

M41h 48G Video Analyzer/Generator

for HDMI 8K Testing

User Guide

Rev: A1



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Table of Contents

1	Abc	out the M41h 48G Video Analyzer/Generator	5
•	1.1	What makes the M41h 48G Video Analyzer/Generator Unique?	5
	1.2	Scope of this User Guide – What is not covered in this User Guide	5
	1.3	What options are available with the M41h 48G Video Analyzer/Generator?	6
	1.4	Changes to this User Guide	6
	1.5	M41h User Interface	6
	1.6	What kinds of data does the M41h 48G Video Analyzer/Generator allow you to view?	9
2		ting Started	11
	2.1	What is shipped with the M41h 48G Video Analyzer/Generator?	11
	2.2	Operational workflow for Source Analysis Testing	11
	2.3	Connector Description	11
	2.4	M41h 48G Video Analyzer/Generator Operational Modes	15
	2.5	M41h 48G Video Analyzer/Generator Analysis Configurations	15
	2.6	M41h Data Analysis Capture Modes	17
	2.7	Getting Started Procedures	17
3		erview of the ATP Manager (External)	19
	3.1	Overview	19
	3.2	Top Level Menu	19
	3.3	Navigator Panel	22
	3.4	Apps Panels	30
	3.5	Capture Control Panel	33
	3.6	Capture Viewer Panel	36
	3.7	Data Decode Panel	37
	3.8	Event Plot Panel	47
	3.9	EDID Editor Panel	56
	3.10	Opening up the EDID Editor	56
	3.11	Loading an EDID into the EDID Editor	59
	3.12	Making Modifications to an EDID with the EDID Editor	63
	3.13	Emulating a Specific EDID	70
4	Rea	Il Time Mode	72
	4.1	Accessing the Real Time mode	72
	4.2	Real Time Mode Overview	73
	4.3	Real Time Mode Data Panels	81
	4.4	Enabling HDCP Authentication and Encryption	90
	3.14	Setting the HDCP 2.2 mode	91
		alyzing HDMI Data with the M41h 48G Video Analyzer/Generator Capture Analysis Utility	93
	5.1	Overview	93
	5.2	Operational workflow for capturing data with your M41h 48G Video Analyzer/Generator	93
	5.3	Configuring the M41h 48G Video Analyzer/Generator Rx Interface	94
	5.4	Capturing HDMI FRL Incoming Streams	99
	5.5	Capturing HDMI TMDS Incoming Streams	103
	5.6	Initiating a Capture with Manual Triggering	109
	5.6	Examining HDMI 2.1 FRL Captured Data	117
	5.7	Examining TMDS Captured Data	127
6		nning Standard Tests	148
	6.1	Running a video timing test	148
	6.2	Running a video analysis test	155
_	6.3	Audio Analysis	161
7	Enh	nanced Audio Return Channel (eARC) Functional Testing	164

M41h 48	BG Video Analyzer/Generator for HDMI 8K Testing - User Guide	Rev. A1
7.1	EARC Tx Functional Testing	164
7.2	EARC Rx Functional Testing	167
7.3	Monitoring the EARC Common Mode Transactions	173
8 Au	xiliary Channel Analyzer (ACA) Utilities	177
8.1	Aux Channel Analyzer (ACA) – For Real Time Viewing of Auxiliary Channel Data	177
8.2	ACA Remote Control – For Real Time Viewing of HDMI Aux Channel Data	183
8.3	Monitoring the HDMI auxiliary channel with the ACA utilities	188
8.4	ACA Data Viewer – Viewing Stored Aux Channel Data	197
8.5	Viewing Stored HDMI DDC-SCDC traces on a PC with the ACA Data Viewer utility	203
8.6	Using the ACA Find Feature	209
8.7	Using the ACA Filter Feature	222
9 Loa	ading and Importing Capture files	238
9.1	Loading an existing captures with the M41h 48G Video Analyzer/Generator	238
9.2	Importing Capture Files from other M41h Systems	240
10 Tra	Insferring Capture Files from the M41h 48G Video Analyzer/Generator to a PC	247
10.1	Transferring Capture Files using the Data Transfer Utility	247
10.2	Transferring Capture Files using the command line	253
10.3	Transferring Capture Files using USB drives	254
11 Tes	sting HDMI Displays with the M41h 48G Video Analyzer/Generator	256
11.1	Workflow for running the video pattern testing of HDMI 2.1 displays	256
11.1	Connector Description	257
11.2	Making the physical HDMI connections	257
11.3	Navigating through the ATP Manager interface	259
11.4	Selecting HDMI or DVI formats	263
11.5	Selecting formats (resolutions) – FRL Mode	265
11.6	Configuring the format Settings	277
11.7	Configuring the Link Training Settings	279
11.8	Generating TMDS Video Streams	279
11.9	Selecting Test Patterns	281
11.10	Testing 3D Displays	288
11.11	Testing UHD Displays with UHD Alliance Test Patterns	293
11.12	8 1 1 9	294
11.13	5	297
11.14	Testing HDR Displays with HDR Test Patterns	325
11.15	Viewing the EDID of a connected display	329
11.16	Viewing the SCDC register contents of a connected display	333
11.17	5	337
11.18	Testing HDCP 2.2 on a connected display	341
11.18	Configuring and Transmitting Custom Metadata Values with the InfoFrame Utility	347
11.19	Viewing Metadata Packets Transmitted to a Connected Display	356
	mmand Line Interface for Capturing Data	359
12.1	Overview	359
12.2	Command Line Examples	361
-	grading the M41h Manager and M41h	363
13.3	Workflow for Upgrading M41h Firmware/Gateware	364
13.4	Workflow for Adding License for optional feature	367

1 About the M41h 48G Video Analyzer/Generator

This chapter provides an overview of the M41h 48G Video Analyzer/Generator and the ATP Manager features. The M41h 48G Video Analyzer/Generator is an analyzer and generator for testing HDMI 2.1 source and sink devices operating up to 600MHz TMDS character rate and up to 1485MHz pixel rate in FRL mode. It provides visibility into the HDMI protocol to help resolve common interoperability problems in HDMI systems. The M41h 48G Video Analyzer/Generator is able to parse HDMI streams from source devices with an FRL data rate of 48Gb/s.

The M41h 48G Video Analyzer/Generator enables you to specify the type of data that you want to capture. This could be:

- Data Analysis (Audio, Video, Data Island) The M41h will capture all the audio packets, video data and the data islands, timing data and auxiliary data and show them encapsulated into the Fixed Rate Link (FRL) packets.
- Fixed Rate Link (FRL) Data Analysis The M41h will capture the Fixed Rate Link (FRL) data and show the underlying TMDS data elements.
- TMDS Data Analysis The M41h will only capture the data islands and video frames.
- Protocol Analysis The M41h will capture the TMDS and Fixed Rate Link (FRL) protocol data such as the preamble and guard band data.

The ATP Manager is a PC application used to manage the M41h 48G Video Analyzer/Generator.

quantumdata M 48Gbps Video Analyzer/Gene				TELEDYNELECROY
0	•<-		DDC Source	
Volume	USB 3.0	In/Rx	Out/Tx	

1.1 What makes the M41h 48G Video Analyzer/Generator Unique?

The M41h 48G Video Analyzer/Generator analyzer provides visibility into the HDMI FRL and TMDS protocol, timing, control and auxiliary data of incoming video stream from an HDMI 2.1 source device. It captures and decodes encrypted or unencrypted metadata (audio sample, infoframes and other data packets) as well as HDMI DDC transactions.

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

This User Guide documents the operation of the M41h 48G Video Analyzer/Generator as installed in the M41h. It is intended to be used with the M41h Quick Start Guide.

The User Guide describes the features and functions of the M41h 48G Video Analyzer/Generator as operated through the standalone PC application, i.e. the M41h Manager. The screen shots used are usually from the most current release of the ATP Manager. In some cases there are functions of the external ATP Manager that will be

covered in detail as well. These include: 1) Provisioning the IP address of the M41h. 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 M41h Test Platform. The start-up procedures are covered in the M41h Advanced Test Platform Quick Start Guide.

1.3 What options are available with the M41h 48G Video Analyzer/Generator?

There are several options available with the: 1) The Protocol Analyzer function and 2) the Video Generator function, 3) eARC functional testing for Tx, 4) eARC functional testing for Rx, 5) eARC compliance testing for Tx, 6) eARC compliance testing for Rx, 7) FRL source compliance testing, 8) FRL sink compliance testing. Procedures for both are described herein except for the FRL compliance tests which are described in the MOIs and available through the HDMI Forum.

1.4 Changes to this User Guide

This is a new User Guide.

1.5 M41h User Interface

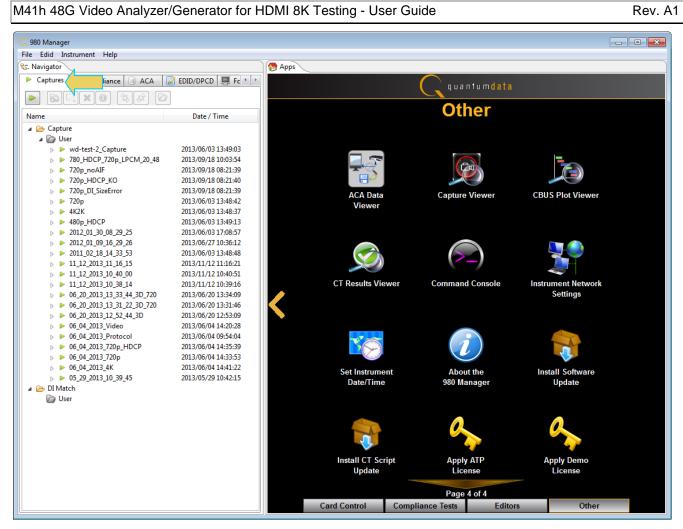
The M41h provides a graphical user interface (ATP Manager) for operation. This GUI can run both on the M41h itself through external display or as a standalone application running on a PC (external ATP Manager). The look and feel and functions are similar but not identical.

1.5.1 ATP Manager

The external ATP Manager provides easy access to the captured data on your PC for sharing with others. Also the external ATP Manager enables you to operate the M41h through a larger interface which allows you to use multiple panels at the same time.

1.5.2 External ATP Manager and External ATP Manager layout differences

There are a few other differences in the layouts between the ATP Manager running on an external display and the ATP Manager running on a host PC. The primary difference is the Navigator panel which enables you to access the data elements and test results from an instrument. In the PC ATP Manager, the **Navigator** panel is always present on the left side of the ATP Manager application window as shown below.



In the ATP Manager displayed on an external monitor, 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 ATP Manager displayed on a remote monitor using the activation key at the bottom of any screen as shown below.

Rev. A1



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

Captures Scompliance ACA Compliance Compliance ACA Compliance C	🗐 Formats 📘 Images 🛛 💷 Instruments	
r 🔁 🗙 🔘 😫 🕼 🙋		
Name	Date / Time	
🛛 🗁 HDMI Capture		
🔺 🗁 User		
12_01_2017_09_29_04_FRL	2017/12/01 09:30:21	
HDMI_21_12G_4LN_NK	2017/11/29 11:56:36	
HDMI_21_10G_4LN_NK	2017/11/29 11:56:03	
HDMI_21_6G_4LN_NK	2017/11/29 09:28:43	
11_01_2017_10_35_26_DLB	2017/11/07 09:36:59	
11_01_2017_10_26_15_DLB	2017/11/07 09:36:57	
10_31_2017_16_24_27_C4	2017/11/07 09:36:35	
10_31_2017_14_08_07SNBR2	2017/11/07 09:36:27	
10_31_2017_14_03_26SNBR1	2017/11/07 09:36:24	
I0_31_2017_13_31_36SNPSPRV	2017/11/07 09:36:20	=
10_31_2017_11_21_59BS65	2017/11/07 09:36:12	
I0_31_2017_09_53_06_SNGMPRHDR_1	2017/11/07 09:36:08	
11_04_2017_00_43_30_FRL	2017/11/03 16:40:35	
10_31_2017_09_53_06_SNGMPRHDR	2017/10/31 12:05:04	
HDMI_21_FRL_Proto	2017/10/26 09:01:41	
HDMI_21_FRL_FEC_Err_Proto_NK	2017/10/26 09:01:35	
10_02_2017_10_10_30	2017/10/10 15:43:54	
10_02_2017_10_25_32	2017/10/10 15:43:28	
10_04_2017_13_42_38	2017/10/04 13:43:08	
> 09_14_2017_12_23_11	2017/09/22 15:36:42	
> 09_14_2017_09_43_59	2017/09/22 15:36:38	
HDMI_21	2017/07/02 11:42:15	
HDMI_HDR_Capture	2017/03/27 20:03:14	
HDMI_6G_Video_Timing_HDCP22	2017/03/27 20:02:48	
HDMI_720p_Error_Protocol_Analysis	2017/03/27 20:02:48	
HDMI_6G_Video_Timing	2017/03/27 20:02:35	
6G_Scrambled_Protocol_Analysis_2	2017/03/27 20:01:54	
HDMI_6G_Protocol	2017/03/27 20:01:54	
6G_Data_Analysis_2	2017/03/27 20:01:53	
6G_Protocol_Analysis_1	2017/03/27 20:01:53	
6G_Protocol_Analysis_2	2017/03/27 20:01:53	
6G_Scrambled_Protocol_Analysis_1_HDCP	2017/03/27 20:01:53	
3G_Data_Analysis_3_HDCP	2017/03/27 20:00:54	
3G_Data_Analysis_1_HDCP	2017/03/27 20:00:30	
DI Match		
Diser (

1.6 What kinds of data does the M41h 48G Video Analyzer/Generator allow you to view?

By providing visibility into the HDMI FRL protocol, and the underlying protocol, video and data island blocs as well as SCDC data during FRL link training data, the M41h 48G Video Analyzer/Generator enables you to detect changes and identify anomalies in the HDMI 2.1 signal. The following is a list of the data types you can view (currently):

Fixed Rate Link (FRL)

- o Fixed Rate Link packets
- Character blocks
- Super blocks
- FEC blocks
- Active Video
 - Guard bands
 - \circ Preambles
- Data Islands, including:
 - $\circ \quad \text{Guard bands}$
 - o Preambles
- DDC, transactions, including:
 - o EDID
 - o SCDC
- Control data (Vsync, Hsync, encryption enable)

2 Getting Started

This chapter explains what is involved in getting your M41h 48G Video Analyzer/Generator up and operating to capture data. Detailed Getting Started procedures are provided in the M41h 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 M41h 48G Video Analyzer/Generator?

When a Teledyne LeCroy quantumdata M41h is shipped it will contain the following additional items:

- AC Power Line Cord.
- CE mark declaration.
- Hi-Speed HDMI Cable.
- Ethernet Cable.
- Mouse.
- Quick Start Guide.

2.2 Operational workflow for Source Analysis Testing

The following are the high level steps you will need to follow to get your M41h 48G Video Analyzer/Generator up and running. Note the first set of these procedures are covered in the M41h Quick Start Guide and not in this User Guide.

2.2.1 Procedures covered in M41h Advanced Test Platform Quick Start Guide:

2.1 Getting the M41h Up and Running

Use the following procedures to get your M41h up and running.

- 1. Remove the M41h from the shipping box and lay it flat or upright on your desktop or benchtop.
- 2. Connect the M41h power cable (provided) to a suitable outlet (110-240V 50/60Hz). The power receptacle is on the back of the M41h as shown below.



3. Connect an external HDMI or DisplayPort monitor to the HDMI or DisplayPort connectors on the back of the M41h; labeled "External Monitor" at the location indicated below.





Important Note: You can connect a wide variety of displays to either the HDMI or the DisplayPort admin port on the back of the M41h as shown. However, if the incoming video from the source device under test is content protected with HDCP 2.3, then unless you connect a display that supports HDCP 2.3 you will not be able to see the incoming video in the Real Time window. You will receive a notification informing you of this.

The setup is depicted below.



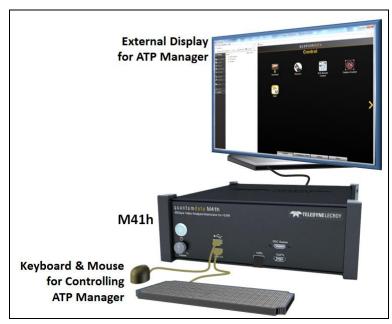
- 4. Connect a mouse to one of the USB ports on the front or back of the M41h as shown below.
- 5. Optionally connect a keyboard to one of the other USB ports on the front or the back of the M41h. You can also use the virtual keyboards that present themselves in the ATP Manager.



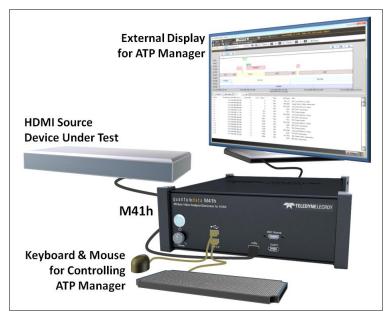
6. Power up the M41h via the power button on the front of the M41h.



The ATP Manager application will appear on the external display as shown below.



7. Connect your HDMI source or sink device under test to the appropriate In/Rx or Out/Tx port on the front of the M41h. The following example shows an HDMI source device connected.



You can fully operate the M41h through the ATP Manager using this connection scenario with a keyboard, mouse and external monitor. However, there is an alternative way with the ATP Manager application running on a host Windows PC as described in the following section.

Important Note: As stated above, you can connect a wide variety of displays to either the HDMI or the DisplayPort admin port on the back of the M41h as shown. However, if the incoming video from the source device under test is content protected with HDCP 2.3, then unless you connect a display that supports HDCP 2.3 you will not be able to see the incoming video in the Real Time window. You will receive a notification informing you of this.

2.3 Connector Description

This User Guide covers three configurations of the M41h rear panels with the M41h 48G Video Analyzer/Generator installed. Each illustration shows a single M41h 48G Video Analyzer/Generator installed in the M41h along with an auxiliary bus board.

Use the following table to identify the connector function and descriptions on your M41h system configuration.

M41h Configurations	Information / Function
Protocol Analyzer in M41h	The following is a description of each connector:
F Case and the second	 M41h 48G Video Analyzer/Generator - Front: A – HDMI 2.1 Rx port for testing HDMI 2.1 sources. B – HDMI 2.1 Tx port for analyzing HDMI 2.1 sinks. C – HDMI 2.1 Rx port used for reading the EDID over the DDC channel (applies to eARC Tx test). D – USB ports (2) used for connecting a mouse and keyboard. E – Volume knob for turning up or down the volume for the internal speaker. F – Power button; press and release.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

M41h Configurations	Information / Function
	 M41h 48G Video Analyzer/Generator - Back: G – Power plug (100-240VAC 50/60Hz; 200 Watts) H - HDMI – Admin port for connecting external HDMI UHD display for M41h ATP Manager. I - DisplayPort – Admin port for connecting the external display for M41h ATP Manager. J - USB/USB-C (2 ea.) – For mouse & keyboard. K - RJ45 (2) - E1 Network for connecting host PC running ATP Mgr. E2 Aux – Not used. L - DVI – Possible future use. M - RS-232 (2) – Possible future use. O - TRIG IN/OUT – Future. P - RCA SPDIF OUT – OUT: Monitors eARC audio; IN: Possible future use.

2.4 M41h 48G Video Analyzer/Generator Operational Modes

The M41h 48G Video Analyzer/Generator can be operated in the Capture and Store mode.

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 2.1 data and is available both through the built-in touch display GUI and the external ATP Manager. You can capture various sets of data: 1) Data islands, 2) Data islands with video and audio, 3) Control data and 4) DDC SCDC transactions.

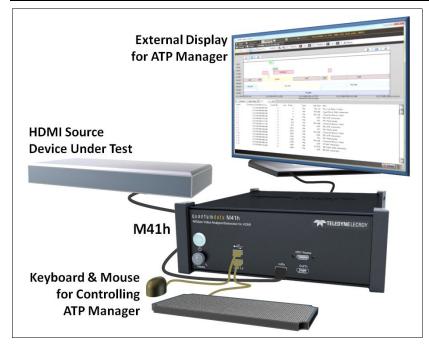
2.4.2 Real Time Monitoring

The Real Time Monitoring mode enables you to view the incoming video and essential video and timing parameters. You can also view the metadata through the flyout panels. The Real Time mode works in for both TMDS and FRL modes. To view the incoming video in Real Time you need to connect an external monitor to the HDMI monitor port on the back.

Important Note: You can connect a wide variety of displays to either the HDMI or the DisplayPort admin port on the back of the M41h as shown. However, if the incoming video from the source device under test is content protected with HDCP 2.3, then unless you connect a display that supports HDCP 2.3 you will not be able to see the incoming video in the Real Time window. You will receive a notification informing you of this.

2.5 M41h 48G Video Analyzer/Generator Analysis Configurations

The M41h 48G Video Analyzer/Generator 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 M41h 48G Video Analyzer/Generator's Rx port.



HDMI 2.1 Source Analysis Configuration – M41h ATP

2.6 M41h Data Analysis Capture Modes

The M41h 48G Video Analyzer/Generator can view different types of data in a capture and store application.

2.6.1 Fixed Rate Link (FRL) and Forward Error Correction (FEC) Analysis

The M41h 48G Video Analyzer/Generator will capture all the FRL and FEC protocol packets and elements and depict them graphically on the Event Plot and in table form in the Data Decode window. The underlying TMDS video and protocol elements such as the preamble and data island blocks are also shown.

2.7 Getting Started Procedures

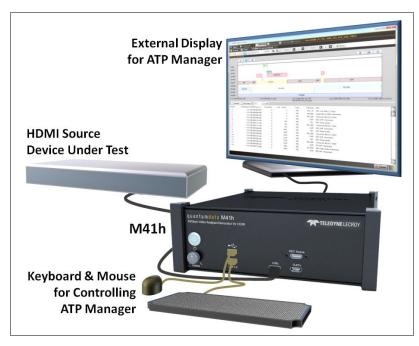
The getting started procedures involve the following tasks:

- Downloading, unzipping and launching the ATP Manager application to allow you to operate the M41h. (Not required if using the embedded ATP Manager on the built-in display exclusively.)
- Powering up the M41h platform.
- Establishing a physical connection from the HDMI source device you wish to test and the M41h platform.
- (Not required if using the built-in display exclusively) Changing the IP address of the M41h 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 M41h Manager (residing on your host PC) and the M41h platform.

2.7.1 Establishing a physical HDMI connection from an HDMI 2.1 source device to the M41h

Use the following procedures to connect your HDMI source device to the M41h 48G Video Analyzer/Generator.

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 M41h 48G Video Analyzer/Generator. Refer to the picture below.



HDMI 2.1 FRL sink emulation for source analysis - M41h



3 Overview of the ATP Manager

3.1 Overview

This chapter describes the ATP Manager panels on the external ATP Manager. The ATP Manager is an application that runs on your local PC. It enables you to examine the data captured by the M41h 48G Video Analyzer/Generator through a user friendly graphical interface.

Note: The ATP Manager displayed on a connected monitor works almost identically.

The main window of the ATP 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.

7 980 Manager
File Edid Instrument Help
দ্দ্ব- Navigator
🕨 Captures 🔯 Compliance 🗊 ACA 📝 EDID/DPCD 🗐 Formats 🔲 Images 💷 Instruments

Top Level Menu Items	Selection	Function
File 980 Manager File Edid Instrument Help Den	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	View Info/Text	Enables you to view the information related to a the selected data file that the Navigator/Data view.
🗙 Delete	Rename 🖢	Enables you to rename a data file.
import ☑ Export	Delete 🔀	Enables you to delete a data file from the M41h Manager application.
Refresh List Switch Workspace X Exit	Import 🚵	Enables you to import a file that resides on the M41h Manager host into the M41h 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 M41h Manager. The file is compressed to a zip file. This can be a capture, ACA data, EDID, or any compliance result.
	Refresh List 😂	Enables you to refreshes the list of captures to

November 21, 2019

Top Level Menu Items	Selection	Function
		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 M41h Manager application.
EDID Edid Instrument Help	Set M41h RX EDID	Configures the M41h Rx port with the specified EDID.
Read 980 TX EDID	Read M41h TX EDID	Loads an EDID from the HDMI sink device connected to the M41h Tx port.
COID View Decoded EDID	View Decoded EDID	Enables you to view the human readable text of the selected EDID
Note : This menu is context sensitive. Its contents depend on whether the EDID Editor Panel is open and being used.	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 M41h. Note that you can have multiple M41hs defined in the ATP Manager. This action is required before connecting to a M41h.
	Delete 🔀	Enables you do delete the selected M41h instrument.
	Connect 🜌	Clicking on this item will initiate a connection to the M41h that is selected in the list. This item will not be highlighted if you have not selected a M41h.
	Disconnect	Clicking on this item will initiate a disconnection from the M41h that is selected in the list that you are currently connected to. This item will not be highlighted if you have not selected a M41h.
	Information	Provides information about the M41h that the M41h Manager is currently selected. This information includes:
		 M41h Name

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Top Level Menu Items	Selection	Function
Instrument Help Image: Add Delete Image: Connect Image: Connect Image: Disconnect Image: Connect	Edit [the Instrument Entry]	 IP address of the M41h Netmask Gateway IP address Hardware revisions of the M41h circuit boards Firmware/Gateware version of the release applied to the M41h Serial number of the M41h OS version Licensed options applied to the M41h Enables you to edit certain information about the M41h that you have selected. You can edit
Upgrade UI/Firmware/Gateware Upgrade CT Scripts Upgrade System Components Generate UID File Apply Old License Apply ATP License Apply Demo License Calibrate the LCD	Configure [Instrument Network]	the name and IP address. Allows you to view and set the network information such as the M41h IP address, netmask and gateway IP address. Enables you to make a capture of the current Real Time screen contents of the M41h 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 M41h 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 M41h built-in GUI as well as the firmware and gateware of a M41h 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 M41h compliance test application scripts. You can download new releases from the Quantum Data website on the downloads page.
	Upgrade System Components	Upgrade System Components - Enables you to apply an upgrade to the M41h HDMI Source Compliance Test application or any other optional application. You can download new releases from the Quantum Data website on the

Top Level Menu Items	Selection	Function
		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 M41h system and(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.
	Calibrate the LCD	Enables you to calibrate the embedded display for touch accuracy.
Help Help About the 980 Manager	About the M41h Manager	Provides release and version information about the M41h 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.

°€_ Navigator						
Captures	🔯 Compliance	ACA	EDID EDID	Formats	国 Images	Instruments

3.3.1 M41h Navigation Panels and their Icons

The M41h **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	
Navigator Tab Captures Provides access to the list of captures. Captures Captures Capture Capture Date / Time Capture Date / Time Capture Date / Time Capture 2013/06/03 13:49:03 P 2013/06/03 13:49:03 P 2013/06/03 13:49:03 P 2012 01_30(08:29:25 2013/06/03 13:48:42 2013/06/03 13:48:43 P 2012 01_30(08:29:25 2012 01_30(916:29:26 2013/06/03 13:48:48 P 2012 01_30(08:29:25 P 2011/02:18:14:33:53 P 2012 01_30(08:29:25 P 2013/06/03 13:48:48 P pdecode.log: 329:12460 bytes P pdecode.log: 329:12460 bytes P pdecode.log: 329:12460 bytes P decode.log: 329:12460 bytes P dot decode.lo	 Connect — Enables you to connect to the selected M41h, 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 M41h, 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 M41h — Enables you to add or define a M41h instrument in the M41h Manager application. This is required before connecting to a M41h. Only appears when the Navigator/Instrument tab is selected. Edit Instrument Information — Enables you to edit name and IP address of the M41h that you have selected. Only appears when the Navigator/Instrument tab is selected. Instrument Network Information — Allows you to 	
Provides access to the data for the various	name and IP address of the M41h that you have selected. Only appears when the Navigator/Instrument tab is selected.	
	 Transfer data to/from instrument Transfer data to/from instrument Opens up the FTP browser enabling you to transfer data to and from the host PC and the M41h instrument. Available 	

Navigator Tab	Associated Icons	
Second	 for all Navigator tabs except Instruments tab. Create new folder Enables you to create a folder under the highlighted directory. Available for all Navigator tabs except Instruments and ACA tab. Organize (move/copy) local data Organize (move/copy) local data 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. Open Selected Item in a file browser Open Selected Item in a file browser Opens up the folder location of the selected file. Available for all Navigator tabs except Instruments tab. Delete the Selected Item Deletes a data item that you have selected. Available for all Navigator tabs except Instruments tab. Show Information about selected item Provides information about selected ata type and the M41h used to capture the data. Available for all Navigator tabs except Instruments tab. Open [the Selected item] Loads the selected data item into the M41h Manager for viewing and analysis. Available for all Navigator tabs except Instruments tab. Use Selected Item on Instrument [the Selected item] Applies the selected data item into the M41h instrument. Available only for the EDID, Formats and Images tabs. 	

Navigator Tab	Associated Icons
Constraint Constraint Constraint Images Images Images Images Images Imag	
Formats	
Provides access to format files that have been saved and format library lists that have been configured.	
Racingator EDID Formats Images	
Images	
Provides access to bitmap image files that have been saved and image library lists that have been configured.	
🔁 Navigator	
Formats Images Instruments Formats Images Image Image Image Image <td></td>	

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide	
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Navigator Tab	Associated Icons
Instruments	
Provides access M41hs that have been configured through the ATP Manager.	
Part Images Formats Images Images Instruments Images Instruments Images Images Images Instruments Images Images Images Images<	

Rev. A1

3.3.2 M41h Navigation Instruments Panel and Right-Click items

The M41h **Navigator Instruments** panel provides a set of right click functions when a specific M41h instrument is selected. These are described in the following table.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Navigator Panel - Item	Function
	 Upgrade HDMI CT Scripts ² 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 M41h 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 M41h system and(s).
	 Apply Old License
	 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.

M41h Navigation Captures Panels and Right-Click items 3.3.3

The M41h Navigator Capture panel provides a set of right click functions when a specific M41h instrument is selected. These are described in the following table.

Navigator Panel - Item	Function	
Right click on M41h Capture	 Import Capture Data Enables you to import a zipped capture file that resides on the M41h Manager host PC. You can then disseminate this file to other colleagues who can view the captured data using the ATP Manager, i.e. they do not need the M41h Protocol Analyzer. Export Capture Data Export Capture Data Enables you to export a capture file that resides on the M41h Manager host PC. All captured data is zipped up into a single file. Open [the Selected Capture] Loads the selected 	

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Navigator Panel - Item	Function		
Captures Compliance ACA EDID 4 Image: Capture Image: Capture Image: Capture Image: Capture Image: Capture Image: Capture 2013/06/03 13:49:03 Image: Capture Image: Capture 2013/06/03 13:48:42 Image: Capture 2013/06/03 13:48:43 Image: Capture 2012_01_30_08_29_25 Image: Capture 2013/06/03 13:48:51 Image: Capture 2013/06/03 13:48:48 Image: Capt	 capture into the M41h 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 M41h used to capture the data: 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 M41h Manager application. 		
Capture Listing (Status) S. Navigator Captures Compliance ACA ■ EDID For Captures Compliance ACA ■ EDID For Name Date / Time Capture Date / Time Capture Date / Time Capture Date / Time Capture Date / Time P wd-test-2_Capture 2013/06/03 13:49:03 P Wd-test-2_Capture 2013/06/03 13:48:42 P 480p_HDCP 2013/06/03 13:48:43 P 480p_HDCP 2013/06/03 13:48:43 P 2012_01_30_08_29_25 2013/06/03 13:48:48 P 2012_01_30_08_29_25 2013/06/03 13:48:48 P 2012_01_31_20_8_14;33_53 2013/06/04 14:20:28 P 06_04_2013_720p_HDCP 2013/06/04 14:33:53 P 06_04_2013_720p_HDCP 2013/06/04 14:33:53 P 06_04_2013_720p_2013_10_39_45 2013/05/04 14:31:52 P 06_04_2013_4K 2013/05/04 14:41:22 P 06_04_2013_9_45 2013/05/29 10:42:15 P 05_29_2013_10_39_45 2	 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. 		

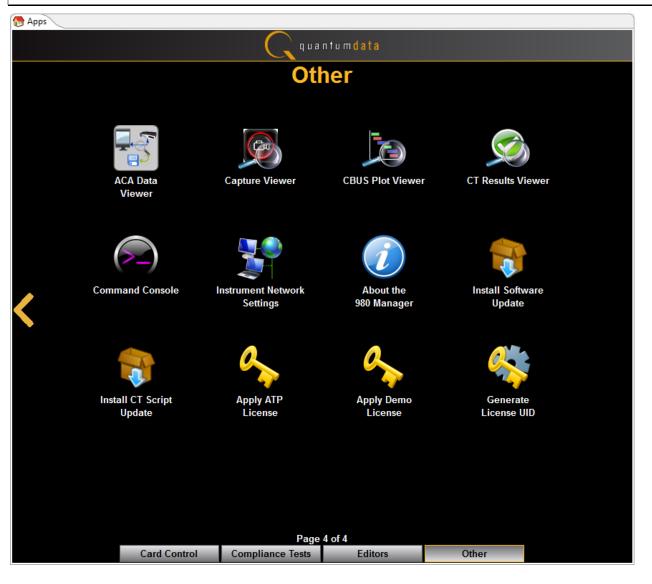
3.4 Apps Panels

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 (future)
 - Receiver (HDMI 2.1)
 - ACA Remote Control
 - Capture Control
 - HEAC
- Page 2 of 4 Compliance Tests (Not currently applicable to HDMI 2.1)
 - DisplayPort (directory)
 - HDMI 1.4 (directory)
 - HDMI 2.1 (directory)
 - MHL/CBUS (directory)
 - UHDA Source CTS
- 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 (Not all items are applicable to HDMI 2.1)
 - ACA Data Viewer
 - Capture Viewer
 - CBUS Plot Viewer
 - CT Results Viewer
 - Command Console
 - Instrument Network Settings
 - Set Instrument Date/Time
 - About the M41h 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.

Capture Control		
Capture Port Select Quantum Data, Inc. HIMI 2.1 RX/TX: Port 10		
Trigger Mode:		
First Event O After TP Immediate First Event O After TP Immediate Trigger on first trigger event to occur. t of Buffer Size before TP = 0 to TP t of Buffer Size after TP = 100 - TP		
Buffer Size:	409.60 MB	
5.000% <	Þ.	
Trigger Position (TP) within the Buffer:	0.00 MB	
0.000% <	4	
HotPlug on Capture Start Duration 1000 ms 🛛 Video Check		
Capture		
► Start Capture		
🗊 Data 🙀 Trigger		
Select the type of data to capture and which post capture analysis to perform.		
Type: FRL Decode	-	
Analysis:		
✓ Data Decode		
	X Close	resi

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

Capture Control Panel - Function	Item - Descript	ion
Instrument Selection		
 Capture Control Capture Port Select Quantum Data, Inc. HIMI 2.0 prot Trigger Mode: First Event After TP Immediate Trigger on first trigger event to occur. of Buffer Size before TP = 0 to TP of Buffer Size after TP = 100 - TP 	ocol analyser: Fort 60	
Capture Trigger Configuration	you to select wh you have more M41h system or Select button wi	on above will open up a dialog box enabling hich M41h system you want to use assuming than one. Typically, you will only have a single in the network in which case the text next to the ill indicate your M41h system.
Capture mgger Comguration	Enables you to define the capture trigger criteria. Use the information below.	
Trigger Mode: © First Event © After TP © Immediate S of Buffer Size before TP = 0 to TP S of Buffer Size after TP = 100 - TP Buffer Size: 5.000% < Trigger Position (TP) within the Buffer: 0.000% <	Trigger Mode	 First Event – The capture function will trigger on the first Scrambler Reset character sequence of the first Super Block. After TP (Trigger Position) – Not supported in this initial release. Immediate – Not supported in this initial release. Enables you to set the size of the captured
✓ HotPlug on Capture Start Duration 1000 ms ✓ Video Check	Buffer Size Slidebar	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 (max is 8Gbytes). A lower value will require less time for the captured data to accumulate.
	[Capture] Trigger Position within Buffer Slidebar	Not supported in this initial release.
	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 M41h, will reinitiate HDCP authentication if the video content from the

Capture Control Panel - Function	Item - Description	
		source is content protected.
	Video Check	Verifies that there is incoming video prior to a capture.
	Start Capture (Capture Tab)	Initiates a capture using the criteria defined in the Data , Trigger and Match tabs below.
Capture Start Capture Data Frigger Select the type of data to capture and which post capture Type: FRL Decode Analysis:	Data Tab (Capture Tab)	Current there is a default Type and there are no other configurations supported.
		 FRL Decode – Supports the capture and storage of FRL and FEC protocol elements while also showing underlying TMDS elements.
✓ Data Decode	Trigger Tab (Capture Tab)	The only currently supported trigger is the initial scrambler reset in a Super Block.

3.5.1 Defining Precision Triggering and Pre-Capture Filtering

Page 35

Rev. A1

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:

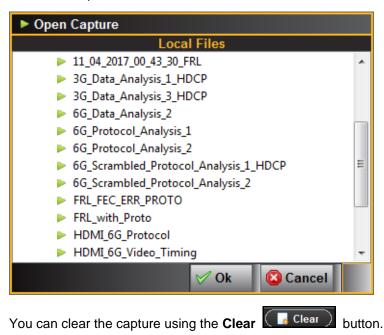
- Event Plot Provides graphical view of metadata.
- Data Decode Provides tabular view of metadata.

When you open up a capture the Event Plot and Data Decode windows will always be shown by default.

Capture Viewer			
🔎 Open 🛛 🔄 Clear			
🖶 Event Plot 🕱 📄 Data Decode 🚾 Timing Analysis			
Segment 🗵 Events 🞯 Rows 🔂 Find 🔄 Sync 🕕 Legend			
Image: Second			
1:47 30.723.578.790.850			
7400			
TMDS VSYNC			
HSYNC			
ENCR-E			
AVMUTE			
DDC			
CEC			
Time (H:M:S.ms.us.ns.ps)			
X Close			

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:



3.7 Data Decode Panel

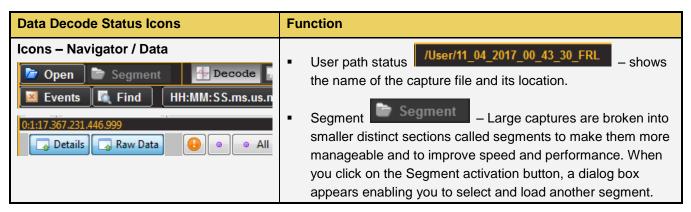
The **Data Decode** panel (shown below) is the primary panel for examining data at the detail level. The example shows data captured in the Data Analysis mode where the FRL, FEC and TMDS data are captured.

Ket TimeStamp (HH:MM:SS.ms Frame/Bl Line Pixel/ Type SubType Info 0 01:17.317.483.097.60 0 1063 FRL BLANK 137 Video Blanking characters 2 01:17.317.483.098.100 0 1063 FRL VDPREAM 136 VIDEO Preamble ctl period 1 1 01:17.317.483.152.100 0 1063 FRL HSYNC 16 HSYNC 3 01:17.317.483.159.00 0 1522 FRL GAP 322 GAP characters 5 01:17.317.483.307.800 0 1530 FRL CHBLK Character Block 3 Start 6 01:17.317.483.307.800 0 2032 FRL GAP 502 GAP characters 7 01:17.317.483.307.800 0 FRL SUPBLK Super Block 2040 characters 8 01:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 10 01:17.317.483.539.100 1 0 FRL GAP 502 GAP characters <td< th=""><th>🗔 Detail</th><th>s 🗔 Raw Data 🛛 🔒 💿</th><th>• All</th><th></th><th></th><th></th><th></th></td<>	🗔 Detail	s 🗔 Raw Data 🛛 🔒 💿	• All				
0 0.1:17.317.483.097.650 0 1063 FRL BLANK 137 Video Blanking characters 2 0.1:17.317.483.098.100 0 1063 FRL VDPREAM 136 VIDEO Preamble ctl period 1 1 0.1:17.317.483.152.100 0 1063 FRL HSYNC 16 HSYNC 3 0.1:17.317.483.159.300 0 1200 FRL GAP 322 GAP characters 4 0.1:17.317.483.309.00 0 1522 FRL FEC FEC Parity bytes 5 0.1:17.317.483.307.800 0 1530 FRL GAP 322 GAP characters 7 0.1:17.317.483.537.300 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.539.100 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 10 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 11	acket			Line Pixel/	Type	SubType	Info
2 0.1:17.317.483.098.100 0 1063 FRL VDPREAM 136 VIDEO Preamble ctl period 1 0.1:17.317.483.152.100 0 1063 FRL HSYNC 16 HSYNC 3 0.1:17.317.483.159.300 0 1200 FRL GAP 322 GAP characters 4 0.1:17.317.483.304.200 0 1530 FRL CHEL Chearacter Block 3 Start 5 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.537.300 0 2032 FRL FEC FEC Parity bytes 8 0.1:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 10 0 FRL GAP 502 GAP characters 502 GAP characters 502 GAP characters 2 0.1:17.317.483.591.00 1 00 FRL CHBLK Character Block 0 Start <td>10</td> <td>• •</td> <td></td> <td></td> <td></td> <td></td> <td></td>	10	• •					
1 0.1:17.317.483.152.100 0 1063 FRL HSYNC 16 HSYNC 3 0.1:17.317.483.159.300 0 1200 FRL GAP 322 GAP characters 1 4 0.1:17.317.483.304.200 0 1522 FRL FEC FEC Parity bytes 5 0.1:17.317.483.307.800 0 1530 FRL CHBLK Characters 3 6 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 8 0.1:17.317.483.537.300 0 2032 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.537.300 1 0 FRL CHBLK Character Block 0 Start 0 0.1:17.317.483.537.300 1 0 FRL GAP 502 GAP characters 10 0.1:17.317.483.537.300 1 0 FRL GAP 502 GAP characters 2 0.1:17.317.483.591.00 1 0 FRL GAP 502 GAP characters </td <td>12</td> <td></td> <td>0</td> <td>1063</td> <td></td> <td></td> <td>-</td>	12		0	1063			-
4 0:1:17.317.483.304.200 0 1522 FRL FEC FEC Parity bytes 5 0:1:17.317.483.307.800 0 1530 FRL CHBLK Character Block 3 Start 6 0:1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0:1:17.317.483.537.300 0 2032 FRL FEC FEC Parity bytes 8 0:1:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0:1:17.317.483.591.00 1 0 FRL GAP G2G GAP characters 10 0.1:17.317.483.591.00 1 0 FRL GAP G2G GAP characters 11 0:1:17.317.483.591.00 1 0 FRL GAP S02 GAP characters 12 0:1:17.317.483.591.00 1 502 FRL FEC FEC Parity bytes 13 0:1:17.317.483.594.500 1 510 FRL GAP 502 GAP characters 14 0:1:17.317.483.994.500	11		0				
4 0.1:17.317.483.304.200 0 1522 FRL FEC FEC Parity bytes 5 0.1:17.317.483.307.800 0 1530 FRL CHBLK Character Block 3 Start 6 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.537.300 0 2032 FRL FEC FEC Parity bytes 8 0.1:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.591.00 1 0 FRL GAP G2 GAP characters 20 0.1:17.317.483.591.00 1 0 FRL GAP G2 GAP characters 21 0.1:17.317.483.591.00 1 0 FRL GAP G2 GAP characters 22 0.1:17.317.483.591.00 1 502 FRL FEC FEC Parity bytes GAP 33 0.1:17.317.483.594.500 1 510 FRL GAP 502 GAP characters 54 0.1:17.317.483.994.500 1 1012 FRL GAP 502 GAP characters 5	13						
5 0.1:17.317.483.307.800 0 1530 FRL CHBLK Character Block 3 Start 6 0.1:17.317.483.307.800 0 1530 FRL GAP 502 GAP characters 7 0.1:17.317.483.537.300 0 2032 FRL FEC FEC Parity bytes 8 0.1:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 0 0.1:17.317.483.591.00 1 0 FRL GAB 502 GAP characters 1 0.1:17.317.483.591.00 1 0 FRL GAP 502 GAP characters 2 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 3 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 5 0.1:17.317.483.994.500 1 1012 FRL GAP 502 GAP characters 5 0.1:17.317.483.998.100 1	14		0			FEC	FEC Parity bytes
7 0.1:17.317.483.533.700 0 2032 FRL FEC FEC Parity bytes 8 0.1:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.539.100 1 0 FRL CHBLK Character Block 0 Start 0 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 20 0.1:17.317.483.550.00 1 252 FRL FEC FEC Parity bytes 30 0.1:17.317.483.768.600 1 502 FRL FEC FEC Parity bytes 33 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 44 0.1:17.317.483.994.500 1 510 FRL GAP 502 GAP characters 55 0.1:17.317.483.994.500 1 1012 FRL FEC FEC FEC Parity bytes 66 0.1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 7 0.1:17.317.483.998.100 1	15	0:1:17.317.483.307.800	0	1530	FRL	CHBLK	
8 01:17.317.483.537.300 1 0 FRL SUPBLK Super Block 2040 characters 9 0.1:17.317.483.539.100 1 0 FRL CHBLK Character Block 0 Start 0 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 2 0.1:17.317.483.525.00 1 252 FRL FEC FER FEC corrected. Clock:287 Data:300. 1 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 3 0.1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0:1:17.317.483.945.00 1 1012 FRL GAP 502 GAP characters 55 0:1:17.317.483.994.500 1 1012 FRL GAP 502 GAP characters 66 0:1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 88	16		0	1530			
9 0.1:17.317.483.539.100 1 0 FRL CHBLK Character Block 0 Start 00 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 1 22 0.1:17.317.483.525.500 1 252 FRL FEC-ER FEC corrected. Clock:287 Data:300. 1 1 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 3 0.1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 5 0.1:17.317.483.994.500 1 1012 FRL GAP 502 GAP characters 5 0.1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 7 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 8 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters <tr< td=""><td>17</td><td>0:1:17.317.483.533.700</td><td>0</td><td>2032</td><td>FRL</td><td>FEC</td><td>FEC Parity bytes</td></tr<>	17	0:1:17.317.483.533.700	0	2032	FRL	FEC	FEC Parity bytes
9 0.1:17.317.483.539.100 1 0 FRL CHBLK Character Block 0 Start 00 0.1:17.317.483.539.100 1 0 FRL GAP 502 GAP characters 1 22 0.1:17.317.483.525.500 1 252 FRL FEC-ER FEC corrected. Clock:287 Data:300. 1 1 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 3 0.1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 5 0.1:17.317.483.994.500 1 1012 FRL GAP 502 GAP characters 5 0.1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 7 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 8 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters <tr< td=""><td>18</td><td>0:1:17.317.483.537.300</td><td>1</td><td>0</td><td>FRL</td><td></td><td></td></tr<>	18	0:1:17.317.483.537.300	1	0	FRL		
2 0.1:17.317.483.652.500 1 252 FRL FEC-ER FEC corrected. Clock:287 Data:300. 11 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 33 0.1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 55 0.1:17.317.483.994.500 1 1012 FRL FEC FEC Parity bytes 66 0.1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 70 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 8 0.1:17.317.484.015.650 1 1029 FRL GAP and the	19		1	0			
1 0.1:17.317.483.765.000 1 502 FRL FEC FEC Parity bytes 3 0.1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0.1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 55 0.1:17.317.483.994.500 1 1012 FRL FEC FEC Parity bytes 66 0.1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0.1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 9 0.1:17.317.484.015.550 1 1059 FRL BLANK 137 Video Blanking characters 9 0.1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	20	0:1:17.317.483.539.100	1	0	FRL	GAP	502 GAP characters
3 0:1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0:1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 55 0:1:17.317.483.994.500 1 1012 FRL FEC FEC Parity bytes 66 0:1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 88 0:1:17.317.484.015.650 1 1059 FRL BLANK 137 Video Blanking characters 99 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	22	0:1:17.317.483.652.500	1	252	FRL	FEC-ER	FEC corrected. Clock:287 Data:300.
3 0:1:17.317.483.768.600 1 510 FRL CHBLK Character Block 1 Start 44 0:1:17.317.483.768.600 1 510 FRL GAP 502 GAP characters 55 0:1:17.317.483.994.500 1 1012 FRL FEC FEC Parity bytes 66 0:1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 88 0:1:17.317.484.05.650 1 1059 FRL BLANK 137 Video Blanking characters 99 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	21	0:1:17.317.483.765.000	1	502	FRL	FEC	FEC Parity bytes
5 0:1:17.317.483.994.500 1 1012 FRL FEC FEC Parity bytes 66 0:1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 88 0:1:17.317.484.015.650 1 1059 FRL BLANK 137 Video Blanking characters 99 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	23	0:1:17.317.483.768.600	1	510	FRL		
6 0:1:17.317.483.998.100 1 1020 FRL CHBLK Character Block 2 Start 77 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 88 0:1:17.317.484.015.650 1 1059 FRL BLANK 137 Video Blanking characters 99 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	24	0:1:17.317.483.768.600	1	510	FRL	GAP	502 GAP characters
7 0:1:17.317.483.998.100 1 1020 FRL GAP 39 GAP characters 8 0:1:17.317.484.015.650 1 1059 FRL BLANK 137 Video Blanking characters 9 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	25	0:1:17.317.483.994.500	1	1012	FRL	FEC	FEC Parity bytes
8 0:1:17.317.484.015.650 1 1059 FRL BLANK 137 Video Blanking characters 9 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	26	0:1:17.317.483.998.100	1	1020	FRL	CHBLK	Character Block 2 Start
9 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	27	0:1:17.317.483.998.100	1	1020	FRL	GAP	39 GAP characters
9 0:1:17.317.484.016.100 1 1059 FRL HSYNC 28 HSYNC	28	0:1:17.317.484.015.650	1	1059	FRL	BLANK	137 Video Blanking characters
0 0:1:17.317.484.016.100 1 1059 FRL VDPREAM 136 VIDEO Preamble ctl period	29	0:1:17.317.484.016.100	1	1059	FRL		
	30	0:1:17.317.484.016.100	1	1059	FRL	VDPREAM	136 VIDEO Preamble ctl period
	5 55B	55B 55B					
SSB SSB SSB							
S SSB SSB							
SSB SSB SSB							

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.

	.264.785						
MDS							
SYNC							
YNC							
c	SCDC SCDC			5	SCDC SCDC		SCDC SCDC
LSBK							
LCBK							
.PKT		na inn a maileann a shain ann in			anna (i) i n ainn (i) i mhai (i)		
ERR							
LFEC:	1 020 550 0.1	17.371.388.977	1 252		0.1.17.272	.807.495.348	0:1:17.376.226.013.345 0:1:17.378.644.531.
			(.352			.ms.us.ns.ps)	0:1:17.576.226.015.545 0:1:17.578.644.551
🚡 Details		• All					
	TimeStamp (HH:MM:SS.ms	Frame/Bl 26	Line		Туре	SubType	
	0.4.47.070.040.000.555	26		510 1012	FRL	GAP	502 GAP characters FEC Parity bytes
928119	0:1:17.373.812.320.555			1012			Character Block 2 Start
928119 928120	0:1:17.373.812.546.455	26		1020	FRI	CHRIK	
928119 928120 928121	0:1:17.373.812.546.455 0:1:17.373.812.550.055	26 26		1020 1020	FRL		
928119 928120 928121 928122	0:1:17.373.812.546.455	26		1020 1020 1522	FRL FRL FRL	GAP	502 GAP characters
928119 928120 928121 928122 928122 928123	0:1:17.373.812.546.455 0:1:17.373.812.550.055 0:1:17.373.812.550.055 0:1:17.373.812.755.955	26 26 26 26		1020	FRL FRL	GAP FEC	502 GAP characters FEC Parity bytes
ket 928119 928120 928121 928122 928122 928123 928124 928125	0:1:17.373.812.546.455 0:1:17.373.812.550.055 0:1:17.373.812.550.055	26 26 26		1020 1522	FRL	GAP FEC	502 GAP characters
928119 928120 928121 928122 928122 928123 928124	0:1:17.373.812.546.455 0:1:17.373.812.550.055 0:1:17.373.812.550.055 0:1:17.373.812.550.055 0:1:17.373.812.775.955 0:1:17.373.812.779.555	26 26 26 26 26		1020 1522 1530	FRL FRL FRL	GAP FEC CHBLK	502 GAP characters FEC Parity bytes Character Block 3 Start
928119 928120 928121 928122 928122 928123 928124	0:1:17.373.812.546.455 0:1:17.373.812.550.055 0:1:17.373.812.550.055 0:1:17.373.812.550.055 0:1:17.373.812.775.955 0:1:17.373.812.779.555	26 26 26 26 26		1020 1522 1530	FRL FRL FRL	GAP FEC CHBLK	502 GAP characters FEC Parity bytes Character Block 3 Start

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
	This dialog box is described further below.
	 Events 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 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.
	 Details 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 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

buttons enable you to advance downward or upward one through the Data Decode records. The record at a time. The button is a scroll button that you can slide up or down.

CHBLK	PBLK CHBLK	SUPBLK							
		SUPBLK							TMDS
		SUPBLK							VSYNC
		SUPBLK							HSYNC
		SUPBLK							DDC
	CHBLK								FRLSBK
GAP	GAP		CHBLK		CHBLK		CHBLK	CHBLK GAP	FRLCBK
	GAP	GAP	ACTIVE		GAP		GAP	GAP	FRLERR
1	1			1		1			FRLFEC
0:28:37.831.65	31.651.106.583	0:28:37.831.651.106.583	1.650.848.109	0:28:37.83		0.588.688	0:28:37.831.6	650.330.214	0:28:37.831.6
			G.ms.us.ns.ps)						
		· •					O All O	ls 🗔 Raw Data	🗔 Detail
			SubType Info	Туре	Pixel/Offset	/Block Line	MM:SS.ms.us.ns) Fram	TimeStamp (HI	Packet
		characters	GAP 502	FRL	1530	5	7.831.650.636.234	0:28:	154980
		y bytes	FEC FEC	FRL	2032	5	7.831.650.824.484	0:28:	154981
		ock 2040 characters		FRL	0	6	7.831.650.827.484		154982
				FRO					
			56, 502	1116	510	•		0.20.	104000
									DATA:
		y bytes	FEC FEC SUPBLK Sup CHBLK Cha GAP 51 G ACTIVE 361 GB Vide GAP 90 G FEC FEC CHBLK Cha	FRL	2032	5	7.831.650.824.484	0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28: 0.28:	154981

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 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.

Decode Segment Selectio	n
Selections	Details
Totals Segment #01 Segment #02	Segment: 02 * # of Packets: 873380 Packet Range: 873380 to 1746759
Segment #02 Segment #03 Segment #04	Packet Counts
~	1b AUD: 0 ACP: 0 ACR: 0 AUD IF: 0 AUDSAM: 0 AVI IF: 10 AVMUTE: 0 CEC: 0 CkDROP: 0 CSB: 0 DST: 0 EDID: 0 ENCR_EN: 0 ERROR: 0 GCP: 2298 GMP: 0 HBR: 0 HDCP: 19
	HSYNC: 869690 ISRC1: 0 ISRC2: 0 MPEG: 0 NULL: 0 PXR: 0 SPD IF: 0 TRIG: 0 UNKN: 0 VEN: 0 VIDEO: 0 VSYNC: 1363
	V Load Segment Cancel

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**).

Image of the MMKMSS:ms.us.mb Frame/Bil Line Pixel/Offset Type SubType Info 5719 0.117.317.796.258.00 10 0 FRL SUDFype Info 5721 0.117.317.796.278.100 11 0 FRL CHBLK Supe Block 2040 characters 5722 0.117.317.796.277.100 11 0 FRL GAP 5724 0.117.317.796.278.000 11 502 FRL FFC-FR FFC created. ClockB7133 Data200. 5724 0.117.317.796.479.000 11 500 FRL GAP 502 GAP characters 5726 0.117.317.796.505.000 11 510 FRL GAP 502 GAP characters 5728 0.117.317.796.793.000 11 1002 FRL GAP 502 GAP characters 5739 0.117.317.796.793.000 11 1020 FRL GAP 502 GAP characters 5731 0.117.317.796.793.000 11 1520 FRL GAP 40 GAP characters 5732 0.117.317.796.793.		Times		Line Divel/Offer				
5719 0:1/17.317.796.265.700 10 2032 FRL FEC FEC Parity bytes 5721 0:1/17.317.796.267.1.00 11 0 FRL SUPBLK Super Block 2040 characters 5722 0:1/17.317.796.271.100 11 0 FRL GAP S02 GAP characters 5723 0:1/17.317.796.2847.100 11 60 FRL FEC FC Parity bytes 5724 0:1/17.317.796.497.000 11 510 FRL FEC FEC Parity bytes 5726 0:1/17.317.796.500.500 11 510 FRL CHBLK Character Block 21 Start 5727 0:1/17.317.796.705.000 11 1002 FRL CHBLK Character Block 25 Start 5728 0:1/17.317.796.705.000 11 1002 FRL GAP 502 GAP characters 5739 0:1/17.317.796.705.000 11 11020 FRL GAP 502 GAP characters 5732 0:1/17.317.796.595.000 11 1522 FRL GAP 502 GAP characters 5731 0:1/17.317.796.595.000 11 1530 FRL GAP 502 GAP characters	5719 5721 5722	0:1:17.317.796.265.700	Frame/Bl	Line Divel/Offer				
5721 0:1/1 317.796.293.00 11 0 FRL SUPBLK Super Block 2040 characters 5722 0:1/1 317.796.271.100 11 0 FRL CHBLK Character Block 2040 characters 5725 0:1/1 317.796.271.100 11 60 FRL FEC-ER FEC corrected. Clocks7133 Data:200. 5725 0:1/1 317.796.500.000 11 502 FRL FEC FEC Pairly bytes 5726 0:1/1 317.796.570.000 11 510 FRL GAP 502 GAP characters 5728 0:1/1 317.796.570.000 11 1012 FRL GAP 502 GAP characters 5729 0:1/1 317.796.570.000 11 1020 FRL GAP 502 GAP characters 5732 0:1/1 317.796.593.000 11 1152 FRL CHBLK Characters 512 5733 0:1/1 317.796.593.000 11 1530 FRL CHBLK Characters 512 5734 0:1/1 317.796.595.000 11 1530 FRL GAB 49 GAP characters 5735 0:1/1 317.796.595.000 11 1530 FRL <	5721 5722			Line Pixel/Offset	Туре	SubType	Info	
5722 0:117.317.796.271.100 11 0 FRL CHBLK Character Block 0 Start 5723 0:117.317.796.278.100 11 0 FRL GAP 502 GAP characters 5724 0:117.317.796.278.100 11 502 FRL FEC-FR FEC Corrected. Clock67133 Data:200. 5726 0:117.317.796.500.600 11 510 FRL GAP Characters 5727 0:117.317.796.500.600 11 1012 FRL GAP S02 GAP characters 5728 0:117.317.796.570.500 11 1012 FRL GAP S02 GAP characters 5729 0:117.317.796.730.100 11 1020 FRL GAP S02 GAP characters 5730 0:117.317.796.503.000 11 11200 FRL GAP S02 GAP characters 5731 0:117.317.796.505.000 11 1530 FRL GAP A9 GAP characters 5733 0:117.317.796.595.000 11 1530 FRL GAP A9 GAP characters 5734 0:117.317.796.595.000 11 1530 FRL GAP A9 GAP characters 5735 0:117.317.796.595.000 11 1530<	5722							
5723 0:117.317.796.271.100 11 0 FRL GAP 502 GAP characters 5725 0:117.317.796.497.000 11 60 FRL FFC FFC FEFC FFC FEFC Fer Airby bytes 5726 0:117.317.796.497.000 11 510 FRL CHBLK Character Block 1 Start 5727 0:117.317.796.205.00 11 100 FRL CHBLK Character Block 1 Start 5728 0:117.317.796.725.00 11 102 FRL FCE FFC FEFC Fer Airby bytes 5729 0:117.317.796.039.00 11 1020 FRL CHBLK Character Block 2 Start 5730 0:117.317.796.039.00 11 1020 FRL GAP 502 GAP characters 5731 0:117.317.796.039.00 11 1522 FRL FEC FEC Corrected. Clock87274 Data:2. 5733 0:117.317.796.039.00 11 1530 FRL GAP 40 GAP characters 5734 0:117.317.796.039.00 11 1530 FRL GAP 40 GAP characters 5735 0:117.317.796.499.00 11 1530 FRL <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
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5724 0.117.317.796.497.000 11 502 FRL FEC FE				-				
5726 0.1.17.317.796.500.600 11 510 FRL CHBLK Character Block 1 Start 5727 0.1.17.317.796.500.600 11 1012 FRL GAP 502 GAP characters 5728 0.1.17.317.796.500.00 11 1002 FRL CHBLK Character Block 1 Start 5729 0.1.17.317.796.730.100 11 1020 FRL CHBLK Character Block 2 Start 5730 0.1.17.317.796.730.100 11 11202 FRL GAP 502 GAP characters 5731 0.1.17.317.796.595.00 11 1522 FRL FEC Parity bytes 5733 0.1.17.317.796.959.600 11 1530 FRL CHBLK Character Block 3 Start 5734 0.1.17.317.796.959.600 11 1579 FRL GAP 90 GAP characters 5735 0.1.17.317.796.982.100 11 1579 FRL GAF 90 GAP characters 5738 0.1.17.317.797.148.00 12 0 FRL GAF Field / Type Sub-Type 5741 0.1.17.317.797.148.00 12 0 FRL CHBL <								ita:200.
5727 0.11.17.317.396.500.600 11 510 FRL GAP 502 GAP characters 5728 0.11.17.317.396.500.600 11 1012 FRL FEC Parity bytes 5729 0.11.27.317.396.730.100 11 1020 FRL CHBLK Character Block 2 Start 5730 0.11.7.317.396.501.00 11 1020 FRL GAP 502 GAP characters 5732 0.11.7.317.396.503.000 11 11522 FRL FEC FEC Parity bytes 5733 0.11.7.317.396.595.600 11 1530 FRL GAP 49 GAP characters 5734 0.11.7.317.396.598.600 11 1530 FRL GAP 49 GAP characters 5735 0.11.17.317.796.598.100 11 1579 ACTIVE 361 Video data characters 5736 0.11.317.371.797.141.00 11 1040 FRL GAP Field / Type Sub-Type 5738 0.11.317.379.189.100 12 0 FRL GHE Gap effeld / Type Sub-Type 5742 0.11.7.317.797.416.800 12 502 FRL FEE <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>								
5728 0.1:17.317.396.726.500 11 1012 FRL FEC FEC Parity bytes 5729 0.1:17.317.396.730.100 11 1020 FRL CHBLK Character Block 2 Start 5730 0.1:17.317.396.730.100 11 1020 FRL GAP 502 GAP characters 5731 0.1:17.317.396.959.600 11 1152 FRL FEC - FEC Parity bytes 5733 0.1:17.317.396.959.600 11 1530 FRL CHBLK Character Block 3 Start 5734 0.1:17.317.396.959.600 11 1530 FRL GAP 49 GAP characters 5735 0.1:17.317.796.959.600 11 1579 ACTIVE 36L Video Guard Band. 5737 0.1:17.317.796.959.600 11 1579 FRL GB Video Guard Band. 5738 0.1:17.317.797.144.100 11 1940 FRL GH Find Event 5739 0.1:17.317.979.144.100 11 2032 FRL GH Find Event Sub-Type 5741 0.1:17.317.979.149.00 12 0 FRL GH Active Video A								
5729 0:1:17.317.796.730.100 11 1020 FRL CHBLK Character Block 2 Start 5730 0:1:17.317.796.5730.100 11 11200 FRL GAP 502 GAP characters 5732 0:1:17.317.796.503.000 11 1184 FRL FEC-ER FEC corrected. Clock87274 Data:2. 5733 0:1:17.317.796.959.600 11 1530 FRL CHBLK Character Block 3 Start 5734 0:1:17.317.796.959.600 11 1530 FRL CHBLK Characters 5735 0:1:17.317.796.959.600 11 1579 ACTIVE 361 Video data characters 5736 0:1:17.317.796.981.650 11 1579 FRL GAP 49 GAP characters 5737 0:1:17.317.797.144.100 11 1940 FRL GA Find Event 5738 0:1:17.317.797.149.000 12 0 FRL SUP BL Super Block 5741 0:1:17.317.797.148.000 12 0 FRL CHBL Artive Video 5742 0:1:17.317.797.404.00 12 510 FRL GA Artive Video								
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Error Data Island Marked Packet DI Preamble DI Leading GB		0:1:17.317.797.879.400	12					
DI Leading GB					11	E	Error	
						N	Marked Packet	
	TA:							DI Trailing GB
	ah ahah a	ab55 0201					Value:	

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.

🔀 Select All on Page Note that you can select or deselect all items on a page with the Select All on Page or Clear All

on Page Lear 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.

Decode Event Selection	
Select All	
InfoFrame (0) Control (0) DDC (64)	• FRL (1591073) Other (0)
Select All on Page	Clear All on Page
🖾 Link Rate (1)	☑ H-Sync (6568)
Super Block (104571)	✓ V-Sync (410)
Character Block (419782)	Encryption Enable (5)
🗹 Gap (497361)	Video Preamble (28964)
✓ Active (56237)	Video Guard Band (6238)
🗹 Blank (22720)	☑ Data Island (6254)
✓ FEC Parity (420243)	DI Preamble (6259)
FEC Error (1023)	☑ DI Leading GB (6259)
Error (1924)	☑ DI Trailing GB (6254)
	🗹 Ok 🛛 🙆 Cancel

Decode Event Selection
Select All Clear All
● InfoFrame (0) ● Control (0) ● DDC (64) ● FRL (1591073) ● Other (0)
Select All on Page Clear All on Page
Any DDC (0)
EDID (0)
HDCP (0)
HDCP 2 (0)
SCDC (64)
V Ok 🖸 Cancel

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
Туре	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:

HDMI Ca	pture Viewer					1			□ X
📴 Open	📄 Segment 🛛 🕂 Decode		.ming 🗐 Aud	lio /Use r	/11 04 2017	00 43 30 FRL			
Events		ns(ns)							
	No Pico-Second		Marker 1 🗲	• 🗗 🗆	Marker 2 🗲	• • •	Rows		
0:1:17.356.22						lock 2040 character			
0.1.17.550.24			0.1.17.307.242.0	///.000 [I.12 L.	- Pioj Super D	IOCK 2040 Character			
	Micro-Second						>		
TMDS	O HH:MM:SS.m	REAM							
VSYNC	Absolute Bas	VNC							
100010	Relative Time	e							
HSYNC									
DDC				SCDC					
FRLSBK	LSBK SUPBLK								
FRLCBK	CHBLK	Ĩ	CHBLK		Ī		CHBLK		
FRLPKT	GAP	GAP BLANK		GAP	Ì		GAP		
FRLERR					(
		n l			0				
FRLFEC		J			U				
0:1:17.367.3	242.965.258 0:1:17.367	7.243.112.546		.367.243.259.8 I:M:S.ms.us.ns.		0:1:17.367.3	243.407.123	0:1:17.367.243	.555.072
Detai	ils 🗔 Raw Data 🔒 💿 💿 A								
Packet		Frame/Bl Line	Pixel/Offset	Туре	SubType	Info			0
819843	0:1:17.367.242.418.660	11	1020	FRL	GAP	502 GAP character	rs		
819844	0:1:17.367.242.644.560	11	1522	FRL	FEC	FEC Parity bytes			
819845	0:1:17.367.242.648.160	11	1530	FRL	CHBLK	Character Block 3	Start		
819846	0:1:17.367.242.648.160	11	1530	FRL	GAP	502 GAP character	rs		
819847	0:1:17.367.242.874.060	11	2032	FRL		FEC Parity bytes			
819848	0:1:17.367.242.877.660	12	0	FRL	SUPBLK				v
819849	0:1:17.367.242.879.460	12	0	FRL	CHBLK				
819850	0:1:17.367.242.879.460	12	0	FRL	GAP	502 GAP character	rs		
819851	0:1:17.367.243.105.360	12	502	FRL	FEC		o		
819852	0:1:17.367.243.108.960	12	510	FRL	CHBLK	Character Block 1	Start		• 🗢
•				111					
SSB SSB	SSB SSB								* -
4									- F
DATA:									
bbbb bbb	dd dddd ddd dd								
4									
		_		_		_	_		_
								💢 Clo	ise

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 M41h.
Micro-Seconds [HHMMSSmsusns]	Time is shown in microseconds. The baseline time is the time from the time of the last boot of the M41h.
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.

Right click option	Description
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 M41h.

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.

Dpen									
Events				Marker 1 🗧 🔹 🛃	Marker 2 🗧 🔹 🗗 🍥	Rows			
0:28:37.831.6							9:51] 361 Video data characters		
		1		1					
TMDS	VDPREAM								DI
VSYNC		,							
HSYNC									
DDC									
FRLSBK		su	PBLK				SUPBLK		
FRLCBK		CHBLK		CHBLK	CHBLK		CHBLK	CHBLK	CHBLK
FRLPKT	BLANK	GAP		GAP	GAP		GAP	GAP	GAP BLANK GA
FRLERR									
FRLFEC									
	649 152 447		0.29.27.921	649,410,040	0.09.27 921	649 669 422	0.09.27.8	21 649 025 025	0,29,27,931,640,192,419
0:28:37.831.	8:27.831.648.153.447 0:28:37.831.648.410.940 0:28:37.831.648.658.433 0:28:37.831.648.925.925 0:28:37.831.649.183.418 Tme (HMLS.ma.u.an.e.pa)						0:28:37.8		

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 set of function backward and forward activation buttons. See the screen shot below.

	¹ Open ¹ Decode ¹ Images									
										R
TMDS	VDPREAM							DI		
VSYNC										
HSYNC										
DDC										
FRLSBK		su	PBLK				SUPBLK			
FRLCBK		CHBLK	Ĭ	CHBLK	CHBLK		CHBLK	CHBLK	CHBLK	
FRLPKT	BLANK	GAP		GAP	GAP		GAP	GAP	GAP BLANK	5A
FRLERR										
FRLFEC]]) [l	
0:28:37.831.	648.153.447		0:28:37.831	648.410.940	0:28:37.831. Time (H:M:S.		0:28:37.8	31.648.925.925	0:28:37.831	649.183.418

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
Icons – Zoom and Panning Zoom 10.000 R C	 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 A and zoom out by clicking on the activation button. The centered point will remain the same. Panning A – The panning function enables you scan across the data quickly by clicking and dragging. Pointer A – 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

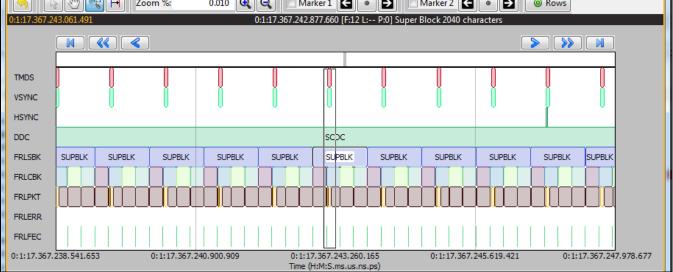
example below, a selection has been made on an AVI infoframe either with the pointer tool or in the **Data Decode** panel.

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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.

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FRLPKT									
FRLERR									
FRLFEC									
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				,					
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HSYNC									
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FRLSBK				SUP	BLK				
FRLCBK	CHBLK				CHE	BLK			
FRLPKT	GAP		GAP	BLANK			GAP		
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3.8.5 Selecting Data to View in the Event Plot

The **Event Plot** enables you to select what data elements to display. You use the Rows button to access the dialog box. The following dialog box will appear allowing you to select what data to display in the **Event Plot**.

Row Selection				
INFO-FR	TMDS	VSYNC		
Info Frames	Any other TMDS Event	Vertical Sync		
HSYNC Horizontal Sync	ENCR-E Encryption Enable/Disable	AVMUTE		
SCDT	TRIG	DDC		
TMDS Clock Drop	Capture Trigger	Any DDC Event		
CEC	HPD Hot Plug	HDCP-E HDCP Encr Enable/Disable		
CH-ST	MATCH	ACTION		
Channel Status	Condition Match	Action Event		
AUDCH1	AUDCH2	AUDCH3		
Audio Channel #1	Audio Channel #2	Audio Channel #3		
AUDCH4	AUDCH5	AUDCH6		
Audio Channel #4	Audio Channel #5	Audio Channel #6		
AUDCH7	AUDCH8	FRLSBK		
Audio Channel #7	Audio Channel #8	FRL Super Blocks		
FRLCBK	FRLPKT	FRLERR		
FRL Character Blocks	FRL Packets	FRL Errors		
FRLFEC FRL FEC				
		Ok 🔇 Cancel		

3.8.6 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
Icons – General Control	 User path status

3.8.7 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 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.

Deco	Decode Segment Selection										
	Selectio	ons			Details						
+	Totals			nent: (*					
	Segment	#01	# of Pack								
	Segment	#02	Packet Range: 873380 to 1746759								
	Segment	#03	Packet Counts								
•	Segment	#04									
			1b AUD:	-	ACP:	-					
			ACR:	-	AUD IF:	-					
			AUDSAM:	-	AVI IF:						
			AVMUTE:	-	CEC:	-					
			CkDROP:	-	CSB:	-					
			DST:	-	EDID:	-					
			ENCR_EN:		ERROR:	-					
				2298		-					
			HBR:		HDCP:						
			HSYNC:								
			ISRC2:	-	MPEG:	-					
			NULL:	-	PXR:	-					
			SPD IF:	-	TRIG:	-					
			UNKN :		VEN:	-					
			VIDEO:	0	VSYNC:	1363					
						~					
					🖉 Load Segment	Cancel					

3.8.8 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

Marker 1 🧲 🛛 🖉

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The

and right arrows associated with each marker

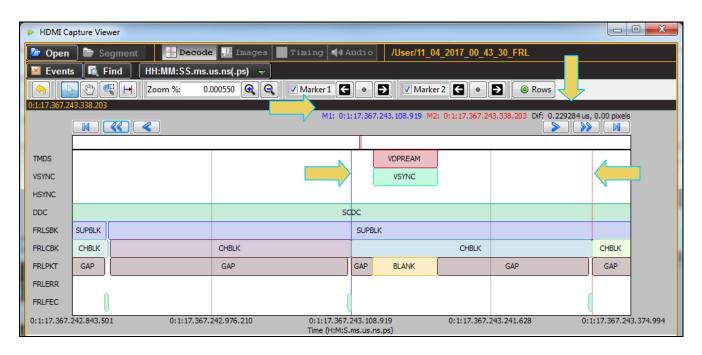
center the particular marker on the Event Plot window. The screens below show the markers being set and the resulting markers placed in the **Event Plot** panel. Note that you can also set the markers using the right click menu also shown below and this is the preferred method because the markers will 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.

center icon allows you to

х HDMI Capture Viewer 🖆 Open 📄 Segment 🔰 🕂 Decode 🛺 Images 🛄 Timing 📣 Audio 🛛 /User/11_04_2017_00_43_30_FRL HH:MM:SS.ms.us.ns(.ps) 🔟 Events 🛛 🔯 Find 0.000550 🔍 🔍 🗆 Marker 1 🗲 🔹 Þ 🥱 💽 🖑 🔍 🛏 Zoom %: Marker 2 🗲 🔹 Þ 🐵 Rows 0:1:17.367.242.951.245 M < < TMDS VDPREAM 🔍 Zoom In Q Zoom Out VSYNC VSYNC Center the view on this point HSYNC Set Marker 1 DDC bc Set Marker 2 FRLSBK SUPBLK SUPBLK \$ **Previous View** FRLCBK CHBLK CHBLK CHBLK R Event Select GAP GAP FRLPKT GAP BLANK GAP Ð Pan FRLERR 💱 Range Zoom FRLFEC H Mark Range 0:1:17.367.242.843.501 0:1:17.367.242.976.210 0:1:17.367.243.108.919 0:1:17.367.243.241.628 0:1:17.367.243.374.994

Time (H:M:S.ms.us.ns.ps)



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

Rev. A1

🕨 HDMI Ca	HDMI Capture Viewer							X	
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🗵 Events									
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			M1: 0:	1:17.5	07.243.100.919 MZ	: 0;1;17.367.24	-5.556.205 Dil: 0.229264 US		
					,				
TMDS					VDPREAM				
VSYNC					VSYNC				
HSYNC									
DDC			, , , , , , , , , , , , , , , , , , ,	фс					
FRLSBK	SUPBLK			SUP	BLK				
FRLCBK	CHBLK		CHBLK			CHBLK		CHBLK	
FRLPKT	GAP		GAP	GAP	BLANK		GAP	GAP	
FRLERR									
FRLFEC				1					
0:1:17.367.	242.843.50	01 0:1:17.367.	242.976.210 0:1:17.367 Time (H:M:			0:1:17.367.3	243.241.628 0:	1:17.367.24	3.374.994

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

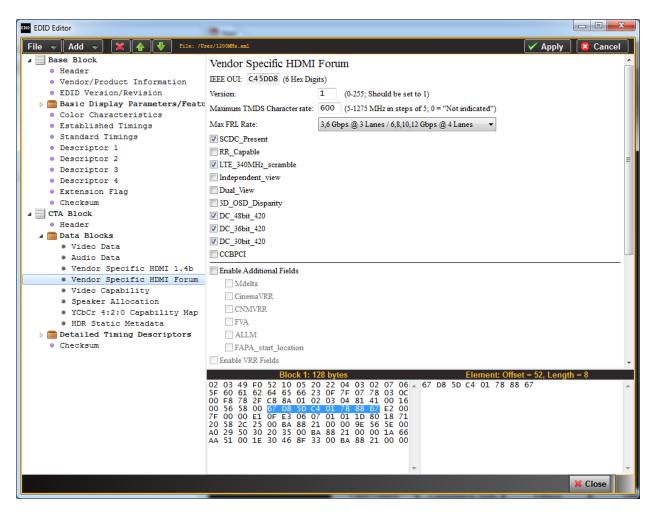
You can remove the marker using the checkboxes associated with each Marker on the top menu bar. Refer to the screens example below.

🕨 HDMI Ca	HDMI Capture Viewer								
📴 Open	🗋 🖿 Se	egment 🚽 Deco	de 📶 Images 📄 🖬 ming 🛋	Audi	o /U: 11_0/	4_2017_00_4	3_30_FRL		
🛛 Event	🛛 Events 🔩 Find 🛛 [HH:MM:SS.ms.us.ns(.ps) 👻 🗸 🗸								
	(<) (<) (<) (<) (<) (<) (<) (<) (<) (<)								
0:1:17.367.2	43.338.203		M1.	0.1.17 3	67 743 108 010 M7	0.1.17 367 2	43.338.203 Dif: 0.229284 u	a 0.00 pixels	
					077210.100.019 PM2	. 0.1.17.507.2			
					(1		
TMDS					VDPREAM				
VSYNC					VSYNC				
HSYNC									
DDC				SCDC					
FRLSBK	SUPBLK	. <u> </u>		SUP	BLK				
FRLCBK	CHBLK		CHBLK			CHBLK		CHBLK	
FRLPKT	GAP		GAP	GAP	BLANK		GAP	GAP	
FRLERR									
FRLFEC	(ļ		ų –				ļ	
0:1:17.367.	242.843.50	0:1:17.36	i7.242.976.210 0:1:17.3 Time (H:N			0:1:17.367.	243.241.628 0	:1:17.367.24	3.374.994

Rev. A1

3.9 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 M41h 48G Video Analyzer/Generator Rx port. In this way you can emulate any EDID at the M41h 48G Video Analyzer/Generator Rx port to ensure that your source responds correctly to it. A sample screen shot of the **EDID Editor** is shown below.



3.10 Opening up the EDID Editor

You may have many EDIDs stored in the EDID directory of the external ATP 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:

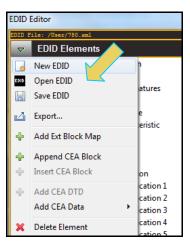
1. Open the EDID Editor from the **Editors** page on the **App** panel.

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

Rev. A1

	🖉 Apply 🛛 🙄 Cancel Element Details
▲ BLOCK 0	
Header	
Vendor/Product Information	
EDID Version/Revision	
Basic Display Parameters/Features	
Video Input Definition	
Horz and Vert Screen Size	
Display Transfer Characteristic	
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 (
Standard Timing Identification 7	
Standard Timing Identification 8	
▲ Descriptors	
Descriptor 1	
Descriptor 2	
Descriptor 3	
Descriptor 4	
Extension Flag	
Checksum	
	DID Bytes
	¥ Close

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



EDID Open EDID
Local Files
🔺 🗁 User
500 780.xml
V Ok 🙆 Cancel

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 <u>EDID Library</u> 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 <u>M41h EDID Library Application Note</u> available on the EDID Library website which describes how to use the EDID Library with the M41h 48G Video Analyzer/Generator.

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

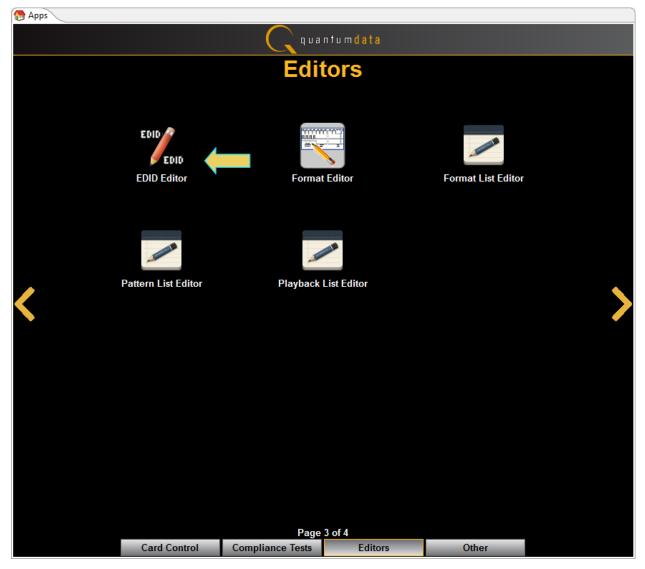
EDID Editor					ι.														x
EDID File: /User/780.xml					_		1												
EDID Elements		V	Apply		Ω Ca	ncel	E	lem	ent	Deta	ails						<u> </u>		
A BLOCKO	-	Ve	ndor	· / P	rodi	ict]	Info	orm	atio	m									
Header		m	Manuf	actur	or No.	na (m	11 of 1		linha	hat	chore	actor		T					
Vendor/Product Information	J								-	iber	citate	acter	· _	_	_				
EDID Version/Revision		D	roduc	t Co	de (4 h	iexad	ecim	al dig	gits)				03	30C					
Basic Display Parameters/Features		D	Serial N	Jumb	er (up	to 8	hexa	decir	nal d	ligits)		07	75B	CD1	5			
Video Input Definition Horz and Vert Screen Size		0	Model	Vear			Wee	k of l	Manı	ufact	11re		-	.4					
						<u> </u>				uaci	uic				-				
Display Transfer Characteristic Feature Support		Yea	r of M	anufa	acture	(199() and	late	r)				20	09					
Color Characteristics																			
Established Timings																			
 Standard Timing Identification 																			
Standard Timing Identification 1																			
Standard Timing Identification 2																			
Standard Timing Identification 3	Ξ																		
Standard Timing Identification 4																			
Standard Timing Identification 5																			
Standard Timing Identification 6																			
Standard Timing Identification 7																			
Standard Timing Identification 8		_					-												
Descriptors		0E 12		10 C2	3 80								57 01						^
Descriptor 1		01	01 0	1 0	1 01	01	02	3A	80	18	71	38	2D	40	58	2C			
Descriptor 2			00 2 2C 2	0 C		00 8E							71 00		_	_			
Descriptor 3			4D 4						79				00	_					
Descriptor 4		00	17 F	1 0	8 8C	17	00	0 A	20	20	20	20	20	20	01	83			
Extension Flag		02	03 5	1 7	1 5F	90	1F	20	05	14	04	13	03	02	12	11			
Checksum		07		6 1		0F		1E				17	18						=
CEA-EXT (BLOCK 1)			0A 0 2C 2	в 0 D 2		08 30	21			24 34	25 35	26	27 37		29				
Extension Tag		3B	23 0	9 Ō	7 07	83	01	00	00	67	03	0C	00	10	00	38			
Revision Number			00 0			00					00		_		00				
DTD Byte Offset			00 0																
CEA Byte 3																			-
CEA Data Blocks	-	ED	ID By	tes											_				
Video Data			J																
																		ose	

3.11 Loading an EDID into the EDID Editor

You can either load a new EDID or modify and existing EDID. In the later case, you may have many EDIDs stored in the EDID directory of the external ATP 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.

EDID Editor	_	. C.	Contraction in the local division in the loc	
✓ EDID Elements	V Apply	😢 Cancel	Element Details	
⊿ BLOCK0				
Header				
Vendor/Product Information				
EDID Version/Revision				
Basic Display Parameters/Features				
Video Input Definition				
Horz and Vert Screen Size				
Display Transfer Characteristic				
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				-
	EDID Byte	s		
				X Close

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**.

EDID	Editor	
EDID E	ile: /User/780.xml	
▽	EDID Element	
	New EDID	ր
EDID	Open EDID 🦳	
	Save EDID	atures
4	Export	e eristic
÷	Add Ext Block Map	
+	Append CEA Block	
$\Phi_{\rm c}$	Insert CEA Block	on
$\Phi_{\rm c}$	Add CEA DTD	cation 1 cation 2
	Add CEA Data	cation 3
×	Delete Element	cation 4

🚥 Open EDID
Local Files
🔺 旑 User
500 780.xml
•
V Ok 😢 Cancel

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 <u>EDID Library</u> 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 <u>M41h EDID Library Application Note</u> available on the EDID Library website which describes how to use the EDID Library with the M41h 48G Video Analyzer/Generator.

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

EDID Editor			
EDID File: /User/780.xml			
✓ EDID Elements		Apply Cancel Element Details	
BLOCK 0	*	Vendor / Product Information	
Header			
Vendor/Product Information		ID Manufacturer Name (must be 3 alphabet characters) QDI	
EDID Version/Revision		ID Product Code (4 hexadecimal digits) 030C	
Basic Display Parameters/Features		ID Serial Number (up to 8 hexadecimal digits) 075BCD15	
Video Input Definition			
Horz and Vert Screen Size		Model Year Week of Manufacture	
Display Transfer Characteristic		Year of Manufacture (1990 and later) 2009	
Feature Support			
Color Characteristics			
Established Timings			
Standard Timing Identification			
Standard Timing Identification 1			
Standard Timing Identification 2	Ξ		
Standard Timing Identification 3			
Standard Timing Identification 4			
Standard Timing Identification 5			
Standard Timing Identification 6			
Standard Timing Identification 7			
Standard Timing Identification 8		OE 13 01 03 80 50 2D 78 0A 0D C9 A0 57 47 98 27	
 Descriptors 		12 48 4C 20 00 00 01 01 01 01 01 01 01 01 01 01 01	
Descriptor 1		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	
Descriptor 2		58 2C 25 00 C4 8E 21 00 00 9E 00 00 00 FC 00 48	
Descriptor 3		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 20 01 83	
Descriptor 4		00 17 F1 08 8C 17 00 0A 20 20 20 20 20 20 01 83	
Extension Flag		02 03 51 71 5F 90 1F 20 05 14 04 13 03 02 12 11	=
Checksum		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	-
CEA-EXT (BLOCK 1)		2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 3A	
Extension Tag Revision Number		3B 23 09 07 07 83 01 00 00 67 03 0C 00 10 00 38	
		2D 00 00 00 00 00 00 00 00 00 00 00 00 00	
DTD Byte Offset		00 00 00 00 00 00 00 00 00 00 00 00 00	
CEA Byte 3 CEA Data Blocks			Ŧ
✓ CEA Data Blocks Video Data	-	EDID Bytes	
NUTED LIAIA		X Close	
		A Close	

3.12 Making Modifications to an EDID with the EDID Editor

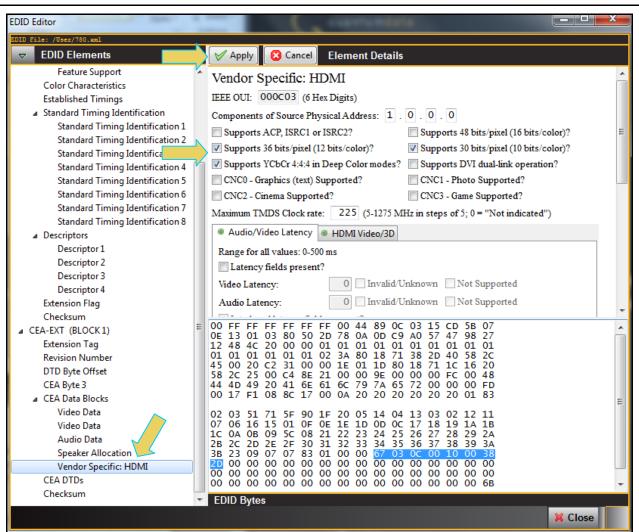
Once you have loaded an EDID you can make changes to individual field values, add data blocks, delete data blocks, add or delete timings or audio formats supported, etc. You can enable or disable parameters using radio buttons or check boxes and you can change values through pull-down menus or text field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

Rev. A1



2. 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):

Rev. A1

EDID I	ile: /User/780.xml		-				(_	*	~	-	-										x
▽	EDID Elements			\checkmark	Apply	E) Can	icel	Ele	eme	ent D)eta	ails										
	New EDID	1	*																				
EDID	Open EDID	L																					
	Save EDID	on																					
2	Export	catio																					
_	Add Ext Plack Man	catio																					
÷	Add Ext Block Map	catio		1																			
÷	Append CEA Block	catio																					
φ.	Insert CEA Block	catio																					
$\Phi_{\rm e}$	Add CEA DTD	catio	n 7																				
	Add CEA Data	÷	Speake	r Alloc	ation																		
×	Delete Element	+	Colorin	netry																			
		$\mathbf{\Phi}_{\mathbf{r}}$	Video (Capabi	ility			X															
	Descriptor 3 Descriptor 4	+	Audio					\mathbf{r}															
	Extension Flag	٠	Video																				
	Checksum	٠	Vendor	Speci	fic - Ge	neral			/	00		00	00	02	15	C.P.	E.c.	07					
⊿ (EA-EXT (BLOCK 1)	٠	Vendor	Speci	fic - HD	IM		0	2D 7	78 (0A	0D		A0	57	47	98	27					Â
	Extension Tag Revision Number	٠	Vendor								01 80 :						01 58						
	DTD Byte Offset	+	Vendor	Speci	fic - Vio				00 1 21 (18	71	1C		20					
	CEA Byte 3				4D 49	20	41	6E	61 (6C 🛛	79	7A	65	72	00	00	00	FD					
	CEA Data Blocks				17 F1		8C	1/	00 (UA .	20	20	20	20	20	20	01	83					Ξ
	Video Data Video Data			02	03 51		5F 01				05 : 1D	14 0D	04 0C	13 17_	03 18	02 19	12 1A	11 1B					
	Audio Data			1C	0A 0E 2C 2E	09	5C	08	21 2	22	23	24	25 35	26 36	27	28 38	29 39	2A 3A					
	Speaker Allocation			3в	23 09	07	07	83	01 (00	00	67	03	0C	00	10	00	38					
	Vendor Specific: HDMI			00	00 00	00	00	00	00 0	00 (00	00	00	00			00 00						
	CEA DTDs Checksum				00 00		00	00	00 (00 (00	00	00	00	00	00	00	6B					Ŧ
			Ŧ	ED	ID Byt	es																	
																				×	Clos	9	

3. Select the block of EDID data that you wish to view or modify using the EDID Elements list on the left of the **EDID Editor** panel. Examples below.

EDID Editor	1	_				ι.		-	en a	•		•							x
EDID File: /User/780.xml EDID Elements		V	Appl		🔀 Ca	ncel	E	lem	ent	Deta	ails						 		
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 7 Standard Timing Identification 8 Descriptors Descriptor 1 Descriptor 2 Descriptor 4 Extension Flag	•	Vie	ieo : Add	Data	l	tries: I	0)												
Checksum 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 Video Data CEA DTDs	E)	0E 12 01 45 58 44 00 07 1C 2B 3B 2D 00 00	13 0 48 4 01 0 20 2 4D 4 17 F 03 5 06 1 0A 0 20 2 23 0 00 0 00 0 00 0	01 0 025 0 19 2 19 2 10 0 19 2 10 0 19 2 10 0 19 2 10 0 10 0 10 10 0 10 0 1	3 80 0 00 L 01 2 31 0 C4 0 41 3 8C L 5F 5 01 9 5C E 2F 7 07 0 00 0 00	50 00 01 00 8E 6E 17 90 0F 08 30 83 00 00	2D 01 02 00 21 61 00 1F 0E 21 31 00 00 00	0A 20 1E 22 32 00 00 00	0A 01 80 01 79 20 05 1D 23 33 00 00 00	0D 01 18 1D 9E 7A 20 14 0D 24 34 67 00 00	C9 01 71 80 00 65 20 04 0C 25 35 03 00 00	A0 01 38 18 00 72 20 13 17 26 36 0C 00 00	57 01 2D 71 00 20 03 18 27 37 00 00 00 00	40 1C FC 00 20 02 19 28 38 10 00 00	98 01 58 16 00 01 12 1A 29 30 00 00 00	27 01 2C 20 48 FD 83 11 18 2A 3A 38 00 00			
CL L	Ŧ	ED	ID By	tes													×	Close	

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

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

EDID Editor	1		
EDID File: /User/780.xml		Apply Cancel Element Details	
Feature Support Color Characteristics	*	Video Data	
Established Timings		Add (# of Entries: 1)	
 Standard Timing Identification Standard Timing Identification 1 		Video Descriptor 1	
Standard Timing Identification 2 Standard Timing Identification 3		V Native	
Standard Timing Identification 4			
Standard Timing Identification 5 Standard Timing Identification 6		Video Identification Code (VIC) Unused (47)1280x720p (720p120)	
Standard Timing Identification 7		(48)720x480p (480p120) (49)720x480p (480p120S)	
Standard Timing Identification 8		(50)720(1440)x480i (480i2x60) (51)720(1440)x480i (480i2x83)	
Descriptor 1		(52)720x576p (576p200)	
Descriptor 2 Descriptor 3		(53)720x576p (576p200S) (54)720(1440)x576i (576i2x_1)	
Descriptor 4		(55)720(1440)x576i (576i2xS2) (56)720x480p (480p240)	
Extension Flag Checksum		(57)720x480p (480p240S) (58)720(1440)x480i (480i2x 1)	
▲ CEA-EXT (BLOCK1)	=	00 FF FF FF FF FF FF C (59)720(1440)x480i (480i2xS5)	
Extension Tag Revision Number		12 48 4C 20 00 00 01 d (60)1280x720p (720p24) 1 01 01 01 01 01 02 3 (61)1280x720p (720p25)	
DTD Byte Offset		45 00 20 C2 31 00 00 1(62)1280x720p (720p30) 58 2C 25 00 C4 8E 21 C(63)1920x1080p (1080p120) ■	
CEA Byte 3 CEA Data Blocks		44 4D 49 20 41 6E 61 6(64)1920x1080p (1080p100) 00 17 F1 08 8C 17 00 CReserved	
Video Data		02 03 52 71 5F 90 1F 20 05 14 04 13 03 02 12 11	=
Video Data		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	
Audio Data Speaker Allocation		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 38	
Vendor Specific: HDMI		2D 40 00 00 00 00 00 00 00 00 00 00 00 00	
Video Data CEA DTDs		00 00 00 00 00 00 00 00 00 00 00 00 00	Ŧ
	Ŧ	EDID Bytes	
		X Close	

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	1	
EDID File: /User/780.xml		Apply Scancel Element Details
 EDID Elements Feature Support Color Characteristics Established Timings Standard Timing Identification Standard Timing Identification 2 Standard Timing Identification 3 Standard Timing Identification 4 Standard Timing Identification 5 Standard Timing Identification 5 Standard Timing Identification 6 Standard Timing Identification 7 Standard Timing Identification 8 Descriptors Descriptor 1 Descriptor 2 Descriptor 3 		Apply Cancel Element Details Audio Data Add (# of Entries: 1) Short Audio Descriptor 1 Audio Format: PCM Max Channels: 2 Sampling Rates (kHz): 32 V 44.1 48 88.2 96 176.4 192 Bit Rates: V 16 bit V 20 bit V 24 bit
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 Speaker Allocation Vendor Specific: HDMI CEA DTDs Checksum	m	00 FF FF <td< th=""></td<>
		X Close

EDID Editor	
EDID File: /User/780.xml	
EDID Elements	Apply Cancel Element Details
Horz and Vert Screen Size	Audio Data
Display Transfer Characteristic	
Feature Support	Add (# of Entries: 2)
Color Characteristics	
Established Timings	🗱 🚺 👽 Short Audio Descriptor 1
Standard Timing Identification	
Standard Timing Identification 1	Audio Format: PCM 🔻
Standard Timing Identification 2	
Standard Timing Identification 3	Max Channels: 2 •
Standard Timing Identification 4	Sampling Rates (kHz): 32 32 44.1 48 88.2 96 176.4 192
Standard Timing Identification 5	Bit Rates: V 16 bit V 20 bit V 24 bit
Standard Timing Identification 6	BR Rates. W 10 DR W 20 DR W 24 DR
Standard Timing Identification 7 Standard Timing Identification 8	Shart Andia Deceminton 2
Descriptors	Short Audio Descriptor 2
Descriptor 1	Audio Format:
Descriptor 2	Unused
Descriptor 3	Max Channels: PCM
Descriptor 4	Sampling Rates (kHz): NIECI
Extension Flag	MPEG1 MP3
Checksum	MBEG2
CEA-EXT (BLOCK 1)	OE 13 01 03 80 5 AACLC 9 A0 57 47 98 27
Extension Tag	12 48 4C 20 00 0DTS 01 01 01 01 01
Revision Number	01 01 01 01 01 0ATRAC 71 38 2D 40 58 2C 45 00 20 C2 31 0DSD 80 18 71 1C 16 20
DTD Byte Offset	58 2C 25 00 C4 8 F-AC-3 00 00 FC 00 48
CEA Byte 3	44 4D 49 20 41 6DTS-HD 55 72 00 00 00 FD 00 17 F1 08 8C 1DTS-HD 20 20 20 01 83
CEA Data Blocks	MLP
Video Data	02 03 51 71 5F 9DST 04 13 03 02 12 11 07 06 16 15 01 0WMAPro 0C 17 18 19 1A 1B
Video Data Audio Data	1C 0A 0B 09 5C 0HE-AAC 25 26 27 28 29 2A
Speaker Allocation	2B 2C 2D 2E 2F 3HE-AACv2 35 36 37 38 39 3A 3B 23 09 07 07 5 MEC Summer 4 33 0C 00 10 00 18
Vendor Specific: HDMI	2D 00 00 00 00 0 0 0 0 0 0 0 0 0 0 0 0 0
CEA DTDs	00 00 00 00 00 00 00 00 00 00 00 00 00
Charlenum	 EDID Bytes
	X 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**.

ltem	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 CEA extension block.

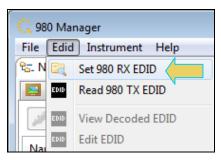
ltem	Item - Column	Description
	Add CEA Audio Data Block	Enables you to add a new Audio Data Block to the CEA extension block.
	Add CEA Video Data Block	Enables you to add a new Video Data Block to the CEA extension block.
	Add CEA Vendor Specific Data Block - General	Enables you to add a new Vendor 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.

3.13 Emulating a Specific EDID

Once you have loaded an EDID and made your changes it to it you can assign it to the M41h 48G Video Analyzer/Generator 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 M41h Rx EDID.



The dialog box shown below opens up.

Rev. A1

EDID Set RX EDID		
Local Files		
🔺 🔯 User 🔺		
EDID A5.XML		
EOID B2.XML		
B3.XML		
EOID B4.XML		
EOID H4P2M00C.XML		
EOLD H4P2M01C.XML		
EOID H4P2M03C.XML		
EOD H7P2L00Q.xml		
EOIO H7P2L01X.XML		
EOD H7P2L02X.XML		
EOID H7P2L03X.XML		
EOID H7P2L04X.XML		
EDID H7P2L05X.XML		
EDID H7P2L06X.XML		
EDID H7P2L07X.XML		
EDID H7P2L08X.XML		
EDID H7P2L10X.XML		
EDID H7P2L11X.XML		
EDID H7P2L12X.XML		
Permanently set the 980's EDID?		
✓ Issue Hot Plug?		
V Ok 🙆 Cancel		

2. Select an EDID to assign to the M41h 48G Video Analyzer/Generator'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 M41h HDMI Protocol Analyzer's EDID This means that the EDID that you provision will persist through a reboot of the M41h. Otherwise the default M41h EDID will be reprovisioned when a reboot occurs.
- Issue Hot Plug This means that the M41h HDMI 2.1 Protocol Analyzer will issue a hot plug when you click the OK activation button on this dialog box.

This chapter describes how to view the incoming HDMI TMDS and FRL 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* ATP 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 (in TMDS mode only).
- 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 ATP Manager:

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



Rev. A1

The Receiver "Real Time" panel appears as shown below:



4.2 Real Time Mode Overview

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

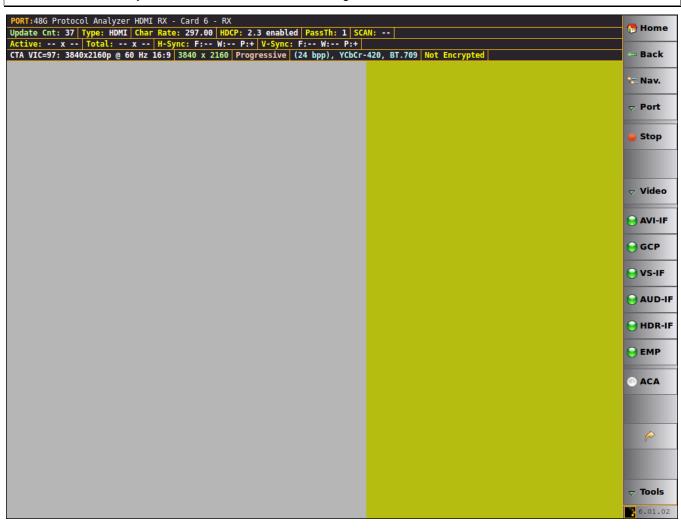
4.2.1 Real Time Mode - Interface Description

This subsection describes the functions of the main interface of the **Real Time** mode. The Real Time mode is supported in both the TMDS and FRL modes.

The **Real Time** mode interface is shown in the example screens below. The first screen image shows the **Real Time** mode without any of the viewing windows open in the TMDS mode. This screen shows you the **Real Time** mode with only the main control panel on the right and the dashboard on the top and the incoming video image. The second **Real Time** screen example shows incoming TMDS with HDCP 2.3 authentication and encryption and with the AVI InfoFrame dialog box shown. The third **Real Time** screen example shows incoming TMDS with HDR active and the HDR InfoFrame dialog box shown. The final screen example shows incoming HDMI stream in the FRL mode at 1485MHz pixel rate with an 8K resolution.

The table that follows describes the data in the Real Time dashboard (or Status Bar).

M41h 48G Video Analyze	er/Generator for HDMI 8K Testing - User Guide	Rev. A1



M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

PORT:48G Protocol Analyzer HDMI RX - Card 6 - R	X	
Update Cnt: 57 Type: HDMI Char Rate: 297.00 H	CP: 2.3 enabled PassTh: 1 SCAN:	🖰 Home
Active: x Total: x H-Sync: F: W:		
CTA VIC=97: 3840x2160p @ 60 Hz 16:9 3840 x 2160	Progressive (24 bpp), YCbCr-420, BT.709 Not Encrypted	- Back
		ta Nav.
🔮 AVI: 0 (0) 9960	ρ ∇	→ Port
AVI InfoFrame		↓ Poit
check sum:	verified	
version:	2	🧉 Stop
length:	13	
scan info:	all active pixels & lines are displayed	
Bar Info:	no Data	
active info:	no data	∀ Video
RGB/YCC indicator:	YCbCr 4:2:0	
active format:	not defined	AVI-IF
picture aspect ratio:	16:9	AVI-IF
colorimetry: non-uniform picture scale:	ITU709 [6] not known	0.00
		GCP
<pre>quantization range: extended colorimetry:</pre>	default (depends on video format) xvYCC601 Not used - Colorimetry (C) bits are not set to 3	Q
video format:	VIC=97 (3840x2160p @ 59.94Hz/60Hz)	🕒 VS-IF
IT content:	no data	
IT content Type:	graphics Not used - IT content bit (IT) bit is set to 0	e AUD-IF
YCC quantization range:	limited range	
pixel repetition:	none	😁 HDR-IF
line number of end of top bar:	0	
line number of start of bottom bar:	2161	😑 ЕМР
pixel number of end of left bar:	0	
pixel number of start of right bar:	3841	
HB: 82 02 0d e4		ACA
SP0: 7b 62 a8 00 61 00 00 20 {b		
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 00		R
#		
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M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

	•			
	G Protocol Analyzer HDMI RX - Card 6 - RX			A Home
	Cnt: 160 Type: HDMI Char Rate: 370.88 HDCP: 2.3 x Total: x H-Sync: F: W: P:+ V			
	=93: 3840x2160p @ 24 Hz 16:9 3840 x 2160 Progres		Encrypted	🛏 Back
				🐮 Nav.
6	HDR: 0 (0) 1358			
	Dynamic Range and Mastering		WORKS AND	→ Port
	InfoFrame version: 0x01 length of HDR Metadata: 26 EOTF: SMPTE	ST 2084 (0x02)	1000	Stop
		Metadata Type 1 (0x00) y_primaries_x[0]: y primaries_y[0]:	0.26500	video
Hele	displa	y_primaries_x[1]: y_primaries_y[1]:	0.15000	
	displa	y_primaries_y[1]: y_primaries_x[2]: y primaries_y[2]:	0.68000	O AVI-IF
	white_	point_x: point y:	0.31270 0.32900	GCP
		splay_mastering_luminance: splay_mastering_luminance:	1000 cd/m2 0.00000 cd/m2	VS-IF
2		m Content Light Level: m Frame-average Light Level	1000 cd/m2 : 400 cd/m2	AUD-IF
19	HB: 87 01 1a 27 SP0: a6 02 00 c2 33 c4 86 05		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	HDR-IF
1ª	SP1: 4c 1d b8 0b d0 84 80 2b L SP2: 3e 13 3d 42 40 e8 03 5a >.= SP3: 00 00 e8 03 90 01 00 f1	3@Z		€ ЕМР
	#	[• ACA
	COLORD LAND		A ANTINI TANK	<i>~</i>
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Rev. A1

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide Rev
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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		
Two example Dashboards are shown. The first with TMDS mode and the second in the FRL mode.		
PORT:48G Protocol Analyzer HDMI RX - Card 6 - RX Update Cnt: 160 Type: HDMI Char Rate: 370.88 HDCP: 2.3 enabled PassTh: 1 SCAN: Active: Total: H-Sync: F: W: P:+ V-Sync: F: W: P:+ CTA VIC=93: 3840x2160p @ 24 Hz 16:9 3840 x 2160 Progressive 30 bpp, RGB, BT.2020-RGB Not Encrypted		
PORT:48G Protocol Analyzer HDMI RX - Card 6 RX Update Cnt: 362 Type: FRL 5 Char Rate: 1485.00 HDCP: NONE PassTh: 0 SCAN: Progressive Active: 4800 x 4320 Total: 5625 x 4400 H-Sync: F:345 W:110 P:+ V-Sync: F:16 W:20 P:+ CTA VIC=199: 7680x4320p @ 60 Hz 16:9 7680 x 4320 Progressive 30 bpp, YCbCr-420, BT.709 Not Encrypted		
The following items are on the Real Time dashboard:		
Top Row Items – and Port:		
Port and Card – The Port area shows the current Rx port that is being displayed on the Real Time Mode PORT 486 Protocol Analyzer HOMT RX = Card 6 = RX		
PORT: 486 Protocol Analyzer HDMI RX - Card 6 - RX. Currently the only analyzer port is the M41h 48G Video Analyzer/Generator port.		
Second Row Items – TMDS and FRL Modes:		
Update Cnt – Increments every time the screen contents are updated Update Cnt: 160		
Type – HDMI for TMDS mode; FRL for Fixed Rate Link (FRL) mode Update Cnt: 362 Type: FRL 5		
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 enables or not		
 HDCP – Indicates whether HDCP is enabled or disabled HDCP: disabled 		
 PassThru – Indicates if pass through is active. Pass Thru is not currently supported on this. 		
Scan: Progressive or Interlaced SCAN: Progressive		
Third Row Items – FRL Mode:		
Active: – The Active video horizontal and vertical pixels and lines of the format resolution Active: 4800 x 4320		
Total: - The Total video horizontal and vertical pixels and lines of the format resolution Total: 5625 x 4400		
 H-Sync: – Indicates the horizontal Front Porch sync pulse width H-Sync: F:345 W:110 P:+ 		
 V-Sync: – Indicates the vertical Front Porch and vertical sync pulse width and the pulse polarity V-Sync: F:16 W:20 P:+ 		
Fourth Row Items – FRL and TMDS modes:		
 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 expect ratio. If the incoming video is not determined to be a CEA format, there will be an		
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 the first example the active horizontal and vertical resolution is 3840 x		

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Re	Real Time Mode – Dashboard Items		
	2160 3840 x 2160. The second example shows an 8K format at 7680 x 4320.		
•	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 Button Descriptions
Control Panel	
Main Control Panel (two views – Active / Inactive)	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:
	 Start/Stop – The Start / Stop button disable the active collection of real time data.
	 Video – The video button 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 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.

Rev. A1

Real Time Mode – Main Control Panel	Control Button Descriptions
Control Panel → Home → Back ↓ Nav. ↓ Stop ↓ Video ↓ Video ↓ VS-IF ↓ GCP ↓ ACA	 ACA - The ACA button AcA 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 roots provides access to various tools such as Set EDID management, HP, 5 Volts, SCDC and HDCP management.
✓ Tools 5.08.07	

4.3 Real Time Mode Data Panels

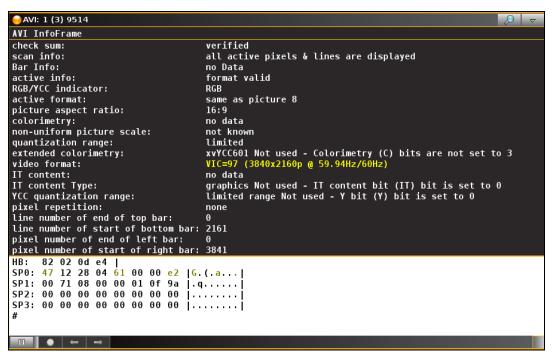
This section describes the **Real Time** controls and data panels. The **Real Time** mode is only available through the embedded GUI. It is not available through the external ATP Manager.

Note: Detailed procedures for operating the M41h 48G Video Analyzer/Generator through the built-in GUI are provided in the M41h Quick Start Guide.

4.3.1 Reference Frames Concept

The M41h 48G Video Analyzer/Generator 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.



4.3.2 Zoom Feature

Because the **Real Time** mode can only be viewed in the embedded M41h 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 if 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
Image Scale dialog box Image Scale Mode	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.
<pre>1:1 I Full Quality Low High Aspect Ratio Fit H:V 4:3 I 16:9</pre>	 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
Video Color panel	The following information is provided in the Video Timing dialog box:
х:0353 у:0387 Сг:2000 Y:0976 Cb:2560	 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.
	There are a series of arrows on the bottom of the Video Info dialog box. These arrows are described below:
	 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
AVI Infoframe AVI Informe AVI Informe Verified Control: C	 The following information is provided in the AVI Infoframe dialog box: 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 end of top bar. Pixel number of end of left bar. Pixel number of start of pight bar.
AVI Pull-down Menu	There is a pull-down menu associated with the

Real Time – AVI Infoframe	Information / Function
Show Pause	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:
ⓒ Clear ⊙ Set Ref	 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.
Upper Status Bar Pause mode	The upper status bar shows the following information from left to right:
II AVI: 5 (7) 23161	 The pause/resume (active) status.
Resume (active) mode	 The type of data panel (e.g. AVI).
e AVI: 4 (6) 19931	 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.
Lower Control Panel Pause mode	The lower control panel enables you to control and view the following:
$\blacktriangleright \bigcirc (\Rightarrow) \Rightarrow 7[7]$	 Set the pause/resume (active) status.
Pause mode after going to the reference frame	 Go to the Reference Frame (must be in paused mode).
Resume (active) 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
Vendor Specific Infoframe 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 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 []	 The following information is provided in the Vendor Specific Infoframe dialog box: 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.
VS-IF Pull-down Menu Show Pause Clear © Set Ref	 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: 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.
Upper Status Bar	The upper status bar shows the following information

M41h 48G Video Analyzer/Generator for HDM	VI 8K Testing - User Guide
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Real Time – VS-IF	Information / Function
Pause mode	from left to right:
VSI: 3 (3) 409366	 The pause/resume (active) status.
Resume (active) mode	The type of data panel (e.g. VS-IF).
₩VSI: 3 (3) 409366	 The number of changes defined since you set the reference frame.
	The number of distinct data views in parentheses.
	 409366 The total number of frames captured since the panel was opened or since the last clear.
Lower Control Panel	The lower control panel enables you to control and view the following:
Pause mode	
▶ ○ ⇐ ➡ 3 [3]	Set the pause/resume (active)
Pause mode after going to the reference frame	status.
Reference	 Go to the Reference Frame (must be in paused mode).
Resume (active) mode	 Image: Analysis of the second s
	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
General Control Packet	 The following information is provided in the General Control Packet data island dialog box: 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.
GCP Pull-down Menu Show Pause Clear Set Ref	 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: 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.
Upper Status Bar Resume (active) mode II Deep Color GCP: 1 (1) 183288 Pause mode Deep Color GCP: 1 (1) 183288	 The upper status bar shows the following information from left to right: II The pause/resume (active) status. Deep Color GCP: The type of data panel (e.g. GCP). I The number of changes defined since you set the reference frame. II The number of distinct data views in parentheses. III The total number of frames captured since the panel was opened or since the last clear.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide Rev. A1

Real Time – General Control Packet	Information / Function
Real Time – General Control Packet Lower Control Panel Pause mode Pause mode after going to the reference frame Reference Resume (active) mode	 The lower control panel enables you to control and view the following: 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.

4.3.8 HDR InfoFrame Panel

The **HDR IF** (InfoFrame) button opens up the **HDR IF** panel (shown below). The **HDR IF** panel enables you to view the HDR InfoFrame Packet data. The table below describes the information in the GCP Info panel and the associated control menu.

Real Time – HDR InfoFrame Packet	Information / Function
HDR InfoFrame Packet Pynamic Range and Mastering InfoFrame version: 0x01 length of HDR Metadata: 26 EOTF: SMPTE ST 2084 (0x02) Static Metadata Descriptor ID: Static Metadata Type 1 (0x00) display_primaries_x[0]: 0.26500 display_primaries_x[1]: 0.15000 display_primaries_x[2]: 0.68000 display_primaries_y[2]: 0.32000 white_point_x: 0.31270 white_point_y: 0.32900 max_display_mastering_luminance: 1000 cd/m2 Maximum Content Light Level: 400 cd/m2 Maximum Frame-average Light Level: 400 cd/m2 FP: 4c 1d b8 0b d0 84 80 2b L+ SP2: 9c 13 33 d4 24 0e 80 35 a >.=B0Z SP3: 00 00 es 03 90 01 00 f1 + SP3: 00 00 es 03 90 01 00 f1 +	 The following information is provided in the HDR InfoFrame Packet dialog box: InfoFrame Version – Identifies the version of the HDR InfoFrame. Length of HDR Metadata – Indicates the number of bytes of data in the HDR InfoFrame. EOTF – Electro Optical Transfer Function industry standard used. Static Metadata Descriptor ID – The Static Metadata Descriptor – The Static Metadata parameters used for the display primaries, white point, display luminance, light level and frame average light level.
HDR IF Pull-down Menu	 There is a pull-down menu associated with the HDR IF Info panel. You can access either from the main control panel or from the panel via the icon on the upper right of the panel. The pull-down menu provides the following functions: Show/Hide – Enable or disable the

Real Time – HDR InfoFrame Packet	Information / Function
 Show □ Pause ⊖ Clear ⊙ Set Ref 	 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.
Upper Status Bar	The upper status bar shows the following
Resume (active) mode	information from left to right:
II Deep Color GCP: 1 (1) 183288	 Image: The pause/resume (active) status.
Pause mode Color GCP: 1 (1) 183288	Deep Color GCP: The type of data panel (e.g. GCP).
	The number of changes defined since you set the reference frame.
	 The number of distinct data views in parentheses.
	• 183288 The total number of frames captured since the panel was opened or since the last clear.
Lower Control Panel	The lower control panel enables you to
Pause mode	control and view the following:
▶ 🕞 🖙 🔿 3[3]	 Set the pause/resume (active) status.
Pause mode after going to the reference frame	Go to the Reference Frame (must
► Reference	be in paused mode).
Resume (active) mode	 Navigate left or right through the distinct data views (must be in paused mode).
	 The data view currently displayed.
	• ^[3] The number of distinct data views.

4.4 Enabling HDCP Authentication and Encryption

This section describes the procedure for enabling HDCP authentication and encryption on the Protocol Analyzer to test a source HDCP functionality.

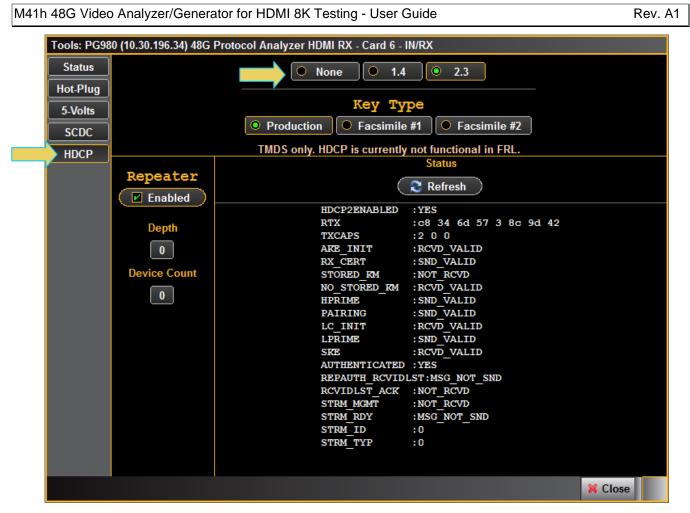
3.14 Setting the HDCP 2.3 mode

The M41h 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.



- 1. Select the **RX Control and Configuration** dialog box using the check boxes.
 - **Enabled** In the Enabled mode, the M41h 48G Video Analyzer/Generator sink emulator will respond to HDCP 2.3 authentication request from a source device under test.
 - Disabled In the Disabled mode, the M41h 48G Video Analyzer/Generator sink emulator will not respond to HDCP 2.3 authentication from a source device under test.
 - Repeater This check box enables you to indicate whether the M41h 48G Video Analyzer/Generator emulates an HDCP 2.3 repeater device.
 - **Depth** This indicates the depth count if M41h 48G Video Analyzer/Generator is emulating an HDCP 2.3 repeater device.
 - Device Count This indicates the Device count if the M41h 48G Video Analyzer/Generator is emulating an HDCP 2.3 repeater device.
 - **Refresh** This activation button refreshes the HDCP 2.3 status area of the dialog box.

5 Analyzing HDMI Data with the M41h 48G Video Analyzer/Generator Capture Analysis Utility

This chapter describes how to use the M41h 48G Video Analyzer/Generator to view HDMI protocol data from the HDMI source device under test in the M41h 48G Video Analyzer/Generator Capture Utility. Analysis of TMDS and FRL incoming streams are supported.

5.1 Overview

These procedures assume that you have powered up the M41h system, connected your HDMI 2.1 source device, connected the Ethernet cable and established an IP connection from the ATP Manager running on your PC to the M41h system that the M41h 48G Video Analyzer/Generator resides in. You should now have the ATP Manager open on your PC.

5.2 Operational workflow for capturing data with your M41h 48G Video Analyzer/Generator

This subsection describes how to use the M41h 48G Video Analyzer/Generator to capture and analyze HDMI source devices. Testing an HDMI 2.1 source device involves the following high level steps:

- 1. Configure the M41h 48G Video Analyzer/Generator in the proper mode HDMI.
- 3. Set the +5V threshold level.
- 4. Configure the M41h 48G Video Analyzer/Generator's Rx port with the proper EDID.
- 6. Specify a trigger method (There is only one default trigger condition currently support which is the first instance of a Scrambler Reset character sequence in a Super Block).
- 7. Specify the data that you want to capture and how much data you want to capture. Currently all data is captured; there is no pre-capture filtering supported.
- 8. Initiate the capturing of the data.
- 9. Examine the test data through the ATP 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. Examine the data through the capture viewer.

5.3 Configuring the M41h 48G Video Analyzer/Generator Rx Interface

Use the procedures below to provision the M41h 48G Video Analyzer/Generator's Rx port through a **Tools** dialog box. You can configure the Rx port with an EDID, the +5V load, generated hot plug during. Through this dialog box you can also view the SCDC registers and the status of the FRL lanes.

Access the **Tools** dialog box from **Card Control** page of Apps menu as shown below.



The **Tools** dialog box appears as shown below. By default the **Tools** dialog box shows the **Status** of the FRL lanes if FRL is active. The following is an example. In this example the interface is trained at 12Gbps on 4 FRL lanes. The lanes are aligned and FRL lanes in the locked state with no pattern errors.

Tools: My_M	141h (10.30.196.48) 48G Protocol Analyzer HDMI RX - IN/RX
Status	
Hot-Plug	C Refresh
5-Volts	State :LTS_P
SCDC	Lanes :4 Rate :6 GHz
	MAX FFE :0
HDCP	FLT_NO_TO :0
	FRL_MAX :0
	RX_EQ :5
	LTP :5:6:7:8
	Valid GAP Chrs received:YES
	Valid Super Block structure:YES
	Disparity:lock:CDR Errors
	Ln_1 :0:NO:NO
	Ln_2 :0:NO:NO
	Ln_3 :0:NO:NO
	FEC Corrupted Code Block Count:0
	FEC Symbol Error Count:0
	🗱 Close

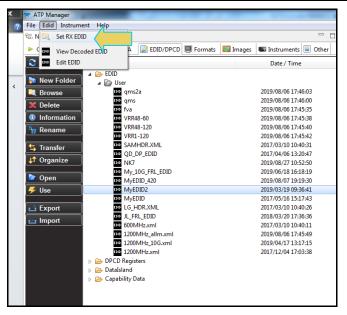
To provision the EDID:

screen below).

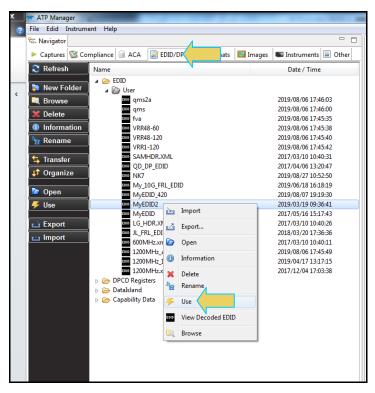
There are two ways to provision the M41h 48G Video Analyzer/Generator's Rx port with an EDID of your choosing. Not that the EDID has to support FRL. The default EDID does support FRL.

1. (optional) Load the EDID to use in the M41h 48G Video Analyzer/Generator. This is the EDID that the M41h 48G Video Analyzer/Generator will be emulating.

The default EDID in the M41h 48G Video Analyzer/Generator has a preferred timing of 4Kp60 and supports FRL. You can provision the M41h 48G Video Analyzer/Generator with a different EDID. Sample EDIDs are available from the Quantum Data website on the downloads page (<u>http://www.quantumdata.com/support/M41hreadme.asp#edid</u>). You can download these EDIDs to the host PC where the ATP Manager is running. Select an EDID file by activating the **Set M41h Rx EDID** (shown on the



Alternatively you can use the EDID/DPCD tab to select and EDID as shown below. Select the EDID and then right click to access a pull-down menu. Select Use to set the Rx port with the selected EDID as shown below.



The dialog box shown below opens up as shown below. You will have to select which M41h 48G Video Analyzer/Generator if there are more than one installed in your M41h system. The example below shows the selection of the M41h 48G Video Analyzer/Generator.

Which RX Port?
Select a Port
IN10: 48G Protocol Analyzer HDMI RX - IN/RX
Source of the second se
V Ok 🙆 Cancel
END Set RX EDID
Local Files
🔺 🗁 User
1200MHz.xml
600MHz.xml
COLO LG_HDR.XML
SAMHDR.XML
Permanently set the EDID?
✓ Issue Hot Plug?
V Ok 🙆 Cancel

Select the EDID that you wish to provision the Rx port with. The example above shows 1200MHz EDID being selected. Select the desired EDID and then click on the OK button. Select **Issue Hot Plug**? Check box if you want to issue a hot plug once the selection is made. Select the **Permanently set the EDID** if you want this EDID to be the new default EDID.

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

- Permanently set the EDID M41h HDMI 2.1 Protocol Analyzer's EDID This means that the EDID that you provision will persist through a reboot of the M41h. Otherwise the default M41h EDID will be reprovisioned when a reboot occurs.
- Issue Hot Plug This means that the M41h 48G Video Analyzer/Generator will issue a hot plug when you click the OK activation button on this dialog box.

To Set the Hot Plug duration:

 (optional) Set the Hot Plug duration and generate a hot plug as shown on the screen below. Select the Hot-Plug access button on the Tools menu as shown below. Specify the duration of the hot plug in milliseconds.

Tools: My_M41h (10.30.196.48) 48G Protocol Analyzer HDMI RX - IN/RX		
Status		
Hot-Plug	Duration 100.00 ms (100.0 - 4000)	
5-Volts	Generate Hot-Plug	
SCDC		
HDCP		
	X Close	

To Set the +5V load:

 (optional) Set the Rx port's +5V load via the 5 Volts access button through the **Tools** menu as shown below. Specify the current load in milliamps. Use the slide bar or enter the value in the field provided. The **Measured** value of the +5V is shown (4.97 V in the example below). Hit the Apply button when you have set the desired load. Use **Refresh** to view the new measured value of the +5V.

Tools: My_M41h (10.30.196.48) 48G Protocol Analyzer HDMI RX - IN/RX		
Status	Measured: 4.95 V	
Hot-Plug	Load: 8.70 mA (6.06 - 148.00)	
5-Volts		٦
SCDC	·	
HDCP		
	(🖌 Apply)(📚 Refresh)	
	X Close	

To View the SCDC Registers:

1. (optional) View the SCDC registers using the **SCDC** access button. The values of various status and configuration registers are shown. Use Refresh to update the values displayed.

Tools: My_M41h (10.30.196.48) 48G Protocol Analyzer HDMI RX - IN/RX									
Status	Refresh								
Hot-Plug									
	TMDS CLOCK RATIO: 1/10								
5-Volts	SCRAMBLING : DISABLED SCRAMBLER STATUS: OFF								
SCDC	CLOCK : DETECTED								
	READ REQUEST : DISABLED								
HDCP	CHO : LOCKED								
	CH1 : LOCKED								
	CH2 : LOCKED								
	X Close								

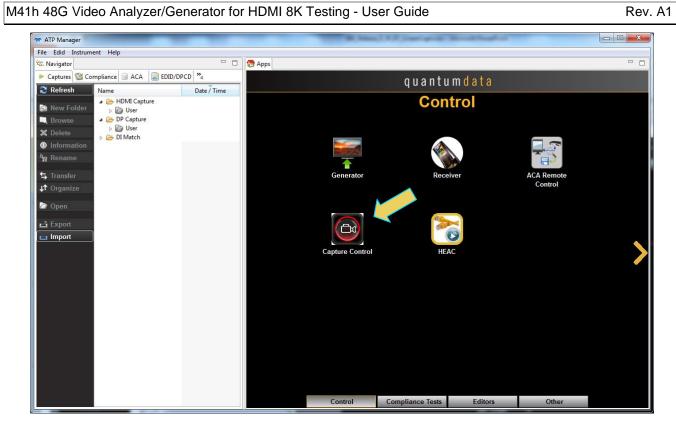
5.4 Capturing HDMI FRL Incoming Streams

The M41h 48G Video Analyzer/Generator supports the capturing of both HDMI TMDS incoming streams and Fixed Rate Link (FRL) incoming streams. This subsection describes the procedures for capturing FRL streams. The following subsection provides procedures for capturing TMDS incoming streams.

To capture FRL streams:

Page 99

1. Select the **Capture Control** application from the **Control Page** of the Main screen.



2. Select the FRL tab from the **Capture Control** window.

Capture Control
Capture Port Select Data, Inc. 486 BX/TX: Port 60 (10.30.196.34)
TMDS FR
Buffer Size: 409.60 MB
5.000% <
✓ HotPlug on Capture Start Duration 1000 ms ✓ Video Check
Capture
► Start Capture
🗊 Data 💫 Trigger
Select the type of data to capture and which post capture analysis to perform.
Type: FRL Decode
Analysis:
☑ Data Decode
X Close

3. Set the **Capture Buffer Size** slidebar to a percent value to meet your requirements. You can capture up to about 8GB of data.

Capture Control	
Capture Port Select Quantum Data, Inc. 486 RX/TX: Port 60 (10.40.196.34)	
TMDS FRL	
Buffer Size:	409.60 MB
5.000% <	
☑ HotPlug on Capture Start Duration 1000 ms ☑ Video Check	
Capture	
► Start Capture	
🗇 Data 🗟 Trigger	
Condition: FRL Start	-
× c	lose

4. Check the **Generate Hot Plug on Capture Start** button if you want the M41h 48G Video Analyzer/Generator 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.

Capture Control
Capture Port Select Quantum Data, Inc. 486 RX/TX: Port 60 (10.40.196.34)
TMDS FRL
Buffer Size: 409.60 MB
5.000% <
✓ HotPlug on Capture Start Duration 1000 ms Video Check
Capture
▶ Start Capture
🗊 Data 😝 Trigger
Select the type of data to capture and which post capture analysis to perform.
Type: FRL Decode
Analysis:
✓ Data Decode
X Close

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

The M41h 48G Video Analyzer/Generator 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.

Сар	oture Progress
	Post Capture Processing
G	ienerating decode data
	Manual Trigger Stop and Save Data Cancel

When the M41h Protocol Analyzer is done capturing data a decode file is shown in the **Event Plot** panel and the **Data Decode** panel.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide
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Rev. A1

Open Events	Segment Mecod	e 🛄 Imag	es Timing	47 Addio	7036171124	11_21_12G_4LN_NK		
	🐑 🚭 🛏 Zoom %:	10.000	A Marker 1	€.	→ Mark	er 2 🗧 🔹 🎒 🛞 Rows		
:37.906.49						31.649.120.484 [F:3 L: P:1575] 54 VIDEO Preambl	e ctl period	
Γ								
os								
NC								
'NC								
-	SCDC SCDC	SCDO	SCDC		SCDC SC	DC SCDC SCDC	SCDCSCDC	SCDCSCDC
SBK		L L						
СВК								
РКТ								
ERR								
FEC								
	96.090.969	0.00.0	7.827.619.217.005			0:28:37.831.642.343.042	0:28:37.835.665.469.078	0:28:37.839.702.095.5
:37.823.5	90.090.909	0:28:3	/.82/.619.21/.005			0:28:37.831.642.343.042 Time (H:M:S.ms.us.ns.ps)	0:28:37.835.665.469.078	0:28:37.839.702.095.5
Details	🛛 🗔 Raw Data 🛛 🔒 💿 💿	All						
ket	TimeStamp (HH:MM:SS.ms	Frame/Bl	Line Pixel/	Туре	SubType	Info		
54942	0:28:37.831.649.103.234	3	1530	FRL		Character Block 3 Start		
54943	0:28:37.831.649.103.234	3	1530	FRL		45 GAP characters		
54944	0:28:37.831.649.120.109	3	1575	FRL	BLANK	137 Video Blanking characters		
54945	0:28:37.831.649.120.484	3	1575	FRL	VDPREAM	54 VIDEO Preamble ctl period		
54946	0:28:37.831.649.140.734	3	1575	FRL		8 DI preamble.		
54947	0:28:37.831.649.144.109	3	1575	FRL		2 DI Leading Guard Band.		
54948	0:28:37.831.649.144.859	3	1575	FRL		64 DI length.		
54949	0:28:37.831.649.168.859	3	1575	FRL		2 DI Trailing.		
154950	0:28:37.831.649.169.234	3	1575	FRL	VDPREAM	6 VIDEO Preamble ctl period		
								,

5.5 Capturing HDMI TMDS Incoming Streams

The M41h 48G Video Analyzer/Generator supports the capturing of both HDMI TMDS incoming streams and Fixed Rate Link (FRL) incoming streams. This subsection describes the procedures for capturing TMDS streams. The previous subsection provides procedures for capturing FRL incoming streams.

To capture TMDS streams:

Use the procedures below to initiate a new capture.

1. Select the **Capture Control** application from the **Control Page** of the Main screen.



2. Select the TMDS tab at the top of the Capture Control window.

Capture Control	
Capture Port Select Quantum Data, Inc. 486 RX/TX: Fort 60 (10.30.196.34)	
TMDS FRL	
Trigger	
 First Event After TP Immediate Immediat	
Buffer Size:	409.60 MB
5.000% <	4
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4
HotPlug on Capture Start Duration 1000 ms Video Check	
Capture Std Tests	
► Start Capture	
🗊 Data 😝 Trigger	
Select the type of data to capture and which post capture analysis to perform.	
Type: Data Analysis [Audio,Video,Data Islands]	
Analysis:	
🕼 Data Decode	
	X Close
	A Close

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

Capture Control	_	x
Capture Port Select Quantum Data, Inc. HDMI 2.0 RX/TX: Port 30		
Trigger Mode:		
First Event After TP Immediate Immed		
Trigger on first trigger event to occur. % of Buffer Size before TP = 0 to TP % of Buffer Size after TP = 100 - TP		

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 prior. At the left most position there will be no data in the capture buffer that accumulated 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).

4. 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 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.

Buffer Size:	1071.92 MB
26.170% <	4
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	•

5. Set the **Trigger Position within the Buffer** slidebar 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 slidebar 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 beginning 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.

Buffer Size:	1071.92 MB
26.170% <	4
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4

 Check the Generate Hot Plug on Capture Start button if you want the M41h 48G Video Analyzer/Generator 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.

HotPlug on Capture Start Video Check	uration 1000 ms
Capture Std Tests	
	Start Capture

- 7. Select the Capture tab.
- 8. Select the **Data Selection Type** from the pull-down menu provided.

Capture Std Tests					
► Start Capture					
🗊 Data 🛃 Trigger					
Select the type of data to capture and which post capture analysis to perform.					
Type: Data Analysis [Audio,Video,Data Islands]					
Analysis:					
☑ Data Decode					
V Timing					
Video Analysis					
Audio Plot Data					
LPCM Audio (.wav)					

Capture Std Tests				
Start Capture				
🗊 Data 🔒 Trigger				
Select the type of data to capture and which post capture analysis to perform.				
Type: Data Analysis [Audio,Video,Data Islands]				
Analys Data Island Analysis [Audio,Video,Data Islands] Data Island Analysis [Only Data Islands]				
Protocol Analysis [Univ Data Islands]				
Scrambled Protocol Analysis				
Video Analysis				
Audio Plot Data				
LPCM Audio (.wav)				
I				

9. Select the Trigger selection **Condition**.

Capture Std	Tests				
Start Capture					
🔲 Data 🕼	Trigger				
Condition:	Vsync Asserted				
	Vsync Asserted Encryption Enabled Encryption Disabled External Trigger Input Manual Trigger				
	TMDS Clock Change				

10. Click on the Execute Capture button.

HotPlug on Capture Start Video Check	Duration 1000 ms					
Capture Std Tests						
Start Capture						

The M41h 48G Video Analyzer/Generator 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.

Capture Progress				
Performing the C	apture			
Waiting for the capture trigger event to occur (Manual Trigger)				
🛛 🔒 Manual Trig	gger Stop and Save Data 🔀 Cancel			

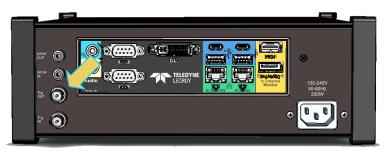
When the M41h 48G Video Analyzer/Generator is done capturing data a decode file is shown in the **Event Plot** panel and the **Data Decode** panel.

Capture Viewer									
🗇 Open) 🤇 📕 Clear)									
_	🕂 Event Plot 🕴 🚾 Timing Analysis 🛄 Video Analysis								
/User/06_04_2013_720p_HDCP									
📄 Segment 🗵 Events 🔘 Rows Д Find 🔄 Sync 🕕 Legend									
A Narker 2 C D Marker 2 C									
17883128577.2									
_		¥							
TMDS	GCP	AVI	VEN		210				
VSYNC HSYNC	HSYNC			VSY	NC				
ENCR-E	Instituc								
AVMUTE									
DDC									
CEC									
1788312857	5.354964 1788312857	6.320746		28577.2920	146	17883128578.263346 17	7883128579.234646	5	
			Т	me (us)				_	
Data Deco									
/User/06_04_201				Deta					
Segment				aw Data	•	● All			
Packet		Frame Line	Pixel	Туре	SubType			\bigcirc	
• 3	17883078576.689999	0	0	TMDS	HSYNC	HSYNC 40 clocks		69	
• 4 • 5	17883078576.689999 17883078576.840000	0	0	TMDS TMDS	GCP	VSYNC 8250 clocks			
• 6	17883078577.270969	0	43	TMDS		General Control Packet (GCP) AVI InfoFrame			
• 7	17883078577.701939	0	75	TMDS		Vendor-Specific InfoFrame			
• 8	17883078598.919998	1	0	TMDS	HSYNC				
• 9	17883078621.139999	2	0	TMDS	HSYNC	HSYNC 40 clocks			
•			III				4	$\mathbf{\overline{\mathbf{C}}}$	
Bar Info:		no Dat						*	
active in	nfo: indicator:	no dat RGB	a						
active fo		not de	fined						
	aspect ratio:	16:9						-	
							Þ		
HB: 82 0	02 0d e4								
	00 28 00 04 00 00 b6 [j								
SP1: 00 d1 02 00 00 01 05 42 B							Ψ.		
							÷		
							🔀 Close		

Note: This feature is not currently supported). The External Trigger Input enables you to initiate a capture trigger event from an external source. You select the external trigger from the Trigger pull-down menu as shown below:

	► Start Capture
	► Start Capture
🕽 🛛 Data 🖉	Trigger
ondition:	Vsync Asserted
	Vsync Asserted
	Encryption Enabled
	Encryption Disabled
	External Trigger Input
	Manual Trigger
	TMDS Clock Change

The minimum voltage required to activate the external trigger is 2.1 volts and will accept up to 5V. The pulse duration of the External Trigger must be greater than 1 TMDS pulse clock period. The Trigger Input is on the rear of the M41h. It is the top most BNC connector. There are a few M41h configurations; the most common are shown below.



M41h Advanced Test Platform – Trigger IN (Not Currently Supported)

5.6 Initiating a Capture with Manual Triggering

In addition to the triggers provided in the pull-down menu, you can select to manually trigger on an event. Refer to the screen shot below:

Capture Sto	d Tests						
	► Start Capture						
🗊 Data 🗟 Trigger							
Condition:	Vsync Asserted						
	Vsync Asserted						
	Encryption Enabled						
	Encryption Disabled						
	External Trigger Input						
	Manual Trigger						
	TMDS Clock Change						

Typically manual triggers are used in the Pass-through mode. In these modes there is a display connected to the M41h HDMI Protocol Analyzer Tx port. A common application would be to observe the connected display and when it exhibits the behavior you are looking for, you can initiate the manual trigger.

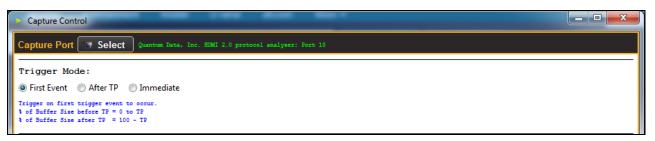
5.6.1 Initiating a Capture with Manual Triggering

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.

To capture data using manual triggering:

Use the procedures below to initiate a new capture.

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 prior. At the left most position there will be no data in the capture buffer that accumulated 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 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.

M41h 48G Video Anal	zer/Generator for HDMI 8K	Testing - User Guide

Buffer Size:	1071.92 MB
26.170% <	Þ
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4

3. Set the Trigger Position within the Buffer slidebar 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 slidebar 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 beginning 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.

Buffer Size:	1071.92 MB
26.170% <	•
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4

4. Check the **Generate Hot Plug on Capture Start** button if you want the M41h 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.

HotPlug on Capture Start	Duration 1000 ms	
Video Check		
Capture Std Tests		
	Start Capture	

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

Capture	Std Tests
	► Start Capture
间 Da	ata 😝 Trigger
Select	t the type of data to capture and which post capture analysis to perform.
Type:	Data Analysis [Audio,Video,Data Islands]
Analys	Data Analysis [Audio,Video,Data Islands]
	Data Island Analysis [Only Data Islands]
	Protocol Analysis
	Scrambled Protocol Analysis
	Video Analysis
	🔲 Audio Plot Data
	LPCM Audio (.wav)

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

		Start Capture
🗍 Data 🕻	Trigger	
Condition:	Vsync Asserted	
	Vsync Asserted	
	Vsync Asserted Encryption Enabled	
	-	
	Encryption Enabled	
	Encryption Enabled Encryption Disabled	

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

☐ HotPlug on Capture Start ✓ Video Check	Duration 1000 ms
Capture Std Tests	
	Start Capture

The M41h 48G Video Analyzer/Generator 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.

Capture Progress	
Performing the Capture	
Waiting for the capture trigger event to occur (Manual Trigger)	
Manual Trigger Stop and Save Data Cancel	

When the M41h 48G Video Analyzer/Generator 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.

Der Geller Statistersen Segment Events Rows Find Sync Legend Signett Events Zoom % 10.000 Marker 1 Image: Signettion of Signet Sign	Capture Vie	ewer		-					x	
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The following screen shots show zoomed in views on the AVI infoframe.

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• 1806	6:39:30.212.972.830.002	0	8	471	TMDS		Vendor-Specific InfoFrame	
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Capture \	liewer	***						-		
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• 3119	0:37:13.103.813.010.000	0	7	0	TMDS		HSYNC 88 clocks			
 3120 3122 	0:37:13.103.827.830.000 0:37:13.103.829.630.000	0	8	0 535	TMDS TMDS		HSYNC 88 clocks AVI InfoFrame			
• 3122	0:37:13.103.842.640.000	0	9	0	TMDS		HSYNC 88 clocks			
• 3125	0:37:13.103.844.230.000	0	9	471	TMDS	SPD IF	Source Product Descripto	r InfoFrame		
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The following screen shots show zoomed in views on the GCP and AUD infoframe.

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• 4 • 5	6:45:25.548.485.240.002 6:45:25.548.485.770.000	0	1	0 317	TMDS	HSYNC GCP	HSYNC 88 clocks General Control Packet (G	(CD)		
• 6	6:45:25.548.492.650.002	0	2	0	TMDS	HSYNC	HSYNC 88 clocks	icr)		
• 9	6:45:25.548.500.049.999	0	3	0	TMDS	HSYNC	HSYNC 88 clocks			
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The following screen shot example shows a capture with HDCP 2.2 active.

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						m	m	
CEC								
0:37:13.082.2	51.867.526 0:37:13.0	93.661.815	5.682			5.123.160.001 (.ms.us.ns.ps)	0:37:13.116.533.108.156	0:37:13.127.994.452.475
Data Deco	4. 8				time (traine	iniaidainaipa)		
/User/3G_Data_A								
Segment			Details	😱 Raw Dat		 All 		
Packet	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Туре	SubType	Info	0
• 3286	0:37:13.105.101.910.000	0	94	0	TMDS	HSYNC		
· 3287	0:37:13.105.103.190.000	0	94	382	TMDS	VIDEO	Active Video 3840 clocks	89
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		
• 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	•
	1							
event num transfer								<u>^</u>
Msg Size:	112							E
Ready:0 ReAuth:0								
Invalid F	Asvd Bits							*
•								•
* START *	r							*
* ACK * 0000: 75	•							
0000: 75	u							
1								<u>v</u>
		_			_			
								🔀 Close

5.6 Examining HDMI 2.1 FRL 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.

5.6.2 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 ATP Manager.

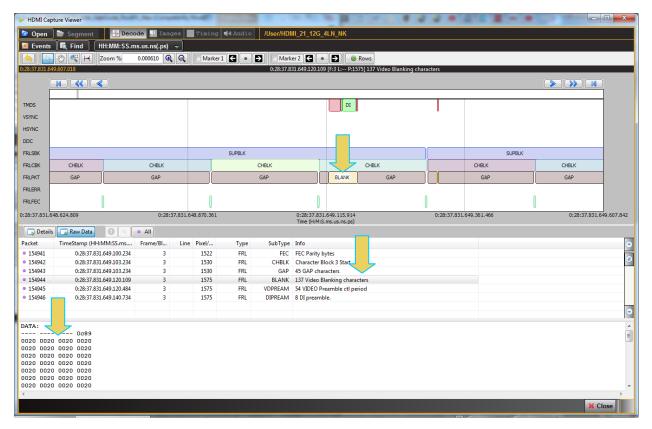
To view captured data through the Data Decode panel:

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.

Note: In the screen capture below the 4 lane data is depicted in columns under DATA in the Raw Data window. This is indicated below.



- HDMI Capture Viewer 🗁 Open 📄 Segme 👉 De code 🕕 Images 🔄 Timing 🛋 Andio 🛛 /User/HDMI_21_12G_4LN_NH 🗵 Events 🛛 🔩 Find 🛛 HH:MM:SS.ms.us.ns(.ps) 0.156 🔍 🔍 🛛 Marker 1 🔄 🔹 🔁 🗌 Marker 2 💽 🔹 🔁 🐵 Rows 💽 🖑 🔍 Η 🛛 Zoom %:):28:37.830.065.120.000 [E . D. . 1 DDC MASTE M < < TMDS VSYNC HSYNC DDC FRI SBK FRLCBK FRIPKT FRLERR FRLFEC 0:28:37.830.168.274.973 0:28:37.830.231.136.317 0:28:37.830.356.859.006 0:28:37.830.419.931.294 0:28:37.830.293.997.662 Time (H:M:S.ms.us.ns.ps) 🕞 Details 🕞 Raw Data 🔒 💿 💿 All TimeStamp (HH:MM:SS.ms.... Packet Frame/Bl... Line Pixel/... SubType Info Туре 0:28:37.830.064.938.987 124447 16 FRL SUPBLK Super Block 2040 character 124448 0:28:37.830.064.940.487 16 0 FRI CHBLK Character Block 0 Start 124449 0:28:37.830.064.940.487 502 GAP characters FRL GAP 16 0 3108439 0:28:37.830.065.120.000 DDC SCDC DDC MASTER -> SLAVE SCDC Read Update_0 124450 0:28:37.830.065.128.737 16 502 FRL FEC FEC Parity bytes • 124451 0:28:37.830.065.131.737 16 510 FRL CHBLK Character Block 1 Start vent number: 9 transfer time: 402.80 us * START * * ACK * 0000: a8 10 1.55 Close
- 2. Highlight a SCDC transaction to view its contents as shown below. The example below shows a register read.

5.6.3 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.

1	HDMI Capture Viewer	with New Compatibility Market - Marcardt Hand - 11. 7
	📴 Ope Segment 🕴 🕂 Decode 🛺 Images 💽 Timing 📢 Audio	/User/HDMI_21_12G_4LN_NK
	🛛 🖾 Events 🖉 🔩 Find 🛛 🛛 HH:MM:SS.ms.us.ns(.ps) 👻	
	(A)	Marker 2 🗲 🔹 🗲 🞯 Rows
	0:28:37.894.884.810.624	0:28:37.830.065.120.000 [F: L: P:1 DDC MASTER -> SLAVE SCDC R

The Decode Event Selection dialog box is shown below.

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

Decode Event Selection										
Select All 📋 Clear All										
Misc (0) Packets (0) InfoFrame (0) Control (0) DDC	C (108) • FRL (3108435) • Other (0)									
Select All on Page	Clear All on Page									
✓ Link Rate (1)	✓ H-Sync (10991)									
✓ Super Block (210124)	✓ V-Sync (738)									
Character Block (840496)	Encryption Enable (9)									
☑ Gap (972638)	Video Preamble (48401)									
☑ Active (94199)	Video Guard Band (10467)									
☑ Blank (37944)	☑ Data Island (10476)									
✓ FEC Parity (840495)	DI Preamble (10485)									
FEC Error (0)	☑ DI Leading GB (10485)									
✓ Error (10)	☑ DI Trailing GB (10476)									
	V Ok 🙆 Cancel									

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

Decode Event Selection	
Select All Clear All	
Misc (0) Packets (0) InfoFrame (0) Control (0) DDC (108) F	RL (3108435) Other (0)
Select All on Page 🔲 Clear A	ll on Page
✓ Any DDC (0)	
✓ EDID (0)	
☑ HDCP (0)	
☑ HDCP 2 (0)	
SCDC (108)	
	V Ok 🙆 Cancel

- 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.

Applying Post Filter Settings	
Loading 11000 records out of 748205	

Note that you can clear all the selections on all pages with the Clear All Clear All activation button on the

top left. Alternatively you can select all items on all pages with the Select All

You can also apply the same Select and Clear operations to each tab of the **Decode Event Selection** dialog box.

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

To search through the data:

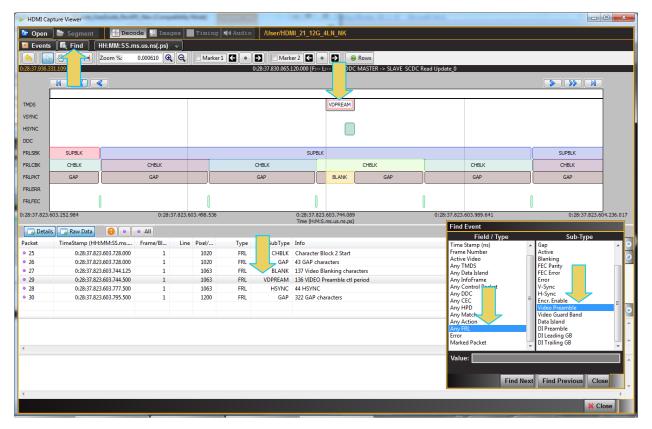
1. Click on the Search icon.



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.

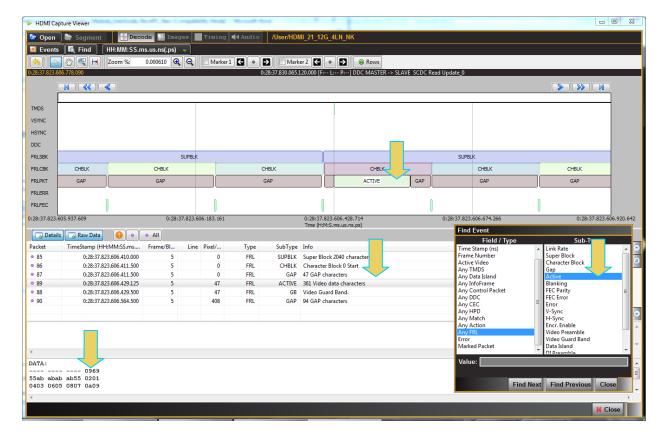
A dialog box appears that enables you can enter search criteria. In this example we will search for an Audio Clock Regeneration packet. The **Data Decode** panel will then show the next General Control Packet (GCP) packet. If you are searching for a specific packet number, timestamp or frame you will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



Rev. A1

This example shows a search for Active video.

Note: In the screen capture below the 4 lane data is depicted in columns under DATA in the Raw Data window. This is indicated below.



5.6.5 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: <u>Event Plot Panel</u>.

The following example shows active video, video guard band, FRL packets and the FEC block packet.

Note: In the screen capture below the 4 lane data is depicted in columns under DATA in the Raw Data window. This is indicated below.

	apture Viewer	and the second	Contraction of the local sectors of	-		- 1 h					×
		ode 🛄 Ima		Audio	/User/HDM	I_21_12G_4LN_NK					
🛛 Events											
0:28:37.823.6	200m %:	0.000038	Marker 1	1 🗧 🔹 🖻	Marke	r 2 🗧 🔹 🔁 🧯	Rows				
TMDS						GB					
VSYNC											
HSYNC											
DDC								_			
FRLSBK	SUPBLK						SUPBLK				
FRLCBK	CHBLK						CHBLK				
FRLPKT	GAP	7		GAP				ACTIVE	7		
FRLERR											
FRLFEC		FEC									
0:28:37.823.	.606.398.405	0:28;	37.823.606.413.752			0:28:37.823.606.429.09	2	0:28:37.823.606.444	1.446	0:28:37.823.606.4	459.845
Deta	ils 🗔 Raw Data 🔒 💿	 All 				Time (H:M:S.ms.us.ns.ps	1				
Packet	TimeStamp (HH:MM:SS.ms		Line Pixel/	Туре	SubType	Info					•
• 85	0:28:37.823.606.410.000	5	0	FRL		Super Block 2040 charad	ters				
	0:28:37.823.606.411.500	5	0	FRL		Character Block 0 Start					
86											
 86 87 	0:28:37.823.606.411.500	5	0	FRL	JAP	47 GAP characters					
	0:28:37.823.606.411.500 0:28:37.823.606.429.125	5	0 47	FRL			rs				
• 87 • 89 • 88	0:28:37.823.606.429.125 0:28:37.823.606.429.500	5	47 47	FRL FRL	GB	47 GAP characters 361 Video data characte Video Guard Band.	rs				
• 87 • 89	0:28:37.823.606.429.125	5	47	FRL	GB	47 GAP characters 361 Video data characte	rs				

The following example shows a blanking period with the video preamble, data island preamble, data island guard band, etc.

IDMI Cap	oture Viewer	hard Property Street Street		tai that	Red 1	and the second second	A Read to a			
Open	📄 Segment 🛛 🕂 Dec	ode 🕂 Imag	ges 🚺 Tin	ning 🛋 Audio	/User/HDI	MI_21_12G_4LN_NK				
Events		ns.us.ns(.ps)	<u></u>		<u>- I</u>					
	🐑 🔍 🛏 🛛 Zoom %:	0.000038		/larker 1 💽 💿	Mark	ter 2 🗧 💿 🄁 💿 Rows				
37.944.9	71.379.733									
ſ										L.
ſ					_					
os -			VDPR	EAM		DIPREAM	DI			1
NC										
NC										
						_	_			
:										
SBK						SUPBLK				
СВК										
PKT	GAP					BLANK	×		GAP	
ERR										
FEC										
:37.823.6	04.694.373	0:28:3	37.823.604.70	9.720		0:28:37.823.604.725.067	0:28:37.823.	504.740.414	0:28:37.823.6	
_						Time (H:M:S.ms.us.ns.ps)				
Detail:		 All 								
ket	TimeStamp (HH:MM:SS.ms		Line Pixe		SubType					
5 6	0:28:37.823.606.410.000 0:28:37.823.606.411.500	5		0 FRL 0 FRL	su	Super Block 2040 characters Character Block 0 Start				
o 7	0:28:37.823.606.411.500	5		0 FRL 0 FRL	- Y	47 GAP characters				
9	0:28:37.823.606.429.125	5		47 FRL	A	361 Video data characters				
8	0:28:37.823.606.429.500	5		47 FRL	GB	Video Guard Band.				
90	0:28:37.823.606.564.500	5	4	408 FRL	GAP	94 GAP characters				
A:	0969									
	b ab55 0201									
	5 0807 0a09									
	5 6667 6465									

The following example shows a couple of blanking periods, vsync and hsync elements and the FRL packet structure.

Note: In the screen capture below the 4 lane data is depicted in columns under DATA in the Raw Data window. This is indicated below.

HDMI Capt	ture Viewer		and the local			-		a. #1	1 B			• 412		the second	- 0 - X
		AL Dogo	de 🛄 Imaç	700 E	Timine	g 🛋 Audio	/Usor/HDI	MI 21 12G			-		-	_	
			s.us.ns(.ps)		TIMIII		/osei/iibi	wii_21_120_							
Events		_													
0:28:37.831.64	200n	m %:	0.001 🗨		Marke	er 1 🔁 💿		er 2 🗲 🖉	P Rows 9 [F:2 L: P:1059] 137 Vid	las Disebies ale					
							0:26:57.6	51.040.100.10	9 [P:2 L: P:1059] 157 Vid	ieo Bianking cha	racters				
-													-		_
TMDS											DI				
VSYNC															
HSYNC															
DDC															
FRLSBK			SUPBL						SUPBLI	к				SUPBLK	
FRLCBK	CHBLK	CHBL	ж	CHBLK	(CHBLK		HBLK	CHBLK	CHBLK		HBLK	CHBLK	CHBLK	СНЕ
FRLPKT	GAP	GAP	•	G	GAP	GAP][GAP	GAP	GAP		GAP	GAP	GAP	GAP
FRLERR															
FRLFEC															
0:28:37.831.64	47.746.013		0:28:3	37.831.648	8.237.117	7	•		1.648.728.222		0:28:3	7.831.649.219.	326	0:28:	37.831.649.712.078
								Time (H:M:S	G.ms.us.ns.ps)						
	Raw Data		• All			-									
 Packet 154921 	TimeStamp (HH:MM: 0:28:37.831.648			Line	Pixel/ 1012	Type FRL	SubType	Info FEC Parity I							•
 154921 154922 	0:28:37.831.648		2		1012	FRL		Character E							6
• 154923	0:28:37.831.648		2		1020	FRL		39 GAP cha							
• 154924	0:28:37.831.648		2		1059	FRL			lanking characters						
 154926 154925 	0:28:37.831.648		2		1059	FRL		136 VIDEO 44 HSYNC	Preamble ctl period						
154925	0:28:37.831.048	.193.484	2		1059	FRL	HSYNC	44 HSYNC							
															(
DATA:															
	0c89 0020 0020														-
0020 0020	0020 0020														
	0020 0020														
	0020 0020														
0020 0020	0020 0020														
0020 0020 ∢	0020 0020														
				_	_						-	_			X Close
															Ciose

5.6.6 Viewing the Embedded TMDS Capture

You can view the underlying TMDS capture of an FRL capture. You can view these TMDS captures under in the Navigator as shown below.

🛪 980 Manager	CHARGE CHARGE	
File Edid Instrume	ent Help	
🔁 Navigator		
🕨 Captures 🛛 🖉 C	Compliance 🗐 ACA 🛛 🧭 EDID/DPCD 🜉 Formats 🗋 🔤 Images	Instruments »1
🔁 Refresh	Name	Date / Time
🗟 New Folder	a 🗁 HDMI Capture	
-	⊿ 🗁 User	2010 (11 (12 12 27 25
Rowse	lest-cmt fec_symbol_err_cap_121918	2018/11/13 12:37:35 2018/12/19 16:11:09
🗶 Delete	Fec_symbol_en_cap_121918	2018/12/19 16:11:05
Information	HDMI_21_RC_Compression_Example	2019/03/25 14:59:25
	HDMI_21_FRL_12G_4LN_FEC_Err1	2018/04/07 13:27:19
₽ <mark>1</mark> 2 Rename	HDMI 21 FRL 12G 4LN 2	2018/04/07 13:27:17
ち Transfer	HDMI_21_FRL_1080p_12G_4LN_with_TMDS	2018/04/13 11:36:55
	pdecode.log: 126588806 bytes	
📌 Organize	pdecode.idx: 76370803 bytes	
	ptiming.log:	
🗁 Open	FieldPixelData.bin:	
A Frances	paudioanalysis.log:	
🖸 Export	audio_lpcm.log:	
🔁 Import 🚽	Log	
	▲ ► TMDS	2018/04/13 11:36:56
	pdecode.log: 2261701 bytes	
	pdecode.idx: 691280 bytes	
	ptiming.log:	
	 FieldPixelData.bin: 49766576 bytes paudioanalysis.log: 	
	audio_lpcm.log:	
	HDMI 21_FRL 1080 12G_4LN_with_TMDS	2018/04/25 10:21:15
	HDMI_21_FKL_1080_120_4LIN_WID_TMD3 HDMI_20_4K HDR TMDS Capture	2018/04/23 10:21:13
	HDMI_20_4K_HDK_TMDS_Capture	2018/06/14 14:52:36
	CMT_Test2	2018/00/14 14:52:50
	CMT_rest1	2018/11/13 12:25:22
	AA_HDMI_21_FRL_4K60	2018/06/14 09:18:36
	AA_HDMI_21_FRL_12G_4LN_FEC_Err	2018/04/07 13:27:20
	AA HDMI 21 8K FRL	2019/02/28 17:51:03
	AA_HDMI_20_6G_TMDS_Video_Timing_HD	2018/04/07 13:27:02
	AA_HDMI_20_6G_Protocol_Capture	2018/04/07 13:26:56
	▷ ▶ 8K_RC2	2019/03/22 14:59:21
	⊳ ▶ 8K_RC	2019/03/22 14:56:33
	02_06_2019_23_50_17	2019/03/25 17:17:54
	DP Capture	
	👂 🗁 DI Match	

Simply double click on the embedded TMDS capture icon to view the TMDS capture as shown below.

 HDMI Cap Open Events 			-		Audio		II_21_FRL_1080p_12G_4LN_with_T	MDS/TMDS		
0:1:32.681.44	6.176.966	38.025				- Mark		_		
ĺ										
TMDS										
IMD3										
VSYNC										
HSYNC							, in the second s			
ENCR-E										
AVMUTE										
DDC										
CEC										
0:0:56.752.8	82.056.320	0:1:8.42	2.345.83	9.393		0:1:2	0.091.809.622.467	0:1:31.761.273.405.541	0:1:43.472.563	.223.680
0.0.00.00.002.00		01110112	210 10:00				H:M:S.ms.us.ns.ps)	01101/012/01/00/011	01211011721000	220.000
🗔 Detail	Is 🗔 Raw Data 🔒 😐	 All 								
Packet	TimeStamp (HH:MM:SS.ms	Frame/Bl	Line	Pixel/	Туре	SubType	Info			0
5287	0:1:20.110.453.260.000	2	8	0	TMDS	HSYNC	HSYNC 44 clocks			
5288	0:1:20.112.291.660.000	2	8	273	TMDS	VEN	Vendor-Specific InfoFrame			
5289	0:1:20.112.722.640.000	2	8	337	TMDS	AVI IF	AVI InfoFrame			
5290	0:1:20.125.066.210.000	2	9	2170	TMDS		Audio Sample Packet(L-PCM and IEC 61	937 compressed formats)		
5291	0:1:20.125.268.240.000	2	9	0	TMDS	HSYNC				
 5292 5293 	0:1:20.127.106.640.000 0:1:20.127.537.620.000	2	9	273 337	TMDS		Source Product Descriptor InfoFrame Audio InfoFrame			
 5293 5294 	0:1:20.127.537.820.000	2	10	2170	TMDS	AUDSAM	Audio Inforrame Audio Sample Packet(L-PCM and IEC 61	027 compressed formats)		
 5294 5295 	0:1:20.140.083.220.000	2	10	0	TMDS	HSYNC	HSYNC 44 clocks	(SSF compressed formats)		
• 5296	0:1:20.154.898.200.000	2	11	0	TMDS		HSYNC 44 clocks			
5297	0:1:20.169.511.160.000	2	12	2170	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61	.937 compressed formats)		
										•
active f picture colorime non-unif quantiza	aspect ratio: stry: form picture scale: stion range: l colorimetry:	16:9 no da not k limit xvYCC	unown ed 2601 N	ot used		etry (C) b z,16:9, 1:	its are not set to 3 1)			E
										Þ
HB: 82	02 0d e4									
	02 28 04 10 00 00 7c 1									=
	39 04 00 00 81 07 69 . 00 00 00 00 00 00 00 .									=
	00 00 00 00 00 00 00 00 1.									
										-
•			_							
									🔀 Clo	se

5.7 Examining TMDS Captured Data

The procedures below describe how to view various types of TMDS 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.

5.7.1 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 ATP 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.

2. 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.

🔲 Data Deco							
/Usez/66_Data_A	t Events 🔯 Find 🔄 Sync	🗔 Detai	Is 🗔 R	aw Data		 All 	
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	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	
							0
active for picture a colorimet non-unifor quantizat	: fo: indicator: inmat: ispect ratio: :ry: irm picture scale: :ion range: colorimetry: rmat: t:	no Data format RGB same as 16:9 no data not knoo limited xvYCC60 VIC=97 no data	valid pictur wn 1 Not t (3840x2	re 8 nsed - 2160p (Colorimet 8 59.94Hz/	60Hz)	s are not set to 3 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.

/User/6G Data A	ide 🛛							
	t 🛛 Events 🔯 Find 🔄 Sync	🗔 Detail	s 🗔 R	aw Data	•	● All		
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	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	
	E Registration ID: HDMI	fied LLC OUI dditiona			format is	present		
24bit IEE	E Registration ID: HDMI	LLC OUI			format is	present		

Rev. A1

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

Data Deco								
Segmen		🗔 Detail	s 🗔 R	aw Data		 All 		
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	SubType	Info	6
• 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- 1 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	(89
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	
								G
set AVI color dep		depth no not indi		cated				^
								-
4								

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

Data Deco								
Segmen		🗔 Detail	s 🗔 R	aw Data		• All		
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	69
• 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	
								\odot
sample s channel s level sh LFE play	frequency: refer to str	eam heade 	er	°L]			,	4
SP0: 70 (SP1: 00 (SP2: 00 (01 0a 4a 01 00 00 00 00 7d p 00 00 00 00 00 7d p 00 00 00 00 00 00 1 00 00 00 00 00 00 1 00 00 00 00 00 00 1 00 00 00 00 00 00 1							4 III >
•							•)-

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

	nalysis_1							
📄 Segment	🛛 🗷 Events 🛛 🐧 Find 🔄 Sync	🗔 Details	5 🗔 R	aw Data	•	 All 	_	
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	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	
		0	127	0	TMDS	HSYNC	HSYNC 88 clocks	
2015	6:39:30.213.853.520.000	0						-
• 2015	6:39:30.213.853.520.000							
	6:39:30.213.853.520.000 ck regeneration: N = 5824,			amp (CT	'S) = 56306	51		
udio clo				amp (C7	'S) = 56306	51		
audio clo	ck regeneration: N = 5824,			amp (CT	"S) = 56306	51		4
audio clo audio clo MB: 01 0	ck regeneration: N = 5824, ck freq: 48.000kHz 0 00 4a	Cycle Ti		amp (CT	'S) = 56306	51		4
audio clo audio clo ((BE: 01 0 SPO: 00 0	ock regeneration: N = 5824, ck freq: 48.000kHz 0 00 4a 8 97 75 00 16 c0 d8 u.	Cycle Ti		amp (CT	'S) = 5630¢	51		4
udio clo udio clo B: 01 0 5P0: 00 0 5P1: 00 0	ck regeneration: N = 5824, ck freq: 48.000kHz 0 00 4a 8 97 75 00 16 c0 d8 u. 8 97 75 00 16 c0 d8 u.	Cycle Ti		amp (CT	'S) = 56306	51		4
undio clo andio clo HB: 01 0 SP0: 00 0 SP1: 00 0 SP2: 00 0	ock regeneration: N = 5824, ck freq: 48.000kHz 0 00 4a 8 97 75 00 16 c0 d8 u.	Cycle Ti		amp (CT	'S) = 56306	51		4

7. 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.

Data Deco								
Segment		🗔 Detail	s 🗔 Ri	aw Data	•	• All		
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	SubType	Info	0
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	68
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 subpacket	0: max channels=2, sampl 0: carries audio data	les=4						*
•								P.
HB: 02 0	01 00 65							
	of 9c 40 9f 9c 88 e4 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 00							
515. 00 0								-
								P.

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).

/User/6G_Da								
[~]	ta_Analysis_1							
📄 Segm	nent 🗵 Events 🛴 Find 🔄 Sync	🛛 🖓 Details	R 🕞 🛛	aw Data	•	• All		
Packet	TimeStamp (HH:MM:SS.ms.us.ns)	Frame	Line	Pixel	Туре	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	69
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:	
								\odot
Categor Source Channel	l status mode : 0 ry code : 0x00 number : ignon l number (audio) : ignon ng frequency : 48kH	ed						
Clock a Max. au Word le	accuracy : Level adio sample word size: 24 bi ength : 24 bit	II ts	fault)				Ŧ
Clock a Max. au Word le	accuracy : Level adio sample word size: 24 bi ength : 24 bit	. II ts s	fault)				*
Clock a Max. at Word le Origina 00: 0 01: 4 002: 11 002: 1 0 03: 24	accuracy : Level ndio sample word size: 24 bi ength : 24 bi accuracy : Not in 0 1 2 3 4 5 0 1 2 3 4 5 0 0 0 0 0 0 8 9 10 11 12 13 0 0 0 0 0 0 6 17 18 19 20 21 0 0 0 0 0 0	. II ts s	fault)				-

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

👕 Segmen	nt 🛛 🗷 Events 🕅 🗔 Find 🔄 Sync) 🗔 D	etails	🚡 Raw Data		• All		
Packet	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Туре	SubType	Info	
3286	0:37:13.105.101.910.000	0	94	0	TMDS	HSYNC	HSYNC 88 clocks	Ē
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	ISYNC	HSYNC 88 clocks	
3289	0:37:13.105.118.010.000	0	95	382	TMDS	VIDEO	Active Video 3840 clocks	
	0:37:13.105.123.160.000				DDC	HDCP	DDC SLAVE -> MASTER HDCP2 Reply	
3291	0:57:15:105:125:100:000				DDC	neer	DDC SERVE -> MASTER TIDOP2 Reply	
• 3291 • 3333	0:37:13.105.123.160.000				DDC	HDCP		
event nu ransfer sg Size eady:0 eAuth:0 nvalid 1	0:37:13.105.123.160.000 mber: 24 time: 112.60 us :112							
vent nu ransfer sg Size eady:0 eAuth:0 nvalid 1	0:37:13.105.123.160.000 mber: 24 time: 112.60 us :112							
3333 event nu cransfer Isg Size Ready:0 ReAuth:0	0:37:13.105.123.160.000 mber: 24 time: 112.60 us :112 Rsvd Bits							Þ

5.7.2 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 ATP Manager.

To view captured data through the Data Decode panel:

1. 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.

> Capture Control	
Capture Port Select Quantum Data, Inc. MDMI 2.0 RX/TX: Port 20	
Trigger Mode:	
Trigger on first trigger event to occur.	
<pre>% of Buffer Size before TP = 0 to TP % of Buffer Size after TP = 100 - TP</pre>	
Buffer Size:	2457.60 MB
30.000% <	۲.
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4
Capture Std Tests Start Capture Trigger	
Select the type of data to capture and which post capture analysis to perform.	
Type: Data Analysis [Audio,Video,Data Islands]	
Analysis:	
✓ Data Decode	
Video Analysis	
Audio Plot Data	
LPCM Audio (.wav)	
	X Close
	~ Close

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

Time (H:M;S.ms.us.ns.ps)	
PERE/ 60 20000000000000000000000000000000000	AM
Image: Constraint of the second state of the second sta	AM
CO22.551.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.613.816 Image: Co22.561.737.737.737 Image: Co22.561.737.737.737 Image: Co22.561.737.737 Image: Co22.561.7377 Image: Co22.561.737.737	AM
Image: Construction	AM
TMDS PREAM	AM
VSYNC HSYNC ENCR-E AVMUTE DDC CEC 0:0:0.033.168.141.225 0:0:0.033.244.202.560 Time (H3M:S.ms.us.ns.ps) Data Decode %	
HSYNC ENCR-€ AVMUTE DDC CEC 0:0:0.033.168.141.225 0:0:0:0.033.244.202.560 Time (H:M:S.ms.us.ns.ps) Data Decode & Time (H:M:S.ms.us.ns.ps)	3.473.241.185
ENCR & AVMUTTE DOC CEC 0:0:0:033.168.141.225 0:0:0:0.033.244.202.560 Time (H:M:S.ms.us.ns.ps) 0:0:0:0.033.396.894.977 0:0:0.03 Time (H:M:S.ms.us.ns.ps)	3.473.241.185
AVMUTE DDC CEC 0:0:0.033.168.141.225 0:0:0.033.244.202.560 Time (H:M:S.ms.us.ns.ps) 0:0:0.033.396.894.977 0:0:0.03 Time (H:M:S.ms.us.ns.ps)	3.473.241.185
DDC CEC 0:0:0.033.158.141.225 0:0:0.033.244.202.560 0:0:0.033.320.548.768 0:0:0.033.396.894.977 0:0:0.033 Image: Data Decode (2) Time (H:M:S.ms.us.ns.ps) 0:0:0.033.396.894.977 0:0:0:0.033	3.473.241.185
CEC 0:0:0.033.168.141.225 0:0:0.033.244.202.560 0:0:0.033.320.548.768 0:0:0.033.396.894.977 0:0:0.033 Image: Data Decode XX Time (H:M:S.ms.us.ns.ps) Views/d6_proceed_phalysisd Views/d6_proceed_	3.473.241.185
Time (H:M:S.ms.us.ns.ps)	3.473.241.185
Piezz 66 protocol justyrez j	
Security Reveals Revea	
📄 Segment 🔀 Events 🖸 Find 😫 Sync 🕞 Details 🕞 Raw Data 🕘 💿 💿 All	
Packet TimeStamp (HH:MM:SS.ms Frame Line Pixel Type SubType Info	 ● 8
• 2 0:0:0.000.006.801.389 1 0 0 TMDS HSYNC HSYNC 88 clocks • 3 0:0:0:000.014.208.843 1 1 0 TMDS HSYNC 88 clocks	8
• 3 • 0000000014208.543 • 1 • 0 • MDS • HSTNC • HSTNC • BSTNC BSTNC • BSTNC BSTNC • BSTNC BSTNC <td></td>	
• 7 0:0:0.000.021:474.882 1 2 4316 TMDS PREAM preamble ch1:2=000:000 8756 clocks CTL0:3=0:0:0:0 [unknown preamble]	
• 5 0:0:0.000.021.616.297 1 2 0 TMDS HSVNC HSVNC 88 clocks	
• 6 0:0:0.000.029.023.751 1 3 0 TMDS HSYNC HSYNC 88 clocks • 8 0:0:0.000.036.215.715 1 4 4272 TMDS PREAM preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble]	
	^
	-
•	
	P

Segme	ent 🗵 Events 🙆 Rows 🔯 Fin	d 🔄 🔄 Syn	nc 🕕 L	egend			
🥱 💽	🖑 🔫 Η 🛛 Zoom %:	0.002 🔍	Q	Marker 1		Marke	er 2 🗲 💿 🔁
:0:0.002.021	.620.447 0:0:0.002.	021.426.813	[F:1 L:272	2 P:4280] Da	ta Island 36 c	locks GB leadin	g ch1:2=055:055, 055:055, trailing ch1:2=055:055, 055:055
1							
TMDS	VIDEO		PREAM	DI			PREAM
VSYNC							
HSYNC			٦Г	- 7 T			HSYNC
NCR-E						_	
AVMUTE							
DDC							
CEC							
:0:0.002.0	21.046.373 0:0:0.002	2.021.291.58	36		0:0:0.002.021		0:0:0.002.021.782.012 0:0:0.002.022.028
				Т	ime (H:M:S.ms	.us.ns.ps)	
Data Dec	ode 🖾 🔪						
er/6G_Proto	col_Analysis_2						
Segmer	nt 🔣 Events 🗔 Find 🔄 Sync		etails	🐻 Raw Data	a 🔒	All	
	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Type	SubType	Info
acket	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Туре	SubType	
acket 957	0:0:0.002.021.332.536	1	272	4224	TMDS	PREAM	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream
acket 957 958	0:0:0.002.021.332.536 0:0:0.002.021.413.345	1 1	272 272	4224 4272		PREAM PREAM	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble]
acket 957 958 959	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813	1 1 1	272 272 272	4224 4272 4280	TMDS TMDS	PREAM PREAM DI	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch2
acket 957 958 959 959 961	0:0:0:002.021.332.536 0:0:0:002.021.413.345 0:0:0:002.021.413.345 0:0:0:002.021.426.813 0:0:0:002.021.487.420	1 1 1 1	272 272 272 272 272	4224 4272 4280 4316	TMDS TMDS TMDS	PREAM PREAM DI PREAM	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble
acket 9 957 9 958 9 959 9 961 9 960	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835	1 1 1 1 1	272 272 272 272 272 272 272	4224 4272 4280 4316 0	TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks
acket 9 957 9 958 9 959 9 961 9 960 9 962	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835 0:0:0:0.002.022.271.936	1 1 1 1 1	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 9 957 9 958 9 959 9 961 9 960 9 962	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835	1 1 1 1 1	272 272 272 272 272 272 272	4224 4272 4280 4316 0	TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks
acket 9 957 9 958 9 959 9 961 9 960 9 962 9 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835 0:0:0:0.002.022.271.936	1 1 1 1 1	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 9 957 9 958 9 959 9 961 9 960 9 962 9 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835 0:0:0.002.022.271.936 0:0:0.002.028.739.990	1 1 1 1 1	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 9 957 9 958 9 959 9 961 9 960 9 962 9 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835 0:0:0:0.002.022.271.936	1 1 1 1 1	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 9 957 9 958 9 959 9 961 9 960 9 962 9 964 • 964 • 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.487.420 0:0:0.002.021.628.835 0:0:0.002.022.271.936 0:0:0.002.028.739.990	1 1 1 1 1	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 9 957 9 958 9 959 9 961 9 960 9 962 9 964 ata Isl B: 02 PO: 44	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.427.420 0:0:0:0.002.021.628.835 0:0:0:0.002.022.271.936 0:0:0:0.002.022.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D	1 1 1 1 1 1 2	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 8: 02 P0: 44 P1: 00	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 964 964 964 964 964 964 964 964 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.427.420 0:0:0:0.002.021.628.835 0:0:0:0.002.022.271.936 0:0:0:0.002.022.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 964 964 964 964 964 964 964 964 964	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 8: 02 P0: 44 P1: 00	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 8: 02 P0: 44 P1: 00 P2: 00	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 8: 02 P0: 44 P1: 00 P2: 00	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 0	272 272 272 272 272 272 272 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 957 958 959 961 960 962 964 ata Isl B: 02 P0: 44 P1: 00 P2: 00 ERC4:	0:0:0.002.021.332.536 0:0:0.002.021.413.345 0:0:0.002.021.426.813 0:0:0.002.021.426.813 0:0:0.002.021.426.835 0:0:0.002.022.271.936 0:0:0.002.022.271.936 0:0:0.002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	272 272 272 272 273 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab
acket 957 958 959 961 960 962 964 964 964 964 8: 02 P0: 44 P1: 00 P2: 00 ERC4: hannel	0:0:0:002.021.332.536 0:0:0:002.021.413.345 0:0:0:002.021.426.813 0:0:0:002.021.426.813 0:0:0:0:002.021.426.835 0:0:0:0:002.022.271.936 0:0:0:0:002.022.271.936 0:0:0:0:002.028.739.990 and 1 packet. 01 00 65 92 da 44 92 da 00 99 D 00 00 00 00 00 00 00 00 00 00 00 00 00	1 1 1 1 1 1 1 1 0 888c8c8t	272 272 272 272 273 273 273	4224 4272 4280 4316 0 382	TMDS TMDS TMDS TMDS TMDS TMDS TMDS	PREAM PREAM DI PREAM HSYNC VIDEO	preamble ch1:2=000:000 48 clocks CTL0:3=0:0:0:0 [unknown pream preamble ch1:2=001:000 8 clocks CTL0:3=1:0:1:0 [di preamble] Data Island 36 clocks GB leading ch1:2=055:055, 055:055, trailing ch preamble ch1:2=000:000 466 clocks CTL0:3=1:0:0:0 [video preamble HSYNC 88 clocks Active Video 3842 clocks GB ch0:2=0ab:055:0ab, 0ab:055:0ab

5.7.3 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 ATP Manager.

Rev. A1

Capture Control	_ D X
Capture Port Select Quantum Data, Inc. HDMI 2.0 RX/TX: Port 30	
Trigger on first trigger event to occur. § of Buffer Size before TP = 0 to TP § of Buffer Size after TP = 100 - TP	
Buffer Size:	2457.60 MB
30.000% <	Þ
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4
✓ Video Check Capture Std Tests ► Start Capture	
🗐 Data 🗔 Trigger	
Select the type of data to capture and which post capture analysis to perform.	
Type: Data Analysis [Audio,Video,Data Islands]	•
Analysis:	
V Data Decode	
✓ Timing	
✓ Video Analysis ■ Audio Plot Data	
LPCM Audio (.wav)	
	X Close

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

Capture	n 🚺 🚺 Clear 🛛 HH:MM:S:	S.ms.us.ns(.ps) 👻	-	-				-	- 1		
Event Plo	ent Events Rows C Find	d 🔄 Sync 0.004 🔍		r1 🗲 💌	D Mark	er 2 🕄 🔹 🗗						
0101213511151												
TMDS VSYNC HSYNC				PREAM	PREAM	PREAM PREAM	PREAM PREAM VSYNC	PREAM	PREAM	PREAM	PREAM	
ENCR-E AVMUTE		1 1 1	1 1 1									
DDC CEC 0:0:0.033.1	68 141 225	0:0:0.033.24	14 202 560		0.0.0 03	3.320.548.768	0.0.0	0.033.396.894.977		0	0:0.033.473	241 185
Data Dec		01010100012	11202.000			S.ms.us.ns.ps)						
📄 Segme	nt 🔀 Events 🔯 Find 🔄 Sync	🗌 🗔 Det			○ ○ All							
Packet • 2	TimeStamp (HH:MM:SS.ms 0:0:0.000.006.801.389	Frame 1	Line Pixel	Type TMDS	SubType HSYNC	Into HSYNC 88 clocks						•
03	0:0:0.000.0014.208.843	1	1 0	TMDS	HSYNC	HSYNC 88 clocks						8
• 4	0:0:0.000.021.414.276	1	2 4280	TMDS	DI	Data Island 36 clocks	GB leading ch1:2=055:05	5, 055:055, trailing	ch1:2=			
◎ 7	0:0:0.000.021.474.882	1	2 4316	TMDS	PREAM	preamble ch1:2=000:0	000 8756 clocks CTL0:3=	0:0:0:0 [unknown	preamble]			
• 5	0:0:0.000.021.616.297	1	2 0	TMDS	HSYNC	HSYNC 88 clocks						
• 6	0:0:0.000.029.023.751	1	3 0	TMDS	HSYNC	HSYNC 88 clocks						
• 8	0:0:0.000.036.215.715	1	4 4272	TMDS	PREAM	preamble ch1:2=001:0	000 8 clocks CTL0:3=1:0:	L:0 [di preamble]				
												•
												*

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

Find Event	
Field / Type	Sub-Type
Packet Number Time Stamp (ns) Frame Number Active Video Any TMDS Any Data Island Any InfoFrame Any Control Packet Any DDC Any CEC Any HPD Any Match Any Action Error Marked Packet	V-Sync H-Sync AVMute Encr. Enable Pixel Ratio TMDS Clock Drop Capture Trigger ENC_ON ENC_OFF SSCP
Value:	
Fi	nd Next Find Previous Close

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

Capture Viewer Copen Clear HH:MM:SS.ms.us.ns(.ps) Event Plot 23 Forex (6) Forex (6											
TMDS		PREAM				DI			PREAM		
VSYNC						ليل v	SYNC				
HSYNC											
ENCR-E											
AVMUTE											
DDC											
CEC											
0:0:0.033.3	33,214,586	0:0:0.033.3	333,360,9	40		0:0:0.033	.333.507.842	0:0:0.033.3	33.654.744	0:0:0.033.33	3.801.646
							S.ms.us.ns.ps)				
🔲 Data Dec	ode 🛙										
/User/6G_Prote	ocol_Analysis_1										
📄 Segmei	nt 🗵 Events 🔯 Find 😫 Sync	: 🗔 D	etails	👼 Raw Dat	ta 🔒	• • All					
Packet	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Туре	SubType	Info				•
18059	0:0:0.033.332.936.227	2	2250	0	TMDS	VSYNC	VSYNC 44000 clocks				69
• 18025	0:0:0.033.333.456.432	3	0	309	TMDS	PREAM	preamble ch1:2=001:000 8 cloc				
• 18026	0:0:0.033.333.469.900	3	0	317	TMDS		Data Island 36 clocks GB leadin	ng ch1:2=055:055, 055:	055, trailing ch1:2=		
 18027 18028 	0:0:0.033.333.530.506	3	0	361 353	TMDS TMDS	SSCP PREAM	SSCP 8 clocks preamble ch1:2=354:354 8 cloc	L. CTI 0.2. 0.0.0.0 (
0 18028	0:0:0.033.333.530.506	3	U	333	TIVIDS	PREAIVI	preamble cn1:2=354:554 8 cloc	:ks CTL0:3=0:0:0:0 [uh	known preamblej		•
											
2: 0154 3: 0154 4: 0154 5: 0154 6: 0154 7: 0154	0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354 0354										E
										×	Close

5.7.4 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

Data Decode 🛛		
📄 Segment 🔀 Events 🗟 Find 😫 Sync	Details 🗔 Raw Data	• • All

The Decode Event Selection dialog box is shown below.

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

Decode Event Selection	
Seiser Aii	
 Data Island Packets (197944) Control Packets (98947)) DDC Packets (28) Other Packets (91812)
Select All on Page	Clear All on Page
Unknown (90227)	Vendor Specific InfoFrame (0)
Audio Clock Regen. (3137)	☑ AVI InfoFrame (189)
Audio Sample (104014)	Source Product Descriptor InfoFrame (0)
General Control (188)	☑ Audio InfoFrame (189)
Audio Content Protection (0)	MPEG Source InfoFrame (0)
SRC1 (0)	
SRC2 (0)	
One Bit Audio Sample (0)	
DST Audio (0)	
HBR Audio Stream (0)	
🔲 Gamut Metadata (0)	
	V Ok 🙆 Cancel

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

Decode Event Selection	
Select All Clear All	
 Data Island Packets (330) Control Packets (86957) 	DDC Packets (16) Other Packets (79201)
Select All on Pag	ge 🔲 Clear All on Page
✓ V-Sync (165)	
🔲 H-Sync (86662)	
AVMUTE (1)	
✓ CTRL3 (128)	
Pixel Ratio (1)	
	V Ok 🙆 Cancel

- 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.
- Cancel Ok 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.

Progress Information	
Applying Post Filter Settings	
Loading 11000 records out of 748205	
	Cancel

Note that you can clear all the selections on all pages with the Clear All

Clear All activation button on the 🔀 Select Ali activation button. top left. Alternatively you can select all items on all pages with the Select All

You can also apply the same Select and Clear operations to each tab of the Decode Event Selection dialog

box.

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.

👕 Segmei	nt 🗵 Events 🔍 Fi	ind 🔄 Syr	nc) 🔽	Details	🗔 Raw	Data	•	All					
Packet	TimeStamp (HH#	SS.ms	Frame	Line	Pixel	Туре	SubType	Info					
2272	0:16:15.	.531.090	0	739	2366	TMDS	ACR	Audio Clock Regeneration Packet					
2302	0:16:15.		1	5	0	TMDS	VSYNC	VSYNC 12375 clocks					
2303	0:16:15.6	72.754.390	1	5	11	TMDS	GCP	General Control Packet (GCP)					
2304	0:16:15.6	72.754.677	1	5	43	TMDS	GCP	General Control Packet (GCP)					
2305	0:16:15.6	72.754.965	1	5	75	TMDS	AVI IF	AVI InfoFrame					
2306	0:16:15.6	72.755.252	1	5	107	TMDS	AUD IF	Audio InfoFrame					
2307	0:16:15.6	72.755.539	1	5	139	TMDS	SPD IF	Source Product Descriptor InfoFrame					
2388	0:16:15.6	73.531.090	1	39	2366	TMDS	ACR	Audio Clock Regeneration Packet					
2527	0:16:15.6	74.531.090	1	84	2366	TMDS	ACR	Audio Clock Regeneration Packet					
•								•					
clear AV	MUTE flag:	1											
	MUTE flag:	0						Find Event					
set AV	nond trag.	color denthy Color Denth not indicated											
color de	pth:		-		nixel packing phase' Phase not indicated								
color de	pth:		-		ated			Field / Type Sub-Type Active Video Null Packet					
color de	pth:		-		ated								
color de	pth:		-		ated			Active Video Any TMDS Any Data Island Audio Clock ten Audio Sample					
color de pixel pa	pth: cking phase:		-		ated			Active Video Any TMDS Any Data Island Any InfoFrame Any InfoFrame					
color de pixel pa HB: 03 0	ppth: loking phase:	Pha	ase not		ated			Active Video Any TMDS Any Data Island Audio Clock ten Audio Sample					
color de pixel pa HB: 03 0 SPO: 10	epth: loking phase:	Pha 00 c1	ase not		ated			Active Video Any TMDS Any Data Island Any InfoFrame Any InfoFrame					
color de pixel pa HB: 03 0 SP0: 10 SP1: 10	ppth: loking phase:	Pha 00 c1 00 c1	ase not		ated			Active Video Any TMDS Any Data Island Any InfoFrame Any Control Packet Audio Cont. Prot.					

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.

Data Deco	de 🖾						
📄 Segment	🛛 🗷 Events 🔍 Find 🔄 Syr	ic [🔒 Details	🕞 Rav	v Data	•	All
Packet	TimeStamp (HH:MM:SS.ms	Frame	Line	Pixel	Туре	SubType	Info
2296	4:47:19.862.498.660	1	3	1923	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed
2297	4:47:19.862.503.619	1	4	0	TMDS	HSYNC	HSYNC 60 clocks
2298	4:47:19.862.519.490	1	4	1768	TMDS	AUDSAM	Audio Sample Packet(L-PCM ar C 61937 compressed
2300	4:47:19.862.525.840	1	5	0	TMDS	HSYNC	HSYNC 60 clocks
2301	4:47:19.862.525.840	1	5	0	TMDS	VSYNC	VSYNC 12375 clocks
2299	4:47:19.862.525.860	0	0	0	TMDS	TRIG	Capture Trigger Event
2302	4:47:19.862.525.939	1	5	11	TMDS	GCP	General Control Packet (GCP)
2303	4:47:19.862.526.227	1	5	43	TMDS	GCP	General Control Packet (GCP)
2304	4:47:19.862.526.515	1	5	75	TMDS	AVI IF	AVI InfoFrame -
						·	•
							Find Event
							Field / Type Sub Type Active Video AVMute Any TMDS Encr. Ena Any Data Island Pixel Rate Any InfoFrame TMDS Clock Drop Any Control Packet Capture Trigger Value: Find Next

5.7.6 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: <u>Event Plot Panel.</u>

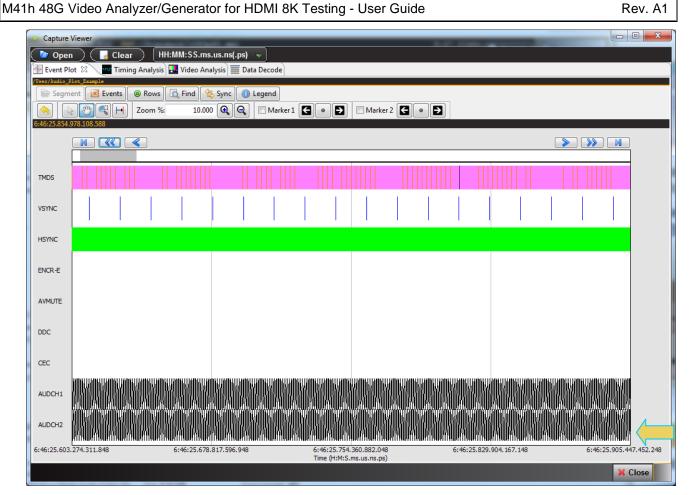
Capture \	Viewer								• ×	
Dpen Clear										
🔠 Event Plot 🛞 🔤 Timing Analysis 🔣 Video Analysis										
/User/06_04_2018_720p_HDCP										
📄 Segment 🗵 Events 🔘 Rows 🔯 Find 🔄 Sync 🕕 Legend										
	- (P) (P)	+ Zoom %:	0.000248	🕽 🔍 🗆 Mai	rker 1 💽 💿 🛛	Marker	r 2 🗲 💿 Đ			
17883128577	7.209264									
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TMDS		GCP	AVI	VEN						
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178831285	575.354964	1788312857	6.320746		577.292046 e (us)	178831285	78.263346	17883128579.	234646	

5.7.7 Viewing Audio Plot data through the Event Plot panel

This subsection provides procedures for viewing the Audio Plot data on the **Event Plot** panels in the ATP Manager. You have to have selected Audio Plot Data as indicated below. You can only view LPCM data. You cannot view compressed audio formats.

Capture Control	
Capture Port Select Quantum Data, Inc. HIMI 2.0 RX/TX: Port 30	
Trigger Mode:	
💿 First Event 💿 After TP 💿 Immediate	
Trigger on first trigger event to occur. % of Buffer Size before TP = 0 to TP % of Buffer Size after TP = 100 - TP 	
Buffer Size:	2457.60 MB
30.000% <	4
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4
Video Check Capture Std Tests Start Capture	
🗊 Data 🔒 Trigger	
Select the type of data to capture and which post capture analysis to perform.	
Type: Data Analysis [Audio,Video,Data Islands]	-
Analysis:	
📝 Data Decode	
Video Analysis	
Audio Plot Data LPCM Audio (vav)	
	X Close

The following screen shot shows an example of the Audio Plot data for 2 channel LPCM.

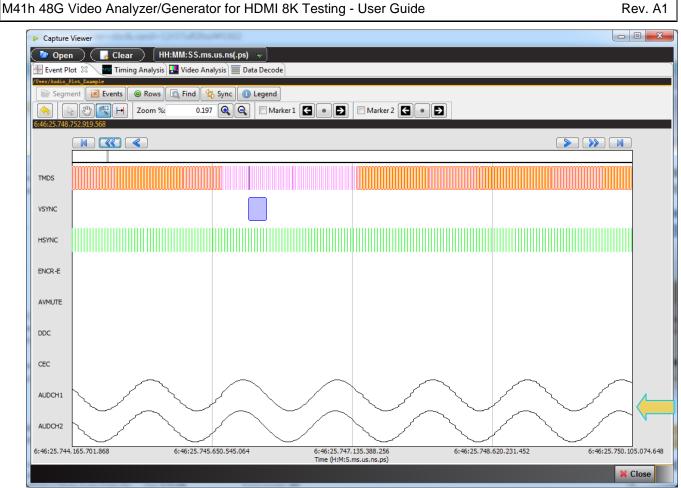


Note: You must be sure to have selected the audio channels using the Rows button on the Event Plot panel (below).

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Se	lect the rows to display in the Ev	vent Plot.
INFO-FR Info Frames	TMDS Any other TMDS Event	VSYNC Vertical Sync
HSYNC Horizontal Sync	ENCR-E Encryption Enable/Disable	
SCDT TMDS Clock Drop	Capture Trigger	DDC Any DDC Event
CEC	HPD Hot Plug	HDCP-E HDCP Encr Enable/Disable
Condition Match	Action Event	CH-ST Channel Status
AUDCH1 Audio Channel #1	AUDCH2 Audio Channel #2	AUDCH3 Audio Channel #3
AUDCH4 Audio Channel #4	AUDCH5 Audio Channel #5	AUDCH6 Audio Channel #6
AUDCH7 Audio Channel #7	AUDCH8 Audio Channel #8	

The following screen example shows the same data zoomed in.



6 Running Standard Tests

This chapter describes how to use the M41h 48G Video Analyzer/Generator special tests. The M41h 48G Video Analyzer/Generator 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.

Note: These tests are currently only available in the TMDS mode.

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 ATP Manager. This subsection describes how to use the M41h 48G Video Analyzer/Generator to run a timing test on an HDMI source device. The setup procedures described above in the section: <u>Analyzing HDMI Data with your M41h</u> 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 M41h 48G Video Analyzer/Generator Rx port with the proper EDID.

To run the video timing analysis test:

 Select the M41h 48G Video Analyzer/Generator that you are using to capture the data from your HDMI source device under test by clicking on the **Select** button and selecting the proper instrument from the list (not shown). Typically you would only have one M41h Test System in your lab.



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.

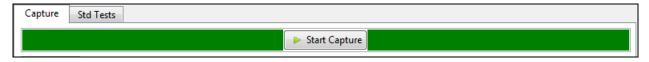
After TP (Trigger Position) – In this setting the trigger condition specified in the Trigger Type pull-down menu will be ignored until data has accumulated in the capture buffer up to the point where the Trigger Position slide-bar is set. Once the data has accumulated to the setting of the Trigger Position, 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).

3. 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.

Buffer Size:	1071.92 MB
26.170% <	•
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4

- 4. Set the **Capture Buffer Position** slidebar 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 slidebar 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.
- 5. Select the Capture tab in the Capture Control panel.



6. 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.

	► Start Capture
📄 Data	a 🔒 Trigger
elect	the type of data to capture and which post capture analysis to perform.
ype:	Data Analysis [Audio,Video,Data Islands]
nalva	Data Analysis [Audio,Video,Data Islands]
	Data Island Analysis [Only Data Islands] Protocol Analysis
	Scrambled Protocol Analysis
	Video Analysis
	Audio Plot Data
_	LPCM Audio (.wav)

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

apture Std Tests
► Start Capture
🗊 Data 🛛 😹 Trigger
ondition: Vsync Asserted
Vsync Asserted
Encryption Enabled
Encryption Disabled
External Trigger Input
Manual Trigger
TMDS Clock Change

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

Capture	Std Tests				
			Start Capture		

The M41h 48G Video Analyzer/Generator 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.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

Capture Progress
Performing the Capture
Waiting for the capture trigger event to occur (TMDS Clock Change)
Manual Trigger Stop and Save Data Cancel

When the M41h 48G Video Analyzer/Generator 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 M41h 48G Video Analyzer/Generator format library and the measured values, the M41h 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.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

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Page 152

Rev. A1

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

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0		0	001	6:45:25.5	65.159.415		0:0:0.000	0.007.408	4400	4400		88	0	0				
0		0	02	6:45:25.5	65.166.822		0:0:0.000	0.007.410	4400	4400		88	0	0				
0		0	003	6:45:25.5	65.174.232		0:0:0.000	0.007.405	4400	4400		88	0	0				
0		0	004	6:45:25.5	65.181.637		0:0:0.000	0.007.408	4400	4400		88	0	0				
0		0	005	6:45:25.5	65.189.045		0:0:0.000	0.007.407	4400	4400		88	0	0				
0		0	006	6:45:25.5	65.196.452		0:0:0.000	0.007.408	4400	4400		88	0	0				
0		0	007	6:45:25.5	65.203.860		0:0:0.000	0.007.408	4400	4400		88	0	0				
0			008		65.211.267		0:0:0.000		4400	4400		88	0	0				
0			009		65.218.675		0:0:0.000		4400	4400		88	0	0				
0			010		65.226.082		0:0:0.000		4400	4400		88	0	0				
0)11		65.233.490		0:0:0.000		4400	4400		88	0	0				
0			12		65.240.897		0:0:0.000		4400	4400		88	0	0				
0)13		65.248.305		0:0:0.000		4400	4400		88	0	0				
0)14		65.255.712		0:0:0.000		4400	4400		88	0	0				
0)15		65.263.120		0:0:0.000		4400	4400		88	0	0				
0)16		65.270.527		0:0:0.000		4400	4400		88	0	0				
)17)18		65.277.935		0:0:0.000		4400	4400		88 88	0	0				
0)18)19		65.285.342 65.292.750		0:0:0.000		4400 4400	4400 4400		88	0	0				
0)20		65.292.750 65.300.157		0:0:0.000		4400 4400	4400		88	0	0				
0)20)21						4400	4400		88	0	0				
0)21		65.307.565 65.314.972		0:0:0.000	0.007.408	4400	4400		88	0	0				
0)22		65.322.380		0:0:0.000		4400	4400		88	0	0				
U		0	125	0:40:20.0	03.322.300		0.0.0.000	1.007.408	4400	4400		00	V	V				

You can view 4K by 2K timing data on the M41h 48G Video Analyzer/Generator.

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r/HDMI_				naco Analy														
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rmat		PP HFreq (kHz) I	nterlaced	Htotal	Vtotal	Hactive	Hfront	HSync \	Width	VActive	Vfront	VSync Width	HSync Polarity	VSync Polar	ty HToVPul	se Del	Pix Free	(MI
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rame	Statistics:	: 🔄 Sync														/ 禽 🛛	≫]ি	3
	Frame	TimeStamp (HH:N	/ Du	ration (HH:I	И	VFreq (Hz)	HFreq (k	(Hz)	Vt	otal	Vactive	Pix Freq (M	HSync Wi	VSync S	art Video	HToVE	Delay	Enc
	0	2:30:28.523.318.9	75 0:0	0.016.666.0	00	60.00	135	5.00	2	250	2160	593.995	88	10	90		0	
	1	2:30:28.539.985.7	73 0:0	0.016.666.0	00	60.00	135	5.00	2	250	2160	593.995	88	10	90		0	
	2	2:30:28.556.652.5	70 0:0	0.016.666.0	00	60.00	135	5.00	2	250	2160	593.995	88	10	90		0	
	3	2:30:28.573.319.3		0.016.666.0	00	60.00	135		-	250	2160	593.995	88	10	90		0	
	4	2:30:28.589.986.1	65 0:0	0.016.666.0	00	60.00	135.00		2	250	2160	593.995	88	10	90		0	
	5	2:30:28.606.652.9	60 0:0	0.016.666.0	00	60.00	135.00		2250		2160	593.995	88	10	90		0	
	6	2:30:28.623.319.7	57 0:0):0.016.666.(00	60.00	135	5.00			2160	593.995	88	10	90		0	
	7	2:30:28.639.986.5	55 0:0	0.016.666.0	00	60.00	135			250	2160	593.995	88	10	90		0	
	8	2:30:28.656.653.3	53 0:0	0:0.016.666.0	00	60.00	135	5.00	2	250	2160	593.995	88	10	90		0	
Line St	atistics:	🔄 Sync															š	4
me	Line	TimeStamp (HH:1	MM:SS.m	s.us.ns)	Duration	(HH:MM:SS	.ms.us.ns)	н	Total	TMDS	HTotal	HSync Widt	h HBack	HActive			-	
	000	2:3	0:28.539.	926.512		0:0:0.00	0.007.407		4400		4400	8	3 0	0				
	001	2:3	0:28.539.	933.920		0:0:0.00	0.007.407		4400		4400	8	3 0	0				
	002	2:3	0:28.539.	941.327		0:0:0.00	0.007.408		4400		4400	8	3 0	0				
	003	2:3	0:28.539.	948.735		0:0:0.00	0.007.407		4400		4400	8	3 0	0				
	004	2:3	0:28.539.	956.142		0:0:0.00	0.007.407		4400		4400	8	3 0	0				
	005		0:28.539.			0:0:0.00	0.007.408		4400		4400	8		0				
	006		0:28.539.				0.007.407		4400		4400	8		0				
	007		0:28.539.				0.007.408		4400		4400	8	-	0				
	008		0:28.539.				0.007.407		4400		4400	8		0				
	009		0:28.539.				0.007.407		4400		4400	8		0				
	010		0:28.540.				0.007.408		4400		4400	8		0				
	011		0:28.540.				0.007.407		4400		4400	8		0				
	012	2:3	0:28.540.0	015.402		0:0:00	0.007.407		4400		4400	8	3 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 M41h 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

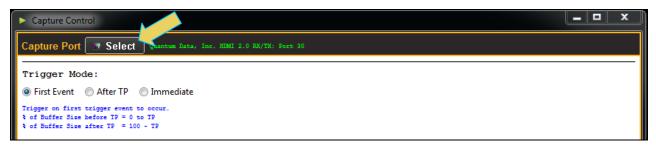
clicking on a frame. You can also synchronize by activating the sync button on the upper left side of the **Data Decode** panel. Once you synchronize the **Data Decode** panel to a frame you can view the transactions for that frame in the **Data Decode** panel.

The setup procedures described above in the section: <u>Analyzing HDMI Data with your M41h Protocol Analyzer</u> should be followed for the video analysis tests. These setup procedures are listed below:

- 1. Set the threshold of the +5V.
- 2. Configure the M41h Rx port with the proper EDID.

To run the video analysis test:

1. Select the M41h 48G Video Analyzer/Generator 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 prior. At the left most position there will be no data in the capture buffer that accumulated 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** 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.

Buffer Size:	1071.92 MB
26.170% <	۶.
Trigger Position (TP) the Buffer:	0.00 MB
0.000% <	٢

- 3. Set the **Capture Buffer Position** slidebar 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 slidebar 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.

Capture	Std Tests	
		► Start Capture

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.

Capture Std Tests
► Start Capture
🗊 Data 🔒 Trigger
Select the type of data to capture and which post capture analysis to perform.
Type: Data Analysis [Audio,Video,Data Islands]
Analys Data Analysis [Audio,Video,Data Islands]
Data Island Analysis [Only Data Islands]
Protocol Analysis Scrambled Protocol Analysis
✓ Video Analysis
Audio Plot Data
LPCM Audio (.wav)

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

Capture Std Tests
Start Capture
🗊 Data 🐼 Trigger
Condition: Vsync Asserted 🗸
Vsync Asserted
Encryption Enabled
Encryption Disabled
External Trigger Input
Manual Trigger
TMDS Clock Change

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

Capture	Std Tests	s	
		Start Capture	

The M41h 48G Video Analyzer/Generator will capture the data including the video data. A series of dialog boxes will appear showing the capturing in progress (one example shown below).

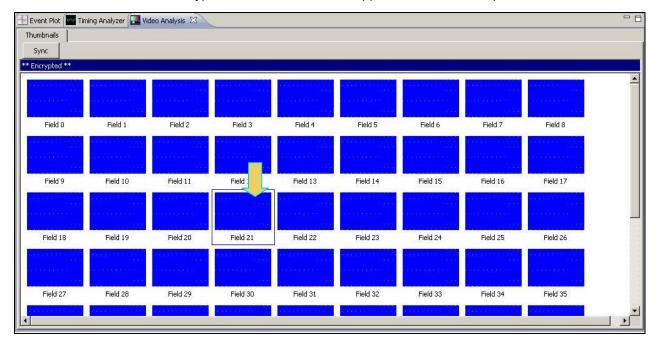
Note: If there is some action that needs to be taken by a user in order to cause the trigger condition occur, the capture dialog box will indicate that. This is shown in the following screen shot.

Ca	apture Progress
(Performing the Capture
Í	
	Waiting for the capture trigger event to occur (TMDS Clock Change)
	Manual Trigger Stop and Save Data Cancel

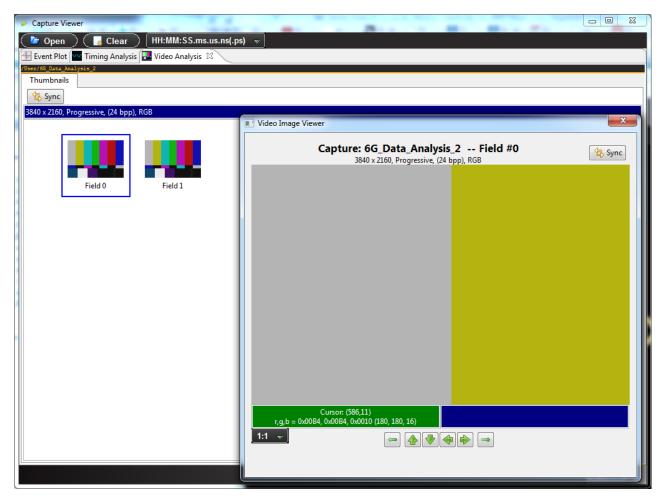
When the M41h 48G Video Analyzer/Generator is done capturing data you can view the video thumbnails in the **Video Analysis** panel. The **Video Analysis** panel enables you to view the captured video images. It provides thumbnails of each captured frame.

Capture Viewer	- • X
🕐 Open 🛛 🕞 Clear 🛛 HH:MM:SS.ms.us.ns(.ps) 👻	
🛨 Event Plot 🔤 Timing Analysis 🔛 Video Analysis 🕱	
/User/66_Data_Analysis_2 Thumbnails	
Sync Sync	
3840 x 2160, Progressive, (24 bpp), RGB	
Field 0 Field 1	
	X Close

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

line 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.

User/6G_Data		lysis 🛛	
Thumbna			
🔄 Sync			
3840 x 2160	, Progressive, (24 bpp), RGB		Video Image Viewer
			Capture: 6G_Data_Analysis_2 Field #0 3840 x 2160, Progressive, (24 bpp), RGB
	Field 0 Field 1	•	
Data Dec	code 🖾		4
Jser/66_Data		🗔 Detai	
Packet	TimeStamp (HH:MM:SS.ms	Frame L	
• 3	6:45:25.548.485.240.002	0	
◎ 4	6:45:25.548.485.240.002	0	
◎ 7	6:45:25.548.485.830.002	0	
≥ 6	6:45:25.548.492.650.002	0	
o 9	6:45:25.548.500.049.999	0	
◎ 10	6:45:25.548.507.459.999	0	
			Cursor: (457,30) Marker: (621,159)
		_	r,g,b = 0x00B4, 0x00B4, 0x00B4 (180, 180, 180) r,g,b = 0x00B4, 0x00B4, 0x0010 (180, 180, 16)

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: <u>Analyzing HDMI Data with your M41h Protocol Analyzer</u> should be followed for the audio analysis tests. These setup procedures are listed below:

- 1. Set the threshold of the +5V.
- 2. Configure the M41h 48G Video Analyzer/Generator Rx port with the proper EDID.

To run the audio analysis test:

1. Select the M41h 48G Video Analyzer/Generator that you are using to capture the data from your HDMI source device under test from the pull-down menu.

Capture Control
Trigger Mode:
💿 First Event 💿 After TP 💿 Immediate
Trigger on first trigger event to occur. % of Buffer Size before TP = 0 to TP % of Buffer Size after TP = 100 - TP

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



 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.

Buffer Size:	1071.92 MB
26.170% <	4
Trigger Position (TP) within the Buffer:	0.00 MB
0.000% <	4

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.

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

Capture	Std Tests	
Execute a pr	edefined set	of capture options.
🕨 AVMu	te Test 🕨	Audio Test

5. 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 M41h Manager. A sample is shown below.

Capture Vie	wer		
🚺 🗁 Open) (🔒 CI	ear HH:MM:SS.ms.us.ns(.ps) 👻	
Data Analys	sis 🛛		
(↓¶			
Frame	Line	Info	
0	2	HDMI Audio Packetization: Sample Packet	
0	9	Audio Info Frame : Sample frequency refer to the stream header	
0	9	Audio Info Frame : Sample Size refer to the stream header	
0	9	Audio Info Frame : Channel Count 2	
0	595	TMDS clock Frequency : 593.995429MHz	
0	611	Audio Clock Reger tion: CTS=563062, N=5824; Sample frequency 47.999673kHz	
0	694	Channel Status Bloger Linear PCM audio	
0	694	Channel Status Block: Sample frequency 48.000000kHz	
0	694	Channel Status Block : Original Sample frequency not indicated	
0	694	Channel Status Block : Channel Count not indicated	
161	617	Actual : Sample frequency 47.982559kHz	
161	617	Actual : ACR packet rate Captured=1.025190kHz, Expected=1.054945kHz	
•		III	•
			💥 Close

Rev. A1

7 Enhanced Audio Return Channel (eARC) Functional Testing

This Section provides information and procedures about testing eARC Tx and eARC Rx devices. This Section does not provide procedures for running eARC compliance tests. Compliance tests are provided in the HDMI Forum MOIs.

7.1 EARC Tx Functional Testing

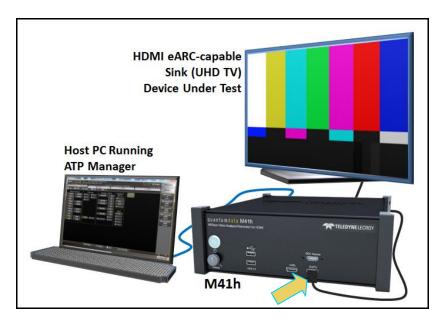
This subsection provides procedures on testing eARC Tx devices. The M41h 48G Video Analyzer/Generator provides eARC Rx emulation and diagnostic testing to run functional verification tests on eARC Tx devices such as eARC capable UHD TVs. You can monitor the Common mode transactions and view the audio metadata status. You can also extract the 2 Channel LPCM or Dolby Digital audio out the SPDIF port on the M41h for audible monitoring.

To view the incoming audio metadata over the eARC channel:

- 1. Establish the physical connection from the eARC Rx DUT to the M41h 48G Video Analyzer/Generator's HDMI Output port.
- 2. Prior to making the physical connection, you can initiate the Aux Channel Analyzer utility to monitor the eARC Common mode transactions. See the subsection further below.

The test setup is shown below. The eARC Tx device is connected via a suitable eARC capable HDMI cable to the M41h 48G's Output port as shown below.

The test setup is depicted below.



Setup for Testing eARC Tx devices

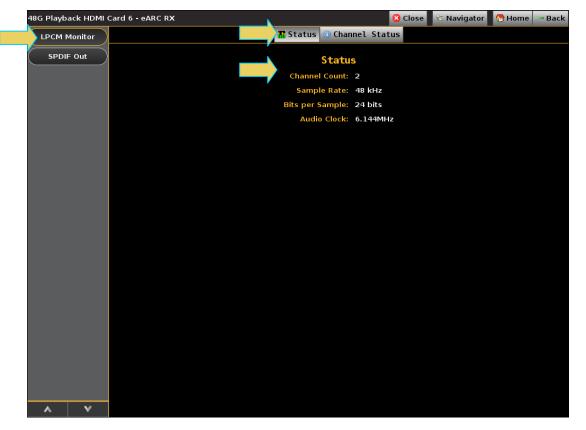
3. Access the eARC Slave (Rx) control panel from the **Card Control** panel as shown below.

Rev. A1

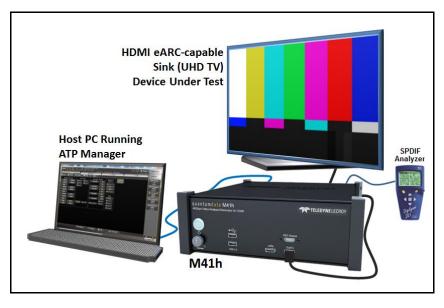
	quantı Card C	ımdata C ontrol		
Generator	9G Protocol Analyzer HDMI RX - Card 1	48G Protocol Analyzer HDMI RX - Card 6	R	Slave X rd 6
Aux. Channel Analyzer	Capture Control	HEAC		>
⊂ Back 🛛 😓 Navigator STATIC: 10.30.196.29	Compliance Tests ATP Version: 5.05	Editors 5.09-Beta 32 bit (3 car	Other ds detected)	٥

The eARC Slave Control dialog box will appear as shown below.

4. Select the LPCM Monitor button and view the Status of incoming audio metadata.



5. To eject the LPCM or Dolby Digital eARC audio out the SPDIF out port on the M41h. You can use a SPDIF analyzer to verify the LPCM audio. Use the setup below.



The SPDIF port is on the back of the M41h and identified in the illustration below.



Then select the SPDIF Out button on the eARC Slave Control panel as shown below.

LPCM Monitor SPDIF Out © On © On	8G Playback HDMI Card 6 - eARC RX	🕄 Close 🧧 😓 Navigator 🖉 Home	B
SPDIF out O on O off Channel Pair Selection O off O 0, 1 0, 2, 3 0, 4, 5 0, 7 0 8, 9 0.11 0.12, 13 0.14, 15 0 16, 17 18, 19 0.20, 21 0.22, 23		SPDIF Output	
• 0 • 1 • 2, 3 • 4, 5 • 6, 7 • 8, 9 • 10, 11 • 12, 13 • 14, 15 • 16, 17 • 18, 19 • 20, 21 • 22, 23	SPDIF Out		
• 0, 1 • 2, 3 • 4, 5 • 6, 7 • 8, 9 • 10, 11 • 12, 13 • 14, 15 • 16, 17 • 18, 19 • 20, 21 • 22, 23			
 ● 8, 9 ● 10, 11 ● 12, 13 ● 14, 15 ● 16, 17 ● 18, 19 ● 20, 21 ● 22, 23 		Channel Pair Selection	
 ● 16, 17 ● 18, 19 ● 20, 21 ● 22, 23 		○ 0, 1 ● 2, 3 ● 4, 5 ● 6, 7	
 ● 16, 17 ● 18, 19 ● 20, 21 ● 22, 23 		● 8, 9 ● 10, 11 ● 12, 13 ● 14, 15	
• 24, 25 • 26, 27 • 28, 29 • 30, 31			
		● 24, 25 ● 26, 27 ● 28, 29 ● 30, 31	

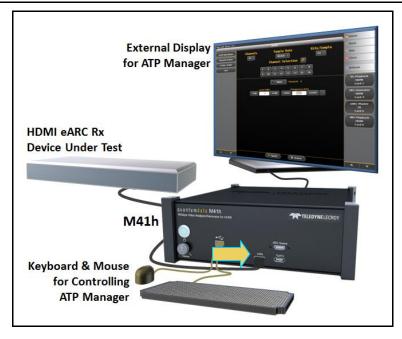
7.2 EARC Rx Functional Testing

This subsection provides procedures on testing eARC Rx devices. The M41h 48G Video Analyzer/Generator emulates an eARC Tx device. The function will invoke the Common mode commands to establish an eARC connection. You can monitor the Common mode channel transactions using the Aux Channel Analyzer (ACA) utility. Procedures for this are provided in the next subsection. You can then select from LPCM or compressed audio formats for transmission over the Differential mode channel. You can select between the Multi-Channel or 2 channel audio layout and mute the audio stream.

Use the procedures below to transmit eARC audio to test an eARC Rx device.

- 1. Establish the physical connection from the eARC Rx DUT to the M41h 48G Video Analyzer/Generator's HDMI Input port.
- 2. Prior to making the physical connection, you can initiate the Aux Channel Analyzer utility to monitor the eARC Common mode transactions. See the subsection below.

The test setup is shown below. The eARC Rx device is connected via a suitable eARC capable HDMI cable to the M41h 48G's Input port as shown below.

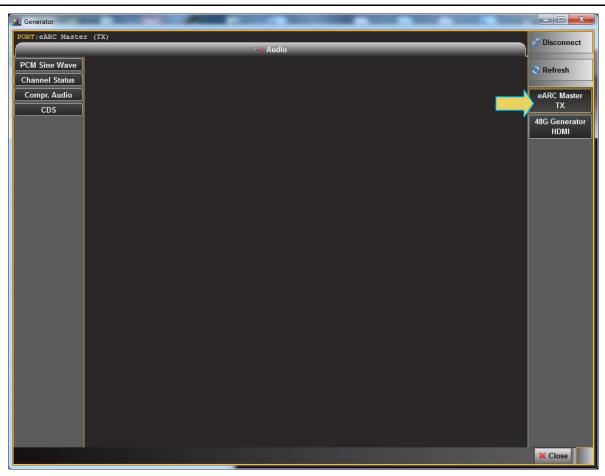


Setup for Testing eARC Rx devices

3. Access the eARC Master (Tx) control panel from the Card Control panel as shown below.



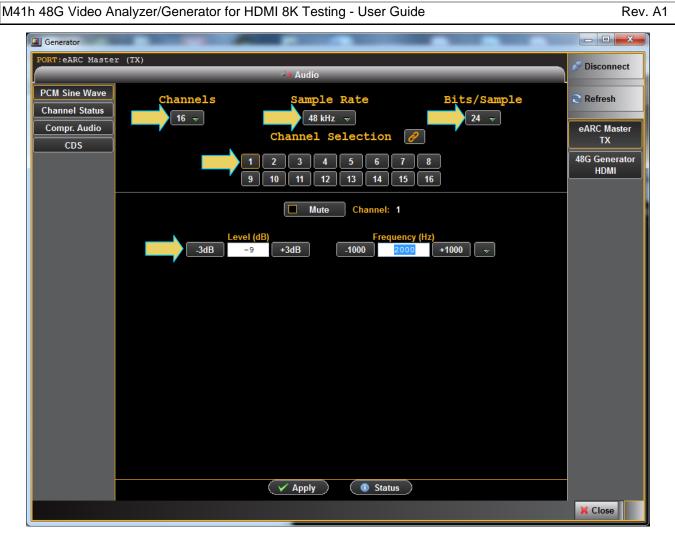
4. Click on the Generator and select eARC Tx Master as shown below.



5. Click on the PCM Sine Wave button to select the LPCM audio to transmit out the eARC Differential mode channel.

You can select the number of channels, sampling rate, bits per sample from the pull-down menus. You can also mute selected channels and set their amplitude. Refer to the screen examples below.

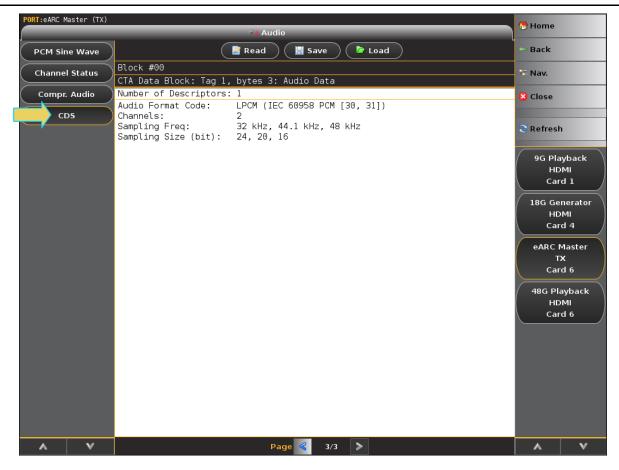




You can also transmit compressed audio files, but Dolby and DTS formats, out the eARC channel.

PORT:eARC Maste	r (TX)		Disconnect
		🐏 Audio	
PCM Sine Wave	File	Description	C Refresh
Channel Status	• 03_FN-L.ac3	DOLBY(AC3), Pink Noise 500-2kHz L channel	
Sompr. Audio	• 04_PN-C.ac3	DOLBY(AC3), Pink Noise 500-2kHz C channel	eARC Master
√	• 05_PN-R.ac3	DOLBY(AC3), Pink Noise 500-2kHz R channel	TX
CDS	 02_cycle.ac3 	DOLBY(AC3), Pink Noise 500-2kHz Cycle channels	
	 08_PNLFE.ac3 	DOLBY(AC3), Pink Noise 500-2kHz LFE channel	48G Generato
	 09_PNall.ac3 	DOLBY(AC3), Pink Noise 500-2kHz All channels	E HDMI
	 07_PN-Ls.ac3 	DOLBY(AC3), Pink Noise 500-2kHz Ls channel	
	06_PN-Rs.ac3	DOLBY(AC3), Pink Noise Rs channel	
	10_PNL.ac3	DOLBY(AC3), Pink Noise 20-20kHz L channel	
	11_PNC.ac3	DOLBY(AC3), Pink Noise 20-20kHz C channel	
	 12_PNR.ac3 	DOLBY(AC3), Pink Noise 20-20kHz R channel	
	16_pulse.ac3	DOLBY(AC3), Pink Noise 20-20kHz pulse ???	
	 15_PNLFE.ac3 	DOLBY(AC3), Pink Noise 20-20kHz LFE	
	14_PNLs.ac3	DOLBY(AC3), Pink Noise 20-20kHz Ls channel	
	 13_PNRs.ac3 	DOLBY(AC3), Pink Noise 20-20kHz Rs channel	
	18_63cyc.ac3	DOLBY(AC3), Sine Wave 63Hz Cycle channels	
	17_63all.ac3	DOLBY(AC3), Sine Wave 63Hz All channels	
	20_125cy.ac3	DOLBY(AC3), Sine Wave 125Hz Cycle channels	
	19_125A1.ac3	DOLBY(AC3), Sine Wave 125Hz All channels	
	22_1Kcyc.ac3	DOLBY (AC3), Sine Wave 1kHz Cycle channels	
	21_1Kall.ac3	DOLBY (AC3), Sine Wave 1kHz All channels	
	24_4Keye.ac3	DOLBY (AC3), Sine Wave 4kHz Cycle channels	
	23_4Kall.ac3	DOLBY (AC3), Sine Wave 4kHz All channels	
	25_IMPL.ac3	DOLBY (AC3), Impulse L channel	
	26_IMPC.ac3	DOLBY (AC3), Impulse C channel	
	• 27_IMPR.ac3	DOLBY (AC3), Impulse R channel	
	• 30IMPLFE.ac3	DOLBY (AC3), Impulse LFE channel	
	• 29_IMPLs.ac3	DOLBY (AC3), Impulse Ls channel	
	• 28_IMPRs.ac3	DOLBY (AC3), Impulse Rs channel	-
	 32 PolL.ac3 	DOLBY (AC3), Polarity L channel	
		🛛 Þ Play 🔰 🔵 Stop 🤇 🎅 Refresh 🌖 🗖 Mode B	

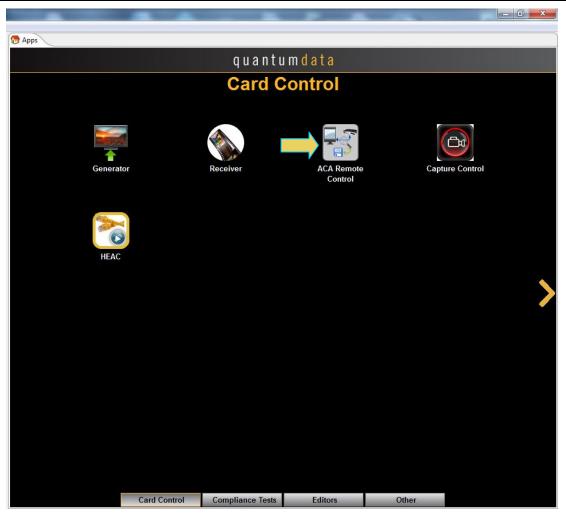
6. View the Capabilities Data Structure (CDS) of the connected eARC Rx device. The CDS shows the audio capabilities of the eARC Rx device.



7.3 Monitoring the EARC Common Mode Transactions

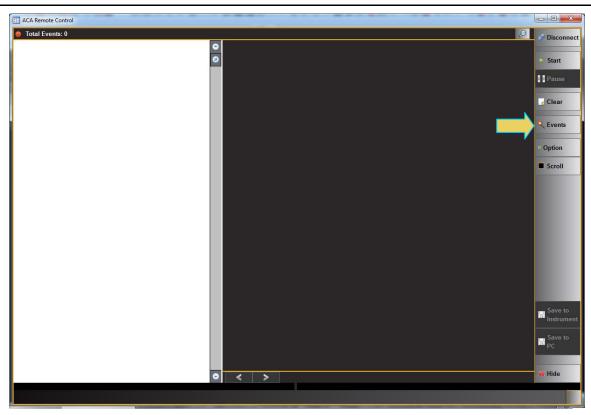
The eARC common mode transactions can monitored using the Aux Channel Analyzer (ACA) utility. The procedures for using the <u>Aux Channel Analyzer</u> are provided in the Section that follows. The screen shows an example of the Common mode transactions viewed in the Aux Channel Analyzer.

1. Access the ACA utility either through the embedded GUI or the remote GUI (shown below).

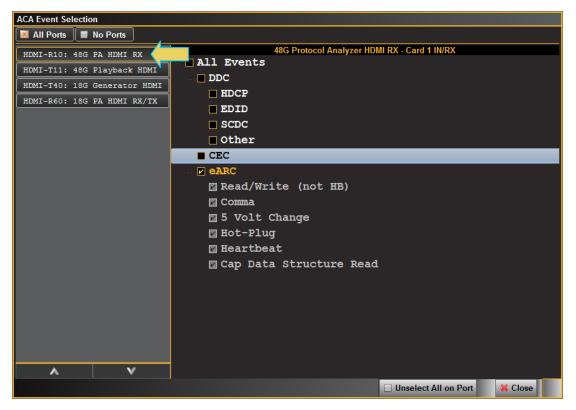


2. Access the Event Selection panel.

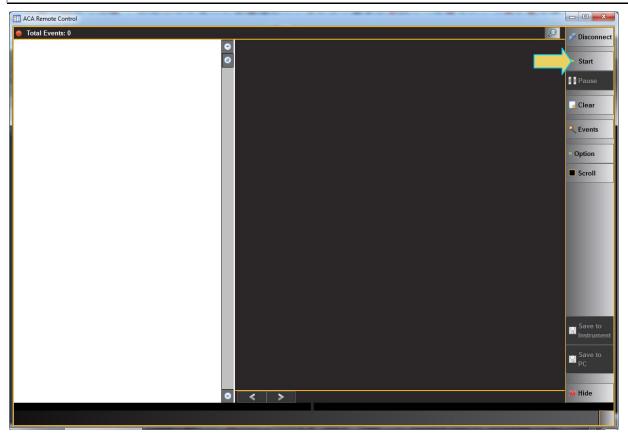
M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide



3. Select the eARC elements from the Event Selection panel.



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You will then see the eARC Common mode transactions in the ACA window.

EARC	5_1_20_01] Eve	+00:04:01.468347	Deed BADG DV CRAM 00				Type: eArc				
EARC	HDMI-T21 HDMT-T21	+00:04:01.468886	Read EARC_RX_STAT 00 Write EARC TX STAT 81	•	St	tart	Time: +00:0	4:02.533822			
				(8)			ation: 507 u				
EARHB	HDMI-T21	+00:04:01.517316	Heartbeats 14		Read EAR	RC R	X STAT 00				
EARHP	HDMI-T21	+00:04:02.229850	HPD Falling Edge		OxDO: EA	ARC	RX STAT				
57	HDMI-T21	+00:04:02.378629	5V Rising Edge		Bit	Na	me		Value	Description	
EARHP	HDMI-T21	+00:04:02.379633	HPD Rising Edge								-
EARC	HDMI-T21	+00:04:02.189856	Write EARC_TX_STAT 81	_	0	EA	RC_HPD		N(O)	Reserved	
EARCM	HDMI-T21	+00:04:02.379633	Comma ON: 8.000 ms		2				0	Reserved	
EARCM	HDMI-T21	+00:04:02.395633	Comma ON: 8.000 ms		3	CA	P CHNG		N(0)		© C
EARCM	HDMI-T21	+00:04:02.411633	Comma ON: 8.000 ms		4	ST.	AT_CHNG		N(0)		
EARCM	HDMI-T21	+00:04:02.427633	Comma ON: 8.000 ms		5				0	Reserved	▽
EARC	HDMI-T21	+00:04:02.438450	Read EARC_RX_STAT 18		6 7				0	Reserved Reserved	
EARC	HDMI-T21	+00:04:02.438993	Write EARC_TX_STAT 99		Packet S	Secon	ence :		0	Reserved	<u>9</u> 7
EARHB	HDMI-T21	+00:04:02.485821	Heartbeats 1								
EARC	HDMI-T21	+00:04:02.533822	Read EARC_RX_STAT 00		001: N	мс	01h Read	+0 us			1 0,
EARC	HDMI-T21	+00:04:02.534360	Write EARC TX_STAT 81				04h Ack	+24 us			
EARHB	HDMI-T21	+00:04:02.581822	Heartbeats 202		003: N			+33 us			
5V	HDMI-T21	+00:04:12.258357	5V Falling Edge		004: 2		04h Ack D0h	+24 us +31 us			
EARHP	HDMI-T21	+00:04:12.259634	HPD Falling Edge				04h Ack	+24 us			
5V	HDMI-T21	+00:04:12.408381	5V Rising Edge				10h Cont	+31 us			2
EARHP	HDMI-T21	+00:04:12.409383	HPD Rising Edge		008: 5			+24 us			
EARCM	HDMI-T21	+00:04:12.409383	Comma ON: 12.000 ms				20h Stop 04h Ack	+31 us +24 us			
EARCM	HDMI-T21	+00:04:12.433383	Comma ON: 12.000 ms		010.		our nex	124 00			
EARCM	HDMI-T21	+00:04:12.457383	Comma ON: 12.000 ms		(M/S = N	Mast	er/Slave, C/	D = Command/Da	ta)		
EARCM	HDMI-T21	+00:04:12.481383	Comma ON: 12.000 ms								
EARCM	HDMI-T21	+00:04:12.505383	Comma ON: 12.000 ms								
EARC	HDMI-T21	+00:04:12.519482	Read EARC_RX_STAT 18								
EARC	HDMI-T21	+00:04:12.520031	Write EARC_TX_STAT 99								
EARHB	HDMI-T21	+00:04:12.564875	Heartbeats 1								
EARC	HDMI-T21	+00:04:12.612878	Read EARC_RX_STAT 00								
EARC	HDMI-T21	+00:04:12.613427	Write EARC TX STAT 81								
EARHB	HDMI-T21	+00:04:12.660876	Heartbeats 248								
EARC	HDMI-T21	+00:04:24.521978	Write EARC TX STAT 81								
				•	<	0	14. D	d EARC RX STAT	00		X

Refer to the <u>ACA Section</u> below for more details on using the ACA utility.

8 Auxiliary Channel Analyzer (ACA) Utilities

The Auxiliary Channel Analyzer **(ACA)** utilities enable you to view the DDC channel traffic for HDMI streams in real time or from stored real time log files. You can view the HDCP authentication transactions, EDID exchanges, SCDC transactions for FRL link training and CEC messages in real time with the ACA either through the embedded M41h GUI or the external ATP Manager application running on a host PC. You can view the transactions between the M41h 48G Video Analyzer/Generator receive port and a connected HDMI source device or you can monitor the auxiliary channel passively between an HDMI source and sink device.

There are three (3) Auxiliary Channel Analyzer utilities:

- Auxiliary Channel Analyzer ("ACA") Used for real time viewing auxiliary channel HDMI DDC channel data through the *embedded* ATP Manager. You can also open existing ACA trace files stored on the M41h Instrument.
- **ACA Remote Control** Used for viewing auxiliary channel HDMI DDC channel data through the *external* ATP 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 these saved ACA traces and disseminate them to colleagues at other locations. These colleagues can then use the ACA Data Viewer utility off-line without a M41h test instrument to view these transactions.

8.1 Aux Channel Analyzer (ACA) – For Real Time Viewing of Auxiliary Channel Data

This subsection describes the **Aux Channel Analyzer** utility used for viewing the real time auxiliary channel data through the *embedded* ATP Manager.

8.1.1 Aux Channel Analyzer (ACA) – 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.



The following is an example of a populated ACA window.

_	DID	60	_aca] Events: 458 +00:20:04.917499	W Segment 00 (48.76 kbps)			Type: SCDC		\square
	DID	60	+00:20:04.917499	R EDID 00 (48.76 kbps)	<u>م</u>	St	art Time: +00:20:18.407879)	
		60	+00:20:04.917827	< 128 bytes (48.81 kbps)	69		Duration: 164 to 328 us		
	DID	60	+00:20:05.043654	W Segment 00 (48.76 kbps)			I2C Rate: 48.81 kbps		
	DID	60	+00:20:05.043834	R EDID 80 (48.76 kbps)		Read, 1	-		
	DID	60	+00:20:05.044473	< 128 bytes (48.81 kbps)		10h: Upd	late_0		
	CDC	60	+00:20:18.385269	R Update 0 (48.81 kbps)		Bit	Name	Value Description	
	CDC	60	+00:20:18.385597	< 21 (48.81 kbps)					
	CDC	60	+00:20:18.385924	W Update 0 21 (48.81 kbps)		0	Status_Update	N (O)	
	CDC	60	+00:20:18.386580	R Update 0 (48.81 kbps)		1	CED_Update	N (0)	
	CDC	60	+00:20:18.386907	< 00 (48.81 kbps)		2	RR_Test Source Test Update	N (0) N (0)	
	CDC	60	+00:20:18.387399	W Update 0 00 (48.81 kbps)		4	FRL_start	Y(1)	 Optic
	CDC	60	+00:20:18.388054	R Sink Version (48.81 kbps)		5	FLT_Update	N (O)	
	CDC	60	+00:20:18.388382	< 01 (48.81 kbps)		6	RSED_Update	N(O) O Reserved	🗢 Data
	CDC	60	+00:20:18.388874	W Source Version 01 (48.81 kbps)		- /		0 Reserved	
	CDC	60	+00:20:18.389365	R Status Flags 0 (48.81 kbps)		* START	*		🖬 Filte
	CDC	60	+00:20:18.389857	< 41 (48.81 kbps)		0000 A9			
	CDC	60	+00:20:18.390184	W Config 1 36 (48.81 kbps)		* STOP *			🗔 Find
	CDC	60	+00:20:18.390840	W Config 0 00 (48.81 kbps)					
	CDC	60	+00:20:18.395755	R Update 0 (48.81 kbps)					
	CDC	60	+00:20:18.396246	< 21 (48.81 kbps)					Clea
s	CDC	60	+00:20:18.396574	R Status Flags 1 (48.81 kbps)					
s	CDC	60	+00:20:18.396902	< 54 (48.81 kbps)					🗁 Оре
s	CDC	60	+00:20:18.397393	R Status Flags 2 (48.81 kbps)					C opo
s	CDC	60	+00:20:18.397721	< 76 (48.81 kbps)					
s	CDC	60	+00:20:18.398212	R Update 0 (48.81 kbps)					🔚 Exp
s	CDC	60	+00:20:18.398540	< 23 (48.81 kbps)					
s	CDC	60	+00:20:18.399031	W Update_0 23 (48.81 kbps)					
s	CDC	60	+00:20:18.401653	R Update_0 (48.81 kbps)					
s	CDC	60	+00:20:18.401981	< 21 (48.81 kbps)					
s	CDC	60	+00:20:18.402472	R Status_Flags_1 (48.81 kbps)					
s	CDC	60	+00:20:18.402800	< 00 (48.81 kbps)					
s	CDC	60	+00:20:18.403291	R Status_Flags_2 (48.81 kbps)					
s	CDC	60	+00:20:18.403619	< 00 (48.81 kbps)					
s	CDC	60	+00:20:18.404110	W Update_0 21 (48.81 kbps)					
s	CDC	60	+00:20:18.404602	R Update_0 (48.81 kbps)					
s	CDC	60	+00:20:18.405093	< 00 (48.81 kbps)					
s	CDC	60	+00:20:18.407551	R Update_0 (48.81 kbps)					
s	CDC	60	+00:20:18.407879	< 10 (48.81 kbps)					
s	CDC	60	+00:20:18.408370	W Update_0 10 (48.81 kbps)	\odot	<	> 39: < 10 (48.81 kb)	nel	🐹 Hide

Real Time – ACA	Information / Function			
Aux Channel Analyzer (ACA) ACA Trace Panel	The following information is provided in the ACA data dialog box for each Event:			
FRL Link Training Transaction Example	 Item number – This is a unique sequence number of the transaction. 			
	 Type – There are various types of data that can be monitored on the HDMI interfaces: EDID, HDCP and CEC messaging. 			
	 M41h Port number, slot number. 			
	 Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the M41h system clock or relative time (Time -deltas) referenced from the initial transaction in the trace. 			
	 Transaction Description – A description of the transaction. 			

Rea	l Time) — ,	ACA		Information / Function				
	A Data View	er	_	the second second second					
📴 [n	eal_edid_	12glt_	_aca] Events: 458						
1	EDID	60	+00:20:04.917499	W Segment 00 (48.76 kbps)					
2	EDID EDID	60 60	+00:20:04.917827 +00:20:04.918318	W Segment 00 (48.76 kbps) R EDID 00 (48.76 kbps) < 128 bytes (48.81 kbps)					
4	EDID	60	+00:20:05.043654	W Segment 00 (48.76 kbps)					
5	EDID	60	+00:20:05.044145	R EDID 80 (48.76 kbps)					
6	EDID	60	+00:20:05.044473	< 128 bytes (48.81 kbps)					
8	SCDC SCDC	60 60	+00:20:18.385269 +00:20:18.385597	R Update_0 (48.81 kbps) < 21 (48.81 kbps)					
9	SCDC	60	+00:20:18.385924	W Update_0 21 (48.81 kbps)					
10	SCDC	60	+00:20:18.386580	R Update_0 (48.81 kbps)					
11 12	SCDC SCDC	60 60	+00:20:18.386907 +00:20:18.387399	< 00 (48.81 kbps) W Update_0 00 (48.81 kbps)					
13	SCDC	60	+00:20:18.388054	R Sink Version (48.81 kbps)					
14	SCDC	60	+00:20:18.388382	< 01 (48.81 kbps)					
15 16	SCDC	60	+00:20:18.388874	W Source Version 01 (48.81 kbps)					
16	SCDC SCDC	60 60	+00:20:18.389365 +00:20:18.389857	R Status_Flags_0 (48.81 kbps) < 41 (48.81 kbps)					
18	SCDC	60	+00:20:18.390184	W Config_1 36 (48.81 kbps)					
19	SCDC	60	+00:20:18.390840	W Config_0 00 (48.81 kbps)					
20 21	SCDC SCDC	60 60	+00:20:18.395755 +00:20:18.396246	R Update_0 (48.81 kbps) < 21 (48.81 kbps)					
22	SCDC	60	+00:20:18.396574	R Status_Flags_1 (48.81 kbps)					
23	SCDC	60	+00:20:18.396902	< 54 (48.81 kbps)					
24 25	SCDC	60 60	+00:20:18.397393	R Status_Flags_2 (48.81 kbps)					
25	SCDC SCDC	60	+00:20:18.397721 +00:20:18.398212	< 76 (48.81 kbps) R Update_0 (48.81 kbps)					
27	SCDC	60	+00:20:18.398540	< 23 (48.81 kbps)					
28	SCDC	60	+00:20:18.399031	W Update_0 23 (48.81 kbps)					
29 30	SCDC SCDC	60 60	+00:20:18.401653 +00:20:18.401981	R Update_0 (48.81 kbps) < 21 (48.81 kbps)					
31	SCDC	60	+00:20:18.402472	R Status_Flags_1 (48.81 kbps)					
32	SCDC	60	+00:20:18.402800	< 00 (48.81 kbps)					
33 34	SCDC SCDC	60 60	+00:20:18.403291 +00:20:18.403619	R Status_Flags_2 (48.81 kbps)					
34	SCDC	60	+00:20:18.403819	< 00 (48.81 kbps) W Update_0 21 (48.81 kbps)					
36	SCDC	60	+00:20:18.404602	R Update_0 (48.81 kbps)					
37	SCDC	60	+00:20:18.405093	< 00 (48.81 kbps)					
38	SCDC SCDC	60 60	+00:20:18.407551 +00:20:18.407879	R Update_0 (48.81 kbps) < 10 (48.81 kbps)					
40	SCDC	60	+00:20:18.408370	W Update_0 10 (48.81 kbps)					
				U C					
	Cont	rol	Menu		There is a menu associated with the ACA Info				
ACA	Com	101	Wenu						
					panel. It is location on the right side of the panel.				
					The ACA pull-down menu provides the following				
					functions:				
					 Home – Navigates you back to the Home menu 				
					screen of the embedded ATP Manager.				
					screen of the embedded ATP Manager.				
					 Back – Navigates back to the previous screen 				
					in the Real Time mode.				
					 Nav – Takes you to the Navigation window. 				
					 Close – Closes out the ACA application. 				
					 Start/Stop – Starts and Stops the collection of 				
					DDC data.				
					 Resume/Pause – Halts the updates of the data 				
					to the ACA panel to view traces and allows you				
					to resume.				
					Events – Opens up the ACA Event Selection				
					window (below left) enabling you to specify the				

Real Time – ACA	Information / Function
Home Back Nav. Close Start Pause Events Option Data Option Data	 and port that you wish to collect trace data from. Also selects which events you wish to collect. Use the check boxes to select which event you wish to collect or collect All Events. Options – Opens up a flyout menu described below-left. Data – Opens up flyout menu with the following options (described below). Clear – Clears the ACA Trace Panel. Open – Opens an existing trace file stored on the M41h. Save – Saves a current trace file to the M41h file system.
CEC/CBUS CEC CBUS CEC CBUS CIDeselect All on Port Close	

Real Time – ACA	Information / Function
Type: HDCP Start Time: 08:49:51.0471 Duration: 164 to 328 us Maximum I2C Rate: 93.98 kbps The master read the following data: Register 0x40 (Bcaps (HDCP B Capability Bits)) = 0x8 REPEATER: 0 RADY: 0 FAST: 0 1.1 FEATURES: 0 FAST_REAUTHENTICATION: 0 * START * 00000 75 80- * STOP *	 The following information is provided in the ACA Event Details dialog box. Two examples are shown on the left. One for HDCP transactions and another for Link Training transactions: Type – There are various types of data that can be monitored on the HDMI interfaces: EDID, HDCP and CEC messages. Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. Note: The information in the Details panel will vary depending on the type of log record that is selected. Duration – The duration in milliseconds of the transaction. Direction – The direction of the transaction either a request or a reply. Maximum I2C Rate – The rate that the I2C 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.
78: Reply 5F7E Save	 There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows: 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. The Options flyout menu items are described below. These options are only available on the Real Time ACA when the trace logging is stopped. Scroll Lock – The left arrow allows you to see the details of the next transaction.
	 Source Legend – Displays a dialog box listing the interface cards on the M41h Instrument and their slot and port numbers, e.g. 32 is Slot 3, Port 2. Show Port Name – Enables you to display or

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

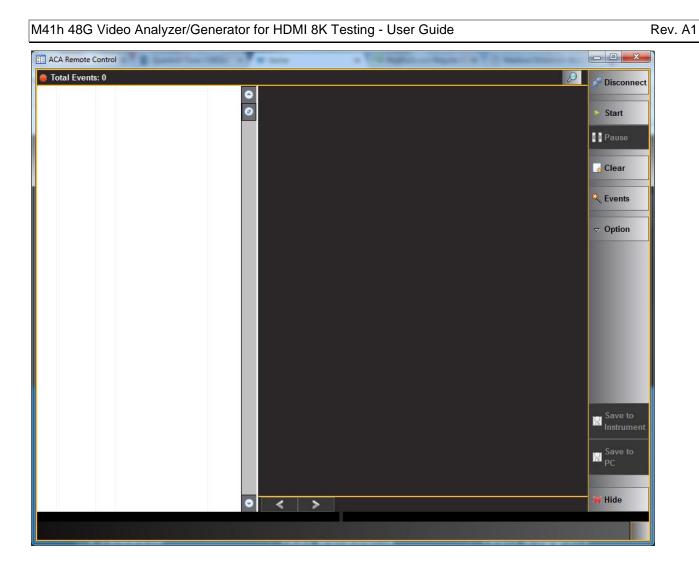
Real Time – ACA	Information / Function
 Scroll Lock Source Legend Show Port Name Show Time-stamp Show Time-deltas Set Zero Time Reset Zero Time 	 not display the Port number. Show Time-stamp – Enables you to show or not show the time stamps for each transaction. Show Time-deltas – Enables you to show the time stamps relative to the previous transaction. Only available when Time-Stamps are shown (see above). Set Zero Time – Enables you to set a log record to zero. Subsequent log records are relative to this new zero time record. Reset to Zero Time – Resets the initial record in the active log in the ACA Trace window to zero.
Data Flyout Menu Sort by time Filter Find	 The Data flyout menu items are described below: Sort by time checkbox – Greyed out. Filter – Opens up a dialog box for filtering the current ACA log based on criteria you select. The Filter function is described in detail in the procedures in the following subsection. The Filter function is only available when the logging is stopped. Find – Opens up a dialog box for searching the current ACA log based on criteria you select. The Find function is described in detail in the procedures in the following subsection. The Find function is described in detail in the procedures in the following subsection. The Find function is described in detail in the procedures in the following subsection. The Find function is only available when the logging is stopped.

8.2 ACA Remote Control – For Real Time Viewing of HDMI Aux Channel Data

This subsection describes the **ACA Remote Control** utility used for viewing the real time HDMI DDC Channel transactions through the *external* ATP Manager.

8.2.1 ACA Remote Control – Panel Description

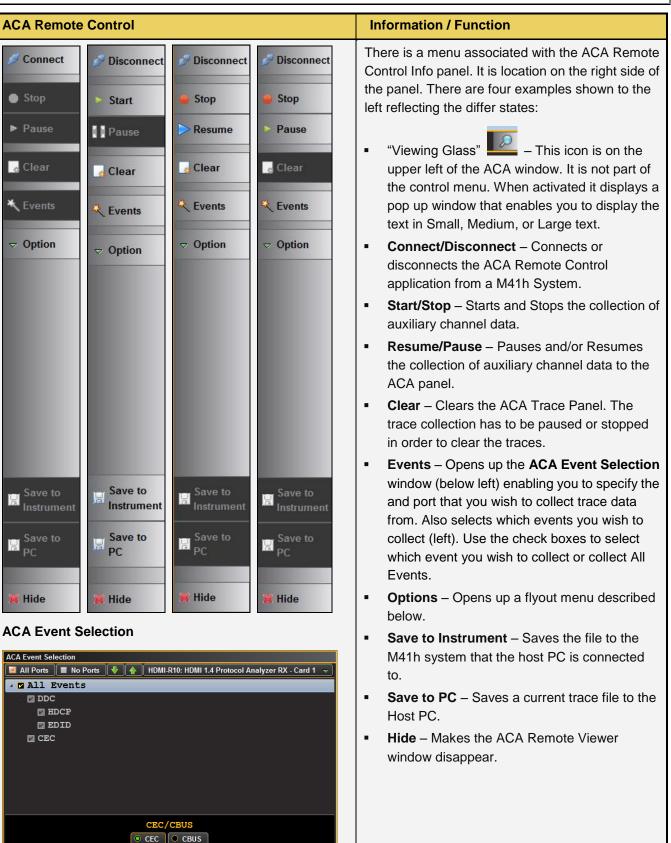
The **ACA Remote Control** panel application is available only on the *external* ATP Manager. It enables you to collect and view the ACA transactions in real time from a remotely connected PC with the ATP Manager application. The control panel elements are described in the table below.



ACA Remote Control	Information / Function
Auxiliary Channel Analyzer	 The following information is provided in the ACA Remote Control Panel data dialog box for each event: Item number – This is a unique sequence number of the transaction. Type – There are various types of data that can be monitored on the HDMI interfaces: EDID, HDCP and CEC messages. M41h Card number, Interface number. Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the M41h system clock or relative time (Time-deltas) referenced from the initial transaction in the trace. Transaction Description – A description of the transaction.
Details Panel Type: SCDC Start Time: +00:20:18.407879 Duration: 164 to 328 us Maximum I2C Rate: 48.81 kbps Read, 1 byte 10h: 10h: Update_0 Bit Name 0 Status_Update 10(0) RR_Test 3 Source_Test_Update 0 RESED_Update 0 Reserved * START * 00000 A9 10-	 The following information is provided in the ACA Event Details dialog box. Two examples are shown on the left. One for HDCP transactions and another for Link Training transactions: Type – There are various types of data that can be monitored on the HDMI interfaces: EDID, HDCP, SCDC and CEC messages. Only SCDC applies to at this time. Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. Note: The information in the Details panel will vary depending on the type of log record that is selected. Duration – The duration in milliseconds of the transaction. Maximum I2C Rate – The rate that the I2C

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

ACA Remote Control	Information / Function
	 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.
52: < 80 (70.22 kbps)	 There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows: 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.



Unselect All on Port X Close

ACA Remote Control	Information / Function
Options Flyout Menu Scroll Lock Source Legend Show Port Name Show Time-stamp Show Time-deltas Show Time-deltas Reset Zero Time	 The Options flyout menu items are described below. These options are only available on the real time ACA when the trace logging is stopped. Scroll Lock – The left arrow allows you to see the details of the next transaction. Source Legend – Displays a dialog box listing the interface cards on the M41h Instrument and their slot and port numbers, e.g. 32 is Slot 3, Port 2. Show Port Name – Enables you to display or not display the Port number. Show Time-stamp – Enables you to show or not show the time stamps for each transaction. Show Time-deltas – Enables you to show the time stamps relative to the previous transaction. Only available when Time-Stamps are shown (see above). Set Zero Time – Enables you to set a log record to zero. Subsequent log records are relative to this new zero time record.
	 Reset to Zero Time – Resets the initial record in the active log in the ACA Trace window to
	zero.

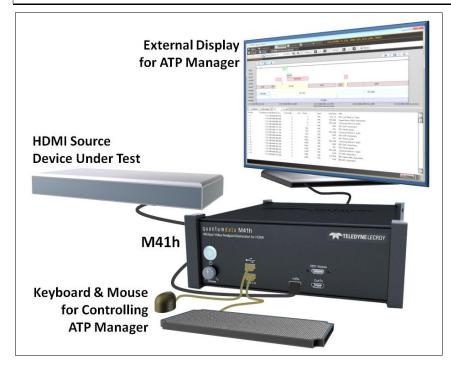
8.3 Monitoring the HDMI auxiliary channel with the ACA utilities

This subsection describes the procedures for monitoring the auxiliary channel data through the ATP Manager using the Aux Channel Analyzer real time utilities. You can monitor the HDMI DDC transactions in real time either while the M41h 48G Video Analyzer/Generator 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 M41h GUI utility.

8.3.1 Making the physical connections.

Use the following procedures to make the physical connection from the UHD source to the M41h 48G Video Analyzer/Generator's Rx port.

1. Connect the output of the UHD HDMI source to the input (Rx) port on the M41h 48G Video Analyzer/Generator as shown in the diagram below:



Connection for HDMI sink emulation and source testing - M41h



Connection for HDMI sink emulation and source testing – M41h

8.3.2 Monitoring the HDMI DDC Transactions in Real Time with the ACA Utilities

Use the following procedures to monitor the HDMI DDC transactions with an HDMI device in real time. The procedures assume that the HDMI device under test is powered up and connected to one of the M41h 48G Video Analyzer/Generator ports. The operation of the ACA is the same when testing a source or a sink.

The operation of the two ACA real time utilities—**Aux Channel Analyzer** on the *embedded* M41h GUI and the **ACA Remote Control** on the *external* ATP Manager-- is similar. The screen examples used in this subsection are from the **ACA Remote Control** utility on the *external* ATP Manager exceptions related to the operation of the ACA on the embedded ATP Manager are noted.

Important Note: You can filter and search through the ACA traces. Procedures for searching and sorting are provided in a separate subsection further below.

To monitor the HDMI DDC transactions:

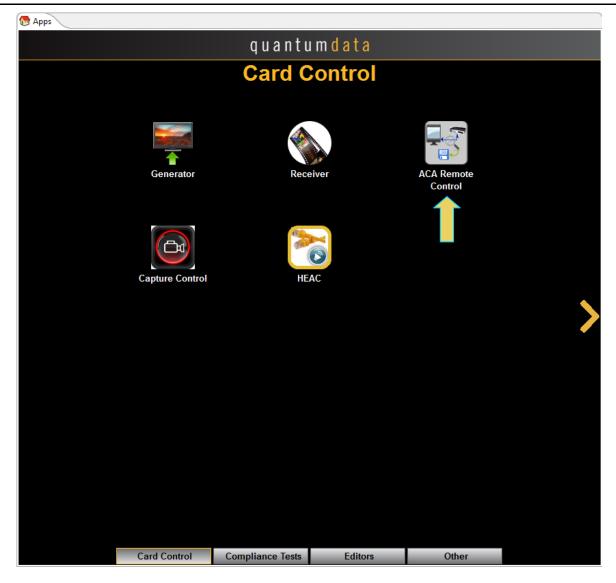
1. For the *embedded* ACA utility, touch select the **Aux Channel Analyzer** on the page 1 (Card Control) of the **Apps** panel:



The Aux Channel Analyzer panel appears as shown below:

▶ [-] Events: 0, Pending: 0		<u> </u>	Home
	•		⊐ Back
	•		⊐ Nav.
			Start
			Pause
			, ause
			Events
			7 Data
			d Clear
			Open
	•	< >	Save

2. For the *embedded* ACA utility, touch select the **Aux Channel Analyzer** on the page 1 (Card Control) of the **Apps** panel:



The ACA Remote Control panel appears as shown below:

ACA Remote Control		
«Not Connected»		D Connect
	o	► Start
		Resume
		d Clear
		🔨 Events
		Savo to
		Save to Instrument
		Save to PC
	• < >	🔀 Hide

For the **ACA Remote Control** panel you will have to connect to a M41h Instrument that you have provisioned in the external ATP Manager application. The **ACA Remote Control** dialog box will appear showing all the M41h systems you have provisioned in the M41h GUI Manger. Typically you will only have one M41h system provisioned in the application, so you will simply select your lone M41h system and click the **OK** button on the dialog box. 3. From the **Events** button on the ACA panel, select the HDMI's port that you are monitoring using the pull-down menu HDMI-R30: HDMI 2.1 RX-PA. Refer to the screen example below.

ACA Event Selection	
🛛 All Ports 🔳 No Ports	
HDMI-R30: HDMI 2.1 RX-PA	HDMI-R30: HDMI 2.1 RX-PA
	All Events
	HDCP
_	EDID
	SCDC
	■ HPD
	🖉 🗖 Edges
	■ SDA Fall
	<pre>All Events All Events All Events All Events All Events All Events All Edges Edges</pre>
	SCL Fall
	SCL Rise
A V	
	Unselect All on Port 🛛 💥 Close

The ACA Event Selection dialog box is shown below.

Specify which events you wish to monitor. You can select **All Events** of any set of individual events.

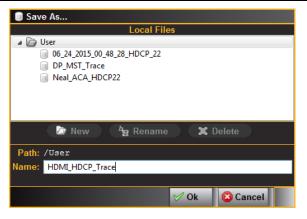
ACA Event Selectio	n	
🛛 All Ports	No Ports	
HDMI-R30: HDMI	2.1 RX-PA	HDMI-R30: HDMI 2.1 RX-PA
		All Events
		HDCP
		CEC
		HPD
		🗸 🗖 Edges
		SDA Fall
		🗖 SDA Rise
		SCL Fall
		SCL Rise
^	v	
		Unselect All on Port K Close

- 4. Take the necessary action—such as a hot plug—to initiate EDID, HDCP or CEC transactions. You will see the Aux Chan transactions in the ACA panel as shown below.
- 5. Touch select the **Start** button on the ACA Menu panel on the right to initiate the viewing of the HDMI (or MHL) DDC 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.

T			aca] Events: 458					
	EDID	60	+00:20:04.917499	W Segment 00 (48.76 kbps)	 	Type: SCDC tart Time: +00:20:18.40787	a	
	EDID	60	+00:20:04.917827	R EDID 00 (48.76 kbps)	8	Duration: 164 to 328 us		
	EDID	60	+00:20:04.918318	< 128 bytes (48.81 kbps)	Maximum	I2C Rate: 48.81 kbps		
	EDID	60	+00:20:05.043654	W Segment 00 (48.76 kbps)	Read, 1	byte		
	EDID	60	+00:20:05.044145	R EDID 80 (48.76 kbps)	10h: Upo	late_0		
	EDID	60	+00:20:05.044473	< 128 bytes (48.81 kbps)				
	SCDC	60	+00:20:18.385269	R Update_0 (48.81 kbps)	Bit	Name	Value Description	_ <
	SCDC	60	+00:20:18.385597	< 21 (48.81 kbps)	0	Status Update	N(O)	
	SCDC	60	+00:20:18.385924	W Update_0 21 (48.81 kbps)	1	CED_Update	N(O)	
	SCDC	60	+00:20:18.386580	R Update_0 (48.81 kbps)	2	RR_Test	N(O)	
	SCDC	60	+00:20:18.386907	< 00 (48.81 kbps)	3	Source_Test_Update FRL start	N(0) Y(1)	
1	SCDC	60	+00:20:18.387399	W Update_0 00 (48.81 kbps)	5	FLT Update	N(0)	
	SCDC	60	+00:20:18.388054	R Sink Version (48.81 kbps)	6	RSED_Update	N(O)	
	SCDC	60	+00:20:18.388382	< 01 (48.81 kbps)	7		0 Reserved	
	SCDC	60	+00:20:18.388874	W Source Version 01 (48.81 kbps)				
	SCDC	60	+00:20:18.389365	R Status_Flags_0 (48.81 kbps)	* START 0000 A			
	SCDC	60	+00:20:18.389857	< 41 (48.81 kbps)	* STOP			
	SCDC	60	+00:20:18.390184	W Config_1 36 (48.81 kbps)				
	SCDC	60	+00:20:18.390840	W Config_0 00 (48.81 kbps)				
	SCDC	60	+00:20:18.395755	R Update_0 (48.81 kbps)				
	SCDC	60	+00:20:18.396246	< 21 (48.81 kbps)				
	SCDC	60	+00:20:18.396574	R Status_Flags_1 (48.81 kbps)				
	SCDC	60	+00:20:18.396902	< 54 (48.81 kbps)				
	SCDC	60	+00:20:18.397393	R Status_Flags_2 (48.81 kbps)				
	SCDC	60	+00:20:18.397721	< 76 (48.81 kbps)				
	SCDC	60	+00:20:18.398212	R Update_0 (48.81 kbps)				
	SCDC	60	+00:20:18.398540	< 23 (48.81 kbps)				
	SCDC	60	+00:20:18.399031	W Update_0 23 (48.81 kbps)				
1	SCDC	60	+00:20:18.401653	R Update_0 (48.81 kbps)				
1	SCDC	60	+00:20:18.401981	< 21 (48.81 kbps)				
1	SCDC	60	+00:20:18.402472	R Status_Flags_1 (48.81 kbps)				
1	SCDC	60	+00:20:18.402800	< 00 (48.81 kbps)				
	SCDC	60	+00:20:18.403291	R Status_Flags_2 (48.81 kbps)				
	SCDC	60	+00:20:18.403619	< 00 (48.81 kbps)				
1	SCDC	60	+00:20:18.404110	W Update_0 21 (48.81 kbps)				
1	SCDC	60	+00:20:18.404602	R Update_0 (48.81 kbps)				
1	SCDC	60	+00:20:18.405093	< 00 (48.81 kbps)				
l	SCDC	60	+00:20:18.407.51	R Update_0 (48.81 kbps)				
Ĩ	SCDC	60	+00:20	< 10 (48.81 kbps)				
I	SCDC	60	+00:20:18.408.70	W Update_0 10 (48.81 kbps)	< <	> 39: < 10 (48.81 kk		

Important Note: You can filter and search through the ACA traces. Procedures for searching and sorting are provided in a separate subsection further below.

6. Click on **Save to Instrument** or **Save to PC** depending on whether you are working with the external ACA Remote Control utility or the embedded Aux Channel Analyzer. A dialog box appears (below). Enter a name and then click on **OK**.



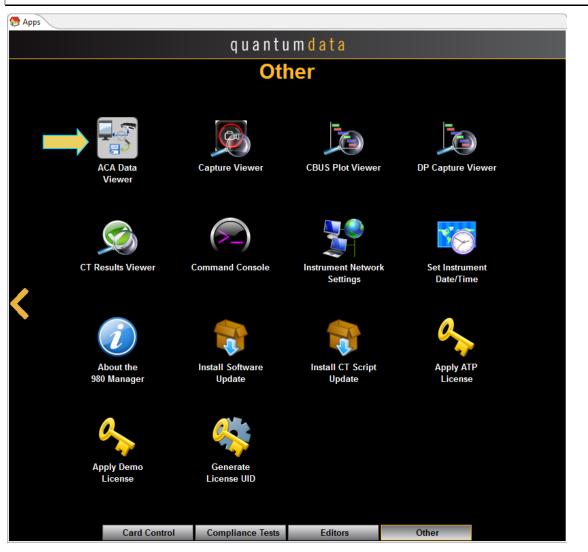
Please note that in order to use the **ACA Data Viewer** utility (next subsection) on your PC to view the traces or the ACA viewer on the M41h embedded display with the powerful searching and filtering features, you must save the file. If you are working on the embedded **Aux Channel Analyzer** viewer but prefer to use **ACA Data Viewer** on the external ATP Manager, you will have to transfer the saved file to your PC using the external ATP Manager.

8.4 ACA Data Viewer – Viewing Stored Aux Channel Data

This subsection describes the **ACA Data Viewer** utility used for viewing HDMI (or MHL) DDC transactions that have been stored on the PC hosting the *external* ATP Manager. You can use the **ACA** utility on the *embedded* display to view ACA trace files stored on the M41h instrument itself. The operation of the two ACA utilities is similar. The screen examples used in this subsection are from the **ACA Data Viewer** utility but the general operation is similar to the embedded version.

8.4.1 ACA Data Viewer – Panel Description

The **ACA Remote Control** panel application is available on the *external* ATP Manager. It enables you to collect and view the ACA transactions in real time from a remotely connected PC with the ATP Manager application. The control panel elements are described in the table below.



Rev. A1

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

lue	eal_edid_	12glt_aca] Eve	ents: 458							J	0
	EDID EDID EDID	HDMI-R60 HDMI-R60 HDMI-R60	+00:20:04.917499 +00:20:04.917827 +00:20:04.918318	W Segment 00 (48.76 kbps) R EDID 00 (48.76 kbps) < 128 bytes (48.81 kbps)	 \$ 		Type: SCDC art Time: +00:20:18. Duration: 328 to 492				
	EDID	HDMI-R60	+00:20:05.043654	W Segment 00 (48.76 kbps)			I2C Rate: 48.81 kbps				
	EDID	HDMI-R60	+00:20:05.044145	R EDID 80 (48.76 kbps)		Read, 1	byte				_
	EDID	HDMI-R60	+00:20:05.044143	< 128 bytes (48.81 kbps)		10h: Upo	late_0				
	SCDC	HDMI-R60	+00:20:18.385269	R Update 0 (48.81 kbps)		Bit	Name		Value	e Description	
	SCDC	HDMI-R60	+00:20:18.385597	< 21 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.385924	W Update 0 21 (48.81 kbps)		0	Status_Update		Y(1)		
	SCDC	HDMI-R60	+00:20:18.386580	R Update 0 (48.81 kbps)		1	CED_Update		N(O)		
	SCDC	HDMI-R60	+00:20:18.386907	< 00 (48.81 kbps)		2	RR_Test Source Test Update		N(O) N(O)		
	SCDC	HDMI-R60	+00:20:18.386907	W Update 0 00 (48.81 kbps)		4	FRL start		N(0)		 Option
	SCDC	HDMI-R60	+00:20:18.387399	R Sink Version (48.81 kbps)		5	FLT Update		Y(1)		
	SCDC	HDMI-R60	+00:20:18.388382	< 01 (48.81 kbps)		6	RSED_Update		N(O)		🗢 Data
	SCDC	HDMI-R60	+00:20:18.388874	W Source Version 01 (48.81 kbps)		7			0	Reserved	
	SCDC	HDMI-R60	+00:20:18.389365	R Status Flags 0 (48.81 kbps)		* START					P Filte
	SCDC	HDMI-R60	+00:20:18.389365	< 41 (48.81 kbps)		0000 A9		1.1			
		HDMI-R60 HDMI-R60	+00:20:18.389857			* STOP *					G Find
	SCDC SCDC	HDMI-R60 HDMI-R60	+00:20:18.390184	W Config_1 36 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.390840	W Config_0 00 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.395755	R Update_0 (48.81 kbps)							
1	SCDC	1		< 21 (48.81 kbps)							🛃 Clea
	SCDC	HDMI-R60 HDMI-R60	+00:20:18.396574	R Status_Flags_1 (48.81 kbps)							
				< 54 (48.81 kbps)							🔯 Oper
	SCDC	HDMI-R60	+00:20:18.397393	R Status_Flags_2 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.397721	< 76 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.398212	R Update_0 (48.81 kbps)							IM CAPC
	SCDC	HDMI-R60	+00:20:18.398540	< 23 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.399031	W Update_0 23 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.401653	R Update_0 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.401981	< 21 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.402472	R Status_Flags_1 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.402800	< 00 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.403291	R Status_Flags_2 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.403619	< 00 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.404110	W Update_0 21 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.404602	R Update_0 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.405093	< 00 (48.81 kbps)							
	SCDC	HDMI-R60	+00:20:18.407551	R Update_0 (48.81 kbps)							
	SCDC SCDC	HDMI-R60 HDMI-R60	+00:20:18.407879 +00:20:18.408370	< 10 (48.81 kbps) W Update 0 10 (48.81 kbps)							

Rev. A1

ACA Data Viewer	Information / Function
ACA Data Viewer Image: Construction of the second seco	 The following information is provided in the ACA Remote Control Panel data dialog box for each event: Item number – This is a unique sequence number of the transaction. Type – The type of; either EDID, HDCP or CEC. M41h Card Type, Interface number. Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the M41h system clock or relative time (Time-deltas) referenced from the initial transaction in the trace. Transaction Description – A description of the transaction.
Details Panel	 The data that is displayed in the Details panel will vary depending on the type of record. following information is provided in the ACA Event Details dialog box: Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. Type – The type of transaction; either EDID, or CEC. Note: The information in the Details panel will vary depending on the type of log record that is selected. Duration – The duration in milliseconds of the transaction. Direction – The direction of the transaction either a request or a reply.

ACA Data Viewer	Information / Function
Type: SOC Daration: 328 to 492 us Maximum I2C Rate: 48.81 kbps Read. Byte 10h: Update_0 0 Status_Opdate Y(1) 1 CED_Opdate N(0) 3 Source_Test_Update N(0) 3 Source_Test_Update N(0) 6 RSED_Opdate Y(1) 1 CED_Opdate N(0) 3 Source_Test_Update N(0) 7 OReserved © Data * START * 0000 A9 21- * STOP * 1 ! * STOP * I !	 Maximum I2C Rate – The rate that the I2C 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.
52: < 80 (70.22 kbps)	 There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows: 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.

ACA Data Viewer	Information / Function
 ✓ Option ✓ Data ☞ Filter ☑ Find ☑ Clear ☑ Open ☑ Export ✗ Hide 	 There is a menu associated with the ACA Remote Control Info panel. It is location on the right side of the panel: "Viewing Glass" — This icon is on the upper left of the ACA window. It is not part of the control menu. When activated it displays a pop up window that enables you to display the text in Small, Medium, or Large text. Options – Opens up a flyout menu. Described below. Data – Opens up a flyout checkbox enabling you to sort the log records by time. Clear – Clears the ACA Trace panel. Open – Enables you to open an ACA trace file stored on your PC. Export – Enables you to export the entire trace file or a range of records in the trace file, to a text file. See dialog box below left.
Options Flyout Menu Source Legend Show Port Name Show Time-stamp Show Time-deltas Set Zero Time Reset Zero Time	 The Options flyout menu items are described below. Source Legend – Window that lists the ports and their definition on each available in the M41h system. Show Port Name – Checkbox enabling you to display or not display the Port number. Time-stamp – Checkbox enabling you to show or not show the timestamps for each transaction. Time-deltas – Checkbox enabling you to show the time stamps relative to the previous transaction. Set Zero Time – Enables you to set a log

ACA Data Viewer	Information / Function
Source Legend 30: HDMI-R30 (HDMI 2.0b RX/TX Protocol Analyzer RX - Card 3 IN/RX) 60: HDMI-R60 (HDMI 2.1 RX/TX Protocol Analyzer RX - Card 6 IN/RX) X Close	 record to zero. Subsequent log records are relative to this new zero time record. Reset Zero Time – Resets the initial record in the active log in the ACA Trace window to zero.
Export as Text Events All Range Max Range: 1 - 397 Start: 1 End: 1	 The Export as Text dialog box elements are described below. All – Radio button to specify that you wish to export the entire ACA trace file to a text file stored on your PC. Range – Checkbox enabling you to display or not display the Port number. Start – Field available only when Range radio button is active to specify the first record of the range of records to include in the export operation. End – Field available only when Range radio button is active to specify the last record of the range of records to include in the export operation. OK – Button to initiate the export. Cancel – Cancel the export operation.

8.5 Viewing Stored HDMI DDC-SCDC 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 with the ACA Data Viewer utility. In order to view the ACA files on your PC with the ATP 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 M41h test instrument. You simply download the ATP Manager from the Quantum Data website on the downloads page.

Transferring ACA trace files from the M41h to a host PC with the ATP Manager:

- 1. Make sure the ATP Manager is installed on your PC. Use the procedures at <u>Downloading and installing the</u> ATP Manager.
- Access a stored ACA data from the Navigator panel and highlight a directory as shown below.

Rev. A1

🔁 Navigator		
🕨 Captures 🔯 Compliance 🔲 ACA	EDID/DPCD 🖳 For	• •
Name	Date / Time	-
🔺 🗁 ACA Data		
⊿ 🗁 User		
▷ □ FRL_81b_NK	2017/05/19 11:21:31	
FRL_81a_NK	2017/05/19 10:14:14	
FRL_12G_LT_EDID_NK	2017/11/30 15:03:18	
FRL_12G_LT_NK	2017/11/29 11:57:29	
FRL_LT_Rate4	2017/11/27 15:23:58	
FRL_LT_Rate3	2017/09/25 13:51:48	
HDMI_HDCP_22_Trace	2017/09/22 08:52:00	
HDMI_HDCP14_Trace_EDID	2017/07/10 19:35:45	
HDMI_21_LT	2017/08/14 12:23:39	=
HDCP_22_Snk_CT_2C_01	2017/07/04 14:56:11	_
▷ □ FRL_LT	2017/11/03 17:08:23	
DP_MST_Trace	2017/05/31 11:48:52	
DP_LT_720p_4L_54LR	2017/05/02 09:42:46	
DP_LT_720p_2L_27LR	2017/11/10 11:46:36	
DP_LT_720p_1L_27LR	2017/03/30 12:10:59	
DP_LT_4Kp_4L_81LR	2017/05/12 16:59:06	
DP_LT_4K_4L_81LR_VS1_PE1	2017/05/24 15:39:41	
DP_LT_4K_4L_81LR	2017/06/30 14:56:33	
DP_LT_4K_4L_54LR	2017/04/03 16:55:05	
DP_LT_13_1080_4L_54LR_1	2017/04/28 16:46:45	
DP_LT_1080p_4L_54LR_VS2_PE	2017/05/12 15:06:12	
DP_LT_1080p_4L_54LR_VS2_PE	2017/05/12 15:08:49	
DP_LT_1080p_4L_54LR_VS1_PE	2017/05/15 17:44:40	
DP_LT_1080p_4L_54LR_VS1_PE	2017/05/15 14:04:34	
DP_LT_1080p_4L_54LR_VS1_PE	2017/05/12 15:13:25	
DP_LT_1080p_4L_54LR_2_HDC	2017/05/02 09:43:42	
DP_LT_1080p_4L_54LR_2	2017/03/30 12:30:29	
DP_LT_1080p_4L_54LR_1	2017/03/30 12:47:04	
DP_LT_1080p_2L_27LR	2017/03/30 12:28:32	
▷ □ Com_ACA_3	2017/03/31 11:37:02	
▷ 🗐 Com_ACA_2	2017/03/31 11:36:40	
	2017/02/21 11 20 00	Υ.

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 M41h that you want to transfer data from. Select the desired M41h and click OK. The **Data Transfer: ACA Data** panel will appear.

Data Transfer: ACA Data			
Select an Ir	nstrument to	exchange data w	/ith.
Select an	Instrument	:	
💷 980JB [1	92.168.254.14	0]	
INKC_98	0 [192.168.25	4.116]	
	4		
🕂 Add	6 Ok	🔇 Cancel	

4. Access the **Data Transfer** panel by double clicking on the Transfer Data icon

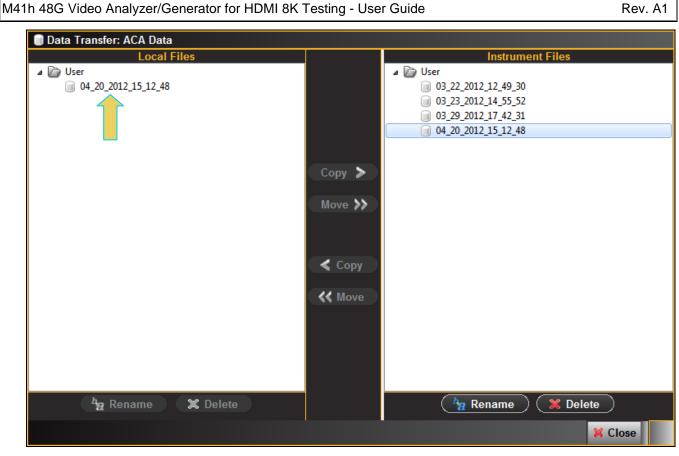


5. The **Data Transfer** panel appears in context with the ACA files on the M41h (Instrument) under the **Instrument Files** available as shown below.

📄 Data Transfer: ACA Data		
Local Files		Instrument Files
🗁 User		🗁 User
		03_22_2012_12_49_30
		03_23_2012_14_55_52
		03_29_2012_17_42_31
		04_20_2012_15_12_48
	Сору 🗲	
	Move >	
	< Сору	
	K Move	
🎝 Rename 🗶 Delete		🏼 🎽 🗶 🕹 🎽 🎽 🎽 🎽
		X Close

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.

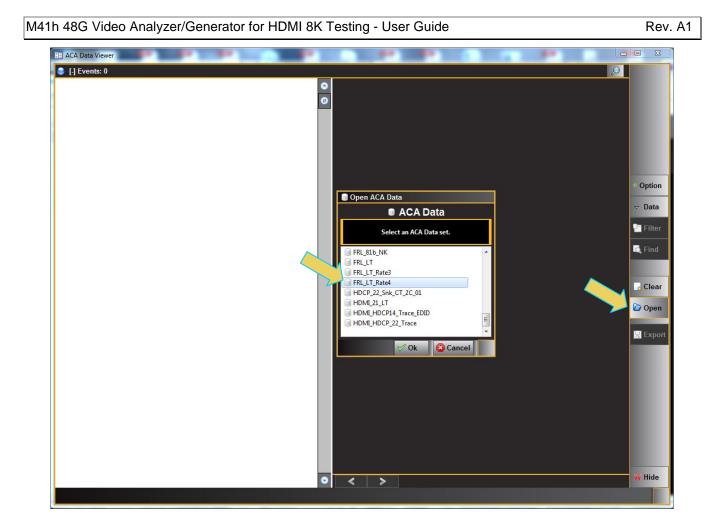
Viewing ACA trace files with the ACA Data Viewer:

1. 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.

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



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

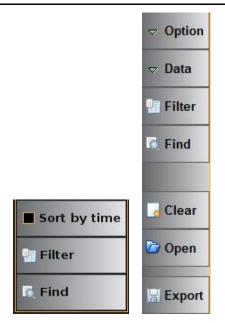
Rev. A1

			Events: 866 (866)		\mathcal{P}
1	SCDC	1	R Update_0 (48.86 kbps)	Type: SCDC Start Time: +00:35:51.354636	
	SCDC	60		 Buration: 492 to 656 us 	
	SCDC	60	W Update_0 00 (48.86 kbps)	Maximum I2C Rate: 48.86 kbps	
	SCDC	60	R Update_0 (48.86 kbps)	Request Read from: 10h Update_0	
	SCDC		< 00 (48.86 kbps)		
	SCDC	60		* START *	
	SCDC	60	R Sink Version (48.86 kbps)	0000 A8 10	
	SCDC	60	< 01 (48.86 kbps)		
	SCDC		W Source Version 01 (48.86 kbps)		
	SCDC	60			• Opti
	SCDC	60			- Opti
	SCDC		R Status_Flags_0 (48.86 kbps)		
	SCDC		< 01 (48.86 kbps)		
	SCDC	60			9a Fil
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		🗔 Fir
	SCDC	60	< 01 (48.86 kbps)		- , FI
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		🛛 🛃 Cle
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		🗁 Op
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		Ex Ex
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60	< 01 (48.86 kbps)		
	SCDC	60	R Status_Flags_0 (48.86 kbps)		
	SCDC	60			
	SCDC	60			
	SCDC	60	< 01 (48.86 kbps)		
	SCDC		R Status Flags 0 (48.86 kbps)	1: R Update 0 (48.86 kbps)	🗙 Hid

8.6 Using the ACA Find Feature

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. The ACA Find feature is not available with the ACA Remote Control utility. It is only available with the ACA feature in the embedded GUI and the ACA Data Viewer. If you wish to use the Find feature on ACA traces that you have captured using the ACA Remote Control utility.

You access the **Find** function through the **Data** flyout menu on the control panel of the embedded **ACA utility** and directly from the **Find** button on the control panel of the **ACA Data Viewer**.



The **Find** dialog box is shown below.

ACA Find				
🗁 Open 🔛 Sa	ave 🔒 Clear	🕂 Add 💥 H	Remove 🛛 👫 Deta	ils
Source		Туре		Label
HDMI-R10				Text contains:
DP-T30	Unknown	Other DDC	HDCP	NOT
DP-T31	EDID	CEC	MHL-DDC	
DP-R32	MHL-MSC	MHL-SC1	MHL-SC3	Regular Expression Syntax
HDMI-R60	Error	DP-Native	DP-I2C	
	DP-EDID	DP-HDCP	DP-LT	Details
	DP-DDC/CI	DP-HPD	DP-PREAMBLE	Text contains:
	SCDC	DP-SB	DP-MST	NOT
	DP-HDCP-MSG	I2C-SDA-FE	I2C-SDA-RE	Ch2_Ln2_Locked
	I2C-SCL-FE	I2C-SCL-RE	HDMI-HPD	Regular Expression Syntax
	EARC	EARC-HB		
			Previous	Vext 🔀 Close

The **Find** function enables you to select data types in the **Type** field and then search based on text string occurrences in the log record labels or the message details.

Note: For the **ACA** utility on the embedded ATP Manager, you have to Stop the collection of real time trace activity using the Start/Stop button on the right side control panel.

The following table describes the **Find** function buttons, fields and functions.

ACA Find Window		
Buttons (Top)	Function	Description

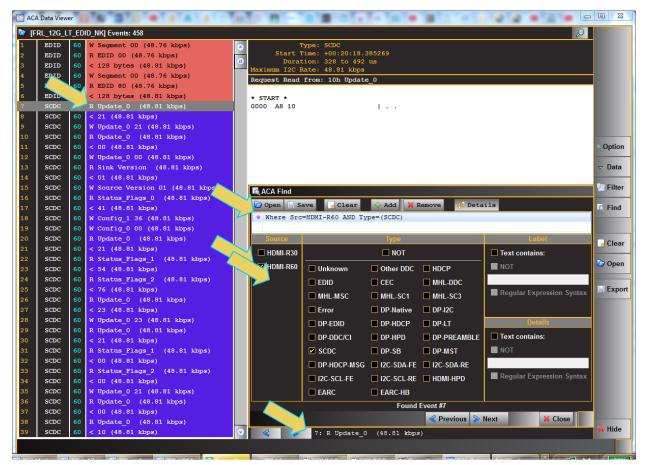
ACA Find Window			
Buttons (Top)	Function	Description	
Open Den Save	Opens a stored user created Find configuration. Saves a user created Find configuration.	You can store commonly used search configurations using the Save function and recall them for quick access using the Open button.	
Clear Clear Add	Clear the existing Find criteria. Sets the currently defined Find criteria defined in either the Source, Type, Label or Details sub-panels and adds another row for a new Find criteria.	You can build up complex Find configurations by concatenating multiple search criteria. When you add multiple configurations they behave as a logical OR function whereby if either of the criteria is True, the search will find an entry. You enter criteria through the embedded touch screen with a pop-up keypad in the ACA real time utility or simply by their on the external ATP Manager interface	
Remove	Removes a highlighted Find criterion of an existing Find configuration.	simply by typing on the external ATP Manager interface. When you are assembling Find configurations you can clear individual configurations by highlighting them in the panel provided and then use the Clear button. You can add through the Add button. You can remove an individual configuration using the Remove button. Example screen shots are shown below.	
Details	Enables or disables the Details panel.		
Buttons (bottom)	Function		
Previous	Enables you to move back to the previous record that meets your search criteria.		
Next > Next	Enables you to advance to the next rec	cord that meets your search criteria.	
Close Konse	Closes the ACA Find window.		
Fields	Function Description		
Source	Checkbox to select the port on a particular that you want to search. Please note that you can collect data in the ACA Trace window from multiple ports.	When you select multiple Source ports they behave as a logical OR function. When you initiate a search, by clicking on the Next or Previous button, the Find function will locate a record matching the criteria. If only the Source (port) is specified the next or previous record from or to that source will be highlighted.	

ACA Find Window			
Buttons (Top)	Function	Description	
Туре	Check boxes enabling you to specify which data types you wish to data types you wish to search through for the string.	When you select multiple data Types they behave as a logical OR function.If only the Type field is specified the next or previous of that data type will be highlighted.	
Label	Combination checkboxes and text fields for specifying criteria for text that appears in the Label field of the message. When you enter a criteria in the Label field, it will automatically be added to the set of criteria in the panel above it.	 Text Contains – A checkbox to activate the Label criteria. Not – A checkbox which when checked will search for records that <i>do not</i> meet the criteria in the field beneath it. Text Field – A text field to enter a string that will be matched (or Not matched). Regular Expression Syntax – A check box to specify whether the text the Text Field will be treated as plain text or a regular expression. Regular expression syntax is a commonly used set of operators for search text. You can find detailed examples on the web including Wikipedia. If Regular Expression checkbox is checked, you can enter in any regular expression into the text field for a string match. 	
Details	Combination checkboxes and text fields for specifying criteria for text that appears in the Label field of the message. When you enter a criteria in the Label field, it will automatically be added to the set of criteria in the panel above it.	 Text Contains – A checkbox to activate the Label criteria. Not – A checkbox which when checked will search for records that <i>do not</i> meet the criteria in the field beneath it. Text Field – A text field to enter a string that will be matched (or Not matched). Regular Expression Syntax – A check box to specify whether the text the Text Field will be treated as plain text or a regular expression. Regular expression syntax is a commonly used set of operators for search text. You can find detailed examples on the web including Wikipedia. If Regular Expression checkbox is checked, you can enter in any regular expression into the text field for a string match. 	
Close	Closes the Find window.		

Searching through the ACA trace files with the Find function:

Here are some screen examples of the **Find** function. Note that the screen examples use the **ACA Data Viewer** utility but the embedded **ACA Data Viewer** works the same way. The only difference is the **ACA** embedded utility uses a pop-up keypad.

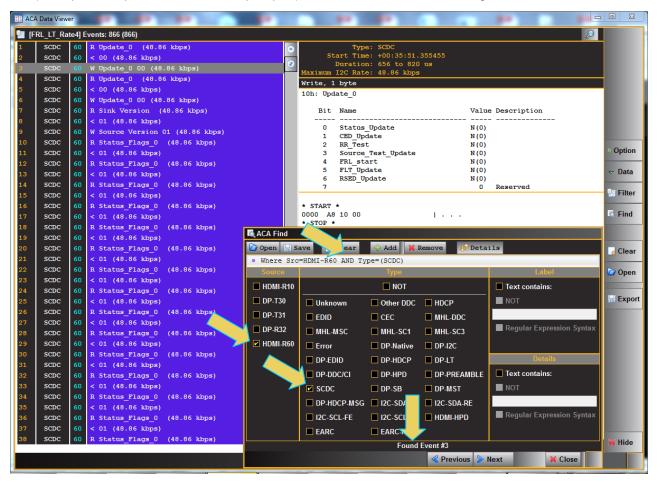
1. To find all data types from a specific port (interface on the), enter the following (example uses port HDMI-T60 transport port 1).



Click on the **Next** button to advance to the recording meeting that criteria. The result is shown below.

		-)_NK] Events: 458	-					\mathcal{P}	-
	EDID EDID		W Segment 00 (48.76 kbps)			Type: SCDC Time: +00:20:18.3	85597			
	EDID		R EDID 00 (48.76 kbps)			tion: 164 to 328				
	EDID	60		Maximum	12C I	Rate: 48.81 kbps				
	EDID	60	Segment 00 (48.76 kbps) EDID 80 (48.76 kbps)	Read, 1	byte					
	EDID	60	128 bytes (48.81 kbps)	10h: Upo	late_()				
	SCDC	2	Update 0 (48.81 kbps)	Dit	Name			alue Description		
	SCDC	60	< 21 (48.81 kbps)	BIC		, 				
	SCDC		< 21 (40.01 kbps) W Update 0 21 (48.81 kbps)	0		tus_Update	Y	(1)		
	SCDC		R Update 0 (48.81 kbps)	1		Update		(0)		
	SCDC		< 00 (48.81 kbps)	2	RR_1	fest rce Test Update		(0) (0)		 Opt
	SCDC		W Update 0 00 (48.81 kbps)	4		start		(0)		opt
	SCDC		R Sink Version (48.81 kbps)	5		Update	Y	(1)		≂ Da
	SCDC		< 01 (48.81 kbps)	6	RSEI	_Update	N	(0) 0 Reserved		
	SCDC		W Source Version 01 (48.81 kbps)					U Reserved		97 Fi
	SCDC		R Status Flags 0 (48.81 kbps)	🔍 ACA F	ind					
	SCDC		< 41 (48.81 kbps)	🕝 Open	🔡 S	ave 🛛 🔒 Clear	🕂 Add 🛛 💥 I	lemove 🌐 🎲 Deta	ils	💿 Fi
:	SCDC		W Config 1 36 (48.81 kbps)	• Wher	e Src	=HDMI-R60 AND Ty	pe=(SCDC)			
	SCDC		W Config 0 00 (48.81 kbps)			-				
	SCDC		R Update 0 (48.81 kbps)	Sour	ce		Туре		Label	
	SCDC	60	< 21 (48.81 kbps)						Dz	🔄 🛃 CI
:	SCDC	60	R Status Flags 1 (48.81 kbps)	HDM	I-R30		NOT		Text contains:	
	SCDC	60	< 54 (48.81 kbps)	🖬 HDM	I-R60	Unknown	Other DDC	HDCP	NOT	0
	SCDC	60	R Status_Flags_2 (48.81 kbps)			EDID	CEC	MHL-DDC		
	SCDC	60	< 76 (48.81 kbps)					—	Regular Expression Syntax	📙 Ex
;	SCDC	60	R Update_0 (48.81 kbps)			MHL-MSC	MHL-SC1	MHL-SC3		
	SCDC	60	< 23 (48.81 kbps)			Error	DP-Native	DP-I2C		
:	SCDC	60	W Update_0 23 (48.81 kbps)			DP-EDID	DP-HDCP	DP-LT	Details	
	SCDC	60	R Update_0 (48.81 kbps)					—	Tout container	
	SCDC	60	< 21 (48.81 kbps)			DP-DDC/CI	DP-HPD	DP-PREAMBLE	Text contains:	
	SCDC	60	R Status_Flags_1 (48.81 kbps)			SCDC	DP-SB	DP-MST	NOT	
:	SCDC		< 00 (48.81 kbps)			DP-HDCP-MSG	I2C-SDA-EE	I2C-SDA-RE		
:	SCDC		R Status_Flags_2 (48.81 kbps)						Regular Expression Syntax	
	SCDC		< 00 (48.81 kbps)			I2C-SCL-FE	I2C-SCL-RE		Regular Expression Sylitax	
5	SCDC	60	W Update_0 21 (48.81 kbps)			EARC	EARC-HB			
5	SCDC		R Update_0 (48.81 kbps)				Found	Event #7		
	SCDC		< 00 (48.81 kbps)					Previous > 1	lext X Close	
:	SCDC		R Update_0 (48.81 kbps)					< Previous >	iext 🕺 Close	
	SCDC	60	< 10 (48.81 kbps)		8	8: < 21 (48.8	1 khns)			📕 💢 Hi

2. To find all data types from a specific port (interface on the) and that are SCDC transactions, enter the following (example uses port HDMI-T60 transport port). This search behaves like a logical AND function.

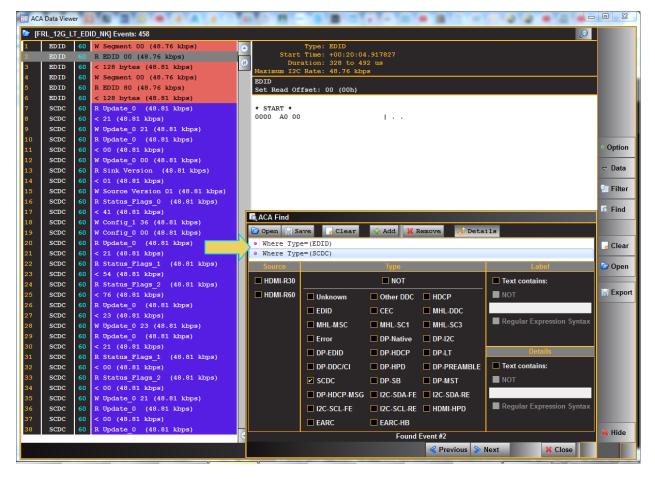


3. Click on the Next button to advance to the log record meeting that criteria. The result is shown below.

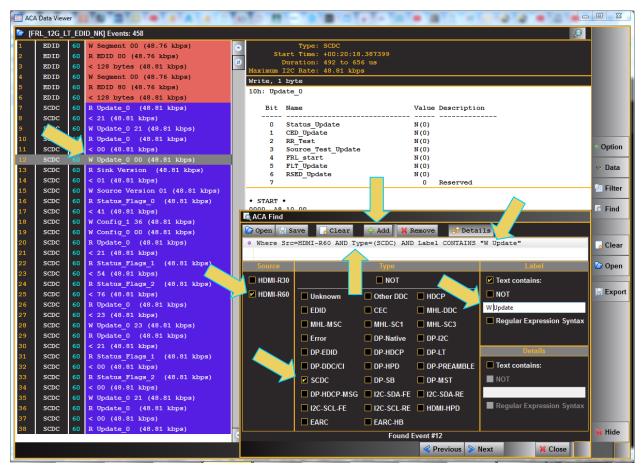
Note that when you select different data type definitions in the same search configuration, example port type and data Type above, the search uses a logical AND function. But if you use two distinct definitions, the search will function as a logical OR function as shown on the screen example below. Note that you will have to click on the **Add** button to add the second of the two OR find criteria.

ILE P	RL_LT_Ra	te4] E	vents: 866 (866)					\mathcal{Q}			
L	SCDC	60	R Update_0 (48.86 kbps)			Type: SCDC					
2	SCDC	60	< 00 (48.86 kbps)	8		art Time: +00:35:51.					
		60	W Update_0 00 (48.86 kbps)	() ()		Duration: 656 to 820 I2C Rate: 48.86 kbps					
l i	SCDC	60	R Update_0 (48.86 kbps)		Write, 1				-		
ō	SCDC	60	< 00 (48.86 kbps)		10h: Upda						
i	SCDC	60	W Update_0 00 (48.86 kbps)		Loni opa						
1	SCDC	60	R Sink Version (48.86 kbps)		Bit	Name	Value	Description			
3	SCDC	60	< 01 (48.86 kbps)			Chatana The data					
•	SCDC	60	W Source Version 01 (48.86 kbps)		0	Status_Update CED Update	N (O) N (O)				
.0	SCDC	60	R Status_Flags_0 (48.86 kbps)		2	RR Test	N(0)				
.1	SCDC	60	< 01 (48.86 kbps)		3	Source_Test_Update	N(O)		 Option 		
.2	SCDC	60	R Status_Flags_0 (48.86 kbps)		4	FRL_start	N(0)				
.3	SCDC	60	< 01 (48.86 kbps)		5	FLT_Update RSED Update	N (O) N (O)				
.4	SCDC	60	R Status_Flags_0 (48.86 kbps)		7		0	Reserved	-		
.5	SCDC	60	< 01 (48.86 kbps)						P Filt		
6	SCDC	60	R Status_Flags_0 (48.86 kbps)		* START						
7	SCDC	60	< 01 (48.86 kbps)	ACA Find	0000 18	10.00			🔍 Fin		
8	SCDC	60	R Status_Flags_0 (48.86 kbps				_	_			
9	SCDC	60	< 01 (48.86 kbps)	/ 🗁 Open 🛛 🔛 S	ave 🛃	Clear 🚽 🕂 Add 🔀	Remove 👘 Deta:	lls			
0	SCDC	60	R Status_Flags_0 (48.86 kbps)	Where Sro	=HDMI-R60)			🚽 Cle		
1	SCDC	60	< 01 (48.86 kbps)	 Where Typ 	<pre>0 Where Type=(SCDC)</pre>						
2	SCDC	60	R Status_Flags_0 (48.86 kbps)	Source	ce Type Label						
3	SCDC	60	< 01 (48.86 kbps)						🗁 Оре		
4	SCDC	60	R Status_Flags_0 (48.86 kbps)	HDMI-R10		NOT		Text contains:			
5	SCDC	60	< 01 (48.86 kbps)	DP-T30	Unkno	own 🔲 Other DDC	HDCP	NOT	🔡 Exp		
6	SCDC	60	R Status_Flags_0 (48.86 kbps)	DP-T31		CEC	MHL-DDC				
7	SCDC	60	< 01 (48.86 kbps)				MHL-DDC	De autos Europeatos Cuntou			
8	SCDC	60	R Status_Flags_0 (48.86 kbps)	DP-R32	MHL-N	MSC MHL-SC1	MHL-SC3	Regular Expression Syntax			
9	SCDC	60	< 01 (48.86 kbps)	HDMI-R60	Error	DP-Native	DP-I2C				
0	SCDC	60	R Status_Flags_0 (48.86 kbps)					Details			
1	SCDC	60	< 01 (48.86 kbps)		DP-ED		DP-LT				
32	SCDC		R Status_Flags_0 (48.86 kbps)		DP-DC	OC/CI 📃 DP-HPD	DP-PREAMBLE	Text contains:			
3	SCDC	60	< 01 (48.86 kbps)		SCDC	DP-SB	DP-MST				
4	SCDC	60	R Status_Flags_0 (48.86 kbps)								
5	SCDC	60	< 01 (48.86 kbps)			OCP-MSG 🔲 I2C-SDA-FE	12C-SDA-RE				
6	SCDC	60	R Status_Flags_0 (48.86 kbps)		🔲 12C-S(CL-FE I2C-SCL-RE	HDMI-HPD	Regular Expression Syntax			
7	SCDC	60	< 01 (48.86 kbps)		EARC	EARC-HB					
8	SCDC	60	R Status_Flags_0 (48.86 kbps)				E 10		🗙 Hid		
						Found	Event #3				

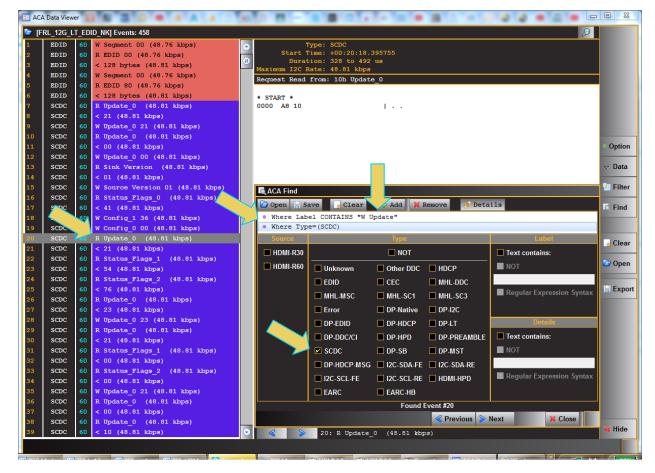
If you specify two different types of data in the **Type** field, the search will be a logical OR function as shown below. Use the **Add** button to add the second item.



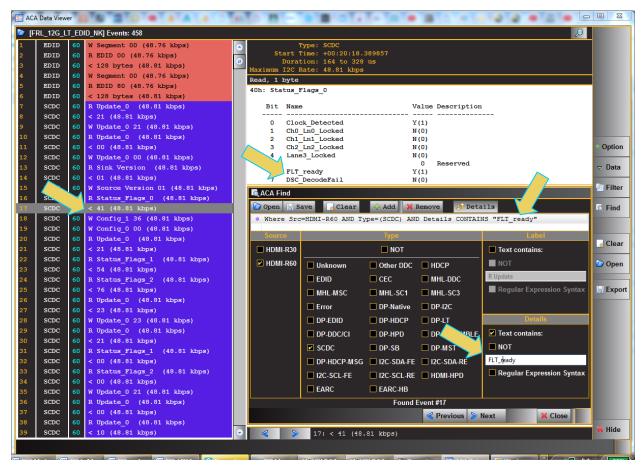
If you specify one or more data types in the **Type** field and enter a string in the **Label** text field in the same search configuration, the search will behave as a logical OR for the data types and a logical AND with the **Type** and the **Label** field as shown below.



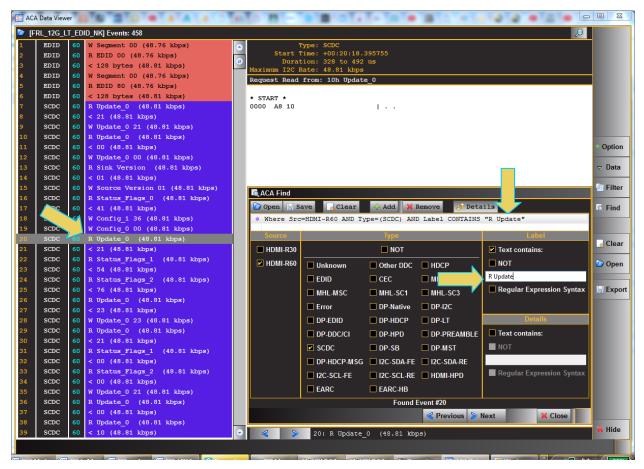
However, if you enter these same criteria using separate configurations as shown below, the search will behave as a logical OR function. In this case it will find the next instance of an SCDC transaction.



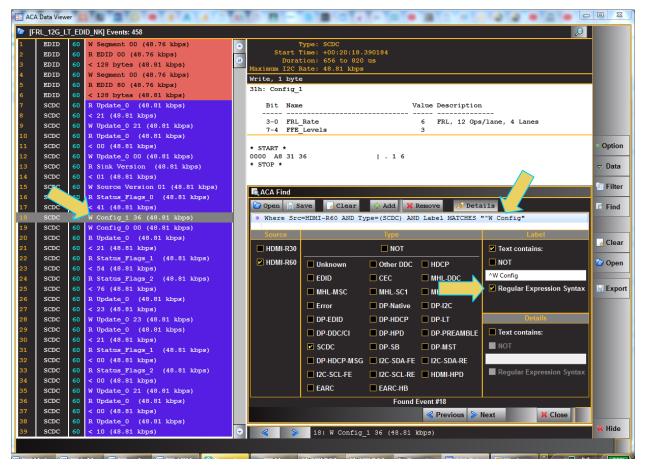
You can also search through the **Details** panel of a record. The following examples depicts this. In this example, we have also restricted the search to SCDC on Port 60 and searching for the text string "FLT_ready" in Details panel.



You can also conduct a string search with a NOT function to exclude message labels or details that contain a specific string. There are not many uses of this type of search but it is supported. The following example shows this type of search.



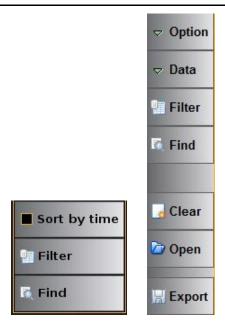
You can use regular expressions as well in either the **Label** field or the **Details** field. The following example shows how you can advance to HDMI SCDC transaction that contains the string "> W Config" at the beginning ([^] operator) of it.



8.7 Using the ACA Filter Feature

The ACA Filter dialog box is accessible through the Data pop-out menu. The ACA Filter function enables you to filter an ACA trace file to view a subset of the log records in a particular file. The ACA Filter feature is not available with the ACA Remote Control utility. It is only available with the ACA feature in the embedded GUI (once you have reloaded a stored ACA trace file) and the ACA Data Viewer. If you wish to use the Filter feature on ACA traces that you have captured using the ACA Remote Control utility you have to save the traces as a file and reload them through the ACA Data Viewer utility.

You access the ACA Filter function through the **Data** flyout menu on the control panel of the embedded **ACA utility** and directly from the **Filter** button on the control panel of the **ACA Data Viewer**.



The ACA Filter dialog box is shown below.

ACA Filter	ACA Filter						
🗁 Open 📙 Sav	7e 🔒 Clear	🕂 Add 🛛 💥 Rei	move				
All Events							
Source		Туре		Label			
HDMI-R30				Text contains:			
HDMI-R60		Other DDC	HDCP	NOT			
	EDID	CEC	MHL-DDC				
	MHL-MSC	MHL-SC1	MHL-SC3	Regular Expression Syntax			
	Error	DP-Native	DP-I2C				
	DP-EDID	DP-HDCP	DP-LT	Details			
	DP-DDC/CI	DP-HPD	DP-PREAMBLE	Text contains:			
	SCDC	DP-SB	DP-MST	NOT			
	DP-HDCP-MSG	I2C-SDA-FE	I2C-SDA-RE				
	I2C-SCL-FE	I2C-SCL-RE	HDMI-HPD	Regular Expression Syntax			
	EARC	EARC-HB					
				V Ok 🙆 Cancel			

The **Filter** function enables you to select data types in the **Type** field and then search based on text string occurrences in the log record labels or the message details.

Note: For the **ACA** utility, you have to Stop the collection of real time trace activity using the Start/Stop button on the right side control panel.

The following table describes the **Filter** function buttons, fields and functions.

ACA Filter Window		
Buttons (Top)	Function	Description
Open	Opens a stored user created Filter configuration.	You can store commonly used filter configurations using the Save function and recall them for quick access using the Open button.
Save	Saves a user created Filter configuration.	
Clear	Clear the existing Filter criteria.	You can build up complex filter configurations by concatenating multiple filter criteria. When you add multiple configurations they behave as a logical OR
Add 🕂 🕂 Add	Sets the currently defined Filter criteria defined in either the Source, Type, Label or Details sub-panels and adds another row for a new filter criteria.	function whereby if either of the criteria is True, the filter function will filter an entry. You enter criteria through the embedded touch screen with a pop-up keypad in the ACA real time utility or simply by typing on the external ATP Manager interface.
Remove	Removes a highlighted filter criterion of an existing filter configuration.	When you are assembling filter configurations you can clear individual configurations by highlighting them in the panel provided and then use the Clear button. You can add through the Add button. You can remove an individual configuration using the Remove button. Example screen shots are shown below.
Buttons (bottom)	Function	
Ok V Ok	Initiate the filter and closes the ACA Fi	lter window.
Cancel	Cancels and closes the filter configurat	ion.
Fields	Function	Description
Source	Checkbox to select the port on a	
	particular that you want to filter. Please note that you can collect data in the ACA Trace window from multiple ports.	 When you select multiple Source ports they behave as a logical OR function. When you initiate a search, by clicking on the Next or Previous button, the Filter function will locate a record matching the criteria. If only the Source (port) is specified the next or previous record from or to that source will be highlighted.
Туре	particular that you want to filter. Please note that you can collect data in the ACA Trace window from	a logical OR function. When you initiate a search, by clicking on the Next or Previous button, the Filter function will locate a record matching the criteria. If only the Source (port) is specified the next or previous record from or to that

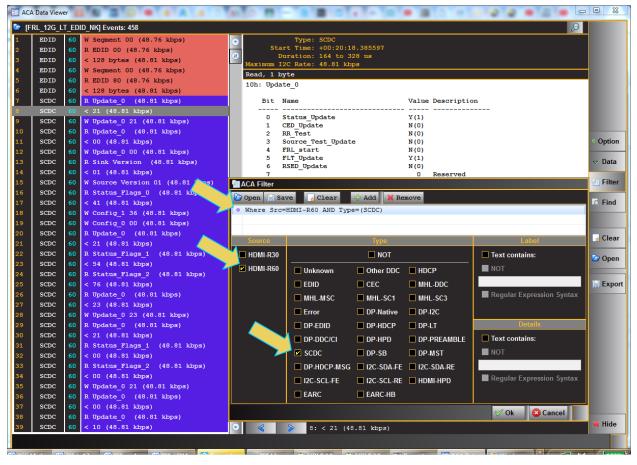
ACA Filter Window		
Buttons (Top)	Function	Description
	fields for specifying criteria for text that appears in the Label field of the message. When you enter a criteria in the Label field, it will automatically be added to the set of criteria in the panel above it.	 criteria. Not – A checkbox which when checked will filter for records that <i>do not</i> meet the criteria in the field beneath it. Text Field – A text field to enter a string that will be matched (or Not matched). Regular Expression Syntax – A check box to specify whether the text the Text Field will be treated as plain text or a regular expression. Regular expression syntax is a commonly used set of operators for filtering the text. You can find detailed examples on the web including Wikipedia. If Regular Expression checkbox is checked, you can enter in any regular expression into the text field for a string match.
Details	Combination checkboxes and text fields for specifying criteria for text that appears in the Label field of the message. When you enter a criteria in the Label field, it will automatically be added to the set of criteria in the panel above it.	 Text Contains – A checkbox to activate the Label criteria. Not – A checkbox which when checked will search for records that <i>do not</i> meet the criteria in the field beneath it. Text Field – A text field to enter a string that will be matched (or Not matched). Regular Expression Syntax – A check box to specify whether the text the Text Field will be treated as plain text or a regular expression. Regular expression syntax is a commonly used set of operators for filtering the text. You can find detailed examples on the web including Wikipedia. If Regular Expression checkbox is checked, you can enter in any regular expression into the text field for a string match.
Close	Closes the Filter window.	

Here are some screen examples of the **Filter** function. Note that the screen examples use the **ACA Data Viewer** utility but the embedded **ACA Data Viewer** works the same way. The only difference is the **ACA** embedded utility uses a pop-up keypad.

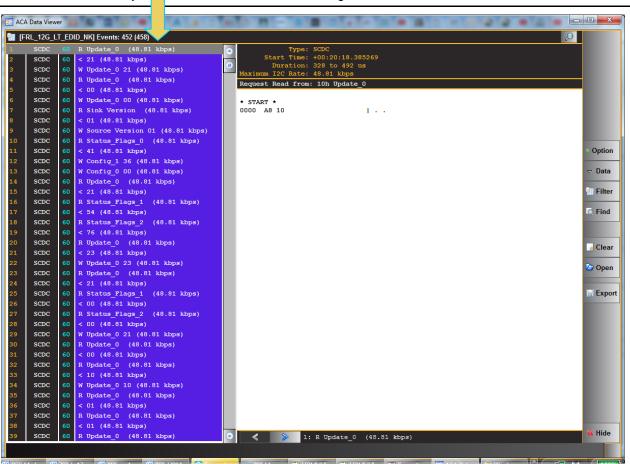
Filtering the ACA trace files with the Filter function:

Here are some screen examples of the **Filter** function. Note that the screen examples use the **ACA Data Viewer** utility but the embedded **ACA Data Viewer** works the same way. The only difference is the **ACA** embedded utility uses a pop-up keypad.

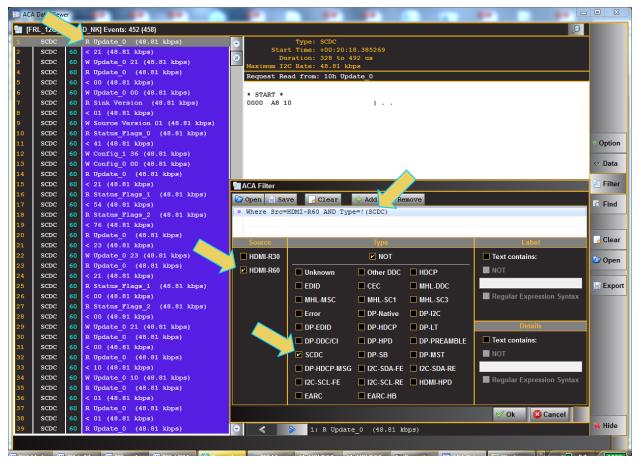
1. To filter all data types from a specific port (interface on the), enter the following (example uses port HDMI-T70 transmit port).



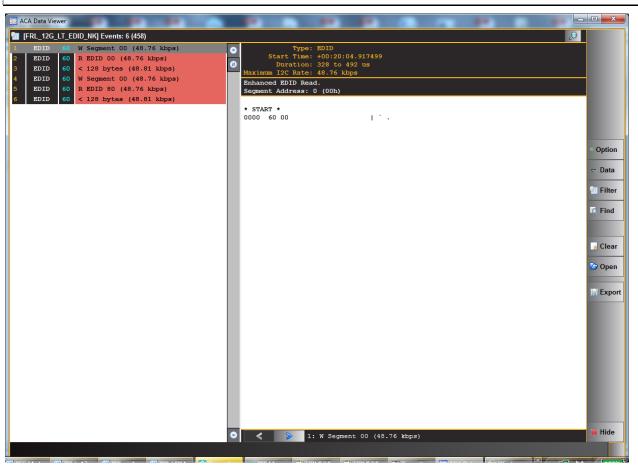
Click on the Ok button to initiate the filter. The result is shown below. Notice the EDID entries go away.



2. To filter out all SCDC messages use the NOT operator as follows.



Click on the **Ok** button to initiate the filter. The result is shown below. The HDMI SCDC message are stripped from the list leaving only the EDID transactions.

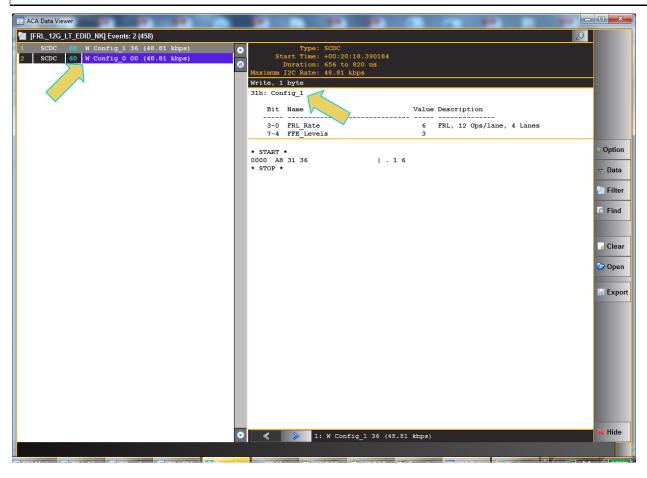


November 21, 2019

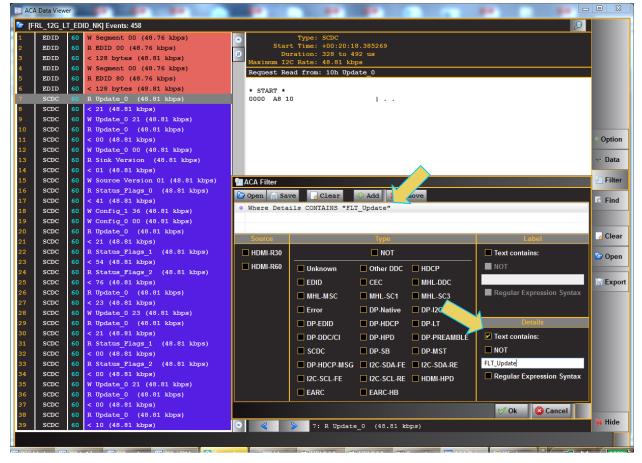
3. To filter using text strings appearing in the message label, use the checkbox(es) on the Label section of the ACA Filter window. You can also include a text string filter with a filter applied to the Type field. For example if you wish to establish a filter based on a source (HDMI-R60) and Type and a text string that includes "W Config" you would use the following.

1-1			ID_NK] Events: 458					P	_
	EDID EDID	60 60	W Segment 00 (48.76 kbps) R EDID 00 (48.76 kbps)	St.	Type: SCDC art Time: +00:20:18	3.385269			
	EDID	60	< 128 bytes (48.81 kbps)		Duration: 328 to 49				
	EDID	60	W Segment 00 (48.76 kbps)		I2C Rate: 48.81 kbp				
	EDID	60	R EDID 80 (48.76 kbps)	Request 1	Read from: 10h Upda	ite_0			
	EDID	60	< 128 bytes (48.81 kbps)	* START					
	SCDC	60		0000 A8		1			
	SCDC	60							
	SCDC	60	W Update_0 21 (48.81 kbps)						
0	SCDC	60	R Update_0 (48.81 kbps)						
1	SCDC	60	< 00 (48.81 kbps)						 Option
2	SCDC	60	W Update_0 00 (48.81 kbps)						
3	SCDC		R Sink Version (48.81 kbps)						⇒ Dat
4	SCDC	60	< 01 (48.81 kbps)						
5	SCDC	60		ACA Filter					P Filt
6	SCDC		R Status_Flags_0 (48.81 kbps)	🗁 Open 🗔 S	ave Clear	🕂 Add 🛛 💥 Re	move		
7	SCDC	60		• Where Sr	=HDMI-R60 AND Type	= (SCDC) AND	Label CONTAINS "W	Config"	🔍 Fin
8 9	SCDC		W Config_1 36 (48.81 kbps)	- mere br		(0000) 1110		Source	
9 0	SCDC SCDC	60 60	W Config_0 00 (48.81 kbps) R Update 0 (48.81 kbps)						
1	SCDC	60		Source		Туре		Label	🚽 🛃 Cle
2	SCDC	60	R Status Flags 1 (48.81 kbps)					✓ Text contains:	
3	SCDC	60	< 54 (48.81 kbps)						🗁 Op
4	SCDC	60	R Status Flags 2 (48.81 kbps)	HDMI-R60	Unknown	Other DDC	HDCP		
5	SCDC	60	< 76 (48.81 kbps)		EDID	CEC	MHL-DDC	W Config	🔡 🔛 Exp
6	SCDC	60	R Update_0 (48.81 kbps)		MHL-MSC	MHL-SC1	MHL-SC3	Regular Expression Syntax	
7	SCDC	60	< 23 (48.81 kbps)						
8	SCDC	60	W Update_0 23 (48.81 kbps)		Error	DP-Native	DP-I2C		
9	SCDC	60	R Update_0 (48.81 kbps)		DP-EDID	DP-HDCP	DP-LT	Details	
0	SCDC		< 21 (48.81 kbps)			DP-HPD	DP-PREAMBLE	Text contains:	
1	SCDC	60	R Status_Flags_1 (48.81 kbps)			DP-SB	DP-MST	 ■ NOT	
2	SCDC	60	< 00 (48.81 kbps)	4					
3	SCDC		R Status_Flags_2 (48.81 kbps)		DP-HDCP-MSG	I2C-SDA-FE	I2C-SDA-RE		
4	SCDC	60	< 00 (48.81 kbps)		I2C-SCL-FE	I2C-SCL-RE	HDMI-HPD	Regular Expression Syntax	
5 6	SCDC	60	W Update_0 21 (48.81 kbps)		EARC	EARC-HB			
6 7	SCDC SCDC	60 60	R Update_0 (48.81 kbps) < 00 (48.81 kbps)		LANC				
8	SCDC	60	< 00 (48.81 kbps) R Update 0 (48.81 kbps)					🤝 Ok 🛛 🙆 Cancel	
9	SCDC	60		\odot	7 D Hadata	0 (48.81 k	hng)		📕 💢 Hid
	0000				/ R Update	(40.01 k)	0057		

The result of the above filter criteria would be the following.



4. To filter using text strings in the message details, use the checkbox on the **Details** section of the **ACA Filter** window. The following example uses filters using a text string in the **Details** field.

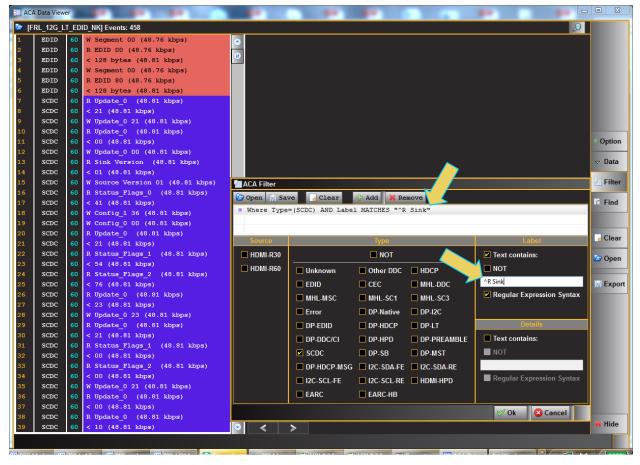


The result of the above filter criteria would be the following.

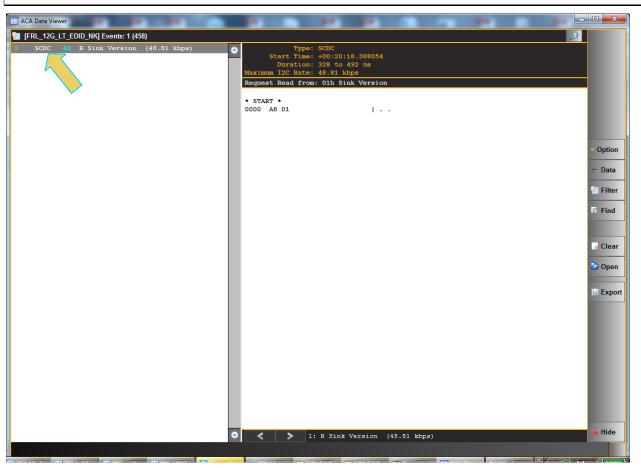
		-	ID_NK] Events: 221 (458)					\mathcal{P}
	SCDC	60	< 21 (48.81 kbps)	۲		Type: SCDC		
2	SCDC	60		(8)		art Time: +00:20:18.385597 Duration: 164 to 328 us		
\$	SCDC	60	< 00 (48.81 kbps)			I2C Rate: 48.81 kbps		
	SCDC	60	W Update_0 00 (48.81 kb		Read, 1			
i	SCDC	60	< 21 (48.81 kbps)		10h: Upd			
5	SCDC	60	< 23 (48.81 kbps)		Ioni ops			
	SCDC	60	W Update_0 23 (48.81 kbps)		Bit	Name	Value Description	
;	SCDC	60	< 21 (48.81 kbps)					
	SCDC	60	W Update_0 21 (48.81 kbps)		0	Status_Update CED Update	Y(1) N(0)	
.0	SCDC	60	< 00 (48.81 kbps)		2	RR Test	N(0)	
1	SCDC	60	< 10 (48.81 kbps)		3	Source_Test_Update	N (D)	 Optio
.2	SCDC	60	W Update_0 10 (48.81 kbps)		4	FRL_start	N(O)	
3	SCDC	60	< 01 (48.81 kbps)		5	FLT_Update	Y(1)	
4	SCDC	60	< 01 (48.81 kbps)		6	RSED_Update	N(0) 0 Reserved	
5	SCDC	60	< 01 (48.81 kbps)		· · ·		0 10001100	📲 Filte
6	SCDC	60			* START	*		
7	SCDC	60	< 01 (48.81 kbps)		0000 AS	21	1	🗔 Find
8	SCDC	60	< 01 (48.81 kbps)		* STOP *	•		
9	SCDC	60	< 01 (48.81 kbps)					
D	SCDC	60	< 01 (48.81 kbps)					
1	SCDC	60	< 01 (48.81 kbps)					Clea
2	SCDC	60						
3	SCDC	60	< 01 (48.81 kbps)					🗁 Оре
4	SCDC	60						
5	SCDC	60	< 01 (48.81 kbps)					Exp
6	SCDC	60	< 01 (48.81 kbps)					
5 7	SCDC	60						
	SCDC	60 60						
3			< 01 (48.81 kbps)					
9)	SCDC	60	< 01 (48.81 kbps)					
	SCDC	60						
	SCDC	60	< 01 (48.81 kbps)					
2	SCDC	60	< 01 (48.81 kbps)					
3	SCDC	60	· · · · ·					
•	SCDC	60	< 01 (48.81 kbps)					
5	SCDC	60	< 01 (48.81 kbps)					
5	SCDC	60	· · · ·					
1	SCDC	60	< 01 (48.81 kbps)					
3	SCDC	60	< 01 (48.81 kbps)					
•	SCDC	60	< 01 (48.81 kbps)	\odot	_ >	> 1: < 21 (48.81 kbps	3)	🐹 Hide

Rev. A1

5. To filter using regular expression text in the message label, text strings in the message details, use the Regular Expression Syntax checkbox on the Label section of the ACA Filter window. Refer to the following example. Note that the (^) operator filters for text strings that begin with the text you enter after it, in this case, "> R Sink"



The result of the above filter criteria would be the following.



6. To save a filter configuration for quick recall, use the **Save** button.

B ACA Data Viewer FRL_12G_LT_EDID_NK] Events: 1 (458) SCDC 60 R Sink Version (48.81 kbps)	•	Type: SCDC	P10.1		مور مور ک	
	Star Du Maximum I2	t Time: +00:20:18 ration: 328 to 49 C Rate: 48.81 kbp ad from: 01h Sink	92 us os			
	* START * 0000 A8 0	1	1.5.5			
						◎ Option マ Data
	ACA Filter	-				🕘 Filter
Save ACA Filter Local Files User	🕝 Open 🔡 Sav		Add 🔀 Remove			🔯 Find
MyFilter						
MyFilter_DP MySearch	Source		Туре		Label	📑 Clear
My_HDMI_HDCP_Filter1	HDMI-R30		NOT		Text contains:	🗁 Open
	HDMI-R60	Unknown	Other DDC HDC	СР		
		EDID	CEC MH	L-DDC	^R Sink	📙 Ехро
		MHL-MSC	MHL-SC1 MH		Regular Expression Syntax	¢
		Error	DP-Native DP-	L		
		DP-EDID	DP-HDCP DP-	F	Details	
		DP-DDC/CI		PREAMBLE	Text contains: NOT	
			 DP-SB DP- I2C-SDA-FE I2C 			
🕼 New 🦄 Rename 🛛 🌋 Delete		I2C-SCL-FE	■ I2C-SDA-FE ■ I2C		Regular Expression Syntax	
Path: /User		EARC	EARC-HB	MI-IIP 0		
Name: MySCDC_Filter_1						
Ø Ok Sancel	○ <	> 1: R Sink V	ersion (48.81 kbp:	3)	V Ok 😢 Cancel	💥 Hide
						h 0

A dialog box appears as shown above. Enter a name and click on **Ok**.

II ACA Data Viewer [FRL_12G_LT_EDID_NK] Events: 1 (458) Type: SCDC Start Time: +00:20:18.388054 Duration: 328 to 492 us m I2C Rate: 48.81 kbps ٢ st Read from: 01h Sink Version * START * 0000 A8 01 $1 \rightarrow \infty$ Option - Data ACA Filter Filter 🕝 Open 📃 Save 🛛 🔒 Clear 🛛 💠 Add 🛛 💥 Remove 💿 Find Where Type=(SCDC) AND Label MATCHES "^R Sink" 🐻 Clear HDMI-R30 Text contains: 🗁 Open HDMI-R60 NOT Unknown Other DDC HDCP AR Sink EDID MHL-DDC CEC 📙 Export 归 Open ACA Filter Regular Expression Syntax MHL-MSC MHL-SC1 MHL-SC3 Local Files 🔺 📄 User DP-Native DP-I2C Error MyFilter DP-HDCP DP-LT DP-EDID MyFilter_DP MySCDC_Filter_1 DP-DDC/CI DP-HPD DP-PREAMBLE Text contains: MySearch SCDC DP-SB DP-MST NOT My_HDMI_HDCP_Filter1 No Pre Filter DP-HDCP-MSG I2C-SDA-FE I2C-SDA-RE Regular Expression Syntax ■ I2C-SCL-FE ■ I2C-SCL-RE ■ HDMI-HPD EARC EARC-HB V Ok 🙆 Cancel 🗸 Ok 🛛 🙆 Cancel K Hide \odot < > 1: R Sink Version (48.81 kbps)

To recall a filter simply click on the open button and an open dialog box appears as shown below.

9 Loading and Importing Capture files

This chapter describes how to use access captured files taken from other M41h 48G Video Analyzer/Generator systems and how to transferred capture files taken through the embedded ATP Manager.

9.1 Loading an existing captures with the M41h 48G Video Analyzer/Generator

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

9.1.1 Loading an existing capture

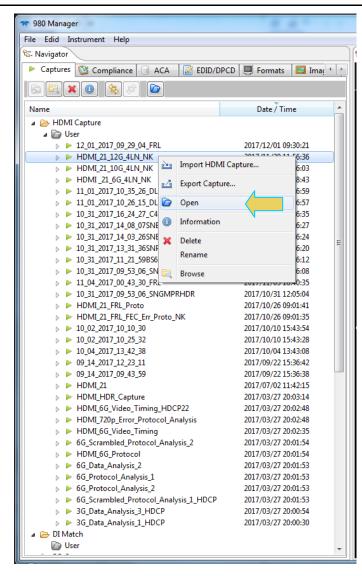
Use the following procedures to load a capture that you have listed in the ATP Manager for the M41h 48G Video Analyzer/Generator. You can load a file in one of three ways:

- 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 ATP Manager in both the **Event Plot** and **Data Decode** panels.

Progress Information	k .
Applying Post Filter Settings	
Loading 10000 records out of 41388	
	Cancel

The captured file appears in the Capture Viewer window as shown below.

HDMI Ca	apture Viewer							
┢ Open	📄 Segment 🛛 🕂 Deco	de 🗐 Imag	ges Timing	📢 Audio	/User/HDN	AI 21 12G 4LN NK		
Events								
	2 🖤 🔍 🛏 Zoom %:			1 🗲 🔹		er 2 🗲 💿 🗩 💿 Rows		
		5.000	Markel		Mark	er 2 🗲 🔹 🔁 🍥 Rows		
):28:37.925.8	819.321.031							
					11111 11111			
TMDS								
VSYNC								
HSYNC								
DDC		SCDC :	SCDC			SCDC SCDC		SCDC SCDC
FRLSBK								
FRLCBK								
FRLPKT								
FRLERR								
FRLFEC								
0:28:37.831.	.489.527.550	0:28:37.8	33.499.163.668			37.835.516.028.692 H:M:S.ms.us.ns.ps)	0:28:37.837.525.664.810	0:28:37.839.542.529.83
🗔 Detai	ils 🗔 Raw Data 🔒 💿	• All			, and (, and a second pop		
Packet	TimeStamp (HH:MM:SS.ms	Frame/Bl	Line Pixel/	Туре	SubType	Info		
• 0	0:28:37.823.602.577.500	0	0	FRL	FRL-LR	FRL Link Rate 1200000000 Hz		
• 1	0:28:37.823.602.577.500	0	0	FRL		Super Block 2040 characters		
• 2	0:28:37.823.602.579.000	0	0	FRL	CHBLK	Character Block 0 Start		
• 3	0:28:37.823.602.579.000	0	0	FRL		502 GAP characters		
• 4	0:28:37.823.602.767.250	0	502	FRL		FEC Parity bytes		
• 5	0:28:37.823.602.770.250	0	510	FRL		Character Block 1 Start		
• 6	0:28:37.823.602.770.250	0	510	FRL		53 GAP characters		
• 7	0:28:37.823.602.790.125	0	563	FRL		361 Video data characters		
• 8	0:28:37.823.602.925.500	0	924	FRL	GAP	88 GAP characters		
• 9	0:28:37.823.602.958.500	0	1012	FRL	FEC	FEC Parity bytes		
DATA:								
	0969							
acab aea	ad b0af b2b1							
٠								•
								X Close
								a close

9.2 Importing Capture Files from other M41h Systems

This subsection provides procedures on loading a previously captured file and also procedures for importing captured files taken from another M41h 48G Video Analyzer/Generator.

The captured data from the M41h 48G Video Analyzer/Generator is portable. You can open up captured files that have been taken by any other M41h 48G Video Analyzer/Generator at any other location. You do not need a M41h 48G Video Analyzer/Generator to examine captured files taken elsewhere; you just need the ATP 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 M41h Protocol Analyzer. In that case, the colleague can simply download the ATP 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 ATP Manager.

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

9.2.1 Importing Capture files

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

To Install the ATP Manager on your PC:

- 1. Download the ATP Manager from the Quantum Data *downloads* page to your PC. The link to the *downloads* page is: <u>http://www.quantumdata.com/downloads</u>.
- 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.

🐻 980 Manager Setup	
Select Installation Folder This is the folder where 980 Manager will be installed.	\mathfrak{S}
To install in this folder, click "Next". To install to a different folder, ent "Browse". Folder:	er it below or click
C:\Program Files\Quantum Data\P5-980 Manager\	Browse
Arlvanced Installer	
< Back Next >	Cancel

- After installation completes, run the new ATP Manager. It should be available in the Start Menu under AII 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 ATP Manager installed.
- 2. Import a previous capture using the Import utility available from the File menu. (See below.)

🖈 ATP Manager		_
File Edid Instrume	ent Help	
^{କ୍ଷ} ୍ଟ୍ର Navigator		- 0
🕨 Captures 🔯 Cor	mpliance 🗐 ACA 🛛 📝 EDID/DPCD 🖳 Formats 🛛 📘 Images	💷 Instruments 📃 Other
S Refresh	Name	Date / Time
🗟 New Folder	▲ → HDMI Capture ▲ → User	
Rrowse	My8K_Capture	2019/10/31 11:41:26
X Delete	HDMI_20_4K	2018/06/14 14:52:36
	AA_HDMI_21_RC	2019/03/25 14:59:25
Information	AA_HDMI_21_8K_FRL	2019/02/28 17:51:03
ba Rename	AA_HDMI_20_6G_TMDS_Video_Timing_HDCP22	2018/04/07 13:27:02
	AA_DA1	2019/08/27 11:45:43
🔄 Transfer	AAA_Test	2019/10/29 09:44:10
↓↑ Organize	▷ ▶ 8K_RC2	2019/03/22 14:59:21
↓ Organize	▷ ▶ 8K_199_420_10b_3	2019/06/19 14:00:52
🔄 Open	b 8K_10G_10bit_Ex_1	2019/06/20 10:16:38
	DP Capture	
🛃 Export 🔒	> 🗁 DI Match	
🔁 Import		

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).

Import Data	
% Import Data	
Select a file type.	
▶ Capture	*
🗐 ACA Data	
EDID EDID	
Format	
🔄 Image	
🔲 Format List	=
🔲 Image List	
Playback List	
WHDMI EDID CT CDF	
HDMI EDID CT Results	
HDMI Source CT CDF	
HDMI Source CT Results	
HDMI Sink CT CDF	
MHL Source CT CDF	
MHL Source CT Results	
MHL Sink CT CDF	-
Cancel 🖉 Ok	

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

Name	Date modified	Туре	Size
퉬 4К2К	3/26/2012 5:03 PM	File folder	
길 480р_HDCP	3/26/2012 5:03 PM	File folder	
\mu 720p	3/26/2012 5:03 PM	File folder	
720p_DI_SizeError	3/26/2012 5:03 PM	File folder	
퉬 720p_HDCP_KO	3/26/2012 5:03 PM	File folder	
퉬 720p_noAIF	3/26/2012 5:04 PM	File folder	
闄 1080р	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	
4 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:

Progress Information	
Importing Data	
)
Copying File to Capture Area	
	Cancel

The imported file will then appear in the Data directory of the M41h 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:

🔺 🗁 Capture			
🔺 应 User			
Þ 🕨	720p_10per_36Frames	2012/04/10 12:00:53	
▶ ▶	720_20per_78Frames	2012/04/10 13:13:26	
> >	4K2K	2012/05/03 13:12:03	
Þ 🕨	480p_5per_54frames	2012/04/10 11:54:24	
Þ 🕨	480p_10per_110frames	2012/04/10 11:58:23	
Þ 🕨	2012_01_30_08_33_37	2012/03/29 09:19:13	
Þ 🕨	2012_01_30_08_33_00	2012/03/29 09:12:20	
Þ 🕨	2012_01_30_08_29_25	2012/03/29 09:12:18	
Þ 🕨	2011_12_27_11_27_23	2012/03/29 09:12:12	
Þ 🕨	2011_02_18_14_33_53	2012/03/29 09:12:08	
Þ 🕨	1080p_5per_6Frames	2012/04/10 14:07:43	
Þ 🕨	1080p_30per_58Frames	2012/04/10 13:39:24	
Þ 🕨	1080p_15per_26Frames	2012/04/10 13:16:18	
Þ 🕨	04_10_2012_10_56_00	2012/04/10 10:56:49	
Þ 🕨	04_09_2012_15_31_31	2012/04/09 15:32:57	
Þ 🕨	04_09_2012_14_41_01	2012/04/09 14:43:13	
Þ 🕨	04_09_2012_14_35_51	2012/04/09 14:38:37	
Þ 🕨	04_09_2012_14_33_15	2012/04/09 14:37:12	
Þ 🕨	04_09_2012_14_32_40	2012/04/09 14:32:49	
Þ 🕨	04_09_2012_14_32_08	2012/04/09 14:32:27	
Þ 🕨	03_27_2012_16_39_13	2012/03/27 16:40:30	

Relocating capture files to the ATP Manager directory

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

GUI_Mgr_3_1_6	• 980mgr •		Search 980mgr			ρ
Organize 🔻 🖻 Open Sh	are with 🔻 Burn New folder		-	≡ ▼ [1 (?)
🚖 Favorites	A Name	Date modified	Туре	Size		
🧮 Desktop	Configuration	8/18/2011 8:08 AM	File folder			
属 Downloads	\mu jre	8/17/2011 8:15 AM	File folder			
🔠 Recent Places	🖟 plugins	8/17/2011 8:15 AM	File folder			
	📔 workspace	8/18/2011 8:07 AM	File folder			
ز Libraries	.eclipseproduct	8/16/2011 3:44 PM	ECLIPSEPRODUCT	1	l KB	
	C 980mgr.exe	8/16/2011 3:44 PM	Application	52	2 KB	
🖳 Computer	980mgr.ini	8/16/2011 3:44 PM	Configuration sett	1	L KB	

- 2. Launch the ATP Manager.
- 3. Locate the ATP Manager captures directory using the Open Selected Folder icon indicated below.

🕾 Navigator			
Captures	🔯 Compliance 🗊 ACA 🛛 📝 EDID/E	OPCD 🗐 Formats 📘 Ima <u>c</u> 🖈	
Name		Date / Time	
a 🗁 HDMI	Capture		
🔺 🖉 Us	er		
Þ 🕨	12_01_2017_09_29_04_FRL	2017/12/01 09:30:21	
▶ ▶	HDMI_21_12G_4LN_NK	2017/11/29 11:56:36	
D 🕨	HDMI_21_10G_4LN_NK	2017/11/29 11:56:03	
D 🕨	HDMI_21_6G_4LN_NK	2017/11/29 09:28:43	
D D D	11_01_2017_10_35_26_DLB	2017/11/07 09:36:59	
D D D	11_01_2017_10_26_15_DLB	2017/11/07 09:36:57	
D D D	10_31_2017_16_24_27_C4	2017/11/07 09:36:35	
D 🕨	10_31_2017_14_08_07SNBR2	2017/11/07 09:36:27	
D D D	10_31_2017_14_03_26SNBR1	2017/11/07 09:36:24	
⊳ ►	10_31_2017_13_31_36SNPSPRV	2017/11/07 09:36:20	
D D D	10_31_2017_11_21_59BS65	2017/11/07 09:36:12	
D 🕨	10_31_2017_09_53_06_SNGMPRHDR_1	2017/11/07 09:36:08	
⊳ ►	11_04_2017_00_43_30_FRL	2017/11/03 16:40:35	
⊳ ►	10_31_2017_09_53_06_SNGMPRHDR	2017/10/31 12:05:04	
D D D	HDMI_21_FRL_Proto	2017/10/26 09:01:41	
D D	HDMI_21_FRL_FEC_Err_Proto_NK	2017/10/26 09:01:35	
▶ ►	10_02_2017_10_10_30	2017/10/10 15:43:54	
⊳ ►	10_02_2017_10_25_32	2017/10/10 15:43:28	
⊳ ►	10_04_2017_13_42_38	2017/10/04 13:43:08	
⊳ ►	09_14_2017_12_23_11	2017/09/22 15:36:42	
	09 14 2017 09 43 59	2017/09/22 15:36:38	

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 ATP Manager **captures** directory using standard Windows methods. The screen example below shows the resulting files stored in the **captures** directory.

🔾 🗢 📕 « 980_Capture_Files	captures > -	Search captures	
	ude in library 🔻 Share v	with 🔻 Burn »	:= • 🔟 🔞
Name	Date modified	Туре	Size
퉬 4K2K	6/3/2013 1:48 PM	File folder	
05_29_2013_10_39_45	5/29/2013 10:42 AM	File folder	
퉬 06_04_2013_4K	6/4/2013 2:41 PM	File folder	
퉬 06_04_2013_720p	6/4/2013 2:33 PM	File folder	
06_04_2013_720p_HDCP	6/4/2013 2:35 PM	File folder	
06_04_2013_Protocol	6/4/2013 9:54 AM	File folder	
퉬 06_04_2013_Video	6/4/2013 2:20 PM	File folder	
06_20_2013_12_52_44_3D	6/20/2013 12:53 PM	File folder	
06_20_2013_13_31_22_3D_720	6/20/2013 1:31 PM	File folder	
06_20_2013_13_33_44_3D_720	6/20/2013 1:34 PM	File folder	
480p_HDCP	6/3/2013 1:49 PM	File folder	
퉬 720p	6/3/2013 1:48 PM	File folder	
2011_02_18_14_33_53	6/3/2013 1:48 PM	File folder	
2012_01_09_16_29_26	6/3/2013 1:48 PM	File folder	
2012_01_30_08_29_25	6/3/2013 5:08 PM	File folder	
퉬 wd-test-2_Capture	6/3/2013 1:49 PM	File folder	

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

10 Transferring Capture Files from the M41h 48G Video Analyzer/Generator to a PC

The M41h 48G Video Analyzer/Generator 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 M41h 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 M41h 48G Video Analyzer/Generator to your host PC in three ways: 1) Data Transfer GUI utility, 2) USB drive, 3) command line FTP.

10.1 Transferring Capture Files using the Data Transfer Utility

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

To transfer ACA files from the M41h to your PC using the Data Transfer utility:

1. Through the external ATP 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.

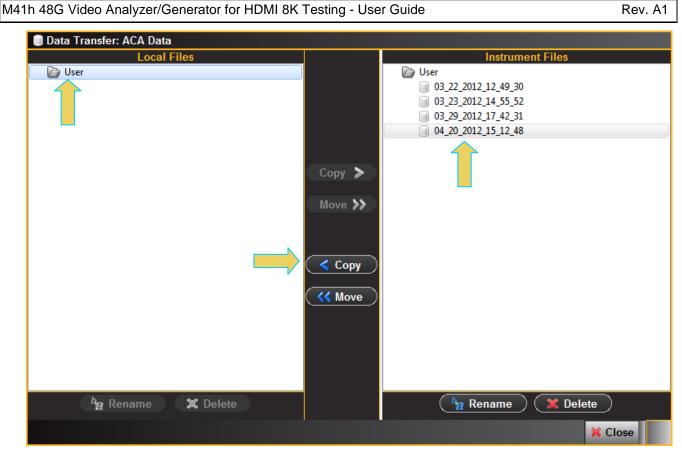
2. Access the **Data Transfer** utility by double clicking on the Transfer Data icon ion one of the data sets in the Navigator window.

🖫 Navigator			
🕨 Captures 🔯 Compliance 🗊 ACA 📝 EDID/I	DPCD 📕 Formats 🛛 🔄 Imag 🔹 🛌		
Name	Date / Time		
🔺 🗁 HDMI Capture			
🔺 🗁 User			
12_01_2017_09_29_04_FRL	2017/12/01 09:30:21		
HDMI_21_12G_4LN_NK	2017/11/29 11:56:36		
HDMI_21_10G_4LN_NK	2017/11/29 11:56:03		
HDMI_21_6G_4LN_NK	2017/11/29 09:28:43		
I1_01_2017_10_35_26_DLB	2017/11/07 09:36:59		
I1_01_2017_10_26_15_DLB	2017/11/07 09:36:57		
10_31_2017_16_24_27_C4	2017/11/07 09:36:35		
10_31_2017_14_08_07SNBR2	2017/11/07 09:36:27		
10_31_2017_14_03_26SNBR1	2017/11/07 09:36:24		
10_31_2017_13_31_36SNPSPRV	2017/11/07 09:36:20		
10_31_2017_11_21_59BS65	2017/11/07 09:36:12		
I0_31_2017_09_53_06_SNGMPRHDR_1	2017/11/07 09:36:08		
I1_04_2017_00_43_30_FRL	2017/11/03 16:40:35		
I0_31_2017_09_53_06_SNGMPRHDR	2017/10/31 12:05:04		
HDMI_21_FRL_Proto	2017/10/26 09:01:41		
HDMI_21_FRL_FEC_Err_Proto_NK	2017/10/26 09:01:35		
10_02_2017_10_10_30	2017/10/10 15:43:54		
10_02_2017_10_25_32	2017/10/10 15:43:28		
10_04_2017_13_42_38	2017/10/04 13:43:08		
> • 09_14_2017_12_23_11	2017/09/22 15:36:42		
N b 09 14 2017 09 43 59	2017/09/22 15:36:38		

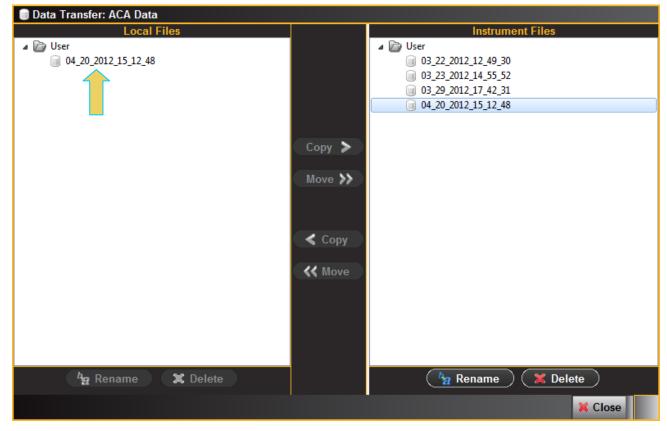
The **Data Transfer: ACA Data** dialog box appears (below) enabling you to select the M41h 48G Video Analyzer/Generator that you want to transfer data from. Select the desired M41h 48G Video Analyzer/Generator and click OK. The **Data Transfer: ACA Data** panel will appear.

Data Transfer: ACA Data			
Select an Instrument to exchange data with.			
Select an Inst	rument:		
B 980JB [192.10	58.254.140]	
E_980 [19	92.168.254	.116]	
	_		
🕂 Add 🛛 🎸	Ok	🙆 Cancel	

The **Data Transfer** panel appears in context with the ACA files on the M41h (Instrument) under the **Instrument Files** available as shown below.



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).



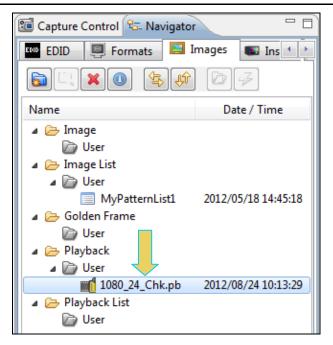
To transfer Playback files from the M41h to your PC using the Data Transfer utility:

1. Through the external ATP 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.

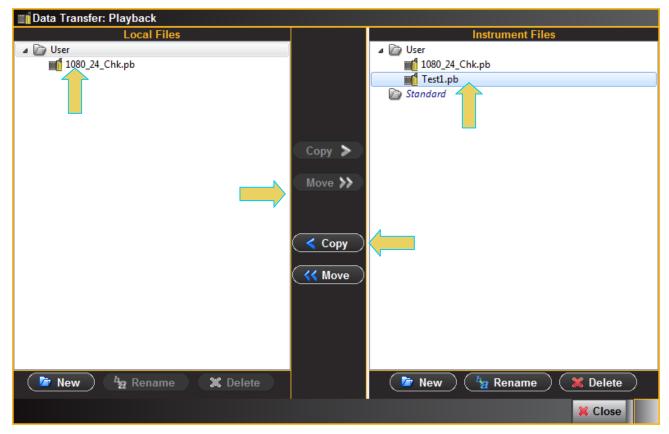
Note: This procedures shows examples of transferring ACA traces, capture files and Playback files but you can transfer EDIDs, ImageLists, or any other type of data type under the Navigator tab.

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





The **Data Transfer** panel appears in context with the ACA files on the M41h (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 M41h to your PC using the Data Transfer utility:

- 1. Through the external ATP 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 in one of the data sets in the Navigator window.

🔓 Navigator		
🕨 Captures 🔯 Compliance	ACA EDID 🗐 Form 🔹 🕨	
Name T	ransfer data to/from an instrument.	
▲ Capture		
wd-test-2_Capture	2013/06/03 13:49:03	
⊳ ⊳ 720p	2013/06/03 13:48:42	
🗛 🕨 4K2K	2013/06/03 13:48:37	
◆ ► 480p_HDCP	2013/06/03 13:49:13	
🔶 ▷ ▷ 2012_01_30_08_29_25	2013/06/03 17:08:57	
▷ ▶ 2012_01_09_16_29_26	2013/06/03 13:48:51	
▷ ▶ 2011_02_18_14_33_53	2013/06/03 13:48:48	
▷ ▶ 06_20_2013_13_33_44	_3D 2013/06/20 13:34:09	
▷ ▶ 06_20_2013_13_31_22	_3D 2013/06/20 13:31:46	
▷ ▶ 06_20_2013_12_52_44	_3D 2013/06/20 12:53:09	
b b 06_04_2013_Video	2013/06/04 14:20:28	
b b 06_04_2013_Protocol		
▷ ▶ 06_04_2013_720p_HD	CP 2013/06/04 14:35:39	
⊳ ► 06_04_2013_720p	2013/06/04 14:33:53	
⊳ ► 06_04_2013_4K	2013/06/04 14:41:22	
▷ ▶ 05_29_2013_10_39_45	2013/05/29 10:42:15	
a 🗁 DI Match		
🗁 User		

The **Data Transfer: Capture Data** dialog box appears (below) enabling you to select the M41h 48G Video Analyzer/Generator that you want to transfer data from. Select the desired M41h 48G Video Analyzer/Generator and click OK.

The **Data Transfer** panel appears in context with the Capture files on the M41h (Instrument) under the **Instrument Files** available as shown below.

Local Files		Instrument Files
🗁 User	A	🔺 🗁 User
▲ ▶ 03_27_2012_16_39_13		07_19_2012_00_47_51
04_09_2012_14_32_08		07_19_2012_00_56_31
04_09_2012_14_32_40		07_19_2012_17_43_09
▶ 04_09_2012_14_33_15		07_19_2012_18_05_10
04_09_2012_14_35_51		07_19_2012_18_24_46
04_09_2012_14_41_01		07_19_2012_20_13_07
04_09_2012_15_31_31	Сору ≽ 🛛	07_19_2012_20_23_14
04_10_2012_10_56_00		07_24_2012_12_38_22
1080p_15per_26Frames	Move ≽	07_25_2012_13_23_22
1080p_30per_58Frames		07_25_2012_13_59_40
1080p_5per_6Frames		07_25_2012_14_00_38
2011_02_18_14_33_53		08_22_2012_18_27_34
2011_12_27_11_27_23	🤇 < Сору 🔵	▶ 08_22_2012_18_29_36
2012_01_30_08_29_25		08_22_2012_18_33_10
2012_01_30_08_33_00	(K Move)	08_22_2012_18_35_08
2012_01_30_08_33_37		08_22_2012_18_37_18
480p_10per_110frames		08_22_2012_18_40_14
480p_5per_54frames		08_23_2012_18_09_12
▶ 4K2K		▶ gril11
720_20per_78Frames		▶ nds1
720p_10per_36Frames	-	▶ nds2
👌 🙀 Rename 🛛 🗶 Delete		🦄 Rename 🕽 🌘 🐹 Delete
2 Kendine		
		X Close

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.

10.2 Transferring Capture Files using the command line

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

There are three ways you can transfer files from the M41h 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 M41h.

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 M41h 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 M41h

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
```

- Repeat the FTP GET command for the other files you wish to view through the external ATP 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 ATP Manager's working directories: quantumdata/M41hManager/M41hmgr/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 ATP Manager.

10.3 Transferring Capture Files using USB drives

If you have initiated captures through the embedded ATP 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 M41h.



M41h Advanced Test Platform

- 2. Minimize or close the embedded GUI by touch selecting the **Quantumdata M41h 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 M41h Manager's working directories: quantumdata/M41hManager/M41hmgr/workspace/captures/.

11 Testing HDMI Displays with the M41h 48G Video Analyzer/Generator

This chapter describes how to operate the M41h 48G Video Analyzer/Generator to test HDMI 2.1 ultra-high definition displays.

11.1 Workflow for running the video pattern testing of HDMI 2.1 displays

The workflow below is a high level set of tasks for operating the M41h 48G Video Analyzer/Generator. Note that the installation of the external ATP Manager and the Ethernet session are optional; you can run the tests through the embedded ATP Manager.

1. Power up the M41h. Refer to the procedures in <u>Powering up the M41h</u>.

Note: The power switch in the front is used when you are turning off the M41h for a short period of time. For extended periods of off time, it is best to power the M41h down by first using the power button on the front and then the rocker switch on the back.

- 2. (Optional) Establish an Ethernet/IP connection between the external ATP Manager and the M41h Advanced Test Platform using the procedures in the M41h Quick Start Guide.
- 3. Connect the HDMI sink device under test to one of the Tx ports.
- 4. Access M41h's interface through the ATP Manager.
- 5. Select HDMI.
- 6. Select the formats (timing or resolution).
- 7. Select the test patterns you wish to test with.
- 8. Select any video options and settings.
- 9. Read the EDID of the connected display.
- 10. Read the SCDC registers of the connected display.
- 11. Select the audio format.
- 12. Test HDCP authentication response on the HDTV.
- 13. Monitor the sink DUT for any anomalies.

11.1 Connector Description

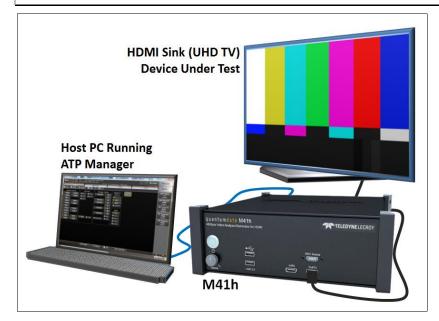
Use the following table to identify the connector function and descriptions on your M41h 48G Video Analyzer/Generator.

Use the following table to identify the connector function and descriptions on your M41h system configuration.

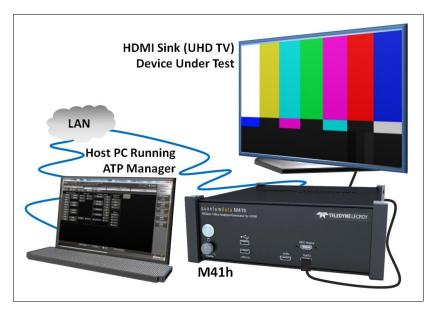
M41h Configurations	Information / Function
Protocol Analyzer in M41h	The following is a description of each connector:
F Uturn	 M41h 48G Video Analyzer/Generator - Front: A – HDMI 2.1 Rx port for testing HDMI 2.1 sources. B – HDMI 2.1 Tx port for analyzing HDMI 2.1 sinks. C – HDMI 2.1 Rx port used for reading the EDID over the DDC channel (applies to eARC Tx test). D – USB ports (2) used for connecting a mouse and keyboard. E – Volume knob for turning up or down the volume for the internal speaker. F – Power button; press and release.
	 M41h 48G Video Analyzer/Generator - Back: G – Power plug (100-240VAC 50/60Hz; 200 Watts) H - HDMI – Admin port for connecting external HDMI UHD display for M41h ATP Manager. I - DisplayPort – Admin port for connecting the external display for M41h ATP Manager. J - USB/USB-C (2 ea.) – For mouse & keyboard. K - RJ45 (2) - E1 Network for connecting host PC running ATP Mgr. E2 Aux – Not used. L - DVI – Possible future use. M - RS-232 (2) – Possible future use. O - TRIG IN/OUT – Future. P - RCA SPDIF OUT – OUT: Monitors eARC audio; IN: Possible future use.

11.2 Making the physical HDMI connections

This subsection describes the physical HDMI connections required to run the video pattern tests on an HDMI display.



Connection for Video Testing – M41h Ethernet Direct Connection

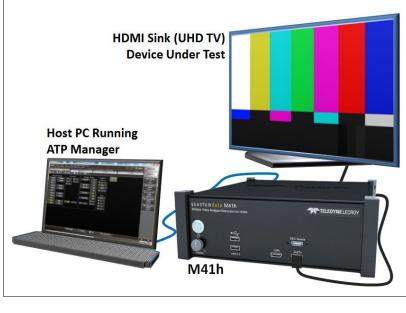


Connection for Video Testing – M41h Ethernet Hub or Corporate LAN

To make the physical HDMI connections:

This procedure assumes that you have assembled the M41h with the M41h 48G Video Analyzer/Generator and the HDMI sink device under test and applied power to all these devices. Refer to the procedures below and the diagrams above.

1. Connect your HDMI 2.1 sink device under test to the HDMI Tx/Out connector on the M41h 48G Video Analyzer/Generator. Use an HDMI high speed compliant cable. Refer to the illustrations below.





11.3 Navigating through the ATP Manager interface

Use the following procedures to navigate to the M41h 48G Video Analyzer/Generator testing functions. You can access the M41h 48G Video Analyzer/Generator functionality through the Card Control tab (Page 1 of 4) of the Apps panel as described below.

To navigate to the video test functions:

1. From the **View** menu, enable select the **Generator** item.



Once you establish the connection, the **Generator** panel will be populated as shown below:

Ih 48G Video	o Analyzer/Gene	erator for HDMI 8	K Testing - User G	uide	Rev
Generator	The local division of	-	-		
Modes 👻		FMT:/Standard/72		H:45.00k	
	20p @ 60 Hz 16:9	tandard/ColorBar.i 1280x	ung 720 Progressive RG	F:60.00H: B-8bpc	P:74.25MHz
	Format	Pattern	📢 Audio	2	Tools 🗧 Refresh
🕼 Folder	Lists				
	CheckBy3	CheckBy6	CheckMByN	Check_02	eARC Master TX
					48G Generator
			0 0	• • •	HDMI
			\circ \circ	≻, ≺,	
	Check_11	Checkers		CirclesS	8
			and the second second	10 C	
	ColorBar	ColorBox	ComFocus	ContBars	
		•			
		• • •		Later -	
	Crosshtch	Crosstalk	Cruise_Ship	Cubes	
	175	Se a			
		A8=1			
	Cubes3D	Dark_Dog	DecodAdj	DecodChk	
C Select	Path: /Standard	(• Settings)	Find) 🔄 Transfer)	
					X Close

The M41h 48G Video Analyzer/Generator can be identified by its name and slot number (Card 5) in the example above.

The Generator screen has a status area on the top of its panel.

I Generator	(m)			
	FRL:4/12G FMT:/Standard/4320p30.x IMG:/Standard/ColorBar.img	cml	H:132.00kHz F:30.00Hz Output	Disconnect
(196) 7680x4320p @ 30	Hz 16:9 7680x4320	Progressive RGB-8bpc	P:1188.00MHz	
Format	Pattern	🛶 Audio	🗞 Tools	Refresh
🗖 CTA 📑 VESA	🗁 Folder 🛛 🔲 Lists 🛛 🚥 EDID]		

	The status area	provides the	following	information:
--	-----------------	--------------	-----------	--------------

Generator Status Area (Top)				
Item	Description			
Card	The name of the. In all cases this will be the HDMI generator analyzer.			
Port	Active port, in this case the two Tx connectors (T30 and T31).			
INTF	The currently selected interface type for the. This could be either HDMI or DVI. The			

Generator Status Area (Top)				
Item	Description			
	sampling mode is included in parentheses after the interface.			
FMT	The currently active format (selected resolution) and its directory path.			
IMG	The currently active image (selected test pattern) and its directory path.			
Video Identification Code (VIC)	The VIC code is shown on the lower left of the upper status panel			
Resolution, scan and color and color depth	The resolution, scan and colorimetry type and color depth are shown on in the lower portion of the upper status panel in the center.			
H:(Rate)	The horizontal refresh rate of the selected timing.			
F:(Rate)	The frame or vertical refresh rate of the selected timing.			
P:(Pixel Rate)	The pixel clock rate of the selected timing.			

Please note that if you are also making changes through the command line the information in the status area is

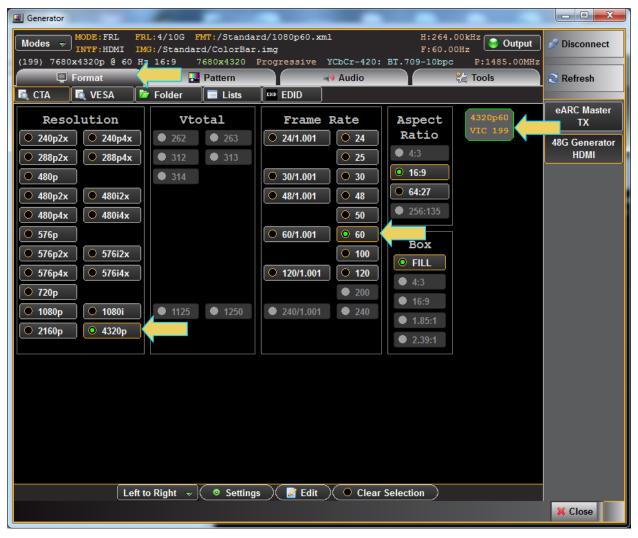
not automatically updated. You must click on the **Refresh** activation button to re-sync the status area.

11.4 Selecting HDMI or DVI formats

Use the following procedures to select the mode, HDMI or DVI on the M41h 48G Video Analyzer/Generator.

To select Modes:

1. From the **Main** menu of the M41h 48G Video Analyzer/Generator, click the **Modes** pulldown menu to select HDMI or DVI. (Example shows 8K format at 1485MHz pixel rate.





When you select the interface type you will get a listing of HDMI (or DVI) formats and the **INTF** field in the status area will show HDMI (or DVI). The screen example below depicts a set of HDMI formats.

I Generator	·	-	-			_		• X
Modes -	MODE:FRL INTF:HDMI 30x4320p @ 6	IMG:/Standar	d/ColorBar.i	/4320p60.xml mg ogressive YCb		H:264.00kHz F:60.00Hz -10bpc P:1485		connect
	Format		Pattern			🖓 Tools	Ref	resh
🔣 CTA	🛛 🔯 VESA	🖻 Folder	Lists					
2	288p2xL1	288p2xL2	288p2xL3	288p2xS1	288p2xS2	288p2xS3		: Master TX
2	288p2x_1	288p2x_2	288p2x_3	288p4xL1	288p4xL2	288p4xL3		enerator DMI
2	288p4xS1	288p4xS2	288p4xS3	288p4x_1	288p4x_2	288p4x_3		
4	320p100	4320p100B	4320p100SB	4320p119	4320p119B	4320p119SB	8	
4	320p120	4320p120B	4320p120SB	4320p23	4320p23B	4320p23SB		
	4320p24	4320p24B	4320p24SB	4320p25	4320p25B	4320p25SB		
	4320p29	4320p29B	4320p29SB	4320p30	4320p30B	4320p30SB		
	4320p47	4320p47B	4320p47SB	4320p48	4320p48B	4320p48SB		
	4320p50	4320p50B	4320p50SB	4320p59	4320p59B	4320p59SB		
	4320p60	4320p60B	4320p60SB	480i	480i2x29	480i2x30		
4	80i2x59	480i2x60	480i2xL1	480i2xL2	480i2xL3	480i2xL4		
4	80i2xL5	480i2xL6	480i2xS1	480i2xS2	480i2xS3	480i2xS4		
	80i2xS5 Path: /Standar	480i2xS6	480i2x 1	480i2x 2	480i4x29	480i4x30		
		🛛 📝 Edit	 Settings) 🔍 Find)	ち Transfer 🔵			
							× CI	ose

11.5 Selecting formats (resolutions) – FRL Mode

You can select formats (timings) from the M41h 48G Video Analyzer/Generator's format library. You can select either from the entire list of formats or you can select from a subset or reduced set of the formats that have or can define. You can select from a reduced set or subset of formats in either of two ways:

- Select from a custom list you have created using the Format List Editor.
- Select from a list of formats configured from the EDID of the connected display.

Use the following procedures to select a video resolution (format). The procedure assumes that you have already selected an interface (HDMI or DVI).

To select a format:

1. From the main window of the M41h 48G Video Analyzer/Generator, click the **Format** tab.

A list of HDMI or DVI formats will appear as shown in the example below.

I Generator	-			_	_	- • ×
Modes ▼ MODE: FRL INTF: HDM (199) 7680x4320p @	I IMG:/Standa	FMT:/Standard/ rd/ColorBar.in 7680x4320 Pro	-		H:264.00kHz F:60.00Hz -10bpc F:1485.0	
Format		Pattern	A 🕪		% Tools	Refresh
🗖 CTA 🛛 🗖 VESA	🕼 Folder					
288p2xL1	288p2xL2	288p2xL3	288p2xS1	288p2xS2	288p2xS3	eARC Master
288p2x_1	288p2x_2	288p2x_3	288p4xL1	288p4xL2	288p4xL3	48G Generator HDMI
288p4xS1	288p4xS2	288p4xS3	288p4x_1	288p4x_2	288p4x_3	
4320p100	4320p100B	4320p100SB	4320p119	4320p119B	4320p119SB	8
4320p120	4320p120B	4320p120SB	4320p23	4320p23B	4320p23SB	
4320p24	4320p24B	4320p24SB	4320p25	4320p25B	4320p25SB	
4320p29	4320p29B	4320p29SB	4320p30	4320p30B	4320p30SB	
4320p47	4320p47B	4320p47SB	4320p48	4320p48B	4320p48SB	
4320p50	4320p50B	4320p50SB	4320p59	4320p59B	4320p59SB	
4320p60)p60B	4320p60SB	480i	480i2x29	480i2x30	
480i2x59	480i2x60	480i2xL1	480i2xL2	480i2xL3	480i2xL4	
480i2xL5	480i2xL6	480i2xS1	480i2xS2	480i2xS3	480i2xS4	
480i2xS5	480i2xS6 ard	480i2x 1	480i2x 2	480i4x29	480i4x30	⊙
	🛛 📝 Edit) 💿 Settings) 🚺 Find	ち Transfer 🔵		
						¥ Close

The highlighted format is the format that is active. You can also determine this from the status information at the top of the panel. Alternatively you can click on the Star button to show the selected format. When

you click on the Star button the list of formats will be repositioned such that the selected format is shown on the top line.

Note that you can browse for a format using the scroll bar. You can also search for a format using a test strings on the Find Format dialog box.

- 2. Select a format from the list by clicking on it.
- 3. Click on the **Find** activation button on the lower portion of the Format panel.

288p4xS1 288p4xS2 288p4xS3 288p4x_1 288p4x_2 288	Bp4x_3
480i# 480i#KA 480i 480i2x29 480i2x30 480	Di2x59
Edit O Settings Find	A V
	🔀 Close

The **Find Format** dialog box appears as shown below. Enter a string in the Search Text field to find a format. You can specify either Starts with or Contains using the radio buttons and you select the Case Sensitive check box to indicate case sensitivity in your text. Click on the **OK** button when you have located the format.

Find						
Search Text:	Matches: 39					
4320	4320p100					
	4320p100B					
Case Sensitive	4320p100SB					
O Starts with	4320p119					
	4320p119B					
Contains	< +					
~	Ok 🔇 Cancel					

4. Click on the EDID smart activation button on the upper panel under the tabs to configure the list of formats in accordance with the EDID for the connected display.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator	-		-			
Modes v MODE:F		FMT:1080p59.xm lard/ColorBar.in	ng	Ι	1:67.43kHz 5:59.94Hz Output] 🖉 Disconnect
(16) 1920x1080p @		1920x1080 Pr	ogressive YCb0	Cr-420: BT.709-	10bpc P:92.72MHz	Refresh
CTA VES			•• EDID		-0-0 10010	S Koncon
1080i29	1080i30	1080p23	1080p24	1080p29	1080p30	ТХ
1080p59	1080p60	2160p23	2160p24	2160p24W	2160p24W_H4	48G Generator HDMI
2160p24_H3	2160p25	2160p25_H2	2160p29	2160p30	2160p30W	
2160p30_H1	2160p50	2160p50W	2160p60	2160p60W	480i2x29	
480i2x30	480i2xL1	480i2xL2	480i2xS1	480i2xS2	480p59	
480p59LH	480p59SH	480p60	480p60LH	480p60SH	720p59	
720p60	CVT0860	DMT0660	DMT0860	DMT1060	DMT1260G	
DetQDI1	DetQDI2	SMT0660D	SVD01H1	SVD01L1	SVD01L2	
SVD02H1	SVD02H2	SVD02H3	SVD02H4	SVD02L1	SVD02L2	
SVD02L3	SVD02L4	SVD03H1	SVD03H2	SVD03L1	SVD03L2	
SVD04H1	SVD04H2	SVD04L1	SVD04L2	SVD05H1	SVD05H2	
SVD05L1	SVD05L2	SVD06H1	SVD06H2	SVD06H3	SVD06H4	
SUDD CL 1		EDID and Generate		etmo781	6 SUDOJUO	
	🤇 🌌 Edit) 🚺 Find	🕏 Transfer 🔵		X Close
						A Close

You can determine if the list of formats displayed is derived from the EDID of the connected display by looking at lower status bar: Read EDID and Generate Formats.

When EDID formats are not active, the directory whose formats are being displayed is listed in the lower panel as indicated below. Typically this would be the Standard directory where the M41h's format list is stored. The default path is the Standard path. The following screen example shows the Standard list indicated.

Rev. A1

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator	-	-	-		-	
Modes v MODE: FRL		FMT:/Standard, rd/ColorBar.in			H:264.00kHz F:60.00Hz	Dutput 🔊 Disconnect
(199) 7680x4320p @			ogressive YCbO			
Format		Pattern		udio	😪 Tools	🕄 Refresh
🖾 CTA 🛛 🖾 VESA	🕼 Folder					eARC Master
288p2xL1	288p2xL2	288p2xL3	288p2xS1	288p2xS2	288p2xS3	TX
288p2x_1	288p2x_2	288p2x_3	288p4xL1	288p4xL2	288p4xL3	48G Generator HDMI
288p4xS1	288p4xS2	288p4xS3	288p4x_1	288p4x_2	288p4x_3	
4320p100	4320p100B	4320p100SB	4320p119	4320p119B	4320p119SB	69
4320p120	4320p120B	4320p120SB	4320p23	4320p23B	4320p23SB	
4320p24	4320p24B	4320p24SB	4320p25	4320p25B	4320p25SB	
4320p29	4320p29B	4320p29SB	4320p30	4320p30B	4320p30SB	
4320p47	4320p47B	4320p47SB	4320p48	4320p48B	4320p48SB	
4320p50	4320p50B	4320p50SB	4320p59	4320p59B	4320p59SB	
4320p60	p60B	4320p60SB	480i	480i2x29	480i2x30	
480i2x59	480i2x60	480i2xL1	480i2xL2	480i2xL3	480i2xL4	
480i2xL5	480i2xL6	480i2xS1	480i2xS2	480i2xS3	480i2xS4	
480i2xS5	480i2xS6 ard	480i2x 1	480i2x 2	480i4x29	480i4x30	
	🛛 📝 Edit) 💿 Settings)(🐧 Find)(ち Transfer 🔵		
						X Close

You can change the directory of formats using the directory activation button Select Path: /Standard. You might wish to change the directory path if you have created your own custom formats using the Format Editor to create custom formats. Note also that you can configure a smaller list of formats to choose from using the Format List Edit; refer to Format List Editor.

By default when you create a custom format, the new format will be saved in the User directory. When you select the directory activation button Select Path: /Standard a dialog box will appear allowing you to select the alternative path such as the User path shown highlighted and selected in the dialog box below.

Rev. A1



You can open up and activate any custom Format Lists you have previously defined with the associated icon Select Path: /Standard. A dialog box will appear enabling you to select a custom format list or lists (below).

✓ Format Lists
Instrument Files
🔺 🗁 User
My_8K_List
🗹 Check All 📕 Un-Check All 🛛 🎸 Ok 🛛 🙆 Cancel

11h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide					
Generator Modes v Mode: FRL FRL:4/12G FMT:/Standard/4320p30.xml H:132.00kHz Output F:30.00Hz	Disconnect				
(196) 7680x4320p (§ 30 Hz 16:9 7680x4320 Progressive RGB-8bpc P:1188.00MHz Image: Format Image: P:1188.00MHz Image: P:1188.00MHz	C Refresh				
4320p60SB 4320p59B 4320p59SB 4320p30SB 4320p29 4320p29B 4320p29SB 4320p30 4320p60B	ТХ				
	HDMI Card 1 18G Generator HDMI Card 4				
	18G Playback HDMI Card 6				
Select Lists: My_8K_List Edit Settings	A V X Close				

You can select all or one custom Format List or any combination if you have several defined. The example here shows selecting one Format List. The **Check All** and **Un-Check All** activation buttons allow convenient selection where you have many Format Lists to choose from. The result of selecting one custom Format List is shown in the screen example below. A limited set of formats are displayed. The Path icon on the bottom status panel will display that new list (indicated below).

🗹 Format Lists							
Instrument Files							
🔺 🗁 User							
My_4K_List							
My_8K_List							
🗹 Check All 🔳 Un-Check All 🛛 🔗 Ok 🛛 🙆 Cancel							

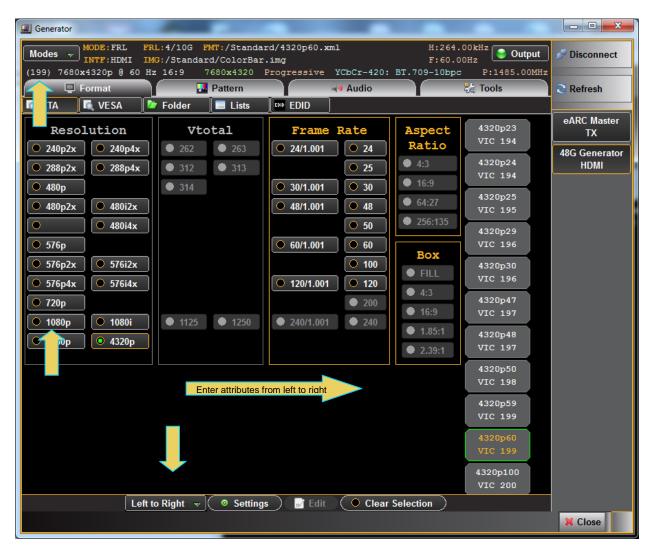
I Generator				
	<pre>//12G FMT:/Standard/4320p3 /Standard/ColorBar.img 6.9 7680x43</pre>	0.xml 20 Progressive RGB-8bpc	H:132.00kHz F:30.00Hz F:1188.00MHz	🔊 Disconnect
Format	Pattern	Audio	Cools	🕄 Refresh
🖾 CTA 🗖 VESA 🗁 F			- Dia)	
2160p59 2160p59SB	2160p59W 2160p60	2160p60B 2160p60SB	2160p60W 2160pS24	eARC Master TX Card 1
4320p60SB 4320p59B 4320p60B	4320p59SB 4320p30SB	4320p29 4320p29B	4320p295B 4320p30	8G Playback HDMI Card 1
				48G Generator HDMI Card 1
				18G Generator HDMI Card 4
				18G Playback HDMI Card 6
Select Lists: My_4K_List, My_	8K iet		0	
C Select Lists my_m_List, my_		🕼 Find 🔵 ち Transfer)	A V
				X Close

To select a format from the CEA smart filtering button:

1. From the main window of the M41h 48G Video Analyzer/Generator, click the Format tab.

The default for HDMI is to present the CEA smart filtering list as shown below. If the CEA button is not active, simply click on the CEA button on the upper left of the top panel (indicted in the screen shot below). The CEA

smart filtering screen enables you to select formats through filtering of various video parameters such as Resolution, Vtotal, Frame Rate and Aspect Ratio. As you optionally move from left to right on the screen the list of available formats that meet the filtering criteria is shown on the right.



Rev. A1

Alternatively you can select Arbitrary on the pull-down list on the lower control panel. The Arbitrary selection enables you to specify filtering criteria in any order. Refer to the example below.

I Generator	-			- C X
	RL:4/10G FMT:/Stan MG:/Standard/ColorB		H:264.00kHz F:60.00Hz BT.709-10bpc P:1485.00M	
(199) 7880x4320p e 80 F	2 16:9 7660x4320	Audio	Cols	Refresh
🗖 CTA 🛛 🗖 VESA	Folder 🛛 🔲 Lists	EDID EDID		
CTA VESA Resolution 240p2x 240p4x 288p2x 288p4x 480p 480i2x 480p2x 480i2x 480p4x 480i4x 576p 576p2x 576p4x 576i4x 720p 1080i 2160p 4320p	 Folder Lists Vtotal 262 263 312 313 314 314 1125 1250 	Image: book state with the state withe state with the state with the state withe	Aspect Ratio • 4:3 • 16:9 • 64:27 • 256:135 720p60 VIC 2 480p60LH VIC 2 480p60SH VIC 3 720p60 VIC 4 240p2x_2 VIC 8 240p2x_4 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 8 240p2xL2 VIC 9 240p2xS2 VIC 9	eARC Master TX 48G Generator HDMI
			240p4x_2 VIC 12	
Arbi	trary 👻 💿 Setti	ngs) 🛃 Edit 🛛 🔍 O Clear		
				X Close

Regardless of whether you choose Arbitrary or Left to Right, once you specify enough criteria, you will be presented with one or a few format options on the right as shown in the example below.

Generator				
	L:4/10G FMT:/Standa G:/Standard/ColorBan z 16:9 7680x4320		H:264.00kHz F:60.00Hz BT.709-10bpc P:1485.00MH	
Format	Pattern	剩 Audio	🖓 Tools	S Refresh
CTA 🛛 🗖 VESA	Folder 🔲 Lists			eARC Master
Resolution 240p2x 240p4x 288p2x 288p4x 480p 480p2x 480i2x 480p4x 480i4x 576p 576p2x 576i2x 576i4x	Vtotal ● 262 ● 263 ● 312 ● 313 ● 314	Frame Rate 24/1.001 24 25 30/1.001 30 48/1.001 48 50 60/1.001 60 100 120	Aspect Ratio • 4:3 • 16:9 • 64:27 • 256:135 Box • FILL	TX 48G Generator HDMI
 720p 1080p 1080i 2160p 4320p 	● 1125 ● 1250	 200 240/1.001 240 	 4:3 16:9 1.85:1 2.39:1 	
Arbitr	ary	js 🕑 Edit 🔿 Clear	Selection	X Close

The selection of formats works the same way when selecting VESA formats as shown in the following sample screens.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator				_ _ X
Modes VINTF:HDMI I	RL:4/10G FMT:/Stand MG:/Standard/ColorBa	r.img	H:264.00kHz F:60.00Hz	
(199) 7680x4320p @ 60 H	Iz 16:9 7680x4320	Progressive YCbCr-420:	BT.709-10bpc P:1485.001	Refresh
	Folder			
Resolution 240p2x 240p4x 288p2x 288p4x 480p 480p2x 480i2x 480p4x 480i4x 576p 576p2x 576i2x 576p4x 576i4x 720p 1080p 1080i 2160p 4320p	vtotal 262 263 312 313 314	Frame Rate 24/1.001 24 25 30/1.001 30 48/1.001 48 50 60/1.001 60 100 120/1.001 200 240/1.001	Aspect Ratio 4320p23 VIC 194 4:3 4320p24 VIC 194 16:9 4320p25 VIC 195 256:135 4320p29 VIC 196 Box 4320p20 VIC 196 FILL VIC 197 16:9 4320p47 VIC 197 1.85:1 4320p48 VIC 197 4320p50 VIC 198 VIC 198	eARC Master TX 48G Generator HDMI
			4320p59 VIC 199 4320p60 VIC 199 4320p100 VIC 200	
Left	to Right	igs 📄 🖬 Edit 🜔 Clear	Selection	X Close

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator		-	-		_		- 0 ×
Modes 👻		IMG:/Standa	FMT:/Standard/4 rd/ColorBar.img			264.00kHz 50.00Hz Output	🖉 Disconnect
	x4320p @ 60 Format		Pattern	ressive YCbCr-420	: BT.709-10	Obpc P:1485.00MHz	S Refresh
🔍 СТА Туре	k vesa	Folder Resolut	(EDID Frame Rate	Aspect	CVT2450D	eARC Master TX
• CVT	• 640	• 720	768 0 800	• 24 • 30	Ratio	CVT2460D	48G Generator HDMI
• DMT	• 848 • 1064	• 1152	960 1024 1224 1280	• 43	• 5:3	CVT2475D CVT2485D	
• DMR	13601536		1400 1440 1680 1704	• 48 • 50	5:411:5		
	17281864		1800 1856 2048 2128	● 60 ● 72	16:916:10		
	• 2304 • 3072		2560 2728	• 75			
	JUL	- JUHU -	- 1000	• 120			
	L	eft to Right 👻	Settings	🛃 Edit 🛛 🔍 🔍 Clea	r Selection)	
							X Close

Rev. A1

11.6 Configuring the format Settings

Use the following procedures to configure the format settings. The Settings dialog box enables you to configure the Color Space, Range and Bits per Component.

To select a format:

1. Specify the format settings by clicking on the **Settings** button on the lower center of the panel (indicated below).

288p4x_2 288p4x_3 480i # KA 480i 480i2x29 480i2x30 480i2x59 EDID Image: Comparis to the second sec	
Edit O Settings	<u> </u>
	💢 Close

The **Settings** dialog box appears as shown below. Four examples are shown below; the first with RGB selected, the second with YCbCr selected and the third with BT.2020 and fourth with DCI-P3 colorimetry selected.

Format Settings			×	Format Settings			×
	Color	Space			Color	Space	
• RGB	• YCbCr	• xvYCC	• AdobeRGB	• RGB	O YCbCr	• xvYCC	• AdobeRGB
• sYCC601	AdobeYCC	BT2020 cYCC	• BT2020 YCC	• sYCC601	• AdobeYCC	• BT2020 cYCC	• BT2020 YCC
• BT2020 RGB	• DCI-P3			• BT2020 RGB	• DCI-P3		
	• 4:4:4	4:2:2 • 4:2:0			• 4:4:4	4:2:2 • 4:2:0	
	Ra O Full O Sh	inge ioot O Limited)		Ra	nge noot O Limited]
	Bits per 8 0 10	Component 0 12 0 16			Bits per	Component 0 12 0 16	
	Scra	ambling				ambling	
	• Enabled	• Disabled			• Enabled	• Disabled	
		Apply			\checkmark	Apply	
Format Settings			×	Format Settings			×
Format Settings	Color	Space	×	Format Settings	Color	: Space	×
Format Settings RGB 	Color	Space	AdobeRGB	Format Settings RGB 	Coloz • YCbCr	Space	XdobeRGB
• RGB	• YCbCr	• xvYCC	• AdobeRGB	• RGB	• YCbCr	• xvYCC	• AdobeRGB
RGB sYCC601	YCbCr AdobeYCC DCI-P3	• xvYCC	• AdobeRGB	RGB sYCC601	YCbCr AdobeYCC DCI-P3	• xvYCC	• AdobeRGB
RGB sYCC601	YCbCr AdobeYCC DCI-P3 4:4:4	xvYCC BT2020 cYCC	• AdobeRGB	RGB sYCC601	YCbCr AdobeYCC DCI-P3 4:4:4	xvYCC BT2020 cYCC	• AdobeRGB
RGB sYCC601	YCbCr AdobeYCC DCI-P3 4:4:4 Ra Full • Sh	xvYCC BT2020 cYCC	• AdobeRGB	RGB sYCC601	YCbCr AdobeYCC OLLP3 4:4:4 Ra Full Si	• xvYCC • BT2020 cYCC 4:2:2 • 4:2:0	• AdobeRGB
RGB sYCC601	 YCbCr AdobeYCC DCI.P3 4:4:4 Ra Full Sh Bits per 8 10 	xvYCC BT2020 cYCC 4:2:2 4:2:0 inge toot Component	• AdobeRGB	RGB sYCC601	YCbCr AdobeYCC OLP3 4:4:4 Ra Full SI Bits per 8 0 10	xvYCC BT2020 cYCC 4:2:2 4:2:0 ange anot Component	• AdobeRGB
RGB sYCC601	 YCbCr AdobeYCC DCI.P3 4:4:4 Ra Full Sh Bits per 8 10 	xvYCC BT2020 cYCC 4:2:2 4:2:2 4:2:2 Component Component 12 16 ambling	• AdobeRGB	RGB sYCC601	YCbCr AdobeYCC OLP3 4:4:4 Ra Full SI Bits per 8 0 10	xvYCC BT2020 cYCC 4:2:2 4:2:2 Limited Component 12 16	• AdobeRGB

Format Settings						
Parameter	Description	Options				
Color Space	Colorimetry and video pixel encoding settings	 RGB – Uses 4:4:4 sampling. YCbCr – Uses either 4:4:4, 4:2:2 or 4:2:0 sampling. xvYCC – High definition colorimetry based on IEC 61966 2-4. AdobeRGB – The AdobeRGB color space is defined in IEC 61966-2-5. If the connected display does not support Adobe color modes, then the sink shall not transmit Adobe encoded video. sYCC601 – Colorimetry based on IEC 61966-2-1/Amendment 1. AdobeYCC - The AdobeRGB color space is defined in Annex A of IEC 61966-2-5. If the connected display does not support Adobe color modes, then the sink shall not transmit Adobe encoded video. BT.2020 YCC - Rec 2020 for YCbCr BT.2020 CYCC Rec 2020 for YCbCr with linear encoding BT.2020 RGB – Rec 2020 for RGB. DCI-P3 – Digital Cinema Initiatives color space. 				
Range	These values are described in CEA-861E. They pertain to the number of levels for RGB and YCbCr mode.	 Limited – Use for CEA formats. Please refer to the HDMI specification section on Video Quantization Ranges for more details. Shoot – for testing the undershoot/overshoot signal code margins. Full - Use for PC formats. Please refer to the HDMI specification section on Video Quantization Ranges for more details. 				
Bits per Component	Color depth per component.	 8 – Eight (8) bit per component (24 bit per pixel) color depth. 10 – Ten (10) bit per component (30 bit per pixel) color depth; deep color. 12 – Twelve (12) bit per component (36 bit per pixel) color depth; deep color. 16 – Sixteen (16) bit per component (48 bit per pixel) color depth; deep color. 				

Rev. A1

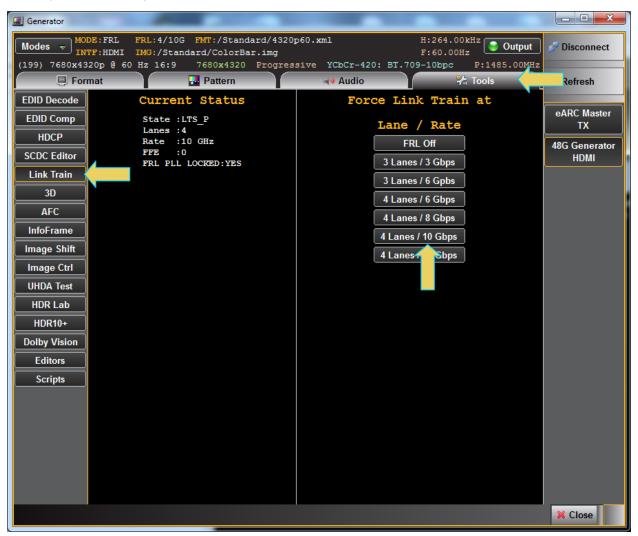
Г

11.7 Configuring the Link Training Settings

Use the following procedures to configure the link training settings. The link training panel is accessible from the Link Train button on the **Tools** tab. You can set the Lane/Rate configuration using the provided buttons on the right side of the panel **Force Link Train** rate. The link training status is shown on the left side **Current Status**.

To select a format:

1. Specify the link training configuration by clicking on the desired button on the right side of the Link Train panel button (indicated below).



11.8 Generating TMDS Video Streams

Use the following procedures to configure the M41h 48G Video Analyzer/Generator to generate TMDS streams instead of FRL streams. You will use the Link Training panel to set this. The Link Training panel is accessible from the Link Train button on the **Tools** tab. You can disable FRL using the FRL Off button.

To specify TMDS mode:

1. Specify the TMDS mode by disabling the FRL mode as shown below. Once you have disabled FRL you can select Formats and Patterns in the same manner as you select FRL formats.

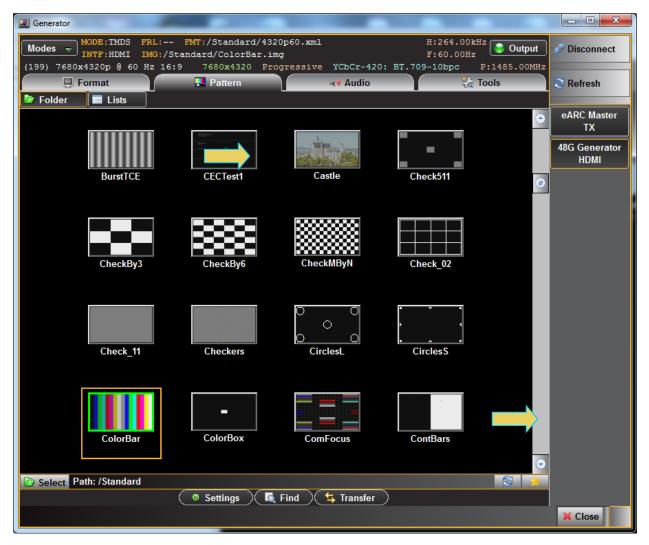


11.9 Selecting Test Patterns

Use the following procedures to select a test pattern.

To select a test pattern:

1. From the main window of the M41h 48G Video Analyzer/Generator, click the **Pattern** tab to access the list of test patterns. Clicking the star on the bottom right shows the active pattern.



2. Select a test pattern from the list by clicking or selecting it. There is a scroll bar on the right to allow access to the entire list by browsing.

You can either scroll through the list of test patterns or use the **Find** feature to search for patterns. When you press the **Find** activation button, you are presented with a dialog window where you can search for a pattern by name using initial and mid string partial searches (below).



The directory whose images (patterns) are being displayed is listed in the lower panel as indicated below. In the example below, the path is set to Standard which will display the entire test pattern library and is the default path.

You might wish to change the directory path if you have added your own bitmap patterns and wanted to select them without scrolling through the complete list. You may also have created a custom Pattern List using the **Pattern List Editor**. Refer to <u>Pattern List Editor</u> for details on creating a custom Pattern List.



You can change the directory path with the directory activation button **Select Frank Stationard**. When you select the directory icon a dialog box will appear allowing you to select the alternative path such as the User path shown in the dialog box below.

41h 48G Video Analyz	er/Generator for	HDMI 8K Testing	- User Guide		Rev. A1
💷 Generator					
Interface v PORT : HDM		andard/1080p59.xml andard/genstats.im		H:67.43kHz F:59.94Hz	ut 📝 Disconnect
(16) 1920x1080p @ 60	Hz 16:9	1920x1080 Proc	ressive RGB-8bpp	P:148.35	
📮 Format	Patt	ern	剩 Audio	Ca loois	😂 Refresh
L R					HDMI 2.0 Generator Card 5
3DBoxes	3DCIrRmp	3DXTalk	3DXTalk2	AFDTest	HDMI
		ӣ Image Path			Generator Card 7
		Instrument Folder		·	HDMI Playback Card 3
ANSIgray	Acer1	0 30	Acer3	Acer4	
•					
Acer5	Acer6	V Ok Cancel	Acer8	Acer9	
$^{\circ}$			-		
Anamorph	AnsiLght	Apple1	AudioLR	AudioLRf	
					•
Select Path: /Standa			6 Tour (60 6	*
	(_ ◎ Settir	ngs) (🙇 Find) (🔄 Transfer 🔵		Close

When you have changed the directory the User directory will be indicated on the lower panel beside the associated icon as shown below.



Now you can configure the list of patterns in accordance with a custom Pattern List by clicking on the

associated icon Eath: /User. A dialog box will appear enabling you to select a custom image list (below).

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide



You can select all or one custom Pattern List or any combination if you have several defined. The example above shows selecting one Pattern List. The **Check All** and **Un-Check All** activation buttons allow convenient selection where you have many Pattern Lists to choose from. The result of selecting one custom Pattern List is shown in the screen example below. A limited set of patterns are displayed. The Path icon on the bottom status panel will display that new list (indicated below).

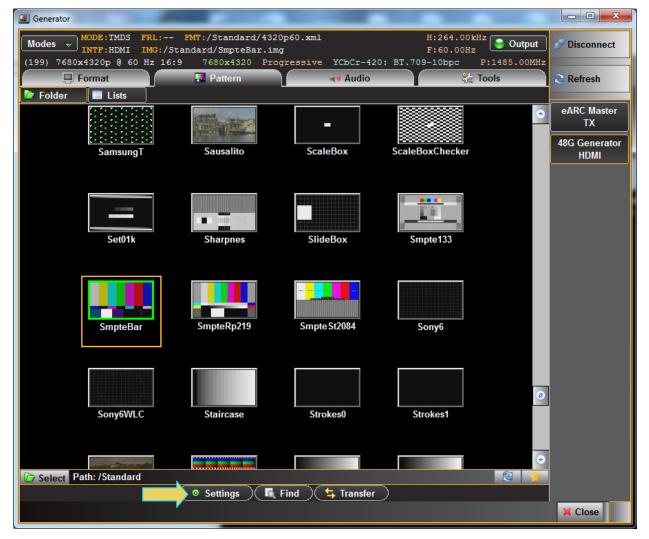
I Generator						
Interface ▼ PORT:HDMI2-7 INTF:HDMI 1000000000000000000000000000000000000	IMG:/Standar	cd/2160p60.xm cd/SmpteBar.in 3840x2160 Pr	ng	RGB-8bpp	H:135.00kHz F:60.00Hz P:594.00MHz	🦻 🔊 Disconnect
📮 Format	Pattern	-	📢 Audio	Ĩ	🖧 Tools	C Refresh
Folder Lists	Geom_1.img	GraysAll.img	Grill	11.img	Ramp.img	Generator Card 5 HDMI Generator Card 7 HDMI Playback Card 3
	 Settings) (属 Find)	🤇 ち Transfe	er)		A V
						X Close

11.9.1 Selecting Test Patterns Settings

Use the following procedures to select a test pattern.

To specify test pattern settings:

- 1. From the main window of the M41h 48G Video Analyzer/Generator, click the **Pattern** tab to access the list of test patterns.
- 2. Specify the image settings by clicking on the **Settings** button on the lower center of the panel.



The Settings dialog box appears as shown below:



 Enable and disable Gamma and Pseudo-random noise and set the gating as desired. Refer to the table below for details on these optional settings.

Pattern Settings - Gating	Description	Options
Gamma Correction	Enables or disables gamma correction which compensate for properties of human vision, to maximize the use of the bits or bandwidth relative to how humans perceive light and color.	• On • Off
Pseudo-Random Noise	Renders a test pattern with high level of volatility between adjacent pixels.	OnOff
Component Gating	Turns on or off the three primary color components.	 Red Green Blue

4. Select the rendition where applicable using the Rendition button. The associated dialog box is shown further below.

Some test patterns have multiple versions such as GraysAll. These multiple versions can be applied using the Rendition button and associated dialog box as shown below. There is a default that is iteration 0. In the example below iteration 2 is currently being rendered on the sink DUT.

Pattern Setti	ngs				X X
⊙ Gating	0 R	endition	O Level	💿 Params	
		\$	2	۵	MAX = 255)

5. Set the luminance level of the image with the Level button. The associated dialog box is shown further below.

You can increment the color component values or can decrement the color component values for all pixels of any image through the front panel or the command line. This feature enables you to increment or decrement the values in increments (or decrements) of 1 throughout a range of 0 to 255. The LEVP feature increments or decrements all color component values (R,G,B) for each action by the use.

Pattern Settings						
⊚ Gating	Rendition	◎ Level	⊚ Params			
	LEVP	¢	255	•		
Pattern Setti	O De	F fault O	'ELD 8 Bits) 32 Bits		

6. Set the pixel depth (PELD) if necessary through the Level button and associated dialog box shown above.

PELD establishes the number of data bits that represent each active pixel in video memory (frame buffer). Parameter. The default setting and setting of 8 allows 256 colors on an image (test pattern) to be rendered. This is suitable for the majority of test patterns. However, some test patterns contain more colors and either require PELD 32 or look optimal only when PELD is set to 32. The test pattern will indicate when PELD 32 setting is required.

- Default uses the M41h video generator default
- 8 8 bits-per-pixel (256 colors)
- 24 24 bits-per-pixel (16,777,216 colors).
- 7. Set the pattern parameters if necessary through the **Params** button and associated dialog box shown below. The following table describes each parameter.

Pattern Settings - Parameters	Description			
OFFX	Set horizontal offset for large patch of Regulate image			
OFFY	Set vertical offset for large patch of Regulate image			
DELX	Set horizontal shift for each step of SlideG/SlideRGB image			
DELY	Set vertical shift for each step of SlideG/SlideRGB image			
DWEL	Set number of frames for each step of SlideG/SlideRGB image			
PENW	Set width variable for line thickness in EeRise, NAWC, and Slider images			
PENH	Set height variable for line thickness in EeRise, NAWC, and Slider images			
SPAX	Set horizontal spacing			
SPAY	Set vertical spacing			
NCYC	Internal use			

Pattern Settings							
⊙ Gating	Rendition	O Level	🧿 Params				
OFFX	0 OFFY	0	PENW	77	PENH	77	
DELX	4 DELY	4	SPAX	320	SPAY	180	
	DWEL	1	нсус	1			

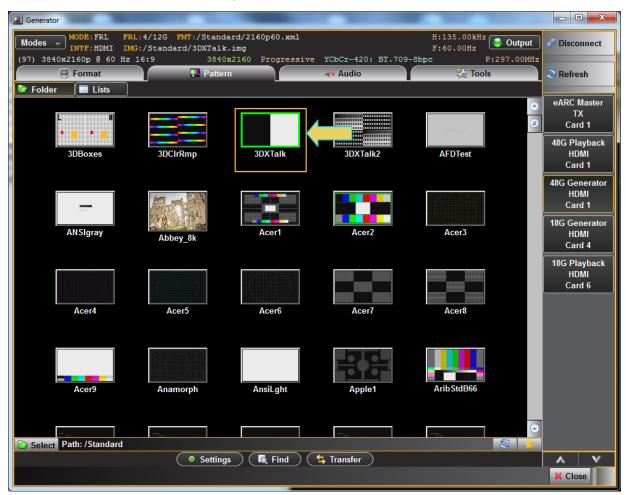
Rev. A1

11.10 Testing 3D Displays

Use the following procedures to test 3D displays.

To test 3D capable HDMI displays:

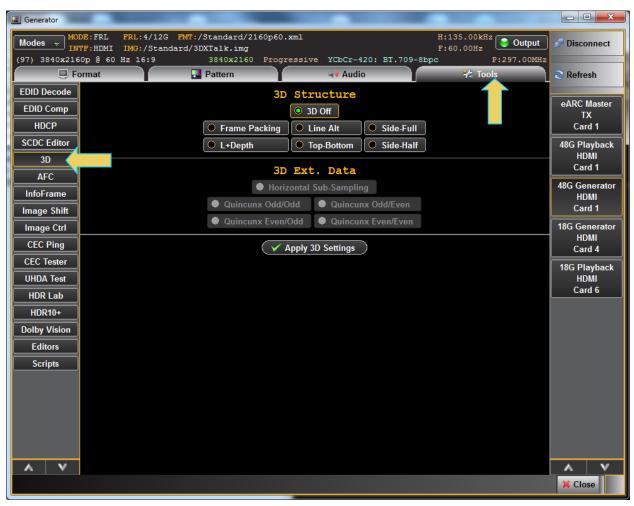
1. From the main window of the M41h 48G Video Analyzer/Generator, select a 3D test pattern for example 3DXTalk indicated in the screen example below.



2. Select the **Format** tab to select a format (resolution).

odes v INTF:HD) 3840x2160p @		ard/3DXTalk.in 3840x2		ve YCbCr-420:		135.00kHz 60.00Hz P:297.0	
Format		🛃 Pattern		剩 Audio		🖧 Tools	🗧 Refresh
CTA 🔩 VESA 1080s25W	Folder 1080s29	1080s29W	EDID 1080s30	1080s30W	1152iLA	1152iLA_	eARC Mast
1152iLH	1152iLH_	1152iSH	1152iSH_	2160p100	2160p100B	2160p100SB	Card 1
2160p100W	2160p119	2160p119W	2160p120	2160p120B	2160p120W	2160p23	48G Playba HDMI Card 1
2160p23SB	2160p23W	2160p24	2160p24B	2160p24SB	2160p24W	2160p25	48G Genera HDMI
2160p25B	2160p25SB	2160p25W	2160p29	2160p29SB	2160p29W	2160p30	Card 1
2160p30B	2160p30SB	2160p30W	2160p47	2160p47SH	2160p47W	2160p48	18G Genera HDMI Card 4
2160p48B	2160p48SH	2160p48W	2160p50	2160p50B	2160p50SB	2160p50W	18G Playba
2160p59	2160p59SB	2160)	2160p60	2160p60B	2160p60SB	2160p60W	HDMI Card 6
2160pS24	240p2xL1	240p2xL2	240p2xL3	240p2xL4	240p2xS1	240p2xS2	
240p2xS3	240p2xS4	240p2x_1	240p2x_2	240p2x_3	240p2x_4	240p4xL1	
240p4xL2	240p4xL3	240p4xL4	240p4xS1	240p4xS2	240p4xS3	240p4xS4	
240p4x_1	240p4x_2	240p4x_3	240p4x_4	288p2xL1	288p2xL2	288p2xL3	
288p2xS1	288p2xS2	288p2xS3	288p2x_1	288p2x_2	288p2x_3	288p4xL1	•
Select Path: /Stan	dard					C 2	

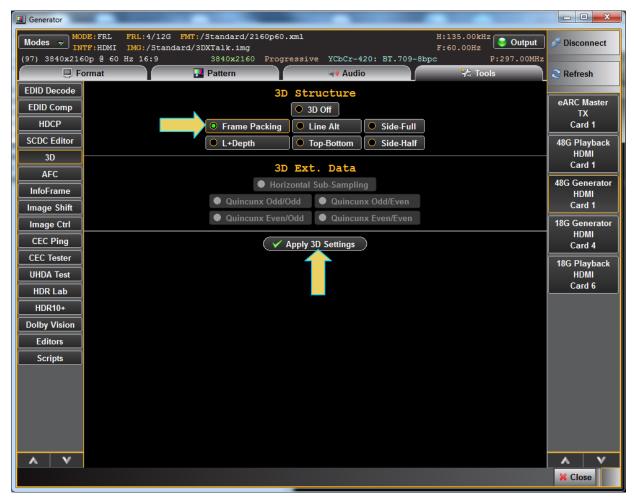
3. Select the **Tools** tab to access the 3D configuration utilities.

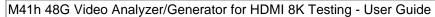


The following table describes the information on the **3D** dialog box.

3D Structure Method	Half Sampling Method	Left Sampling Position	Parameter – Vertical Blanking Lines	Right Sampling Position	Maximum pixel rate
Frame Packing	Not Applicable	Not Applicable	The number of lines between the left and right eye image - typically set to 30 lines for 720 timings and 45 lines for 1080 timings	Not Applicable	150MHz
Top and Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	300MHz
Side by Side (Full)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	150MHz
Side by Side (Half)	One of: - Horizontal - Quincunx	One of: - Odd position - Even position	Not Applicable	One of: - Odd position - Even position	300MHz

4. Apply 3D settings with the activation button provided.







11.11 Testing UHD Displays with UHD Alliance Test Patterns

The UHD Alliance test patterns are called out in the Ultra-High Definition Alliance Test Specification. The test pattern pack is required to assess a UHD TV's compliance to all tests in the specification including:

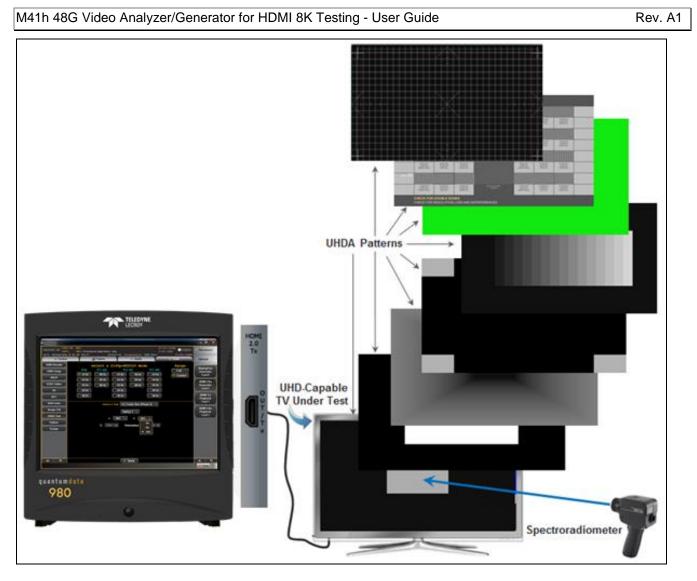
- Section 4.2 High Dynamic Range: Peak White
- Section 4.3 High Dynamic Range: Black Level
- Section 4.4 High Dynamic Range: Tone Mapping
- Section 4.5 Wide Color Gamut
- Section 4.6 Resolution
- Section 4.7 Input Frame Rate and Bit Depth
- Section 4.8 Grey-Scale Tracking

11.11.1UHD Test Setup

For testing a UHD-Capable TV, the M41h 48G Video Analyzer/Generator offers the necessary high resolution format, the test patterns and ease of use to quickly conduct functional testing using visual assessment or to conduct UHD compliance tests (Spectroradiometer required). When the UHD test patterns are selected through the M41h GUI interface, the emulates an UHD-capable source by transmitting the UHD test pattern and, where required, the will also transmit the necessary Dynamic Range and Mastering InfoFrame metadata.

The Dynamic Range and Mastering InfoFrame data includes an Electro-Optical Transfer Function (EOTF) and the Static Metadata with the dynamic range of the video stream.

The following illustration depicts the test setup.



11.11.2UHD Test Procedures

For detailed procedures to test UHD capable HDMI displays refer to the UHD Alliance Application Note.

11.12 Testing 4:2:0 Capable Displays

Use the following procedures to send HDMI 2.1-compliant 4:2:0 pixel encoding to a 4K-capable HDMI HDTV.

To select test 4:2:0 pixel encoding:

1. From the main window of the M41h 48G Video Analyzer/Generator, access the **Format** tab and select a 4K format such as 2160p as shown below.

I Generator	-	-			_	
Modes v Mode: FRL INTF: HDM		FMT :/Standard, rd/SmpteBar.in			H:264.00kHz F:60.00Hz	utput 🔊 Disconnect
(199) 7680x4320p @			ogressive YCbC			
Format		Pattern		udio	😪 Tools	Refresh
🖪 CTA 🛛 🖪 VESA	📴 Folder	Lists I				eARC Master
288p2xL1	288p2xL2	288p2xL3	288p2xS1	288p2xS2	288p2xS3	
288p2x_1	288p2x_2	288p2x_3	288p4xL1	288p4xL2	288p4xL3	48G Generator HDMI
288p4xS1	288p4xS2	288p4xS3	288p4x_1	288p4x_2	288p4x_3	
4320p100	4320p100B	4320p100SB	4320p119	4320p119B	4320p119SB	8
4320p120	4320p120B	4320p120SB	4320p23	4320p23B	4320p23SB	
4320p24	4320p24B	4320p24SB	4320p25	4320p25B	4320p25SB	
4320p29	4320p29B	4320p29SB	4320p30	4320p30B	4320p30SB	
4320p47	4320p47B	4320p47SB	4320p48	4320p48B	4320p48SB	
432(0	4320p50B	4320p50SB	4320p59	4320p59B	4320p59SB	
4320p60	4320p60B	4320p60SB	480i	480i2x29	480i2x30	
480i2x59	480i2x60	480i2xL1	480i2xL2	480i2xL3	480i2xL4	
480i2xL5	480i2xL6	480i2xS1	480i2xS2	480i2xS3	480i2xS4	
480i2xS5	480i2xS6 ard	48012	480i2x 2	480i4x29	480i4x30	
	📝 Edit) 💿 Settings	C Find	ち Transfer 🔵		
						🔀 Close

2. Select the Settings (refer to screen example above).

The **Settings** dialog box will appear as shown below:

Format Settings				
Color Space				
RGB VCbCr xvYCC opRGB				
• sYCC601 • opYCC • BT2020 cYCC • BT2020 YCC				
BT2020 RGB DCI-P3				
• 4:4:4 • 4:2:2 • 4:2:0				
Range Full Shoot Limited				
Bits per Component				
Scrambling Override				
Scrambling Currently Disabled				
Enabled				
Apply				

3. Select YCbCr for the Color Space and then select 4:2:0 (above). Note that the pixel rate indication on the top status bar will indicate 297MHz.

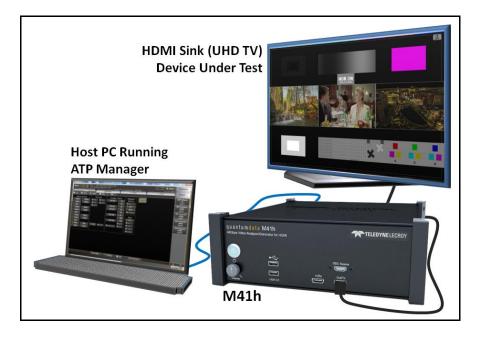
11.13 Testing UHD Displays with HDR Lab Test Patterns

The HDR Lab utility is an optional test pattern pack that requires a license to use.

In order to address the HDR needs of the industry from Device Manufacturers to HDR content Post-Production, Teledyne LeCroy has worked together with industry experts Joe Kane of Joe Kane Productions and Florian Friedrich to develop this new test option "HDR Lab." The solutions use the M41h 48G Video Analyzer/Generator. There are two test applications:

- HDR Display Test Suite Verifies various HDR attributes such as: peak brightness, native contrast, color decoding, signal clipping, and color gamut on an HDR-capable UHD TV using a variety of test patterns (below) while enabling the user to change important signal parameters to test the response of any given HDR display.
- HDR End-to-End Validation in Post Production Verifies HDR metadata, signal levels and many more relevant parameters throughout the post production process. Reference images can be compared with HDR workflow outputs.

The HDR Lab utility is supported by the M41h 48G Video Analyzer/Generator. The HDR Lab utility is an optional test pattern pack that requires a license to use. The illustration below depicts the test setup.



The following table describes just some of the Test Patterns and Reference Images that comprise the HDR Lab utility. Additional test patterns and test images are included and will be described in subsequent versions of this application note.

HDR Lab Test Patterns	
Test Pattern Name	Function, Pattern Layout and Use
Combination Test Pattern	
AB	B C C C C C C C C C C C C C C C C C C C
	D HDR ON when solid white
F	
G	
Function	The Combination Test Pattern's top and bottom portion provide a quick overview of display conditions for black level, white level, HDR on (status information) in the display, color, gray scale with bit depth, resolution, overscan, color decoding, and a 50% gray level. The three images in the center provide example of images color graded for HDR-10, P3 color in a BT.2020 container, mastered at 1,000 nits.

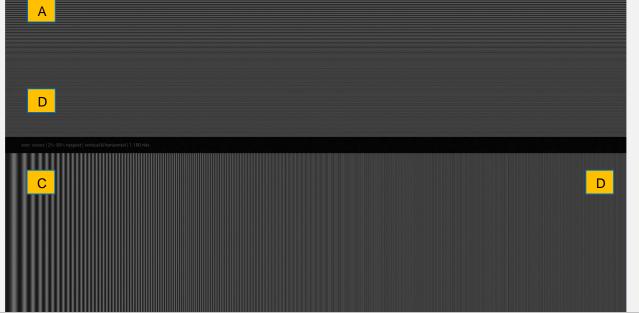
Page 298

Rev. A	1
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HDR Lab Test Patterns	
Test Pattern Name	Function, Pattern Layout and Use
Pattern Layout	The patterns at the top of the image deal primarily with dark part of what can be conveyed in an image while the ones at the bottom deal with resolution color and the bright parts of the image.
	At the top left [A] we have steps near black. Since the PQ curve is absolute we'll call out specific intensities as light levels instead of signal levels. The center of and outside of the rectangle [B] is at black. The band in between is at 0.1 nits.
	The top middle contains a sine wave taking us from 0.1 to 100 nits [C]. Just below the gray ramp is our on screen indication of HDR being on or off. If the letters in 'HDR ON [D] when solid white' are all white then HDR is on in your set. If there are changing shades of gray then HDR is off or tone mapping is not working correctly You can set metadata in the generator to indicate to the display that HDR should be on or should be off.
	The top right shows patches of primary and secondary colors (red, green, blue, cyan, magenta and yellow) [E]. They are 75% in luminance level, 100% color saturation. The 75% level was chosen as it is about 1,000 nits, the level at which most of the current HDR content is being mastered. When we say it is 100% saturated we mean it is a single color with other color channels set to black level. If it is red it is only red and the red is at a level of 75%. There is no blue or green content.
	The center of the combination pattern shows parts of demonstration materials [F]. For the purposes of the generator they are currently single frames from a motion sequence that may later be available in motion from the generator.
	The bottom left is a set of rectangles at levels above 1,000 nits [G]. In a 1,000 nit display they should all appear to be one level.
	The grid in the center varies from dark to light on a 100 nit background [H]. It's used for determining if there is any excessive image enhancement happening in the picture. You'll see ringing around the edges of the grid if there is image enhancement. The white in the pattern doesn't go any higher than 1,000 nits.
	Just to the right of center are two plus symbols [I], one black and the other at 250 nits. Their edges have been slightly softened so the diagonal edges shouldn't be jagged. Under some circumstances they might trigger streaking in the display. They are against a 100 nit background. In the corners of this section there are references for full and half resolution, vertically, horizontally and in a checkerboard.
	The bottom right portion of the pattern is a reference for color decoding [J]. The source signal is stored in RGB, while the generator is capable of converting it using the BT 2020 Y Cb Cr equations. Using the red, green and blue only capability of some sets you'll be able to inspect how well each of the channels is represented. Details for what you should be seeing are illustrated in the section describing color bars with a gray reference.
Description of Use	This pattern is designed to be fully functional in the HDR mode of a UHD set as levels in it are specific to the PQ based HDR-10. It serves as a quick reference for black and white levels,, BT 2020 Y Cr Cb color decoding, sharpness, resolution and overall image quality. Primary color measurements can be made on the patches in the upper right corner and peak light output capability can be measured in the bottom left of the pattern as long as there are no image uniformity issues or significant APL limitations.

HDR Lab Test Patterns	
Test Pattern Name	Function, Pattern Layout and Use
Clipping Test Pattern	
A	C LC LC LC
000 000 1000	
Dosen	
Function	The Clipping pattern is designed to be a quick human inspection pattern to subjectively test for clipping, tone mapping, peak luminance and adherence to the PQ curve. The clipping and tone mapping can be assessed subjectively by inspection. The measuring and calibration of the luminance can be assessed objectively using a measurement sensor or a professional camera with descent manual exposure. The UHD TV under test should be set in the HDR mode for all tests.
Pattern Layout	The Clipping Test pattern is comprised of the following elements: There is a 0 nit vertical band on left side [A] and the 500 nit vertical band on the right side [B]. There is a set of 9 elements in the center arranged as a 3x3 grid. The upper left box [C] in the 3x3 grid is a 100 nit box. The upper right box [D] in the 3x3 grid is an index indicating the percent luminance for each of the letter gradations in the remaining colored elements in the 3x3 colored box grid. The index also relates the percent luminance to a nit value assuming a display following the absolute PQ EOTF (SMPTE 2084). There are six colored boxes for the primary and secondary colors. These colored boxes are 100% color saturation. Each colored boxes (example yellow [E]) and the luminance box [F] are concentric bands which have lettered indications on each of the bands that correspond to the percent luminance and the number of nits in each circular band. On a 1000 nit display, with 1000 nit metadata for the maximum luminance of the mastering display, we expect a solid circle in the center reaching out to the 1000 nit indicator (J) +- 5% according to the tone mapping strategy of the display manufacturer.

 1,000 nit mastering luminance is the default value set for this pattern. The vertical bands on the left [A] and the right [B], and the box at [F] may be used to determine if the display is properly following the Perceptual Quantization (PQ) curve. The 100% saturated primary and secondary colored concentric bands in the 3x3 grid are used test for clipping according to the mastering luminance set by the HDR metadata (default: 1000 nit). As you move inward on any of these circular bands from A to S, you are increasing the luminance. On a 1,000 nit display and using the 1000 nit mastering luminance metadata, you should be able to distinguish the bands from A to about J (75% luminance on a 1000 nit display but from about J to S, you should not be able to distinguish the bands, in other words the color should be clipped from about J (+/- 5%) inward toward the center at S. With 1,400 nit metadata you should be able to distinguish the bands from A to about L with the remaining bands from L S indistinguishable. The last band that is distinguishable, example J would represent the peak luminance of the display, which for a 1000 nit display would be 1,000 nits. If the metadata were mastered at 10,000 nit luminance, you would be able to distinguish all the bands because in that case the display to the display's color or luminance levels that we beyond to the capabilities of the display to the display's color or luminance values that were beyond to the capabilities of the display to the display's color or luminance values that were beyond to the capabilities of the display to the display to the display's color or luminance capabilities. 	Test Pattern Name	Function, Pattern Layout and Use
 test for clipping according to the mastering luminance set by the HDR metadata (default: 1000 nit). As you move inward on any of these circular bands from A to S, you are increasing the luminance. On a 1,000 nit display and using the 1000 nit mastering luminance metadata, you should be able to distinguish the bands from A to about J (75% luminance on a 1000 nit displa but from about J to S, you should not be able to distinguish the bands, in other words the color should be clipped from about J (+/- 5%) inward toward the center at S. With 1,400 nit metadata you should be able to distinguish the bands from A to about L with the remaining bands from L S indistinguishable. The last band that is distinguishable, example J would represent the peak luminance of the display, which for a 1000 nit display would be 1,000 nits. If the metadata were mastered at 10,000 nit luminance, you would be able to distinguish all the bands because in that case the display would tone map the colors and luminance levels that we beyond to the capabilities of the display to the display's color or luminance capabilities. Alternatively, were the display under test to be set in the SDR mode, you would expect to be ab to distinguish all bands. All luminance levels would be viewable up to 100% which would correspond to 100 nits. In this case tone mapping would occur to reassign color and luminance values that were beyond to the capabilities of the display to the display to the display's color or luminance capabilities. 	Description of Use	
 bands because in that case the display would tone map the colors and luminance levels that we beyond to the capabilities of the display to the display's color or luminance capabilities. Alternatively, were the display under test to be set in the SDR mode, you would expect to be at to distinguish all bands. All luminance levels would be viewable up to 100% which would correspond to 100 nits. In this case tone mapping would occur to reassign color and luminance values that were beyond to the capabilities of the display to the display's color or luminance capabilities. The user could use the M41h HDMI Video Generator InfoFrame Utility to test different metadated. 		luminance. On a 1,000 nit display and using the 1000 nit mastering luminance metadata, you should be able to distinguish the bands from A to about J (75% luminance on a 1000 nit display) but from about J to S, you should not be able to distinguish the bands, in other words the colors should be clipped from about J (+/- 5%) inward toward the center at S. With 1,400 nit metadata, you should be able to distinguish the bands from A to about L with the remaining bands from L to S indistinguishable. The last band that is distinguishable, example J would represent the peak
to distinguish all bands. All luminance levels would be viewable up to 100% which would correspond to 100 nits. In this case tone mapping would occur to reassign color and luminance values that were beyond to the capabilities of the display to the display's color or luminance capabilities. The user could use the M41h HDMI Video Generator InfoFrame Utility to test different metadat		If the metadata were mastered at 10,000 nit luminance, you would be able to distinguish all the bands because in that case the display would tone map the colors and luminance levels that were beyond to the capabilities of the display to the display's color or luminance capabilities.
•		correspond to 100 nits. In this case tone mapping would occur to reassign color and luminance values that were beyond to the capabilities of the display to the display's color or luminance
		The user could use the M41h HDMI Video Generator InfoFrame Utility to test different metadata scenarios such as 1,000 nit, 4,000 nit and 10,000 nit mastering luminance.



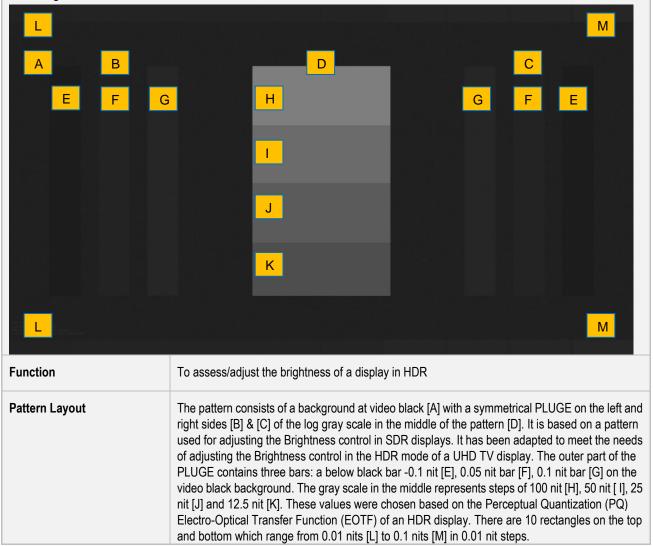
HDR Lab Test Patterns			
Test Pattern Name	Function, Pattern Layout and Use		
Function	This Luma Resolution pattern is designed to be a quick human inspection pattern to subjectively test for proper handling of resolution without color being involved. It uses 1 to 100 nits in HDR mode to ensure that there should never be any clipping		
Pattern Layout	The Luma Resolution Test pattern is comprised of the following elements: A luma sine wave resolution vertical sweep on the top [A] to [B] and a luma sine wave resolution horizontal sweep on the bottom [C] to [D]. The sine waves vary from a luminance of 1 to 100 nits for each cycle and at a frequency that ranges from 2% to 50% of the Nyquist frequency from start to end of each sweep. Both frequency sweeps are linear.		
Description of Use	Check the pattern in both RGB and YCbCr in all sampling modes: 4:4:4, 4:2:2 and 4:2:0. Also check for different bit depths. In none of these colorimetry or sampling modes should the observer see any chroma. There should be no loss of resolution; the waves should all be distinguishable. Interferences (ringing) are indicating edge enhancement, masking some of the original information.		

Chroma Resolution Test Pattern

A D snewars (2x-2x) (444 systef) (serifical & hercental) - 55% dyr	
Function	The Chroma Resolution pattern is designed to be a quick human inspection pattern to subjectively
	test for proper handling of chroma resolution and chroma subsampling.
Pattern Layout	The Chroma Resolution pattern is comprised of the following elements: A chroma sine wave resolution vertical sweep on the top [A] to [B] and a chroma sine wave resolution horizontal sweep on the bottom [C] to [D]. The sine wave's green and magenta colors are fully saturated at their peaks at each frequency but vary in dynamic range only up to 50% throughout each sine wave cycle at their peak. The frequency of the sine wave sweep ranges from 2% to 25% of the Nyquist frequency from start to end of each sweep. Both frequency sweeps are linear.

HDR Lab Test Patterns				
Test Pattern Name	Function, Pattern Layout and Use			
Description of Use	Check the pattern in both RGB and YCbCr in all sampling modes: 4:4:4, 4:2:2 and 4:2:0. Also check for different bit depths. In none of these colorimetry or sampling modes should the observer see any chroma other than magenta or green or something in between. The green and magenta at their peaks should look equally saturated. There should be no gray, black or highlighted color between the colors nor should there be any blue or red chroma even in 4:2:2 or 4:2:0. The edges should not be desaturated, i.e. the area between the peaks should not look grayish or black. There should be no loss of resolution; the waves should all be distinguishable. Interferences (ringing) are indicating edge enhancement, masking some of the original information.			

HDR Pluge Test Pattern



November 21, 2019

HDR Lab Test Patterns	
Test Pattern Name	Function, Pattern Layout and Use
Description of Use	The levels in this PLUGE pattern are specific to the 1,000 nit master using the PQ version of HDR. The pattern has been designed to function the same way as the SDR version of PLUGE but at levels specific to 1,000 nit PQ curve. This particular pattern is not correct for use in the SDR mode of a display.
	The PLUGE is on both sides of the center to provide a greater opportunity to set black taking image uniformity and viewing angle into account when setting the brightness control. There are two above black steps [F] [G] in the PLUGE, one really close to black and the other a little further above it. The step below black may or may not be visible depending on where the individual set clips black.
	The HDR-10 system we are using assumes nothing useful in picture information will go below black. Some sets will accommodate the below black portion of this signal just to make it easier to properly set the Brightness control. Others won't and there will be nothing lost in the picture if the set clips everything below black.
	Turn the brightness control up far enough so the strip just above black [G] is clearly visible. Turn the control down to the point where the just above black stripe disappears into the black background. Raise the Brightness control just enough for the strip to reappear. This is the correct setting for black.
	If the below black stripe is visible when the Brightness control is turned up, turn the control back down to the point where the below black [E] stripe disappears into the background with the just above black strip still being visible.
	The pattern has a low average picture level (APL). As much as white levels may change in the HDR mode depending on APL black level should remain fixed.
	In some displays you'll never actually reach black, an absence of light. What you reach is a digital cut-off, a point where information in the video signal is no longer displayed. Any information in the signal above black will be displayed, even if it looks slightly washed out because the set can't make an absence of light.
	The center grayscale [D] allows for a quick determination of the color of gray. Many calibrators use this pattern as a reference for quickly adjusting a grayscale as it allows one to see what is happening to the entire gray scale as adjustments are being made.

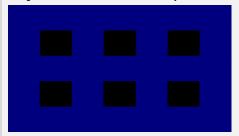
HDR Lab Test Patterns	
Test Pattern Name	Function, Pattern Layout and Use
Reverse Ramp Test Pattern	
C	
•	4 North Gapp Alternative added
в	
*	5
C	
Function	The Reverse Dither Ramps test pattern provides a look at how well the display is doing at producing a smooth gray scale with no apparent steps. It helps assess color bit depth handling
	and gray tracking. Through visual inspection an assessment can be made as to whether the display is handling 10 bit color properly. Also the bidirectional nature of the ramps enables an
	assessment as to whether improper bit depth handling or setting is related to a problem at a specific luminance level or a region of the display.
Pattern Layout	The Reverse Dither Ramp test pattern is comprised of two luminance ramps running in the opposite directions [A] and [B]. The top and bottom horizontal bands [C] are at black. There has
	been some low level static dither noise added across the entire image to make it easier to discern banding. The ramps are in the center of the image. The top ramp goes from 25% luminance on the
	left to 75% luminance on the right. The lower ramp goes from 75% luminance on the left to 25% luminance on the right. There are indicators on the ramp to show the luminance level.
Description of Use	The ramps in this pattern should be smooth with no visible stepping (banding) from one level to another which would indicate improper rendering of 10 bit content. The amplitude is limited to 75%
	reflecting the 1,000 nit mastering level. There should be no chroma artifacts—no color detectable. If color is observed this means that the gray tracking on the display is improper. Switch between 8
	bit mode and 10 bit mode on the video generator and verify that there is a difference on the display.

ColorBars Test Pattern	
Function	To assess color decoding and or assist in determining the best operating positions of the Color and or Tint control.
Pattern Layout	This pattern is specific to HDR-10 and the PQ EOTF, but also works for SDR. It consists of a 50 % gray background with yellow, cyan, green, magenta, red, and blue rectangles on the top and bottom rows in the image. The colors are 50% in level and are reversed in direction from the top to the bottom. The original signal in the generator is stored as a RGB signal gets converted according to the requirements (for example the ITU 2020 specifications for YCrCb).

Description of Use

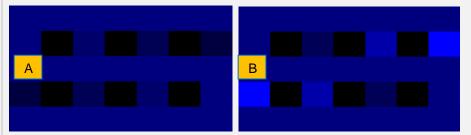
This pattern was designed to better serve the function of checking and adjusting color decoding in all component video systems. Its larger area of reference gray makes it much easier to use, especially when dealing with user menu graphics that often cover just the area you want to see in the conventional color bar pattern. This pattern is particularly useful when trying to evaluate the conditions of the green and red channels after levels have been properly set while looking at the blue channel.

Decoder adjustments should be made looking at the blue channel. You'll find a blue only function in the user menu of several brands of TV sets. Alternately you can use the blue filter that comes with some calibration discs. When looking at the blue channel all of the areas of the blue in the image should be the same intensity.



All areas of blue should be the same intensity (above).

The two images below show the adjustment color control:



If the color control is low in level some of the areas will be desaturated as shown above [A]. If the color control is set high in some of the areas they will look oversaturated as shown above [B].

In a component video system the Tint control should not be active but a number of TV set manufacturers make it active anyway. If it is functional adjusting it will affect the inside squares more than the outside squares. Adjust it so the squares are equal in level with the reference areas. If the Tint control is active it may interact with the Color control making it necessary to go back and forth between the two controls to get the desired results. If the set won't do exactly as it is supposed to do get as close to correct as you can.

Once the blue channel is set properly the other two channels should be checked. Details of how you might do this are covered in the Background on UHD section of this document. If you have access to the green only and red only they should look like the following illustrations.

All levels of green and red should be equal.

The decoder is most likely not functioning properly if the blue channel is correct and the red and or green channel is (are) wrong.

Function, Pattern Layout and Use

Castle Reference Image



Function	The Castle image is a natural image shot with a Nikon D800E still picture camera. The image offers rich dynamic range and detail that usually is not produced by a motion picture camera. The image is used to gain a subjective assessment of the display's ability to render details in a high dynamic range setting and also the ability to maintain detail within highly saturated colors.
Pattern Layout	The Castle image offers high dynamic range and color saturation and a high level of detail with maximum resolution where there are single pixel transitions between image elements. The image contains details in the highlights (example on the left side wall of the castle at [A]) and in the shadows (example on the windows in the roof at [B]). The image also has a lot of highly saturated colors in the greens on the trees in the foreground at [C].
Description of Use	Visually inspect the image for sharpness. The details of the bricks on the left side of the castle wall [A] should be discernable despite the highlights of the wall; in some cases you should be able to see each individual brick. The wall should not look washed out.
	The details in the shadows should be discernable as well, for example on the windows of the roof at [B]. You should be able to see the details of the grid on these windows.
	Check for resolution artifacts such as double edges or loss of chromatic details in the leaves on the trees in the foreground example [C]. The individual leaves should be distinguishable and not desaturated. You should not see a uniformly colored patch of green.

Function, Pattern Layout and Use

Flowers Reference Image

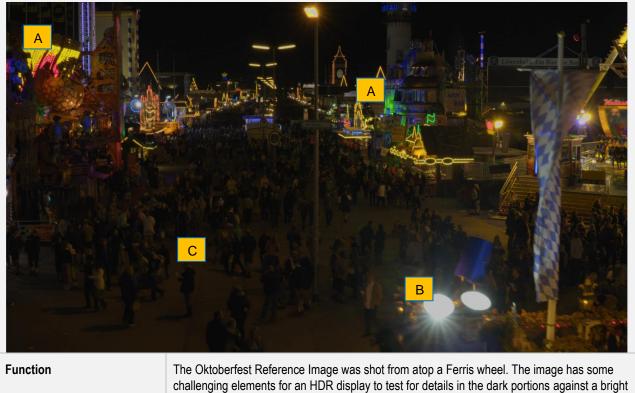


	colors throughout the highly saturated natural flowers.
Pattern Layout	The Montage Flower image contains an arrangement of fully chroma saturated flowers of various hues. The image was shot with a 4K Red ONE Mx digital motion picture camera in a warm ambience light environment ~3000 degrees Kelvin. The warm nature of the image was maintained throughout the color grading process. The image was mastered such that is appears naturally on a P3 color gamut display, while using BT.2020 as a container.
Description of Use	Upon visual inspection the colors in the flowers should be differentiated without any patches of uniform color. The lighter parts of the image especially should not be uniform in color which would indicate that the colors were clipped.

HDR Lab Reference Imag	ges
Reference Image Name	Function, Pattern Layout and Use
Cruise Ship Reference Image	
Function	The Cruise Ship image is a natural image shot in time lapse with a Canon 5D Mark 2 camera. The image is used to gain a subjective assessment of a display's ability to render details in a high dynamic range setting.
Pattern Layout	The Cruise Ship image offers high dynamic range image. The image depicts a sunset with the sun behind a cruise ship at dock. The clouds contain nearly white elements. The sun is behind the ship and the image is graded in such a way that you see the transition from the violet bluish sky a yellowish sunset.
Description of Use	Visually inspect the image for details in the carrier vessels beside. A high level of details in these vessels should be discernable. The lights on these smaller vessels [A] aiming toward the viewer, should appear considerably brighter than the diffuse white parts of the image.
	Inspect the windows on the navigator's deck on the front of the ship; notice the reflections on the glass [B] which should exhibit some color and should be brighter than the windows adjacent to them.
	Overall the image should reveal a dramatic effect exhibiting stark dynamic range transition from the sun light clouds at [C] to the shadows aside the ship [D]. The impression that the sun is behind the ship should be pronounced. This dramatic level of high dynamic range will not be visible when the display is in the SDR mode.
	There should be a significant difference in the brightness between the outer and inner portions of the cloud nearest the sun at [C]. The yellows in the clouds should be highly saturated.

Function, Pattern Layout and Use

OktoberFest Reference Image

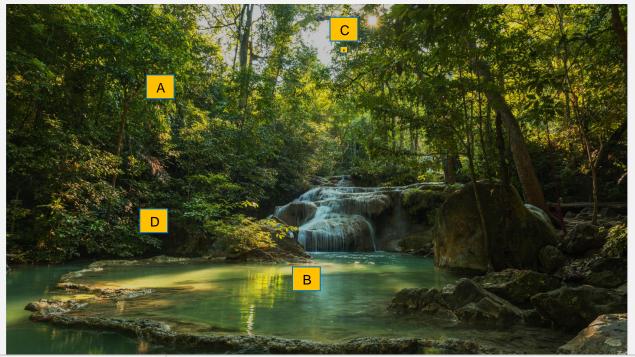


	light and also for wide color gamut.
Pattern Layout	The main elements to examine are the LED lights in the background [A], the bright white 1000 nit light in the foreground [B] and the people walking in the shadows [C]. Note that the sky in the background should be uniformly black.
Description of Use	The bright 1,000 nit light in the foreground is pointing directly at toward the camera. Ideally, it should appear like a real light. The LED red, green and blue lights in the background are great examples of why a modern HDR display needs to have a wider color gamut than the current BT.709. There are elements of these LEDs that extend into coordinates of the P3 and BT.2020 color space. They are highly saturated and radiate though a very narrow color spectrum. They should appear as modern LED lights.

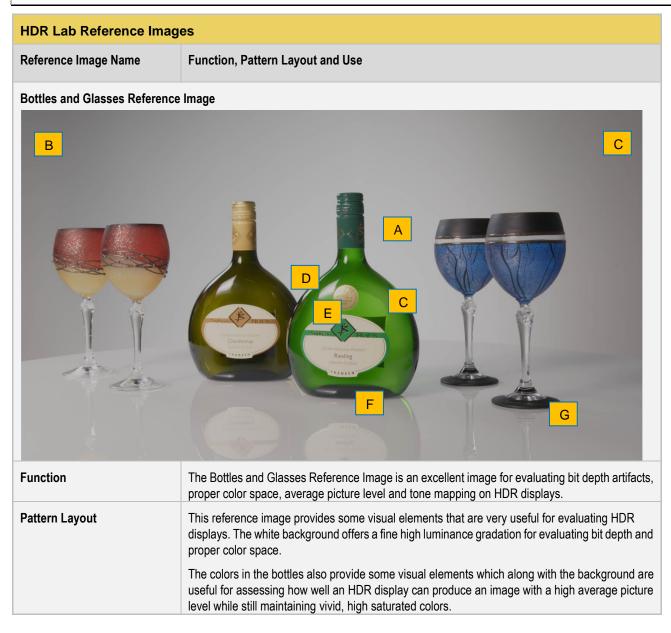
Another challenging element of this image is the amount of details in the people walking in the shadows. These elements are near black but a viewer should be able to discern the individuals and differentiate their clothing. Their shadows should also be clearly visible.

Function, Pattern Layout and Use

Forest and Waterfall Reference Image



Function	The Forest and Waterfall reference image contains many elements that are ideal for evaluating HDR displays. This is a good representation of what HDR should be able to do. It can show bright highlights differentiation in bright colors and subtle differentiation in the dark portion of the images.
Pattern Layout	The image offers several challenging visual elements with varying levels of bright and highly saturated greens as well as greens in the shadow. The image should show this differentiation in the greens. To accurately represent these colors it would be necessary to have a display that is capable of producing bright colors without losing color information. In a poorly engineered HDR display, the greens would tend to appear the same color.
Description of Use	The leaves should not appear to be the same color throughout the area at [A]. Some are reflecting the sunlight and some are in the shadows. Some of the leaves are younger and in the sunlight and so they should appear with a vivid green. Some are older and should appear less saturation.
	The same sort of differentiation in the greens should also be apparent in the water [B]. Examination of the water elements should show a variety of blue, cyan and green colors.
	One particular element that is challenging is the sun peeking through the leaves [C] and reflecting off the leaves. A well-engineered HDR display should be able to reproduce that these highlights. On a ideal HDR display, it should actually look like the sun is hitting your eyes.
	The image also contains some details in the dark elements. Close examination of these elements should reveal some details and differentiation even in the darkest areas [D]. This is what makes a good HDR TV; it should be possible for a viewer to distinguish between the darks. If you see a uniform black area in the picture this means that the HDR display is not properly representing the visual elements.



HDR Lab Reference Images	
Reference Image Name	Function, Pattern Layout and Use
Description of Use	Examine the light background behind the bottles and glasses in the foreground. The background should be a smooth gradation from the brightest portion in the center [A] to the slightly darker areas on the edges [B]. There should be no discernable steps or banding. If there is any banding that is an indication that the display is not handling the color depth properly. Also there should be no chromatic elements apparent in the background. An appearance of greenish or reddish chroma elements in the background would be an indication that the wrong color space standard is being used. For example: If the display would decode YCbCr following the BT.709 matrix coefficients, while the generator created it with BT.2020 matrix coefficients.
	Examine the bottles. The green [C] on the bottle should pop out; some of the elements should be vivid, highly saturated green. The transitions in the color should look natural with no stark changes. If the colors do not appear highly saturated this would be indication that the HDR display cannot produce an image with a high average picture level and still produce saturated colors.
	The brightness of the specular highlight on the bottle [D] should be significantly brighter than the white background [A]. The reflections should not appear as diffuse light. If there is not a significant difference between the reflections and the diffuse background, then this is a sign that the display is doing aggressive tone mapping.
	The round label on the green bottle at [E] has some structural elements. These structural elements should be readily discernable.
	The bottom of the glasses at [F] and the bottom of the bottle at [G] are near dark but they should not appear as being completely black. They should appear as a gradation.

HDR Lab Reference Images Function, Pattern Layout and Use Reference Image Name Las Vegas Dark and Bright Reference Image the would 111 С A R Las Vegas - Dark

Las Vegas - Bright

HDR Lab Reference Images	
Reference Image Name	Function, Pattern Layout and Use
Function	This pair of images is good for evaluating how OLEDs and LCDs handle highlights in differing Average Picture Levels of brightness. The set of image is also useful for testing projection system's ability to reproduce black levels or contrast. The pair of images presents different challenges for OLED HDR TVs vs LCD HDR TVs because the highlights remain the same intensity of light but the ambient light changes dramatically. The Las Vegas Dark image starts off with a very low Average Picture Level (APL) and the Las Vegas Bright Image has a much higher APL which is challenging an APL dependent TV. Some HDR TVs can produce bright highlights when the scene is dark but they cannot produce these bright highlights when the scene is getting brighter. As a result some TVs would look less rich in contrast.
Pattern Layout	There are two images of the Las Vegas Strip taking from the Cosmopolitan hotel using time lapse photography. The Las Vegas Dark image was taken in the middle of the night. The Las Vegas Bright image was taken in the early morning hours.
Description of Use	Images with high Average Picture Level are sometimes difficult to reproduce with current OLED TVs. This technology will result in a loss of contrast where an image has highlights with a high APL. Therefore the Las Vegas Bright image is challenging for OLEDs.
	Images with a low Average Picture Level are sometimes difficult to reproduce with LCD TVs.
	When subjectively evaluating these images, you should look out for good differentiation in the darkest parts of the image, like the underlying structure in the water in the center of the image [A]. Cars on the street [B] should be individually distinguishable while still providing texture.
	The individual letters of the Eiffel tower restaurant [C] advertising should be perfectly sharp and separated. In some of these letters, you should be able to see single pixel transitions, where one pixel is white and the next is nearly black.
	The street lights and hotel lighting should appear like realistic lights, adding depth to the scene.
	The image with the higher APL should reveal many more details of the area, while maintaining the intensity of lights in a realistic way, still reasonably differentiated from the background.

HDR Lab Reference Images **Reference Image Name** Function, Pattern Layout and Use Mountain Lake Reference Image E D С В Function The Mountain Lake reference image German Alps in the early morning contains several useful elements for evaluating HDR displays. Pattern Layout There is a low hanging cloud in the foreground floating just above the lake. The cloud should really pop out on good HDR display. The lake gives off a reflection that should appear bright silver almost a metallic surface [B]. The image overall should have a warm appearance and should not look bluish in the clouds or sky. If the color temperature on the display is not adjusted correctly, then the mountains in the background would show a intense blue. **Description of Use** There should be a lot of detail visible in the trees. There is a path [C] that should be discernable. The fresh younger trees on the left of the path [D] are in the sunlight and should show a lot of detail and there should be some differentiation in the green colors. They should really pop out from the duller greens in the shade in front and older trees behind them. An examination of the cloud area just above the horizon [E] where the mountains forming the valley occur should not show banding, nor should they look uniform in color at any point. There should not be any chroma elements in the clouds.

HDR Lab Reference Images

Reference Image Name

Function, Pattern Layout and Use

Faces Reference Image



Function	The woman's face was shot with a RED Epic Dragon camera. The lighting that was used had a warm color temperature slightly below 3000K to match the candles in the background. The pattern is designed to reveal the TV's capability to reproduce warm skin tones, soft highlights and clear differentiation in the darkest parts of HDR images.
	It also shows potential viewing angle issues and halos around bright objects if the display has such issues.
Pattern Layout	The skin tones should look natural and well differentiated in the lights as well as the shadow part below her chin. Hairs should show good structure with no ringing or other artificial edges.
	The candles in the background [A] should appear with a soft bouquet, while being noticeably brighter than the face itself.
Description of Use	The image should look soft in the background and sharp in the foreground, while the scene light should provide an ambience like in a dinner situation with a lot of near black details.
	Hair and skin should show shadow details [B]. The system is not set up properly when there are larger areas of uniform black in the image.
	In order to test for viewing angle dependencies, you may choose a specific angle like 30 degree or 45 degree relative to the screen and look for luminance and color changes especially in the dark part of the image.

To test your UHD display with HDR Lab:

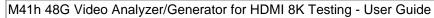
- 1. Make the physical connections as shown in Making the physical HDMI connections.
- 2. Access the **Generator** window from the **Card Control** page.



The Generator window opens.

Note: You can access the HDR Lab patterns from the **Patterns** tab individually or use the **HDR Lab** utility. The instructions below use the HDR Lab Utility under the **Tools** menu and this is the recommended way.

3. Select the Format tab menu and select 8K at 30Hz format.





4. Select the **Tools** tab and then the **HDR Lab** utility.

The HDR Lab utility window appears as shown below.

Rev. A1



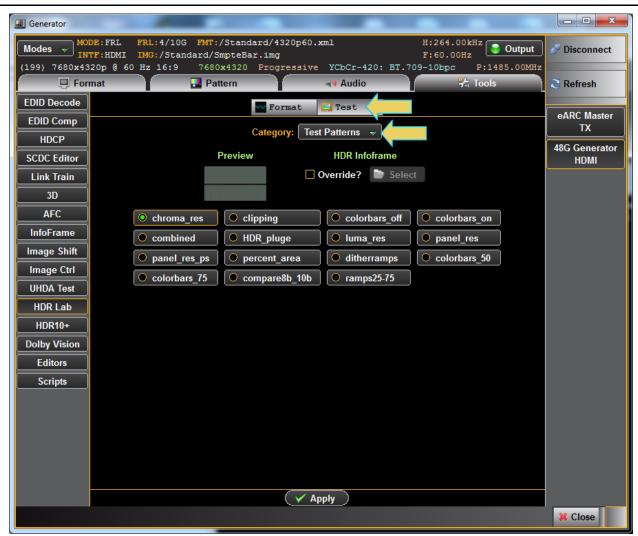
I Generator		
	DE:FRL FRL:4/10G FMT:/Standard/4320p60.xml H:264.00kHz TF:HDMI IMG:/Standard/SmpteBar.img F:60.00Hz	Putput 💋 Disconnect
	320p @ 60 Hz 16:9 7680x4320 Progressive YCbCr-420: BT.709-10bpc P:1485	
🖉 📮 Form	rmat 🔛 Pattern 📣 Audio 😪 Tools	C Refresh
EDID Decode	Format 🔁 Test	
EDID Comp		eARC Master TX
HDCP	Select a 2160p+BT2020 Mode Dept	
SCDC Editor	RGB YCC-420 YCC-422 YCC-444 O 8 bpc	
Link Train	● 23 Hz ● 50 Hz ● 23 Hz ● 50 Hz ● 23 Hz ● 10 bp	bc
3D	• 24 Hz • 59 Hz • 24 Hz • 59 Hz • 24 Hz	
AFC	● 25 Hz ● 60 Hz ● 25 Hz ● 60 Hz ● 25 Hz	
InfoFrame	• 29 Hz • 29 Hz • 29 Hz	
Image Shift	• 30 Hz • 30 Hz	
Image Ctrl		
UHDA Test		
HDR Lab		
HDR10+		
Dolby Vision		
Editors		
Scripts		
	Apply)	
		X Close

- 5. Select the Format button to access the video parameter selection page (above).
- 6. Select the Colorimetry, sampling mode and bit depth in accordance with your specifications.
- 7. Select the **Image** button to access the pull-down menu enabling you to select either the HDR test patterns or the test images (below).

Generator							
Modes 👻 IN	DE:FRL FRL:4/10G FMT:/S TF:HDMI IMG:/Standard/Smp	teBar.img		H:264.00kHz F:60.00Hz 09-10bpc P:1485.00MH	Disconnect		
(199) 7680x4320p @ 60 Hz 16:9 7680x4320 Progressive YCbCr-420: BT.709-10bpc P:1485.00MHz							
EDID Decode							
EDID Comp		eARC Master TX					
HDCP	-	48G Generator					
SCDC Editor	Pre	HDMI					
Link Train							
3D							
AFC InfoFrame	O BW_Tree	Castle	Cruise_Ship	Dark_Dog			
Image Shift	• Face_Colorpatches	• Flowers	• Forest	Harbor			
Image Ctrl	• jkpff_presenting	• Lady_1	• Lady_2	Lady_DarkBG			
UHDA Test	Lake	• Leaves	• LV_day	LV_night			
HDR Lab	• Man_BrightBG	• Man_Contrast	• Man_DarkBG	Mountains			
HDR10+	Oktoberfest1	Oktoberfest2	• Sausalito	• Sunset			
Dolby Vision	• Waterfalls	• Wine	• Winery	• Wintermountain			
Editors	• Winter_bushes						
Scripts							
Apply							
					💢 Close		

8. From the Category pull-down menu select either Test Patterns or Test Images (below).

Rev. A1

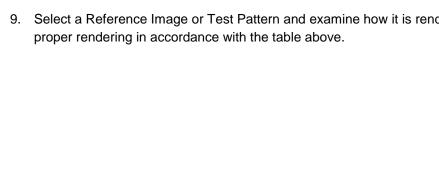


The following pulldown appears:



Test Patterns shown above; Reference images shown below.

Rev. A1



M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide I Generator ODE:FRL FRL:4/10G FMT:/Standard/4320p60.xml H:264.00kHz Output Modes 👻 INTF:HDMI IMG:/Standard/SmpteBar.img (199) 7680x4320p @ 60 Hz 16:9 7680x4320 Progressive YCbCr-420: BT.709-10bpc P:1485.00MHz 🛃 Pattern Format 刺 Audio 🗶 Tools EDID Decode 🔁 Test 🕶 Format

EDID Comp		eARC Master TX						
HDCP								
SCDC Editor	Pre	view	HDR Infoframe		48G Generator HDMI			
Link Train	and the second sec							
3D								
AFC	• BW_Tree	• Castle	• Cruise_Ship	Dark_Dog				
InfoFrame	• Face_Colorpatches	• Flowers	• Forest	• Harbor				
Image Shift	• jkpff_presenting	• Lady_1	• Lady_2	Lady_DarkBG				
Image Ctrl	• Lake		• LV_day	LV_night				
UHDA Test	Man_BrightBG	• Man_Contrast	• Man_DarkBG	• Mountains				
HDR Lab	Oktoberfest1	• Oktoberfest2	• Sausalito	• Sunset				
HDR10+ Dolby Vision	• Waterfalls	• Wine	• Winery	• Wintermountain				
Editors	• Winter_bushes							
Scripts								
	Apply							
					💢 Close			

9. Select a Reference Image or Test Pattern and examine how it is rendered on your HDR display to assess

Rev. A1

- - X

Disconnect

🕄 Refresh

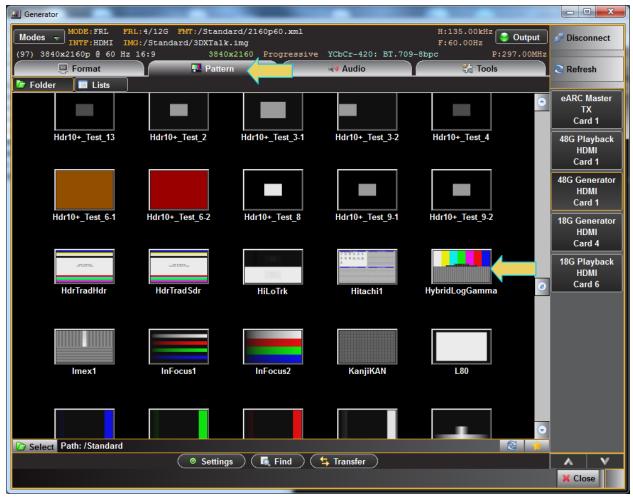
11.14 Testing HDR Displays with HDR Test Patterns

There are HDR related test images and functions that can be used for testing HDR apart from the UHD Alliance test patterns described in the previous subsection. When the patterns are selected, the appropriate metadata is transmitted through the AVI and HDR infoframes. These test patterns require separate licenses for use.

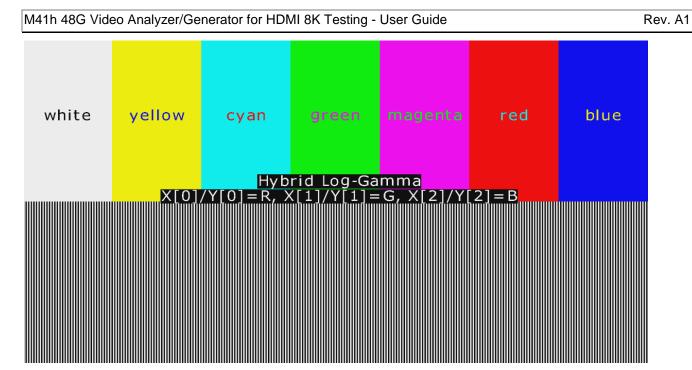
Currently there two specialized HDR test patterns:

- **Hybrid Gamma Log** This pattern itself it not useful for checking the video attributes of HLG HDR. Its purpose is to provide assurance that the infoframe is not impeding the ability of the display to render of the image.
- Dolby Vision The Dolby Vision test image verifies a Dolby Vision display's Dolby Vision-specific EDID data, its response to the Dolby Vision protocol handshake and its handling of the Dolby Vision signal and metadata. The Dolby Vision test image will be rendered with a checkmark in the proper location if the display has properly interpreted the color space, metadata and checksum correctly.

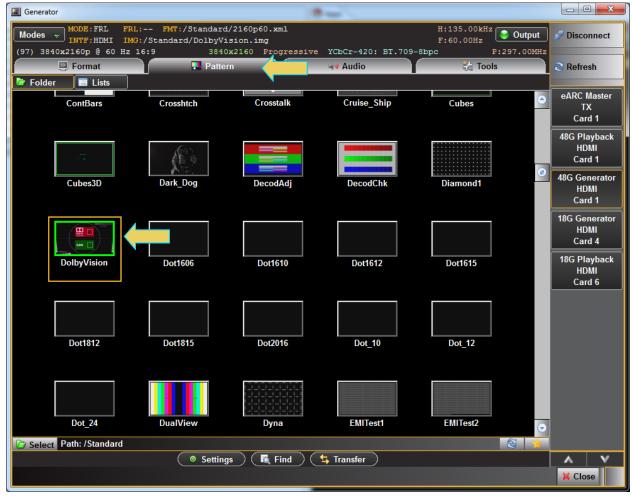
You select the pattern (e.g. Hybrid Log Gamma) as you would any other pattern from the **Patterns** tab shown below.



The HLG test pattern is shown below for reference.



Similarly you can select the Dolby Vision test pattern as shown below.

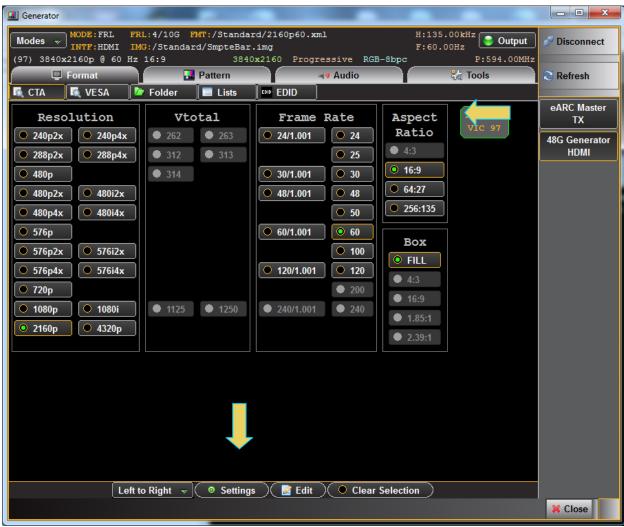


You will set the video format to any 2160p or 1080p image using the following settings:

Colorimetry: RGB

- Range: Full
- Bit depth: 8 bits per component

The format selection and format settings are depicted sample screen examples below.

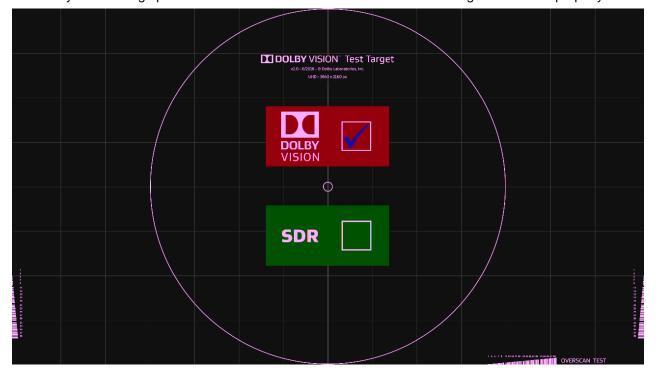


		5
Format Settings		×
	Color Space	
O RGB	• YCbCr • xvYCC	• AdobeRGB
• sYCC601	AdobeYCC BT2020 cYCC	• BT2020 YCC
• BT2020 RGB	O DCI-P3	
	● 4:4:4 ● 4:2:2 ● 4:2:0	
	Range Full Shoot Limited	
	Bits per Component 8 10 12 16	
	Scrambling Override	

Enabled
Disabled

🗸 Apply

The Dolby Vision image provides a check mark in the HDR box when the image is rendered properly.



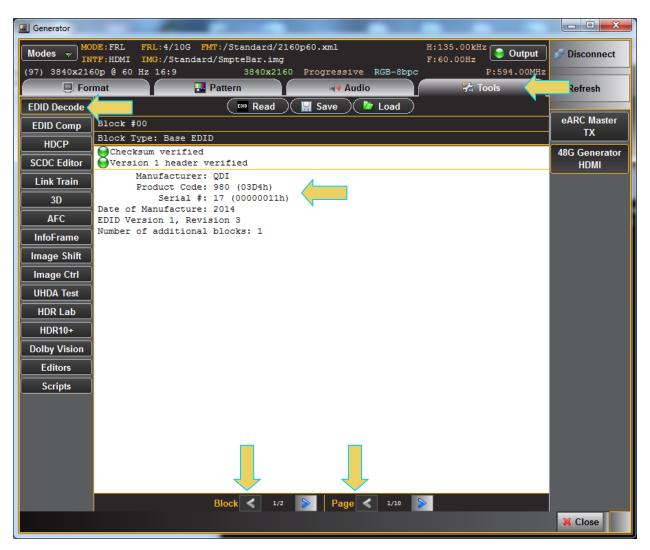
11.15 Viewing the EDID of a connected display

Use the following procedures to view the EDID of the connected display. This procedure assumes that you have an HDTV or other sink device connected to the Tx port.

To view the EDID of a connected display:

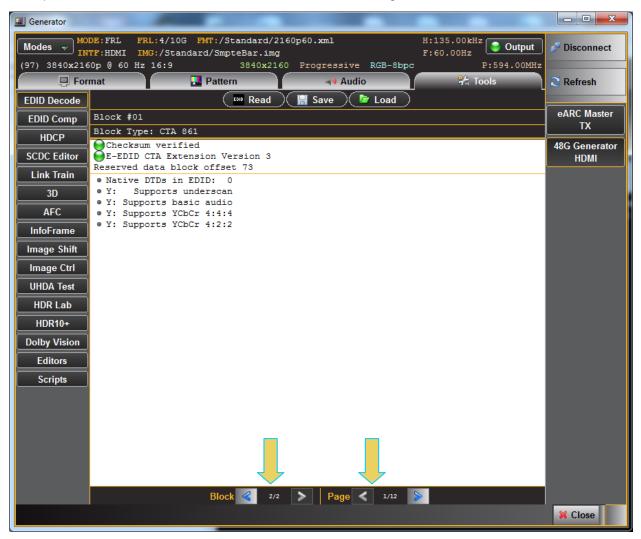
- 1. From the main window of the M41h 48G Video Analyzer/Generator, select the Tools tab.
- 2. Activate the EDID Decode button on the upper left (indicated below).

Contents of the initial data in the first block of the EDID will be displayed (below).



Navigate through the blocks and pages of the EDID using the arrow buttons on the lower panel (indicated above).

Examples of the **EDID Decode** content are shown in the following screens.



The CEA Audio Block is shown below.

Modes 👻 IN	DE:FRL FRL:4/10G FMT:/Standard/2160p60.xml H:135.00kHz FF:HDMI IMG:/Standard/SmpteBar.img F:60.00Hz	
(97) 3840x216	op @ 60 Hz 16:9 3840x2160 Progressive RGB-8bpc P:594.00MH mat Pattern ◄♥ Audio ?? Tools	Refresh
EDID Comp	Block #01 CTA Data Block: Tag 1, bytes 3: Audio Data	eARC Master TX
HDCP SCDC Editor Link Train	Number of Descriptors: 1 Audio Format Code: LPCM (IEC 60958 PCM [30, 31]) Channels: 8	48G Generator HDMI
3D AFC	Sampling Freq: 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 Sampling Size (bit): 24, 20, 16	2
InfoFrame Image Shift		
Image Ctrl UHDA Test HDR Lab		
HDR10+ Dolby Vision		
Editors Scripts		
	✓ III Block <	•
		X Close

I Generator					- 0 X
	DE:FRL FRL:4/10G FMT:/ FF:HDMI IMG:/Standard/Sn	'Standard/2160p60.xml mpteBar.img	H:135.00kHz F:60.00Hz Outpu	t	🔊 Disconnect
(97) 3840x216	0p @ 60 Hz 16:9	3840x2160 Progressive RGB-8bpc	P:594.00M	Hz	
🔅 🗐 For	mat 🛛 🔛 Pati	tern 🔫 Audio	👫 Tools		😂 Refresh
EDID Decode		🚥 Read 🔚 Save 🔎 Load		_	
EDID Comp	Block #01			<u>^</u>	eARC Master
HDCP		bytes 24: Vendor Specific			TX
SCDC Editor	24-bit IEEE Registration HDMI 1.4b Vendor Spec				48G Generator HDMI
	• CEC Physical Address:				
Link Train	<pre> ISRC/ACP: </pre>	supported			
3D	Deep Color				
AFC	48 bits per color				
	36 bits per color 30 bits per color				
InfoFrame	YCbCr 4:4:4 support	ed			
Image Shift	<pre> ø DVI dual-link: </pre>	Not supported		Ξ	
Image Ctrl	Max TMDS clock:	600 MHz			
	Content types:				
UHDA Test	Game				
HDR Lab	Cinema Photo				
HDR10+	Graphics (text)				
	Latency:	Not Present			
Dolby Vision	Interlaced Latency:	Not Present			
Editors	Basic 3D:	Supported			
	<pre>@ Image Size:</pre>	Only indicates correct aspect ratio	•		
Scripts	4K x 2K Support: 3840x2160 30Hz				
	3840x2160 25Hz				
	3840x2160 24Hz				
	4096x2160 24Hz				
		On the SVDs listed below.			
	Frame packing				
	Top-and-Bottom Side-by-Side (Half)				
	For SVDs:			-	
	Blo	ock < 2/2 > Page < 4/12			
					💢 Close
(

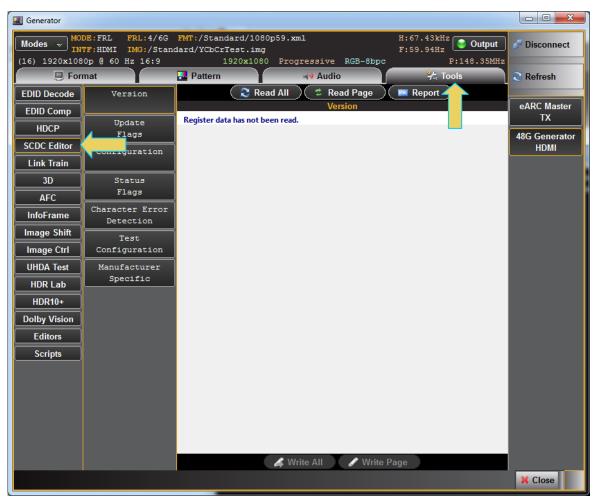
The CEA Vendor Specific Data Block is shown below.

Use the following procedures to view the SCDC register contents of the connected display. These procedures assume that you have connected the HDMI 2.1 HDTV to thes Tx port.

To view the SCDC register contents of a connected display:

1. From the main window of the M41h 48G Video Analyzer/Generator, select the Tools tab.

11.16 Viewing the SCDC register contents of a connected display



Make sure the M41h 48G Video Analyzer/Generator is selected.

- 2. Activate the SCDC Decode button on the upper left (indicated below).
- 3. Select a register set to view (example Update Flags)
- 4. Select Read All or Read Page.

The following screen example shows the SCDC Update Flags. (No data is shown in the following screen example.)

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

- O X Generator MODE:FRL FRL:4/10G FMT:/Standard/21 INTF:HDMI IMG:/Standard/SmpteBar.img FRL:4/10G FMT:/Standard/2160p60.xml H:135.00kHz Output Modes 👻 Disconnect F:60.00Hz (97) 3840x2160p @ 60 Hz 16:9 3840x2160 Progressive RGB-8bpc P:594.00MHz 🛃 Pattern Format 剩 Audio 😤 Tools 🕄 Refresh 🤇 🎅 Read All 🖈 Read 🚾 Report 🔵 EDID Decode eARC Master Update F EDID Comp 0x10 (R/W) Update_0 D: ☑ Status_Update ТΧ Update HDCP Flags 48G Generator Bit 1: CED_Update (Character Error Detection Update) HDMI SCDC Editor Configuration Bit 2: RR_Test Link Train Bit 3: Source_Test_Update Bit 4: 🔽 🛛 FRL_start 3D Status Bit 5: FLT_Update Flags AFC Bit 6: RSED_Update Character Error Bit 7: 📃 Rsvd (0) InfoFrame Detection x11 (R/W) Update_1 Image Shift Bit 0: Rsvd (0) Bit 1: Rsvd (0) Image Ctrl Configuration Bit 2: 📃 Rsvd (0) UHDA Test Manufacturer Bit 3: 📃 Rsvd (0) Specific HDR Lab Bit 4: 📃 Rsvd (0) Bit 5: 📃 Rsvd (0) HDR10+ Bit 6: 📃 Rsvd (0) Dolby Vision Bit 7: 📃 Rsvd (0) Editors Scripts 🛛 🔏 Write All 🔍 Write Page X Close

Rev. A1

The following screen example shows the SCDC Status Flags. (No data is shown in the following screen example.)

Generator			
Modes 👻 INT	DE:FRL FRL:4/10G F:HDMI IMG:/Stand Op @ 60 Hz 16:9	FMT:/Standard/2160p60.xml H:135.00kHz Bard/SmpteBar.img F:60.00Hz 3840x2160 Progressive RGB-8bpc P:594.00MH	J S Disconnect z
🔅 Form	nat	📱 Pattern 🔫 Audio 😤 Tools	😂 Refresh
EDID Decode	Version	🞅 Read All 🤇 🤹 Read Page 🗲 🔤 eport 🔵	
EDID Comp		Configuration 0x20 (R/W) TMDS Config	eARC Master
HDCP	Update	Bit 0: Scrambling_Enable	
SCDC Editor	Flags	Bit 1: TMDS_Bit_Clock_Ratio	48G Generator HDMI
	Configuration	Bit 2: Rsvd (0)	
	F	Rsvd (0) Bit 4: Rsvd (0)	
3D	Status Flags	Bit 5: Rsvd (0)	
AFC		Bit 6: 🔲 Rsvd (0)	
InfoFrame	Character Error Detection	Bit 7: Rsvd (0)	
Image Shift	Test	0:30 (R/W) Config_0 Bit 0: R Enable	
Image Ctrl	Configuration	Bit 1: FLT_no_retrain	
UHDA Test	Manufacturer	Bit 2: DAISY_ERR	_
HDR Lab	Specific	Bit 3: MONO_DIR_ON Bit 4: MONO DIR ERR	
		Bit 5: CA PWR ERR	
HDR10+		Bit 6: Rsvd (0)	
Dolby Vision		Bit 7: 🔲 Rsvd (0)	
Editors		0x31 (R/W) Config_1	
Scripts		Bits 0-3: FRL_Rate 5: FRL, 10 Gps/lane, 4 Lanes 👻	
		Bits 4-7: FFE_Levels 0 👻	
		0x35 (R) Source Test Configuration Bit 0: Reserved	
		Bit 1: TxFFE_Pre_Shoot_Only	
		Bit 2: TxFFE_De_Emphasis_Only	
		Bit 3: TxFFE_No_FFE	
		Bit 4: Reserved	
		Bit 5: FLT no timeout	
		a white All a white Page	
			💢 Close

I Generator			- • X
Modes V IN	DE:FRL FRL:4/10G FF:HDMI IMG:/Stand Op @ 60 Hz 16:9	FMT:/Standard/2160p60.xml H:135.00kHz lard/SmpteBar.img F:60.00Hz 3840x2160 Progressive RGB-8bpc P:594.00MHz	S Disconnect
🔋 Forr		🛄 Pattern 🛶 Audio 😤 Tools	C Refresh
EDID Decode	Version	C Read All 2 Read Page Report	eARC Master
EDID Comp HDCP	Update	0xD0-0xD2 (R) Manufacturer_OUI 00-07-AA 0xD3-0xDA (R) Device_ID_String 51-44-49-00-00-00-00-00: "QDI"	ТХ
SCDC Editor	Flags Configuration	0xDB (R) Hardware_Rev Major: 1, Minor: 0 0xDC (R) Software_Major_Rev 1	48G Generator HDMI
Link Train		0xDD (R) Software_Minor_Rev 1	
3D	Status Flags		
AFC InfoFrame	Character Error		
Image Shift	Detection Test		
Image Ctrl	Configuration		
UHDA Test	Manufacturer Specific		
HDR Lab HDR10+			
Dolby Vision			
Editors			
Scripts			
		🛹 Write All 🖉 Write Page	
			X Close

The following screen example shows the SCDC Manufacturing Specific data.

- _ O _X Generator FRL:4/10G FMT:/Standard/2160p60.xml ODE : FRL H:135.00kHz Modes 👻 Output Disconnect INTF:HDMI IMG:/Standard/SmpteBar.img F:60.00Hz (97) 3840x2160p @ 60 Hz 16:9 3840x2160 Progressive RGB-8bpc P:594.00MHz Format 🛃 Pattern 刺 Audio 👫 Tool Refresh 🔁 Read All Read Page 🚾 Report EDID Decode eARC Master EDID Comp xD0-0xD2 (R) Manufacturer_OU xD3-0xDA (R) Device_ID_String Manufacturer_OUI 00-07-AA ТΧ Update HDCP 51-44-49-00-00-00-00-00: "QDI" Flags 48G Generator Hardware_Rev Major: 1, Minor: O SCDC Editor Software_Major_Rev HDMI Software Minor Rev Link Train 3D Flags AFC Character Error InfoFrame Detection Image Shift Test Image Ctrl Configuration UHDA Test Manufacturer Specific HDR Lab HDR10+ Dolby Vision Editors Scripts 💰 Write All 🖉 Write Page X Close
- 5. (Optionally) issue an HTML report with the Report activation button as shown below.

11.17 Selecting audio formats

Use the following procedures to select HDMI formats.

To select an audio format:

1 From the main window of the M41h 48G Video Analyzer/Generator, select the Audio tab indicated below.

The following example shows LPCM selection. The second slide shows selection of compressed audio formats.

141h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide Rev.				
I Generator				
Modes v MODE:FRL FRL:4/10G FMT:/Standard/2160p60.xml H:135.00kHz C Output INTF:HDMI IMG:/Standard/SmpteBar.img F:60.00Hz	S Disconnect			
(97) 3840x2160p @ 60 Hz 16:9 3840x2160 Progressive GB-8bpc P:594.00MHz	C Refresh			
PCM Sine Wave Channels Sample Rate Bits/Sample	eARC Master			
2.0 v 48 kHz v 24 v Channel Selection 27	TX 48G Generator			
1 2	HDMI			
Mute Channel: 1	-			
Level (dB) Frequency (Hz)				
-3dB -48 +3dB -1000 1000 +1000 ▼				
Apply 1 Status				
	X Close			

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator			- 0 X
Modes ▼ MODE:: INTF:: (97) 3840x2160p	HDMI IMG:/St	0G FMT:/Standard/2160p60.xml H:135.00kHz andard/SmpteBar.img F:60.00Hz Output 3840x2160 Progressive RGB-8bpc P:594.00MHz	🔊 Disconnect
			C Refresh
PCM Sine Wave	Туре	Description	
Compr. Audio	DOLBY (AC3)	Pink Noise 500-2kHz L channel	eARC Master TX
V	 DOLBY (AC3) 	Pink Noise 500-2kHz C channel	`
	 DOLBY (AC3) 	Pink Noise 500-2kHz R channel	48G Generator
	DOLBY (AC3)	Pink Noise 500-2kHz Cycle channels	HDMI
	DOLBY (AC3)	Pink Noise 500-2kHz LFE channel	
	DOLBY (AC3)	Pink Noise 500-2kHz All channels	
	 DOLBY (AC3) 	Pink Noise 500-2kHz Ls channel	
	 DOLBY (AC3) 	Pink Noise Rs channel	
	 DOLBY (AC3) 	Pink Noise 20-20kHz L channel	
	 DOLBY (AC3) 	Pink Noise 20-20kHz C channel	
	 DOLBY (AC3) 	Pink Noise 20-20kHz R channel	
	 DOLBY (AC3) 	Pink Noise 20-20kHz pulse ???	
	 DOLBY (AC3) 	Pink Noise 20-20kHz LFE	
	 DOLBY (AC3) 	Pink Noise 20-20kHz Ls channel	
	 DOLBY (AC3) 	Pink Noise 20-20kHz Rs channel	
	 DOLBY (AC3) 	Sine Wave 63Hz Cycle channels	
	 DOLBY (AC3) 	Sine Wave 63Hz All channels	
	 DOLBY (AC3) 	Sine Wave 125Hz Cycle channels	
	 DOLBY (AC3) 	Sine Wave 125Hz All channels	
	 DOLBY (AC3) 	Sine Wave 1kHz Cycle channels	
	 DOLBY (AC3) 	Sine Wave 1kHz All channels	
	 DOLBY (AC3) 	Sine Wave 4kHz Cycle channels	
	 DOLBY (AC3) 	Sine Wave 4kHz All channels	
	 DOLBY (AC3) 	Impulse L channel	
	 DOLBY (AC3) 	Impulse C channel	
	 DOLBY (AC3) 	Impulse R channel	
	 DOLBY (AC3) 	Impulse LFE channel	
	 DOLBY (AC3) 	Impulse Ls channel	
		► Play 😪 Refresh	
			💥 Close
C			

Rev. A1

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator				
Modes v MODE: INTF: (97) 3840x2160p	HDM	I <mark>IMG:</mark> /Sta	G FMT:/Standard/2160p60.xml H:135.00kHz Output indard/SmpteBar.img F:60.00Hz Output 3840x2160 Progressive RGB-8bpc P:594.00MHz	S Disconnect
🗐 Format	t		💀 Pattern 📣 Audio 😪 Tools	😂 Refresh
PCM Sine Wave		Туре	Description	
Compr. Audio		DTS (ES)	Impulse C channel	eARC Master TX
		DTS(ES)	Impulse R channel	
	•	DTS(ES)	Impulse LFE channel	48G Generator
	•	DTS(ES)	Impulse Ls channel	HDMI
	•	DTS (ES)	Impulse Cs channel	
	•	DTS(ES)	Impulse Rs channel	
	•	DTS(ES)	Polarity L channel	
	•	DTS(ES)	Polarity C channel	
	•	DTS(ES)	Polarity R channel	
	•	DTS(ES)	Polarity LFE channel	
	•	DTS(ES)	Polarity All channel	
	•	DTS(ES)	Polarity Ls channel	
	•	DTS(ES)	Polarity Cs channel	
	•	DTS(ES)	Polarity Rs channel	
	•	DTS	File: 1509_51.pcm, Channels: 5.1, Sampling: 48000Hz	
	•	DTS(ES)	File: 1509_61.pcm, Channels: 6.1, Sampling: 48000Hz	
	•	DTS (HDHRA)	File: 5376_71.pcm, Channels: 7.1, Sampling: 192000Hz	
	•	DTS (HDHRA)	File: 3840_51.pcm, Channels: 5.1, Sampling: 192000Hz	
	•	DTS (HDHRA)	File: 5760_71.pcm, Channels: 7.1, Sampling: 192000Hz	
	•	DTS (HDMA)	File: VBR_51.pcm, Channels: 5.1, Sampling: 192000Hz	
	•	DTS(HDMA)	File: VBR_71.pcm, Channels: 7.1, Sampling: 192000Hz	
	•	DOLBY (AC3)	File: 2k_Odb2.pcm, Channels: 2, Sampling: 48000Hz	
	•	DOLBY (EAC3)	File: 1k_20db2.pcm, Channels: 2, Sampling: 48000Hz	
	•	DOLBY (EAC3)	File: 1k_20db5.pcm, Channels: 5.1, Sampling: 48000Hz	
	•	DOLBY (EAC3)	File: 1k_1fm7.pcm, Channels: 7.1, Sampling: 48000Hz	
	•	DOLBY (TRUEHD)	File: 1k_20db7.pcm, Channels: 7.1, Sampling: 192000Hz	
		DOLBY (TRUEHD)	File: nxt2ch2s.pcm, Channels: 2, Sampling: 192000Hz	
			► Play C Refresh	
				X Close

The table below summarizes the M41h 48G Video Analyzer/Generator uncompressed LPCM programmable audio test tones.

LPCM Programmable Sine Wave options				
Parameter	Description	Options		
Channels	This is the number of channels in the audio sine wave test tone.	 2.1 2.1 5.1 6.1 7.1 		
Sampling Rate	This is the sampling rate of the audio sine wave test tone.	 32kHz 44.1kHz 48kHz 88.2kHz 96kHz 176.4kHz 		

Rev. A1

LPCM Programmable Sine Wave options				
Parameter	Description	Options		
		• 192kHz		
Bits per Sample	This is the number of bits per channel of the audio sine wave test tone.	 16 20 24 		
Channel Selection	Indicates the channels that are active. Also indicates the channel that is configured for the Level, Mute and Frequency Parameters.	are active. Also • FL – Front Left s configured for the • FR – Front Right		
Level (dB)) This is the amplitude of the audio sine wave test tone. Increments in 3dB t			
Mute	Mutes or unmutes the audio for a particular channel.	On Off		
Frequency (Hz)	The frequency of the audio sine wave test tone.	Programmable throughout a range of – -0.01kHz to 20kHz (per channel) in increments of: • 1Hz • 10Hz • 10Hz • 1kHz		

11.18 Testing HDCP 2.2 on a connected display

Use the following procedures to test HDCP authentication on a connected display. HDPC 2.2 is tested using a special test image called HDCP2.2. This test images is selectable through the **Pattern** tab.

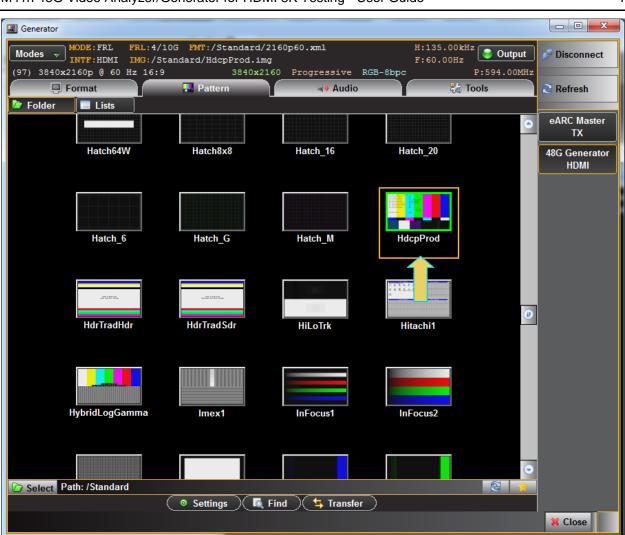
Note that you can view the HDCP 2.2 authentication transations using the Auxiliary Channel Analyzer (ACA) utility. Please refer to <u>Auxiliary Channel Analyzer (ACA)</u> for more details.

11.18.1Running the HDCP 2.2 test

You can enable HDCP 2.2 in one of two ways: 1) Using the HDCP2.2 test image and 2) Using the Tx Control dialog box. Use the procedures below to run an HDCP 2.2 test on a connected display.

To test HDCP on a connected display (HDCP2.2 Test Image):

1. Access the **Pattern** tab to view the test patterns.



M41h 48G	Video Analyzer/G	senerator for HDI	VII 8K Testing - U	ser Guide	
I Generator					
Modes ▼		0G FMT:/Standard/ andard/HdcpProd.im		H:135.00kHz F:60.00Hz	Output 🔊 Disconnect
	Format	Pattern	Audio	Санарс	
					eARC Master TX
	Hatch64W	Hatch8x8	Hatch_16	Hatch_20	48G Generator HDMI
	Hatch_6	Hatch_G	Hatch_M	HdcpProd	
				1 1 1 4 4 3 7 1 1 1 8 4 4 4 7 4	8
	HdrTradHdr	HdrTradSdr	HiLoTrk	Hitachi1	
	HybridLogGamma	lmex1	InFocus1	InFocus2	
C Select	Path: /Standard				 ○ ○
- Juniout		Settings	Find 🗲 Transfer	\supset	
					💢 Close

2. Select the HDCP2.2 test image (above).

A typical result is shown below.

Rev. A1



Note that you can view the HDCP 2.2 authentication transations using the Auxiliary Channel Analyzer (ACA) utility. Please refer to <u>Auxiliary Channel Analyzer (ACA)</u> for more details.

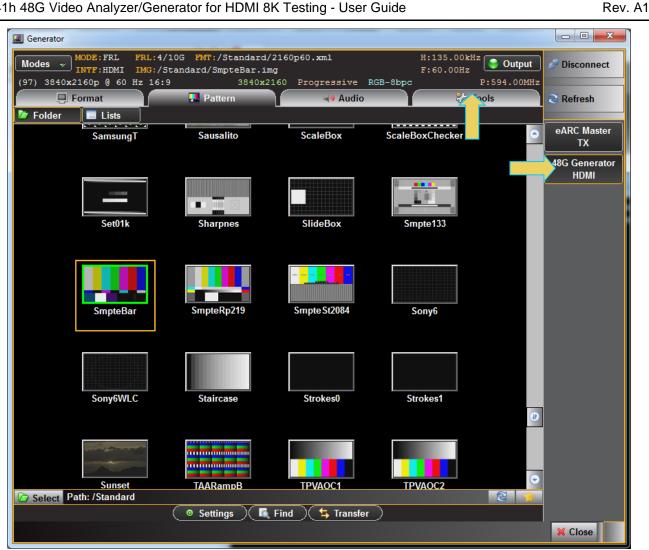
To test HDCP on a connected display (HDCP Tx Control Dialog Box):

1. From the View menu, enable select the Generator item.



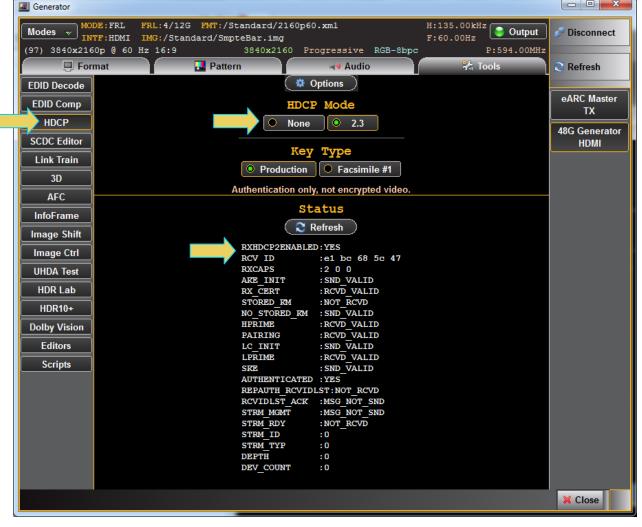
The **Generator** panel will be populated as shown below.

2. Select the **Tools** tab (indicated below).



- 3. Select the HDCP button (indicated below).
- 4. Enable HDCP 2.2 using the radio button as indicated on the screen examples below.

The status is shown in the center portion of the panel. Hit the refresh button when any changes are made to refresh the view.



Note that you can view the HDCP 2.2 authentication transations using the Auxiliary Channel Analyzer (ACA) utility. Please refer to Auxiliary Channel Analyzer (ACA) for more details.

11.18 Configuring and Transmitting Custom Metadata Values with the InfoFrame Utility

Use the following procedures to configure and transmit custom metadata over the HDMI interface. You can use the InfoFrame Utility to configure and disable/enable the transmission of the following types of metadata:

- Auxiliary Video InfoFrame (AVI) Enable or disable transmission and configure custom values.
- Audio Infoframe Enable or disable transmission of this InfoFrame.
- Source Product Descriptor (SPD) Enable or disable transmission of this InfoFrame. .
- Vendor Specific InfoFrame (VSIF) Enable or disable transmission and configure custom values. •
- HDMI 2.1 Forum Vendor Specific InfoFrame (HF-VSIF) Enable or disable transmission and • configure custom values.
- MPEG Enable or disable transmission of this InfoFrame. •
- GIF Enable or disable transmission of this InfoFrame. •
- GIF2 Enable or disable transmission of this InfoFrame.

х

- 0

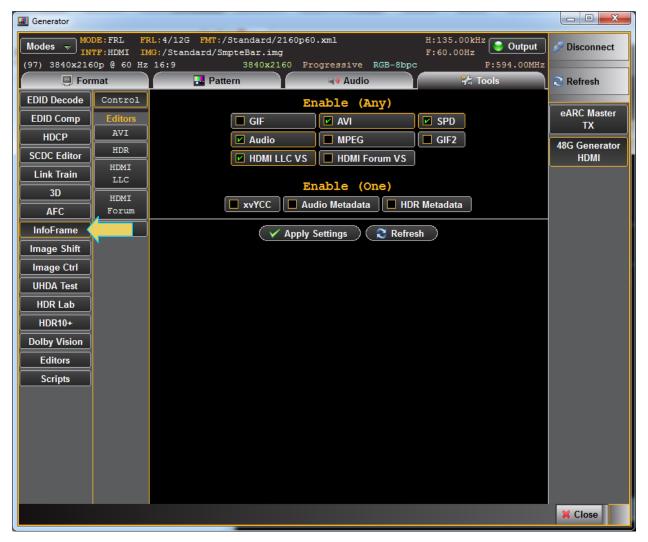
- Gamut Metadata Packet (xvYCC) Enable or disable transmission of this data island.
- High Dynamic Range (HDR) Enable or disable transmission and configure custom values.
- Audio Metadata Enable or disable transmission of this metadata for 3D audio and multi-stream audio.

11.18.1Configuring Metadata for Transmission

Use the procedures below to enable/disable the transmission of metadata and configure custom metadata values.

To enable/disable transmission of specific metadata types:

1. Access InfoFrame Utility from the Tools tab (below).



2. Select the Control button on the left side as indicated below.

M41h 48G Video Anal	yzer/Generator for HDMI	8K Testing - User Guide

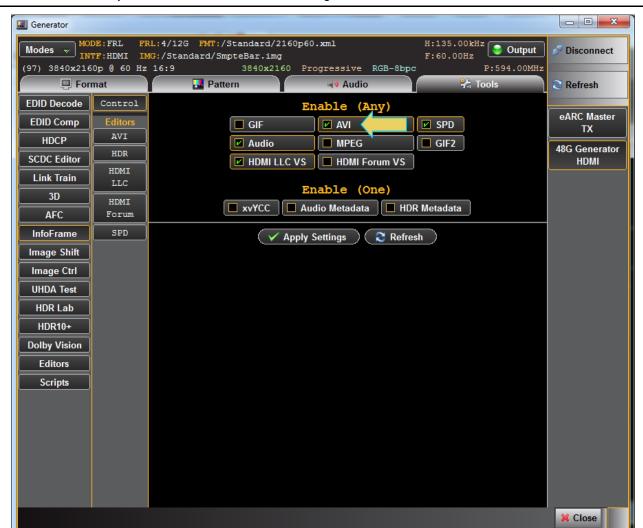
I Generator			
		L:4/12G FMT:/Standard/2160p60.xml H:135.00kHz G:/Standard/SmpteBar.img F:60.00Hz Output	🔊 Disconnect
(97) 3840x216			
🔋 For	mat	Pattern 🛶 Audio 😤 Tools	😂 Refresh
EDID Decode	Control	Enable (Any)	
EDID Comp	Editors	GIF 🛛 🗹 AVI 🔽 SPD	eARC Master TX
HDCP	AVI	🗹 Audio 📄 MPEG 🔤 🔲 GIF2	48G Generator
SCDC Editor	HDR	HDMI LLC VS HDMI Forum VS	HDMI
Link Train	HDMI LLC		
3D	HDMI		
AFC	Forum	xvYCC Audio Metadata HDR Metadata	
InfoFrame	SPD	Apply Settings C Refresh	
Image Shift			
Image Ctrl			
UHDA Test			
HDR Lab			
HDR10+			
Dolby Vision			
Editors			
Scripts			
			💢 Close

- 3. Select the metadata types that you wish to enable or disable using the checkboxes under the **Enable (Any)** area of the **InfoFrame** Utility window.
- 4. Click on the **Apply Settings** activation button **Apply Settings** to initiate the change.

Note: The **Refresh** button reasserts the default state with all applicable metadata transmitted.

The example below shows a configuration where AVI, HDMI LLC VSIF and SPD metadata are enabled for transmission but Audio InfoFrames are not transmitted.

Rev. A1



5. You can specifically enable only a single type of metadata for a particular set of types under the Enable (One) area. The Enable One operates as a one or none case. If you select one type, for example HDR Metadata (below), only it will be transmitted and the other two types (xvYCC and Audio Metadata) will not.

Rev. A1

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - L	Jser Guide

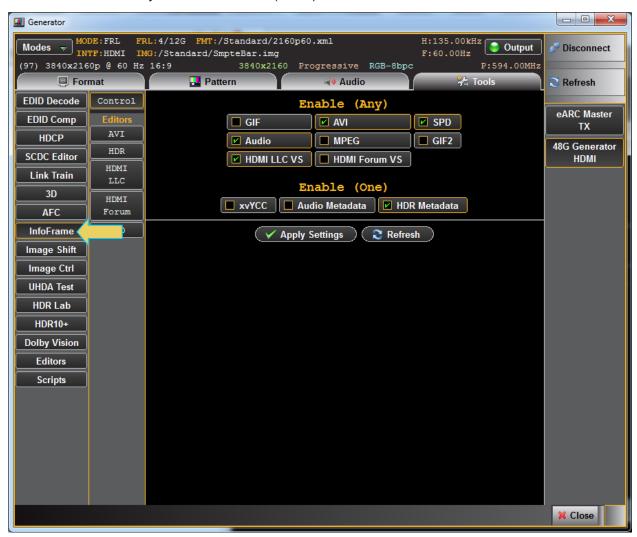
I Generator			
		L:4/12G FMT:/Standard/2160p60.xml H:135.00kHz G:/Standard/SmpteBar.img F:60.00Hz Output	🔊 Disconnect
(97) 3840x216	0p @ 60 Hz		
🔋 For	mat	Pattern 📣 Audio 👫 Tools	🔁 Refresh
EDID Decode	Control	Enable (Any)	
EDID Comp	Editors	GIF 🛛 AVI 🖉 SPD	eARC Master TX
HDCP	AVI	🗹 Audio 🛛 🔲 MPEG 🔤 🗍 🔲 GIF2	48G Generator
SCDC Editor	HDR	HDMI LLC VS HDMI Forum VS	HDMI
Link Train	HDMI LLC		
3D	HDMI		
AFC	Forum	🔲 xvYCC	
InfoFrame	SPD	Apply Settings	
Image Shift			
Image Ctrl			
UHDA Test			
HDR Lab			
HDR10+			
Dolby Vision			
Editors			
Scripts			
			X Close

6. Click on the **Apply Settings** activation button **Apply Settings** to initiate the change.

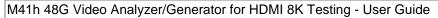
Refresh reasserts the default state with all applicable metadata transmitted. Note: The Refresh button

To configure InfoFrame and metadata parameter values:

1. Access InfoFrame Utility from the Tools tab (below).



2. Select the **Control** button on the left side as indicated below.



Generator					
		:4/12G FMT:/Standard/216 :/Standard/SmpteBar.img	50p60.xml	H:135.00kHz F:60.00Hz	🖉 Disconnect
	0p @ 60 Hz 1		Progressive RGB-8bp		
🖳 For	mat	Pattern	🕪 Audio	👫 Tools	C Refresh
EDID Decode	Control		Enable (Any)		
EDID Comp	Editors	GIF	IVI 🗹	SPD SPD	eARC Master TX
HDCP	AVI	🗹 Audio	MPEG	GIF2	48G Generator
SCDC Editor	HDR	HDMI LLC	VS HDMI Forum VS)	HDMI
Link Train	HDMI LLC				
3D	HDMI	xvYCC	Enable (One)		
AFC	Forum		Audio Metadata	R Metadata	
InfoFrame	SPD	(🗸 A	pply Settings 🔵 🎅 Refre	esh	
Image Shift					
Image Ctrl					
UHDA Test					
HDR Lab					
HDR10+					
Dolby Vision					
Editors					
Scripts					
					X Close

In the example below, the AVI InfoFrame is being configured. In the two screens below the **Component Format** parameter is being changed from RGB to YCbCr 4:2:2.

Note: To activate the pull-down menu you have to double-click on the item.

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

I Generator		
	RL:4/12G FMT:/Standard/2160p60.xml H:135.00kHz 00kHz 00kHz 00kHz	Putput 💋 Disconnect
(97) 3840x2160p @ 60 Hz		.00MHz
Format	🔜 Pattern 🔫 Audio 😪 Tools	🕄 Refresh
EDID Decode Control	Version: (a) 2 (b) 3 (b) 4	
EDID Comp Editors	Video Format ID (VIC): 0 (0 - 255)	eARC Master TX
HD AVI	Component Format (Y): 0 = RGB	48G Generator
SCDC Editor	AFD Present (A): 0 = No 💎	НДМІ
Link Train LLC	Bar Data (B): 0 = Not Present 🗸	
3D HDMI AFC Forum	Scan Info (S): 0 = No Data ▽	
InfoFrame SPD	Colorimetry (C): 0 = No Data 👓	Ξ
Image Shift	Picture Aspect Ratio (M): 0 = No Data	
	Active Aspect Ratio (R): 0 = Not Specified 🗸	
UHDA Test	ITC Content (ITC): 0 = No Data	
HDR Lab	Ext. Colorimetry (EC): 0 = xvYCC601 🗸	
HDR10+	RGB Quantization (Q): 0 = Default	
Dolby Vision	Picture Scaling (SC): 0 = None 🗸	
Editors	YCC Quantization (YQ): 0 = Limited Range 🛛	
Scripts	IT Content Type (CN): 0 = Graphics	
	Pixel Repitition (PR): 0 = No Repetition (x1)	
	Add Colorimetry Ext (ACE): 0 - DCI D3 D'C'B' (D65)	-
	I V L C Params I Vic Params 2 APD 82 02 0D 6F 0000000 00 00 000000000000000000000000000000000000	
	Params 3 Reserved	
	00 000000000000000000000000000000000000	
	🔚 New 🔎 Open 🔛 Save 🧷 Read 🥒 M	Vrite
		🗙 Close

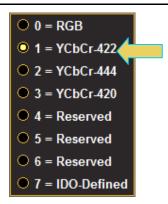
The pull-down meny for the Component Format is shown below.

O 0 = RGB
● 1 = YCbCr-422
• 2 = YCbCr-444
● 3 = YCbCr-420
4 = Reserved
5 = Reserved
6 = Reserved
7 = IDO-Defined

Select YCbCr 4:2:2 for example:

Rev. A1





3. Click on the **Write** activation button **Wite** to initiate the change and the transmission. The **Reset** button re-establishes the default configuration.

In the second example, the HDR InfoFrame is being configured with appropriate values (screens below).

I Generator			
	TF:HDMI IN	RL:4/12G FMT:/Standard/2160p60.xml H:135.00kHz Output IG:/Standard/SmpteBar.img F:60.00Hz Output 16:9 3840x2160 Progressive RGB-8bpc P:594.00MHz	S Disconnect
📮 For		Pattern 📣 Audio 😤 Tools	C Refresh
EDID Decode	Control	Traditional gamma - SDR Luminance Range	
EDID Comp	Editors	 Traditional gamma - HDR Luminance Range SMPTE ST 2084 [2] 	eARC Master TX
HDCP	AVI	 Hybrid Log-Gamma (HLG) 	48G Generator
SCDC Editor	HDR	Dispray Primaries	HDMI
Link Train	HDMI LLC	x[0] 0.00000 y[0] 0.00000 0.0000 to 1.0000	
3D	HDMI	x[1] 0.00000 y[1] 0.00000 0.0000 to 1.0000	
AFC	Forum	x[2] 0.00000 y[2] 0.00000 0.0000 to 1.0000	
InfoFrame	SPD	White Point	
Image Shift		x 0.00000 y 0.00000 0.0000 to 1.0000	
Image Ctrl		Display Mastering Luminance	
UHDA Test		max 0 0 to 65535 cd/m^2	
HDR Lab		min 0.0000 0.0 to 6.5535 cd/m^2	
HDR10+		Maximum Content Light Level 0 0 to 65535 cd/m^2	
Dolby Vision		Maximum Frame-average Light Level 0 0 to 65535 cd/mA2	
Editors			
Scripts			
		T V L C EOTF SMD-ID	
		87 01 1A 5E 00 00	
		Static Metadata Descriptor -	
		000000000000000000000000000000000000000	
		🕞 New 🌘 Open 🔛 Save 🧳 Read 🥒 Write	
			🔀 Close

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide

- 0 **X** 💷 Generator H:67.50kHz SOkHz FMT:/Standard/1080p60.xml ORT : TX V INTF:HDMI IMG:/Standard/Acer2.img Interface Disconnect (16) 1920x1080p @ 60 Hz 16:9 1920x1080 Progressive RGB-10bp P:185.63MH Format 🛃 Pattern 剩 Audio Refresh Traditional gamma - SDR Luminance Range EDID Decode Orregional gamma - HDR Luminance Range Orregion SMPTE ST 2084 [2] HDMI 2.0a EDID Comp Generator Card 1 AVI 🔘 Hybrid Log-Gamma (HLG) HDR HDCP **Display Primaries** HDMI 1.4 x[0] 0.8500 y[0] 0.39850 0.0000 to 1.0000 SCDC Editor Playback Card 6 x[1] 0.6550 y[1] 0.2300 0.0000 to 1.0000 3D x[2] 0.35400 y[2] 0.00000 0.0000 to 1.0000 AFC White Point InfoFrame x 0.15635 y 0.16450 0.0000 to 1.0000 Image Ctrl **Display Mastering Luminance** max 1000 0 to 65535 cd/mA2 UHDA Test min 100.0000 0.0 to 6.5535 cd/m^2 Editors Maximum Content Light Level 1000 0 to 65535 cd/mA2 Scripts Maximum Frame-average Light Level 868 0 to 65535 cd/mA2 T V L C EOTF SMD-II 87 01 1A 80 01 00 Static Metadata Descriptor 04 A6 D5 4D EE 7F EC 2C 24 45 00 0 0 89 1E 21 20 E8 03 FF FF E8 03 64 03 00 🔻 🚺 New 🕽 🌘 🔽 Open 🔵 🗍 Save 🗇 Read 🔵 🥒 Write ۸ Close

4. Click on the **Write** activation button **Write** to initiate the change and the transmission of the new HDR values. Click on the **Reset** button **Creative** to re-establish the default configuration.

11.19 Viewing Metadata Packets Transmitted to a Connected Display

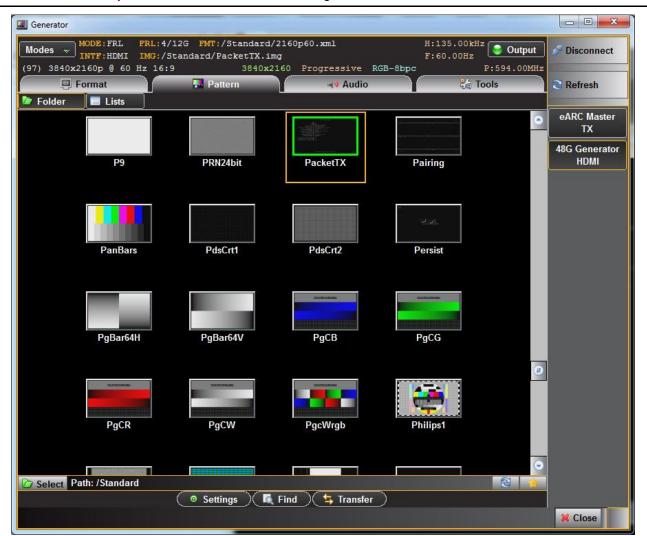
Use the following procedures to view the HDMI metadata packets transmitted to your display under test. The test image used to view the metadata is selectable through the **Pattern** tab.

11.19.1Viewing Metadata Packets

Use the procedures below to view metadata packets transmitted to a connected display. These procedures assume that you have an HDMI HDTV connected to M41h's Tx port.

To view the metadata packets transmitted to a connected display:

1. Access the **Pattern** tab to view the test patterns.



2. Select the PacketTx test.

View the results on the connected display. A typical example of the first packet type (AVI Infoframe) is shown below. The following is a list of packet types viewable through the PacketTx test image:

- AVI Infoframe.
- Audio infoframe
- Source product descriptor Infoframe.
- Other packets:
 - o Audio Clock Regeneration packets
 - o Channel Status bits
- Vendor Specific Infoframe

The image below is the first page of the multi-page test image. This screen shows the AVI Infoframe.

Rev. A1

Rev. A1

_Transmitted AVI	Infoframe
Type: Version: Length: Checksum: Mode:	2 13
Scan information (S): Bar information (B): Active format information present (A): RGB or YCbCr (Y):	Active format info valid
Active format aspect ratio (R): Picture aspect ratio (M): Colorimetry (C):	16:9
Non-uniform picture scaling (SC): Video identification code (VIC): Pixel repetition (PR):	0
Line number of end of top bar (ETB): Line number of start of bottom bar (SBB): Line number of end of left bar (ELB): Line number of start of right bar (SRB):	1081 0
Press Content-Options-Mor	e for other packets

To advance to the next metadata packet type, access the **Renditions** dialog box through the **Settings** activation button as shown below.

Pattern Setti	ngs			X X
⊙ Gating	O Rendition	O Level	🧿 Params	
		2		MAX = 255)
	4			

The procedure below is a general procedure that is not specific to a release.

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 M41h 48G Video Analyzer/Generator through the command line via a telnet session or from the M41h Manager Console panel. When searching through the captured data, Teledyne LeCroy 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 M41h Console.

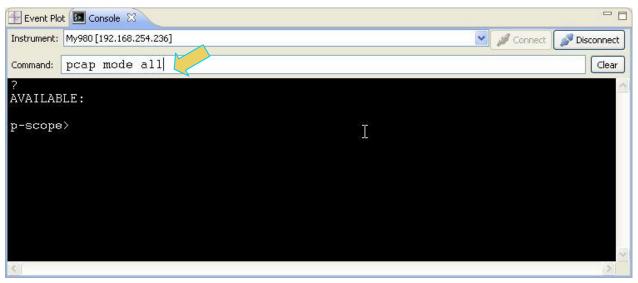
There are M41h-based commands that enable you to initiate commands to capture data. Once you capture data, you can conduct searches either on your host PC or the M41h itself. To conduct searches on your PC you have to transfer the captured data to your host PC using an FTP utility. This procedure is described in the section: <u>Transferring Capture Files from the M41h to a PC</u>.

The M41h 48G Video Analyzer/Generator is based on the Linux operating system; therefore, to conduct searches directly on the M41h 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 M41h Console window:

- 1. Establish an Ethernet connection between the M41h 48G Video Analyzer/Generator using the procedures defined in: <u>Connection Scenarios for external ATP Manager</u>.
- 2. Highlight the M41h 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 M41h 48G Video Analyzer/Generator.



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 M41h 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@spcope:~$
```

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

qd@spcope:~\$ 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 M41h using the following command. Note you will enter in the IP address of the M41h (192.168.254.001 in example below):

>telnet 192.168.254.001

The M41h login prompt will then appear as shown below. The M41h 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 PCA	List of PCAP Commands					
Note: Comr	Note: Commands are lower case.					
Command	Description	Syntax	Command Example			
pcap size	Defines the capture buffer size in percent of total (2GB).	pcap size < <i>size</i> > Where < <i>size</i> > 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	pcap mode < <i>data</i> >	To set the mode:			
		Where <data> can be:</data>	>pcap mode di			
		 all - video & data 	Captures only data island			
	video and data islands	 di – data islands only 	information (not video).			
		 tmds – raw protocol data 				

List of PCAP Commands

Note: Commands are lower case.

Command	Description	Syntax	Command Example
pcap trig	Defines the trigger mechanism	 pcap trig <type> <pos></pos></type> Where <type> can be:</type> 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:</pos> 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 M41h
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

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 M41h instrument or that resides on your PC. However, the method is different. For captures that reside on the M41h, you must run the capture through the command line either through a telnet session or through the M41h 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
```

	M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide	Rev. A1
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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.

2. To run the Timing Analyzer utility enter the following:

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

3. To run the Audio Analyzer utility enter the following:

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

5. 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@spcope:~\$ 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@spcope:~\$ 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
audio clock regeneration N = 6144, cycle time Stamp CTS = 74250
```

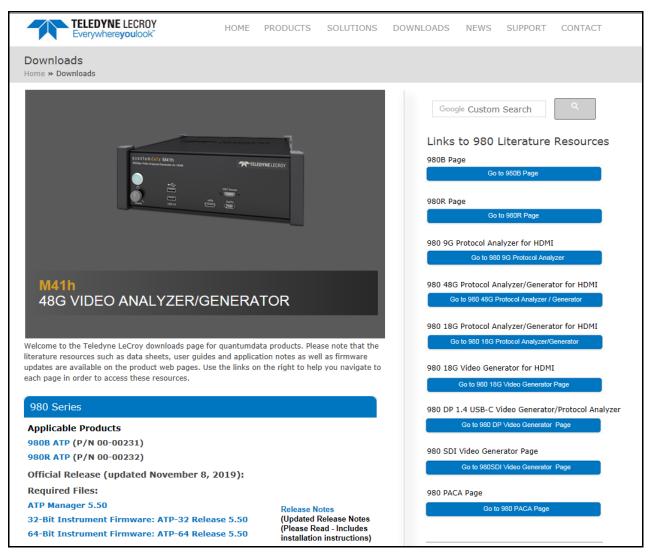
6. To return to the pscope prompt: qd@pscope:~\$ sudo /qd/ptalk

13 Upgrading the M41h Manager and M41h

This Chapter provides information about upgrading your M41h and ATP 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.*

Teledyne LeCroy 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



Two software packages are available for upgrading the M41h:

- 1. Embedded firmware and gateware package for the M41h 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 M41h software package includes the firmware and gateware for all availables.
- 2. Graphical User Interface for Windows PCs. This is the M41h Manager GUI that can be used to control all M41h instruments from a Windows PC.

Notes:

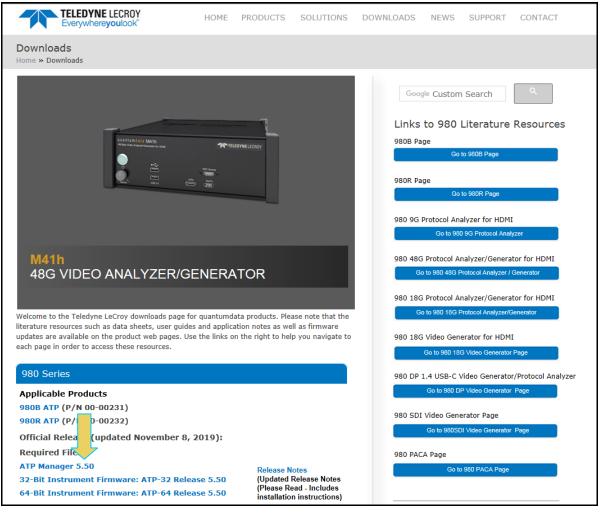
- 1. If the Windows-based M41h Manager GUI and the embedded firmware are both being upgraded, you will need to upgrade the M41h Manager first, and then upgrade the embedded firmware.
- 2. Be sure to check the release notes associated with the download files. Any special installation instructions will be noted in the release notes.
- 3. In some cases if your M41h is not at the most recent version, you may have to first upgrade to the most current version and then to the new version.

12.3 Workflow for Upgrading M41h 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*.

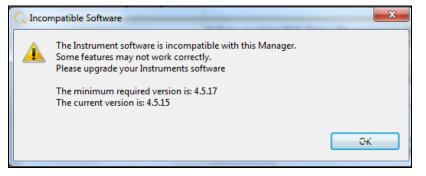
Please note that you have to upgrade the ATP Manager before using the ATP Manager to upgrade the M41h firmware and gateware.

1. Download the ATP Manager and M41h Firmware/Gateware files from the Quantum Data website downloads page:



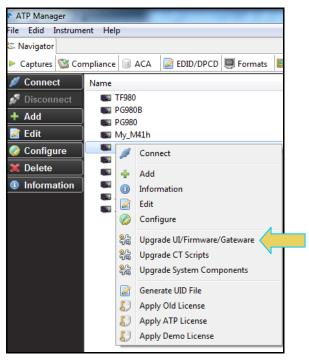
2. Upgrade the ATP Manager and restart.

Note: You may receive the following error indicating that you must update the M41h firmware/gateware.



3. Connect to the M41h that you wish to upgrade.

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

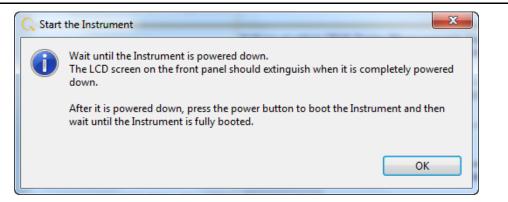


4. Update the M41h Firmware/Gateware.

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

48G Video Analyzer/Ge	enerator for HDMI 8k	Testing - User Guid	e		Rev.
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→ → 980_Release_5_2	9 🕨			✓ 4→ Search 980_Releas	:e_5_29
Organize 👻 New folder				:==	- 🔟 🤅
	0mgr 0-atp.deb	Date modified 9/12/2012 12:10 PM 9/11/2012 4:32 PM	Type File folder DEB File	Size 391,947 KB	
 Gateway (C:) 					
File name				- × deb	-
File name:				▼ *.deb Open	+ Cancel
pgrade Verification Firmware Is the upgrade "C:\Users\nkendall\Desl 980 adv	e/Gateware Upgr information below corre ktop\980_Release_5_29\ vanced test platform ersion = 4.5.28	ect? \980-atp.deb"			Cancel

M41h 48G Video Analyzer/Generator for HDMI 8K Testing - User Guide



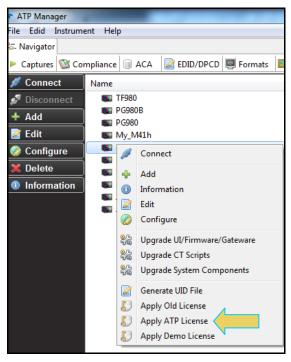
5. Reconnect the ATP Manager to the M41h.

12.4 Workflow for Adding License for optional feature

This section describes the workflow of the upgrade your M41h Protocol Analyzer with an optional feature using a license key. process. It is not intended to be a detailed procedure. *Please consult Teledyne LeCroy 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 Teledyne LeCroy distributor or representative.
- 2. Call Teledyne LeCroy customer support.
- 3. Generate UID text file from the **Instrument** pull-down menu (below) and convey to Teledyne LeCroy customer support.
- 4. Teledyne LeCroy will provide a QDATP.lic file. Store this on your host PC.
- 5. From the Instrument pull-down menu (below) select Apply ATP License.



END OF USER GUIDE