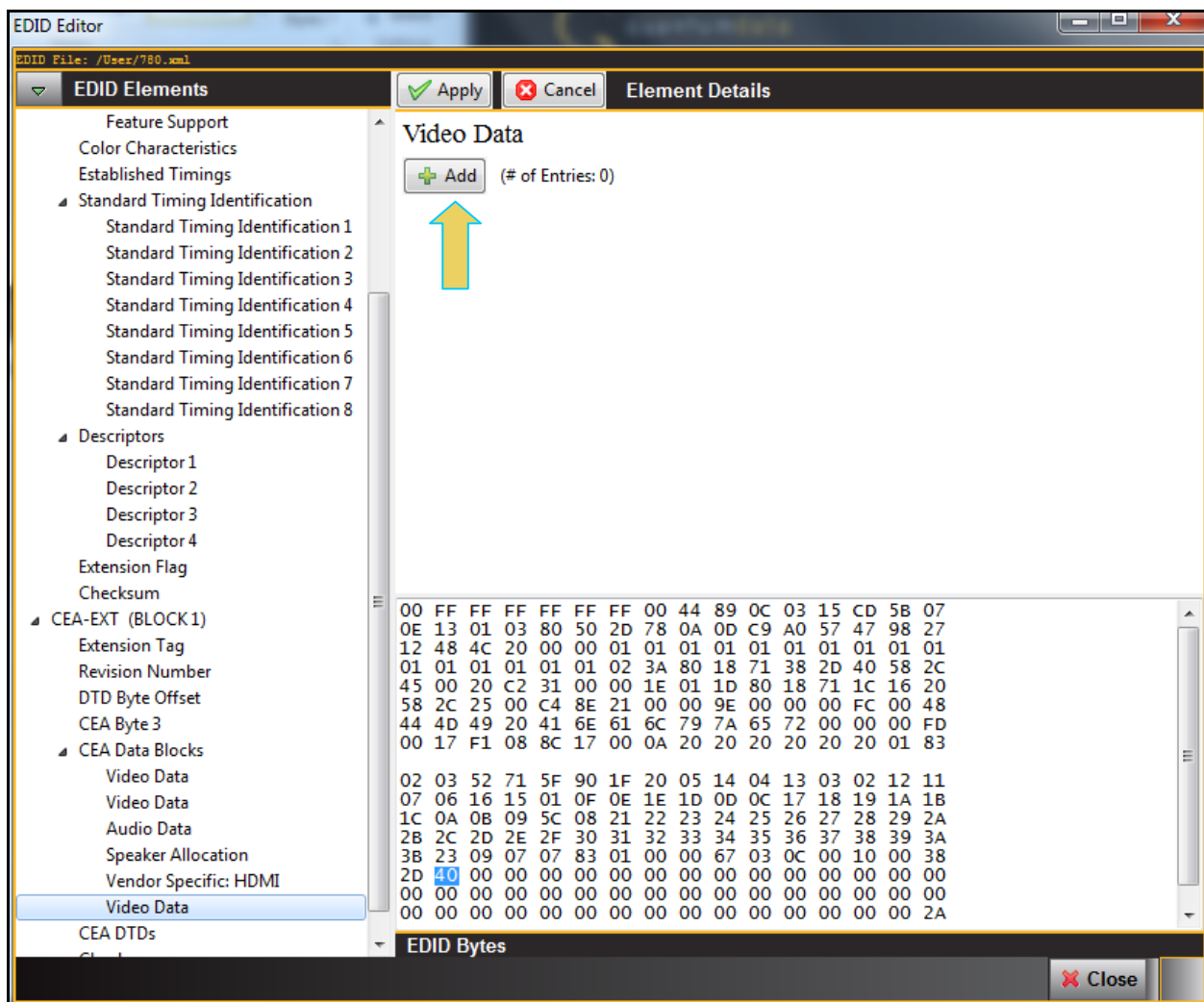
To make a change to an EDID loaded into the EDID Editor:

1. To make a change to an existing EDID on an existing data block, select that data block using the navigator panel **EDID Elements** on the left.

Use the check boxes or fields to make the change, then click on the **Apply** activation button to enable the change. The example below shows the Deep Color definition being changed in the Vendor Specific block.

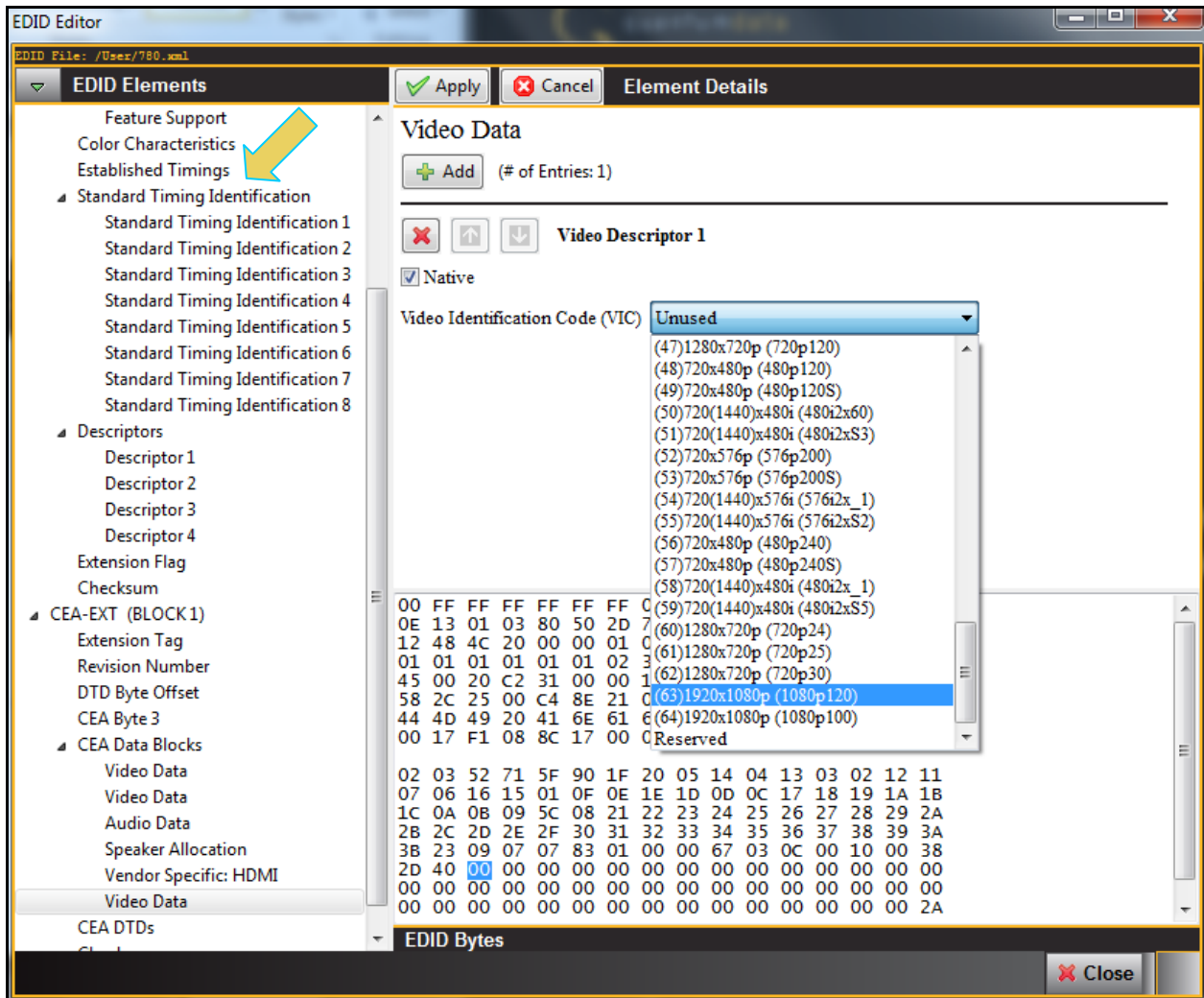



- To add a block into an EDID, use the right click menus or pull-down menus as shown below (adding a Video Data Block into the CEA Extension block):



4. Define the new data block in accordance with your specifications.

The example below shows a **Video Data** block's Native timing being defined.



The second example shows additional audio descriptor added to an **Audio Block**. The first screen example only a single audio descriptor, the second screen example shows selecting the audio format. To add a descriptor you click on the **Add**  activation button.

EDID Editor

EDID File: /User/780.xml

EDID Elements

- Feature Support
- Color Characteristics
- Established Timings
- Standard Timing Identification
 - Standard Timing Identification 1
 - Standard Timing Identification 2
 - Standard Timing Identification 3
 - Standard Timing Identification 4
 - Standard Timing Identification 5
 - Standard Timing Identification 6
 - Standard Timing Identification 7
 - Standard Timing Identification 8
- Descriptors
 - Descriptor 1
 - Descriptor 2
 - Descriptor 3
 - Descriptor 4
- Extension Flag
- Checksum
- CEA-EXT (BLOCK 1)
 - Extension Tag
 - Revision Number
 - DTD Byte Offset
 - CEA Byte 3
 - CEA Data Blocks
 - Video Data
 - Video Data
 - Audio Data
 - Speaker Allocation
 - Vendor Specific: HDMI
 - CEA DTDs
 - Checksum

Apply Cancel Element Details

Audio Data

+ Add (# of Entries: 1)

Short Audio Descriptor 1

Audio Format: PCM

Max Channels: 2

Sampling Rates (kHz): 32 44.1 48 88.2 96 176.4 192

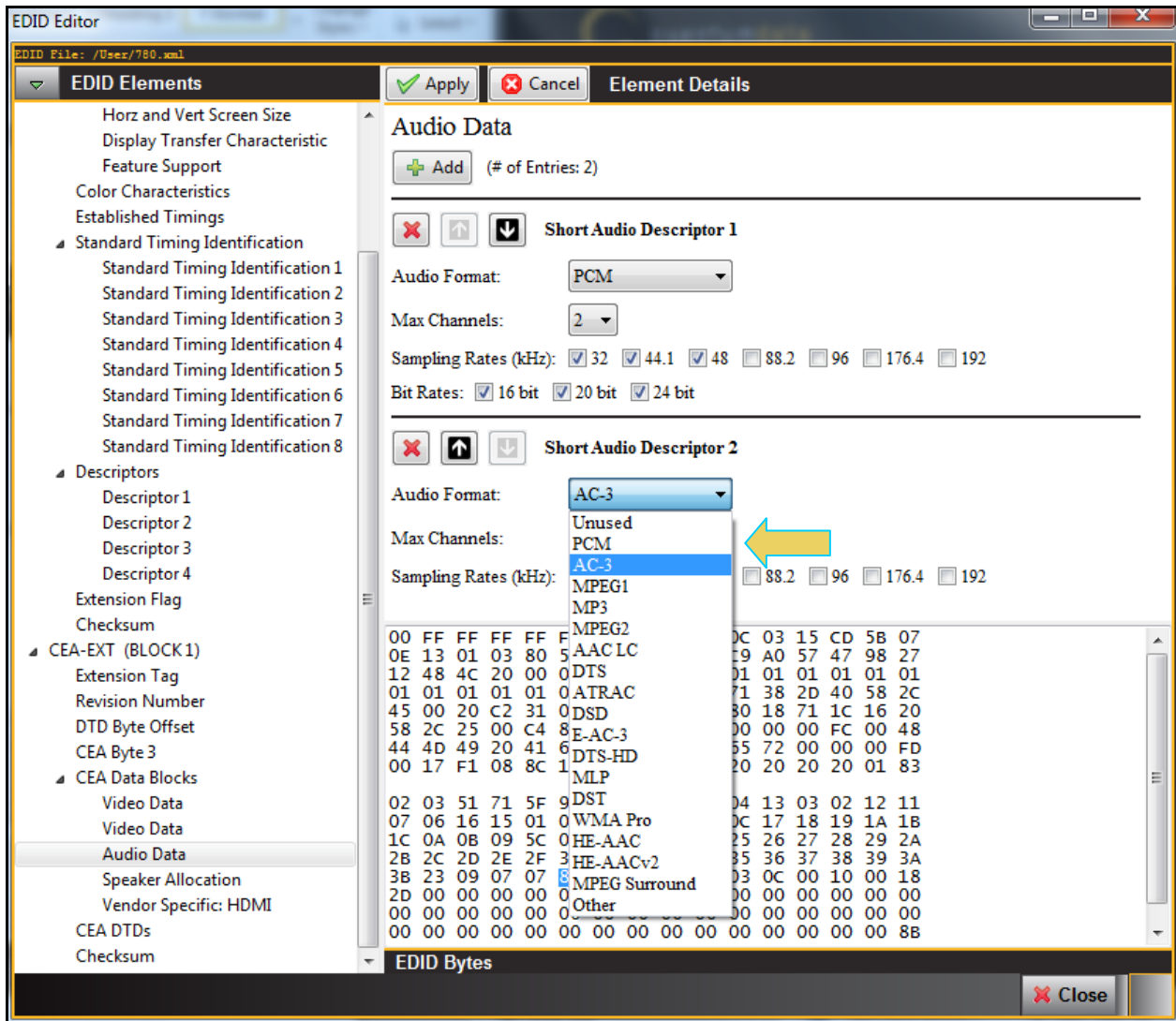
Bit Rates: 16 bit 20 bit 24 bit

```
00 FF FF FF FF FF FF 00 44 89 0C 03 15 CD 5B 07
0E 13 01 03 80 50 2D 78 0A 0D C9 A0 57 47 98 27
12 48 4C 20 00 00 01 01 01 01 01 01 01 01 01 01
01 01 01 01 01 01 02 3A 80 18 71 38 2D 40 58 2C
45 00 20 C2 31 00 00 1E 01 1D 80 18 71 1C 16 20
58 2C 25 00 C4 8E 21 00 00 9E 00 00 00 FC 00 48
44 4D 49 20 41 6E 61 6C 79 7A 65 72 00 00 00 FD
00 17 F1 08 8C 17 00 0A 20 20 20 20 20 01 83

02 03 51 71 5F 90 1F 20 05 14 04 13 03 02 12 11
07 06 16 15 01 0F 0E 1E 1D 0D 0C 17 18 19 1A 1B
1C 0A 0B 09 5C 08 21 22 23 24 25 26 27 28 29 2A
2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 3A
3B 23 09 07 07 83 01 00 00 67 03 0C 00 10 00 18
2D 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

EDID Bytes

Close



Click the **Apply**  button to save the change. Then click on Close to exit the **EDID Editor**.

5. Once you make a change on a particular EDID block you use the **Apply** button to invoke the change.
6. Use the following table as a guide to make other changes in the **EDID Editor**.

Item	Item - Column	Description
EDID Edit	Append CEA Block	Adds a CEA extension block to the existing VESA block.
	Append CEA DTD	Adds a CEA Detailed Timing Data block.
	Add CEA Speaker Allocation Data Block	Enables you to add a new Speaker Allocation Data Block to the CEA extension block.
	Add CEA Colorimetry Data Block	Enables you to add a new Colorimetry Data Block to the CEA extension block.
	Add CEA Video Capability	Enables you to add a new Video Data Block to the

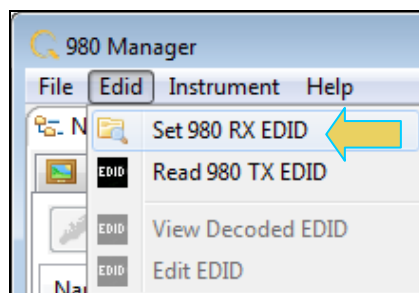
Item	Item - Column	Description
		CEA extension block.
	Add CEA Audio Data Block	Enables you to add a new Audio Data Block to the CEA extension block.
	Add CEA Video Data Block	Enables you to add a new Video Data Block to the CEA extension block.
	Add CEA Vendor Specific Data Block - General	Enables you to add a new Vendor Specific Data Block to the CEA extension block.
	Add CEA Vendor Specific Data Block - HDMI	Enables you to add HDMI information to new Vendor Specific Data Block to the CEA extension block.
	Insert CEA Vendor Specific Audio Data Block	Enables you to add a new Vendor Specific Audio Data Block to the CEA extension block.
	Add CEA Vendor Specific Video Data Block	Enables you to add a new Vendor Specific Video Data Block to the CEA extension block.
	Delete Element	Deletes a selected EDID element or block.

3.16 Emulating a Specific EDID

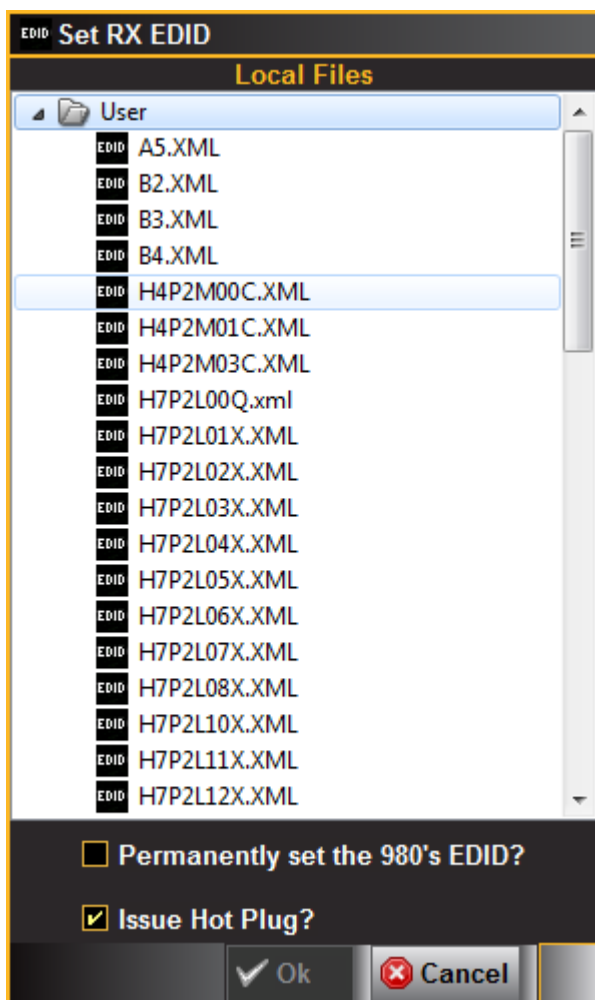
Once you have loaded an EDID and made your changes to it you can assign it to the 980 HDMI 2.0 Protocol Analyzer Rx port for emulation and testing your source device. This subsection describes how you can do that.

To assign an EDID to the Rx port:

1. Use the EDID pull-down menu and select **Set 980 Rx EDID**.



The dialog box shown below opens up.



2. Select an EDID to assign to the 980 HDMI Protocol Analyzer's Rx port. Click Ok after selecting the EDID.

Note that there are two checkbox options on the dialog box. The following is a description of each:

- Permanently set the 980 HDMI Protocol Analyzer's EDID – This means that the EDID that you provision will persist through a reboot of the 980. Otherwise the default 980 EDID will be reprovisioned when a reboot occurs.
- Issue Hot Plug – This means that the 980 HDMI 2.0 Protocol Analyzer will issue a hot plug when you click the OK activation button on this dialog box.

4 Real Time Mode

This chapter describes how to view the incoming HDMI video metadata in real time using the Real Time mode. **The Real Time mode is only available through the built-in front panel display. It is not supported through the external 980 GUI Manager.** The Real Time mode enables you can view the following data in real time:

- **Video** – View the incoming video even when encrypted with HDCP 2.2.
- **Infoframes** – View the AVI, Audio, Vendor Specific infoframes.
- **Data Islands** – View various other data islands such as General Control Packet and Source Product Descriptor.
- **Video Timing Data** – View the format, resolution, color depth, video type and specific pixel values.
- **DDC Data** – View the DDC transactions such as the EDID and HDCP 2.2 transactions.

4.1 Accessing the Real Time mode

The Real Time mode can be accessed from Page 1 of the App panel **Card Control** using the procedures below.

To access the Real Time mode:

1. Touch select the **HDMI RX-PA** icon on the page 1 of the **Apps** panel on the embedded 980 GUI Manager:

Note: The Real Time viewing windows are not available on the PC-based external GUI Manager.



The Receiver “Real Time” panel appears as shown below:



4.2 Real Time Mode Overview

This section describes the **Real Time** mode user interface.

4.2.1 Real Time Mode - Interface Description

This subsection describes the functions of the main interface of the **Real Time** mode. The **Real Time** mode interface is shown in the two example screens below. The first screen image shows the **Real Time** mode without any of the viewing windows open. This screen shows you the **Real Time** mode with only the main control panel on the right and the dashboard on the left and the incoming video image. The second screen example shows the **Real Time** mode with several data panels open. The table that follows describes the main control panel.



The screenshot displays the HDMI 2.0 Protocol Analyzer software interface. At the top, it shows the port (HDMI2-R10) and card (Quantum Data, Inc. HDMI 2.0 protocol analyzer). Key settings include Char Rate: 594.00, TMDS Clock Ratio: 1/40, Scrambling: enabled, and HDCP: disabled. The CEA VIC is 97, indicating 3840x2160p @ 60 Hz 16:9, 3840 x 2160 Progressive (24 bpp), RGB, Not Encrypted.

The main display area shows the AVI: 1 (3) 9514 infoframe. The AVI InfoFrame details are as follows:

- check sum: verified
- scan info: all active pixels & lines are displayed
- Bar Info: no Data
- active info: format valid
- RGB/YCC indicator: RGB
- active format: same as picture 8
- picture aspect ratio: 16:9
- colorimetry: no data
- non-uniform picture scale: not known
- quantization range: limited
- extended colorimetry: xvYCC601 Not used - Colorimetry (C) bits are not set to 3
- video format: VIC=97 (3840x2160p @ 59.94Hz/60Hz)
- IT content: no data
- IT content Type: graphics Not used - IT content bit (IT) bit is set to 0
- YCC quantization range: Limited range Not used - Y bit (Y) bit is set to 0
- pixel repetition: no data

Below the AVI infoframe, the line number of end of top bar, line number of start of bottom bar, pixel number of end of left bar, and pixel number of start of right bar are listed. Hexadecimal data for SP0, SP1, SP2, and SP3 is shown.

The Deep Color GCP: 0 (0) 26261 packet is displayed with the following details:

- General Control Packet (GCP)
- clear AVMUTE flag: 0
- set AVMUTE flag: 0
- color depth: color depth not indicated
- pixel packing phase: Phase not indicated

The VSI: 2 (2) 26261 Vendor-Specific InfoFrame is also shown:

- check sum: verified
- 24bit IEEE Registration ID: HDMI LLC OUI [0x000c03]
- HDMI Video Format: no additional HDMI video format is present

Hexadecimal data for SP0, SP1, SP2, and SP3 is provided for the VSI frame.

The interface includes a sidebar with navigation buttons: Home, Back, Nav., Stop, Video, AVI-IF, VS-IF, GCP, ACA, and Tools. A video preview window shows a child's face.

4.2.2 Dashboard Panel

This subsection describes the dashboard components on the top of the Real Time panel. Refer to the table below for a description of these components.

Real Time Mode – Dashboard Items			
PORT:HDMI2-R10 CARD:Quantum Data, Inc. HDMI 2.0 protocol analyzer			
Char Rate: 594.00	TMDS Clock Ratio: 1/40	Scrambling: enabled	HDCP: disabled
CEA VIC=97: 3840x2160p @ 60 Hz 16:9	3840 x 2160	Progressive	(24 bpp), RGB Not Encrypted

The following items are on the Real Time dashboard:

Top Row Items – Module and Port:

- **Port** –The Port area shows the current Rx port that is being displayed on the Real Time Mode **PORT:HDMI2-R10**. Currently the only analyzer port is the 980 HDMI Protocol Analyzer port.
- **Card** –The Card area shows the current module whose port is being displayed on the Real Time Mode **CARD:Quantum Data, Inc. HDMI 2.0 protocol analyzer**. Currently the only analyzer module (card) is the 980 HDMI Protocol Analyzer module.

Second Row Items - Mode:












- **Char Rate:** –The HDMI character rate **Char Rate: 594.00**.
- **TMDS Clock Ratio:** – The ratio of the TMDS clock rate to the TMDS bit rate **TMDS Clock Ratio: 1/40**.
- **Scrambling:** – Whether or not scrambling is enabled or not **Scrambling: enabled**.
- **HDCP** – Indicates whether HDCP is enabled or disabled **HDCP: disabled**.

Third Row Items - Mode:

- **Video Identification (format)** – The first item indicates the video identification code (if there is one) **CEA VIC=97: 3840x2160p @ 60 Hz 16:9**. This includes the active horizontal and vertical resolution, vertical frame rate and aspect ratio. If the incoming video is not determined to be a CEA format, there will be an indication of CEA VIC 0 and a note: “No Video Identification Code Available.”
- **Resolution** - The next item is the. In this example the active horizontal and vertical resolution is 3840 x 2160 **3840 x 2160**.
- **Scan.** The next item is the scan. In this example the field indicates Progressive **Progressive**. The other option is Interlaced.
- **Bit Depth and Video colorimetry.** The next item is the bit depth and video mode. In this example the field indicates YCbCr with 4:4:4 sampling and 24 bit color depth **(24 bpp), RGB**. The other options are: RGB, YCbCr 4:2:2 and deep color at either 30 or 36 bit color depth.
- **HDCP Status.** The next item is HDCP status which could either be Encrypted or Not Encrypted **Not Encrypted**.

4.2.3 Main Control Panel

This subsection describes the main control panel for the Real Time mode. Refer to the table below for a description of these controls.

Real Time Mode – Main Control Panel	Control Button Descriptions
<p>Main Control Panel (two views – Active / Inactive)</p>  <p>The screenshot shows a vertical stack of buttons. From top to bottom: Home (with a house icon), Back (with a left arrow), Nav. (with a magnifying glass), Stop (with a red circle and white text), Video (with a play icon and a dropdown arrow), AVI-IF (with a play icon and a dropdown arrow), VS-IF (with a play icon and a dropdown arrow), GCP (with a play icon and a dropdown arrow), ACA (with a play icon and a dropdown arrow), Tools (with a play icon and a dropdown arrow), and a version indicator '5.08.07' at the bottom.</p>	<p>The following controls are provided in the main control panel on the right edge of the Real Time mode interface. Each of the buttons have a pulldown menu associated with them. The purpose of each button and their basic control functions are described below:</p> <ul style="list-style-type: none"> ▪ Start/Stop –The Start / Stop button  /  is used to enable and disable the active collection of real time data. ▪ Video – The video button  and associated pulldown menu (not shown) is used to display the Video Info panel which provides timing, resolution and other basic information about the incoming video. ▪ Scale – The Scale button  and associated pulldown menu (not shown) enables you to control how the video image is displayed in the Real Time mode window. ▪ AVI-IF - The AVI-IF button  and associated pulldown menu (not shown) enables you to show or hide the AVI info panel and pause and resume updates to the panel. It also enables you to control which set of data serves as a “Reference Frame” of data that can be used for comparisons with subsequent frames collected. ▪ VS-IF - The VS-IF button  and associated pulldown menu (not shown) enables you to show or hide the Vendor Specific infoframe info panel and pause and resume updates to the panel. It also enables you to control which set of data serves as a “Reference Frame” of data that can be used for comparisons with subsequent frames collected. ▪ GCP - The GCP button  and associated pulldown menu (not shown) enables you to show or hide the General Control Packet panel and pause and resume updates to the panel. It also enables you to control which set of data serves as a “Reference Frame” of data that can be used for comparisons with subsequent frames collected. ▪ ACA - The ACA button  launches the Auxiliary Channel Analyzer (ACA) application for monitoring the DDC transactions. ▪ Back - The arrow button  enables you to toggle between the current view and the previous view. ▪ Tools - The Tools button  provides access to various tools such as Set EDID management, HP, 5 Volts, SCDC and HDCP management.

4.3 Real Time Mode Data Panels

This section describes the **Real Time** controls and data panels. The **Real Time** mode is only available through the embedded GUI. It is not available through the external 980 GUI Manager.

Note: Detailed procedures for operating the 980 HDMI 2.0 Protocol Analyzer through the built-in GUI are provided in the 980 Quick Start Guide.

4.3.1 Reference Frames Concept

The 980 HDMI 2.0 Protocol Analyzer Real Time feature uses the concept of “Reference Frames” which are sets of data values that you can compare with other collected frames of data of the same type. As you collect data in the **Real Time** mode, the feature will create a distinct view for each change in the source stream for that specific data type. For example, if you have opened up the AVI infoframe panel, a change in any data that is part of the infoframe, such as the video type (RGB, YCbCr), will result in a new distinct view of the data.

By default, the **Real Time** mode establishes the initial data set as the Reference Frame. The initial view is the view of data that occurs when you open up a panel or when you initiate a Clear operation. You can change the Reference Frame at any time using a pull-down menu. The data in all other views is compared against the data in the Reference Frame. Differences are highlighted in **gold** text.

```

AVI: 1 (3) 9514
AVI InfoFrame
check sum:                verified
scan info:                all active pixels & lines are displayed
Bar Info:                 no Data
active info:              format valid
RGB/YCC indicator:       RGB
active format:            same as picture 8
picture aspect ratio:    16:9
colorimetry:              no data
non-uniform picture scale: not known
quantization range:      limited
extended colorimetry:    xvYCC601 Not used - Colorimetry (C) bits are not set to 3
video format:             VIC=97 (3840x2160p @ 59.94Hz/60Hz)
IT content:               no data
IT content Type:         graphics Not used - IT content bit (IT) bit is set to 0
YCC quantization range:  limited range Not used - Y bit (Y) bit is set to 0
pixel repetition:        none
line number of end of top bar: 0
line number of start of bottom bar: 2161
pixel number of end of left bar: 0
pixel number of start of right bar: 3841
HB: 82 02 0d e4 |
SP0: 47 12 28 04 61 00 00 e2 |G.(.a...|
SP1: 00 71 08 00 00 01 0f 9a |.q.....|
SP2: 00 00 00 00 00 00 00 00 |.....|
SP3: 00 00 00 00 00 00 00 00 |.....|
#
  
```

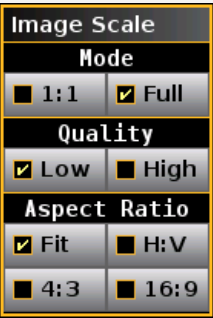
4.3.2 Zoom Feature

Because the **Real Time** mode can only be viewed in the embedded 980 GUI where screen real estate is limited, the interface has a zoom feature for setting the viewing size of each dialog box. The zoom feature enables you to set the viewing size of a data panel to any of three settings: 1) Small, 2) Medium, and 3) Large. The zoom dialog box is accessible from the upper right corner of each panel. Simply touch select the desired checkbox. The following image depicts a typical zoom dialog box.



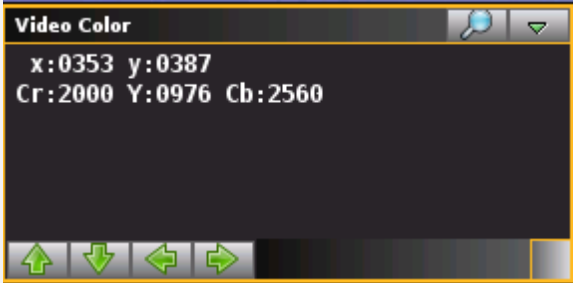




4.3.3 Image Scale Dialog Box

The incoming video content, whether it be full motion video or a basic test pattern, is shown in the window (refer to the screen examples above). You can control the way the incoming video is displayed using the **Video** pop-out dialog box on the right side control panel. When you select the **Scale** button of this pop-out menu, the Image Scale dialog box appears. The control features of the Image Scale dialog box are described in the following table.

Real Time Mode – Image Scale	Controls
<p>Image Scale dialog box</p>  <p>The screenshot shows the 'Image Scale' dialog box with the following settings: Mode is set to 'Full' (checked), Quality is set to 'Low' (checked), and Aspect Ratio is set to 'Fit' (checked). Other options include '1:1' for Mode, 'High' for Quality, and 'H:V', '4:3', and '16:9' for Aspect Ratio.</p>	<p>The following controls are provided in the Image Scale dialog box. These controls determine how the incoming video is displayed in the Real Time main window.</p> <ul style="list-style-type: none"> ▪ Mode – The Mode can be either 1:1 or Full. Use the checkbox adjacent to each item to select. The 1:1 selection will show the image in its true size; because the Real Time window on the built-in front panel display does not support higher resolutions, much of the content will not be viewable in the window when 1:1 is selected. The Full mode enables you to view the entire image. When Full is selected you can also select which Aspect Ratio setting to use. ▪ Quality – The Quality setting determines the frame rate used to show the incoming video. Selecting Low reduces the frame rate. The High selection will display the video in its native frame rate. ▪ Aspect Ratio – The Aspect Ratio options can be set only if the Mode is set to Full. The Fit option will cause the image to be scaled such that it occupies the entire window. The H:V option will display the image at its native aspect ratio with letter boxing used to fill in the blank area. The 4:3 option will cause the image to scale to a 4:3 aspect ratio. The 16:9 option will cause the image to be scaled to 16:9.

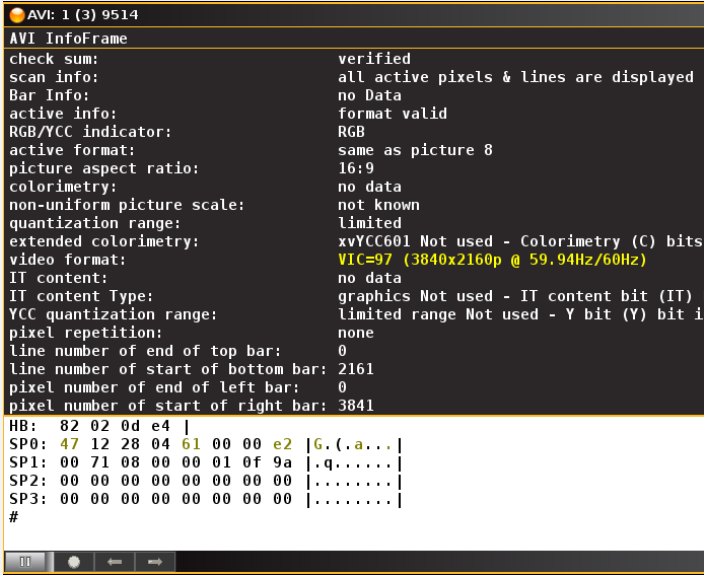
4.3.4 Video Info Panel


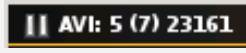
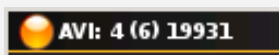






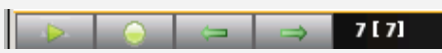









The **Video Color** panel (shown below) enables you to view the pixel values of the incoming video content. The table below describes the information in this panel.

Real Time Mode – Video Color	Information
<p>Video Color panel</p>  <p>The screenshot shows a window titled "Video Color" with a dark background. It displays the following text: "x:0353 y:0387" and "Cr:2000 Y:0976 Cb:2560". Below the text is a horizontal bar with four green arrows pointing up, down, left, and right, used for navigating between pixels.</p>	<p>The following information is provided in the Video Timing dialog box:</p> <ul style="list-style-type: none"> Pixel and pixel values – The pixel x/y coordinates and the color values for any selected pixel are shown in their format RGB or YCbCr. <p>There are a series of arrows on the bottom of the Video Info dialog box. These arrows are described below:</p> <ul style="list-style-type: none"> Up Arrow – The up arrow  enables you to move up to an adjacent pixel to view its color components. Down Arrow – The down arrow  enables you to move down to an adjacent pixel to view its color components. Left Arrow – The left arrow  enables you to move left to an adjacent pixel to view its color components. Right Arrow – The right arrow  enables you to move right to an adjacent pixel to view its color components.

4.3.5 AVI Infoframe Panel

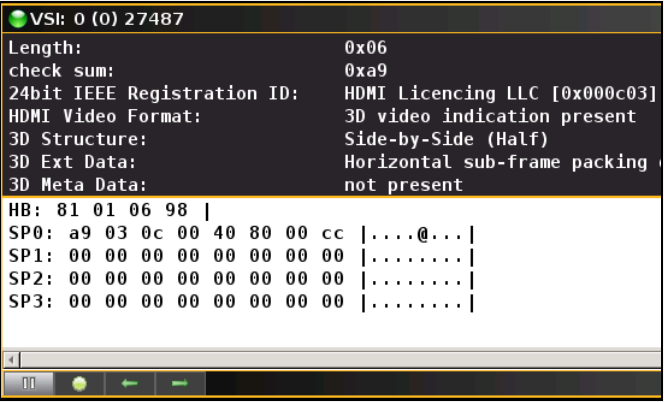
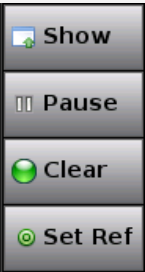
The **AVI-IF** button to open up the **AVI** panel (shown below). The AVI panel enables you to view the AVI infoframe data. There is a control pull down menu associated with the AVI Info panel. The control menu can be accessed either from the panel itself (the pull down tab on the upper right corner) or from the AVI-IF button on the main control panel on the right side of the **Real Time** window. The table below describes the information in the AVI Info panel and the associated control menu.










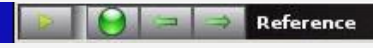







Real Time – AVI Infoframe	Information / Function
<p>AVI Infoframe</p>  <pre> AVI: 1 (3) 9514 AVI InfoFrame check sum: verified scan info: all active pixels & lines are displayed Bar Info: no Data active info: format valid RGB/YCC indicator: RGB active format: same as picture 8 picture aspect ratio: 16:9 colorimetry: no data non-uniform picture scale: not known quantization range: limited extended colorimetry: xvYCC601 Not used - Colorimetry (C) bits video format: VIC=97 (3840x2160p @ 59.94Hz/60Hz) IT content: no data IT content Type: graphics Not used - IT content bit (IT) YCC quantization range: limited range Not used - Y bit (Y) bit i pixel repetition: none line number of end of top bar: 0 line number of start of bottom bar: 2161 pixel number of end of left bar: 0 pixel number of start of right bar: 3841 HB: 82 02 0d e4 SP0: 47 12 28 04 61 00 00 e2 G.(.a... SP1: 00 71 08 00 00 01 0f 9a .q..... SP2: 00 00 00 00 00 00 00 00 SP3: 00 00 00 00 00 00 00 00 # </pre>	<p>The following information is provided in the AVI Infoframe dialog box:</p> <ul style="list-style-type: none"> ▪ Checksum – Calculation of a checksum to ensure integrity of the data. ▪ Scan Info – Indicates whether there is any underscan or overscanning applied to the video. ▪ Active info – Indicates whether the Active Format Descriptor is information is valid. ▪ RGB/YCC indicator – Indicates whether the incoming video is in the RGB mode or the YCC mode and what sampling mode is used with YCC (YCbCr 4:4:4 or 4:2:2) ▪ Active format – Active format aspect ratio. ▪ Picture aspect ratio – The aspect ratio of the video format transmitted. ▪ Colorimetry – The colorimetry standard used; typically ITU-601 or ITU-709. ▪ Non-uniform scaling – Indicates if the picture has been scaled vertically and/or horizontally. ▪ Quantization range – Indicates the range of values for defining the data is limited or full. ▪ IT content – Indicates when the picture content is composed in accordance with common IT practices. ▪ Video format – The CEA video identification code (VIC) and the resolution and frame rate. ▪ Pixel repetition – Indicates to the DTV how many of each unique pixels are transmitted. ▪ Line number of end of top bar. ▪ Line number of start of bottom bar. ▪ Pixel number of end of left bar. ▪ Pixel number of start of right bar.

Real Time – AVI Inframe	Information / Function
<p>AVI Pull-down Menu</p> 	<p>There is a pull-down menu associated with the AVI Info panel. You can access either from the main control panel or from the AVI panel via the icon on the upper right of the panel. The AVI pull-down menu provides the following functions:</p> <ul style="list-style-type: none"> ▪ Show/Hide – Enable or disable the appearance of the AVI infoframe panel in the Real Time window. ▪ Pause/Start – Halt the updates of the data to the AVI panel or Start collection. ▪ Clear – Clear the currently displayed reference frame. ▪ Set Ref – Set a new reference frame.
<p>Upper Status Bar</p> <p>Pause mode</p>  <p>Resume (active) mode</p> 	<p>The upper status bar shows the following information from left to right:</p> <ul style="list-style-type: none"> ▪   The pause/resume (active) status. ▪  The type of data panel (e.g. AVI). ▪  The number of changes defined since you set the reference frame. ▪  The number of distinct data views in parentheses. ▪  The total number of frames captured since the panel was opened or since the last clear.
<p>Lower Control Panel</p> <p>Pause mode</p>  <p>Pause mode after going to the reference frame</p>  <p>Resume (active) mode</p> 	<p>The lower control panel enables you to control and view the following:</p> <ul style="list-style-type: none"> ▪   Set the pause/resume (active) status. ▪  Go to the Reference Frame (must be in paused mode). ▪   Navigate left or right through the distinct data views (must be in pause mode). ▪  The data view currently displayed. This field shows “Reference” if you are at the reference frame. ▪  The number of distinct data views.

4.3.6 VS-IF Infoframe Panel

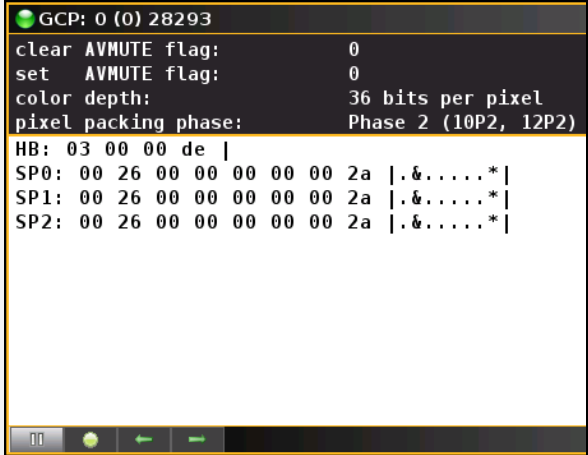



The **VS-IF** button opens up the **VS-IF** panel (shown below). The **VS-IF** panel enables you to view the Vendor Specific infoframe data. There is a control pull down menu associated with the **VS-IF** panel. The control menu can be accessed either from the panel itself (the pull down tab on the upper right corner) or from the **VS-IF** button on the main control panel on the right side of the **Real Time** window. The table below describes the information in the AVI Info panel and the associated control menu.



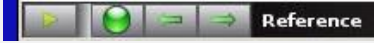






Real Time – VS-IF	Information / Function
<p>Vendor Specific Infoframe</p>  <pre> VSI: 0 (0) 27487 Length: 0x06 check sum: 0xa9 24bit IEEE Registration ID: HDMI Licencing LLC [0x000c03] HDMI Video Format: 3D video indication present 3D Structure: Side-by-Side (Half) 3D Ext Data: Horizontal sub-frame packing 3D Meta Data: not present HB: 81 01 06 98 SP0: a9 03 0c 00 40 80 00 cc @... SP1: 00 00 00 00 00 00 00 00 SP2: 00 00 00 00 00 00 00 00 SP3: 00 00 00 00 00 00 00 00 </pre>	<p>The following information is provided in the Vendor Specific Infoframe dialog box:</p> <ul style="list-style-type: none"> ▪ Length – The length in hex of the Vendor Specific infoframe. ▪ Checksum – A checksum to verify the integrity of the infoframe. ▪ Registration ID – IEEE Registration ID ▪ HDMI Video Format – Provides additional information such as 4K by 2K or 3D format structure. ▪ 3D Structure – This is the 3D format structure used. This could be one of: Frame Packing, Field Alternative, Line Alternative, Side-by-Side (Full), L + depth, L + depth + Graphics-Depth, Side-by-Side (half) ▪ 3D Extra Data – Applies when the 3D structure is Side-by-Side (half). Indicates the horizontal sub-sampling and Quincunx matrix. ▪ 3D Meta Data – Indicates whether 3D metadata is present or not.
<p>VS-IF Pull-down Menu</p> 	<p>There is a pull-down menu associated with the VS-IF Info panel. You can access either from the main control panel or from the VS-IF panel via the icon on the upper right of the panel. The AV-IF pull-down menu provides the following functions:</p> <ul style="list-style-type: none"> ▪ Show/Hide – Enable or disable the appearance of the VS-IF infoframe panel in the Real Time window. ▪ Pause – Halt the updates of the data to the VS IF panel. ▪ Clear – Clear the currently displayed reference frame. ▪ Set Ref – Set a new reference frame.

Real Time – VS-IF	Information / Function
<p>Upper Status Bar</p> <p>Pause mode</p>  <p>Resume (active) mode</p> 	<p>The upper status bar shows the following information from left to right:</p> <ul style="list-style-type: none">   The pause/resume (active) status.  The type of data panel (e.g. VS-IF).  The number of changes defined since you set the reference frame.  The number of distinct data views in parentheses.  The total number of frames captured since the panel was opened or since the last clear.
<p>Lower Control Panel</p> <p>Pause mode</p>  <p>Pause mode after going to the reference frame</p>  <p>Resume (active) mode</p> 	<p>The lower control panel enables you to control and view the following:</p> <ul style="list-style-type: none">   Set the pause/resume (active) status.  Go to the Reference Frame (must be in paused mode).  Navigate left or right through the distinct data views (must be in paused mode).  The data view currently displayed.  The number of distinct data views.

4.3.7 General Control Packet Data Panel

The **GCP** (General Control Packet) button opens up the **GCP** panel (shown below). The **GCP** panel enables you to view the General Control Packet data. There is a control pull down menu associated with the **GCP** panel. The control menu can be accessed either from the panel itself (the pull down tab on the upper right corner) or from the **GCP** button on the main control panel on the right side of the **Real Time** window. The table below describes the information in the GCP Info panel and the associated control menu.

Real Time – General Control Packet	Information / Function
<p>General Control Packet</p>  <pre> GCP: 0 (0) 28293 clear AVMUTE flag: 0 set AVMUTE flag: 0 color depth: 36 bits per pixel pixel packing phase: Phase 2 (10P2, 12P2) HB: 03 00 00 de SP0: 00 26 00 00 00 00 00 2a .&.....* SP1: 00 26 00 00 00 00 00 2a .&.....* SP2: 00 26 00 00 00 00 00 2a .&.....* </pre>	<p>The following information is provided in the General Control Packet data island dialog box:</p> <ul style="list-style-type: none"> AVmute flag (clear/set) – Identifies whether the AVmute is set or cleared. Color depth – Indicates the color depth in bits per pixel Pixel packing phase – Indicates the pixel packing phase of the last pixel character sent prior to the GCP when the source is transmitting deep color.
<p>GCP Pull-down Menu</p> 	<p>There is a pull-down menu associated with the GCP Info panel. You can access either from the main control panel or from the GCP panel via the icon on the upper right of the panel. The GCP pull-down menu provides the following functions:</p> <ul style="list-style-type: none"> Show/Hide – Enable or disable the appearance of the GCP panel in the Real Time window. Pause – Halt the updates of the data to the GCP panel. Clear – Clear the currently displayed reference frame. Set Ref – Set a new reference frame.
<p>Upper Status Bar</p> <p>Resume (active) mode</p>  <p>Pause mode</p> 	<p>The upper status bar shows the following information from left to right:</p> <ul style="list-style-type: none"> The pause/resume (active) status. Deep Color GCP: The type of data panel (e.g. GCP). 1 The number of changes defined since you set the reference frame. (1) The number of distinct data views in parentheses.

Real Time – General Control Packet	Information / Function
	<ul style="list-style-type: none">  The total number of frames captured since the panel was opened or since the last clear.
<p>Lower Control Panel</p> <p>Pause mode</p>  <p>Pause mode after going to the reference frame</p>  <p>Resume (active) mode</p> 	<p>The lower control panel enables you to control and view the following:</p> <ul style="list-style-type: none">  Set the pause/resume (active) status.  Go to the Reference Frame (must be in paused mode).  Navigate left or right through the distinct data views (must be in paused mode).  The data view currently displayed.  The number of distinct data views.

5 Analyzing HDMI Data with your 980 HDMI 2.0 Protocol Analyzer

This chapter describes how to use the 980 HDMI 2.0 Protocol Analyzer module to view HDMI protocol data from the HDMI source device under test.

5.1 Overview

These procedures assume that you have powered up the 980 system, connected your HDMI 2.0 source device, connected the Ethernet cable and established an IP connection from the 980 GUI Manager running on your PC to the 980 system that the HDMI 2.0 Protocol Analyzer module resides in. You should now have the 980 GUI Manager open on your PC.

5.2 Operational workflow for capturing data with your 980 HDMI 2.0 Protocol Analyzer module

This subsection describes how to use the 980 HDMI 2.0 Protocol Analyzer module to capture and analyze HDMI source devices. Testing an HDMI 2.0 source device involves the following high level steps:

1. Configure the 980 HDMI 2.0 Protocol Analyzer module in the proper mode HDMI.
3. Set the +5V threshold level
4. Configure the 980 HDMI 2.0 Protocol Analyzer module's Rx port with the proper EDID.
6. Specify a trigger method.
7. Specify the data that you want to capture and how much data you want to capture.
8. Initiate the capturing of the data.
9. Examine the test data through the 980 GUI Manager at the high level view on the **Event Plot** panel or the **Video Analysis** panel.
10. Drill down to examine the data at the lower level through the details of the **Data Decode** panel view.
11. Use the analysis tools (Video Analysis, Timing Analysis, Audio Analysis) to examine the data.
12. (Optional) If you have purchased the HDMI 2.0 source compliance test option packages you can run these test suites as well.

5.4 Setting the +5V current load levels

The 980 enables you to view the +5V levels from the source device under test and to set the current load on the +5V lead.

1. Select the **RX 5 Volts...** item from the **Tools** pop-out menu on the built-in front panel as shown below.



2. Select Control/Config as shown above.
The RX Settings dialog box is displayed.
3. Select the 5V tab as shown below.



The RX Settings dialog box is displayed. Adjust to meet your specifications.

4. Select the current Load using the lower slider provided. Increasing the current load will cause the detected voltage to fall. Be sure to select the **Apply** button. Then hit **Refresh** to view the new value.

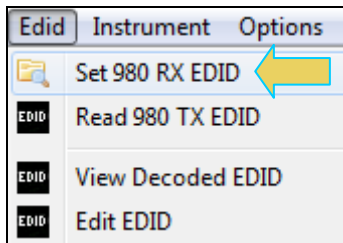
5.5 Configuring the 980 HDMI 2.0 Protocol Analyzer module with an EDID

Use the procedures below to provision the 980 HDMI 2.0 Protocol Analyzer module's Rx port with an EDID to emulate a sink device.

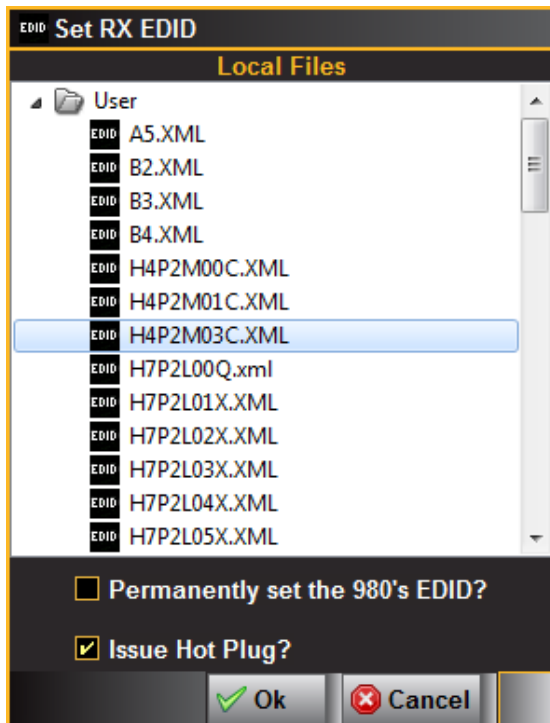
To provision the EDID:

- (optional) Load the EDID to use in the 980 HDMI 2.0 Protocol Analyzer module. This is the EDID that the 980 HDMI 2.0 Protocol Analyzer module will be emulating.

The default EDID in the 980 HDMI 2.0 Protocol Analyzer module has a preferred timing of 1080p60 with a maximum TMDS rate of 165MHz. You can provision the 980 HDMI 2.0 Protocol Analyzer module with a different EDID. Sample EDIDs are available from the Quantum Data website on the downloads page (<http://www.quantumdata.com/support/980readme.asp#edid>). You can download these EDIDs to the host PC where the 980 GUI Manager is running. Select an EDID file by activating the **Set 980 Rx EDID** (shown on the screen below).



The dialog box shown below opens up.



If you wish to use a different EDID from an HDTV that you have available you can quickly provision the 980 HDMI 2.0 Protocol Analyzer module with that EDID.

Note you can also set the EDID from the Tools menu of the Real Time mode window as shown below.





2. Select an EDID to assign to the 980 HDMI 2.0 Protocol Analyzer's module's Rx port. Click Ok after selecting the EDID.

Note that there are two checkbox options on the dialog box. The following is a description of each:

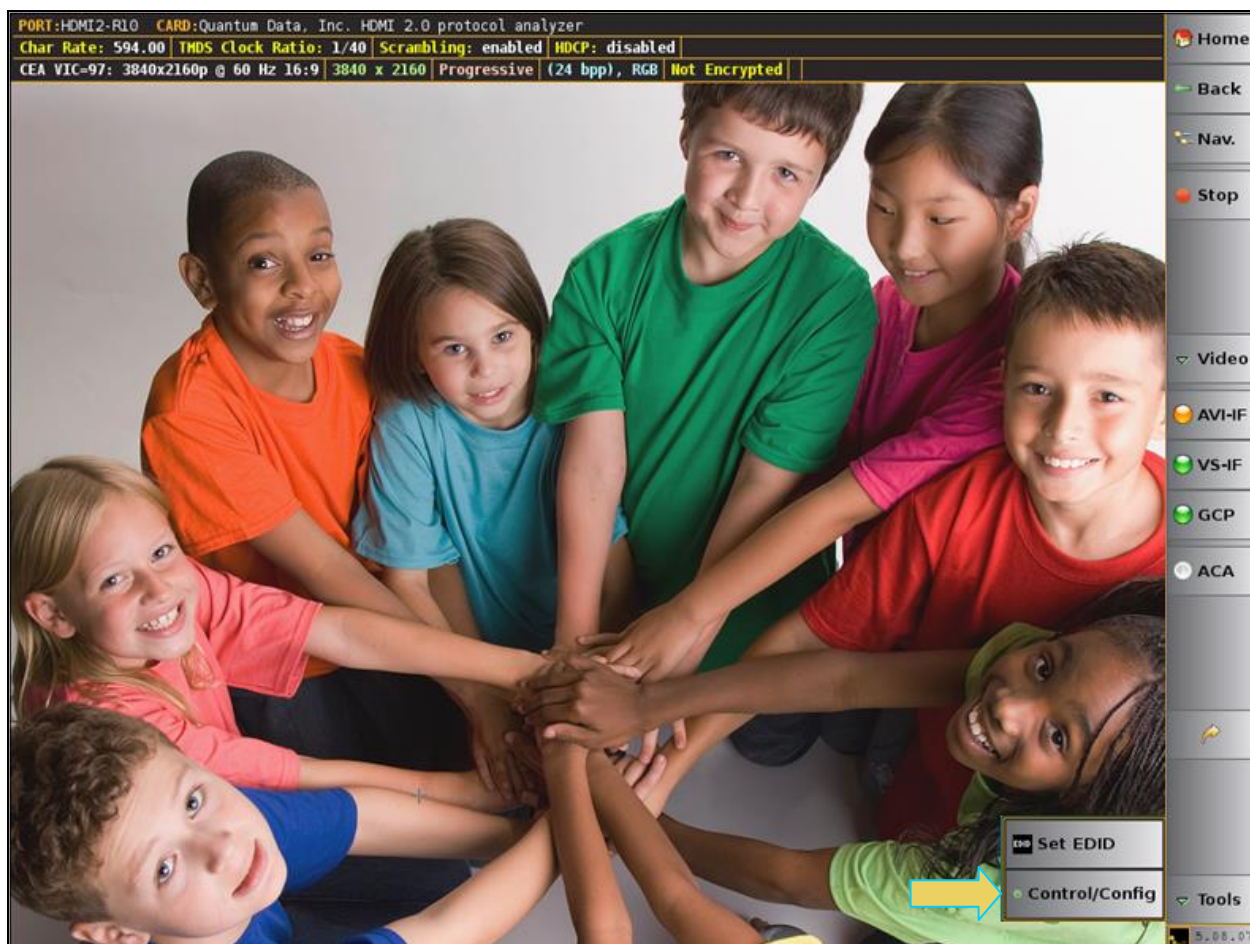
- Permanently set the 980 HDMI 2.0 Protocol Analyzer's EDID – This means that the EDID that you provision will persist through a reboot of the 980. Otherwise the default 980 EDID will be reprovisioned when a reboot occurs.
 - Issue Hot Plug – This means that the 980 HDMI 2.0 Protocol Analyzer module will issue a hot plug when you click the OK activation button on this dialog box.
3. (optional) Set the Hot Plug duration and generate a hot plug as shown on the screen below.



5.7 Setting the HDCP 2.2 mode

The 980 enables you to enable and disable HDCP on the Rx sink emulation port. This enables you to test how your source device under test responds to a sink that does not support HDCP. Use the following procedures to set the HDCP mode and registers.

1. Select the Rx HDCP Settings... item from the Instrument pull-down menu on the built-in front panel as shown below.



The RX HDCP 2.2 Settings dialog box appears as shown below.



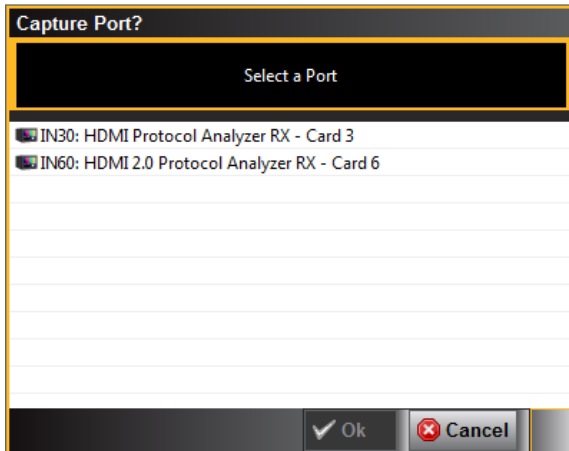
2. Select the **RX Control and Configuration** dialog box using the check boxes.
 - **Enabled** – In the Enabled mode, the 980 HDMI 2.0 Protocol Analyzer sink emulator will respond to HDCP 2.2 authentication request from a source device under test.
 - **Disabled** – In the Disabled mode, the 980 HDMI 2.0 Protocol Analyzer sink emulator will not respond to HDCP 2.2 authentication from a source device under test.
 - **Repeater** – This check box enables you to indicate whether the 980 HDMI 2.0 Protocol Analyzer module emulates an HDCP 2.2 repeater device.
 - **Depth** – This indicates the depth count if the 980 HDMI 2.0 Protocol Analyzer module is emulating an HDCP 2.2 repeater device.
 - **Device Count** – This indicates the Device count if the 980 HDMI 2.0 Protocol Analyzer module is emulating an HDCP 2.2 repeater device.
 - **Refresh** – This activation button refreshes the HDCP 2.2 status area of the dialog box.

5.8 Initiating a Capture

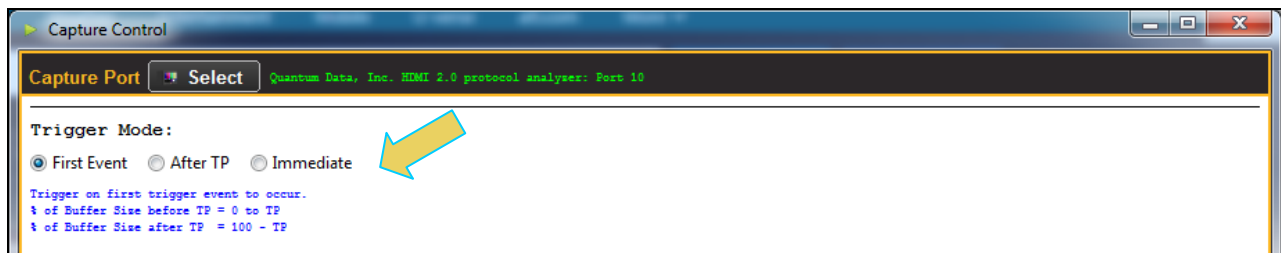
With the manual capture, you can monitor the downstream HDMI sink device for particular behavior or symptom to a problem and then initiate a capture when the particular condition exhibits itself. This ensures that the relevant data—data related to interoperability—is captured.

Use the procedures below to initiate a new capture.

Note: If you have both the HDMI 1.4 and the HDMI 2.0 Protocol Analyzer modules in the 980 test system, you will be prompted with the following dialog box to select which analyzer.



1. Set the Video Trigger mode using the information described below:

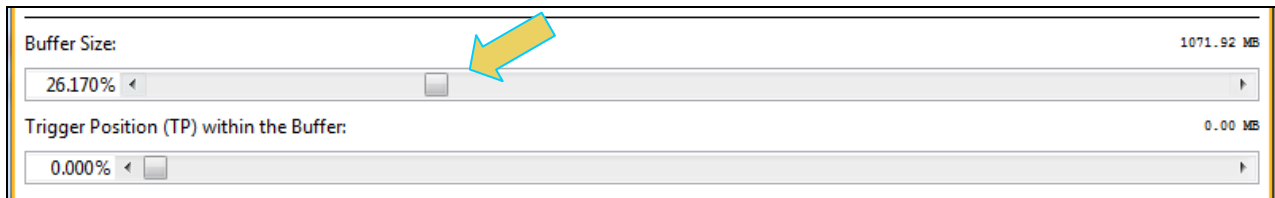


First Event – The trigger occurs on the first event—first occurrence—of the trigger condition defined in the Trigger Type pull-down menu (Vsync, encryption Enabled, Encryption Disabled, External Trigger, Manual Trigger, TMDS Clock Change). Depending on the setting of the Trigger Position slide bar, you may have some of the captured data in the buffer that accumulated prior to the trigger condition and some of the captured data in the buffer that accumulated after the trigger condition. At the left most position there will be no data in the capture buffer that occurred prior to the trigger event. At the right most position, all the data in the capture buffer will be data that accumulated prior to the trigger event. Because the trigger condition could be met quite quickly, the capture buffer may not be filled to the amount specified in Buffer Size.

After TP (Trigger Position) – In this setting the trigger condition specified in the Trigger Type pull-down menu will be ignored until data has accumulated in the capture buffer up to the point where the Trigger Position slide-bar is set. Once the data has accumulated to the setting of the Trigger Position, any event matching the Trigger Type specified will cause a trigger condition and data accumulation will begin. Some of the data in the capture buffer will be data that has accumulated prior to the trigger condition being met and some of the data in the capture buffer will be data that has accumulated after the trigger condition was met. This setting will ensure that the capture buffer is filled to the Buffer Size setting.

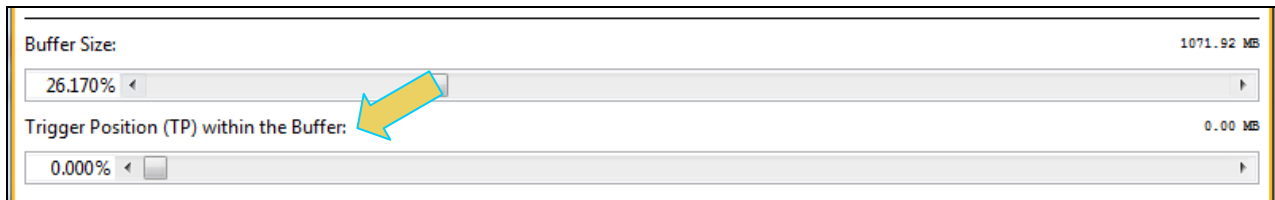
Immediate – Data capture begins accumulating immediately when the Start Capture button is activated. Data capture halts when buffer is filled. This setting will not provide any capture history, i.e. none of the captured data accumulated in the capture buffer will be data that occurred prior to the capture trigger event (activating the Start Capture button).

2. Set the **Capture Buffer Size** sliderbar to a percent value to meet your requirements. You can capture up to about 4GB of data which is about 1150 frames at 576p/480p and about 204 frames at 1080p which includes the video. If you do not want to capture the video and only capture the metadata, you can store well over 200,000 frames of data with the 4GByte storage capabilities.



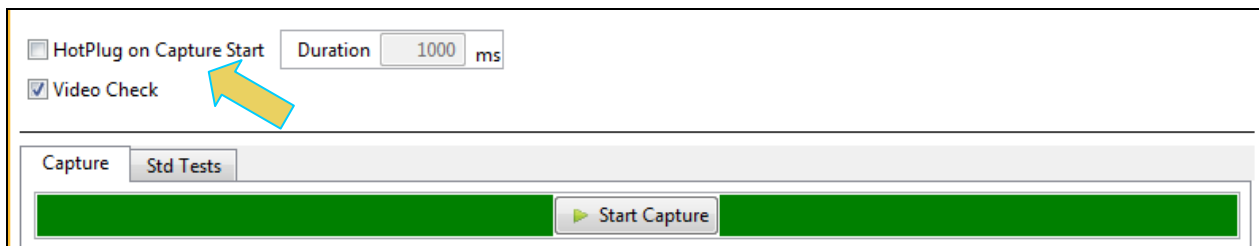
3. Set the **Trigger Position within the Buffer** sliderbar to a percent value to meet your requirements. This slide bar enables you to set the position of the trigger event within the captured data. This is a sliderbar that provides an indication (on the left) of the location within the captured data, expressed as a percent with 0% indicating that the trigger event occurs at the beginning of the captured data and 100% indicating that the trigger event occurs at the end of the captured data.

Note: When using a **Manual** trigger it is important to set the Trigger Position to ensure that there is some captured data prior to the manual trigger start point. The manual trigger is particularly useful when you are observing the behavior of a connected sink and then manually initiating the trigger when a particular symptom exhibits itself. Typically, you should move the trigger position to the right nearer the 100% mark. This way you ensure that there is data prior to the trigger event by accounting for reaction time between the time the symptom occurs and you initiate the trigger. Refer to the settings below which are typical.

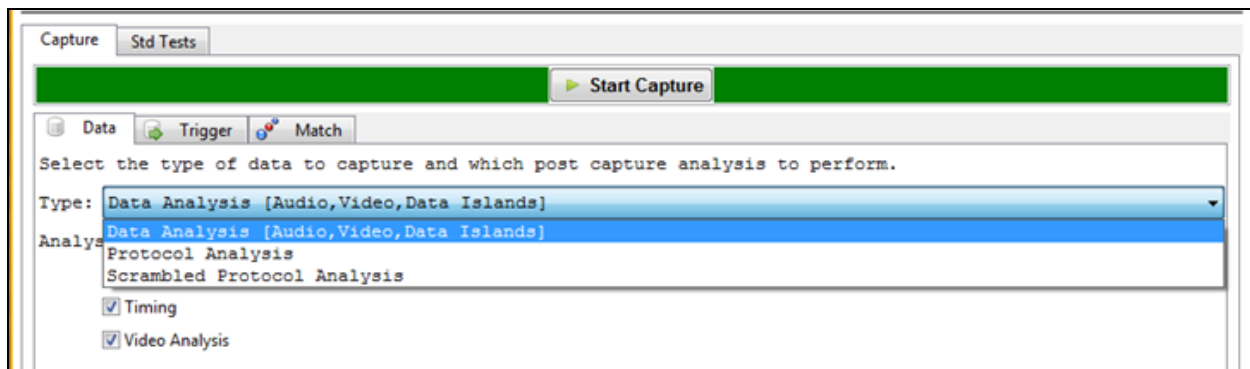


4. Check the **Generate Hot Plug on Capture Start** button if you want the 980 HDMI 2.0 Protocol Analyzer to issue a hot plug to initiate HDCP authentication. You also need to specify the duration of hot plug pulse in milliseconds.

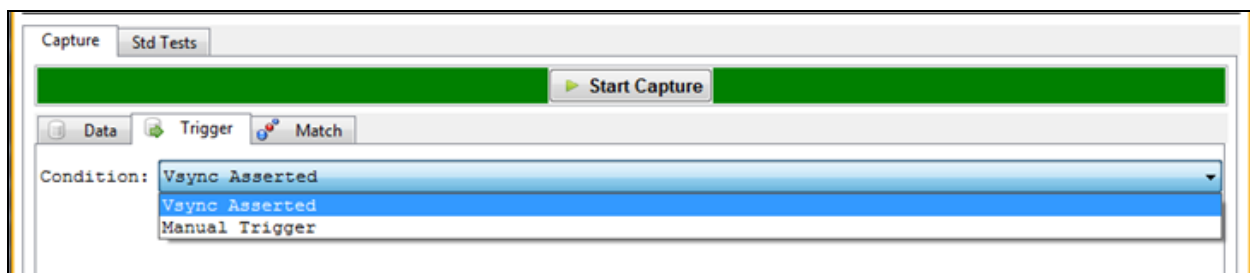
Note: If you are going to be taking some action on the device under test that will halt video, such as unseating and reseating the HDMI cable, you will need to check the **Video Check** box in the Capture Configuration section of the **Capture Control** dialog box.



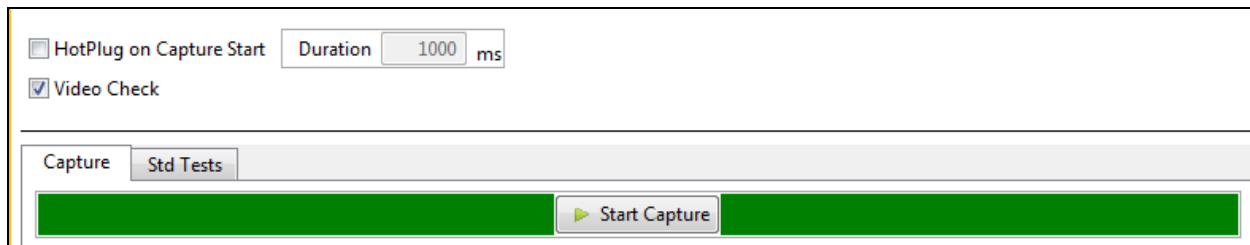
5. Select the **Capture** tab.
6. Select the **Data Selection Type** from the pull-down menu provided.



7. Select the Trigger selection **Condition**.

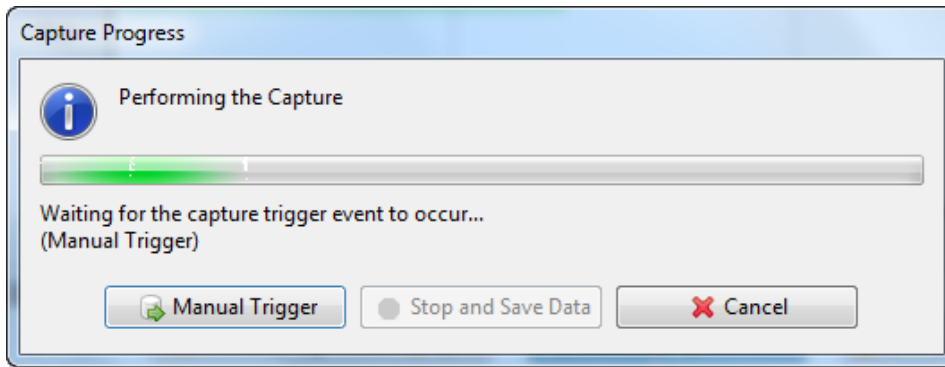


8. Click on the **Execute Capture** button.

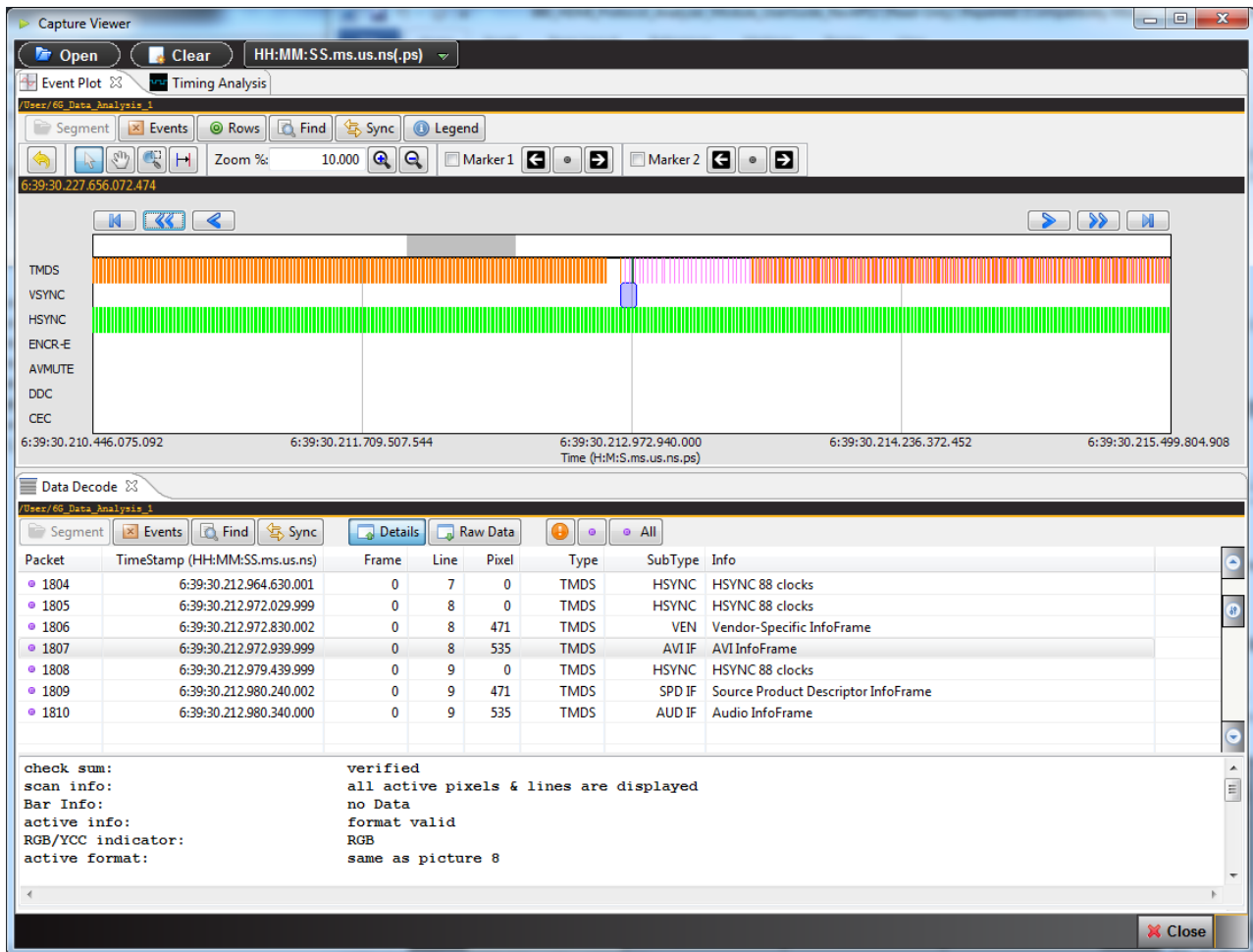


The 980 HDMI 2.0 Protocol Analyzer will capture the data. A series of dialog boxes will appear showing the capturing in progress (one example shown below).

Note: If there is some action that needs to be taken by a user in order to cause the trigger condition occur, the capture dialog box will stating “**Waiting for capture trigger to occur...**” This is shown in the following screen shot.



When the 980 HDMI 2.0 Protocol Analyzer is done capturing data a decode file is shown in the **Event Plot** panel and the **Data Decode** panel. The following screen shots show examples of captures.



The following screen shots show zoomed in views on the AVI infoframe.

The screenshot displays the 'Capture Viewer' interface. The top toolbar includes 'Open', 'Clear', and a time filter 'HH:MM:SS.ms.us.ns(ps)'. Below this, the 'Event Plot' and 'Timing Analysis' tabs are visible. The main display area shows a timing diagram for a 'Vendor-Specific InfoFrame' at time 6:39:30.212.972.830.002 [F:0 L:8 P:471]. The diagram shows TMS, VSYNC, HSYNC, and AVI frames. The AVI frame is highlighted in blue. Below the diagram, the 'Data Decode' section shows a table of packets:

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
1804	6:39:30.212.964.630.001	0	7	0	TMS	HSYNC	HSYNC 88 clocks
1805	6:39:30.212.972.029.999	0	8	0	TMS	HSYNC	HSYNC 88 clocks
1806	6:39:30.212.972.830.002	0	8	471	TMS	VEN	Vendor-Specific InfoFrame
1807	6:39:30.212.972.939.999	0	8	535	TMS	AVIF	AVI InfoFrame
1808	6:39:30.212.979.439.999	0	9	0	TMS	HSYNC	HSYNC 88 clocks
1809	6:39:30.212.980.240.002	0	9	471	TMS	SPD IF	Source Product Descriptor InfoFrame

Below the table, the following text is displayed:

```

check sum:          verified
scan info:          all active pixels & lines are displayed
Bar Info:           no Data
active info:        format valid
RGB/YCC indicator:  RGB
active format:      same as picture 8
picture aspect ratio: 16:9
colorimetry:        no data
non-uniform picture scale: not known
quantization range: limited
extended colorimetry: xvYCC601 Not used - Colorimetry (C) bits are not set to 3
video format:       VIC=97 (3840x2160p @ 59.94Hz/60Hz)
    
```

The screenshot displays the 'Capture Viewer' application window. At the top, there are menu options like 'Open', 'Clear', and a file path 'HH:MM:SS.ms.us.ns(.ps)'. Below this is a toolbar with icons for 'Event Plot', 'Timing Analysis', and 'Video Analysis'. The main area shows a video analysis timeline with a grid. The grid has columns for time and rows for video signals: TMDS, VSYNC, HSYNC, ENCR-E, AVMUTE, DDC, and CEC. A purple bar labeled 'AVI' is visible in the TMDS row, and a blue bar labeled 'VSYNC' is in the VSYNC row. The timeline shows time markers: 0:32:39.980.624.833.849, 0:37:13.103.829.533.340, 0:37:13.103.829.695.843, 0:37:13.103.829.859.078, 0:37:13.103.830.021.580, and 0:37:13.103.830.184.815. Below the grid is a 'Data Decode' section with a table of packets and a summary of video information.

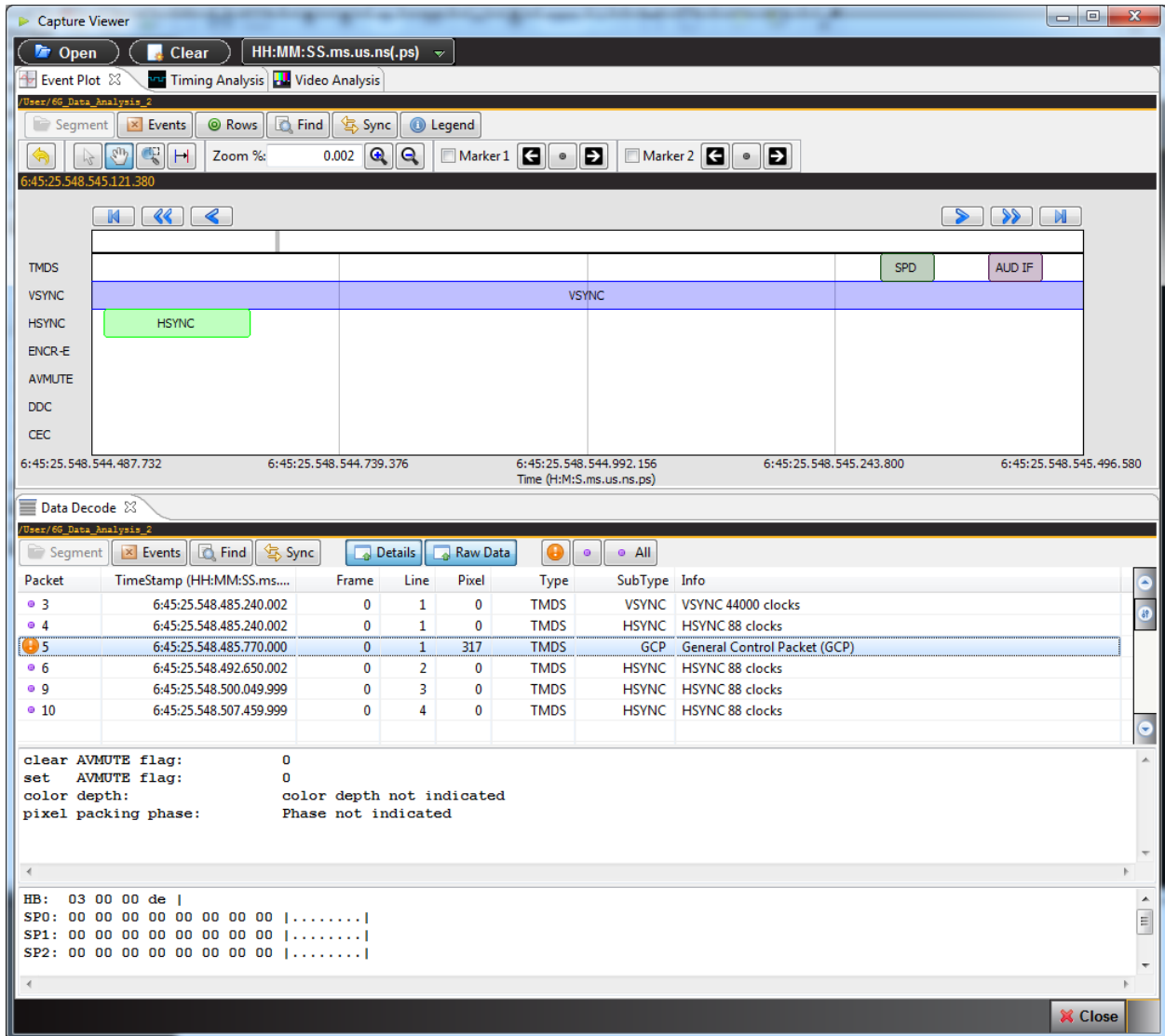
Packet	TimeStamp (HH:MM:SS.ms....)	Frame	Line	Pixel	Type	SubType	Info
3117	0:37:13.103.798.200.000	0	6	0	TMDS	HSYNC	HSYNC 88 clocks
3119	0:37:13.103.813.010.000	0	7	0	TMDS	HSYNC	HSYNC 88 clocks
3120	0:37:13.103.827.830.000	0	8	0	TMDS	HSYNC	HSYNC 88 clocks
3122	0:37:13.103.829.630.000	0	8	535	TMDS	AVI IF	AVI InfoFrame
3124	0:37:13.103.842.640.000	0	9	0	TMDS	HSYNC	HSYNC 88 clocks
3125	0:37:13.103.844.230.000	0	9	471	TMDS	SPD IF	Source Product Descriptor InfoFrame

check sum: verified
 scan info: all active pixels & lines are displayed
 Bar Info: no Data
 active info: format valid
 RGB/YCC indicator: RGB
 active format: same as picture 8

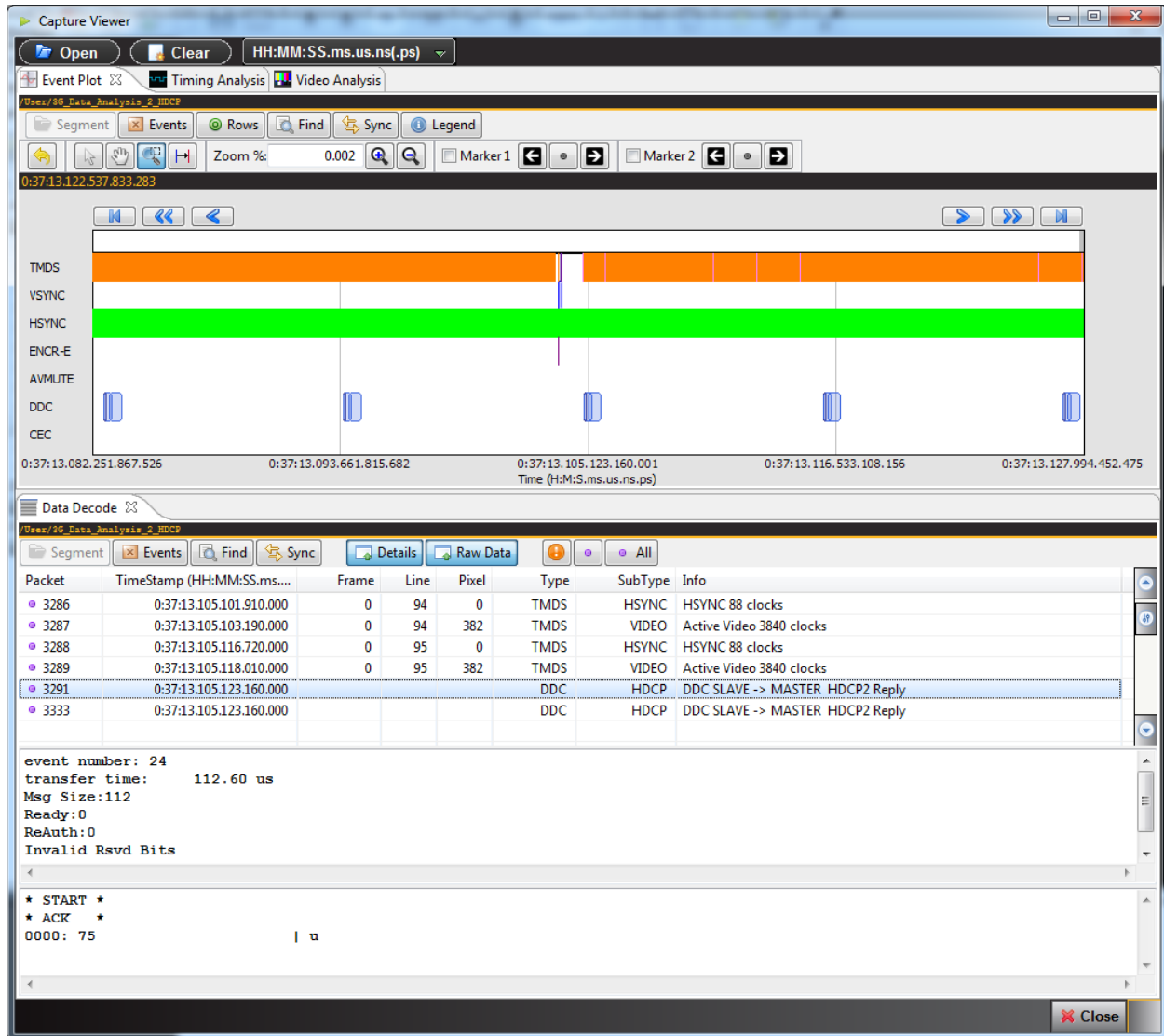
```

HB: 82 02 0d e4 |
SP0: a8 12 28 04 00 00 00 6c |..{...}|
SP1: 00 71 08 00 00 01 0f 9a |.q.....|
SP2: 00 00 00 00 00 00 00 00 |.....|
    
```

The following screen shots show zoomed in views on the GCP and AUD infoframe.



The following screen shot example shows a capture with HDCP 2.2 active.



5.9 Examining Captured Data

The procedures below describe how to view various types of captured data through the **Data Decode** and **Event Plot** panels. This procedure assumes that you have captured the data or have opened up a previously captured data file.

5.9.1 Viewing Data Analysis captures through the Data Decode panel

This subsection provides procedures for viewing the captured data taken using one of the Data Analysis capture modes through the **Data Decode** panel in the 980 GUI Manager.

To view captured data through the Data Decode panel:

1. To view the protocol data transactions on the **Data Decode** panel, activate the **Data Decode** tab.

The **Data Decode** window shows the protocol data in a report.

- Highlight an AVI infoframe record to view its contents as shown below. The **Data Decode** window above shows the AVI Infoframe data record selected. The AVI infoframe contents are parsed out in human readable text on the upper panel. The hex representation of the contents is presented in the lower panel.

The screenshot shows the 'Data Decode' window with a table of packets. Packet 1807 is selected, and its details are shown below the table. A yellow arrow points to the selected row in the table.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
1804	6:39:30.212.964.630.001	0	7	0	TMDS	HSYNC	HSYNC 88 clocks
1805	6:39:30.212.972.029.999	0	8	0	TMDS	HSYNC	HSYNC 88 clocks
1806	6:39:30.212.972.830.002	0	8	471	TMDS	VEN	Vendor-Specific InfoFrame
1807	6:39:30.212.972.939.999	0	8	535	TMDS	AVI IF	AVI InfoFrame
1808	6:39:30.212.979.439.999	0	9	0	TMDS	HSYNC	HSYNC 88 clocks


```

check sum:          verified
scan info:         all active pixels & lines are displayed
Bar Info:          no Data
active info:       format valid
RGB/YCC indicator: RGB
active format:     same as picture 8
picture aspect ratio: 16:9
colorimetry:      no data
non-uniform picture scale: not known
quantization range: limited
extended colorimetry: xvYCC601 Not used - Colorimetry (C) bits are not set to 3
video format:     VIC=97 (3840x2160p @ 59.94Hz/60Hz)
IT content:       no data
IT content Type:  graphics Not used - IT content bit (IT) bit is set to 0
    
```

3. Highlight a Vendor Specific infoframe record to view its contents. The example below shows a Vendor Specific infoframe where the HDMI source is transmitting 3D content in Frame Packing.

The screenshot shows the Data Decode window with a table of packets. Packet 1806 is highlighted, and a yellow arrow points to it. Below the table, the details for packet 1806 are shown, including a verified checksum and HDMI LLC OUI [0x000c03].

Packet	TimeStamp (HH:MM:SS.ms.us.us)	Frame	Line	Pixel	Type	SubType	Info
1804	6:39:30.212.964.630.001	0	7	0	TMDS	HSYNC	HSYNC 88 clocks
1805	6:39:30.212.972.029.999	0	8	0	TMDS	HSYNC	HSYNC 88 clocks
1806	6:39:30.212.972.830.002	0	8	471	TMDS	VEN	Vendor-Specific InfoFrame
1807	6:39:30.212.972.939.999	0	8	535	TMDS	AVI IF	AVI InfoFrame
1808	6:39:30.212.979.439.999	0	9	0	TMDS	HSYNC	HSYNC 88 clocks

check sum: verified
24bit IEEE Registration ID: HDMI LLC OUI [0x000c03]
HDMI Video Format: no additional HDMI video format is present

- Highlight a General Control Packet record to view its contents as shown below.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
7033	6:39:30.229.579.549.999	0	2250	0	TMDS	HSYNC	HSYNC 88 clocks
7034	6:39:30.229.586.750.000	0	2250	4280	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
7035	6:39:30.229.586.959.999	1	1	0	TMDS	VSYNC	VSYNC 44000 clocks
7036	6:39:30.229.586.959.999	1	1	0	TMDS	HSYNC	HSYNC 88 clocks
7037	6:39:30.229.587.490.002	1	1	317	TMDS	GCP	General Control Packet (GCP)
7039	6:39:30.229.587.549.999	1	2	163	TMDS	SSCP	SSCP 8 clocks
7038	6:39:30.229.594.360.001	1	2	0	TMDS	HSYNC	HSYNC 88 clocks

```

clear AVMUTE flag:      0
set   AVMUTE flag:      0
color depth:           color depth not indicated
pixel packing phase:   Phase not indicated
    
```

- Highlight an audio infoframe record to view its contents as shown below.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
1808	6:39:30.212.979.439.999	0	9	0	TMDS	HSYNC	HSYNC 88 clocks
1809	6:39:30.212.980.240.002	0	9	471	TMDS	SPD IF	Source Product Descriptor InfoFrame
1810	6:39:30.212.980.340.000	0	9	535	TMDS	AUD IF	Audio InfoFrame
1811	6:39:30.212.986.650.002	0	9	4280	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
1812	6:39:30.212.986.849.998	0	10	0	TMDS	HSYNC	HSYNC 88 clocks

```

check sum:              verified
coding type:            refer to Stream Header
channel count:          2ch
sampling frequency:     refer to stream header
sample size:            refer to stream header
channel speaker alloc:  [ - - - - - FR FL]
level shift value:      0dB
LFE playback level:     no information
down mixed stereo out: permitted
    
```

```

HB: 84 01 0a 4a |
SP0: 70 01 00 00 00 00 00 7d |p.....|
SP1: 00 00 00 00 00 00 00 00 |.....|
SP2: 00 00 00 00 00 00 00 00 |.....|
SP3: 00 00 00 00 00 00 00 00 |.....|
    
```

- Highlight an Audio Clock Regeneration packet record to view its contents as shown below.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
2007	6:39:30.213.831.299.999	0	124	0	TMDS	HSYNC	HSYNC 88 clocks
2008	6:39:30.213.831.939.999	0	124	382	TMDS	VIDEO	Active Video 3840 clocks
2009	6:39:30.213.838.509.998	0	124	4280	TMDS	ACR	Audio Clock Regeneration Packet
2010	6:39:30.213.838.563.869	0	124	4312	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
2011	6:39:30.213.838.709.999	0	125	0	TMDS	HSYNC	HSYNC 88 clocks
2012	6:39:30.213.839.349.998	0	125	382	TMDS	VIDEO	Active Video 3840 clocks
2013	6:39:30.213.846.119.999	0	126	0	TMDS	HSYNC	HSYNC 88 clocks
2014	6:39:30.213.846.759.998	0	126	382	TMDS	VIDEO	Active Video 3840 clocks
2015	6:39:30.213.853.520.000	0	127	0	TMDS	HSYNC	HSYNC 88 clocks

audio clock regeneration: N = 5824, Cycle Time Stamp (CTS) = 563061
audio clock freq: 48.000kHz

```

HB: 01 00 00 4a |
SP0: 00 08 97 75 00 16 c0 d8 |...u...|
SP1: 00 08 97 75 00 16 c0 d8 |...u...|
SP2: 00 08 97 75 00 16 c0 d8 |...u...|
SP3: 00 08 97 75 00 16 c0 d8 |...u...|
    
```

- Highlight an audio sample packet record to view its contents as shown below. The number of channels and samples are provided and the content of the samples is shown in the lower panel.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
2007	6:39:30.213.831.299.999	0	124	0	TMDS	HSYNC	HSYNC 88 clocks
2008	6:39:30.213.831.939.999	0	124	382	TMDS	VIDEO	Active Video 3840 clocks
2009	6:39:30.213.838.509.998	0	124	4280	TMDS	ACR	Audio Clock Regeneration Packet
2010	6:39:30.213.838.563.869	0	124	4312	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
2011	6:39:30.213.838.709.999	0	125	0	TMDS	HSYNC	HSYNC 88 clocks
2012	6:39:30.213.839.349.998	0	125	382	TMDS	VIDEO	Active Video 3840 clocks
2013	6:39:30.213.846.119.999	0	126	0	TMDS	HSYNC	HSYNC 88 clocks
2014	6:39:30.213.846.759.998	0	126	382	TMDS	VIDEO	Active Video 3840 clocks
2015	6:39:30.213.853.520.000	0	127	0	TMDS	HSYNC	HSYNC 88 clocks

layout 0: max channels=2, samples=4
subpacket 0: carries audio data

```

HB: 02 01 00 65 |
SP0: 40 9f 9c 40 9f 9c 88 e4 |@..@...|
SP1: 00 00 00 00 00 00 00 00 |.....|
SP2: 00 00 00 00 00 00 00 00 |.....|
SP3: 00 00 00 00 00 00 00 00 |.....|
    
```

8. Highlight an audio sample packet channel status block record to view its contents as shown below.

The channel status block is shown in the detailed data window when it is fully acquired, i.e. after the 192 frames are all captured. There are two blocks, one for each subframe A and B. The first subframe (A) corresponds to the Left channel and the second subframe (B) corresponds to the Right channel.

You can determine when the channel status bits begin to be acquired by looking at the top section of the Details panel (not shown below).

The screenshot shows the Data Decode window with a list of packets and a detailed view of a Channel Status Block (CSB) packet. A yellow arrow points to the CSB packet in the list.

Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Type	SubType	Info
3129	6:39:30.217.343.080.002	0	598	382	TMDS	VIDEO	Active Video 3840 clocks
3130	6:39:30.217.349.840.000	0	599	0	TMDS	HSYNC	HSYNC 88 clocks
3131	6:39:30.217.350.480.000	0	599	382	TMDS	VIDEO	Active Video 3840 clocks
3132	6:39:30.217.357.049.999	0	599	4280	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
3133	6:39:30.217.357.049.999	0	599	4316	TMDS	CSB	Channel Status Block (IEC 60958 first sub-frame) (starts @ 0:59:4316:239...
3134	6:39:30.217.357.049.999	0	599	4316	TMDS	CSB	Channel Status Block (IEC 60958 second sub-frame) (starts @ 0:59:4316:...

Bits accumulated : 192
 Use of channel status block: Consumer
 Data use : LPCM sample
 Copyright is : asserted
 Additional Info : 2 audio channels without pre-emphasis
 Channel status mode : 0
 Category code : 0x00
 Source number : ignored
 Channel number (audio) : ignored
 Sampling frequency : 48kHz
 Clock accuracy : Level II
 Max. audio sample word size: 24 bits
 Word length : 24 bits
 Original sampling freq. : Not indicated(default)

```

00: 0| 1| 2| 3| 4| 5| 6| 7|
    0| 0| 0| 0| 0| 0| 0| 0|
01: 8| 9| 10| 11| 12| 13| 14| 15|
    0| 0| 0| 0| 0| 0| 0| 0|
02: 16| 17| 18| 19| 20| 21| 22| 23|
    0| 0| 0| 0| 0| 0| 0| 0|
03: 24| 25| 26| 27| 28| 29| 30| 31|
    0| 1| 0| 0| 0| 0| 0| 0|
  
```

- Highlight a DDC transaction to view its contents as shown below. The example below shows a register read.

Packet	TimeStamp (HH:MM:SS.ms....)	Frame	Line	Pixel	Type	SubType	Info
3286	0:37:13.105.101.910.000	0	94	0	TMDS	HSYNC	HSYNC 88 clocks
3287	0:37:13.105.103.190.000	0	94	382	TMDS	VIDEO	Active Video 3840 clocks
3288	0:37:13.105.116.720.000	0	95	0	TMDS	HSYNC	HSYNC 88 clocks
3289	0:37:13.105.118.010.000	0	95	382	TMDS	VIDEO	Active Video 3840 clocks
3291	0:37:13.105.123.160.000				DDC	HDCP	DDC SLAVE -> MASTER HDCP2 Reply
3333	0:37:13.105.123.160.000				DDC	HDCP	DDC SLAVE -> MASTER HDCP2 Reply

event number: 24
transfer time: 112.60 us
Msg Size:112
Ready:0
ReAuth:0
Invalid Rsvd Bits

```
* START *
* ACK *
0000: 75          | u
```

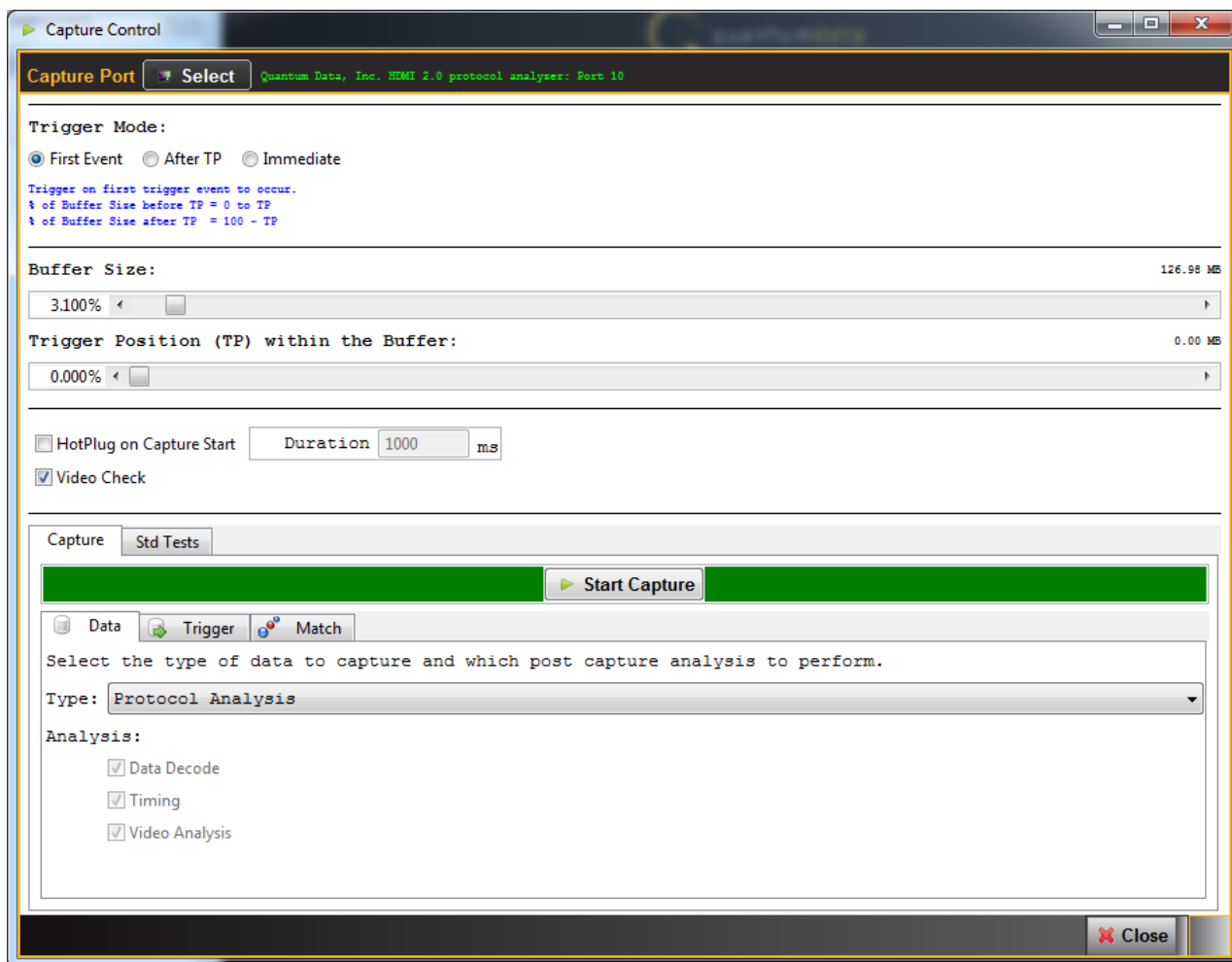
5.9.2 Viewing Protocol Analysis captures through the Data Decode panel

This subsection provides procedures for viewing the captured data taken using the Protocol Analysis capture mode through the **Data Decode** and **Event Plot** panels in the 980 GUI Manager.

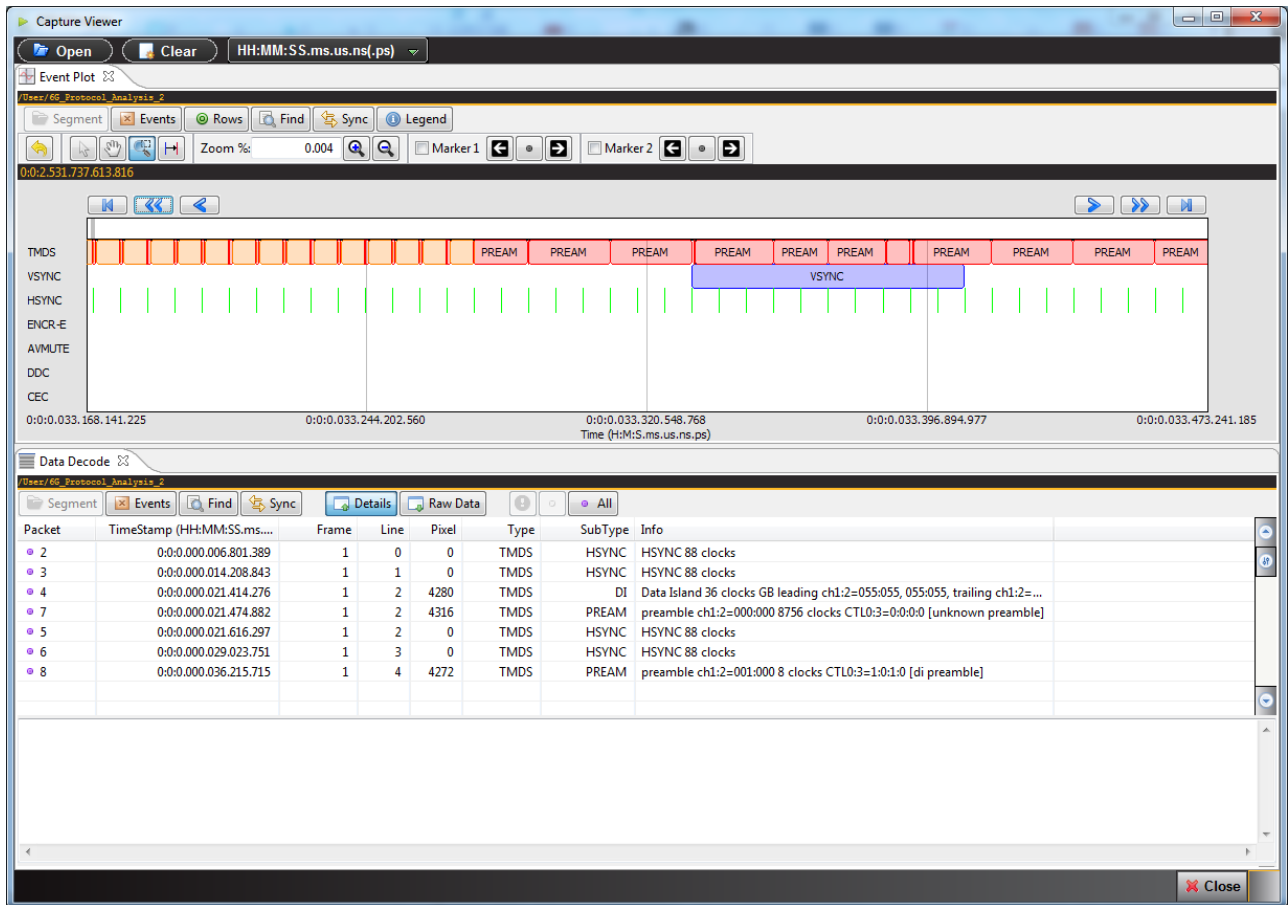
To view captured data through the Data Decode panel:

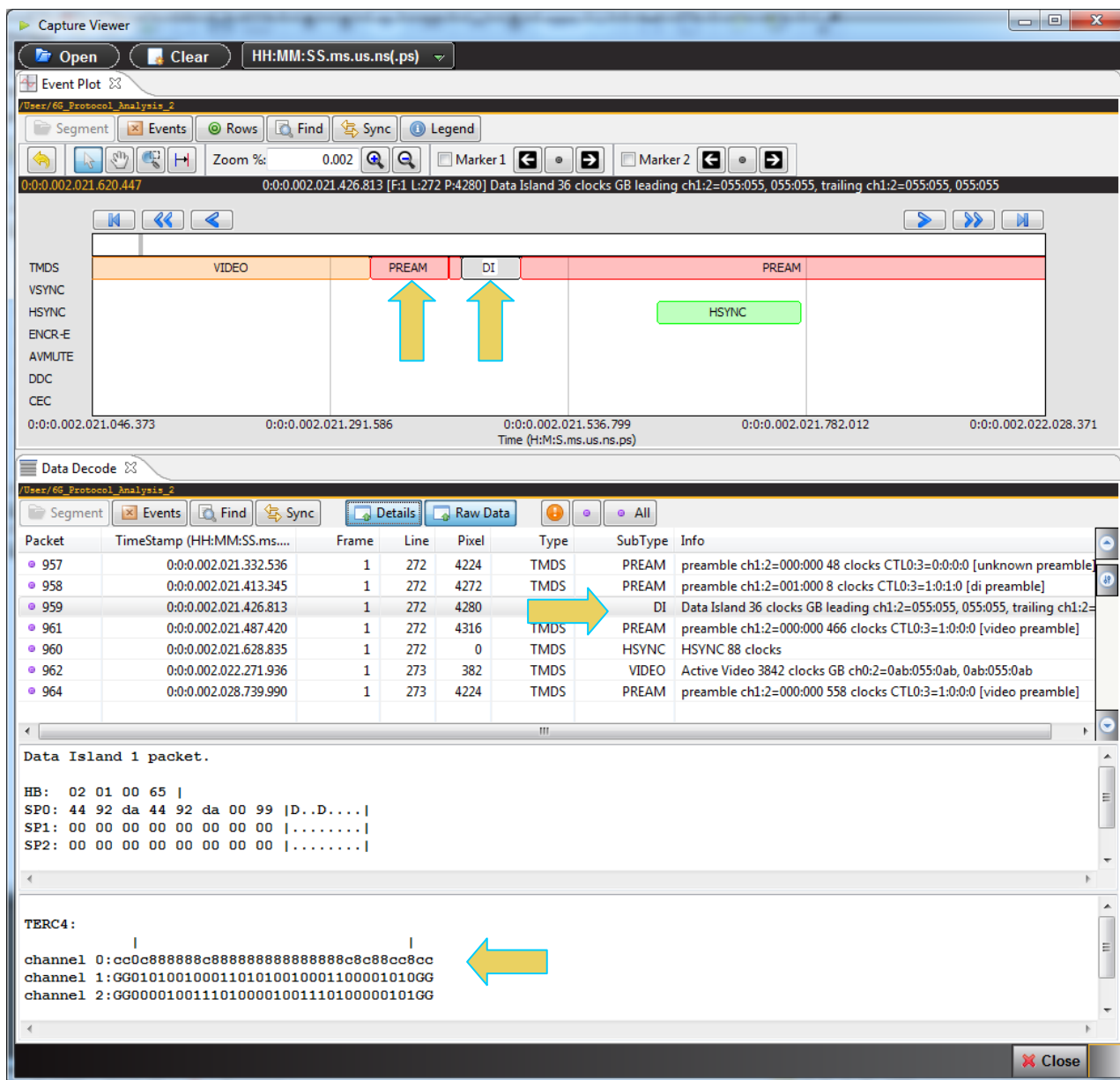
- To view the Protocol Analysis data transactions on the **Data Decode** and **Event Plot** panels, activate the **Data Decode** and **Event Plot** tabs.

The screen example below shows data captured using the Protocol Analysis mode. The preamble data is shown as a distinct data type in both the **Event Plot** and the **Data Decode**. The guard band data is shown as part of the Video data period in the example.



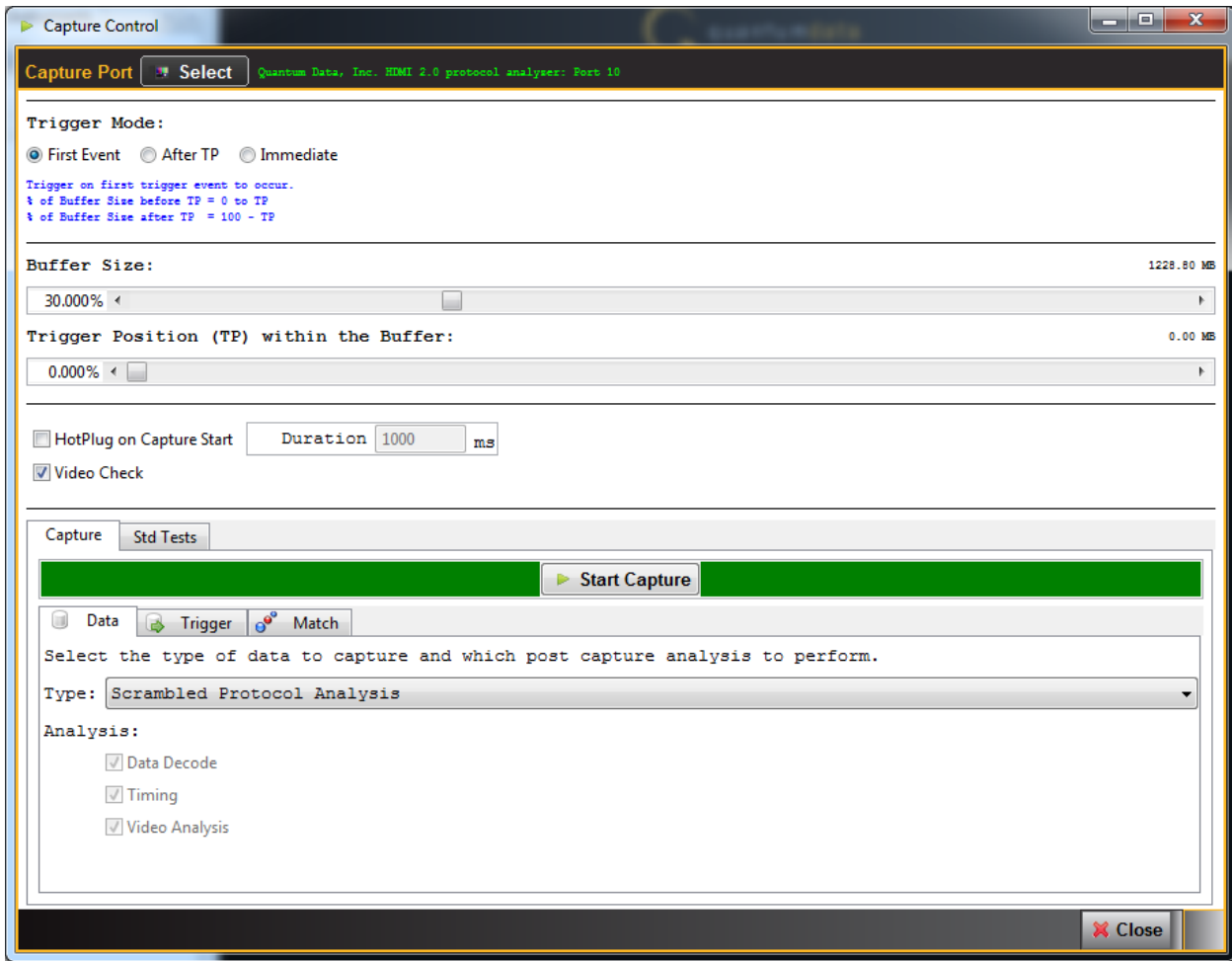
The following screen shots show examples of the protocol captured data showing the guard bands and preambles.



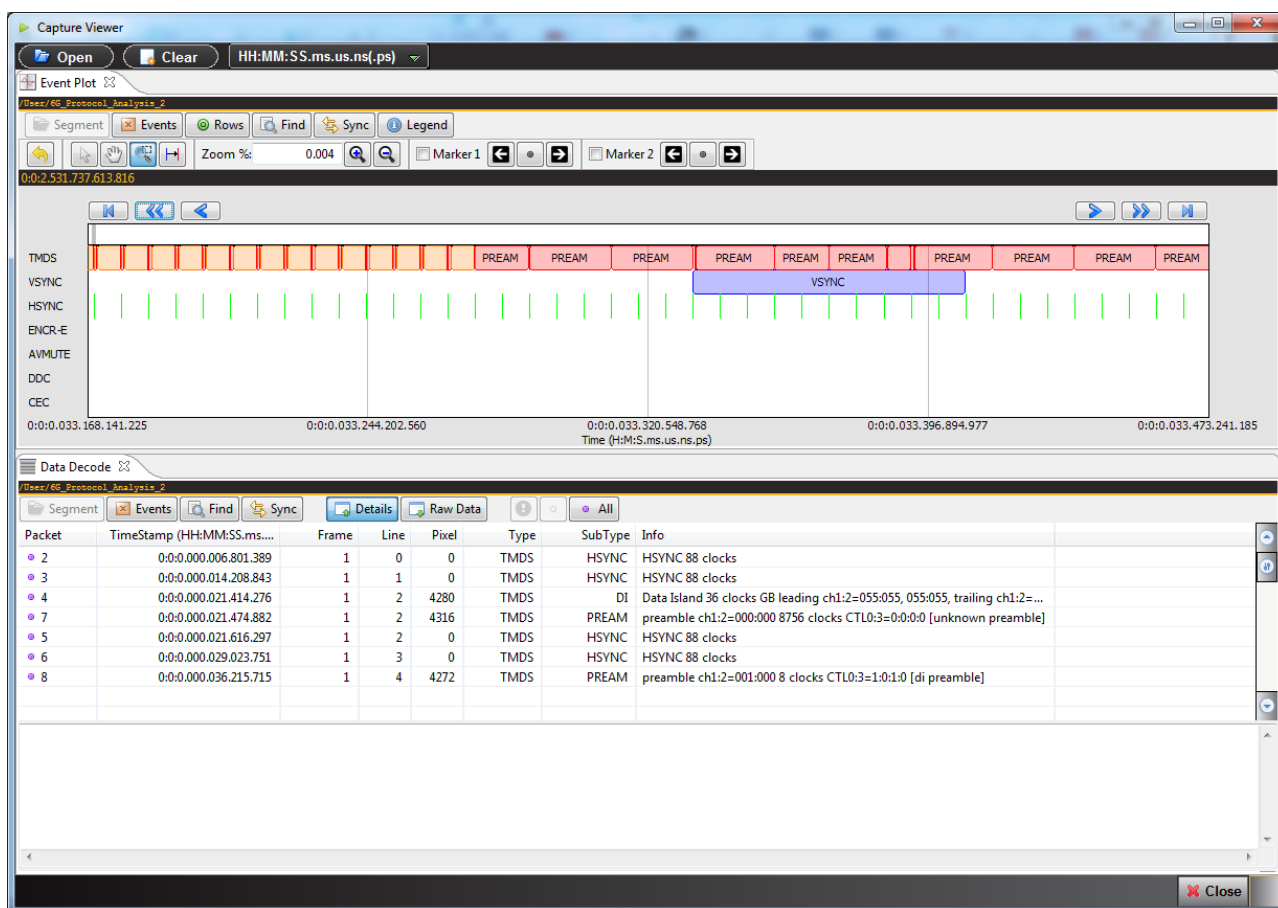


5.9.3 Viewing Scrambled Protocol Analysis captures through the Data Decode panel

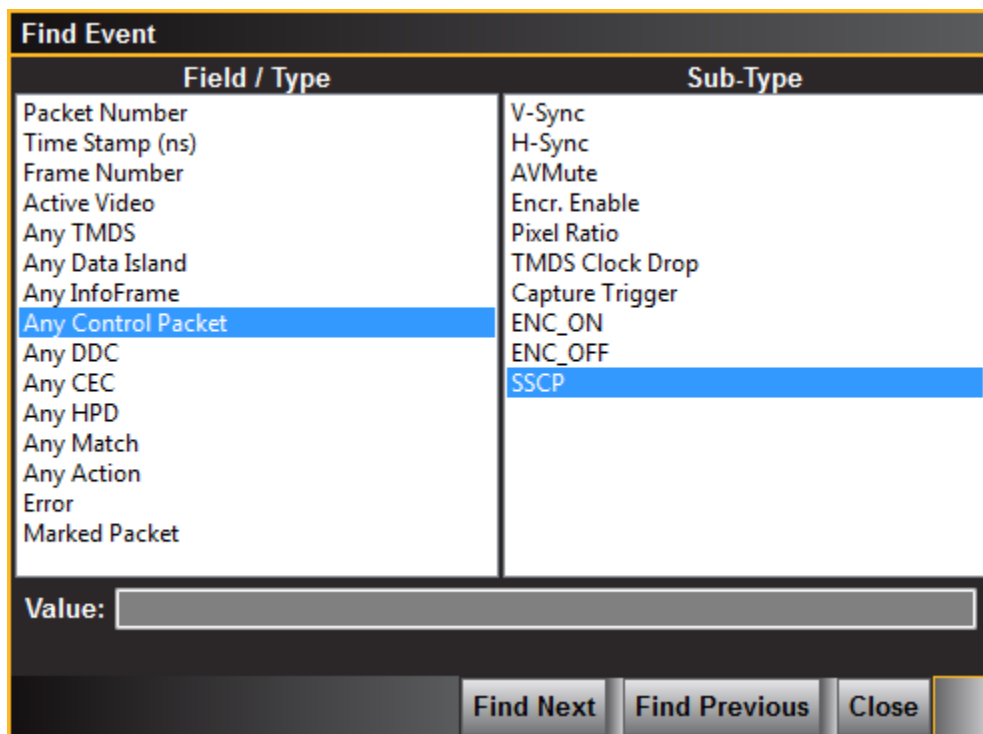
This subsection provides procedures for viewing the captured data taken using the Scrambled Protocol Analysis capture mode through the **Data Decode** and **Event Plot** panels in the 980 GUI Manager.



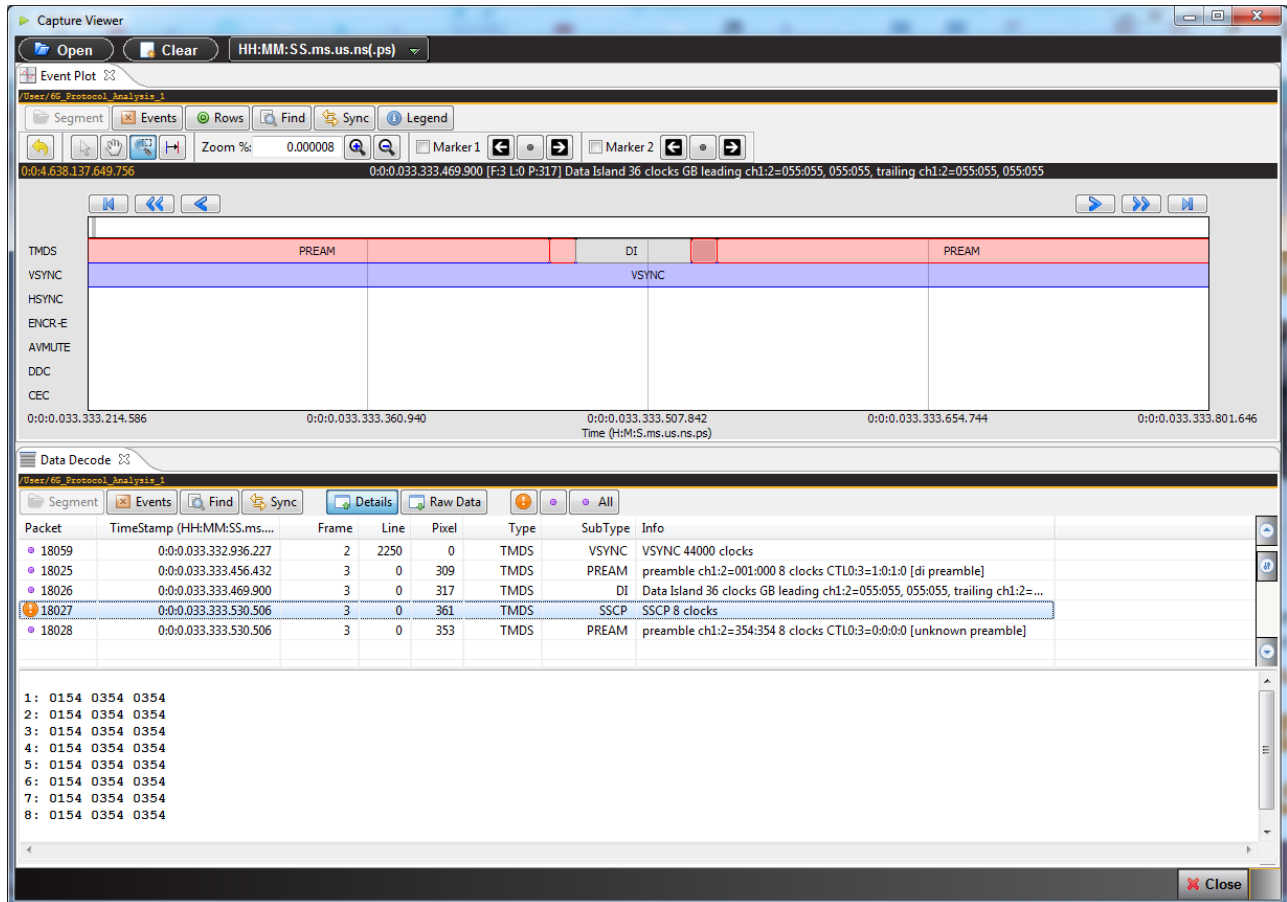
The following screen shot shows an example of the protocol data capture with scrambling enabled.



You can search for the Scrambler Synchronization Control Period (SSCP) bytes.



The following screen shot shows an example of the protocol data with the SSCP byte.

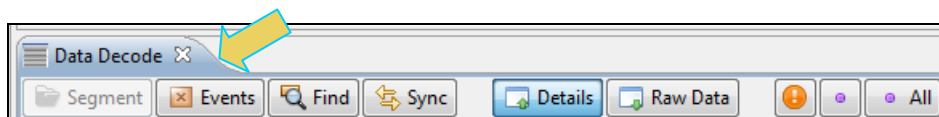


5.9.4 Filtering the data in the Data Decode panel

The procedures below describe how to filter the data in the **Data Decode** panel. You use the panel on the right that is adjacent to the **Data Decode** panel to apply filtering on the data displayed on the **Data Decode** panel.

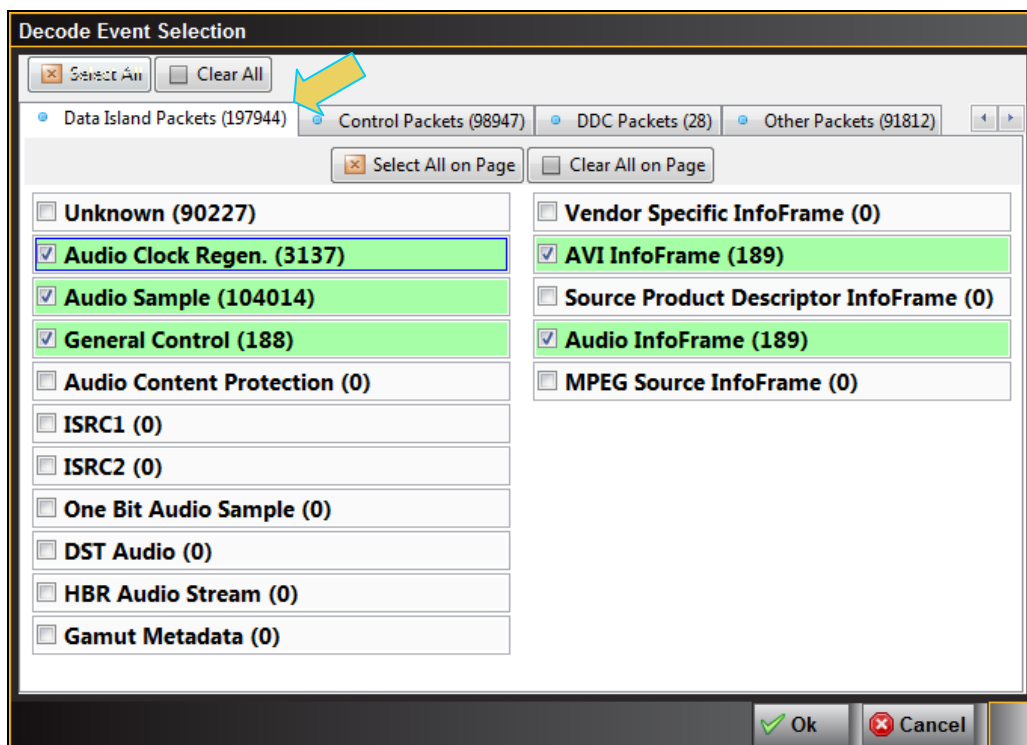
To apply filters to the data:

1. From the **Data Decode** panel, select the **Events** activation button to access the **Decode Event Selection** dialog box

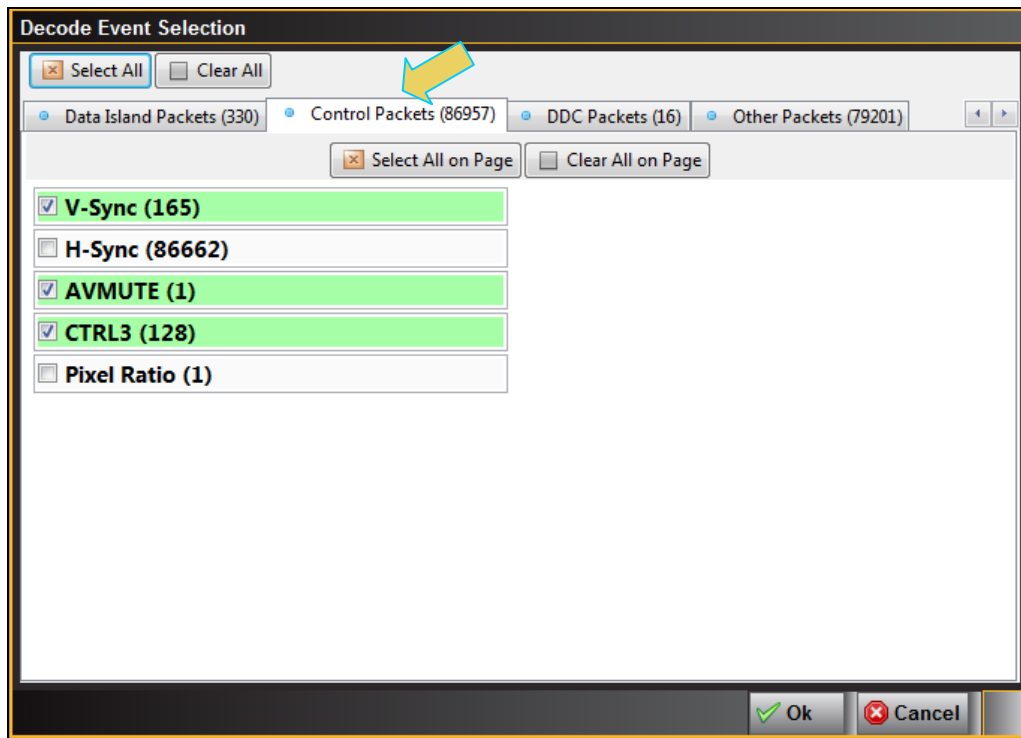




The **Decode Event Selection** dialog box is shown below.

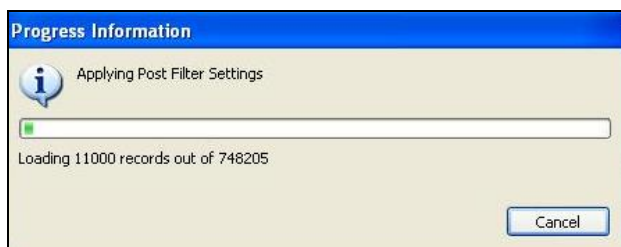
In the example below, only some of the data islands are selected.





The following is a screen example of the **Control Packets** page.



2. Select the data items you want to appear in the **Data Decode** panel. The filtering you apply in this series of dialog boxes also applies to the **Event Plot** panel.
3. Click the **OK**  button on the bottom right to set your selections or click on the **Cancel**  button to exit without saving the changes.




Note that you can clear all the selections on all pages with the **Clear All**  activation button on the top left. Alternatively you can select all items on all pages with the **Select All**  activation button. You can also apply the same Select and Clear operations to each tab of the **Decode Event Selection** dialog box.

5.9.5 Searching through the data in the Data Decode panel

The procedures below describe how to search through the data in the **Data Decode** panel.

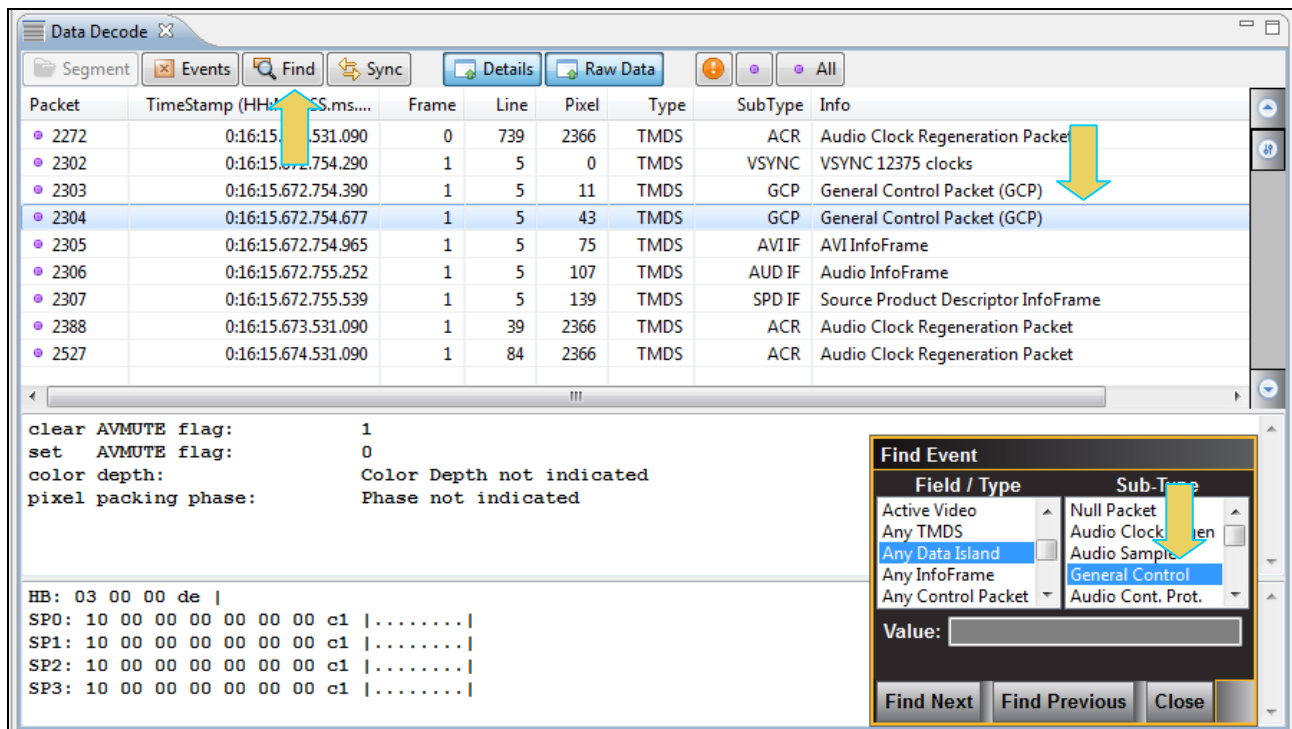
To search through the data:

1. Click on the Search icon. 

You can search on a variety of packet types and some of the fields in the **Data Decode** panel such as Packet, Timestamp, Frame, Line and Pixel. You can also search for a variety of control events such as the occurrence of Avmute in an ACR packet or a Vsync/Hsync.

The default is to search Forward which is a search for events that occur later in time. You can change that to search backward by selecting associated radio button.

A dialog box appears that enables you can enter search criteria. In this example we will search for an Audio Clock Regeneration packet. The **Data Decode** panel will then show the next General Control Packet (GCP) packet. If you are searching for a specific packet number, timestamp or frame you will have to enter value in the Find/Goto field.



The screenshot shows the Data Decode panel with a table of packets. The 'Find' icon is highlighted. The 'Find Event' dialog box is open, showing search criteria for 'General Control'.

Packet	TimeStamp (HH:MM:SS.ms...)	Frame	Line	Pixel	Type	SubType	Info
2272	0:16:15.672.531.090	0	739	2366	TMDS	ACR	Audio Clock Regeneration Packet
2302	0:16:15.672.754.290	1	5	0	TMDS	VSYNC	VSYNC 12375 clocks
2303	0:16:15.672.754.390	1	5	11	TMDS	GCP	General Control Packet (GCP)
2304	0:16:15.672.754.677	1	5	43	TMDS	GCP	General Control Packet (GCP)
2305	0:16:15.672.754.965	1	5	75	TMDS	AVI IF	AVI InfoFrame
2306	0:16:15.672.755.252	1	5	107	TMDS	AUD IF	Audio InfoFrame
2307	0:16:15.672.755.539	1	5	139	TMDS	SPD IF	Source Product Descriptor InfoFrame
2388	0:16:15.673.531.090	1	39	2366	TMDS	ACR	Audio Clock Regeneration Packet
2527	0:16:15.674.531.090	1	84	2366	TMDS	ACR	Audio Clock Regeneration Packet

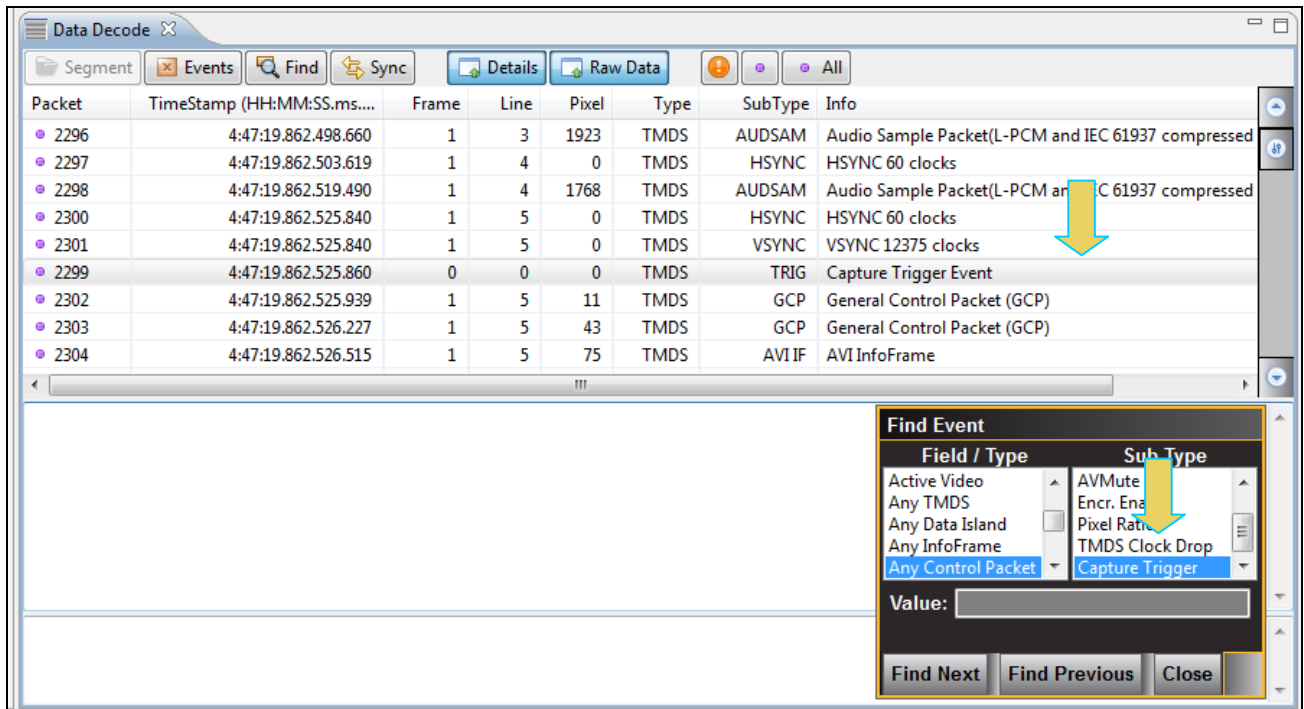
Find Event dialog box:

Field / Type	Sub-Type
Active Video	Null Packet
Any TMDS	Audio Clock
Any Data Island	Audio Sample
Any InfoFrame	General Control
Any Control Packet	Audio Cont. Prot.

Value:

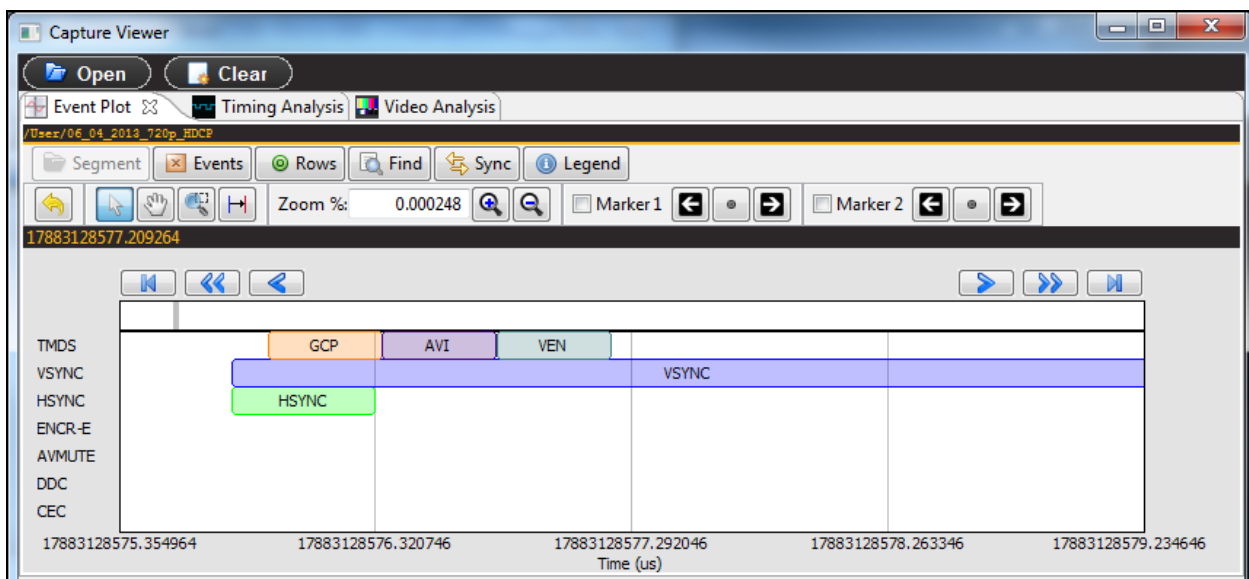
Buttons: Find Next, Find Previous, Close

Sometimes you may wish to search for the trigger event. In this case you have to select Any Control Packet under Field / Type and then select Capture Trigger under Sub-Type as shown below.



5.9.6 Viewing data through the Event Plot panel

The Event Plot panel provides you with a graphical view of the data. It enables you to see relationships between the various data types on a time line. A sample screen of the **Event Plot** is shown below. The operation of the **Event Plot** is described at: [Event Plot Panel](#).



6 Running Standard Tests

This chapter describes how to use the 980 HDMI 2.0 Protocol Analyzer special tests. The 980 HDMI 2.0 Protocol Analyzer supports the following special tests:

- **Video timing analysis** – Verifies that the timing parameters from an HDMI source device including all horizontal and vertical parameters.
- **Video analysis** – Enables you to check the video parameters and pixel values from the HDMI source device.
- **Audio analysis** - Identify audio inconsistencies in metadata related to sampling rate and audio clock recover that could result in interoperability problems.

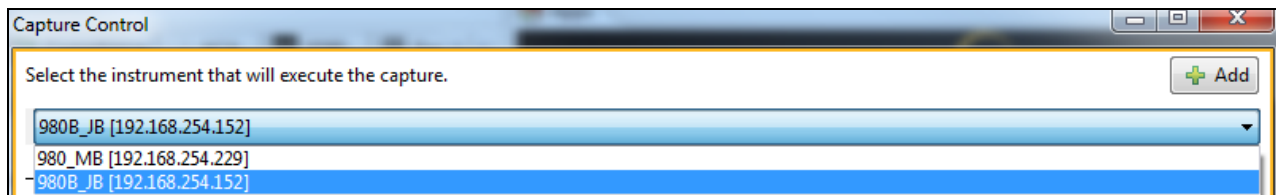
6.1 Running a video timing test

The procedures below describe how to run the video timing test on an HDMI source device through the 980 GUI Manager. This subsection describes how to use the 980 HDMI 2.0 Protocol Analyzer to run a timing test on an HDMI source device. The setup procedures described above in the section: [Analyzing HDMI Data with your 980 Protocol Analyzer](#) should be followed for the timing tests. These setup procedures are listed below:

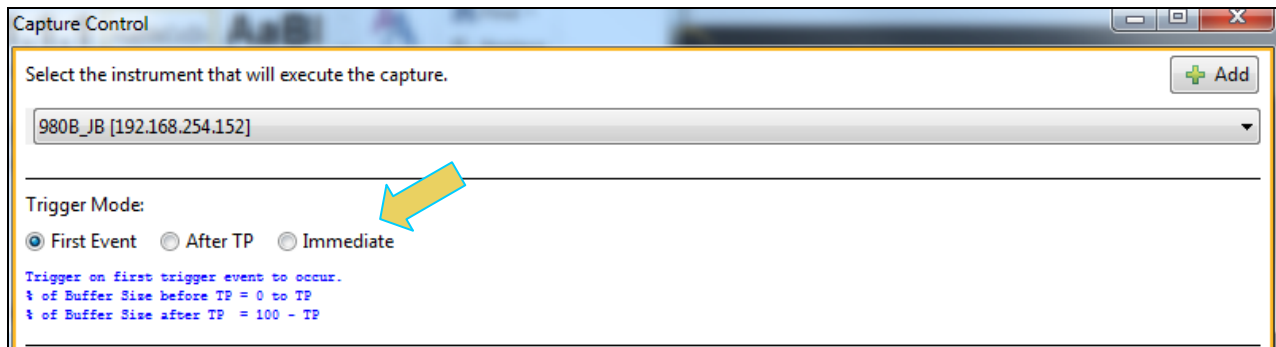
1. Set the threshold of the +5V.
2. Configure the 980 HDMI 2.0 Protocol Analyzer Rx port with the proper EDID.

To run the video timing analysis test:

1. Select the 980 HDMI 2.0 Protocol Analyzer that you are using to capture the data from your HDMI source device under test from the pull-down menu.



2. Set the Video Trigger mode using the information provided below. Note that typically for a Video Timing test you would select either Immediate or First Event.



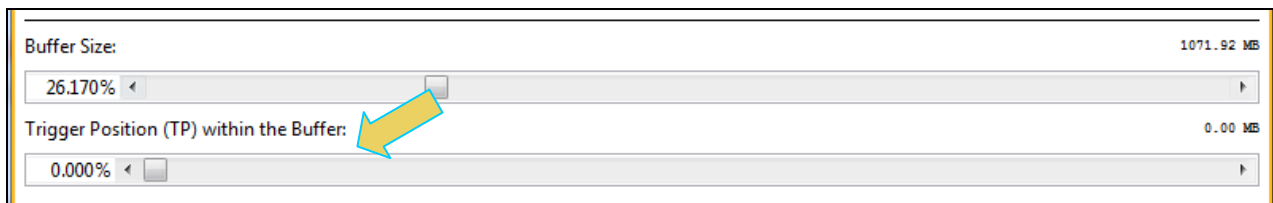
First Event – The trigger occurs on the first event—first occurrence—of the trigger condition defined in the Trigger Type pull-down menu (Vsync, encryption Enabled, Encryption Disabled, External Trigger, Manual Trigger, TMDS Clock Change). Depending on the setting of the Trigger Position slide bar, you may have some of the captured data in the buffer that accumulated prior to the trigger condition and some of the captured data in the buffer that accumulated after the trigger condition. At the left most position there will be no data in the

capture buffer that occurred prior to the trigger event. At the right most position, all the data in the capture buffer will be data that accumulated prior to the trigger event. Because the trigger condition could be met quite quickly, the capture buffer may not be filled to the amount specified in Buffer Size.

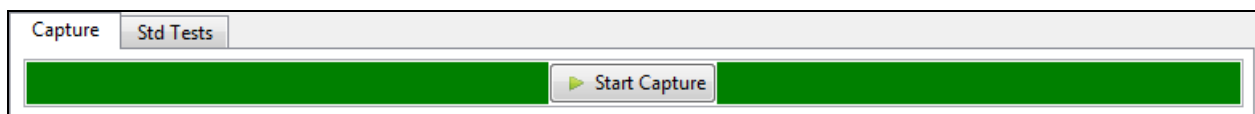
After TP (Trigger Position) – In this setting the trigger condition specified in the Trigger Type pull-down menu will be ignored until data has accumulated in the capture buffer up to the point where the Trigger Position slide-bar is set. Once the data has accumulated to the setting of the Trigger Position, any event matching the Trigger Type specified will cause a trigger condition and data accumulation will begin. Some of the data in the capture buffer will be data that has accumulated prior to the trigger condition being met and some of the data in the capture buffer will be data that has accumulated after the trigger condition was met. This setting will ensure that the capture buffer is filled to the Buffer Size setting.

Immediate – Data capture begins accumulating immediately when the Start Capture button is activated. Data capture halts when buffer is filled. This setting will not provide any capture history, i.e. none of the captured data accumulated in the capture buffer will be data that occurred prior to the capture trigger event (activating the Start Capture button).

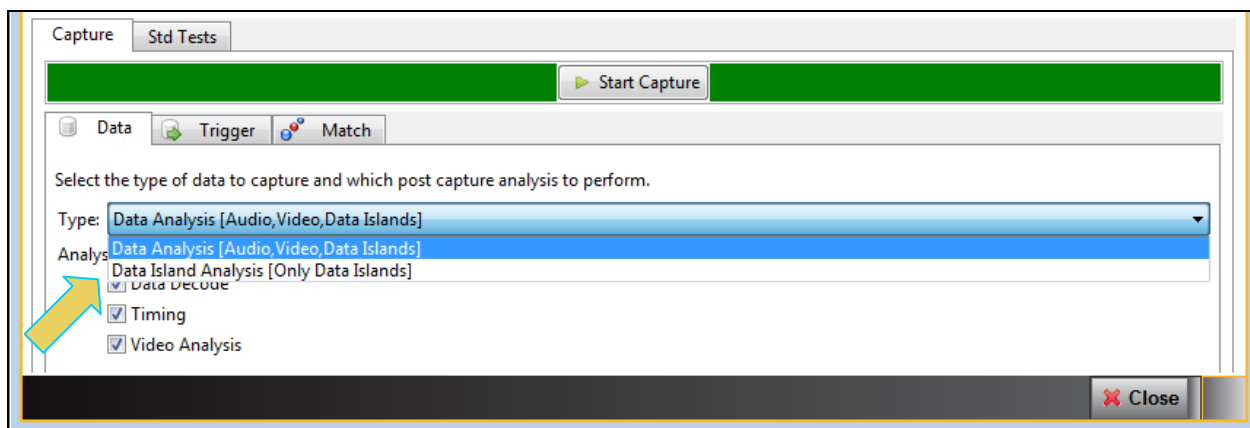
- Set the **Capture Buffer Size** slidebar to a percent value to meet your requirements. You can capture up to about 4GB of data which is about 2300 frames at 576p/480p and about 400 frames at 1080p which includes the video. If you do not want to capture the video and only capture the metadata, you can store well over 200,000 frames of data.



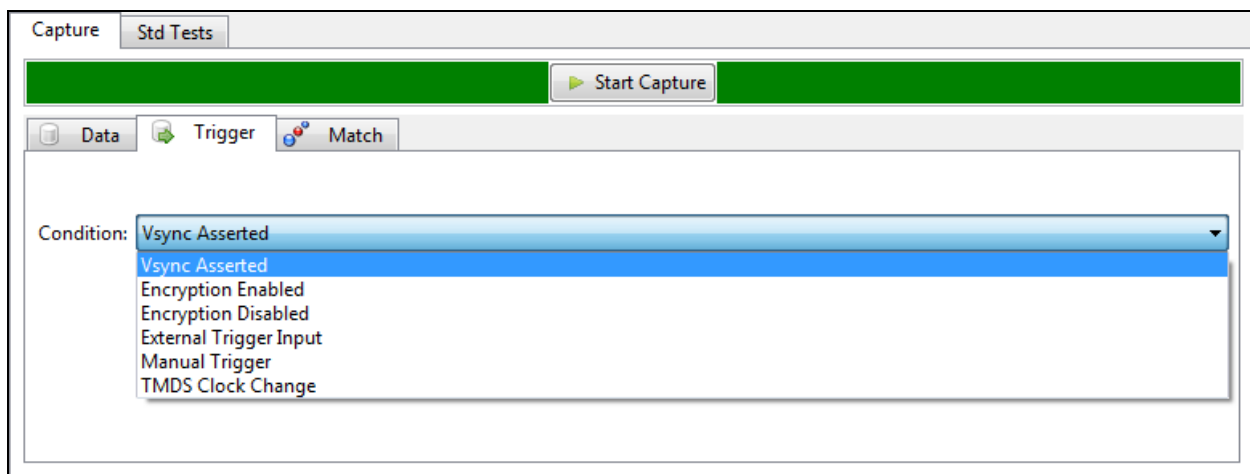
- Set the **Capture Buffer Position** sidebar to a percent value to meet your requirements. This slide bar enables you to set the position of the trigger event within the captured data. This is a sidebar that provides an indication (on the right) of the location within the captured data, expressed as a percent with 0% indicating that the trigger event occurs at the beginning of the captured data and 100% indicating that the trigger event occurs at the end of the captured data.
- Select the **Capture** tab in the **Capture Control** panel.



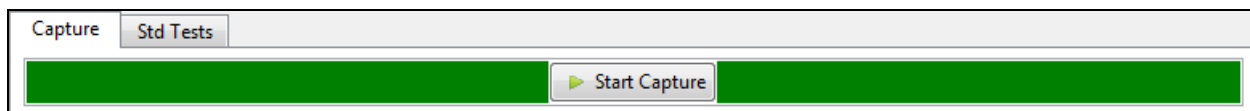
- Select Data Analysis (Audio, Video, Data Islands) in the **Data Selection Type** pull-down menu provided as shown below. Then make sure you check the **Timing** check box.



7. Select Vsync Asserted for the **Trigger Selection** condition.

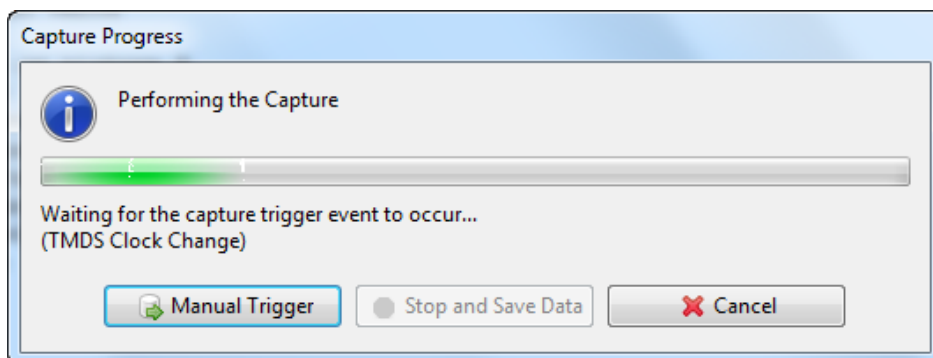


8. Click on the **Execute Capture** button to initiate the test.



The 980 HDMI 2.0 Protocol Analyzer will capture the data including the timing data. A series of dialog boxes will appear showing the capturing in progress (one example shown below).

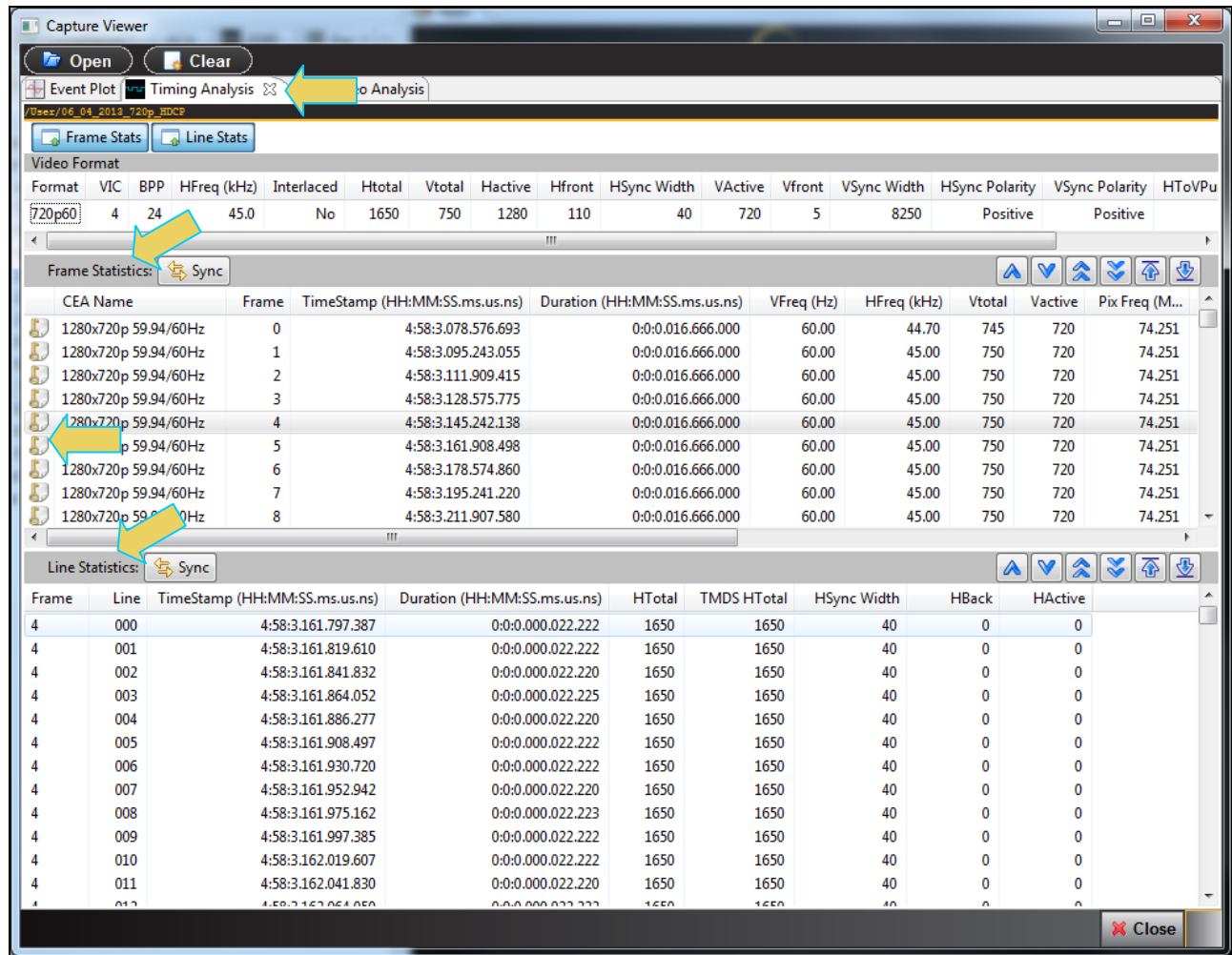
Note: If there is some action that needs to be taken by a user in order to cause the trigger condition occur, the capture dialog box will indicate that. This is shown in the following screen shot.



When the 980 HDMI 2.0 Protocol Analyzer is done capturing data you can view the timing parameters in the **Timing Analyzer** panel. The **Timing Analysis** panel has three subpanels: 1) **Video Format**, 2) **Frame Statistics** 3) **Line Statistics**. The **Video Format** panel shows a summary of the key parameters and indicates the standard format timing that the timing parameters detected from the source match. If there is not a precise match between the timing parameters of a format in the 980 HDMI 2.0 Protocol Analyzer format library and the measured values, the 980 will select the format nearest to the values measured and indicate any parameters that deviate from that standard timing.

The **Frame Statistics** panel shows the frame or vertical parameters. When you highlight a particular frame, the parameters for each of the lines in that frame are listed in the **Line Statistics** panel.

The **Frame Statistics** panel also indicates whether the frame is encrypted or not. If the frame is encrypted a key icon will be shown on the left side of each frame. Refer to the screen example below.



The screen shot of the Timing Analysis panel below shows an example of a 6G timing data.

The screenshot displays the Timing Analysis panel of a software application. The interface includes a menu bar with 'Open' and 'Clear' buttons, and a file path 'HH:MM:SS.ms.us.ns(.ps)'. Below the menu bar are tabs for 'Event Plot', 'Timing Analysis', and 'Video Analysis'. The 'Timing Analysis' tab is active, showing a 'Video Format' table and two data tables: 'Frame Statistics' and 'Line Statistics'.

Video Format Table:

Format	VIC	BPP	HFreq (kHz)	Interlaced	Htotal	Vtotal	Hactive	Hfront	HSync Width	VActive	Vfront	VSync Wi...	HSync Polarity	VSync Polarity	HToVPulse Del...	Pix Freq (M...
VIC97	97	24	135.0	No	4400	2250	3840	176	88	2160	8	44000	Positive	Positive	0	593.996

Frame Statistics Table:

CEA Name	Frame	TimeStamp (HH:M...	Duration (HH:M...	VFreq (Hz)	HFreq (kHz)	Vtotal	Vactive	Pix Freq (M...	HSync Wi...	VSync	Start Video ...	HToVD
3840x2160p @ 59.94Hz/60Hz	0	6:45:25.565.152.007	0:0:0.016.666.000	60.00	135.00	2250	2160	593.996	88	10		82
3840x2160p @ 59.94Hz/60Hz	1	6:45:25.581.818.780	0:0:0.016.666.000	60.00	135.00	2250	2160	593.996	88	10		82

Line Statistics Table:

Frame	Line	TimeStamp (HH:MM:SS.ms....	Duration (HH:MM:SS.ms.us....	HTotal	TMDS HTotal	HSync Width	HBack	HActive
0	000	6:45:25.565.152.007	0:0:0.000.007.408	4400	4400	88	0	0
0	001	6:45:25.565.159.415	0:0:0.000.007.408	4400	4400	88	0	0
0	002	6:45:25.565.166.822	0:0:0.000.007.410	4400	4400	88	0	0
0	003	6:45:25.565.174.232	0:0:0.000.007.405	4400	4400	88	0	0
0	004	6:45:25.565.181.637	0:0:0.000.007.408	4400	4400	88	0	0
0	005	6:45:25.565.189.045	0:0:0.000.007.407	4400	4400	88	0	0
0	006	6:45:25.565.196.452	0:0:0.000.007.408	4400	4400	88	0	0
0	007	6:45:25.565.203.860	0:0:0.000.007.408	4400	4400	88	0	0
0	008	6:45:25.565.211.267	0:0:0.000.007.407	4400	4400	88	0	0
0	009	6:45:25.565.218.675	0:0:0.000.007.408	4400	4400	88	0	0
0	010	6:45:25.565.226.082	0:0:0.000.007.408	4400	4400	88	0	0
0	011	6:45:25.565.233.490	0:0:0.000.007.407	4400	4400	88	0	0
0	012	6:45:25.565.240.897	0:0:0.000.007.408	4400	4400	88	0	0
0	013	6:45:25.565.248.305	0:0:0.000.007.408	4400	4400	88	0	0
0	014	6:45:25.565.255.712	0:0:0.000.007.407	4400	4400	88	0	0
0	015	6:45:25.565.263.120	0:0:0.000.007.408	4400	4400	88	0	0
0	016	6:45:25.565.270.527	0:0:0.000.007.408	4400	4400	88	0	0
0	017	6:45:25.565.277.935	0:0:0.000.007.407	4400	4400	88	0	0
0	018	6:45:25.565.285.342	0:0:0.000.007.408	4400	4400	88	0	0
0	019	6:45:25.565.292.750	0:0:0.000.007.408	4400	4400	88	0	0
0	020	6:45:25.565.300.157	0:0:0.000.007.407	4400	4400	88	0	0
0	021	6:45:25.565.307.565	0:0:0.000.007.408	4400	4400	88	0	0
0	022	6:45:25.565.314.972	0:0:0.000.007.408	4400	4400	88	0	0
0	023	6:45:25.565.322.380	0:0:0.000.007.408	4400	4400	88	0	0

A yellow arrow points to the 'Pix Freq (M...)' column in the Video Format table, which contains the value 593.996.

You can view 4K by 2K timing data on the 980 HDMI 2.0 Protocol Analyzer.


The screenshot displays the 'Capture Viewer' application window. At the top, there are buttons for 'Open' and 'Clear', and a file path 'HH:MM:SS.ms.us.ns(.ps)'. Below this, there are tabs for 'Event Plot', 'Timing Analysis', and 'Video Analysis'. The 'Video Analysis' tab is active, showing a 'Video Format' section with a table of parameters. A yellow arrow points to the 'Pix Freq (MHz)' column in this table. Below the video format section is a 'Frame Statistics' table with columns for Frame, TimeStamp, Duration, VFreq, HFreq, Vtotal, Vactive, Pix Freq, HSync Width, VSync, Start Video, HTToVDelay, and Encr Sta. Below that is a 'Line Statistics' table with columns for Frame, Line, TimeStamp, Duration, HTotal, TMDS HTotal, HSync Width, HBack, and HActive. The interface includes various navigation icons and a 'Close' button at the bottom right.

Format	VIC	BPP	HFreq (kHz)	Interlaced	Htotal	Vtotal	Hactive	Hfront	HSync Width	VActive	Vfront	VSync Width	HSync Polarity	VSync Polarity	HToVPulse Del...	Pix Freq (MHz)
VIC97	0	24	135.0	No	4400	2250	3840	176	88	2160	8	44000	Positive	Positive	0	593.995

Frame	TimeStamp (HH:M...	Duration (HH:M...	VFreq (Hz)	HFreq (kHz)	Vtotal	Vactive	Pix Freq (M...	HSync Wi...	VSync	Start Video ...	HToVDelay	Encr Sta
0	2:30:28.523.318.975	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
1	2:30:28.539.985.773	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
2	2:30:28.556.652.570	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
3	2:30:28.573.319.368	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
4	2:30:28.589.986.165	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
5	2:30:28.606.652.960	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
6	2:30:28.623.319.757	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
7	2:30:28.639.986.555	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0
8	2:30:28.656.653.353	0:0:0.016.666.000	60.00	135.00	2250	2160	593.995	88	10	90	0	0

Frame	Line	TimeStamp (HH:MM:SS.ms.us.ns)	Duration (HH:MM:SS.ms.us.ns)	HTotal	TMDS HTotal	HSync Width	HBack	HActive
1	000	2:30:28.539.926.512	0:0:0.000.007.407	4400	4400	88	0	0
1	001	2:30:28.539.933.920	0:0:0.000.007.407	4400	4400	88	0	0
1	002	2:30:28.539.941.327	0:0:0.000.007.408	4400	4400	88	0	0
1	003	2:30:28.539.948.735	0:0:0.000.007.407	4400	4400	88	0	0
1	004	2:30:28.539.956.142	0:0:0.000.007.407	4400	4400	88	0	0
1	005	2:30:28.539.963.550	0:0:0.000.007.408	4400	4400	88	0	0
1	006	2:30:28.539.970.957	0:0:0.000.007.407	4400	4400	88	0	0
1	007	2:30:28.539.978.365	0:0:0.000.007.408	4400	4400	88	0	0
1	008	2:30:28.539.985.772	0:0:0.000.007.407	4400	4400	88	0	0
1	009	2:30:28.539.993.180	0:0:0.000.007.407	4400	4400	88	0	0
1	010	2:30:28.540.000.587	0:0:0.000.007.408	4400	4400	88	0	0
1	011	2:30:28.540.007.995	0:0:0.000.007.407	4400	4400	88	0	0
1	012	2:30:28.540.015.402	0:0:0.000.007.407	4400	4400	88	0	0

6.2 Running a video analysis test

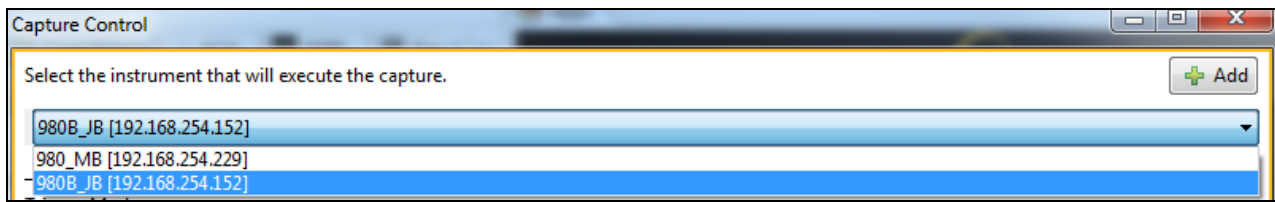
The procedures below describe how to run the video analysis test on an HDMI source device through the 980 Manager. The **Video Analysis** panel enables you to view the captured video images. It provides thumbnails of each captured frame. It also enables you to navigate to the **Data Decode** panel to view the transactions for that frame. The **Video Analysis** panel can synchronize with the **Data Decode** panel by pressing the ALT key and clicking on a frame. You can also synchronize by activating the sync button  on the upper left side of the **Data Decode** panel. Once you synchronize the **Data Decode** panel to a frame you can view the transactions for that frame in the **Data Decode** panel.

The setup procedures described above in the section: [Analyzing HDMI Data with your 980 Protocol Analyzer](#) should be followed for the video analysis tests. These setup procedures are listed below:

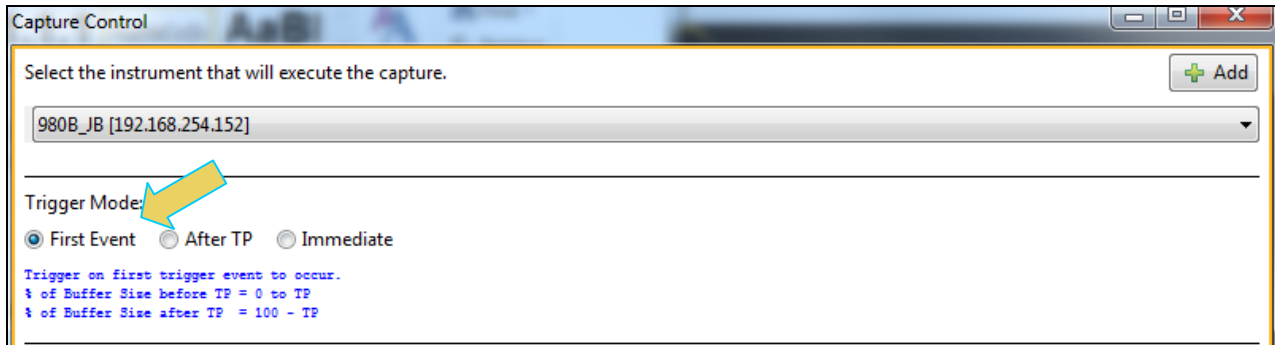
1. Set the threshold of the +5V.
2. Configure the 980 Rx port with the proper EDID.

To run the video analysis test:

1. Select the 980 HDMI 2.0 Protocol Analyzer that you are using to capture the data from your HDMI source device under test from the pull-down menu.



2. Set the Video Trigger mode using the information provided below. Note that typically for a Video Timing test you would select First Event.

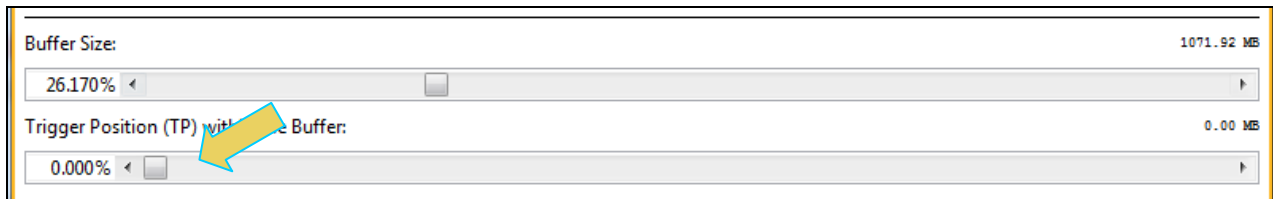


First Event – The trigger occurs on the first event—first occurrence—of the trigger condition defined in the Trigger Type pull-down menu (Vsync, encryption Enabled, Encryption Disabled, External Trigger, Manual Trigger, TMDS Clock Change). Depending on the setting of the Trigger Position slide bar, you may have some of the captured data in the buffer that accumulated prior to the trigger condition and some of the captured data in the buffer that accumulated after the trigger condition. At the left most position there will be no data in the capture buffer that occurred prior to the trigger event. At the right most position, all the data in the capture buffer will be data that accumulated prior to the trigger event. Because the trigger condition could be met quite quickly, the capture buffer may not be filled to the amount specified in Buffer Size.

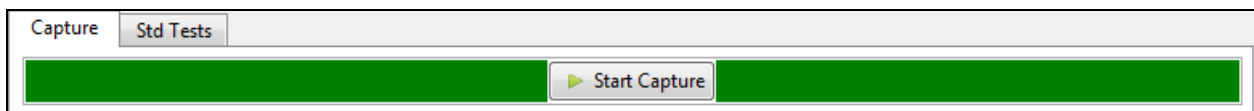
After TP (Trigger Position) – In this setting the trigger condition specified in the Trigger Type pull-down menu will be ignored until data has accumulated in the capture buffer up to the point where the Trigger Position slide-bar is set. Once the data has accumulated to the setting of the Trigger Position, any event matching the Trigger Type specified will cause a trigger condition and data accumulation will begin. Some of the data in the capture buffer will be data that has accumulated prior to the trigger condition being met and some of the data in the capture buffer will be data that has accumulated after the trigger condition was met. This setting will ensure that the capture buffer is filled to the Buffer Size setting.

Immediate – Data capture begins accumulating immediately when the Start Capture button is activated. Data capture halts when buffer is filled. This setting will not provide any capture history, i.e. none of the captured data accumulated in the capture buffer will be data that occurred prior to the capture trigger event (activating the Start Capture button).

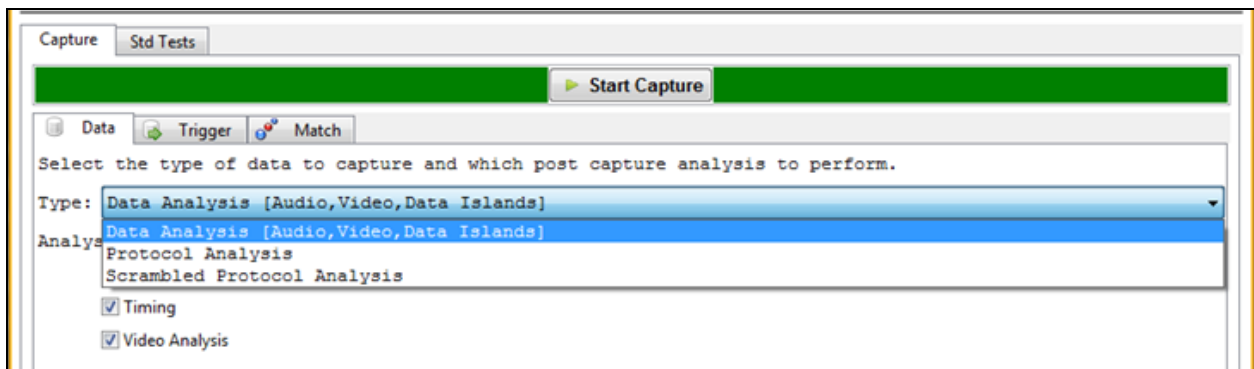
1. Set the **Capture Buffer Size** sidebar to a percent value to meet your requirements. You can capture up to about 4GB of data which is about 2300 frames at 576p/480p and about 400 frames at 1080p which includes the video. If you do not want to capture the video and only capture the metadata, you can store well over 200,000 frames of data.



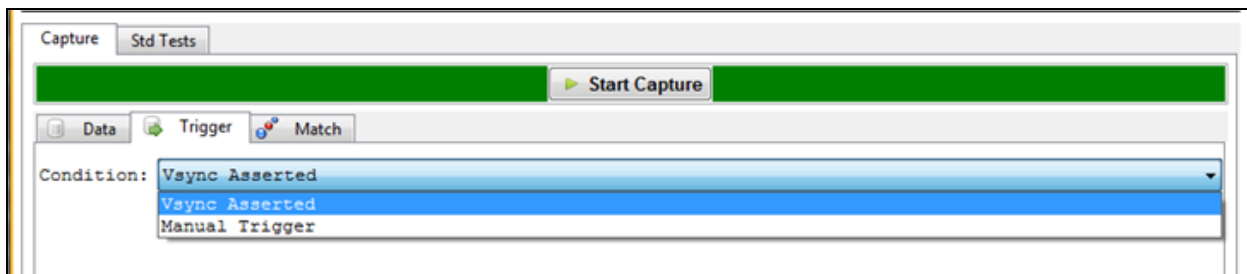
3. Set the **Capture Buffer Position** sidebar to a percent value to meet your requirements. This slide bar enables you to set the position of the trigger event within the captured data. This is a sidebar that provides an indication (on the right) of the location within the captured data, expressed as a percent with 0% indicating that the trigger event occurs at the beginning of the captured data and 100% indicating that the trigger event occurs at the end of the captured data.
4. Select the **Capture** tab under the **Options** section of the **Capture Control** panel.



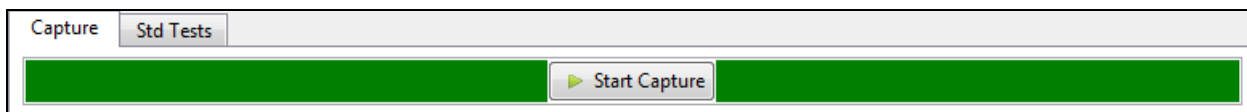
5. Select Data Analysis (Audio, Video, Data Islands) in the **Data Selection Type** pull-down menu provided as shown below. Then make sure you check the **Video Analysis** check box.



6. Select Vsync Asserted for the **Trigger Selection** condition.

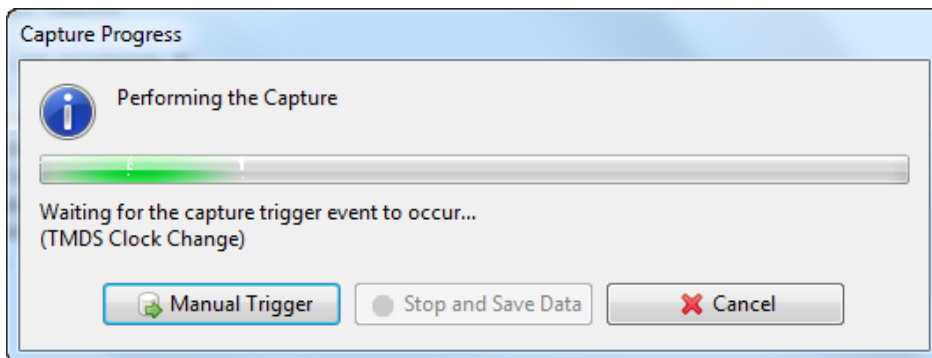


7. Click on the **Execute Capture** button to initiate the test.

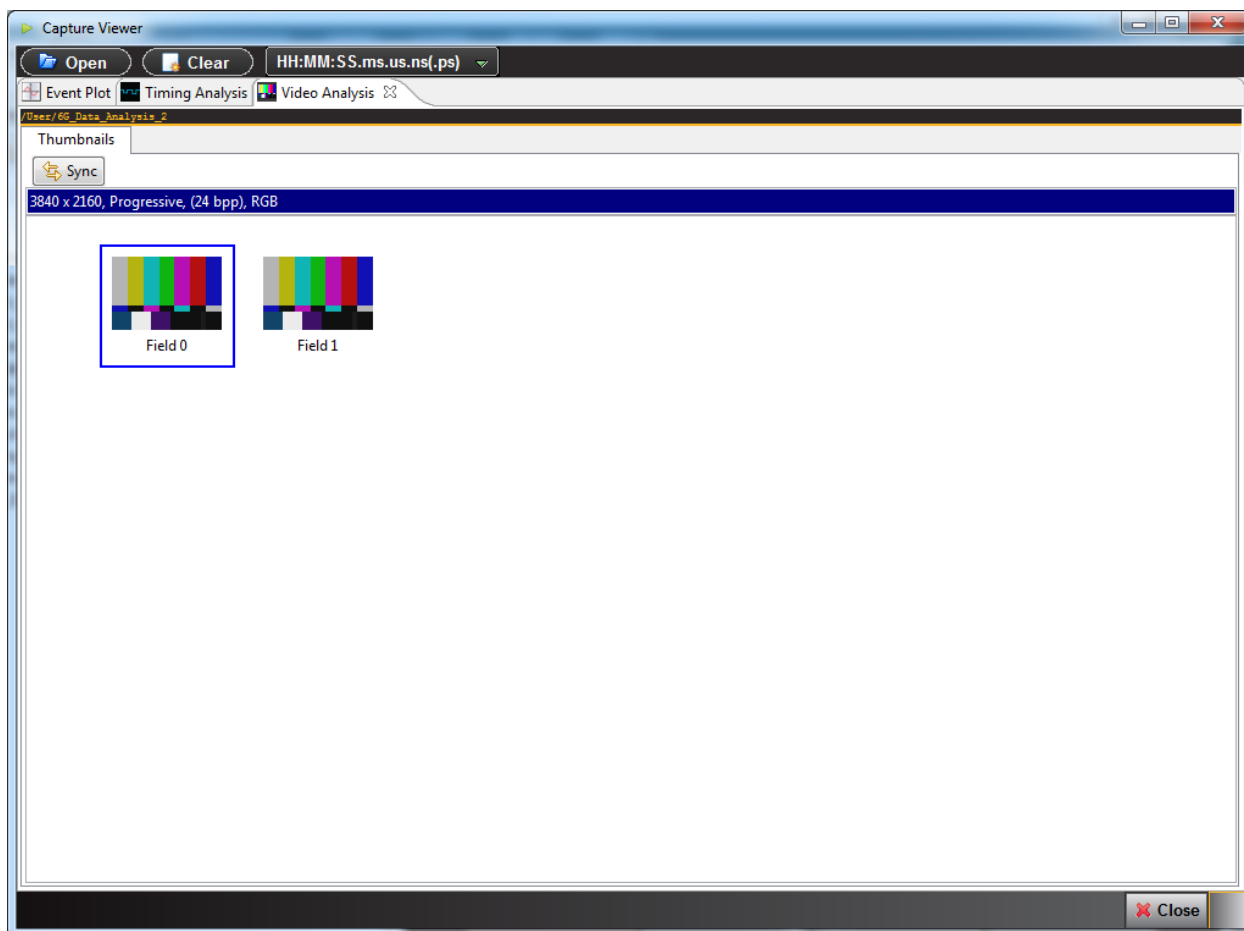


The 980 HDMI 2.0 Protocol Analyzer will capture the data including the video data. A series of dialog boxes will appear showing the capturing in progress (one example shown below).

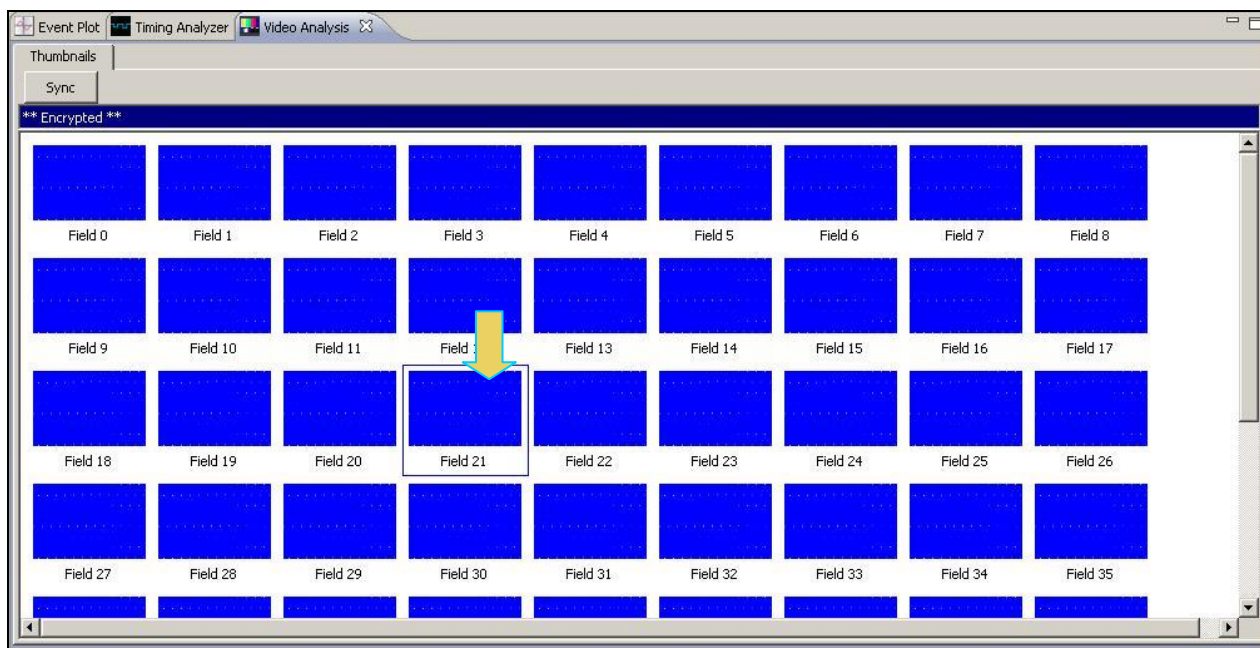
Note: If there is some action that needs to be taken by a user in order to cause the trigger condition occur, the capture dialog box will indicate that. This is shown in the following screen shot.



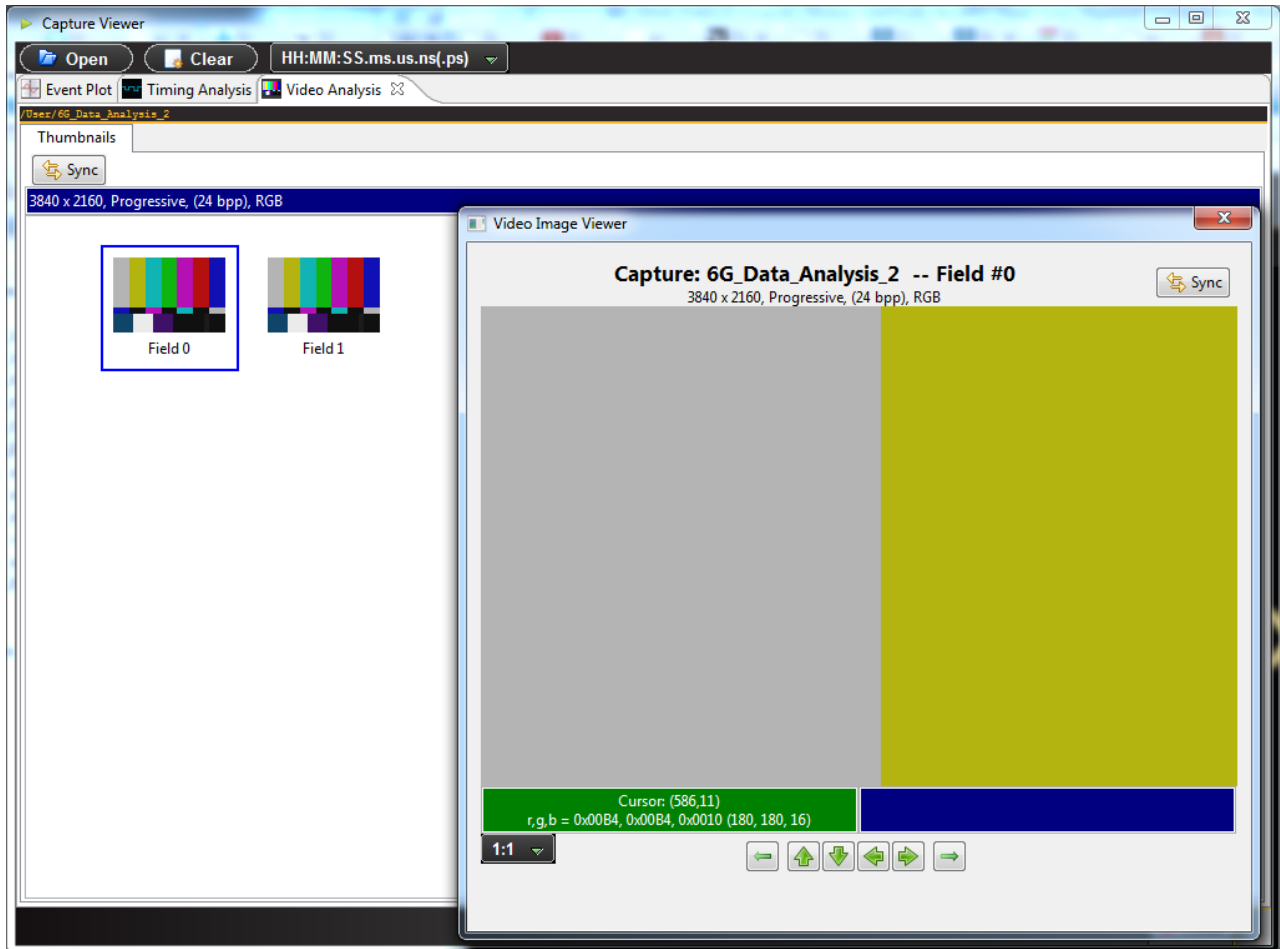
When the 980 HDMI 2.0 Protocol Analyzer is done capturing data you can view the video thumbnails in the **Video Analysis** panel. The **Video Analysis** panel enables you to view the captured video images. It provides thumbnails of each captured frame.



Note: You cannot view video frames of video that is encrypted with HDCP. The **Video Analysis** will show blue thumbnails and the word “Encrypted” will be shown in the upper left corner of the panel as shown below.



8. View the pixel values of any frame by double clicking on any frame to open up the **Video Image Viewer** panel (shown below).



The **Video Analysis** panel enables you view the video pattern or content for a frame in full size by simply double clicking on a frame. Once you have activated the full view of a frame in the **Video Image Viewer** panel you can view the pixel values for any pixel by moving your mouse over the pattern.

You can view the pixel value by clicking on an area on the image (Marker) and/or by moving the mouse cursor over the image (Cursor). In the example below the Cursor is over pixel (x=684, y=223) and the Marker is set on pixel (x=380, y=198). If the color space is YCbCr the Video Image Viewer will show these values and indicate the color space. Deep color values are also shown in either YCbCr or RGB color space.

You can advance to an adjacent pixel (up/down or left/right) using the thick green arrow buttons



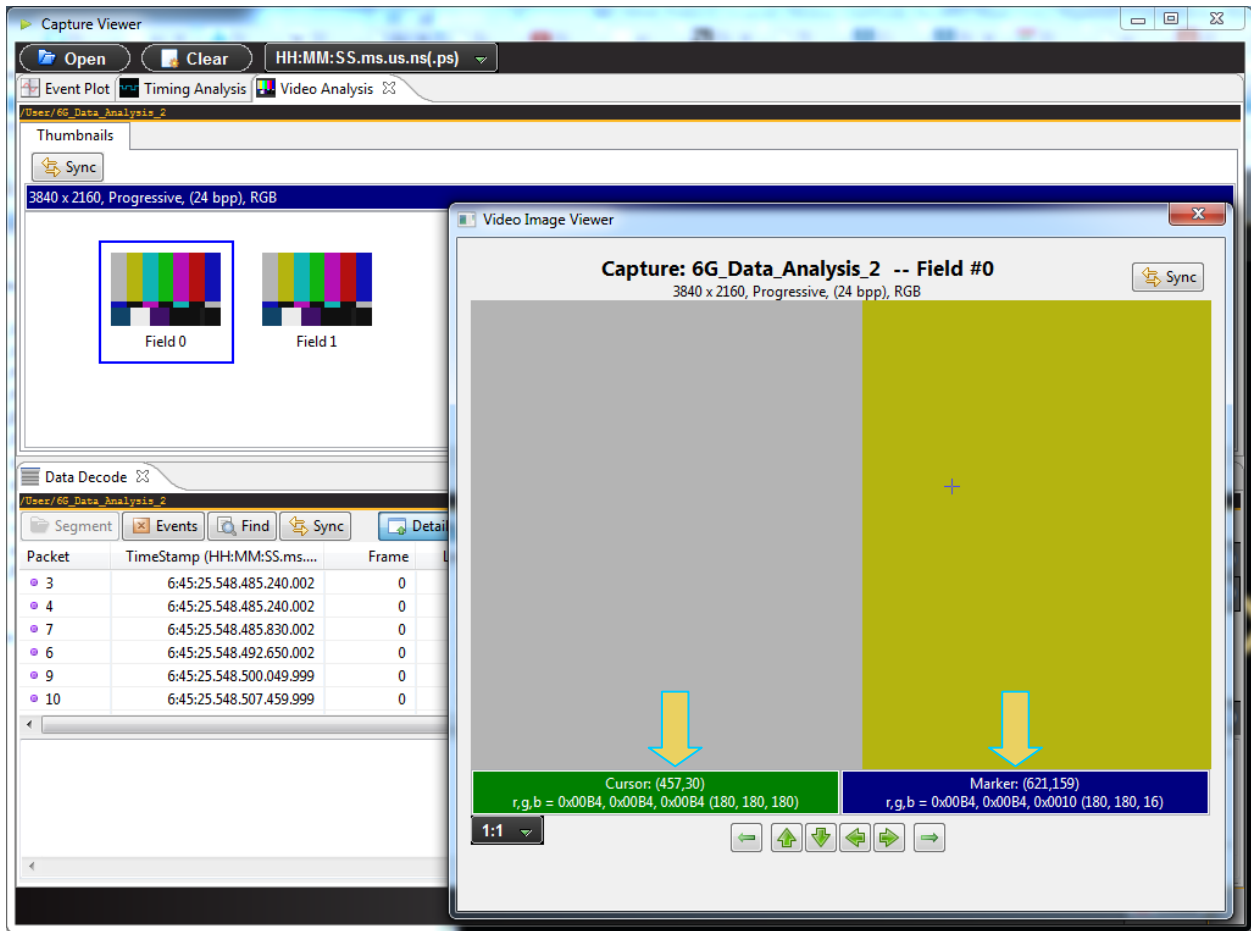
on the bottom of the **Video Image Viewer** panel.

You can advance to the image of an adjacent frame (earlier or later) using the thin green arrow buttons




on the bottom of the **Video Image Viewer** panel.

These are shown in the screen image below.



Navigate to the **Data Decode** panel by first synchronizing the **Data Decode** Panel to the **Video Analysis** panel and then activating the **Data Decode** panel. The **Video Analysis** panel is shown in the screen image below.

The **Video Analysis** panel can synchronize with the **Data Decode** panel by pressing the ALT key and clicking on a frame. You can also synchronize by activating the sync button  on the upper left side of the **Data Decode** panel.

6.3 Audio Analysis

The **Audio (Data) Analysis** feature enables you to detect inconsistencies in the metadata relating to the sampling rate and the audio clock regeneration values. The following items are listed and/or verified during the test:

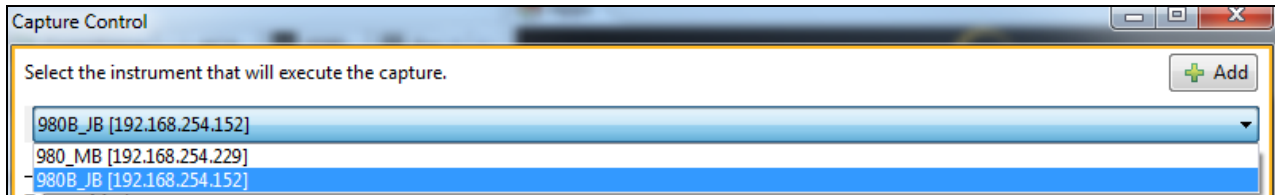
- Sampling rate shown in the Audio Infoframe.
- Sampling size (bit depth) in the Audio Infoframe.
- Channel count in the Audio Infoframe.
- N and CTS values in the Audio Clock Regeneration packets.
- Audio type listed in the Channel Status Blocks.
- Sampling frequency in the Channel Status Blocks.
- Original sampling frequency listed in the Channel Status Blocks.
- Channel count listed in the Channel Status Blocks.
- Sampling rate calculated from the audio samples.
- Rate that the ACR packets are transmitted.

The setup procedures described above in the section: [Analyzing HDMI Data with your 980 Protocol Analyzer](#) should be followed for the audio analysis tests. These setup procedures are listed below:

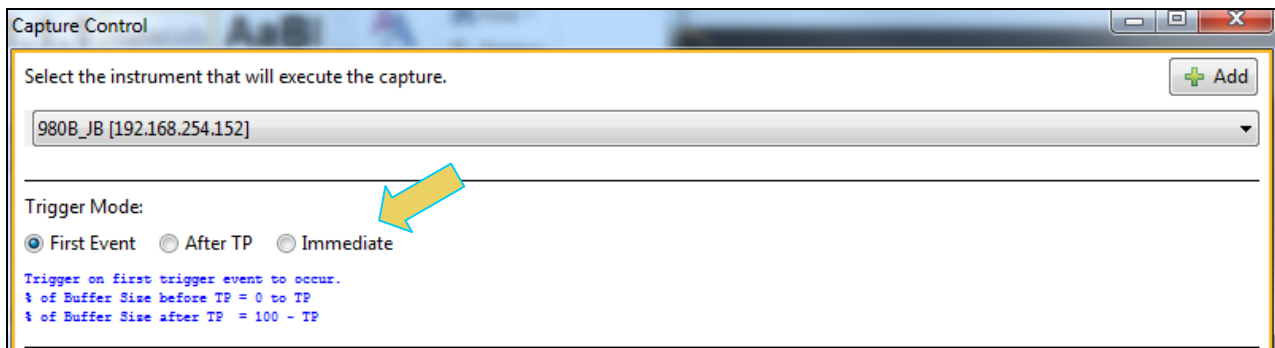
1. Set the threshold of the +5V.
2. Configure the 980 HDMI 2.0 Protocol Analyzer Rx port with the proper EDID.

To run the audio analysis test:

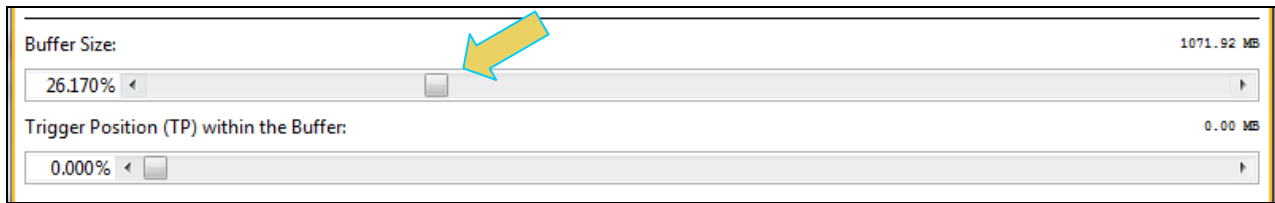
2. Select the 980 that you are using to capture the data from your HDMI source device under test.



3. Set the Video Trigger mode using the information provided below. Note that typically for a Video Timing test you would select First Event.

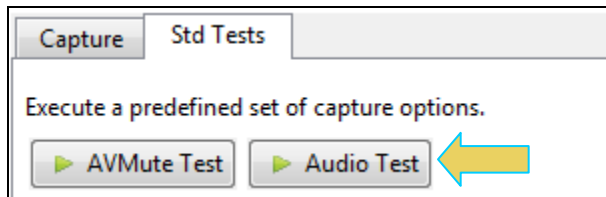


4. Set the **Capture Buffer Size** slidebar to a percent value to meet your requirements. You can capture up to 4GB of data which is about 2300 frames at 576p/480p and about 400 frames at 1080p which includes the video. If you do not want to capture the video and only capture the metadata, you can store well over 200,000 frames of data.



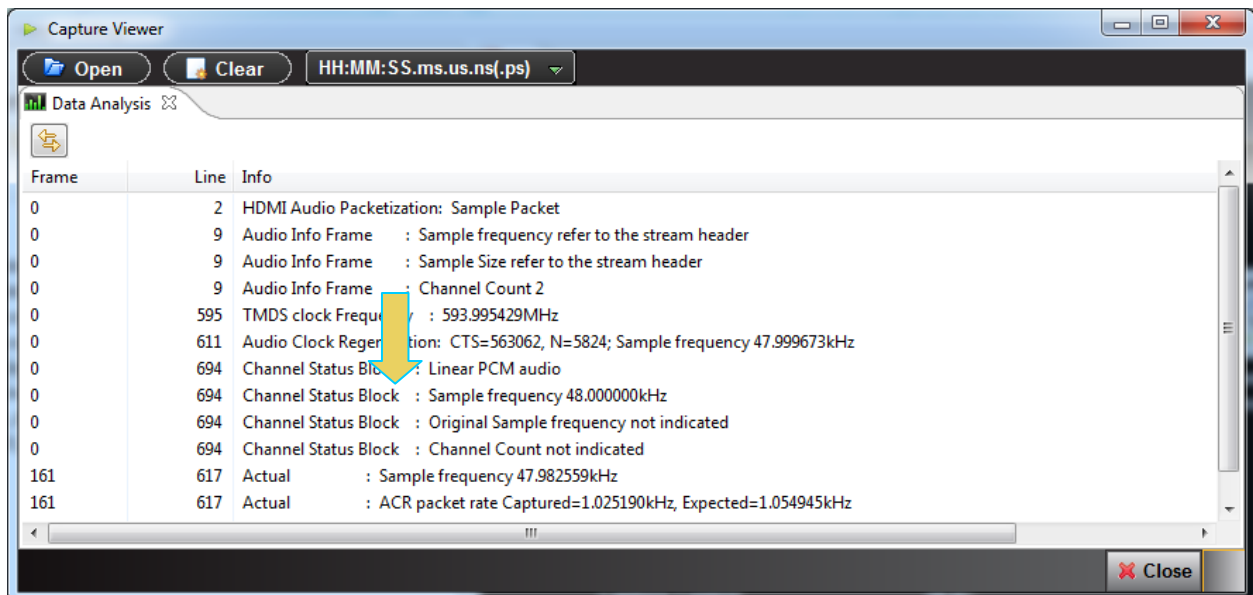
Note: You do not need to set the **Trigger Position** or the **Trigger Selection** when running the **Audio Analysis** test. The Trigger Position is always reset to 0% and the **Trigger Selection** is set to Vsync. These settings occur as part of the test when you initiate the test.

5. Select the **Std Tests** tab under the **Options** section of the **Capture Control** panel (below).



6. Click on the Audio Test to initiate the Audio Analysis test.

The results are shown in the **Data Analysis** panel in the main window of the 980 Manager. A sample is shown below.



7 Auxiliary Channel Analyzer (ACA) Utilities

The Auxiliary Channel Analyzer (**ACA**) utilities enables you to view the DDC and CEC traffic for HDMI streams and the C-Bus traffic for MHL streams in real time or from stored real time files. For HDMI, you can view the HDCP authentication transactions (future), EDID exchanges and CEC messages either through the embedded 980 GUI (or the external 980 GUI with release 4.9.35 or later).

Note: Monitoring HDCP transactions is currently not supported. This feature is planned for a future release.

There are three (3) Auxiliary Channel Analyzer utilities:

- **Auxiliary Channel Analyzer** – Used for real time viewing auxiliary channel HDMI data through the embedded 980 GUI Manager.
- **ACA Remote Control** - Used for viewing auxiliary channel HDMI data through the *external* 980 GUI Manager. This application operates in sync with the Aux Channel Analyzer on the embedded display.
- **ACA Data Viewer** - Used for viewing previously captured auxiliary channel data. You can view saved these ACA traces and disseminate them to colleagues at other locations. These colleagues can then use the ACA Data Viewer utility off-line without a 980 test instrument to view these transactions.

The look and feel of each utility is somewhat different.

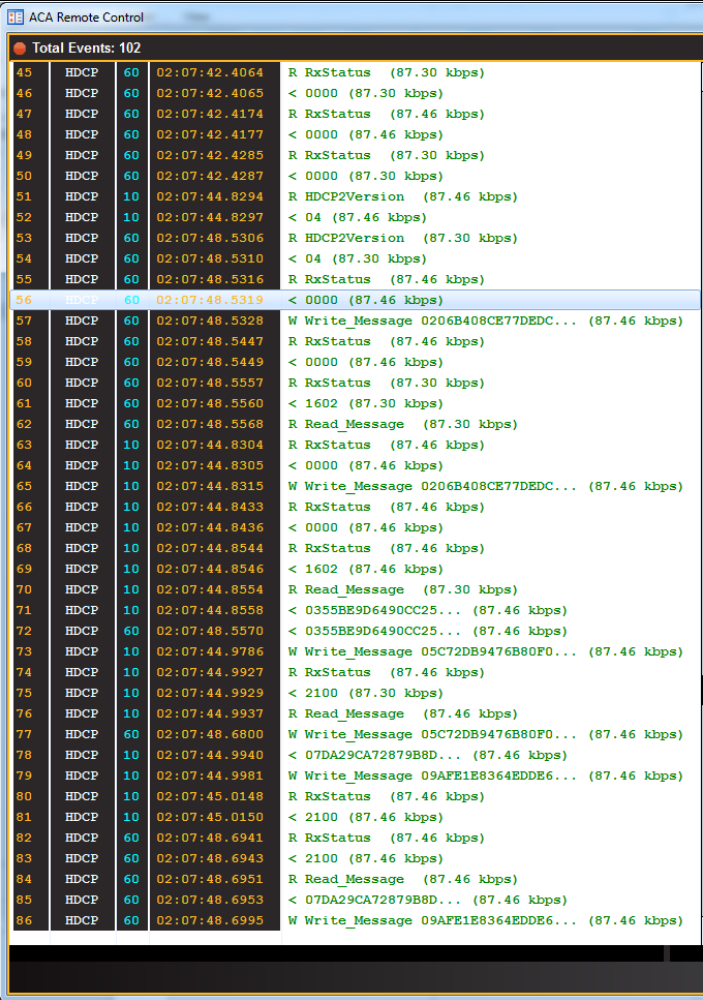
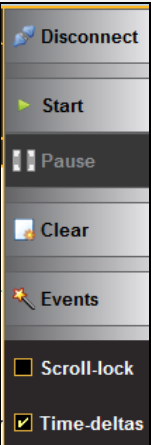
7.1 Aux Channel Analyzer and ACA Remote Control – For Real Time Viewing of HDMI Aux Channel Data

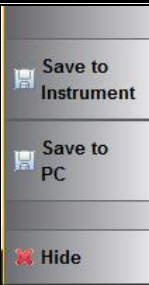
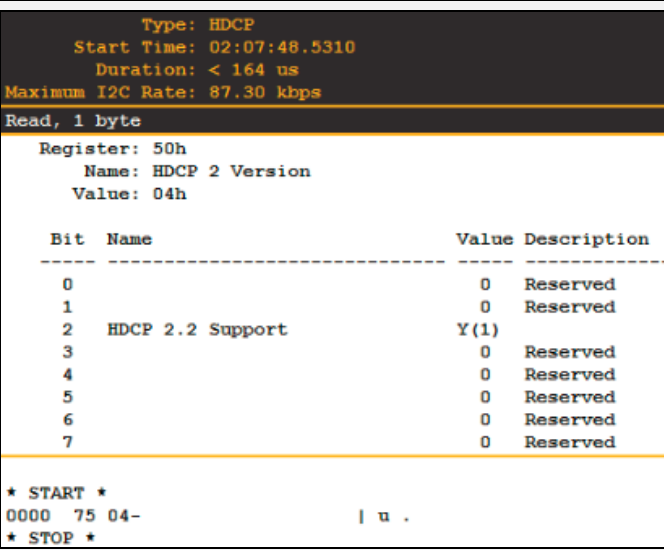

This subsection describes the **Aux Channel Analyzer** utility and the ACA Remote Control utility used for viewing the real time DDC and CEC transactions through the 980 GUI Manager.

7.1.1 Aux Channel Analyzer – Panel Description

The Aux Channel Analyzer panel is described in the table below. There is a control menu panel on the right side. The control menu and elements of the ACA panel are described in the following table.

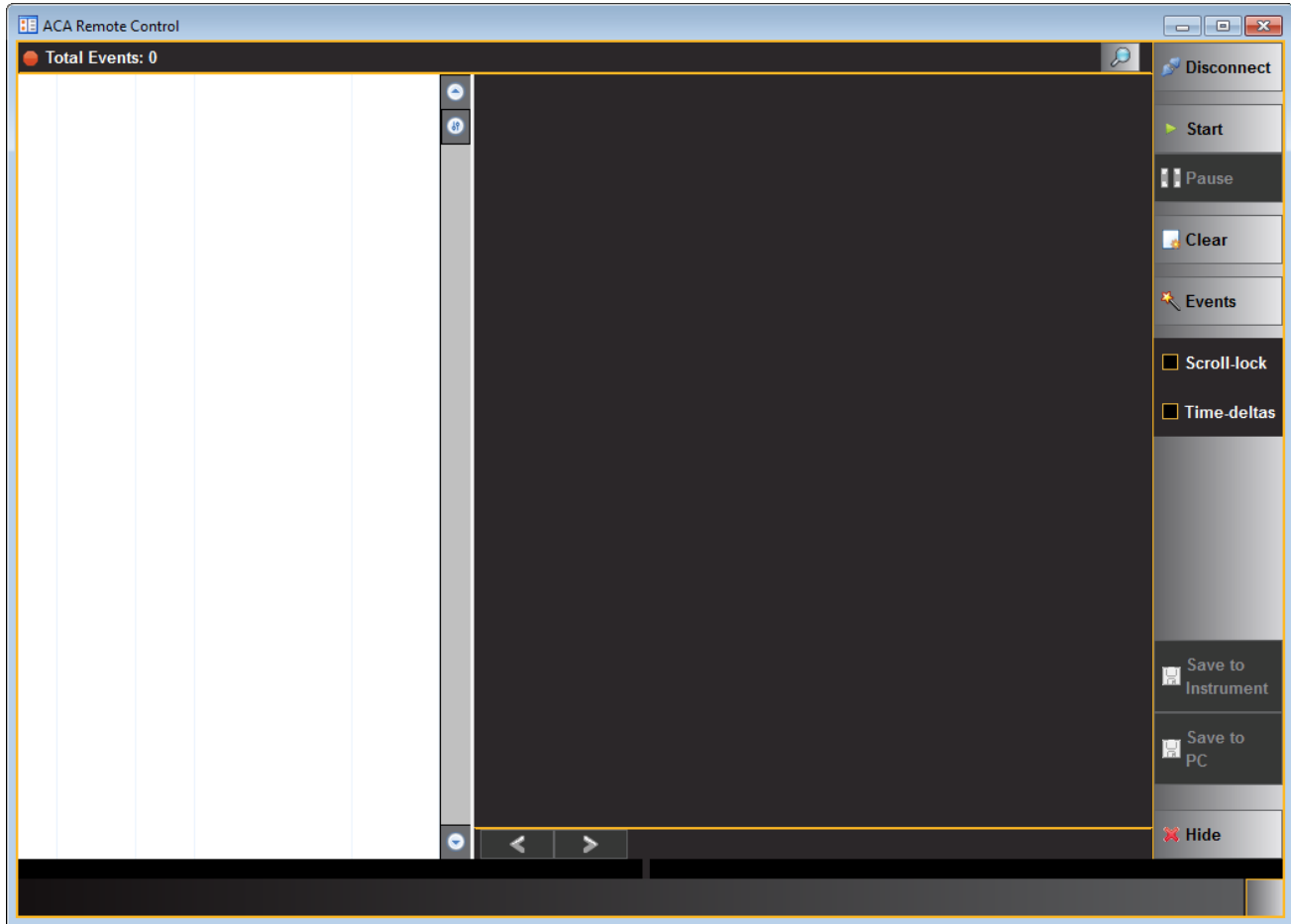
Real Time – ACA	Information / Function
Auxiliary Channel Analyzer	<p>The following information is provided in the ACA data dialog box for each Event:</p> <ul style="list-style-type: none"> ▪ Item number – This is a unique sequence number of the transaction. ▪ Type – The type of DDC transaction; either EDID, or HDCP. ▪ 980 Port number, slot number. ▪ Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the 980 system clock or relative time (Time -deltas) referenced from the initial transaction in the trace. ▪ Transaction Description – A description of the

Real Time – ACA	Information / Function																																																																																																																																																																																																																		
 <p>ACA Remote Control</p> <p>Total Events: 102</p> <table border="1"> <tr><td>45</td><td>HDCP</td><td>60</td><td>02:07:42.4064</td><td>R RxStatus (87.30 kbps)</td></tr> <tr><td>46</td><td>HDCP</td><td>60</td><td>02:07:42.4065</td><td>< 0000 (87.30 kbps)</td></tr> <tr><td>47</td><td>HDCP</td><td>60</td><td>02:07:42.4174</td><td>R RxStatus (87.46 kbps)</td></tr> <tr><td>48</td><td>HDCP</td><td>60</td><td>02:07:42.4177</td><td>< 0000 (87.46 kbps)</td></tr> <tr><td>49</td><td>HDCP</td><td>60</td><td>02:07:42.4285</td><td>R RxStatus (87.30 kbps)</td></tr> <tr><td>50</td><td>HDCP</td><td>60</td><td>02:07:42.4287</td><td>< 0000 (87.30 kbps)</td></tr> <tr><td>51</td><td>HDCP</td><td>10</td><td>02:07:44.8294</td><td>R HDCP2Version (87.46 kbps)</td></tr> <tr><td>52</td><td>HDCP</td><td>10</td><td>02:07:44.8297</td><td>< 04 (87.46 kbps)</td></tr> <tr><td>53</td><td>HDCP</td><td>60</td><td>02:07:48.5306</td><td>R HDCP2Version (87.30 kbps)</td></tr> <tr><td>54</td><td>HDCP</td><td>60</td><td>02:07:48.5310</td><td>< 04 (87.30 kbps)</td></tr> <tr><td>55</td><td>HDCP</td><td>60</td><td>02:07:48.5316</td><td>R RxStatus (87.46 kbps)</td></tr> <tr><td>56</td><td>HDCP</td><td>60</td><td>02:07:48.5319</td><td>< 0000 (87.46 kbps)</td></tr> <tr><td>57</td><td>HDCP</td><td>60</td><td>02:07:48.5328</td><td>W Write_Message 0206B408CE77DED... 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<p>ACA Control Menu</p>  <ul style="list-style-type: none"> Disconnect Start Pause Clear Events Scroll-lock Time-deltas 	<p>There is a menu associated with the ACA Remote Control Info panel. It is location on the right side of the panel:</p> <ul style="list-style-type: none"> Disconnect – Navigates you back to the Home menu screen of the embedded 980 GUI Manager. Start/Stop – Starts and Stops the collection of DDC data. Resume/Pause – Halts the updates of the data to the ACA panel. Events – Shows or hides events enabling you to configure what events you see in the real time panel. Clear – Clears the ACA trace panel. 																																																																																																																																																																																																																		

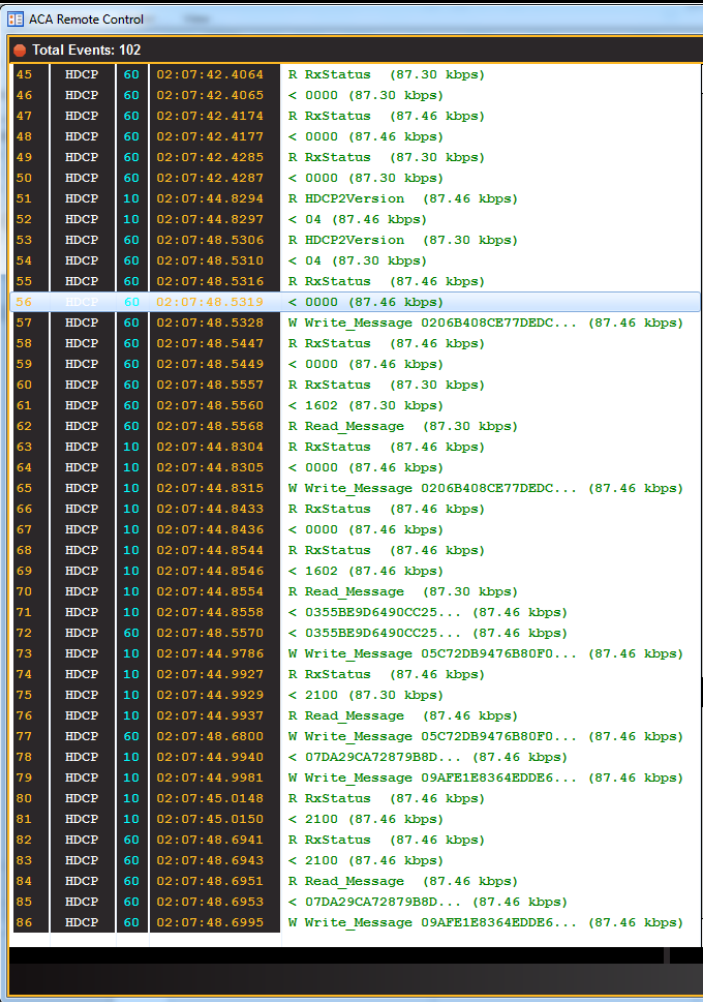
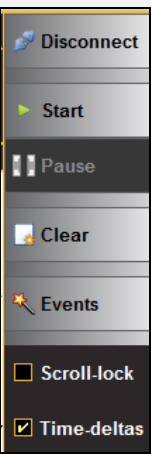
Real Time – ACA	Information / Function
	<ul style="list-style-type: none"> Events – Opens up the Events dialog box. Scroll – Stops the trace files from scrolling. Save to Instrument – Saves the file to the 980 system that the host PC is connected to. Save to PC – Saves a current trace file to the Host PC.
 <pre> Type: HDCP Start Time: 02:07:48.5310 Duration: < 164 us Maximum I2C Rate: 87.30 kbps Read, 1 byte Register: 50h Name: HDCP 2 Version Value: 04h Bit Name Value Description ----- 0 0 Reserved 1 0 Reserved 2 HDCP 2.2 Support Y(1) 3 0 Reserved 4 0 Reserved 5 0 Reserved 6 0 Reserved 7 0 Reserved * START * 0000 75 04- u . * STOP * </pre>	<p>The following information is provided in the ACA Event Details dialog box:</p> <ul style="list-style-type: none"> Type – The type of event, one of HDCP, EDID. Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. Duration – The duration in milliseconds of the transaction. Maximum I2C Rate – The rate that the DDC channel clock is operating. Details (text) – The contents of the transaction in human readable text. Details (hex) – The contents of the transaction in hex data.
	<p>There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows:</p> <ul style="list-style-type: none"> Left arrow – The left arrow allows you to see the details of the next transaction. Right arrow – The right arrow allows you to see the details of the previous transaction. Status field – Shows the sequence number and the description of the selected transaction.

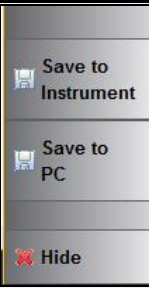
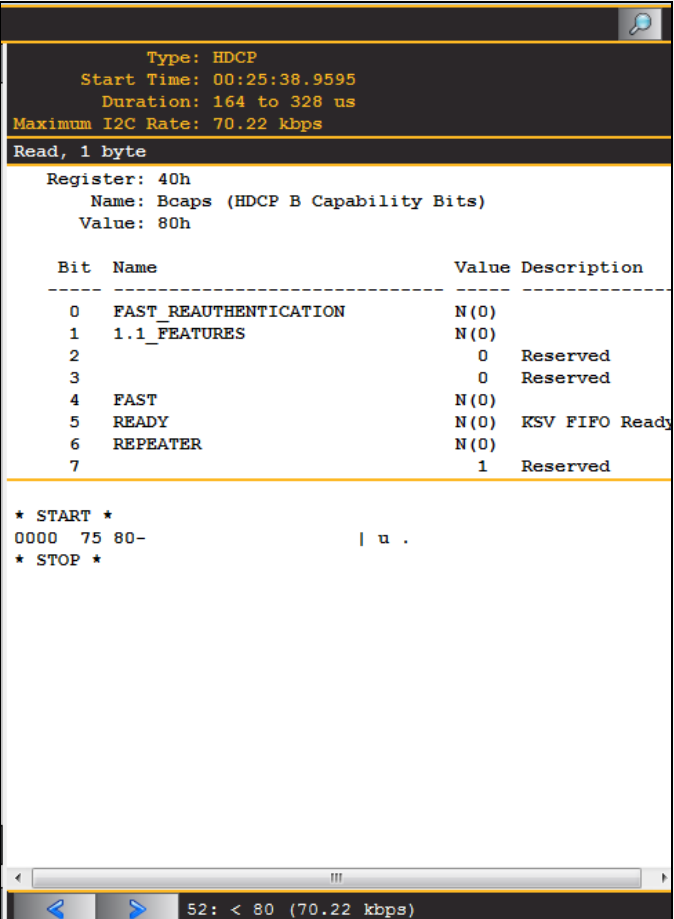
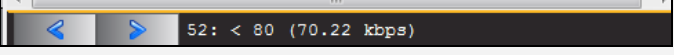
7.1.2 ACA Remote Control – Panel Description

The ACA Remote Control panel is described in the table below. The GUI elements differ somewhat from the embedded Aux Channel Analyzer. The ACA Remote Control main screen is shown below.



ACA Remote Control	Information / Function
<p>Auxiliary Channel Analyzer</p>	<p>The following information is provided in the ACA data dialog box for each Event:</p> <ul style="list-style-type: none"> ▪ Item number – This is a unique sequence number of the transaction. ▪ Type – The type of DDC transaction; either EDID, HDCP. ▪ 980 Card number, Interface number ▪ Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the 980 system clock or relative time (Time -deltas) referenced from the initial transaction in the

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<p>ACA Control Menu</p> 	<p>There is a menu associated with the ACA Remote Control Info panel. It is location on the right side of the panel:</p> <ul style="list-style-type: none"> Disconnect – Navigates you back to the Home menu screen of the embedded 980 GUI Manager. Start/Stop – Starts and Stops the collection of DDC data. Resume/Pause – Halts the updates of the data to the ACA panel. Events – Shows or hides events enabling you to configure what events you see in the real time panel. Clear – Clears the ACA trace panel. Events – Opens up the Events dialog box. 																																																																																																																																																																																																																							

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	<ul style="list-style-type: none"> ▪ Scroll – Stops the trace files from scrolling. ▪ Save to Instrument – Saves the file to the 980 system that the host PC is connected to. ▪ Save to PC – Saves a current trace file to the Host PC. 																																				
<p>Details Panel</p>  <table border="1" data-bbox="203 840 820 1060"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>FAST_REAUTHENTICATION</td> <td>N(0)</td> <td></td> </tr> <tr> <td>1</td> <td>1.1_FEATURES</td> <td>N(0)</td> <td></td> </tr> <tr> <td>2</td> <td></td> <td>0</td> <td>Reserved</td> </tr> <tr> <td>3</td> <td></td> <td>0</td> <td>Reserved</td> </tr> <tr> <td>4</td> <td>FAST</td> <td>N(0)</td> <td></td> </tr> <tr> <td>5</td> <td>READY</td> <td>N(0)</td> <td>KSV FIFO Ready</td> </tr> <tr> <td>6</td> <td>REPEATER</td> <td>N(0)</td> <td></td> </tr> <tr> <td>7</td> <td></td> <td>1</td> <td>Reserved</td> </tr> </tbody> </table>	Bit	Name	Value	Description	0	FAST_REAUTHENTICATION	N(0)		1	1.1_FEATURES	N(0)		2		0	Reserved	3		0	Reserved	4	FAST	N(0)		5	READY	N(0)	KSV FIFO Ready	6	REPEATER	N(0)		7		1	Reserved	<p>The following information is provided in the ACA Event Details dialog box:</p> <ul style="list-style-type: none"> ▪ Type – The type of event, one of HDCP, EDID. ▪ Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. ▪ Duration – The duration in milliseconds of the transaction. ▪ Maximum I2C Rate – The rate that the DDC channel clock is operating. ▪ Details (text) – The contents of the transaction in human readable text. ▪ Details (hex) – The contents of the transaction in hex data.
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6	REPEATER	N(0)																																			
7		1	Reserved																																		
	<p>There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows:</p> <ul style="list-style-type: none"> ▪ Left arrow – The left arrow allows you to see the details of the next transaction. ▪ Right arrow – The right arrow allows you to see the details of the previous transaction. ▪ Status field – Shows the sequence number and the description of the selected 																																				

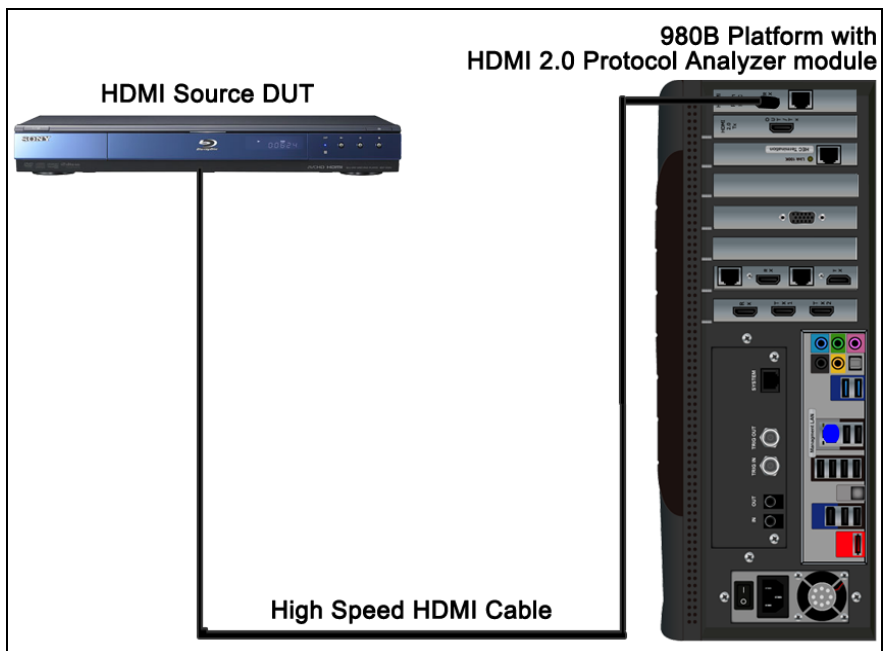
ACA Remote Control	Information / Function
	transaction.

7.1.3 Monitoring the HDMI auxiliary channels with the ACA utilities

This subsection describes the procedures for monitoring the auxiliary channel data through the 980 GUI Manager using the Aux Channel Analyzer real time utilities. You can monitor the HDMI DDC transactions in real time either while the 980 HDMI 2.0 Protocol Analyzer is emulating a sink device or you can monitor the transactions passively. Most of the screen examples are from the Aux. Channel Analyzer utility which is the embedded 980 GUI utility.

Use the following procedures to monitor the HDMI DDC transactions from an HDMI source device in real time. The procedures assume that the HDMI source device is powered up and connected to the 980 HDMI 2.0 Protocol Analyzer Rx port. The procedure also assumes that the 980 HDMI 2.0 Protocol Analyzer is in the HDMI mode.

The following diagrams depict the test setups.



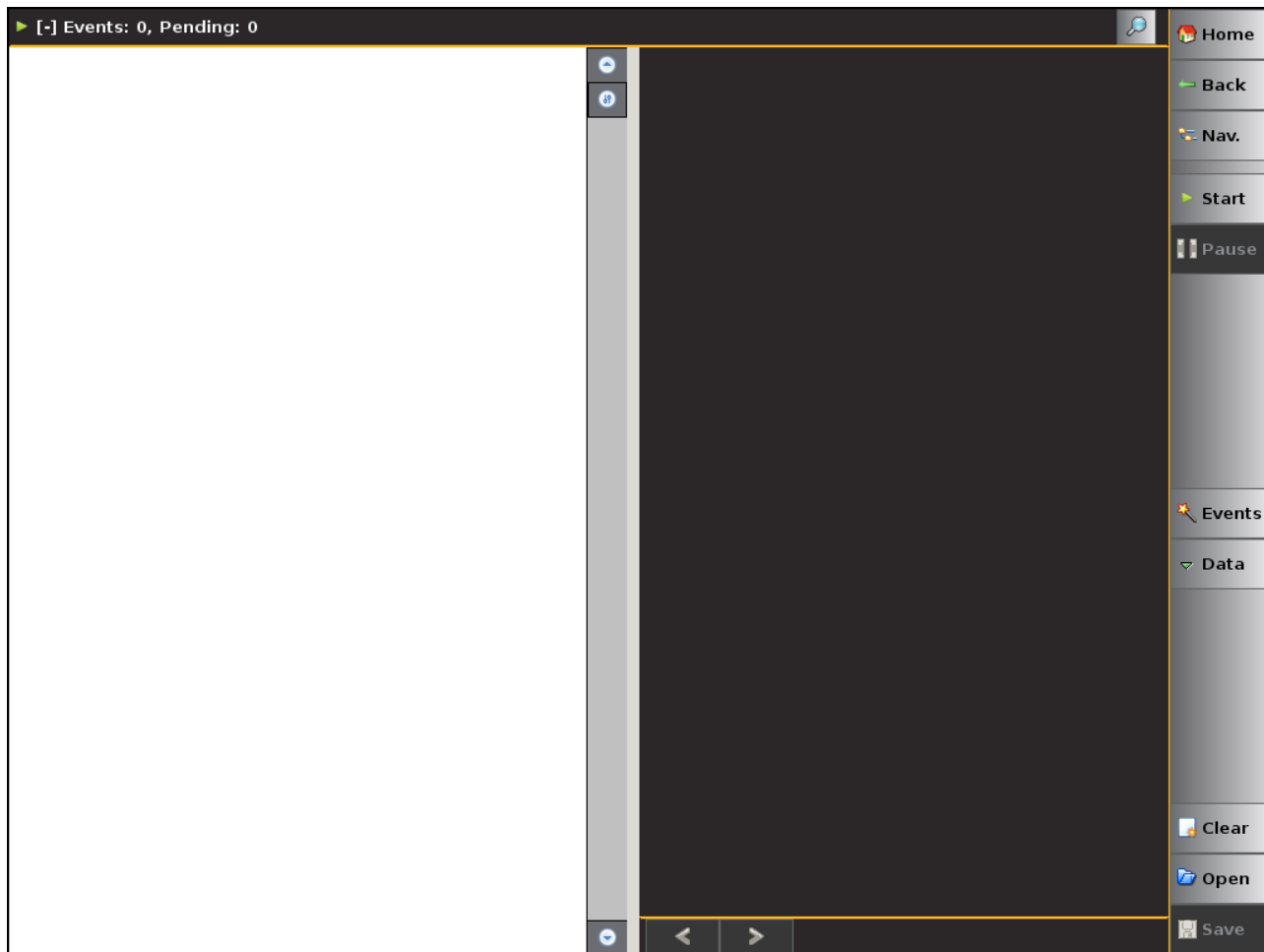
Connection for HDMI sink emulation – 980B


To monitor the HDMI DDC transactions:

1. Touch select the **Aux Channel Analyzer** on the page 1 of the **Apps** panel:

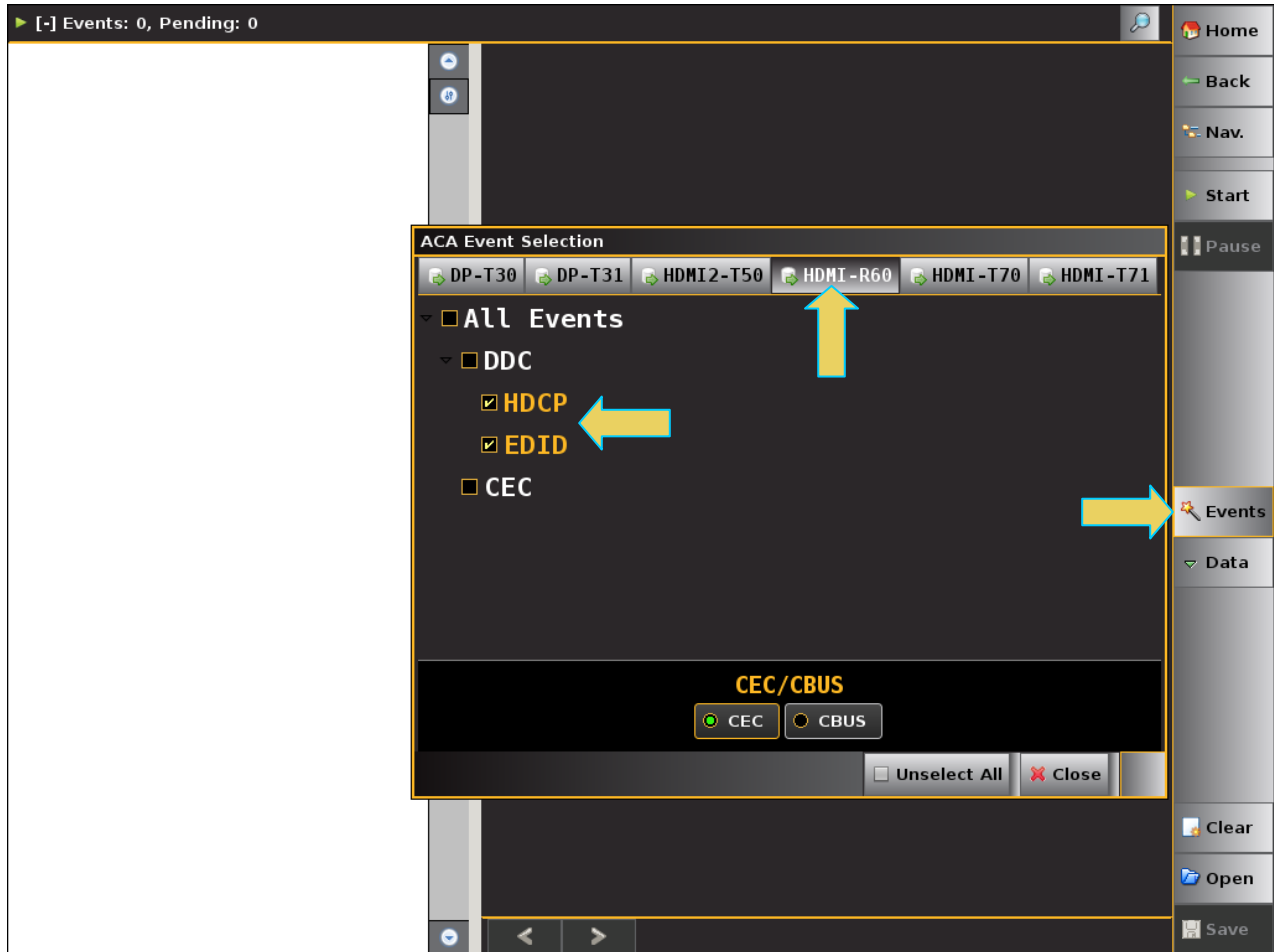


The **Aux Channel Analyzer** panel appears as shown below:




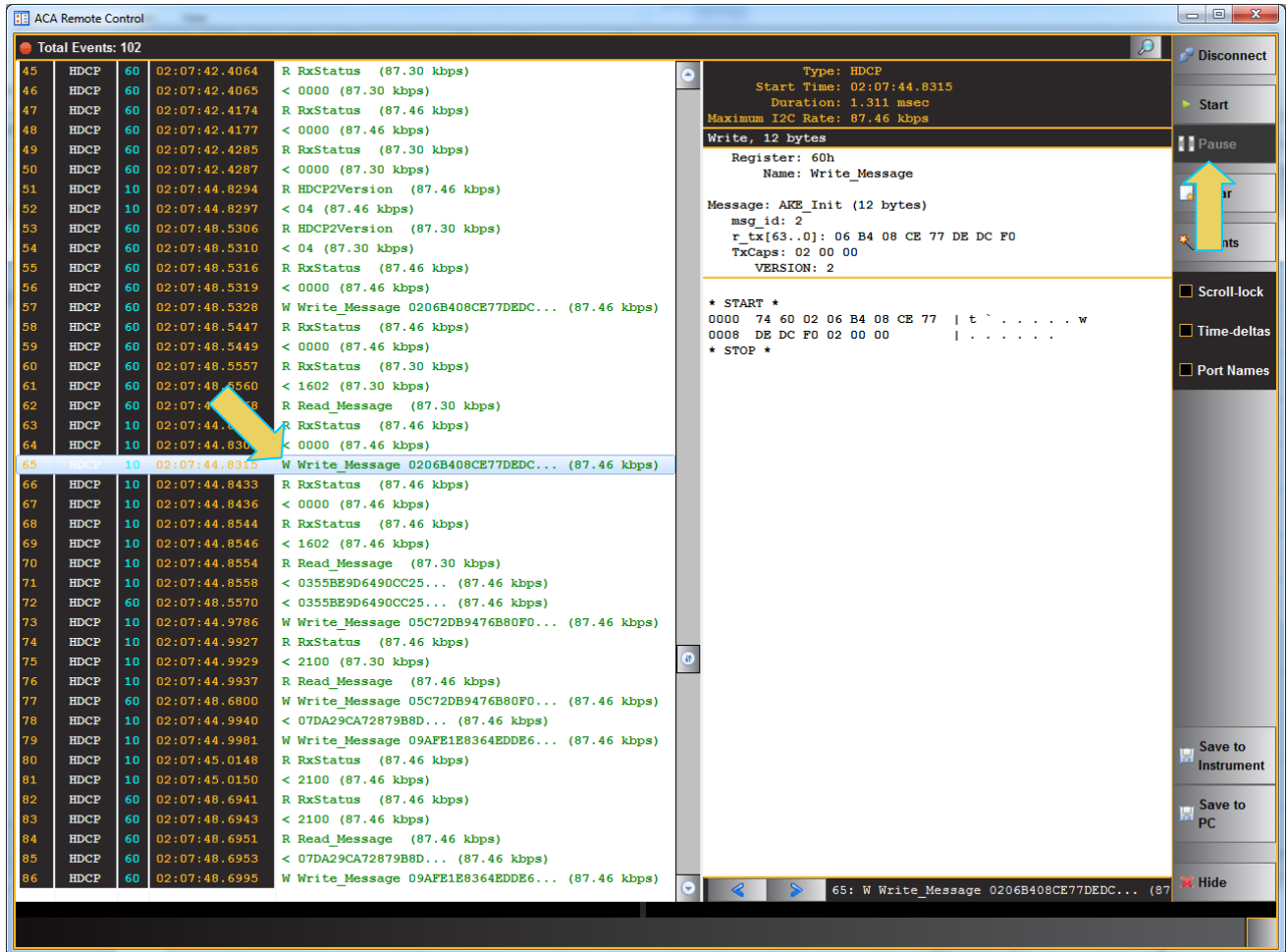
2. Select the event types that you wish to capture by touch selecting the **Events**  button on the **ACA** panel menu at the right. Refer to the screen example above.

The **ACA Event Selection** dialog box is shown below. You first need to select the tab associated with the physical module and interface you wish to monitor. The example below shows selecting the HDMI 2.0 Protocol Analyzer module in slot 6 interface 0 which is the HDMI Rx port. Note that only the HDCP and EDID items are selected. You can also specify selecting **All Events**. If you wish to view only a subset of the events deselect the **All Events** option and then select the specific event.




3. Take the necessary action—such as a hot plug—to initiate EDID or HDCP transactions from the HDMI source device. You will see the DDC transactions in the ACA panel as shown below.

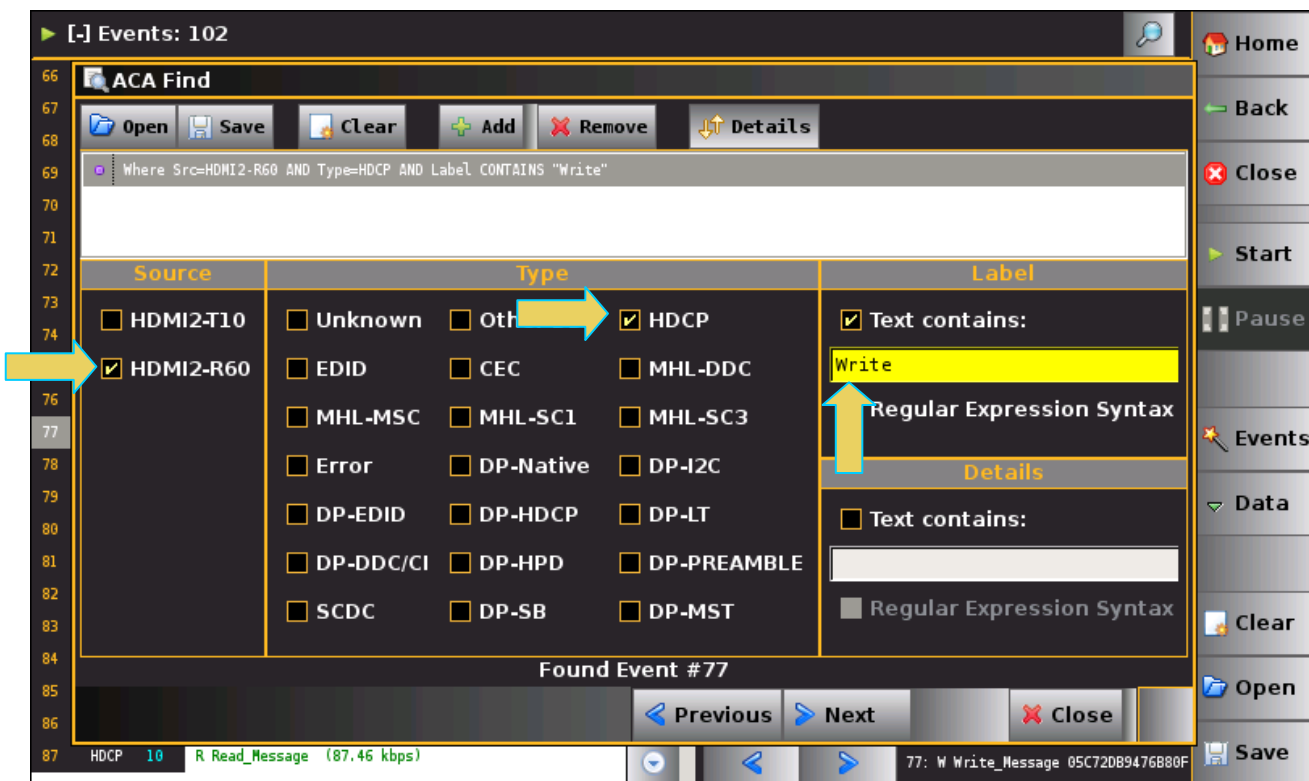
4. Touch select the **Start**  button on the ACA Menu panel on the right to initiate the viewing of the HDMI HDCP and EDID transactions. An example showing monitored data is shown below. You can stop or pause the collection at any time using the buttons on the ACA menu panel on the right. These are indicated in the screen example below.



5. Scroll through the data to find specific events. The scroll bars are indicated in the screen example above.
6. The **ACA Find** dialog box is accessible through the **Data** pop-out menu shown in the screen example below. The **ACA Find** function enables you to quickly locate different types of events.

- a) Click the **Add**  button to add a new search criteria.
- b) Select the Source which is the module.
- c) Define the search by selecting the Source, Type and any Text on the Event. HDMI2-R60 for the 980 HDMI 2.0 Protocol Analyzer module with HDCP in the dialog box example below.
- d) You can also search for specific text strings such as the word "Write" (case sensitive).

- e) Click **Previous** or **Next**  to locate the item in the transactions.



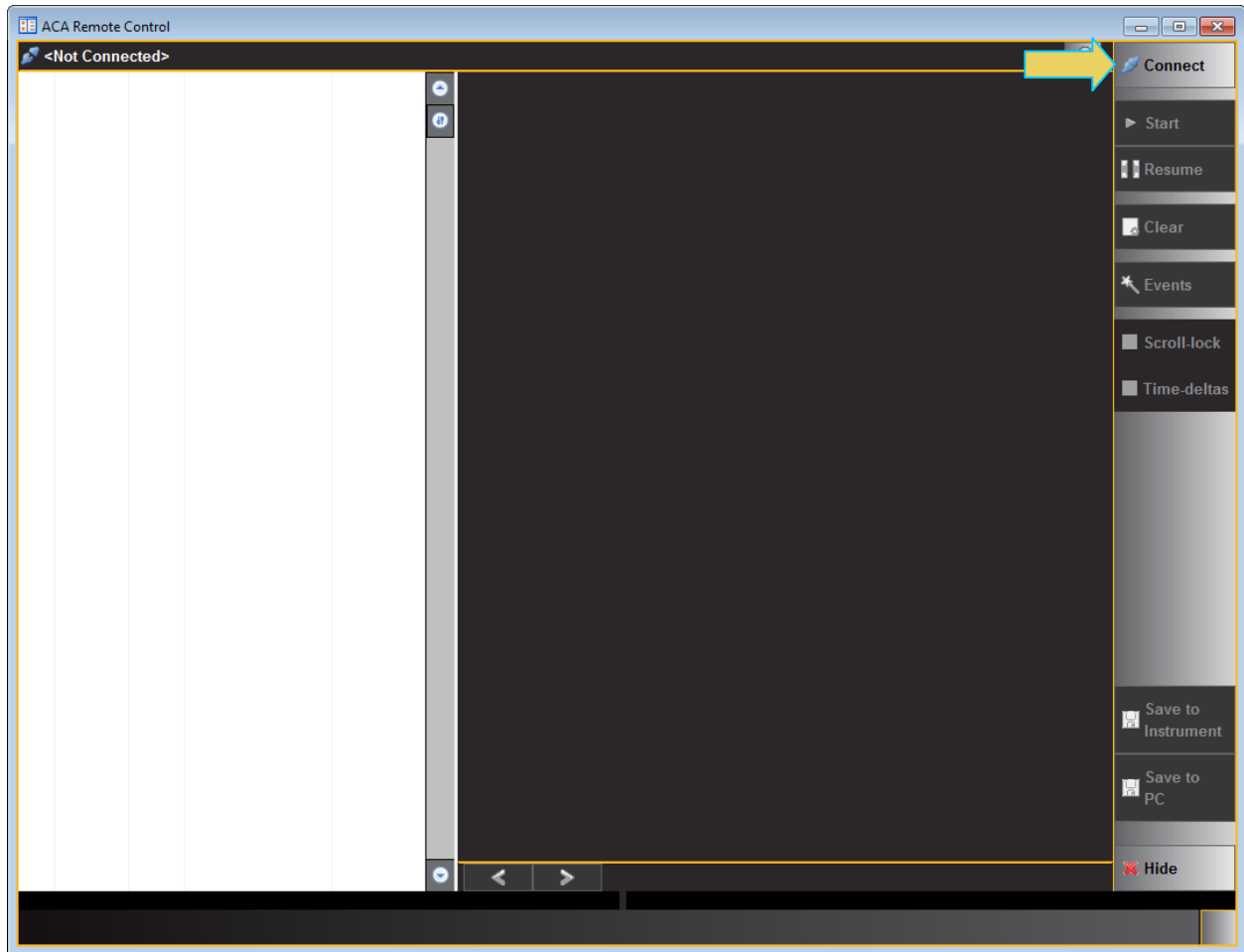
7.2 Monitoring Auxiliary Channel transactions from the External 980 GUI Manager with the ACA Remote Control panel

The ACA Remote Control panel enables you to view the ACA traces in real time from the external 980 GUI Manager. The ACA Remote Control tool operates in sync with the embedded ACA. The procedure between the two is essentially the same with a few differences in the screens.

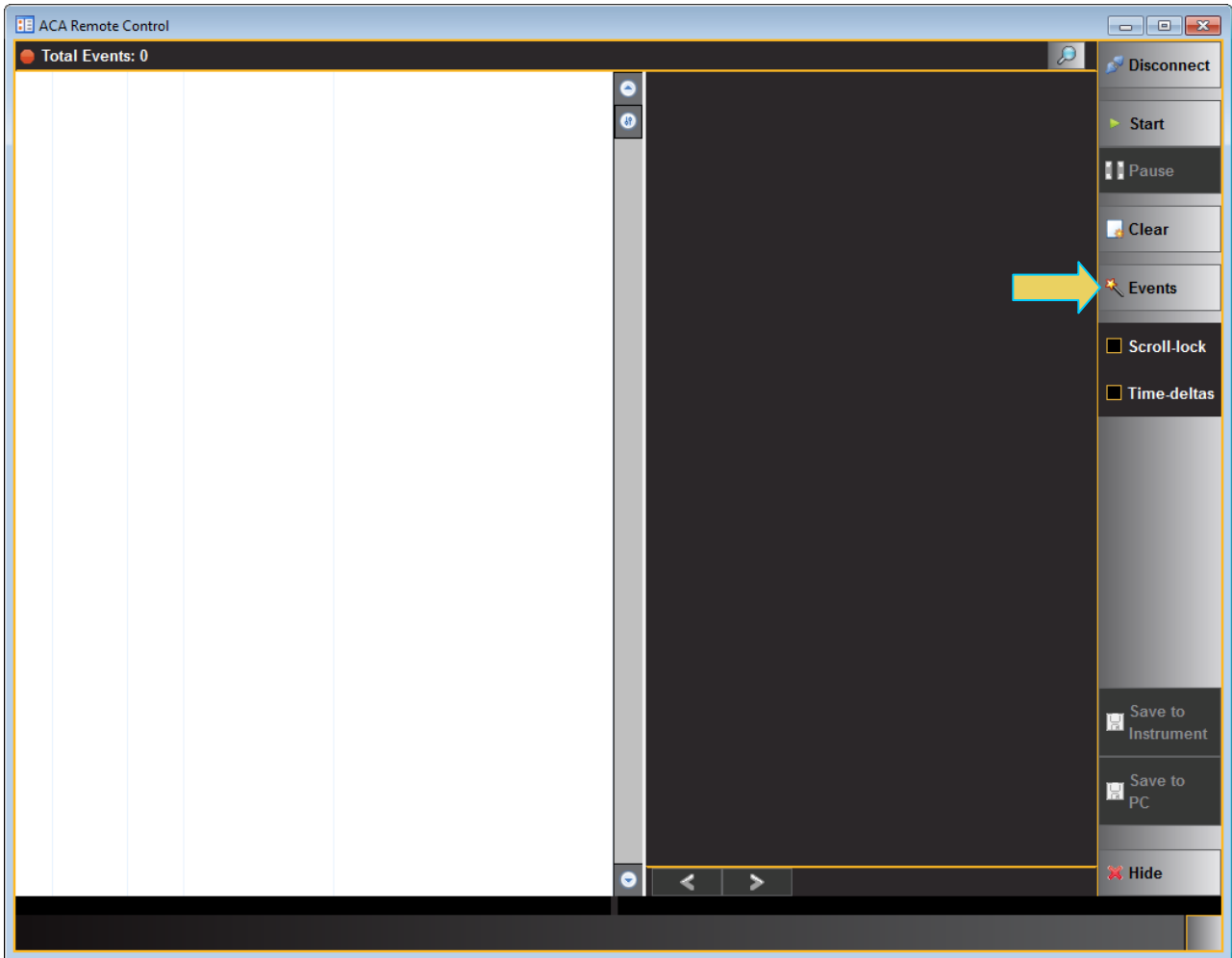
1. Touch select the **ACA Remote Control** panel on the **Card Control** page of the **Apps** panel:



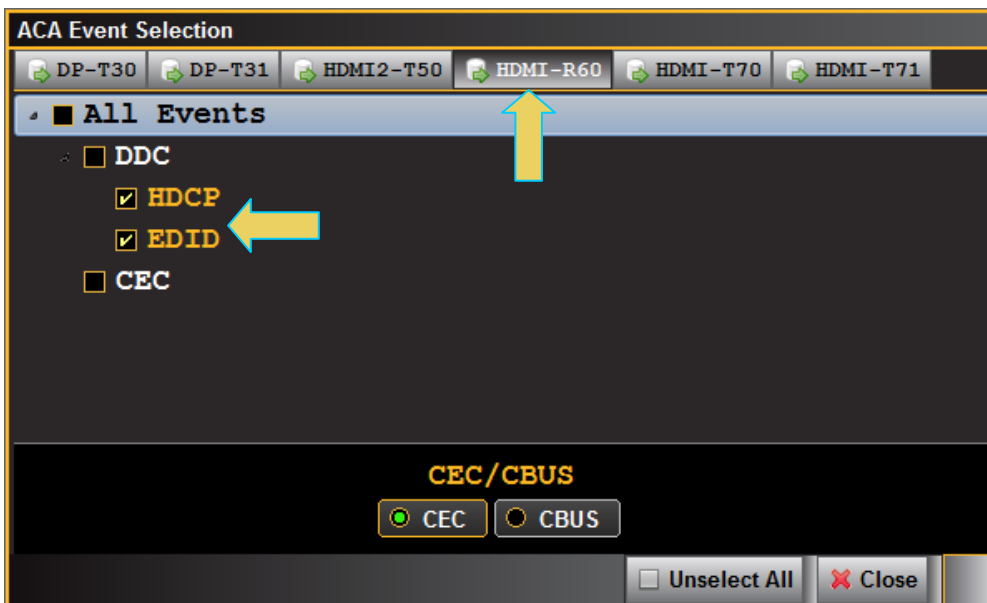
The **ACA Remote Control** panel will appear in a separate window.




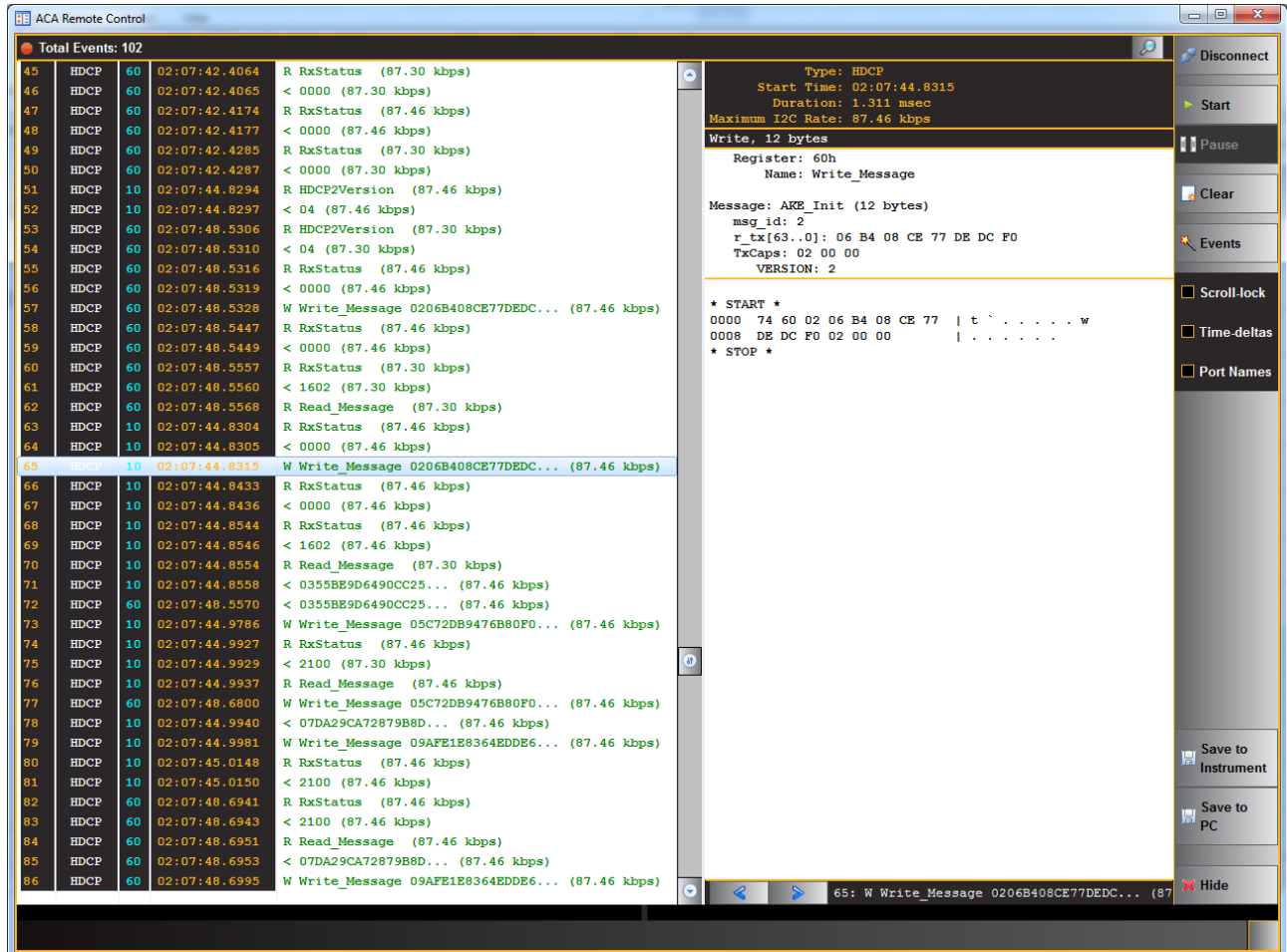
2. Touch select the **Connect** activation button (refer to the screen above) to connect to your 980 system.



- 3. Touch select the **Events** activation button (refer to the screen above) to connect to your 980 system. A dialog box appears enabling you to select the module and interface to monitor on the Remote Control ACA.



4. Select the HDMI Protocol Analyzer module (HDMI-R60).
5. Select the types of transactions you wish to monitor. In the example above, HDCP and EDID transactions are going to be logged. You can select **All Events** as well or any subset.
6. Click on the **Start**  button to initiate the capturing of the transactions. An example of a trace file is shown below.



The screenshot displays the ACA Remote Control software interface. The main window shows a list of events with columns for event number, type, duration, and data. The selected event (65) is a Write Message transaction. The detailed view on the right shows the following information:

```

Type: HDCP
Start Time: 02:07:44.8315
Duration: 1.311 msec
Maximum I2C Rate: 87.46 kbps
Write, 12 bytes
Register: 60h
Name: Write_Message
Message: AKE_Init (12 bytes)
msg_id: 2
r_tx[63..0]: 06 B4 08 CE 77 DE DC F0
TxCaps: 02 00 00
VERSION: 2

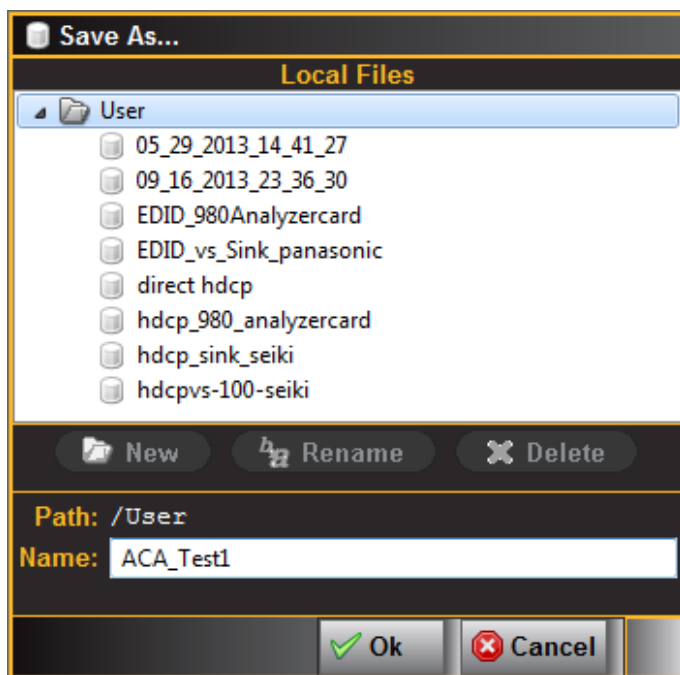
* START *
0000 74 60 02 06 B4 08 CE 77 | t ..... w
0008 DE DC F0 02 00 00 | .....
* STOP *

```

The interface also includes a sidebar with various control buttons such as Disconnect, Start, Pause, Clear, Events, Scroll-lock, Time-deltas, Port Names, Save to Instrument, Save to PC, and Hide.

You can save the traces either to the 980 test instrument or to your PC using the activation buttons provided.

7. Click on **Save to Instrument** or **Save to PC**. A dialog box appears (below). Enter a name and then click on **OK**.



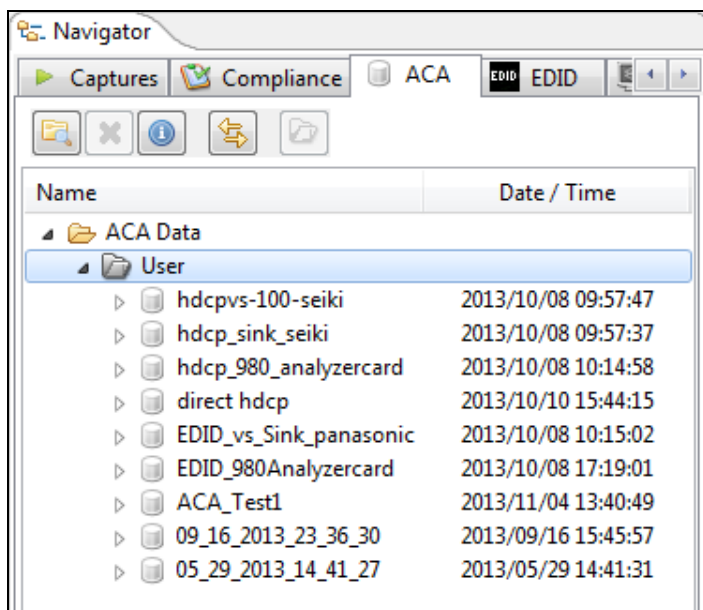
7.3 Viewing Stored HDMI auxiliary channel traces on a PC with the ACA Data Viewer utility

This subsection describes how you can view ACA traces using the ACA viewer off-line on your PC. In order to view the ACA files on your PC with the 980 GUI Manager application you will first have to transfer them to the PC using the **Data Transfer** utility.

The ability to save ACA traces enables you to disseminate them to other subject matter experts for analysis or to Quantum Data for support. You can view the ACA traces without a 980 test instrument. You simply download the 980 GUI Manager from the Quantum Data website on the downloads page.

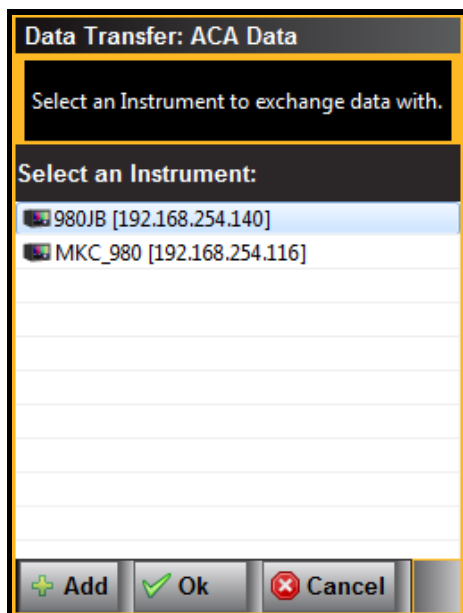
To view saved ACA trace files:


1. Make sure the 980 GUI Manager is installed on your PC. Use the procedures at [Downloading and installing the 980 GUI Manager](#).
2. Access the ACA data from the **Navigator** panel and highlight a directory as shown below.

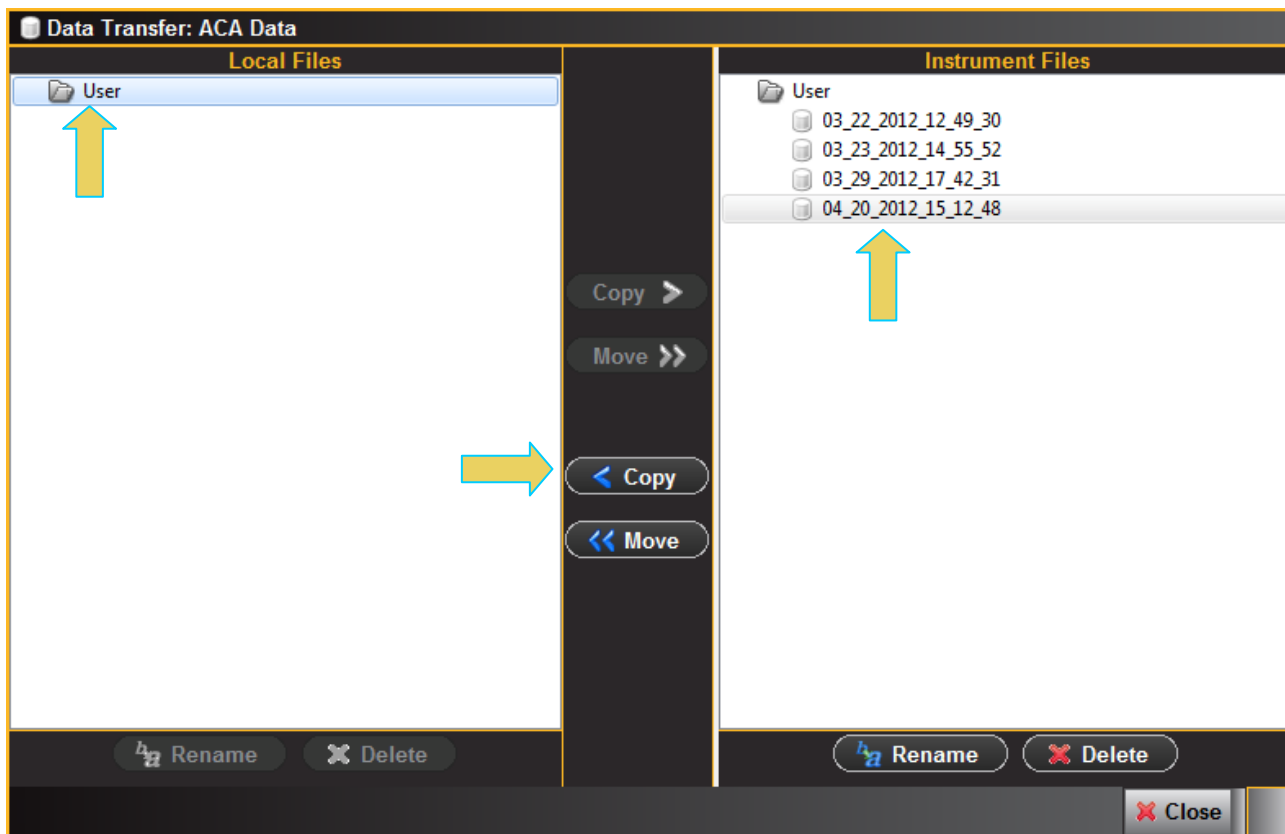


3. Access the **Data Transfer** utility by double clicking on the Transfer Data icon .

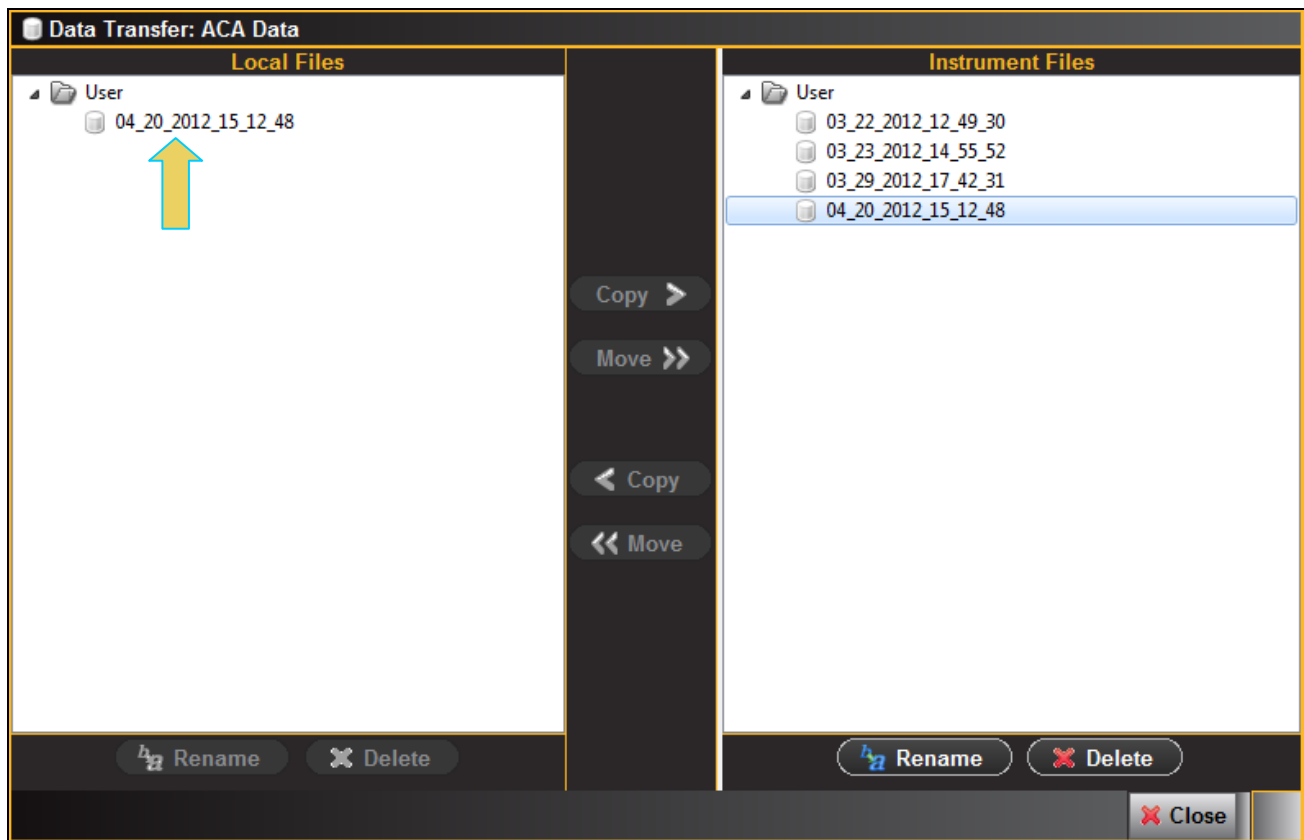
The **Data Transfer: ACA Data** dialog box appears (below) enabling you to select the 980 that you want to transfer data from. Select the desired 980 and click OK. The **Data Transfer: ACA Data** panel will appear.



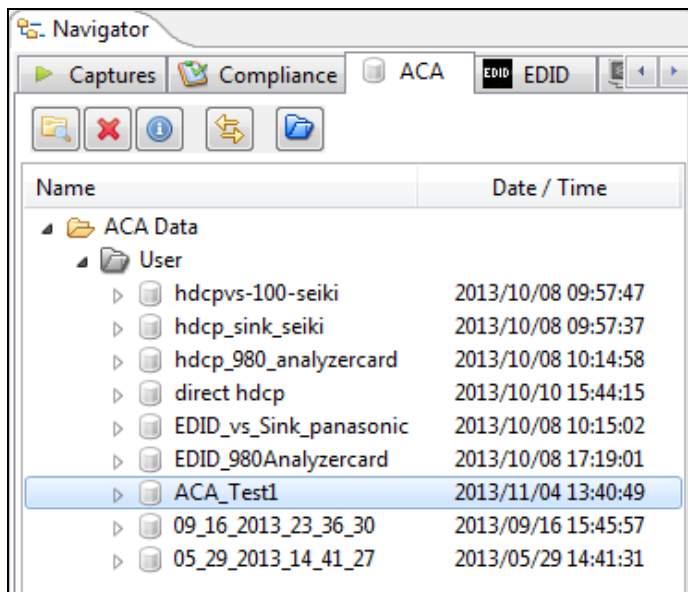
4. Access the **Data Transfer** panel by double clicking on the Transfer Data icon .
5. The **Data Transfer** panel appears in context with the ACA files on the 980 (Instrument) under the **Instrument Files** available as shown below.



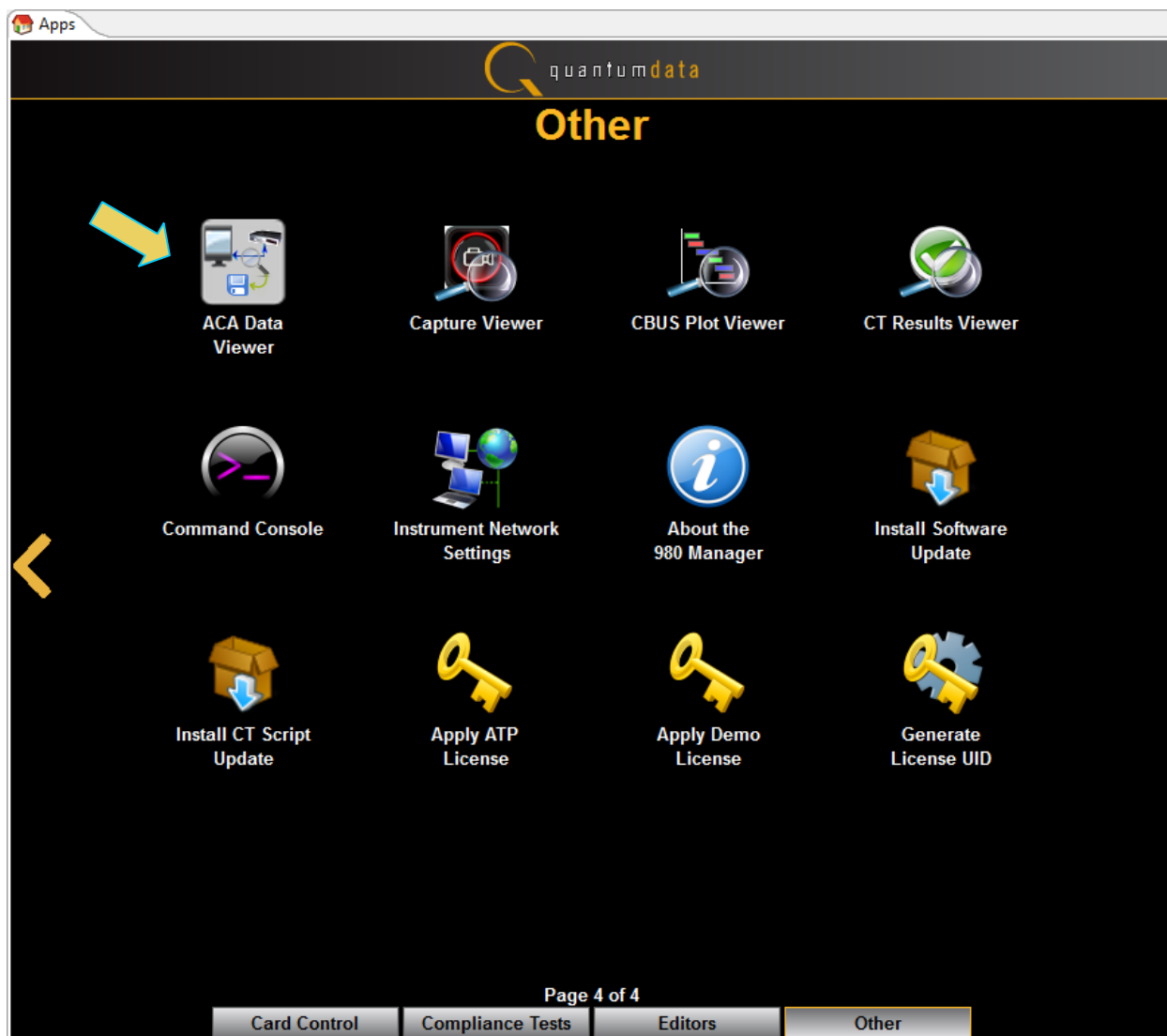
- 6. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.
The file appears on the PC host **Local Files** (below).



The data appears in the **Navigator** panel under the ACA data as shown below.

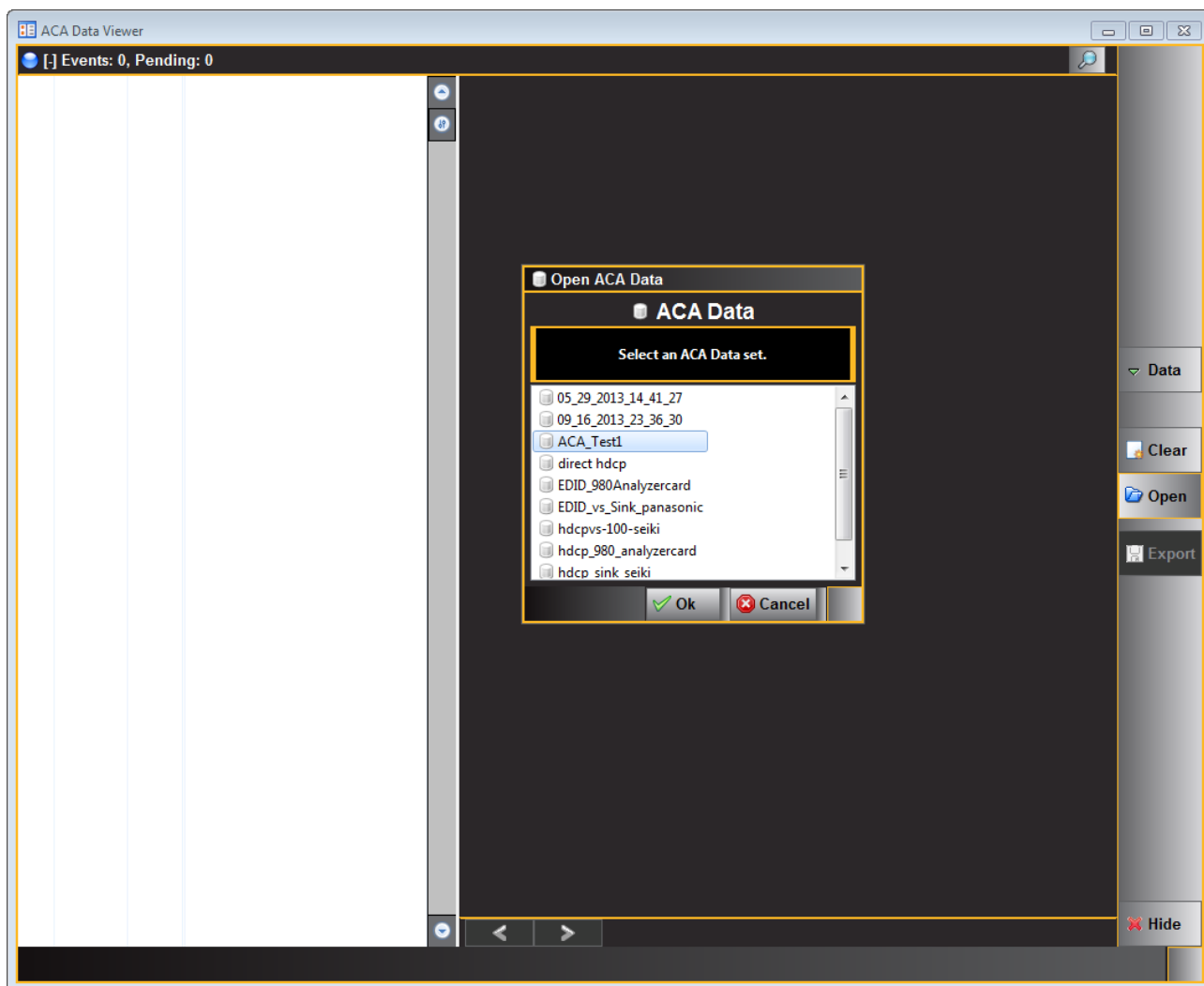


- Open up the ACA panel to view the transferred file. You can access the ACA panel from the **Other Apps** panel (Page 4).



The **Aux Channel Analyzer** panel appears.

8. Select the **Open** button to open the ACA file as shown below:



9. Click the **OK** activation button on the Open ACA Data dialog box. The ACA trace file will appear in the window.

The screenshot displays the ACA Remote Control interface. On the left, a list of 102 events is shown, with event 65 selected. The main window shows the details for event 65: a Write_Message of type HDCP. The details include the start time (02:07:44.8315), duration (1.311 msec), and maximum I2C rate (87.46 kbps). The message name is 'Write_Message' and the register is '60h'. The message content is 'AKE_Init (12 bytes)' with a message ID of 2. The raw data is shown as 'r_tx[63..0]: 06 B4 08 CE 77 DE DC F0' and 'TxCaps: 02 00 00'. The version is 2. A yellow arrow points to the 'Write_Message' name in the details pane. On the right, there are control buttons: Disconnect, Start, Pause, Clear, Events, Scroll-lock, Time-deltas, Port Names, Save to Instrument, Save to PC, and Hide.

Event No.	Direction	Rate	Type	Content
45	HDCP	60	R RxStatus	(87.30 kbps)
46	HDCP	60	<	0000 (87.30 kbps)
47	HDCP	60	R RxStatus	(87.46 kbps)
48	HDCP	60	<	0000 (87.46 kbps)
49	HDCP	60	R RxStatus	(87.30 kbps)
50	HDCP	60	<	0000 (87.30 kbps)
51	HDCP	10	R HDCP2Version	(87.46 kbps)
52	HDCP	10	<	04 (87.46 kbps)
53	HDCP	60	R HDCP2Version	(87.30 kbps)
54	HDCP	60	<	04 (87.30 kbps)
55	HDCP	60	R RxStatus	(87.46 kbps)
56	HDCP	60	<	0000 (87.46 kbps)
57	HDCP	60	W Write_Message	0206B408CE77DEDC... (87.46 kbps)
58	HDCP	60	R RxStatus	(87.46 kbps)
59	HDCP	60	<	0000 (87.46 kbps)
60	HDCP	60	R RxStatus	(87.30 kbps)
61	HDCP	60	<	1602 (87.30 kbps)
62	HDCP	60	R Read_Message	(87.30 kbps)
63	HDCP	10	R RxStatus	(87.46 kbps)
64	HDCP	10	<	0000 (87.46 kbps)
65	HDCP	10	W Write_Message	0206B408CE77DEDC... (87.46 kbps)
66	HDCP	10	R RxStatus	(87.46 kbps)
67	HDCP	10	<	0000 (87.46 kbps)
68	HDCP	10	R RxStatus	(87.46 kbps)
69	HDCP	10	<	1602 (87.46 kbps)
70	HDCP	10	R Read_Message	(87.30 kbps)
71	HDCP	10	<	0355BE9D6490CC25... (87.46 kbps)
72	HDCP	60	<	0355BE9D6490CC25... (87.46 kbps)
73	HDCP	10	W Write_Message	05C72DB9476B80F0... (87.46 kbps)
74	HDCP	10	R RxStatus	(87.46 kbps)
75	HDCP	10	<	2100 (87.30 kbps)
76	HDCP	10	R Read_Message	(87.46 kbps)
77	HDCP	60	W Write_Message	05C72DB9476B80F0... (87.46 kbps)
78	HDCP	10	<	07DA29CA72879B8D... (87.46 kbps)
79	HDCP	10	W Write_Message	09AFE1E8364EDDE6... (87.46 kbps)
80	HDCP	10	R RxStatus	(87.46 kbps)
81	HDCP	10	<	2100 (87.46 kbps)
82	HDCP	60	R RxStatus	(87.46 kbps)
83	HDCP	60	<	2100 (87.46 kbps)
84	HDCP	60	R Read_Message	(87.46 kbps)
85	HDCP	60	<	07DA29CA72879B8D... (87.46 kbps)
86	HDCP	60	W Write_Message	09AFE1E8364EDDE6... (87.46 kbps)

8 Loading and Importing Capture files


This chapter describes how to use access captured files taken from other 980 HDMI 2.0 Protocol Analyzer systems and how to transferred capture files taken through the embedded 980 GUI Manager.

8.1 Loading an existing captures with the 980 HDMI 2.0 Protocol Analyzer

You can load a decoded file that had been captured previously for analysis.

8.1.1 Loading an existing capture

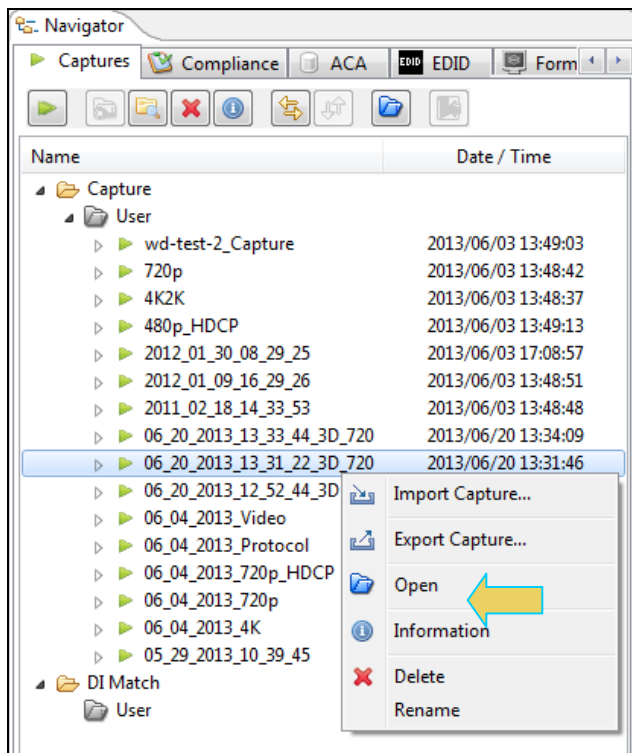
Use the following procedures to load a capture that you have listed in the 980 GUI Manager for the 980 HDMI Protocol Analyzer. You can load a file in one of three ways:

- Double clicking on the captured file in the **Captures** panel
- Accessing the **Open** option from the right-click menu of a selected capture in the **Data** pull-down menu
- Clicking on the **Open** icon  in the area near the top of the **Data** panel

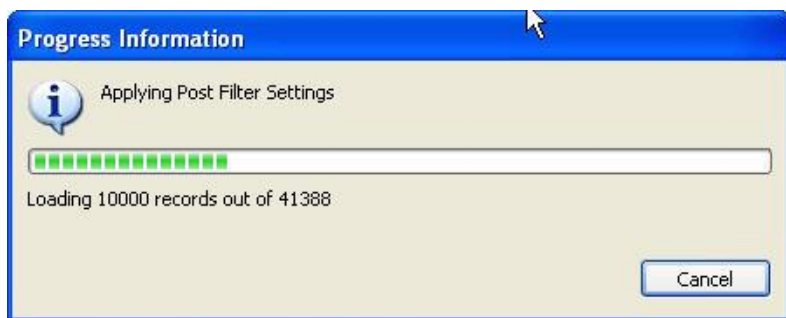
The procedures below show you how to load the capture from the right click menu.

To Load a captured data file:

1. Load a capture for analysis by right clicking on it and then select the **Open** item on the list.



A dialog box will display indicating the progress in loading the capture (sample shown below). Once the data is fully loaded it is displayed through the 980 GUI Manager in both the **Event Plot** and **Data Decode** panels.



8.2 Importing Capture Files from other 980 Systems

This subsection provides procedures on loading a previously captured file and also procedures for importing captured files taken from another 980 HDMI 2.0 Protocol Analyzer.

The captured data from the 980 HDMI 2.0 Protocol Analyzer is portable. You can open up captured files that have been taken by any other 980 HDMI 2.0 Protocol Analyzer at any other location. You do not need a 980 HDMI 2.0 Protocol Analyzer to examine captured files taken elsewhere; you just need the 980 GUI Manager. For example, you may wish to send a set of captured files to a colleague at a different location and this colleague may not have a 980 Protocol Analyzer. In that case, the colleague can simply download the 980 GUI Manager from the Quantum Data website to view the captured files that you sent them. Of course it may be the case that your colleague is sending you a set of captured files as well. Typically, the file would be posted on an FTP site as a zip file. You would then need to download the file, unzip it and then access it by browsing utilities provided in the 980 GUI Manager.

In some cases you may wish to put a series of captured files in a 980 GUI Manager local directory for easy access. In this case move these files to the proper 980 GUI Manager directory. Procedures for this are provided below as well.

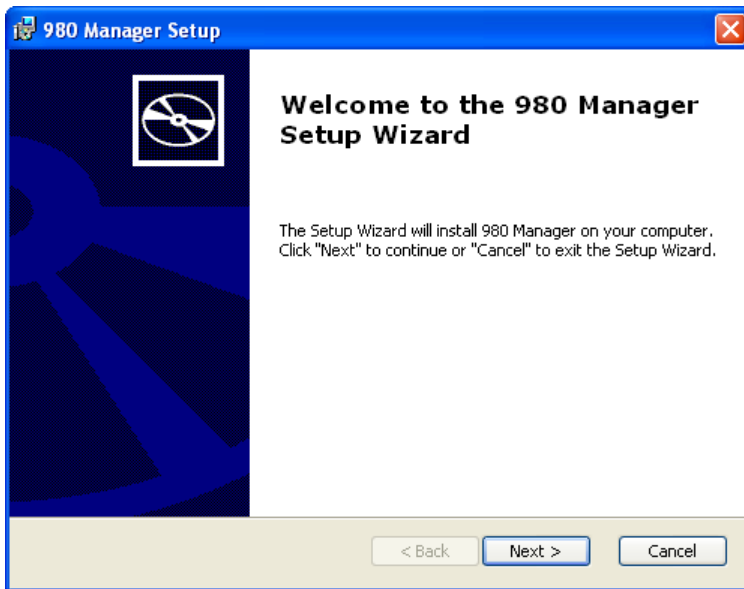
8.2.1 Importing Capture files

Use the following procedures to import a capture. The first procedure describes how to install the 980 GUI Manager on your PC. The second procedure describes how to import the capture.

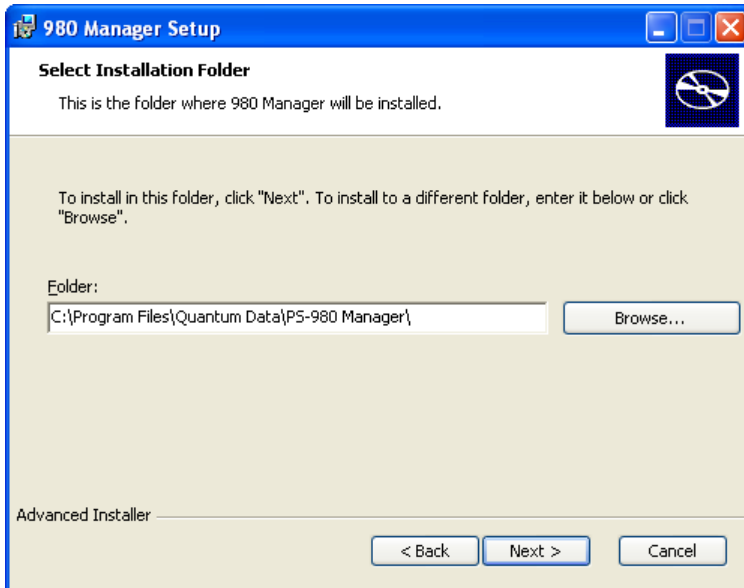
To Install the 980 GUI Manager on your PC:

1. Download the 980 GUI Manager from the Quantum Data *downloads* page to your PC. The link to the *downloads* page is: <http://www.quantumdata.com/downloads>.
2. Start the installation by double-clicking on your downloaded *.msi file.

The Setup Wizard will launch.



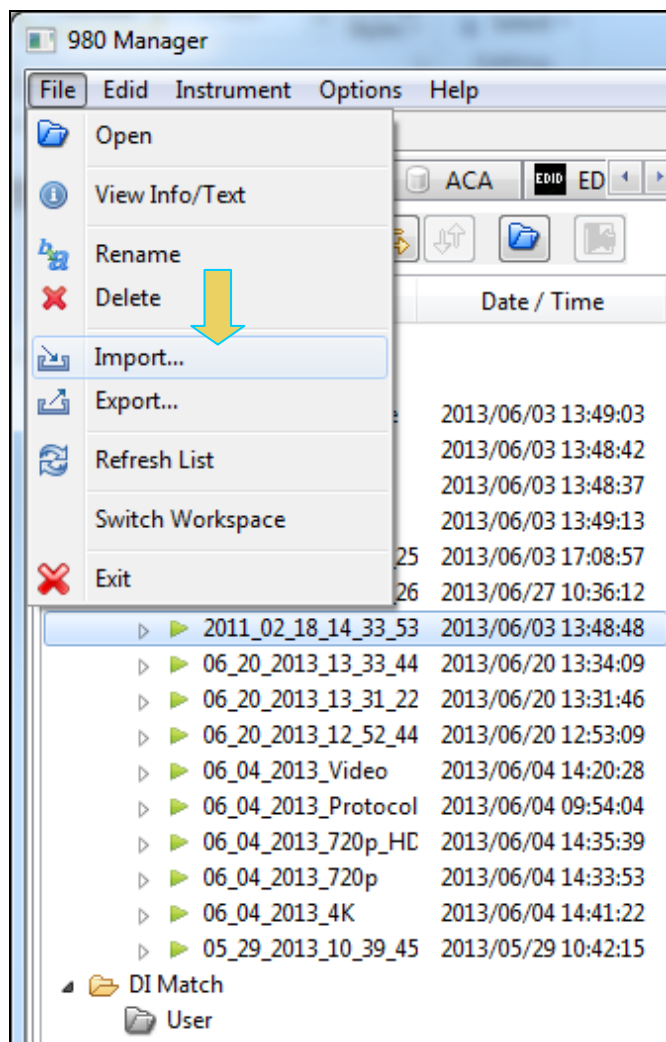
3. Select the installation folder. We recommend installation in the default folder.



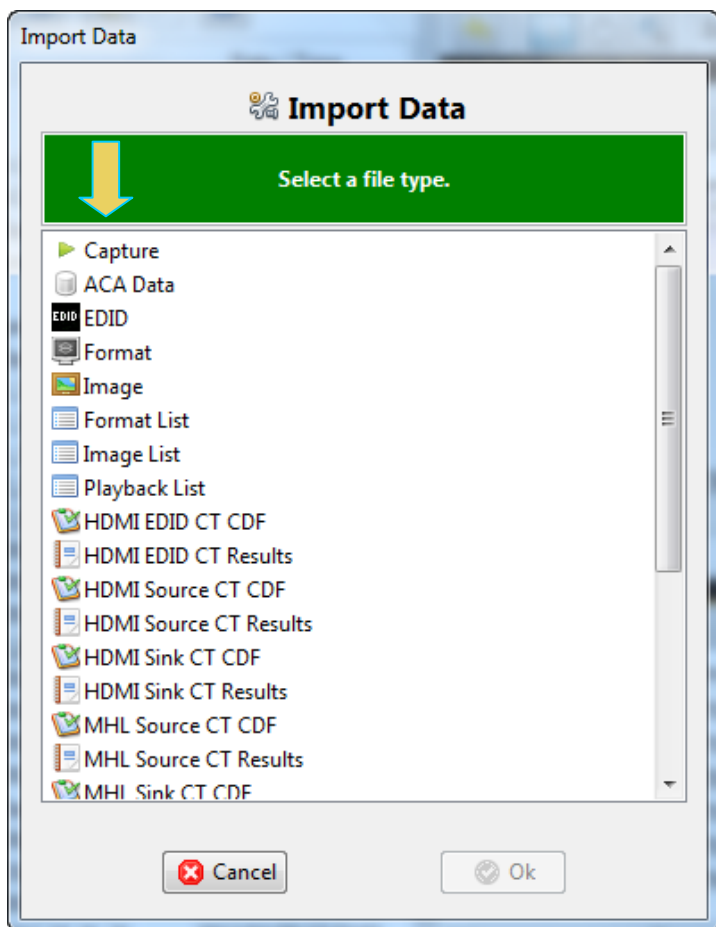
4. After installation completes, run the new 980 GUI Manager. It should be available in the Start Menu under **All Programs** → **Quantum Data**, and also from an icon on your Desktop.
5. Verify that the version number in the title bar matches the version on the website.

Importing capture files

1. Download the captures zip file from your FTP site, save it and unzip it on your PC that now has the 980 GUI Manager installed.
2. Import a previous capture using the **Import** utility available from the **File** menu. (See below.)



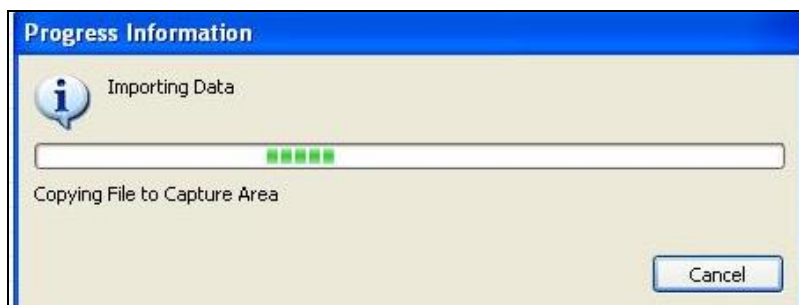
3. Select **Import**. A dialog box will appear enabling you to select which data type (EDID, Capture, etc) you want to import. In this example, you want to import a capture. Select **Capture** and click Ok (see below).



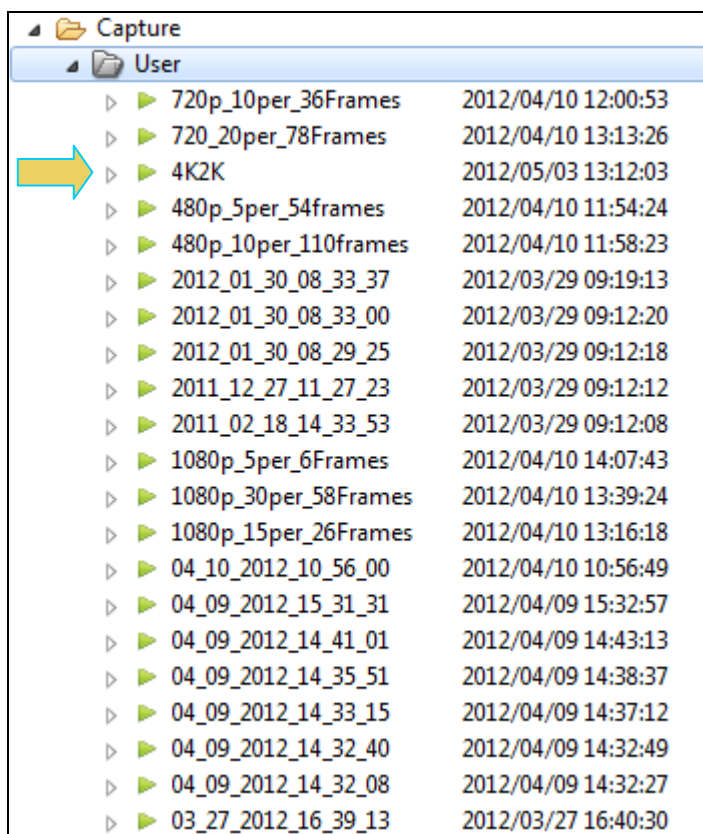
You will be asked to browse for a file through a standard Windows dialog.

Name	Date modified	Type	Size
4K2K	3/26/2012 5:03 PM	File folder	
480p_HDCP	3/26/2012 5:03 PM	File folder	
720p	3/26/2012 5:03 PM	File folder	
720p_DI_SizeError	3/26/2012 5:03 PM	File folder	
720p_HDCP_KO	3/26/2012 5:03 PM	File folder	
720p_noAIF	3/26/2012 5:04 PM	File folder	
1080p	3/26/2012 5:02 PM	File folder	
2011_02_18_14_33_53	3/26/2012 5:02 PM	File folder	
2011_12_27_11_27_23	3/26/2012 5:02 PM	File folder	
2012_01_09_16_29_26	3/26/2012 5:02 PM	File folder	
2012_01_30_08_07_44	3/26/2012 5:02 PM	File folder	
2012_01_30_08_27_41	3/26/2012 5:02 PM	File folder	
2012_01_30_08_29_25	3/26/2012 5:02 PM	File folder	
2012_01_30_08_33_00	3/26/2012 5:02 PM	File folder	
2012_01_30_08_33_37	3/26/2012 5:02 PM	File folder	
4K2K.zip	5/3/2012 1:11 PM	WinZip File	7,827 KB

Once you select the file you will see a progress dialog box as shown below:



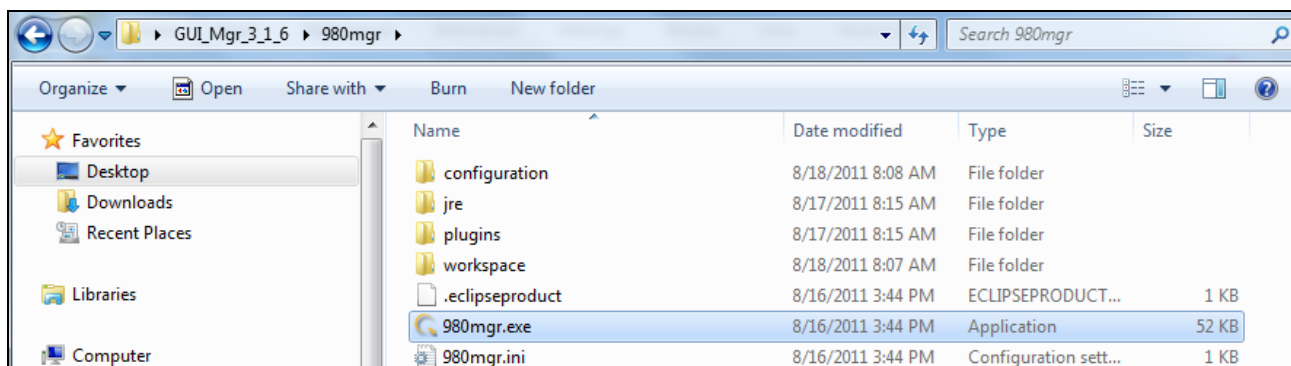
The imported file will then appear in the **Data** directory of the **980 Navigator** panel as shown below. The captured file is loaded automatically and has an asterisk in front of it to indicate that this capture is the one that is loaded:



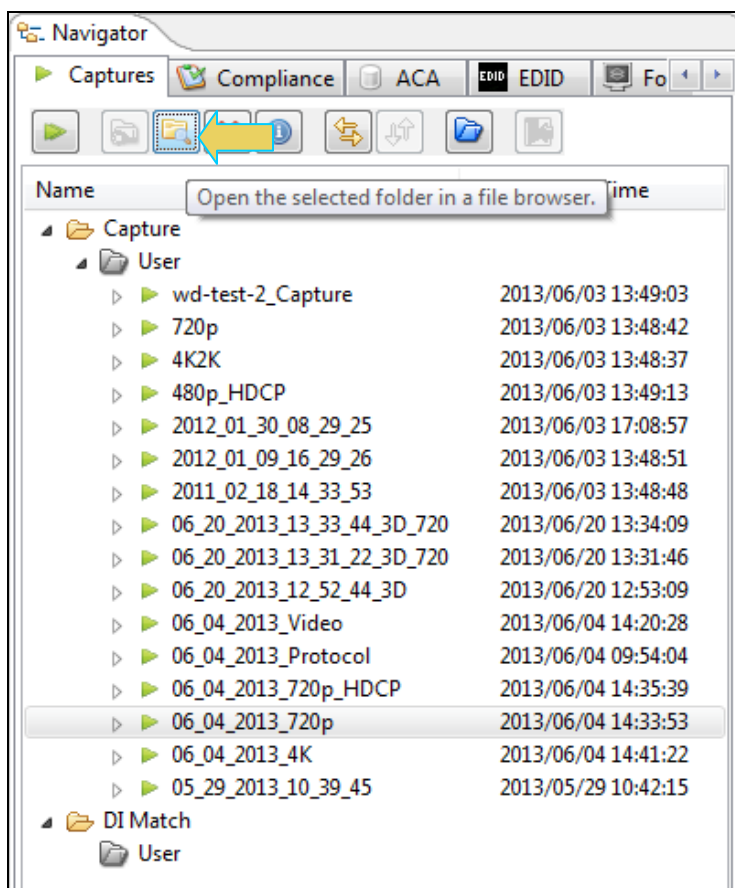
Relocating capture files to the 980 GUI Manager directory

If you receive a capture file from a colleague for analysis, you will need to be able to access it on your 980 GUI Manager. To do this you will need to place the file in a directory that the 980 GUI Manager will be able to access it. Use the following procedures.

1. Download the captured zip file from your FTP site, save it and unzip it on your PC that now has the 980 GUI Manager installed.

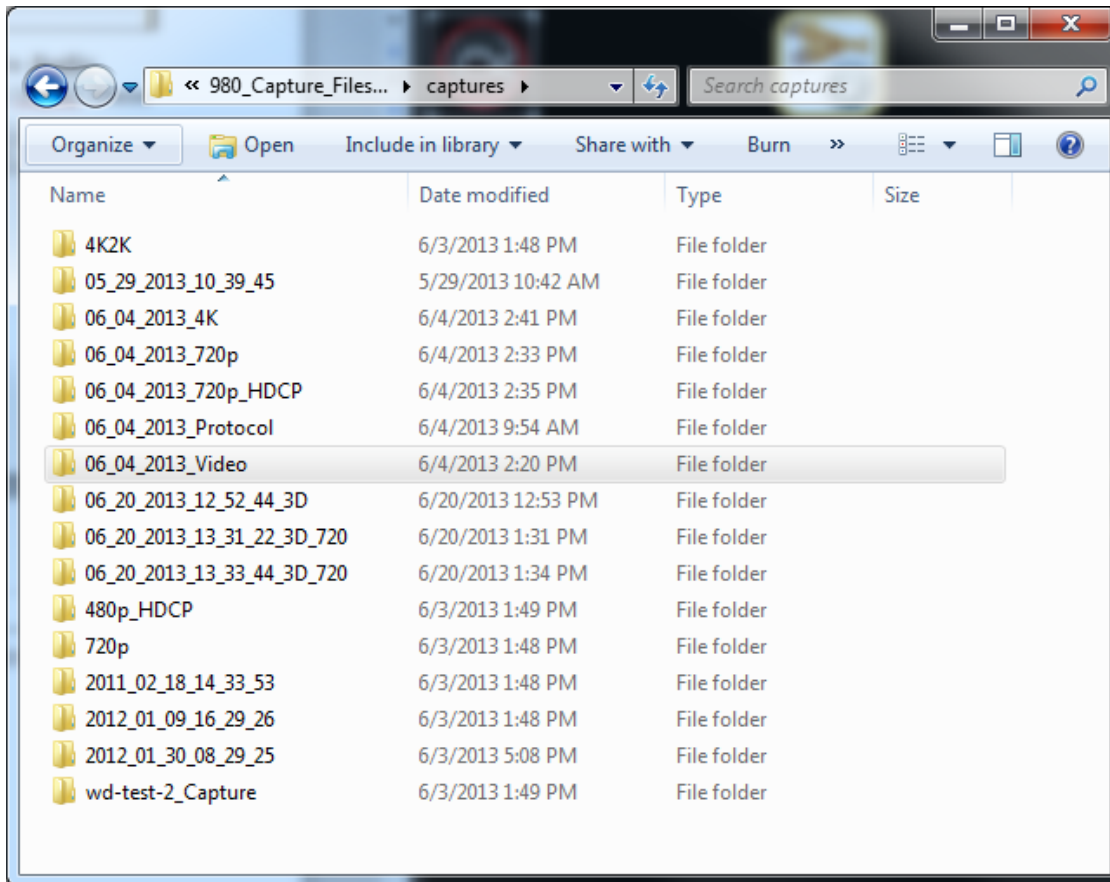


2. Launch the 980 GUI Manager.
3. Locate the 980 GUI Manager **captures** directory using the Open Selected Folder icon indicated below.



A Windows Explorer window will appear at the captured file. From there you can determine the location of the **captures** directory.

4. Transfer the capture directory (from the file you unzipped) to the 980 GUI Manager **captures** directory using standard Windows methods. The screen example below shows the resulting files stored in the **captures** directory.



When you relaunch the 980 GUI Manager you will see all the capture files that you transferred to the **captures** directory.

9 Transferring Capture Files from the 980 HDMI 2.0 Protocol Analyzer to a PC

The 980 HDMI 2.0 Protocol Analyzer offers portability of data. You can disseminate captured files or even compliance tests to other locations for analysis by other colleagues. When you make a capture using the embedded GUI the captured files are retained on the 980 test instrument.

Note: The procedures provided in this chapter show how to transfer ACA traces, captures playback files but you can transfer EDIDs, ImageLists, or any other type of data type under the Navigator tab.

If you want to disseminate these captured files to others you will have to transfer these capture files to your PC. You can transfer files from the 980 HDMI 2.0 Protocol Analyzer to your host PC in three ways: 1) Data Transfer GUI utility, 2) USB drive, 3) command line FTP.


9.1 Transferring Capture Files using the Data Transfer Utility

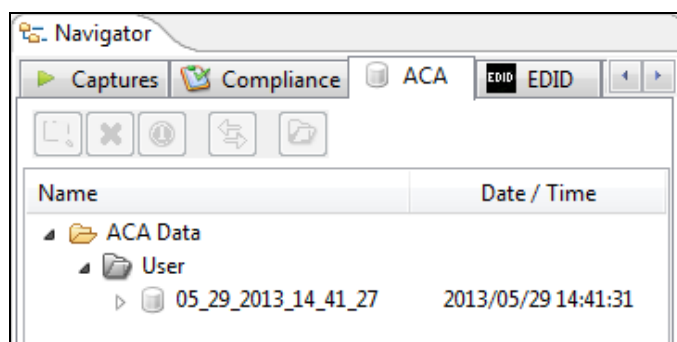
You can transfer files easily using the 980 GUI Manager's **Data Transfer** utility. Follow the procedures below.

To transfer ACA files from the 980 to your PC using the Data Transfer utility:

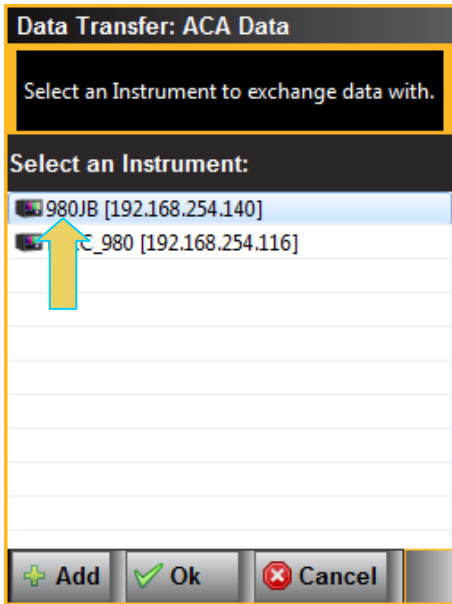
1. Through the external 980 GUI Manager, access the **Generator/Port Control** panel either through the **View** pull-down menu or the **Generator** button located on the top of the interface. Refer to the screen shots below.

Note: This procedures shows examples of transferring ACA traces, capture files and Playback files but you can transfer EDIDs, ImageLists, or any other type of data type under the Navigator tab.

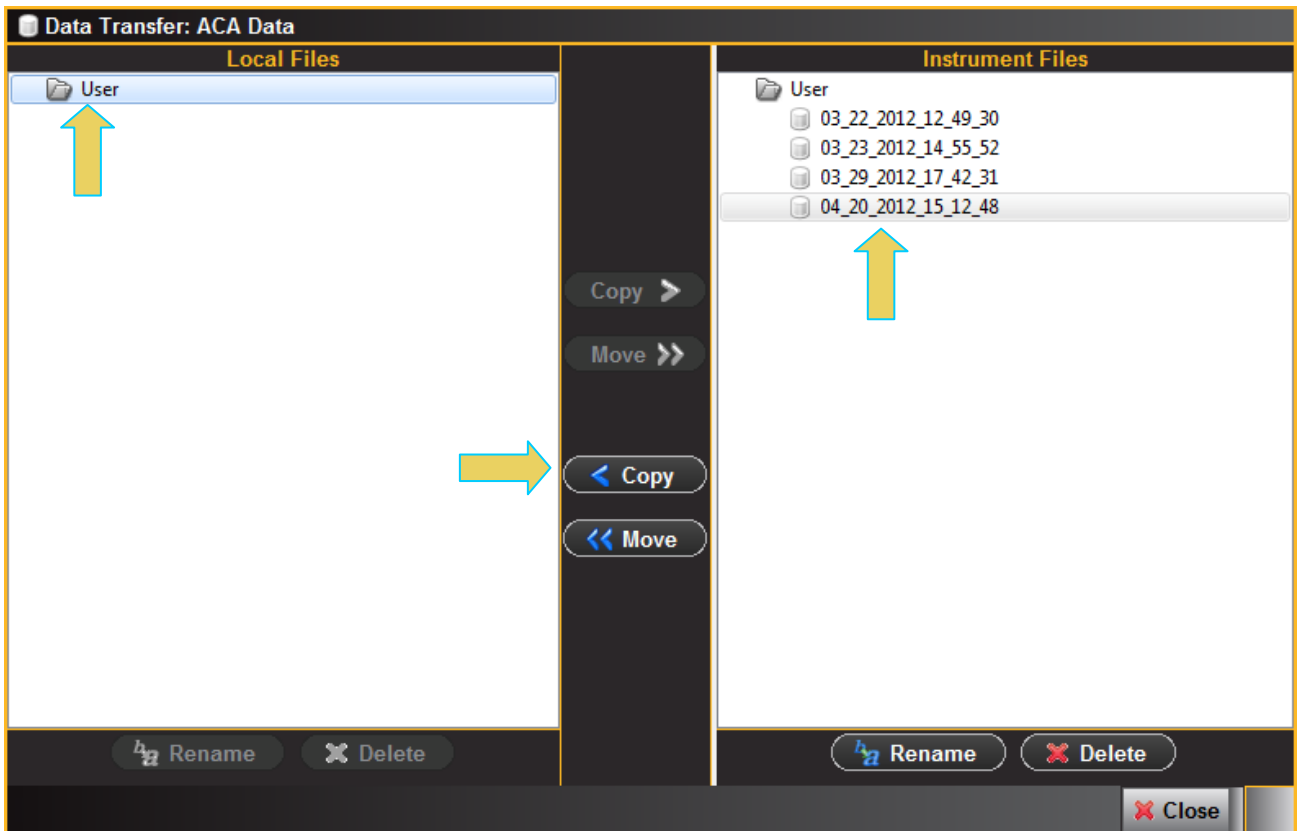
2. Access the **Data Transfer** utility by double clicking on the Transfer Data icon  on one of the data sets in the Navigator window.



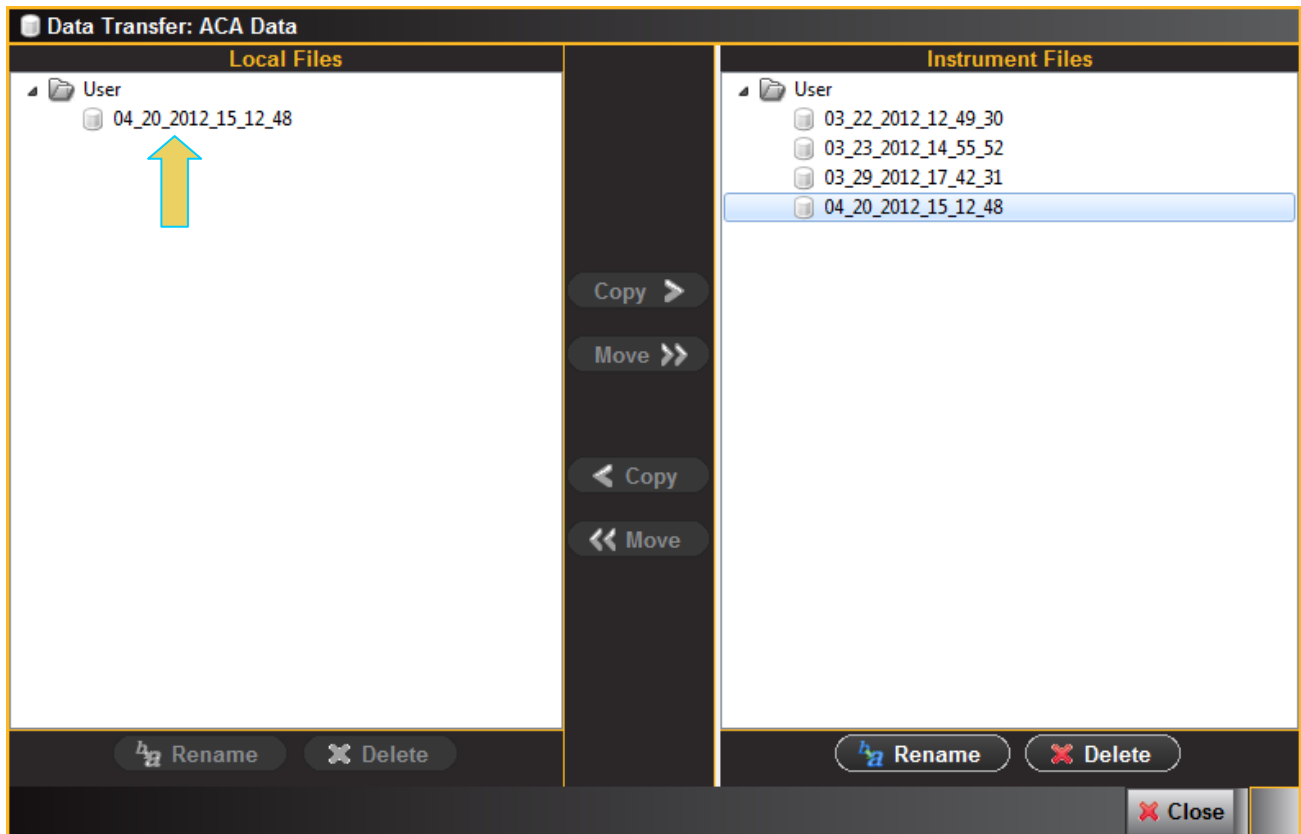
The **Data Transfer: ACA Data** dialog box appears (below) enabling you to select the 980 HDMI 2.0 Protocol Analyzer that you want to transfer data from. Select the desired 980 HDMI 2.0 Protocol Analyzer and click OK. The **Data Transfer: ACA Data** panel will appear.



The **Data Transfer** panel appears in context with the ACA files on the 980 (Instrument) under the **Instrument Files** available as shown below.




3. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.
The file appears on the PC host **Local Files** (below).

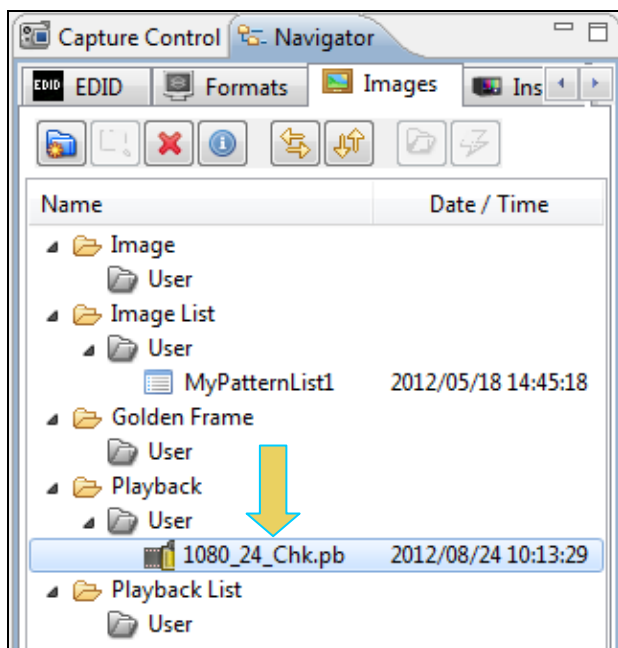


To transfer Playback files from the 980 to your PC using the Data Transfer utility:

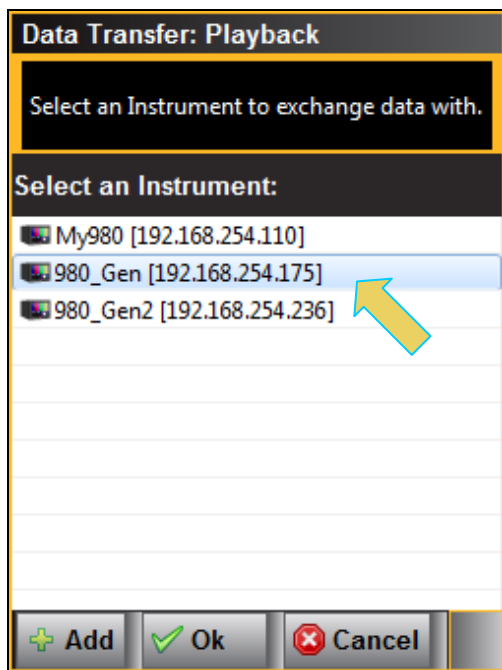
1. Through the external 980 GUI Manager, access the **Generator/Port Control** panel either through the **View** pull-down menu or the **Generator** button located on the top of the interface. Refer to the screen shots below.

Note: This procedure shows examples of transferring ACA traces, capture files and Playback files but you can transfer EDIDs, ImageLists, or any other type of data type under the Navigator tab.

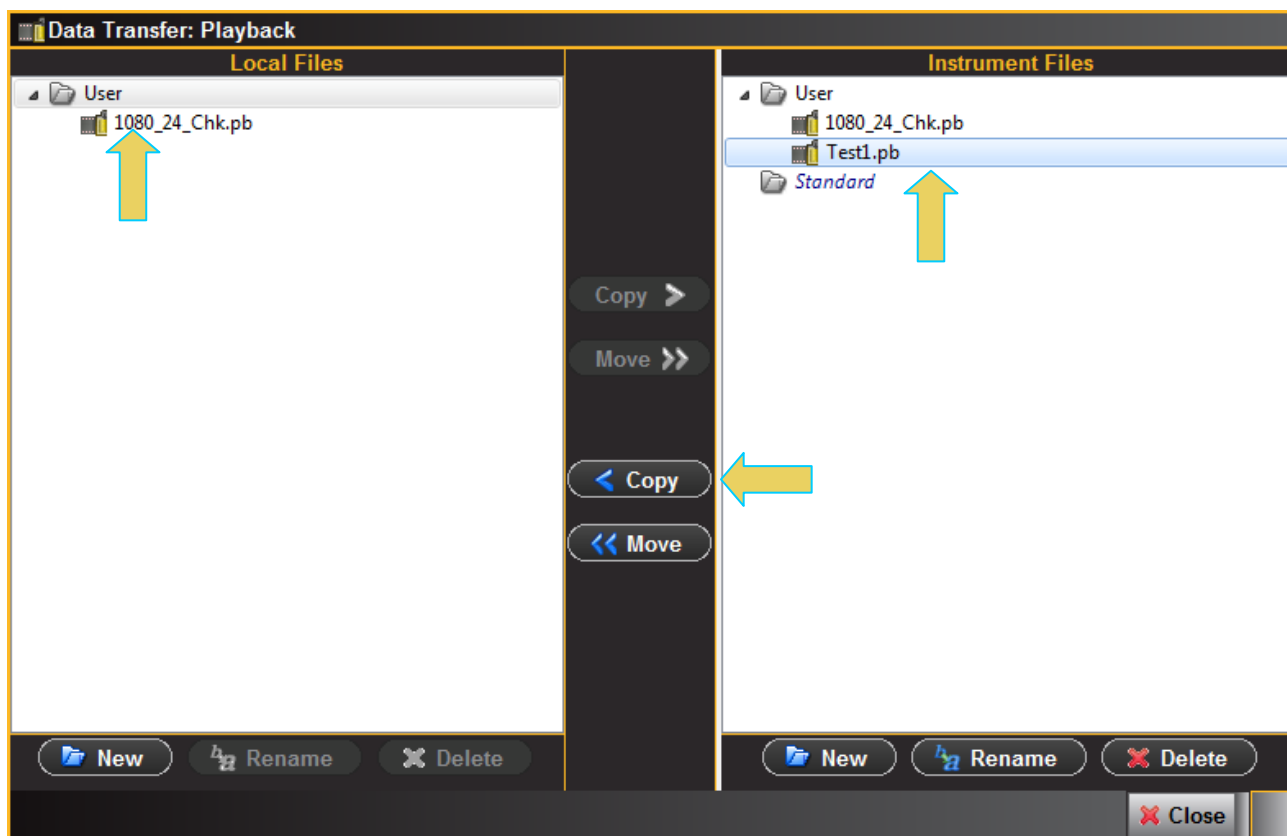
2. Access the **Data Transfer** utility by double clicking on the Transfer Data icon  on one of the data sets in the Navigator window.



The **Data Transfer: Playback** dialog box appears (below) enabling you to select the 980 HDMI 2.0 Protocol Analyzer that you want to transfer data from. Select the desired 980 HDMI 2.0 Protocol Analyzer and click OK. The **Data Transfer: Playback** panel will appear.




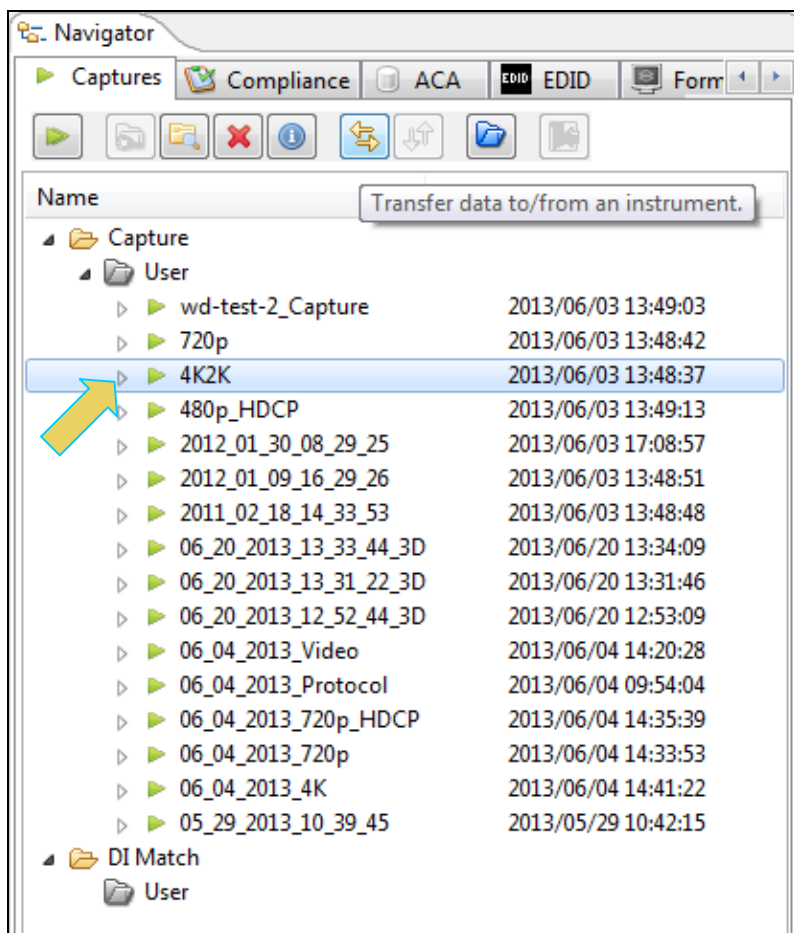
The **Data Transfer** panel appears in context with the ACA files on the 980 (Instrument) under the **Instrument Files** available as shown below.



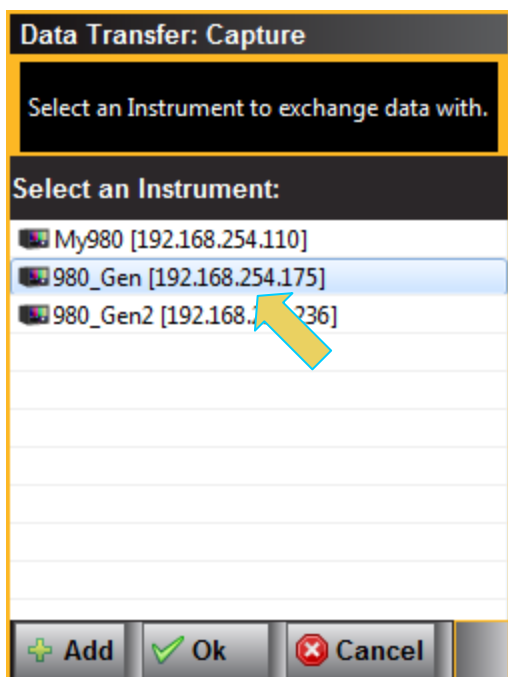
3. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.
The file appears on the PC host **Local Files** (below).

To transfer Capture files from the 980 to your PC using the Data Transfer utility:

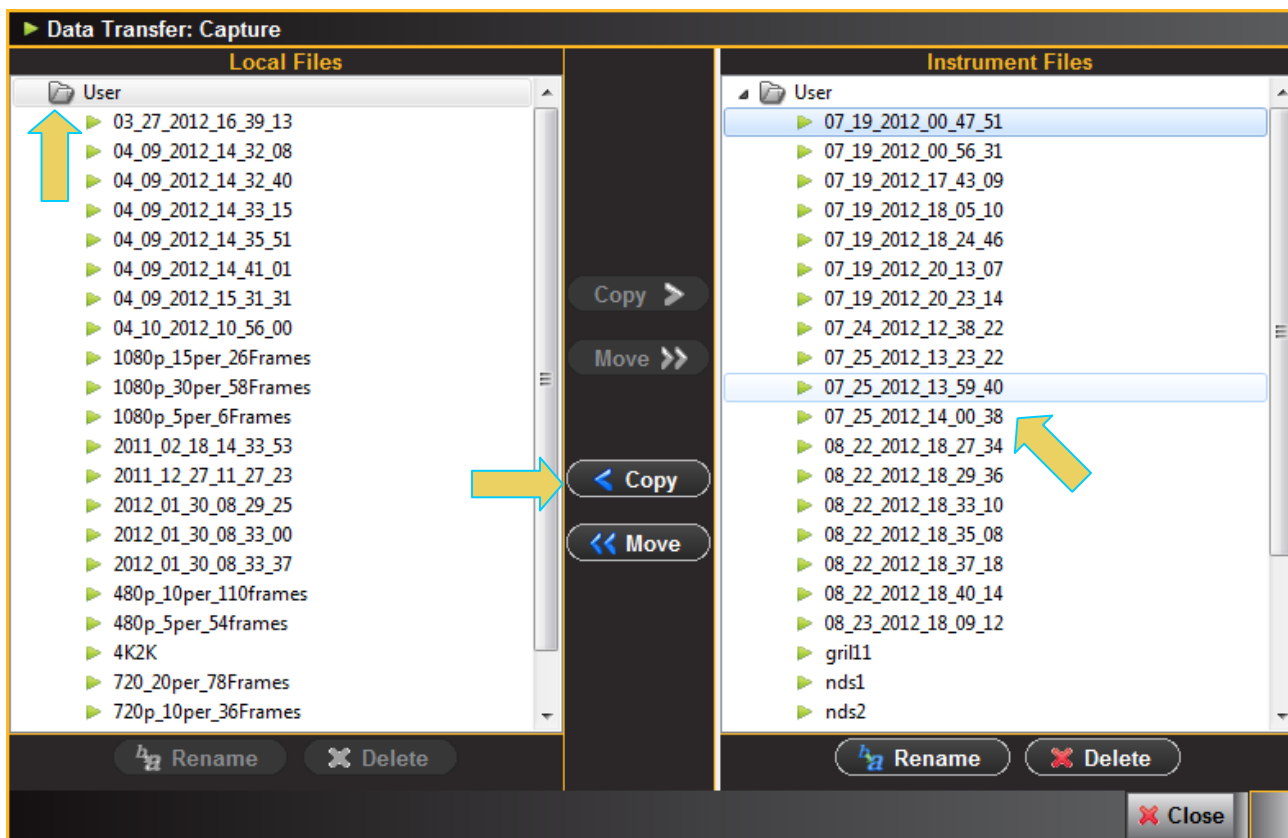
1. Through the external 980 GUI Manager, access the **Generator/Port Control** panel either through the **View** pull-down menu or the **Generator** button located on the top of the interface. Refer to the screen shots below.
2. Access the **Data Transfer** utility by double clicking on the Transfer Data icon  on one of the data sets in the Navigator window.



The **Data Transfer: Capture Data** dialog box appears (below) enabling you to select the 980 HDMI 2.0 Protocol Analyzer that you want to transfer data from. Select the desired 980 HDMI 2.0 Protocol Analyzer and click OK. The **Data Transfer: Capture Data** panel will appear.



The **Data Transfer** panel appears in context with the Capture files on the 980 (Instrument) under the **Instrument Files** available as shown below.



3. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.
The file appears on the PC host **Local Files**.

9.2 Transferring Capture Files using the command line

If you have initiated captures through the embedded 980 GUI Manager through the built-in touch screen, you can transfer these capture files to your PC where the external 980 GUI Manager is installed. This enables you to view the captured data on the external 980 GUI Manager and to disseminate these captures to other colleagues for additional analysis.

There are three ways you can transfer files from the 980 to the PC. 1) using an FTP utility, 2) using the FTP command, or 3) saving the files to a USB drive connected to the 980.

Instructions for transferring files using the command line FTP and saving to a USB are provided. Procedures for transferring the captured files using an FTP utility such as FileZilla are not provided. Please refer to the user documentation provided with FileZilla. You can download FileZilla at:

https://www.ohloh.net/projects/filezilla/download?filename=FileZilla_3.3.2_win32-setup.exe.

You will need to use the username of **qd** and the password of **qd** to login to the 980 in each case.

To transfer capture files using the FTP command:

1. Open up the DOS utility window on your PC.
2. Enter the following command at the prompt:

```
ftp 192.168.254.237 // where 192.168.254.237 is the IP address of the 980
```

You will then be prompted for a login. Enter **qd** and **qd** for the username and password as shown below.

```
User (192.168.254.237:(none)): qd
Password required for qd
```

3. Change directories to the specific **workspace** directory using the DIR and CD commands.

```
ftp> dir
ftp> cd workspace
ftp> cd captures
ftp> cd 2010_07_14_01_37_01
```

4. Use the binary mode for the FTP transfer.

```
ftp> bin
```

5. Initiate the FTP get command on the **pdecode.log** file.

```
ftp> get pdecode.log
```

6. Repeat the FTP GET command for the other files you wish to view through the external 980 GUI Manager. You will want to transfer the .log files at a minimum. You may also want to transfer the .img files for the video thumbnails.

7. Exit the FTP command line with the following command:

```
ftp> bye
```

8. Recreate the directory with an appropriate name in the 980 GUI Manager's working directories: quantumdata/980Manager/980mgr/workspace/captures/.

9. Move the pdecode.log file and other files that you transferred to your PC into the new directory.

You will now be able to view the files through the 980 GUI Manager.

9.3 Transferring Capture Files using USB drives

If you have initiated captures through the embedded 980 GUI Manager through the built-in touch screen, you can transfer these capture files to a PC using a USB drive.

To transfer capture files using a USB drive:

1. Connect a USB thumb drive on the back of the 980.



980B Advanced Test Platform

2. Minimize or close the embedded GUI by touch selecting the **Quantumdata 980 Manager** icon on the bottom status panel of the GUI.
3. Touch the workspace icon on the touch screen desktop.
A navigation directory window appears.
4. Browse and locate the capture files in `/home/qd/workspace/captures/`
5. Touch select and highlight the captures directory
6. Touch select the top level Edit pull-down menu and select Copy.
7. Touch select the lower left button just above the Start button to change the left panel view.
You should see qd, Desktop, USB flash disk, and 2 GB Volume if you touched the correct button on lower left).
8. Touch select the USB flash disk to change the right panel view to show the USB thumb drive's contents.
9. Touch any white space on the right panel to focus it.
10. Touch select Edit at top and then touch Paste to copy the capture directory to your USB drive.
11. You can now place the USB drive in your PC and move the files over to the 980 Manager's working directories:
`quantumdata/980Manager/980mgr/workspace/captures/`.

11 Upgrading the 980 Manager and 980

This Chapter provides information about upgrading your 980 and 980 GUI Manager. Detailed procedures are not provided in this document. **Please be sure to refer to the Release Notes for a specific release for detailed upgrade instructions.**

Quantum Data periodically provides maintenance release of software and firmware. The most recent versions are available on the downloads page of the Quantum Data website.

<http://www.quantumdata.com/downloads/index.asp>

Product	Current firmware/gateware version	Updated	Release notes
882EA (882E with HDMI Analyzer option) Notice: This is the release approved by DCP for HDCP CTS 1.2 Compliance Testing.	882EA 2.26.0 (See Instructions)	01-Feb-2012	View
HDMI 1.4a 3D Test Tools	3D Test Tools	28-Jun-2010	App Note
980 Protocol Scope Generation 3 (P/N 00-00229) Notice: This release supports MHL CTS 1.2 Compliance Testing.	External Manager 3.1.12 Release 3.1.11 with MHL CTS 1.2 support 980 Gen 3 HDMI Sink Compliance Test package Sample EDID Files	26-Mar-2012	View 980 Gen 3

Two software packages are available for upgrading the 980:

1. Embedded firmware and gateware package for the 980 instrument. This is a Debian software package for installation in the Linux-based instrument. (The file extension is .deb.) This package also includes the embedded Graphical User Interface that will be installed for the Touch Screen User Interface. The 980 software package includes the firmware and gateware for all available modules.
2. Graphical User Interface for Windows PCs. This is the 980 Manager GUI that can be used to control all 980 instruments from a Windows PC.

Notes:

1. If the Windows-based 980 Manager GUI and the embedded firmware are both being upgraded, you will need to upgrade the 980 Manager first, and then upgrade the embedded firmware.
2. Be sure to check the release notes associated with the download files. Any special installation instructions will be noted in the release notes.
3. In some cases if your 980 is not at the most recent version, you may have to first upgrade to the most current version and then to the new version.

11.1 Workflow for Upgrading 980 Firmware/Gateware

This section describes the workflow of the upgrade process. It is not intended to be a detailed procedure. **Please refer to the Release Notes for detailed upgrade procedures.**

Please note that you have to upgrade the 980 GUI Manager before using the GUI Manager to upgrade the 980 firmware and gateware.

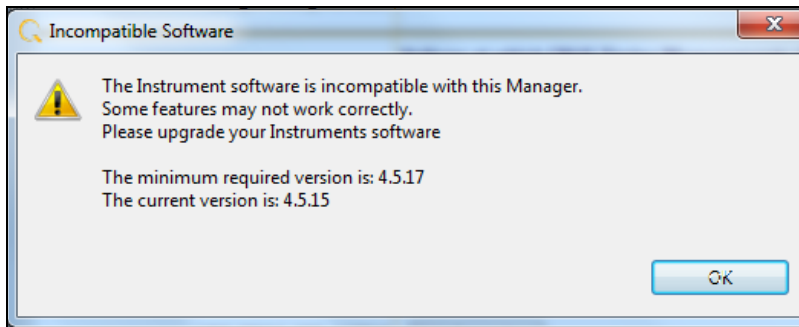
1. Download the GUI Manager and 980 Firmware/Gateware files from the Quantum Data website downloads page:

The screenshot shows the Quantum Data website's 'Downloads' page. The navigation menu includes HOME, ABOUT, NEWS, PRODUCTS, DOWNLOADS, SUPPORT, and CONTACT. The Quantum Data logo is on the left. The main content area is titled 'Downloads' and includes a sub-section 'Firmware and Gateware' with a table of product updates. A yellow arrow points to the '980 Protocol Scope Generation 3' entry in the table.

Product	Current firmware/gateware version	Updated	Release notes
882EA (882E with HDMI Analyzer option) Notice: This is the release approved by DCP for HDCP CTS 1.2 Compliance Testing.	882EA 2.26.0 (See Instructions)	01-Feb-2012	View
HDMI 1.4a 3D Test Tools	3D Test Tools	28-Jun-2010	App Note
980 Protocol Scope Generation 3 (P/N 00-00229) Notice: This release supports MHL CTS 1.2 Compliance Testing.	External Manager 3.1.12 Release 3.1.11 with MHL CTS 1.2 support 980 Gen 3 HDMI Sink Compliance Test package Sample EDID Files	26-Mar-2012	View 980 Gen 3

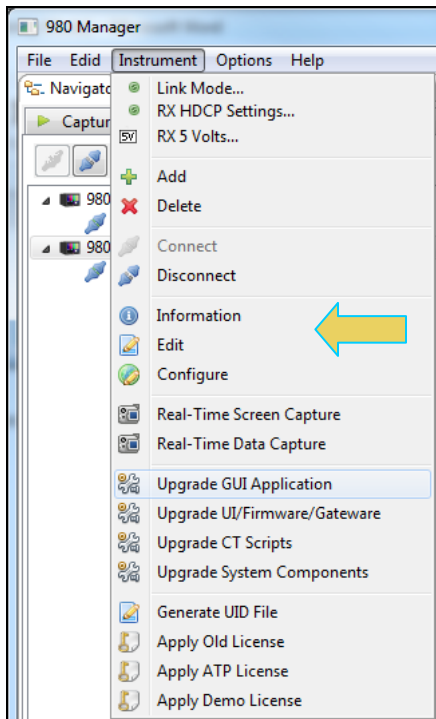
2. Upgrade the 980 GUI Manager and restart.

Note: You may receive the following error indicating that you must update the 980 firmware/gateware.



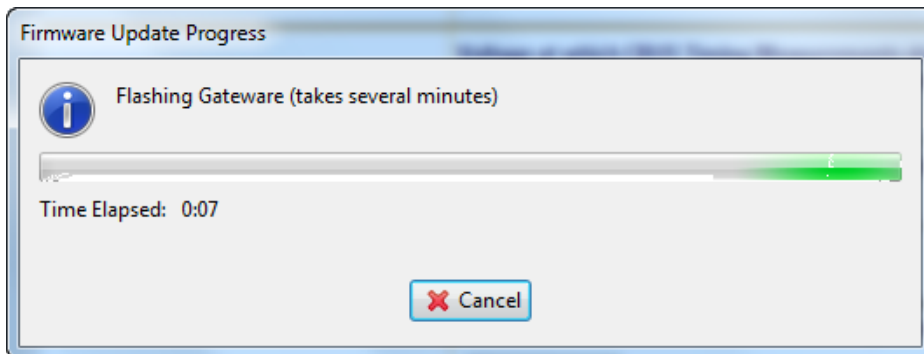
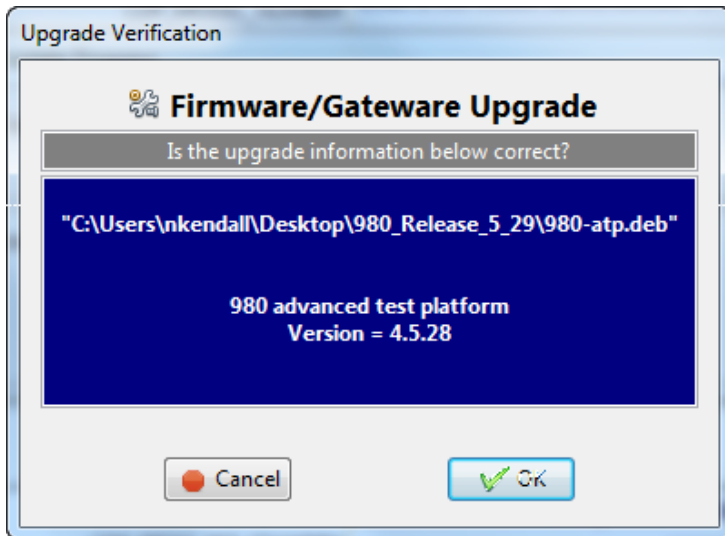
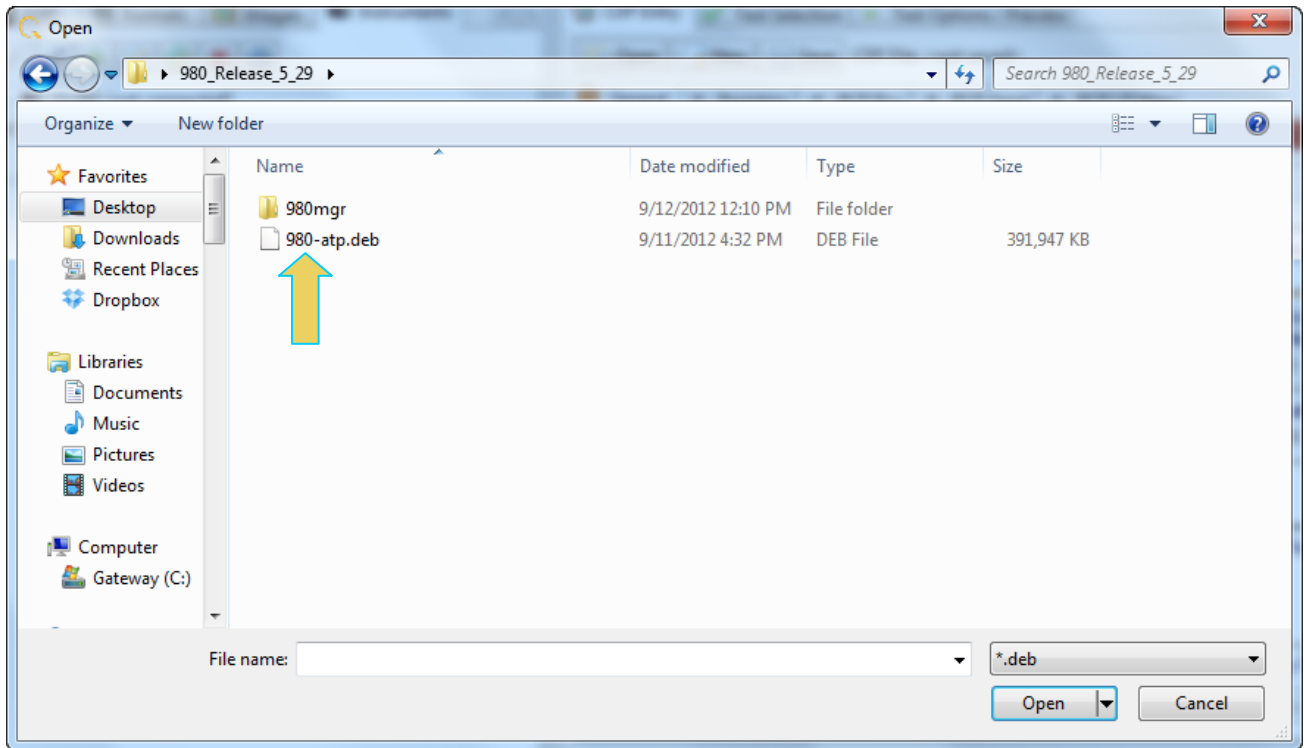
3. Connect to the 980 that you wish to upgrade.

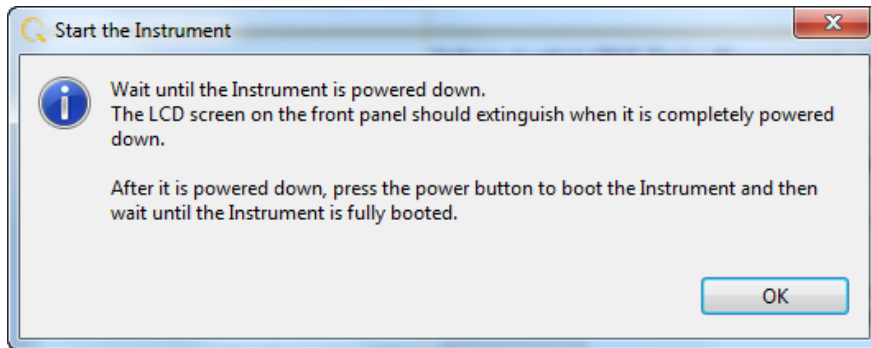
Access the **Upgrade Firmware/Gateware** option from the **Instrument** pull-down.



4. Update the 980 Firmware/Gateware.

Browse to the Deb file and select it. Follow the on-screen prompts.





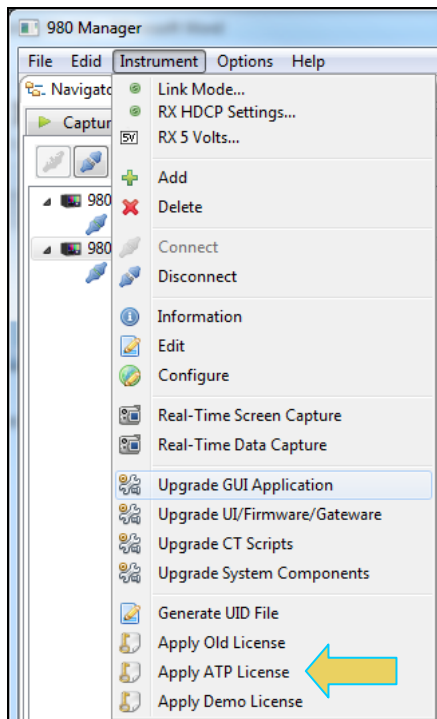
5. Reconnect the 980 GUI Manager to the 980.

11.2 Workflow for Adding License for optional feature

This section describes the workflow of the upgrade your 980 Protocol Analyzer with an optional feature using a license key. process. It is not intended to be a detailed procedure. **Please consult Quantum Data Customer Support for details.**

Note: You must have purchased the optional feature through the normal channels of your Quantum Data representative or distributor.

1. Purchase optional feature from Quantum Data distributor or representative.
2. Call Quantum Data customer support.
3. Generate UID text file from the **Instrument** pull-down menu (below) and convey to Quantum Data customer support.
4. Quantum Data will provide a QDATP.lic file. Store this on your host PC.
5. From the **Instrument** pull-down menu (below) select Apply ATP License.



12 Command Line Interface for Capturing Data

This chapter describes the command line interface for captured data.

12.1 Overview

The command line enables you to capture data and search through captures for specific subsets of data. You can control the 980 HDMI 2.0 Protocol Analyzer through the command line via a telnet session or from the 980 Manager Console panel. When searching through the captured data, Quantum Data recommends that you use the Telnet or some other terminal program such as Putty because there is a limited set of Linux commands supported through the 980 Console.

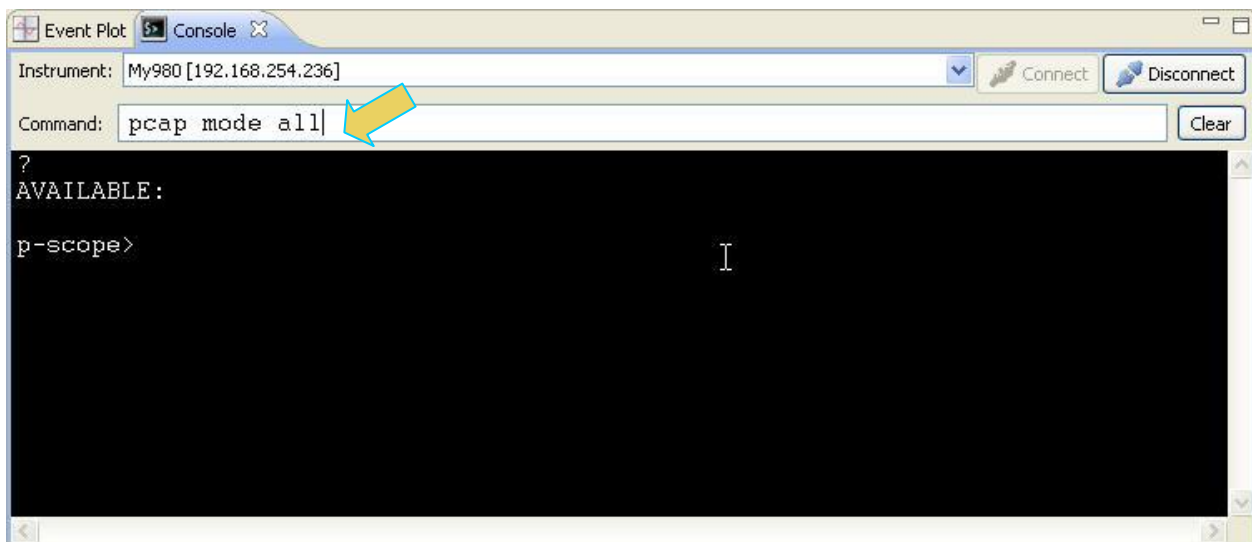
There are 980-based commands that enable you to initiate commands to capture data. Once you capture data, you can conduct searches either on your host PC or the 980 itself. To conduct searches on your PC you have to transfer the captured data to your host PC using an FTP utility. This procedure is described in the section: [Transferring Capture Files from the 980 to a PC](#).

The 980 HDMI 2.0 Protocol Analyzer is based on the Linux operating system; therefore, to conduct searches directly on the 980 you use the Linux search and filter utilities such as `grep`.

You can access the Linux prompt from the pscope prompt available from the **Console** panel or through a separate telnet window. Procedures for both are shown below.

To establish a command line session through the 980 Console window:

1. Establish an Ethernet connection between the 980 HDMI 2.0 Protocol Analyzer using the procedures defined in: [Connection Scenarios for external 980 GUI Manager](#).
2. Highlight the 980 that you want to execute commands on.
3. Activate the **Console** tab to access the **Console** panel interface.
4. Click on the **Open Connection** activation button to establish a telnet session with the 980 Protocol Analyzer.



5. The `p-scope>` prompt will appear allowing you to enter commands.

Note: You enter commands in the **Command** field above the terminal area.

The primary command for setting up and initiating the capture data is the **PCAP** command (not case sensitive). There are several arguments of the PCAP command and these are explained in the table in the procedures below.

To quit out of the 980 Console window session:

1. To quit out of the console session enter the following sequence:

```
p-scope>quit    // Takes you to the Linux shell prompt.
qd@scope:~$
```

2. Enter the following to exit out of the console session:

```
qd@scope:~$ exit
```

To establish a command line session through a telnet session:

1. Launch the Command Prompt utility from the Windows Accessories.
2. Establish a telnet session with the 980 using the following command. Note you will enter in the IP address of the 980 (192.168.254.001 in example below):

```
>telnet 192.168.254.001
```

The 980 login prompt will then appear as shown below. The 980 login and password are **qd**.

```
Pscope login: qd
```

```
Password: qd // you will not be able to see the entry.
```

3. The **p-scope>** prompt will appear allowing you to enter commands.

The primary commands for setting up and initiating the capture data is the **PCAP** command (not case sensitive). There are several arguments of the PCAP command and these are explained in the table in the procedures below.

List of PCAP Commands

Note: Commands are lower case.

Command	Description	Syntax	Command Example
pcap size	Defines the capture buffer size in percent of total (2GB).	pcap size <size> Where <size> can be 0 to 100 percent.	To set the capture buffer size to 50% of the total buffer capacity: >pcap size 50 Captures data up to 50% of the capacity of the buffer.
pcap mode	Defines the data that is captured. In other words determines if video and data islands	pcap mode <data> Where <data> can be: <ul style="list-style-type: none"> ▪ all - video & data ▪ di – data islands only ▪ tmds – raw protocol data 	To set the mode: >pcap mode di Captures only data island information (not video).

List of PCAP Commands

Note: Commands are lower case.

Command	Description	Syntax	Command Example
pcap trig	Defines the trigger mechanism	pcap trig <type> <pos> Where <type> can be: <ul style="list-style-type: none"> ▪ vsync – when a vsync event occurs ▪ encr- – encryption enable pulse is disabled (not detected in window of opportunity) ▪ encr+ - encryption enable pulse occurs ▪ in – external trigger input ▪ prat – a change in the pixel rate ▪ match – matched values in the data islands Where <pos> can be a percent in the range of: <ul style="list-style-type: none"> ▪ 0 to 100 	To set the trigger criteria: >pcap trig vsync 50 This example would set the trigger event to the occurrence of vsync and the position such that the trigger event would be midway between the data accumulated in the capture buffer.
pcap start	Initiates the capture of video stream.	pcap start	To initiate a capture: > pcap start
pcap decode	Decodes an existing capture in the capture buffer and creates a decode file.	pcap decode	To a decode of a capture: > pcap decode Creates a file using the default name of pdecode.log on the 980
pcap stat	Obtain a list of the video format timing statistics.	pcap stat	To obtain a list of the video format timing information: > pcap stat

Note: The commands are not case sensitive.

12.2 Command Line Examples

The following is an example of how to use the command line. You use the capture control commands at the pscope prompt. Once you have captured data you can transfer into the Linux shell and run typical Unix commands.

Note: You can run Linux commands on a capture file (decode.log) that either resides in the 980 instrument or that resides on your PC. However, the method is different. For captures that reside on the 980, you must run the capture through the command line either through a telnet session or through the 980 Manager Console.

12.2.1 Searching through captured text

This example shows you how to search through captured text. The primary capture utility in Linux is grep. Consult the man pages for the grep filter to determine how best to use this command.

To search through the captured text:

1. Enter the following commands to capture the data:

```

p-scope> pcap size 25           // Sets the capture buffer to 25% of its maximum size
p-scope> pcap mode di          // Only captures data islands (no video is captured)
p-scope> pcap trig vsync 10    // Initiates the capture when vsync is detected
p-scope> pcap start            // Initiates the capture
  
```

```
p-scope> pcap decode           // Decodes the hex file into human readable text and
                               stores in default directory: /home/qd/pdecode.log
```

Note: If you want to recapture and save a decode file you will have to move the existing decode file to another directory or rename it.

- To run the Timing Analyzer utility enter the following:

```
p-scope> pcap timing // Creates the timing analysis file
```

- To run the Audio Analyzer utility enter the following:

```
p-scope> pcap auda // Creates the audio analysis file
```

- Quit out of the pscope command line to access the Linux utilities in the bash shell:

```
p-scope> quit // quits out of the pscope shell to the bash shell where you
               enter linux command
```

- Here you can navigate to the proper directory or use the full directory path and enter any Linux shell command to search through the data.

```
qd@spscope:~$ cd /home/qd/workspace/captures/2010_05_27_17_15_28
```

Where "2010_05_27_17_15_28" is the name of a capture directory.

```
qd@spscope:~$ grep "CTS = 74250" pdecode.log
```

The command above will return all lines in the captured data where CTS is equal to the value specified.

```
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
```

- To return to the pscope prompt: `qd@spscope:~$ sudo /qd/ptalk`

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