

Quantum Data Inc.

980 Advanced Test Platform Systems

Overview of Applications



Models and Modules

Quantum Data 980 Test Platforms



980 Front View



980B Front View



980R Front View

980 Advanced Test Platform – Features / Modules

980 Test Platform



Standard Features:

- 10.4 inch touch screen – 800 x 600 resolution.
- Operates through embedded touch display or remote GUI from host PC.
- Accommodates two (2) 980 series modules (Protocol Analyzer always equipped).
- Command line control via telnet.
- Software upgradable.

Modules:

- HDMI Protocol Analyzer module.
- CBUS Compliance Test module.
- HDMI 1.4 Video Generator module.

980B Advanced Test Platform – Features / Modules

980B Test Platform



Standard Features:

- 15 inch touch screen – 1280 x 768 resolution.
- Operates through embedded touch display or remote GUI from host PC.
- Accommodates five (5) 980 series modules.
- Command line control via telnet.
- Software upgradable.

Modules:

- HDMI Protocol Analyzer module.
- CBUS Compliance Test module.
- HDMI 1.4 Video Generator module.
- DisplayPort 1.2 Video Generator module.
- HDMI 2.0 Video Generator module.
- HDMI 2.0 Protocol Analyzer module.

980R Advanced Test Platform – Features / Modules

980R Test Platform



Standard Features:

- 7 inch touch screen – 800 x 480 resolution.
- Rack mountable.
- Operates through embedded touch display or remote GUI from host PC.
- Accommodates five (5) 980 series modules.
- Command line control via telnet.
- Software upgradable.

Modules:

- HDMI Protocol Analyzer module.
- CBUS Compliance Test module.
- HDMI 1.4 Video Generator module.
- DisplayPort 1.2 Video Generator module.
- HDMI 2.0 Video Generator module.
- HDMI 2.0 Protocol Analyzer module.

Applications

HDMI Protocol Analyzer module

980 Protocol Analyzer Application – Capture/Store

- HDMI Source Analysis (Metadata)
 - Discover root cause of interoperability issues.
 - Set triggers to capture specific sets of data.
 - Analyze HDMI & MHL metadata, timing, auxiliary data including HDMI 2.0 4K UHD video streams.
 - View data in graphical timeline or table form.
 - View precise time stamps for all data.
 - Verify data island packets values.
 - Locate data through filtering and search utilities.



The screenshot shows the "Capture Viewer" application interface. The top section displays a graphical timeline with various data packets represented by colored bars: GCP (orange), AVI (purple), AUD IF (pink), VEN (green), HSYNC (light green), and VSYNC (blue). The bottom section shows a "Data Decode" table with the following data:

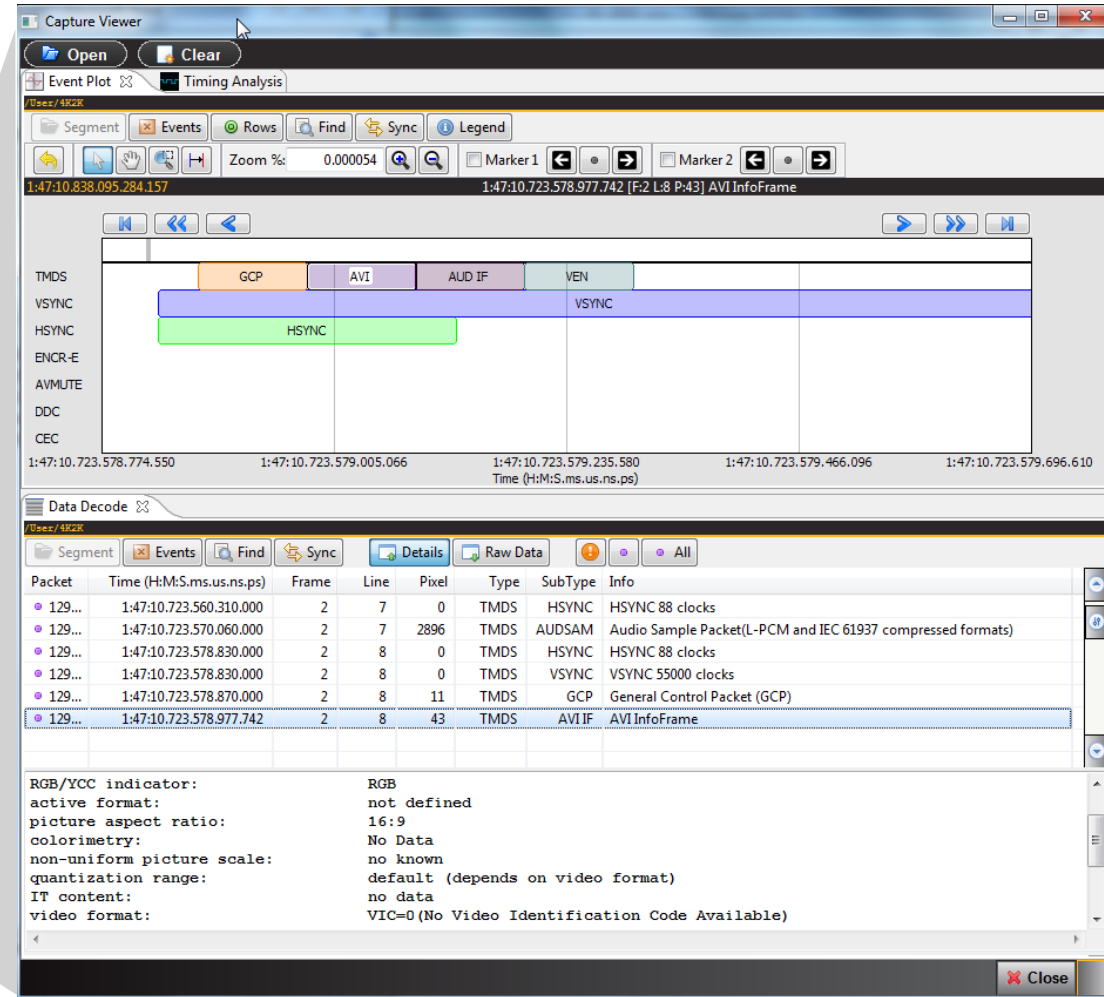
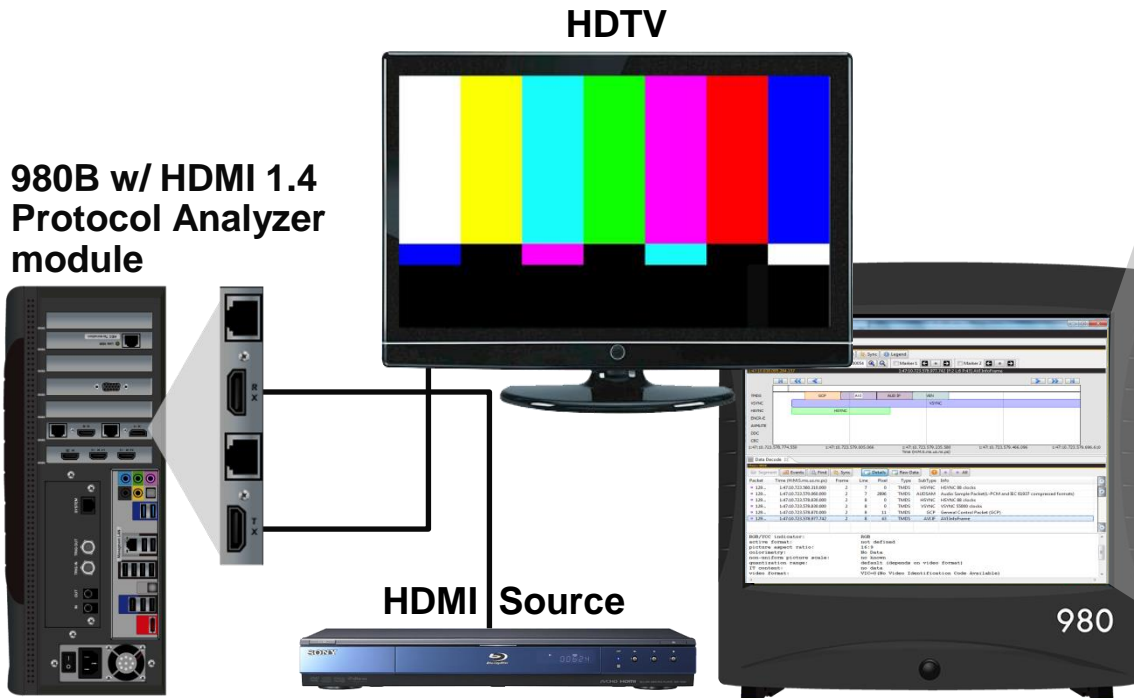
Packet	Time (H:M:S.ms.us.ns.ps)	Frame	Line	Pixel	Type	SubType	Info
129...	1:47:10.723.560.310.000	2	7	0	TMDS	HSYNC	HSYNC 88 clocks
129...	1:47:10.723.570.060.000	2	7	2896	TMDS	AUDSAM	Audio Sample Packet(L-PCM and IEC 61937 compressed formats)
129...	1:47:10.723.578.830.000	2	8	0	TMDS	HSYNC	HSYNC 88 clocks
129...	1:47:10.723.578.830.000	2	8	0	TMDS	VSYNC	VSYNC 55000 clocks
129...	1:47:10.723.578.870.000	2	8	11	TMDS	GCP	General Control Packet (GCP)
129...	1:47:10.723.578.977.742	2	8	43	TMDS	AVIIF	AVI InfoFrame

Below the table, the application displays metadata for the AVI InfoFrame:

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

980 Protocol Analyzer App – Encrypted Analyzer

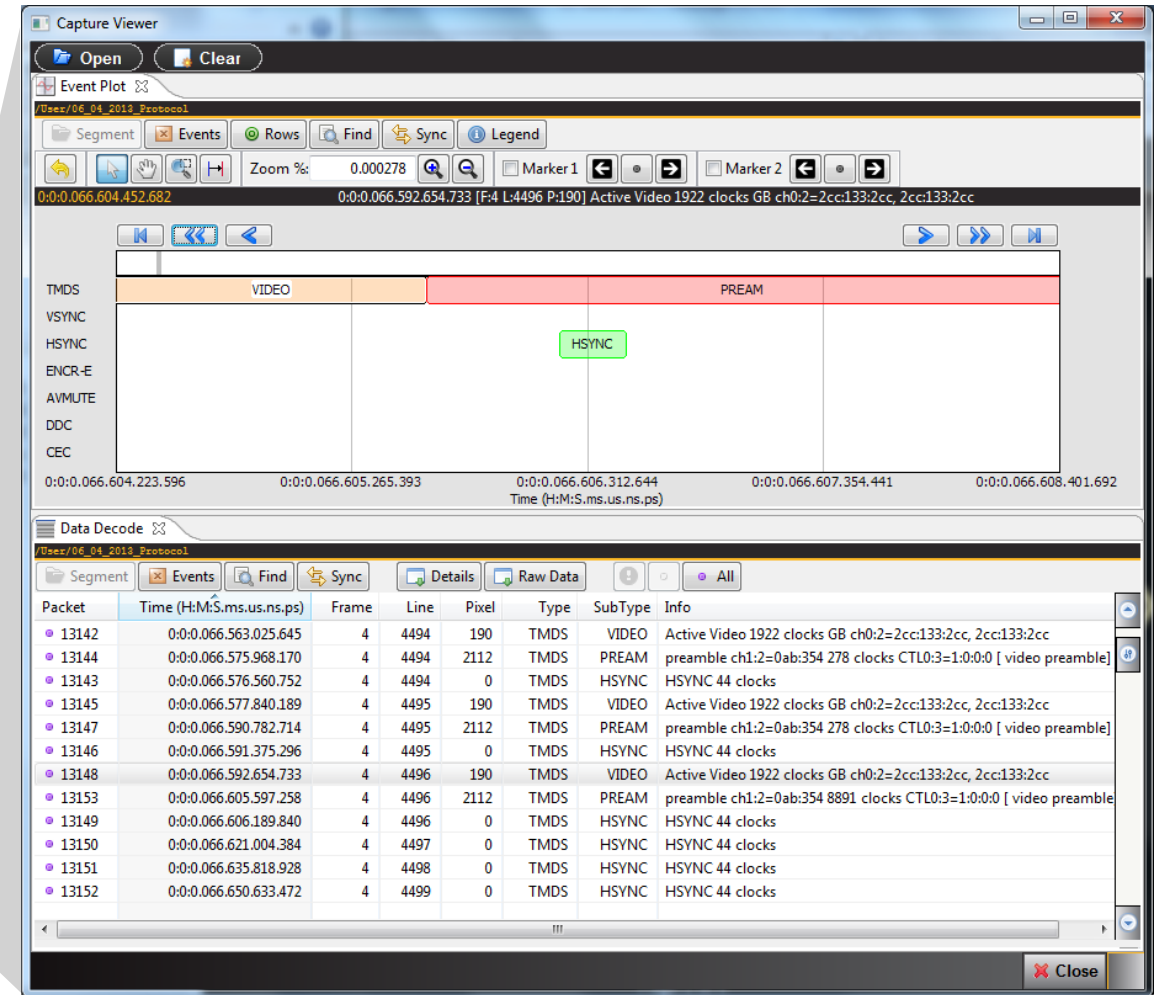
- HDMI Source Analysis (Metadata)
 - Monitor encrypted HDMI stream between source and sink.
 - View all protocol and metadata in graphical timeline or table form.
 - View real time data.



980 Protocol Analyzer Application – Protocol Data

- HDMI Source Analysis – Protocol Data
 - Capture and store TMD5 protocol data.
 - View preamble and guard band data.
 - Verify the results of Protocol Compliance test.
 - Identify protocol interoperability issues.
 - View precise time stamps for all data.

980B w/ HDMI 1.4
Protocol Analyzer
module



980 Protocol Analyzer Application – Timing Analysis

- HDMI Source Analysis – Timing Analysis
 - View summary timing for multiple frames.
 - View frame timing parameters.
 - View line timing parameters.
 - Identify timing errors.

980B w/ HDMI 1.4
Protocol Analyzer
module



980B w/ HDMI 1.4 Protocol Analyzer module

980

Format	VIC	BPP	HFreq (kHz)	Interlaced	Htotal	Vtotal	Hactive	Hfront	HSync Width	VActive	Vfront	VSync Wi...	HSync Polarity	VSync Polarity	HToVPulse Del...
4K x 2...	3	24	54.0	No	5500	2250	3840	1276	88	2160	8	55000	Positive	Positive	0

CEA Name	Frame	TimeStamp (HH:MM:SS.ms.us.ns.ps)	Duration (HH:MM:SS.ms.us.ns.ps)	VFreq (Hz)	HFreq (kHz)	Vtotal	Vactive	Pix Freq (M...	HSync Wi...	VSync	Start Video ...
4K x 2K 23.98/24Hz	0	1:47:10.681.912.910	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	1	1:47:10.723.578.830	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	2	1:47:10.765.244.750	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	3	1:47:10.806.910.670	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	4	1:47:10.848.576.590	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	5	1:47:10.890.242.510	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	6	1:47:10.931.908.427	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	7	1:47:10.973.574.347	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90
4K x 2K 23.98/24Hz	8	1:47:11.015.240.267	0:0:0.041.665.000	24.00	54.00	2250	2160	297.005	88	10	90

Frame	Line	TimeStamp (HH:MM:SS.ms.us...	Duration (HH:MM:SS.ms.us...	HTotal	TMDS HTotal	HSync Width	HBack	HActive
4	000	1:47:10.848.428.445	0:0:0.000.018.515	5500	5500	88	0	0
4	001	1:47:10.848.446.960	0:0:0.000.018.520	5500	5500	88	0	0
4	002	1:47:10.848.465.480	0:0:0.000.018.517	5500	5500	88	0	0
4	003	1:47:10.848.483.997	0:0:0.000.018.520	5500	5500	88	0	0
4	004	1:47:10.848.502.517	0:0:0.000.018.517	5500	5500	88	0	0
4	005	1:47:10.848.521.035	0:0:0.000.018.517	5500	5500	88	0	0
4	006	1:47:10.848.539.552	0:0:0.000.018.517	5500	5500	88	0	0
4	007	1:47:10.848.558.070	0:0:0.000.018.520	5500	5500	88	0	0
4	008	1:47:10.848.576.590	0:0:0.000.018.517	5500	5500	88	0	0
4	009	1:47:10.848.595.107	0:0:0.000.018.517	5500	5500	88	0	0
4	010	1:47:10.848.613.625	0:0:0.000.018.517	5500	5500	88	0	0
4	011	1:47:10.848.632.142	0:0:0.000.018.520	5500	5500	88	0	0
4	012	1:47:10.848.650.662	0:0:0.000.018.517	5500	5500	88	0	0
4	013	1:47:10.848.669.180	0:0:0.000.018.517	5500	5500	88	0	0
4	014	1:47:10.848.687.697	0:0:0.000.018.520	5500	5500	88	0	0
4	015	1:47:10.848.706.217	0:0:0.000.018.518	5500	5500	88	0	0

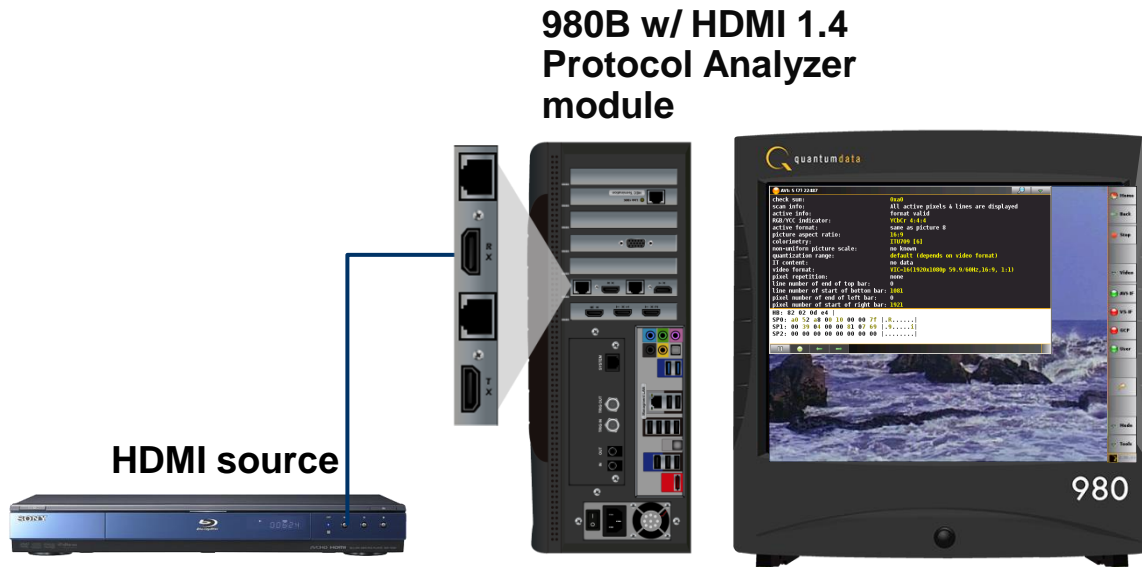
980 Protocol Analyzer Application – Video Analysis

- HDMI Source Analysis – Video Analysis
 - View video frame thumbnails.
 - View pixel values for any frame.



980 Protocol Analyzer Application – Real Time

- HDMI Source Analysis – Real Time Analysis (video and metadata)
 - View incoming video in real time.
 - View video parameters in real time.
 - Identify changes in video parameters as they occur.



AVI: 5 (7) 22487

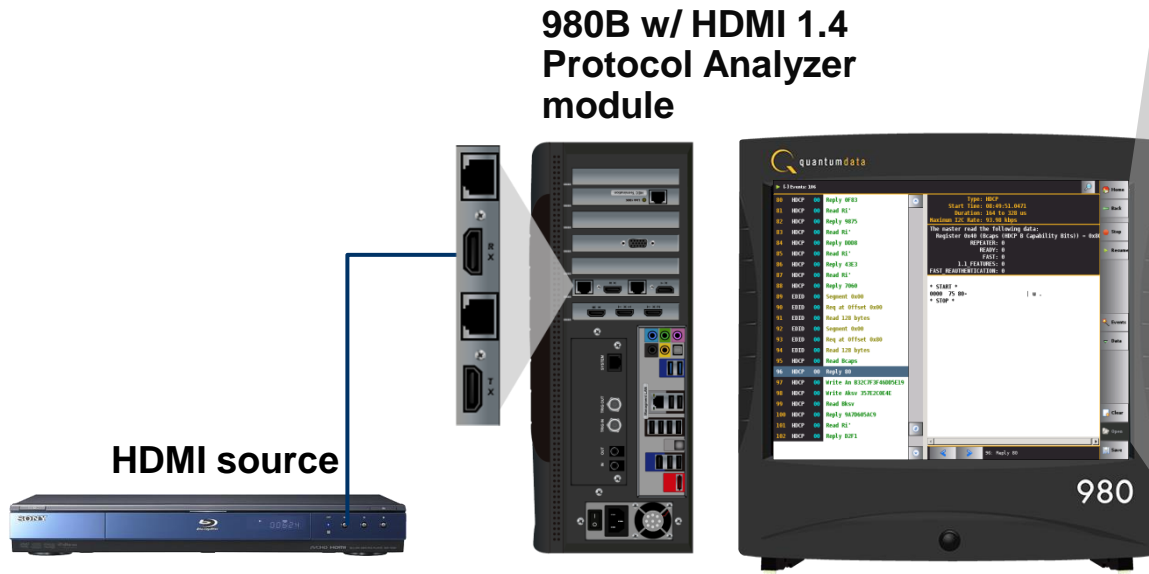
```
check sum: 0xa0
scan info: All active pixels & lines are displayed
active info: format valid
RGB/YCC indicator: YCbCr 4:4:4
active format: same as picture 8
picture aspect ratio: 16:9
colorimetry: ITU709 [6]
non-uniform picture scale: no known
quantization range: default (depends on video format)
IT content: no data
video format: VIC=16(1920x1080p 59.9/60Hz,16:9, 1:1)
pixel repetition: none
line number of end of top bar: 0
line number of start of bottom bar: 1081
pixel number of end of left bar: 0
pixel number of start of right bar: 1921
```

HB: 82 02 0d e4 |
SP0: a0 52 a8 00 10 00 00 7f |.R.....|
SP1: 00 39 04 00 00 81 07 69 |.9.....i|
SP2: 00 00 00 00 00 00 00 00 |.....|

Home
Back
Stop
Video
AVI-IF
VS-IF
GCP
User
Mode
Tools
2...05...D.3

980 Protocol Analyzer Application – Real Time

- HDMI Source Analysis – Real Time Analysis (auxiliary data)
 - View EDID exchange data in real time.
 - View HDCP authentication transactions in real time.
 - View details of each transaction.



[-] Events: 106

80	HDCP	00	Reply 0F83
81	HDCP	00	Read Ri'
82	HDCP	00	Reply 9875
83	HDCP	00	Read Ri'
84	HDCP	00	Reply DDD8
85	HDCP	00	Read Ri'
86	HDCP	00	Reply 43E3
87	HDCP	00	Read Ri'
88	HDCP	00	Reply 7060
89	EDID	00	Segment 0x00
90	EDID	00	Req at Offset 0x00
91	EDID	00	Read 128 bytes
92	EDID	00	Segment 0x00
93	EDID	00	Req at Offset 0x80
94	EDID	00	Read 128 bytes
95	HDCP	00	Read Bcaps
96	HDCP	00	Reply 80
97	HDCP	00	Write An B32C7F3F46DD5E19
98	HDCP	00	Write Aksv 357E2C0E4E
99	HDCP	00	Read Bksv
100	HDCP	00	Reply 9A7D605AC9
101	HDCP	00	Read Ri'
102	HDCP	00	Reply D2F1

Type: HDCP
Start Time: 08:49:51.0471
Duration: 164 to 328 us
Maximum I2C Rate: 93.98 kbps

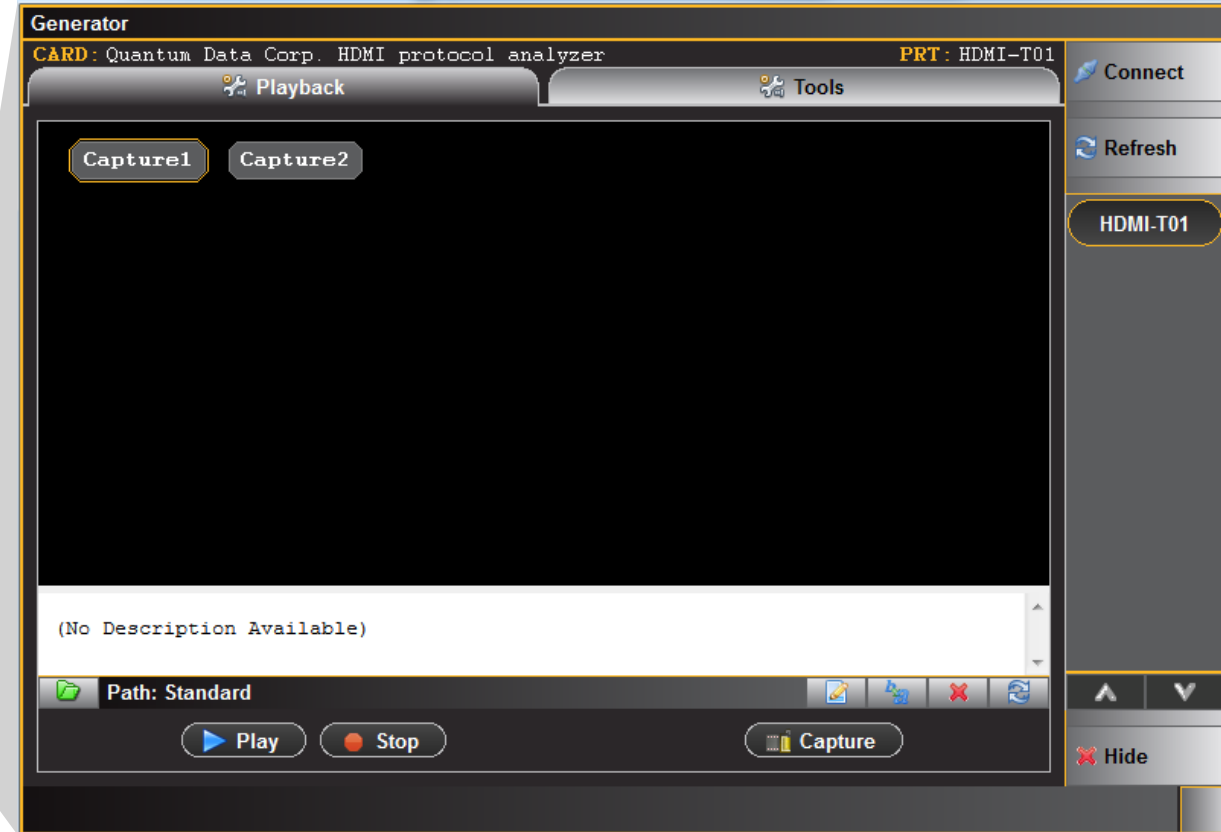
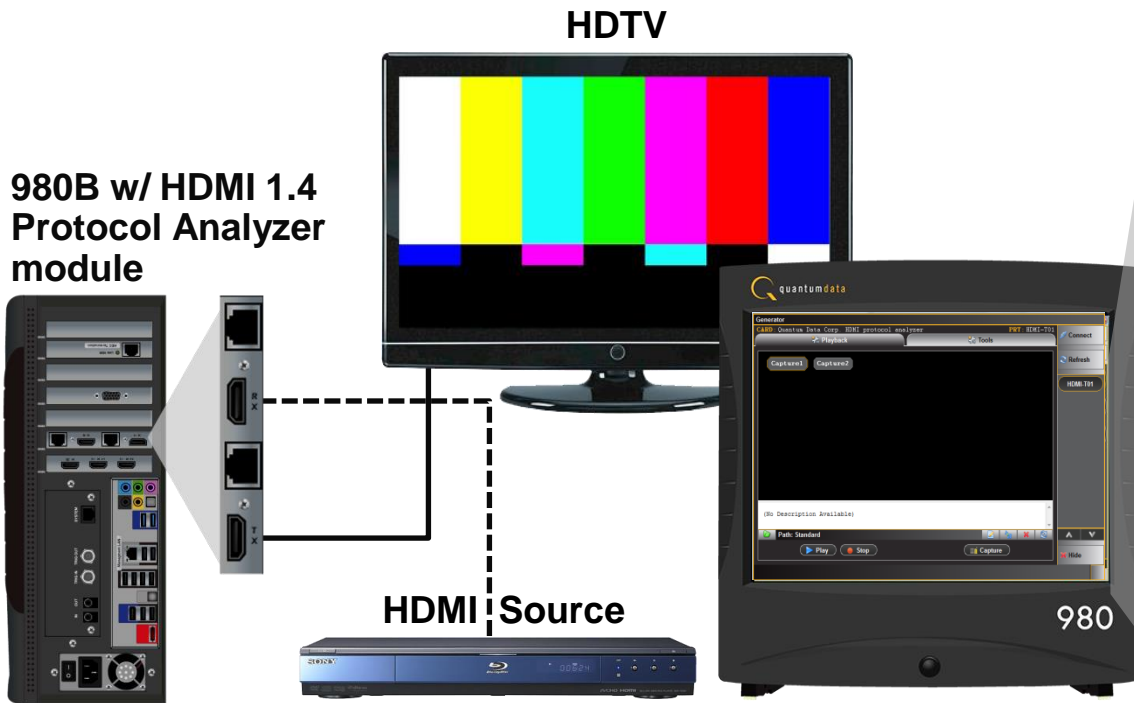
The master read the following data:
Register 0x40 (Bcaps (HDCP B Capability Bits)) = 0x80
REPEATER: 0
READY: 0
FAST: 0
1.1 FEATURES: 0
FAST_REAUTHENTICATION: 0

* START *
0000 75 80- | u .
* STOP *

96: Reply 80

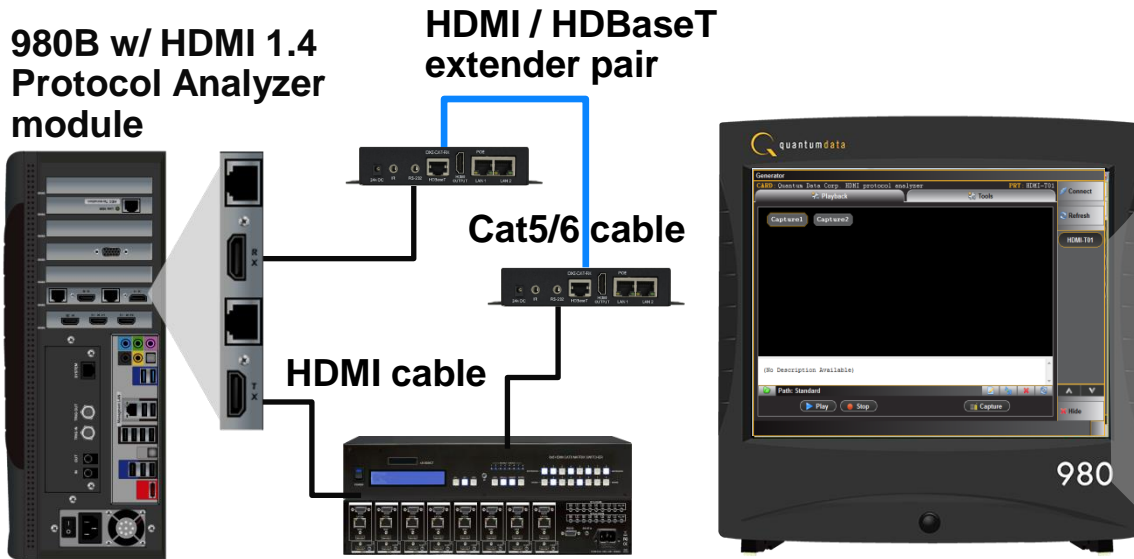
980 Protocol Analyzer Application – Playback

- HDMI Sink Video Test
 - Playback a previously captured file to test a sink device.
 - Utility enables you to capture from a source with interoperability problems to help identify root cause.



980 Protocol Analyzer Application – Cable/Link Test

- HDMI Cable or Link Test
 - Test HDMI cables or HDMI distribution networks for pixel errors.
 - Real time results show frames tested, pixels tested, pixel errors and pixel error rate.
 - HTML report shows which pixels were in error and expected values and measured values.



Pseudo-Random Noise Test

Number of Frames: Continuous

Max Recorded Errors: (1 - 255)

Format:

[▶ Start Analysis](#)

Frames Analyzed: 1745
Total Errors: 300619
Pixels Analyzed: 608947200
Error Rate: 493670.059 per Billion

[HTML Report](#)

HTML Viewer

Detailed Error Report

Quantum Data

PRN Error Test: Detailed Error Summary

Frames Analyzed : 1745
 Total Errors : 300619
 Pixels Measured : 608947200
 Error Rate : 493670.059 Errors per Billion

Error Details

Error #	Frame				Measured			Expected		
		X	Y		R	G	B	R	G	B
1	435	0	0		85	85	165	115	17	196
2	435	0	1		85	85	165	127	0	128
3	435	0	2		229	254	248	201	43	103
4	435	0	3		239	244	236	127	26	112
5	435	0	4		247	247	224	58	95	109
6	435	0	5		227	224	224	110	23	155
7	435	0	6		239	234	224	181	55	179
8	435	0	7		251	224	224	138	10	136

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980 Protocol Analyzer App – Source Compliance Test

- Run HDMI 1.4 source compliance tests
 - Pre-test your HDMI 1.4 source device.
 - Self-test your HDMI 1.4 source device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4 Protocol Analyzer module



The screenshot shows the "HDMI Src CT 1.4b" software interface. The top window displays test selection options, including "Protocol", "Video", "Audio", "Interop. With DVI", and "Advanced Features". Below this, two green boxes highlight specific test categories: "7-16: Legal Codes" and "7-17: Basic Protocol". The main window shows a "Test List" table with columns for Category, Test Name, Duration, and Status. The table lists various tests, including "7-32: Audio Sample Packet Layout", "Interop. With DVI", and "Advanced Features". The status of each test is indicated by a colored bar (green for Pass, yellow for Incomplete, red for Fail, and cyan for In Progress). A "Test Log" window at the bottom shows a sequence of messages, including "Performing the Capture Starting...", "Waiting for the capture trigger event to occur...", "Capturing data...", and "Post Capture Processing".

Category / Test Name	Duration	Status
Iter 01: (4) 1280x720p @ 60 Hz, 96 kHz 3 or more Channel PCM Audio	2 s	Fail
Iter 02: (2,3) 720x480p @ 60 Hz, 48 kHz 2 Channel PCM or Compressed Audio	2 s	User Skipped
7-32: Audio Sample Packet Layout		Incomplete
Iter 01: Any supported format, 2-Channel PCM Audio	15 f	Pass
Iter 02: Any supported format, Greater than 2-Channel PCM Audio	15 f	User Skipped
Interop. With DVI		Incomplete
7-33: Interoperability with DVI		Incomplete
Iter 01: Any supported format, DVI	15 f	User Skipped
Iter 02: Any supported format, HDMI VSDB = 5	15 f	User Skipped
Iter 03: Any supported format, HDMI VSDB > 5	15 f	User Skipped
Advanced Features		Incomplete
7-34: Deep Color		Incomplete
Iter 01: (2,3) 720x480p @ 60 Hz, Deep Color 36 bpp	15 f	User Skipped
7-38: 3D Video Format Timing		Incomplete
Iter 01: (32) 1920x1080p @ 24 Hz, Frame Packing, 3D, HDCP Disabled	15 f	User Skipped
Iter 02: (4) 1280x720p @ 60 Hz, Frame Packing, 3D, HDCP Disabled	15 f	Pass
Iter 03: (19) 1280x720p @ 50 Hz, Frame Packing, 3D, HDCP Disabled	15 f	Fail
Iter 04: (5) 1920x1080i @ 60 Hz, Side-by-Side (Half), 3D, HDCP Disabled	15 f	User Skipped
Iter 05: (20) 1920x1080i @ 50 Hz, Side-by-Side (Half), 3D, HDCP Disabled	15 f	User Skipped
Iter 06: (32) 1920x1080p @ 24 Hz, Top-and-Bottom, 3D, HDCP Disabled	15 f	In Progress
Iter 07: (4) 1280x720p @ 60 Hz, Top-and-Bottom, 3D, HDCP Disabled	15 f	Not Tested
Iter 08: (19) 1280x720p @ 50 Hz, Top-and-Bottom, 3D, HDCP Disabled	15 f	Not Tested

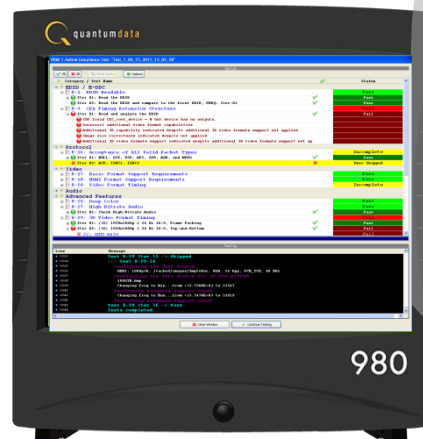
980 Protocol Analyzer App – Sink Compliance Test

- Run HDMI 1.4 sink compliance tests
 - Pre-test your HDMI 1.4 sink device.
 - Self-test your HDMI 1.4 sink device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4
Protocol Analyzer
module



UHDTV



The screenshot shows the software interface for the 980 Protocol Analyzer. The main window displays a test results table for "HDMI 1.4 Sink Compliance Test: 'Test_1_04_15_2011_12_05_58'". The table lists various test categories and their results:

Category / Test Name	Status
EDID / E-DDC	
8-1: EDID Readable	Pass
Iter 01: Read the EDID	Pass
Iter 02: Read the EDID and compare to the first EDID, PREQ: Iter-01	Pass
8-3: CEA Timing Extension Structure	Fail
Iter 01: Read and analyze the EDID	Fail
CDP field CEC_root_device = N but device has no outputs.	Fail
Incorrect additional video format capabilities	Fail
Additional 3D capability indicated despite additional 3D video formats support not applied	Fail
Image size correctness indicated despite not applied	Fail
Additional 3D video formats support indicated despite additional 3D video formats support not ap	Fail
Protocol	
8-16: Acceptance of All Valid Packet Types	Incomplete
Iter 01: NULL, GCP, VSP, AVI, SPD, AUD, and MPEG	Pass
Iter 02: ACP, ISRC1, ISRC2	User Skipped
Video	
8-17: Basic Format Support Requirements	Pass
8-18: HDMI Format Support Requirements	Pass
8-20: Video Format Timing	Incomplete
Audio	
Advanced Features	
8-25: Deep Color	Pass
8-27: High Bitrate Audio	Pass
Iter 01: Check High-Bitrate Audio	Pass
8-29: 3D Video Format Timing	Fail
Iter 01: (32) 1920x1080p @ 24 Hz 16:9, Frame Packing	Pass
Iter 02: (32) 1920x1080p @ 24 Hz 16:9, Top-and-Bottom	Fail
01: MIN Rate	Fail

Below the table, a "Test Log" window shows the following messages:

```
Line Message
0337 Test 8-29 Iter 15 -> Skipped
0338 --- Test 8-29-16
0339 Configuring the Test Source
0340 HDMI, 1080p30, /cache0/images/SmpteBar, RGB, 24 bpp, PCM_2CH, 48 KHz
0341 Configuring the Test Source for 3D TOP BOTTOM
0342 1080TB.hmp
0343 Changing freq to Min...from +33.7500E+03 to 33547
0344 Performing adequate support check
0345 Changing freq to Max...from +33.9470E+03 to 33919
0346 Performing adequate support check
0347 Test 8-29 Iter 16 -> Pass
0348 Tests completed
```

980 Protocol Analyzer App – Source Compliance Test

- Run HDMI 2.0 4:2:0 Compliance tests for 4K UHD resolutions
 - Pre-test your HDMI 2.0 sink device.
 - Self-test your HDMI 2.0 sink device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4 Protocol Analyzer module



HDMI 2.0 Src CT 2.0

Compliance Test Results Viewer

HDMI Src (2.0) Compliance Test Results

Results Name: XYZ-ABC Manufacturer: XYZ
Date Tested: September 12, 2013 10:45 AM Model Name: ABC
Overall Status: **CTS 2.0 - Pass** Port Tested: Output 1

Test Name / Details	Status
HF1-31: Pixel Encoding - YCBCR 4:2:0 - TMDS Pixel Encoding	Pass
Iter 01: (97) 3840x2160p @ 60 Hz, YCbCr 4:2:0, EDID w/ Y420 VDB	Pass
Test image not supported by DUT; Image analysis skipped.	
Visual verification: The image was transmitted with the correct pixel encoding.	
Iter 02: (97) 3840x2160p @ 60 Hz, YCbCr 4:2:0, EDID w/ Y420 Cap. Map	Pass
Test image not supported by DUT; Image analysis skipped.	
Visual verification: The image was transmitted with the correct pixel encoding.	

Instrument: 980B_JB [192.168.254.166] Continue Test Execution

980 Protocol Analyzer App – Source Compliance Test

- Run HDMI 2.0 4:2:0 Compliance tests for 4K UHD resolutions
 - Pre-test your HDMI 2.0 source device.
 - Self-test your HDMI 2.0 source device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4 Protocol Analyzer module



The screenshot shows the "Compliance Test Results Viewer" application. The main window displays "HDMI Src (2.0) Compliance Test Results" for "ABC DUT". The overall status is "CTS 2.0 - Pass". A table lists test results for "HF1-33: Video Timing - YCBCR 4:2:0", showing two iterations (Iter 01 and Iter 02) both passing. A secondary window, "HDMI 2.0 Src CT 2.0", provides detailed test options and a list of test items. The "HF1-33: Video Timing - YCBCR 4:2:0" test is selected and highlighted in green.

Test Name / Details	Status
HF1-33: Video Timing - YCBCR 4:2:0	Pass
Iter 01: (97) 3840x2160p @ 60 Hz, YCbCr 4:2:0, EDID w/ Y420 VDB	Pass
Iter 02: (97) 3840x2160p @ 60 Hz, YCbCr 4:2:0, EDID w/ Y420 Cap. Map	Pass

HF1-14: Video Timing - 6G - 2160p 24-bit Color Depth
Confirm that the Source, whenever transmitting any 24bits Deep Color 2160p Video Format with a TMDS Character Rate greater than 340Mpsc, complies with all of the required Pixel and line counts.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)

HF1-15: Video Timing - 6G - Deep Color
Confirm that the Source outputs correct Deep Color Video Format for TMDS Character Rates greater than 340Mpsc.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)

HF1-16: Video Timing - 6G - 2160p 3D
Confirm that the Source outputs the correct 3D and 2160p Video Formats with a TMDS Character Rate greater than 340Mpsc.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)

HF1-33: Video Timing - YCBCR 4:2:0
Confirm that the Source outputs the correct timing for YCBCR 4:2:0 timings.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #1)

980 Protocol Analyzer App – Sink Compliance Test

- Run HDMI 2.0 4:2:0 Sink Compliance tests for 4K UHD resolutions
 - Pre-test your HDMI 2.0 sink device.
 - Self-test your HDMI 2.0 sink device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4 Protocol Analyzer module



UHDTV



The screenshot shows the 'HDMI 2.0 Sink CT 2.0' software interface. The main window displays test results for 'HF2-23: Pixel Decoding - YCBCR 4:2:0' and 'HF2-24: Pixel Decoding - YCBCR 4:2:0 Deep Color'. Both tests are marked as 'Pass'. Below this, a 'Compliance Test Results Viewer' window shows a summary of the test results, including the test name, date, manufacturer, and overall status 'CTS 2.0 - Pass'. A table of test results is also visible, showing four iterations of the HF2-23 test, all of which passed.

Test Name / Details	Status
HF2-23: Pixel Decoding - YCBCR 4:2:0	Pass
Iter 01: (97) 3840x2160p @ 60 Hz 16:9 (Low Pixel Clock)	Pass
Iter 02: (97) 3840x2160p @ 60 Hz 16:9 (High Pixel Clock)	Pass
Iter 03: (102) 4096x2160p @ 60 Hz (Low Pixel Clock)	Pass
Iter 04: (102) 4096x2160p @ 60 Hz (High Pixel Clock)	Pass

980 Protocol Analyzer App – Sink Compliance Test

- Run HDMI 2.0 EDID Sink Compliance tests for 4K UHD resolutions
 - Pre-test your HDMI 2.0 sink device.
 - Self-test your HDMI 2.0 sink device to reduce costs and meet product time to market requirements.

980B w/ HDMI 1.4 Protocol Analyzer module



The image shows two overlapping software windows. The top window, titled 'Compliance Test Results Viewer', displays test results for 'HDMI Sink (2.0) Compliance Test Results'. It shows a 'Results Name' of '780A_EDID_Test_26_1', a 'Date Tested' of 'October 15, 2013 11:15 AM', and an 'Overall Status' of 'CTS 2.0 - Pass'. A table below lists test results, with 'HF2-26: EDID - Video Format Declaration' showing a 'Pass' status for 'Iter 01: Perform EDID Checks.' The bottom window, titled 'HDMI 2.0 Sink CT 2.0', shows a list of test items with checkboxes and descriptions:

- HF2-10: Video Timing - 6G - HF-VSDB
Confirm that the Sink DUT contains a valid HF-VSDB.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #2)
- HF2-26: EDID - Video Format Declaration
Confirm that an HDMI 2.0 capable Sink DUT correctly declares support for Video Formats in its EDID.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #2)
- HF2-31: EDID - YCBCR 4:2:0 - Data Blocks
Confirm that a YCBCR 4:2:0 capable Sink DUT EDID contains a valid Video Data Block and/or YCBCR 4:2:0 Capability Map Data Block
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #1)
- HF2-32: EDID - YCBCR 4:2:0 BT.2020 - Data Block
Confirm that a YCBCR 4:2:0 BT.2020 capable Sink DUT EDID contains a valid Colorimetry Data Block
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #2)
- HF2-35: EDID YCBCR 4:2:0 Deep Color HF-VSDB
Confirm that a YCBCR 4:2:0 Deep Color Pixel encoding-capable Sink DUT EDID contains a valid HF-VSDB.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #2)
- HF2-39: EDID 3D and Multi-stream Audio Data Blocks
Confirm that the structure of the HDMI Audio Data Block in the EDID is valid.

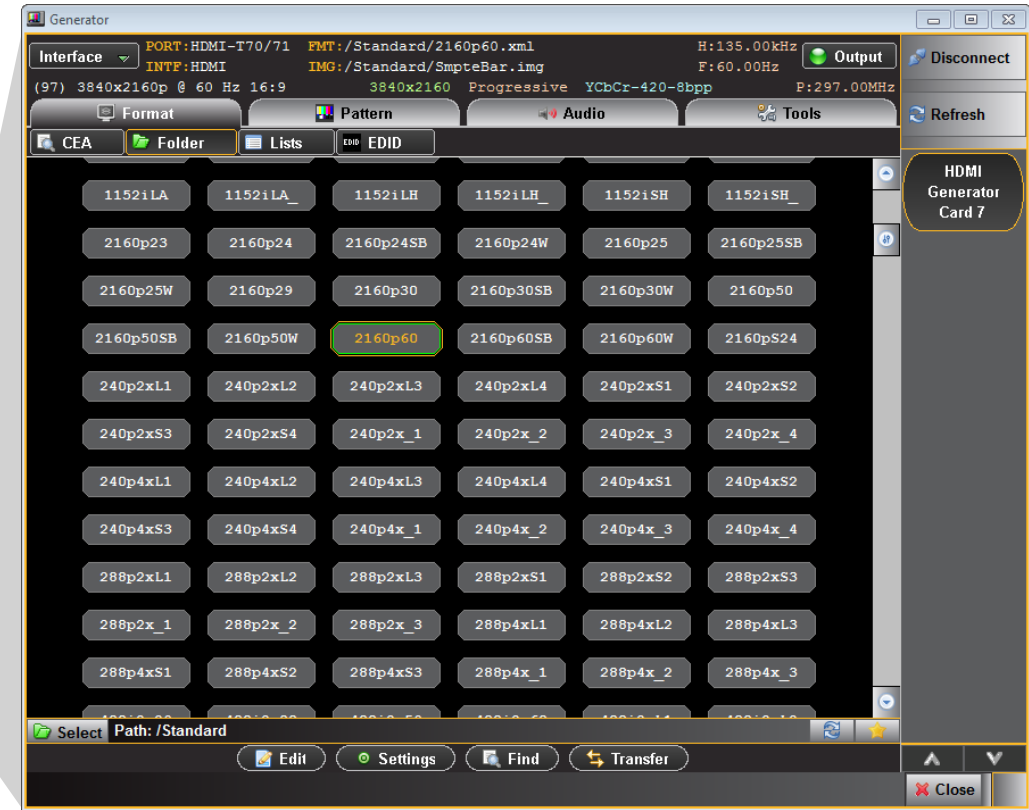
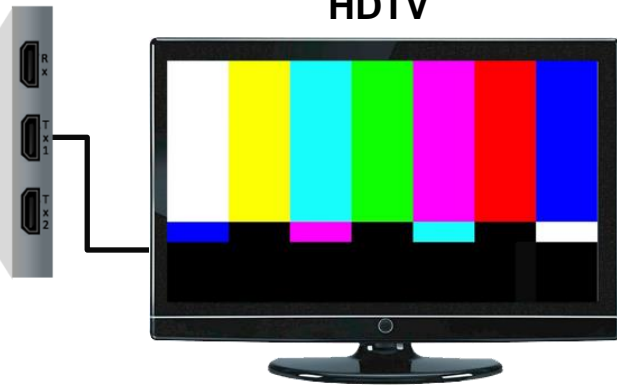
Applications

HDMI 1.4 Video Generator module

980 HDMI Video Generator Application – Video Test

- HDMI Video Test of an HDMI 1.4 sink device
 - Run video tests including advanced features such as deep color and 3D.
 - Supports formats up to 300MHz pixel rates.
 - Use extensive format and test pattern library.

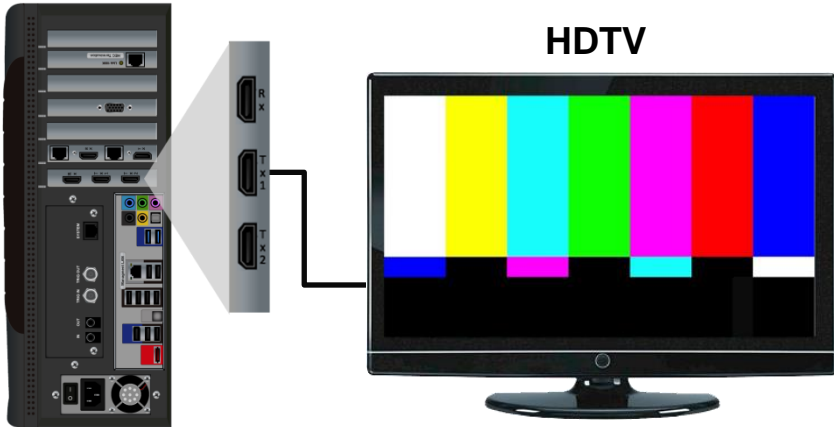
980B w/ HDMI 1.4
Video Generator
module



980 HDMI Video Generator Application – Video Test

- HDMI Video Test of an HDMI 1.4 sink device
 - Use filtering system to select format.

980B w/ HDMI 1.4
Video Generator
module



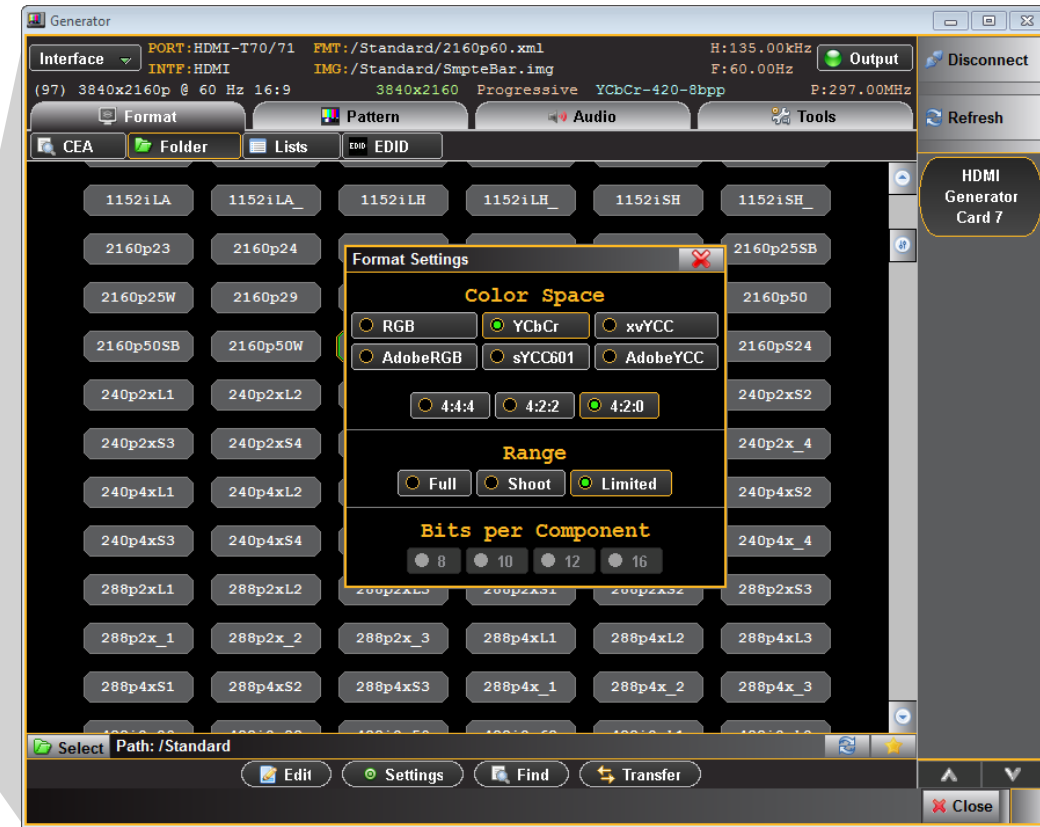
980 HDMI Video Generator Application – Video Test

- HDMI Video Test of an HDMI 2.0 sink device
 - Run video tests including advanced features such as deep color and 3D.
 - Use extensive format and test pattern library.
 - Test HDMI 2.0 4K ultra high definition TVs at 50/60Hz using HDMI 2.0 4:2:0 pixel encoding.

980B w/ HDMI 1.4
Video Generator
module



Ultra-HDTV



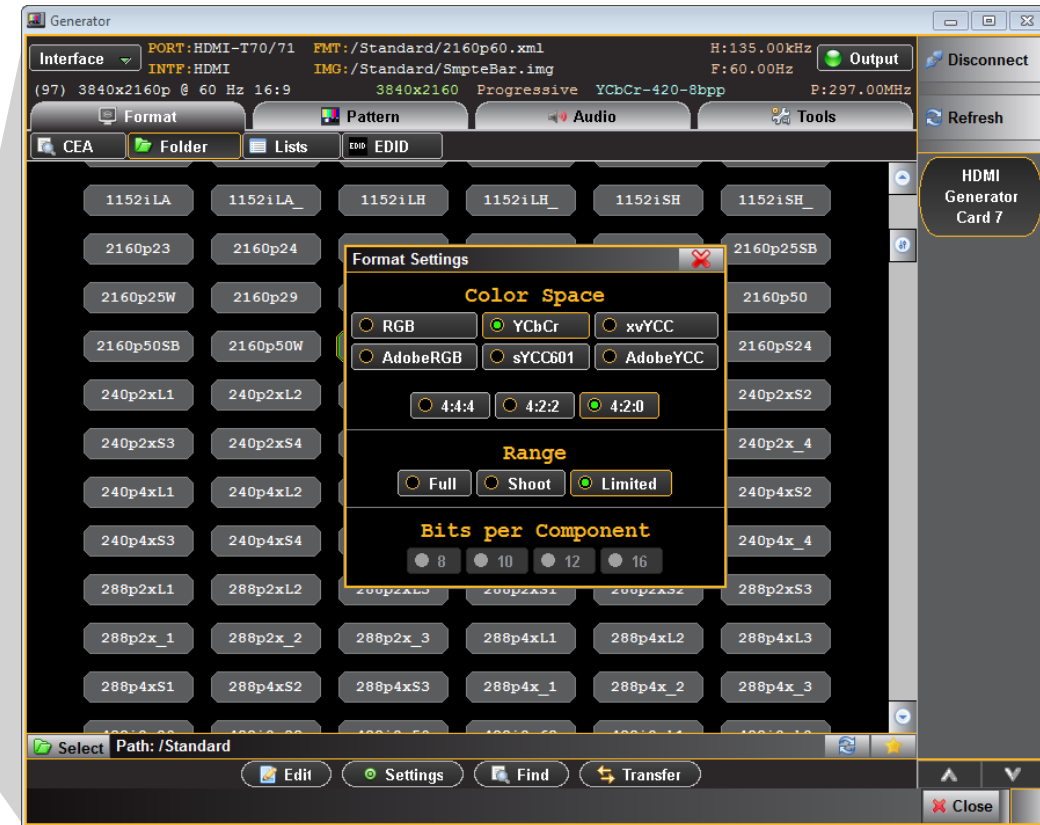
980 HDMI Video Generator Application – Video Test

- HDMI Deep Color Video Test of an HDMI 2.0 sink device
 - Run video tests including advanced features such as deep color and 3D.

980B w/ HDMI 1.4
Video Generator
module



Ultra-HDTV



980 HDMI Video Generator Application – Video Test

- HDMI 3D Video Test of an HDMI 2.0 sink device
 - Run video tests including advanced features such as deep color and 3D.

980B w/ HDMI 1.4
Video Generator
module



Ultra-HDTV



980 HDMI Video Generator Application – Audio Test

- HDMI Video Test of an HDMI audio rendering device
 - Run LPCM uncompressed formats with programmable audio parameters.



980 HDMI Video Generator Application – Audio Test

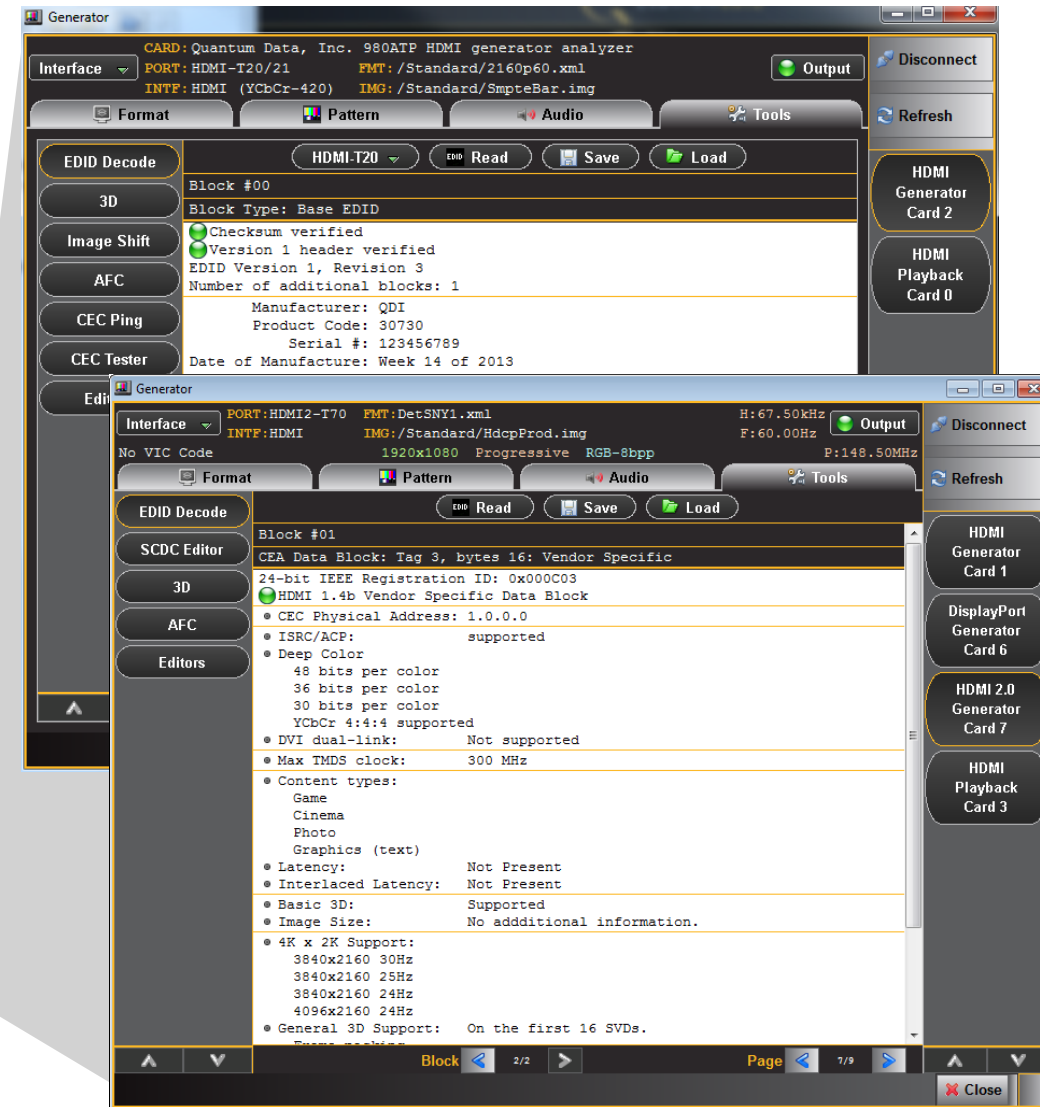
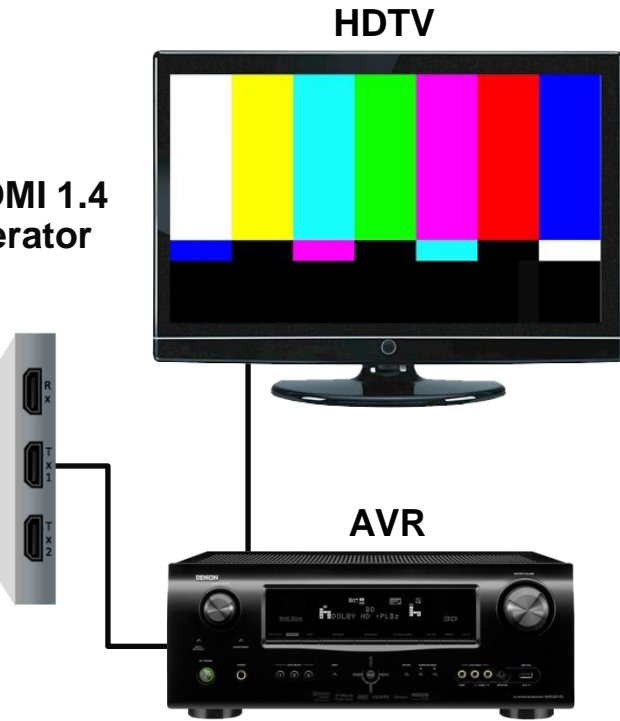
- HDMI Video Test of an HDMI audio rendering device
 - Select from a variety of Dolby and DTS compressed audio clips.



980 HDMI Video Generator Application – EDID Test

- HDMI EDID verification test of an HDMI sink device
 - View the entire EDID in human readable text.
 - Check for checksum and header errors.

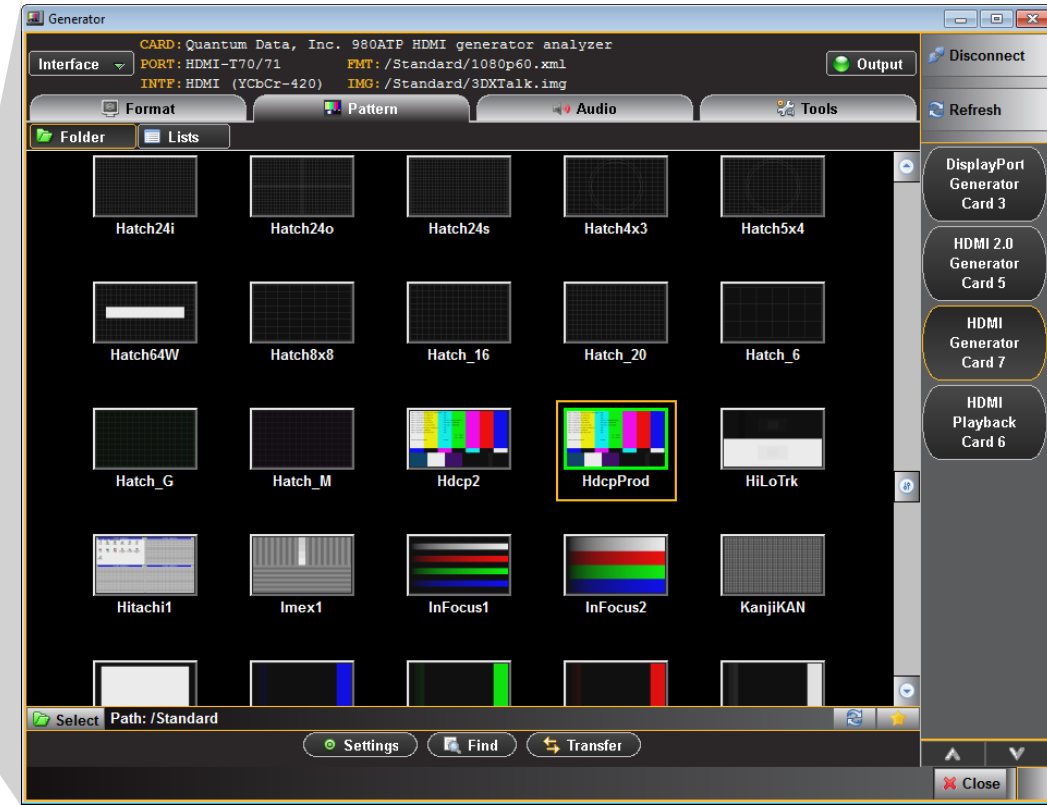
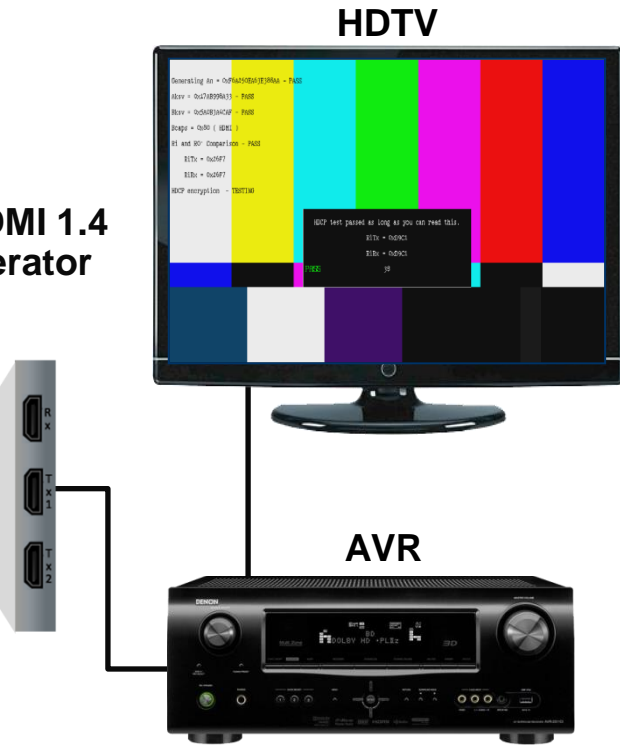
980B w/ HDMI 1.4
Video Generator
module



980 HDMI Video Generator Application – HDCP Test

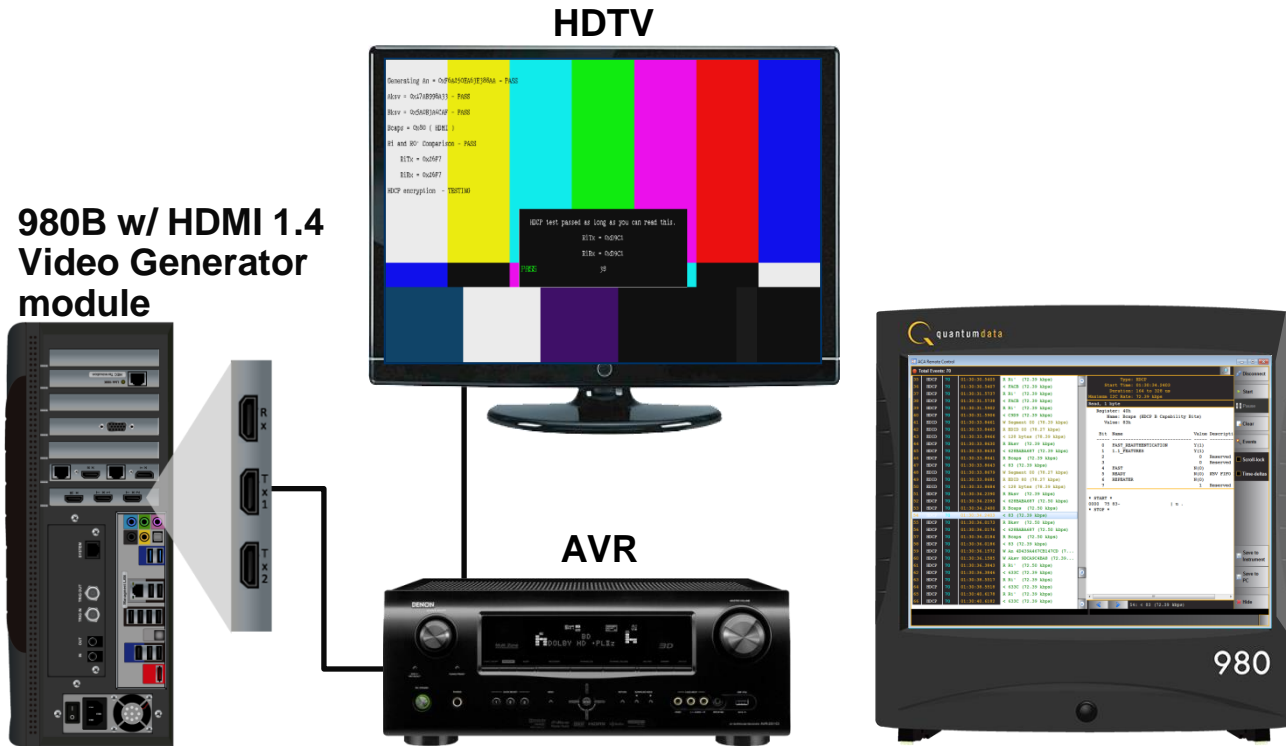
- HDCP verification test of an HDMI sink device
 - Verify HDCP authentication.
 - View results on connected display.

980B w/ HDMI 1.4
Video Generator
module



980 HDMI Video Generator Application – HDCP Test

- HDCP verification with an HDMI sink device
 - Verify HDCP authentication transactions on Auxiliary Channel Analyzer (ACA) utility.
 - Save results and disseminate to colleagues at other locations.



ACA Remote Control

Total Events: 70

Event	Time	Source	Destination	Rate
35	01:30:30.5405	R Ri'	(72.39 kbps)	
36	01:30:30.5407	< FACB	(72.39 kbps)	
37	01:30:31.5737	R Ri'	(72.39 kbps)	
38	01:30:31.5738	< FACB	(72.39 kbps)	
39	01:30:31.5902	R Ri'	(72.39 kbps)	
40	01:30:31.5906	< C9D9	(72.39 kbps)	
41	01:30:33.8461	W Segment 00	(78.39 kbps)	
42	01:30:33.8463	R EDID 00	(78.27 kbps)	
43	01:30:33.8466	< 128 bytes	(78.39 kbps)	
44	01:30:33.8630	R Bksv	(72.39 kbps)	
45	01:30:33.8633	< 628BABA687	(72.39 kbps)	
46	01:30:33.8641	R Bcaps	(72.39 kbps)	
47	01:30:33.8643	< 83	(72.39 kbps)	
48	01:30:33.8679	W Segment 00	(78.27 kbps)	
49	01:30:33.8681	R EDID 80	(78.27 kbps)	
50	01:30:33.8684	< 128 bytes	(78.39 kbps)	
51	01:30:34.2390	R Bksv	(72.39 kbps)	
52	01:30:34.2393	< 628BABA687	(72.50 kbps)	
53	01:30:34.2400	R Bcaps	(72.50 kbps)	
54	01:30:34.2403	< 83	(72.39 kbps)	
55	01:30:36.0173	R Bksv	(72.50 kbps)	
56	01:30:36.0176	< 628BABA687	(72.50 kbps)	
57	01:30:36.0184	R Bcaps	(72.50 kbps)	
58	01:30:36.0186	< 83	(72.39 kbps)	
59	01:30:36.1572	W An 4D439A467CB147CD	(7...	
60	01:30:36.1585	W Aksv 9DCA9C4BA8	(72.39...	
61	01:30:36.3843	R Ri'	(72.50 kbps)	
62	01:30:36.3846	< 633C	(72.39 kbps)	
63	01:30:38.5517	R Ri'	(72.39 kbps)	
64	01:30:38.5518	< 633C	(72.39 kbps)	
65	01:30:40.6178	R Ri'	(72.39 kbps)	
66	01:30:40.6182	< 633C	(72.39 kbps)	

Register: 40h
Name: Bcaps (HDCP B Capability Bits)
Value: 83h

Bit	Name	Value	Description
0	FAST_REAUTHENTICATION	Y(1)	
1	1.1_FEATURES	Y(1)	
2		0	Reserved
3		0	Reserved
4	FAST	N(0)	
5	READY	N(0)	KSV FIFO
6	REPEATER	N(0)	
7		1	Reserved

* START *
0000 75 83-
* STOP *

980 HDMI Video Generator Application – CEC Test

- CEC message verification with an HDMI device
 - Verify CEC messaging with CEC Tester utility.
 - Select any message from dialog box, choose parameters.
 - View results in dialog box.



980 HDMI Video Generator Application – CEC Test

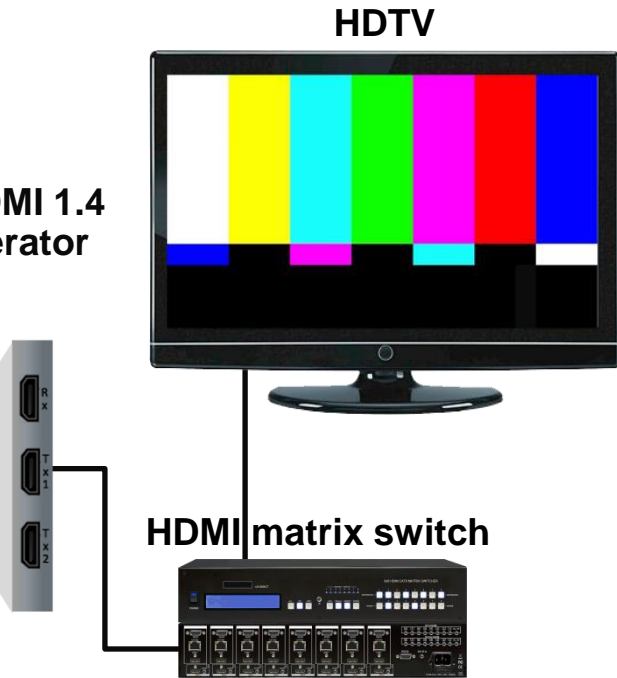
- CEC message verification with an HDMI device
 - Modify timing and send corrupt bits using CEC Tester utility.
 - Run robustness (“irregular” tests on acknowledgment and arbitration.



980 HDMI Video Generator Application – CEC Test

- CEC message verification with an HDMI device
 - View CEC messaging on Auxiliary Channel Analyzer utility.

980B w/ HDMI 1.4 Video Generator module



[] Events: 23, Pending: 0

1	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
2	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
3	CEC	20	TV->	TV, Ping or UnACKed Header
4	CEC	20	TV->	TV, Ping or UnACKed Header
5	CEC	20	TV->	TV, Ping or UnACKed Header
6	CEC	20	TV->	TV, Ping or UnACKed Header
7	CEC	20	TV->	TV, Ping or UnACKed Header
8	CEC	20	TV->	TV, Ping or UnACKed Header
9	CEC	20	TV->	TV, Ping or UnACKed Header
10	CEC	20	TV->	TV, Ping or UnACKed Header
11	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
12	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
13	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
14	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
15	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
16	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
17	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
18	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
19	CEC	20	PLAY1->	TV, Give Physical Address (0x83)
20	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
21	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
22	CEC	20	TV->*	ALL*, Report Physical Address (0x84)
23	CEC	20	TV->*	ALL*, Report Physical Address (0x84)

Type: CEC
Time since last reset: 00:00:00.7983

- Missing one or more acknowledgements.
- Shorter than the opcode it contains will allow.

Size of message: 2 bytes (21 bits total)
Message source: TV (0x0)
Message destination: *ALL* (0xF)
Message opcode: Report Physical Address (0x84)
Physical Address: <Insufficient Data>
Device Type: ERROR:None given

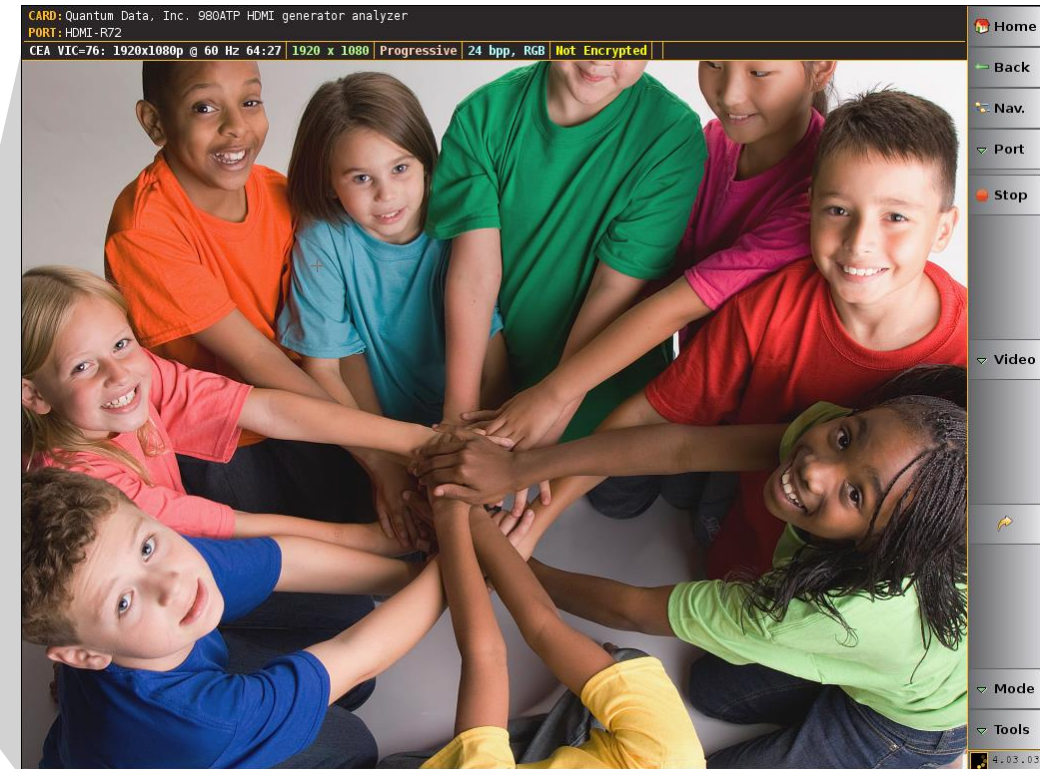
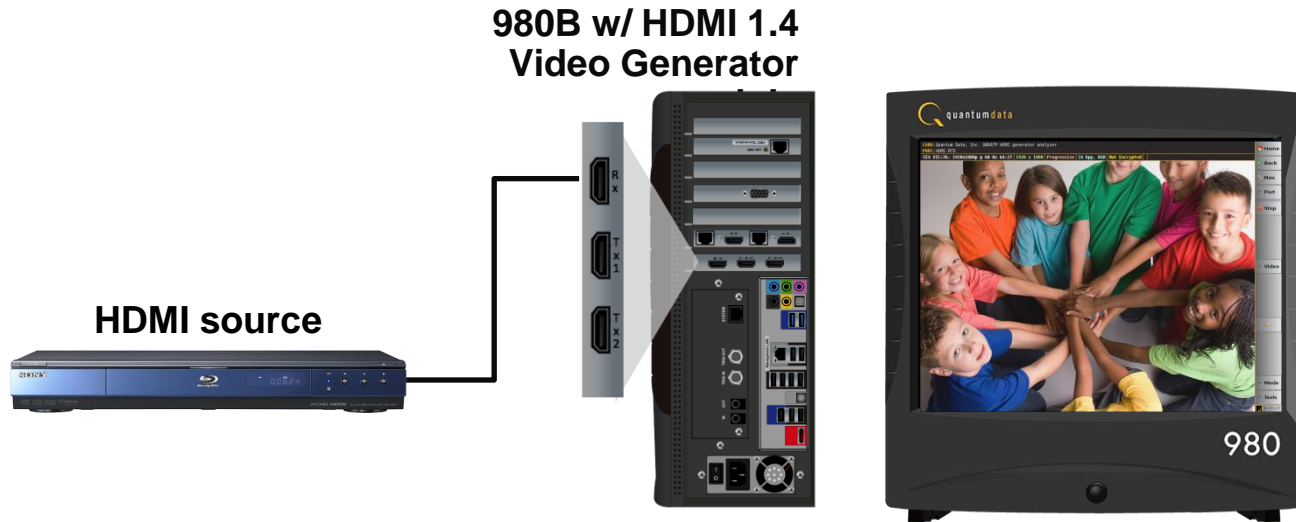
Byte Count: 2
[0000][0F+ 84-] [. . ----]

Number	Lo(ms)	Hi(ms)	Inv	Dat	Val
0	3.69	0.81	---	H	S
1	1.50	0.89	---	Y	0
2	1.50	0.90	---	Y	0
3	1.50	0.89	---	Y	0
4	1.50	0.90	---	Y	0
5	0.59	1.80	---	Y	1
6	0.59	1.81	---	Y	1
7	0.59	1.80	---	Y	1
8	0.59	1.81	---	Y	1
9	1.49	0.90	---	Y	0
10	0.60	1.80	---	Y	1
11	0.59	1.80	---	Y	1
12	1.49	0.91	---	Y	0
13	1.49	0.90	---	Y	0
14	1.49	0.91	---	Y	0
15	1.49	0.90	---	Y	0
16	0.59	1.80	---	Y	1
17	1.49	0.90	---	Y	0
18	1.49	0.90	---	Y	0
19	1.49	0.91	---	Y	0
20	1.50	9.16	---	Y	0

20: TV->*ALL*, Report Physical

980 HDMI Video Generator Application – Source Test

- Run basic functional test on HDMI source
 - View video image and video parameters on upper status bar.
 - View image content of HDCP encrypted video stream.
 - Emulate any EDID to test source response.



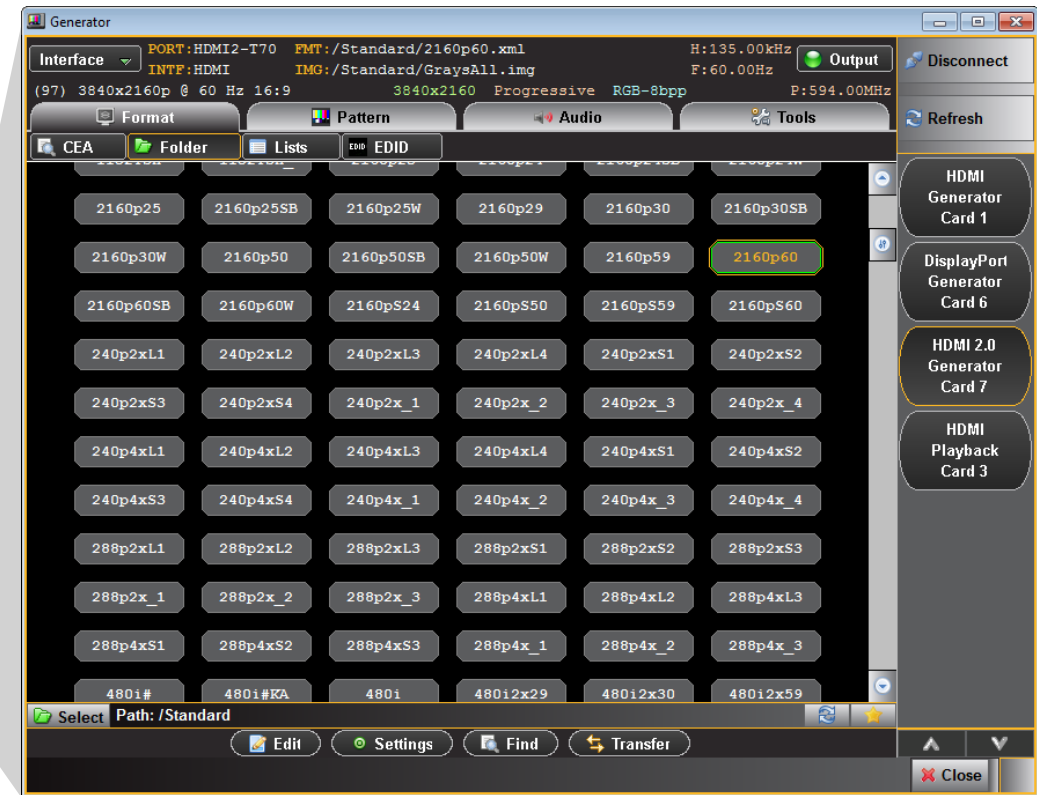
Applications

HDMI 2.0 Video Generator module

980 HDMI 2.0 Video Gen Application – Video Test

- HDMI Video Test of an HDMI 2.0 sink device
 - Run video tests with HDMI 2.0 4K formats at 50/60Hz up to 600MHz pixel rate (6Gb/s data rate).
 - Run video tests including advanced features such as deep color and 3D.
 - Supports 21:9 aspect ratio.
 - Use extensive format and test pattern library.

980B w/ HDMI 2.0
Video Generator
module



980 HDMI 2.0 Video Gen Application – Video Test

- HDMI Video Test of an HDMI 2.0 sink device
 - Test HDMI 2.0 4K ultra high definition TVs at 50/60Hz using HDMI 2.0 4:2:0 pixel encoding.

980B w/ HDMI 2.0
Video Generator
module



980 HDMI 2.0 Video Gen Application – Video Test

- HDMI 3D Video Test of an HDMI 2.0 sink device
 - Test 3D video on HDMI 2.0 4K ultra high definition TVs.

980B w/ HDMI 2.0
Video Generator
module



980 HDMI 2.0 Video Gen Application – Audio Test

- HDMI Video Test of an HDMI audio rendering device
 - Run LPCM uncompressed formats with programmable audio parameters.



980 HDMI 2.0 Video Gen Application – Audio Test

- HDMI Video Test of an HDMI audio rendering device
 - Select from a variety of Dolby and DTS compressed audio clips.



980 HDMI 2.0 Video Gen Application – EDID Test

- HDMI EDID verification test of an HDMI sink device
 - View the entire EDID in human readable text.
 - Check for checksum and header errors.

980B w/ HDMI 2.0
Video Generator
module



Generator

CARD: Quantum Data, Inc. 980ATP HDMI generator analyzer

Interface: PORT: HDMI-T20/21 FMT: /Standard/2160p60.xml

INTF: HDMI (YCbCr-420) IMG: /Standard/SmpteBar.img

Output

Disconnect

Refresh

HDMI Generator Card 2

HDMI Playback Card 0

EDID Decode

Block #00

Block Type: Base EDID

Checksum verified

Version 1 header verified

EDID Version 1, Revision 3

Number of additional blocks: 1

Manufacturer: QDI

Product Code: 30730

Serial #: 123456789

Date of Manufacture: Week 14 of 2013

Generator

PORT: HDMI2-T70 FMT: DetSNY1.xml

INTF: HDMI IMG: /Standard/HdcpProd.img

H: 67.50kHz

F: 60.00Hz

Output

Disconnect

Refresh

HDMI Generator Card 1

DisplayPort Generator Card 6

HDMI 2.0 Generator Card 7

HDMI Playback Card 3

EDID Decode

Block #01

CEA Data Block: Tag 3, bytes 16: Vendor Specific

24-bit IEEE Registration ID: 0x000C03

HDMI 1.4b Vendor Specific Data Block

CEC Physical Address: 1.0.0.0

ISRC/ACP: supported

Deep Color

48 bits per color

36 bits per color

30 bits per color

YCbCr 4:4:4 supported

DVI dual-link: Not supported

Max TMDS clock: 300 MHz

Content types:

Game

Cinema

Photo

Graphics (text)

Latency: Not Present

Interlaced Latency: Not Present

Basic 3D: Supported

Image Size: No additional information.

4K x 2K Support:

3840x2160 30Hz

3840x2160 25Hz

3840x2160 24Hz

4096x2160 24Hz

General 3D Support: On the first 16 SVDs.

Block 2/2

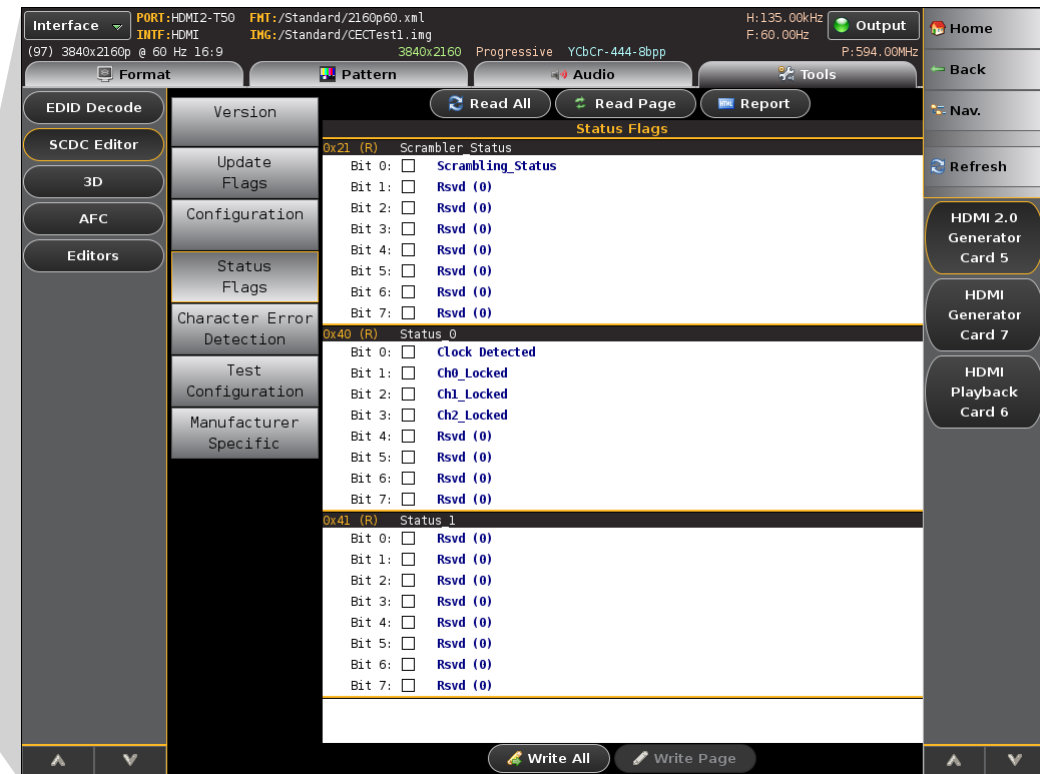
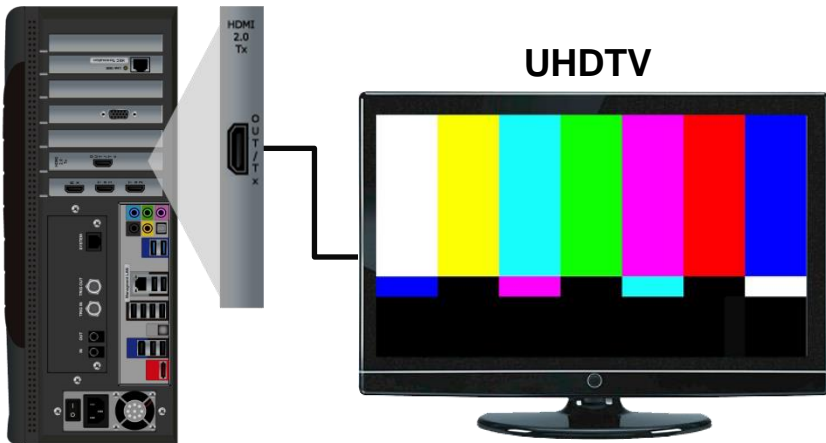
Page 7/9

Close

980 HDMI 2.0 Video Gen Application – SCDC Test

- HDMI SCDC verification test of an HDMI sink device
 - View SCDC registers in human readable text.

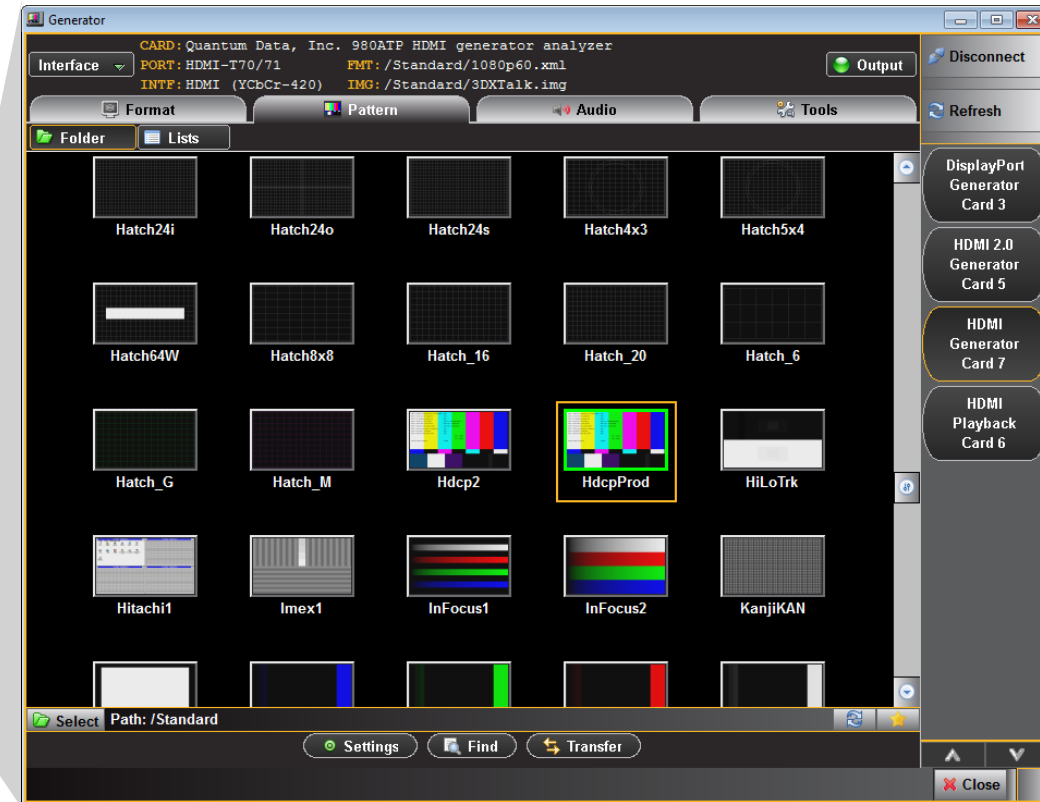
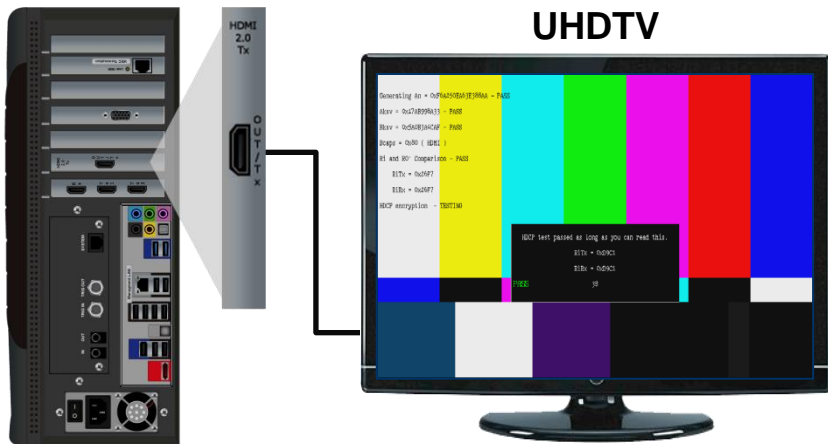
980B w/ HDMI 2.0 Video Generator module



980 HDMI 2.0 Video Gen Application – HDCP Test

- HDCP verification test of an HDMI sink device
 - Verify HDCP authentication.
 - View results on connected display.

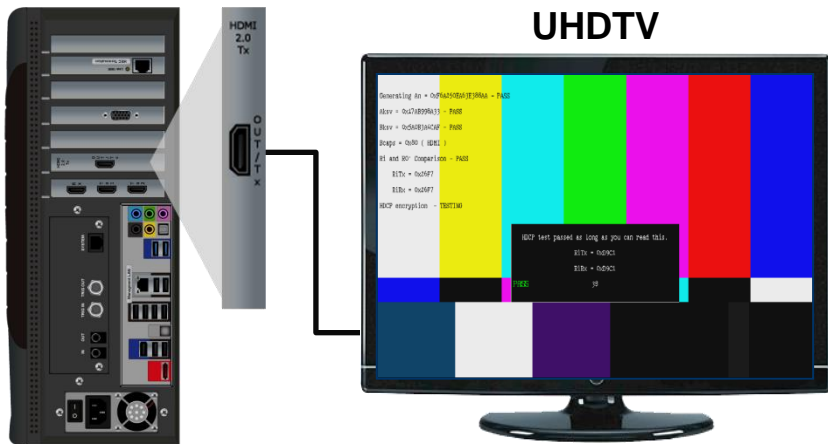
980B w/ HDMI 2.0
Video Generator
module



980 HDMI 2.0 Video Gen Application – HDCP Test

- HDCP verification with an HDMI sink device
 - Verify HDCP authentication transactions on Auxiliary Channel Analyzer (ACA) utility.
 - Save results and disseminate to colleagues at other locations.

980B w/ HDMI 2.0 Video Generator module



ACA Remote Control

Total Events: 70

Event #	Protocol	Time	Direction	Rate
35	HDCP	01:30:30.5405	R Ri'	(72.39 kbps)
36	HDCP	01:30:30.5407	< FACB	(72.39 kbps)
37	HDCP	01:30:31.5737	R Ri'	(72.39 kbps)
38	HDCP	01:30:31.5738	< FACB	(72.39 kbps)
39	HDCP	01:30:31.5902	R Ri'	(72.39 kbps)
40	HDCP	01:30:31.5906	< C9D9	(72.39 kbps)
41	EDID	01:30:33.8461	W Segment 00	(78.39 kbps)
42	EDID	01:30:33.8463	R EDID 00	(78.27 kbps)
43	EDID	01:30:33.8466	< 128 bytes	(78.39 kbps)
44	HDCP	01:30:33.8630	R Bksv	(72.39 kbps)
45	HDCP	01:30:33.8633	< 628BABA687	(72.39 kbps)
46	HDCP	01:30:33.8641	R Bcaps	(72.39 kbps)
47	HDCP	01:30:33.8643	< 83	(72.39 kbps)
48	EDID	01:30:33.8679	W Segment 00	(78.27 kbps)
49	EDID	01:30:33.8681	R EDID 80	(78.27 kbps)
50	EDID	01:30:33.8684	< 128 bytes	(78.39 kbps)
51	HDCP	01:30:34.2390	R Bksv	(72.39 kbps)
52	HDCP	01:30:34.2393	< 628BABA687	(72.50 kbps)
53	HDCP	01:30:34.2400	R Bcaps	(72.50 kbps)
54	HDCP	01:30:34.2403	< 83	(72.39 kbps)
55	HDCP	01:30:36.0173	R Bksv	(72.50 kbps)
56	HDCP	01:30:36.0176	< 628BABA687	(72.50 kbps)
57	HDCP	01:30:36.0184	R Bcaps	(72.50 kbps)
58	HDCP	01:30:36.0186	< 83	(72.39 kbps)
59	HDCP	01:30:36.1572	W An 4D439A467CB147CD	(7...
60	HDCP	01:30:36.1585	W Aksv 9DCA9C4BA8	(72.39...
61	HDCP	01:30:36.3843	R Ri'	(72.50 kbps)
62	HDCP	01:30:36.3846	< 633C	(72.39 kbps)
63	HDCP	01:30:38.5517	R Ri'	(72.39 kbps)
64	HDCP	01:30:38.5518	< 633C	(72.39 kbps)
65	HDCP	01:30:40.6178	R Ri'	(72.39 kbps)
66	HDCP	01:30:40.6182	< 633C	(72.39 kbps)

Selected Event Details:

Type: HDCP
Start Time: 01:30:34.2403
Duration: 164 to 328 us
Maximum I2C Rate: 72.39 kbps

Read, 1 byte

Register: 40h
Name: Bcaps (HDCP B Capability Bits)
Value: 83h

Bit	Name	Value	Description
0	FAST_REAUTHENTICATION	Y(1)	
1	1.1_FEATURES	Y(1)	
2		0	Reserved
3		0	Reserved
4	FAST	N(0)	
5	READY	N(0)	KSV FIFO
6	REPEATER	N(0)	
7		1	Reserved

* START *
0000 75 83-
* STOP *

980 HDMI 2.0 Video Gen App – Compliance Tests

- Run HDMI 2.0 Compliance test at 6G
 - Pre-test your HDMI 2.0 sink device.
 - Self-test your HDMI 2.0 sink device to reduce costs and meet product time to market requirements.

980B w/ HDMI 2.0
Video Generator
module



HDMI Sink CT 2.0

HF2-6: Video Timing - 6G - 2160p 24-bit Color Depth
Confirm that the Sink DUT supports 24-bit Deep Color 2160p Video Formats with a TMDS Character Rate greater than 340Mcs indicated in the EDID.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #4)

Category / Test Name	Status
Timing 6G	Pass
HF2-6: Video Timing - 6G - 2160p 24-bit Color Depth	Pass
Iter 01: (96) 3840x2160p @ 50 Hz 16:9, 24 bpp	Skipped
Iter 02: (97) 3840x2160p @ 60 Hz 16:9, 24 bpp	Pass
Iter 03: (101) 4096x2160p @ 50 Hz 256:135, 24 bpp	Skipped
Iter 04: (102) 4096x2160p @ 60 Hz 256:135, 24 bpp	Pass

Test Log

```
0019 Performing adequate support check.
0020 Test HF2-6 Iter 04 -> Pass
0021 Tests completed
0022 Restarting Test Execution
0023 Tests completed
```


Applications

DisplayPort 1.2 Video Generator module

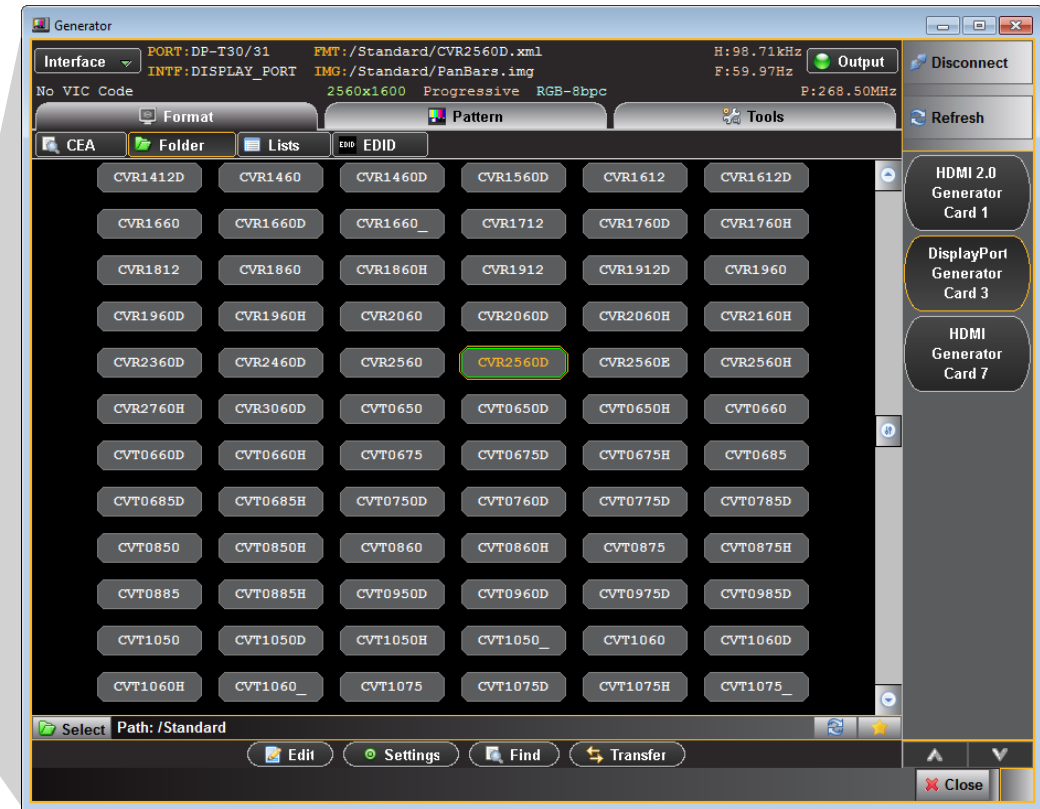
980 DP1.2 Video Gen Application – Video Test

- DP 1.2 Video Test of an DP 1.2 sink device
 - Run video tests with DP 1.2 formats at HBR2 (5.4Gb/s) link rates on four (4) lanes.
 - Use extensive format and test pattern library.

980B w/ DP 1.2
Video Generator
module



DP 1.2 Display



980 DP1.2 Video Gen Application – Audio Test

- DP 1.2 Video Test of an DP 1.2 audio rendering device
 - Run LPCM uncompressed formats with programmable audio parameters.

980B w/ DP 1.2 Video Generator module



DP 1.2 Display



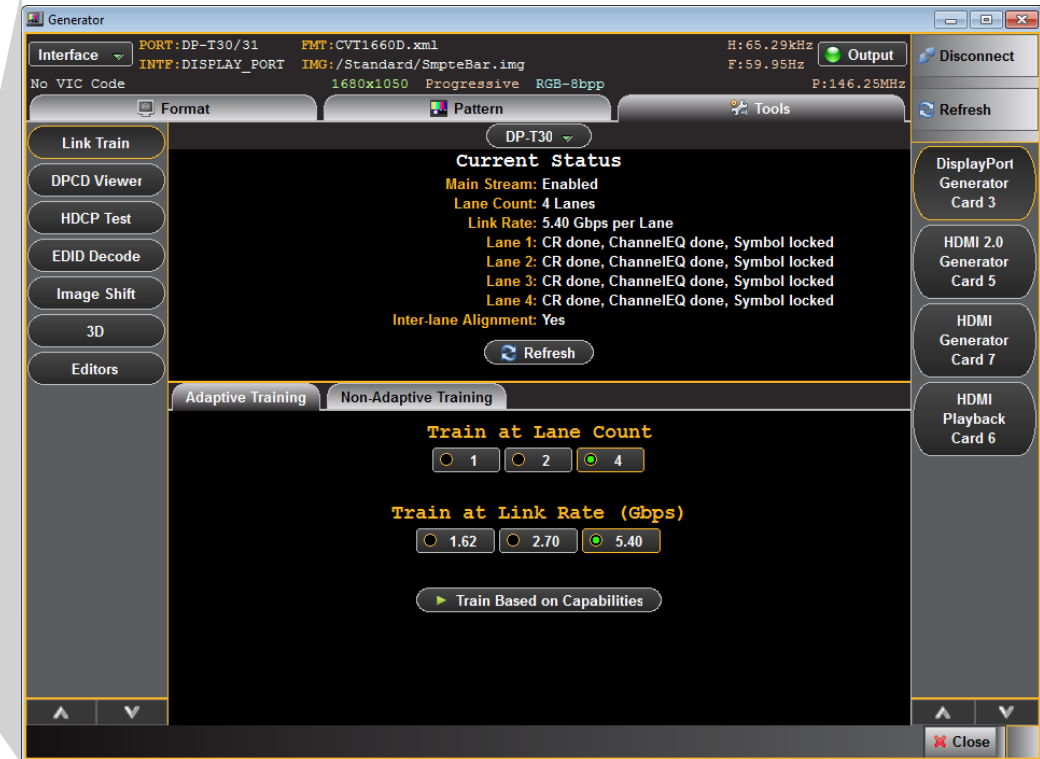
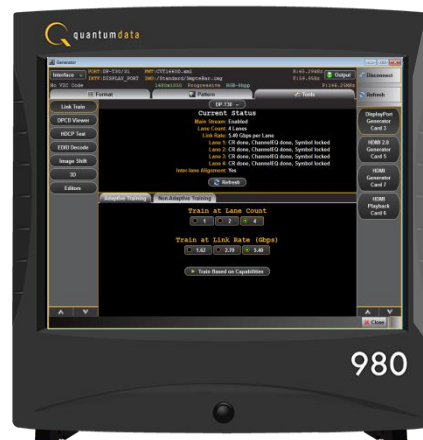
980 DP1.2 Video Gen Application – Link Train Test

- DP 1.2 Link Training test of an DP 1.2 sink device
 - Provides current status of link training on top panel.
 - Control settings on lower panel.

980B w/ DP 1.2
Video Generator
module



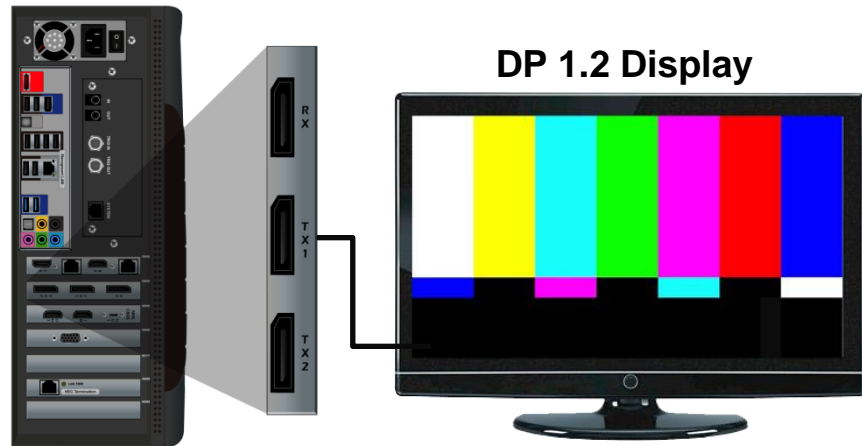
DP 1.2 Display



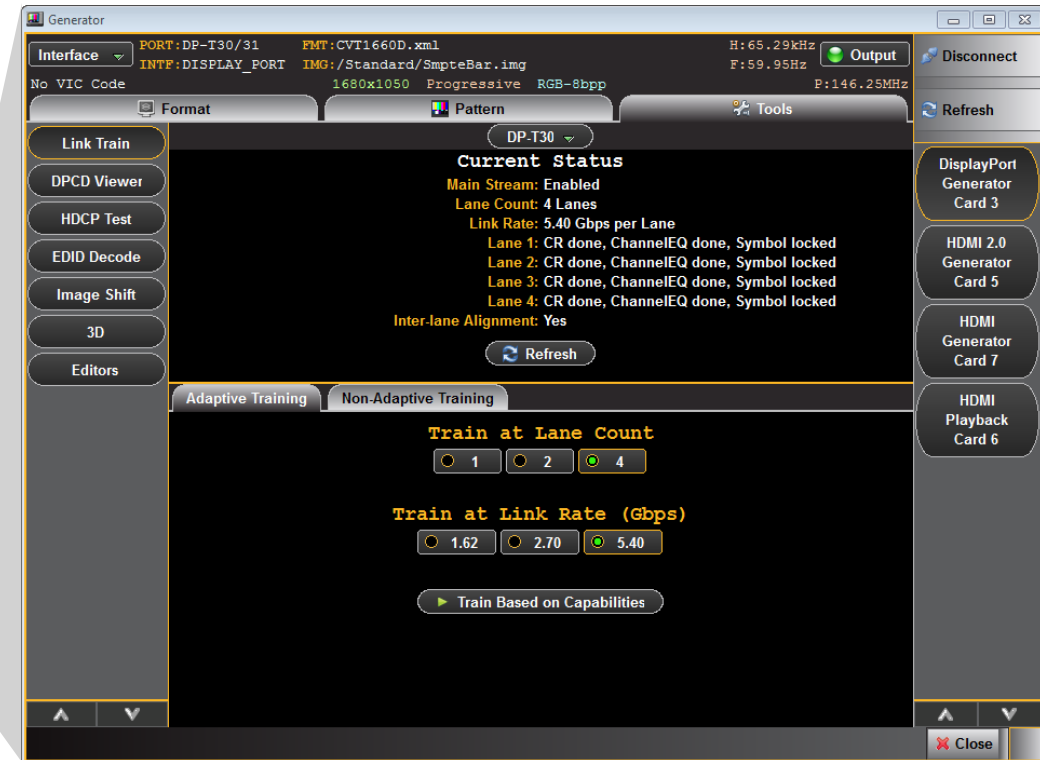
980 DP1.2 Video Gen Application – Link Train Test

- DP 1.2 Link Training test of an DP 1.2 sink device
 - Select Adaptive (automatic) link training and Non-Adaptive.
 - Set limits on source lane count and link rate capabilities.

980B w/ DP 1.2
Video Generator
module



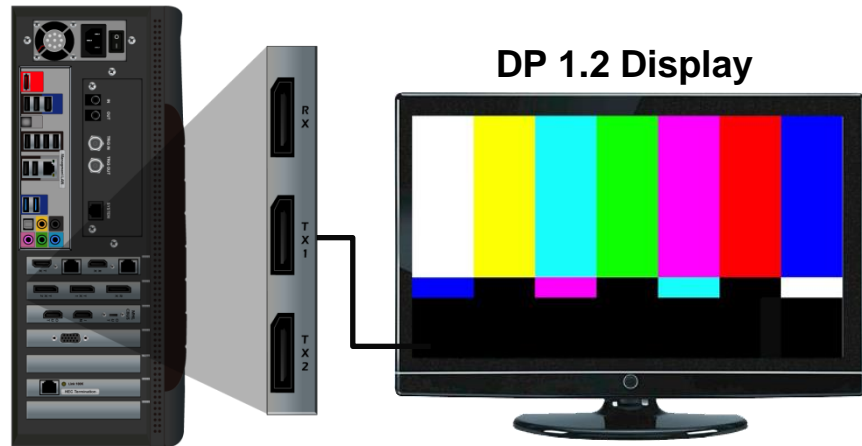
DP 1.2 Display



980 DP1.2 Video Gen Application – Link Train Test

- DP 1.2 Link Training test of an DP 1.2 sink device
 - Select Adaptive link training and Non-Adaptive (user control).
 - Enables precise control over lane count and link rate.

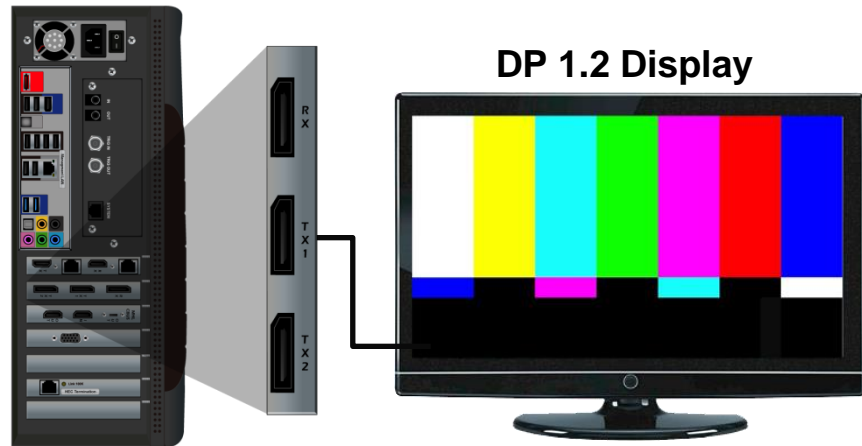
980B w/ DP 1.2
Video Generator
module



980 DP1.2 Video Gen Application – Link Train Test

- View DP 1.2 Link Training transactions in Auxiliary Channel Analyzer (ACA).
- View timestamps of each transaction.
- View details of each transaction.

980B w/ DP 1.2
Video Generator
module



DP 1.2 Display



[09_06_2013_14_25_30-test] Events: 76

```
37 DI2C 30 > R:A0 EDID L=16
38 DI2C 30 < ACK 00 38 4C 1E 51 11 00 0A.
39 DPLT 30 > W:100 LINK_BW_SET L=1 14
40 DPLT 30 < ACK
41 DPLT 30 > W:101 LANE_COUNT_SET L=1 84
42 DPLT 30 < ACK
43 DPLT 30 > W:107 DOWNSPREAD_CTRL L=1 00
44 DPLT 30 < ACK
45 DPLT 30 > W:102 TRAINING_PATTERN_SET:
46 DPLT 30 < ACK
47 DPLT 30 > W:103 TRAINING_LANE0_SET L=4
48 DPLT 30 < DEFER
49 DPLT 30 > W:103 TRAINING_LANE0_SET L=4
50 DPLT 30 < ACK
51 DPLT 30 > R:202 LANE0_1_STATUS: L=6
52 DPLT 30 < ACK 00 00 80 00 44 44
53 DPLT 30 > W:103 TRAINING_LANE0_SET L=4
54 DPLT 30 < DEFER
55 DPLT 30 > W:103 TRAINING_LANE0_SET L=4
56 DPLT 30 < ACK
57 DPLT 30 > R:202 LANE0_1_STATUS: L=6
58 DPLT 30 < ACK 11 11 80 00 44 44
59 DPLT 30 > W:102 TRAINING_PATTERN_SET:
60 DPLT 30 < ACK
61 DPLT 30 > W:103 TRAINING_LANE0_SET L=4
62 DPLT 30 < ACK
63 DPLT 30 > R:202 LANE0_1_STATUS: L=6
64 DPLT 30 < ACK 77 77 81 00 44 44
65 DPLT 30 > W:102 TRAINING_PATTERN_SET:
66 DPLT 30 < ACK
67 DPLT 30 > R:202 LANE0_1_STATUS: L=3
```

Start Time: 00:00:35.9268
Type: Native
Direction: Reply
Command: ACK
Reply to Read Request.

Bit	Name	Value	Description
0	LANE0_CR_DONE	N(0)	
1	LANE0_CHANNEL_EQ_DONE	N(0)	
2	LANE0_SYMBOL_LOCKED	N(0)	
3		0	Reserved
4	LANE1_CR_DONE	N(0)	
5	LANE1_CHANNEL_EQ_DONE	N(0)	
6	LANE1_SYMBOL_LOCKED	N(0)	
7		0	Reserved

Bit	Name	Value	Description
0	LANE2_CR_DONE	N(0)	
1	LANE2_CHANNEL_EQ_DONE	N(0)	
2	LANE2_SYMBOL_LOCKED	N(0)	
3		0	Reserved
4	LANE3_CR_DONE	N(0)	
5	LANE3_CHANNEL_EQ_DONE	N(0)	
6	LANE3_SYMBOL_LOCKED	N(0)	
7		0	Reserved

Bit	Name	Value	Description
0	INTERLANE_ALIGN_DONE	N(0)	
1		0	Reserved
2		0	Reserved
3		0	Reserved
4		0	Reserved
5		0	Reserved
6	DOWNSPREAD_PORT_STATUS_CHANGED	N(0)	
7	LINK_STATUS_UPDATED	Y(1)	

Bit	Name	Value	Description
0	RECEIVE_PORT_0_STATUS	N(0)	

52: < ACK 00 00 80 00 44 44

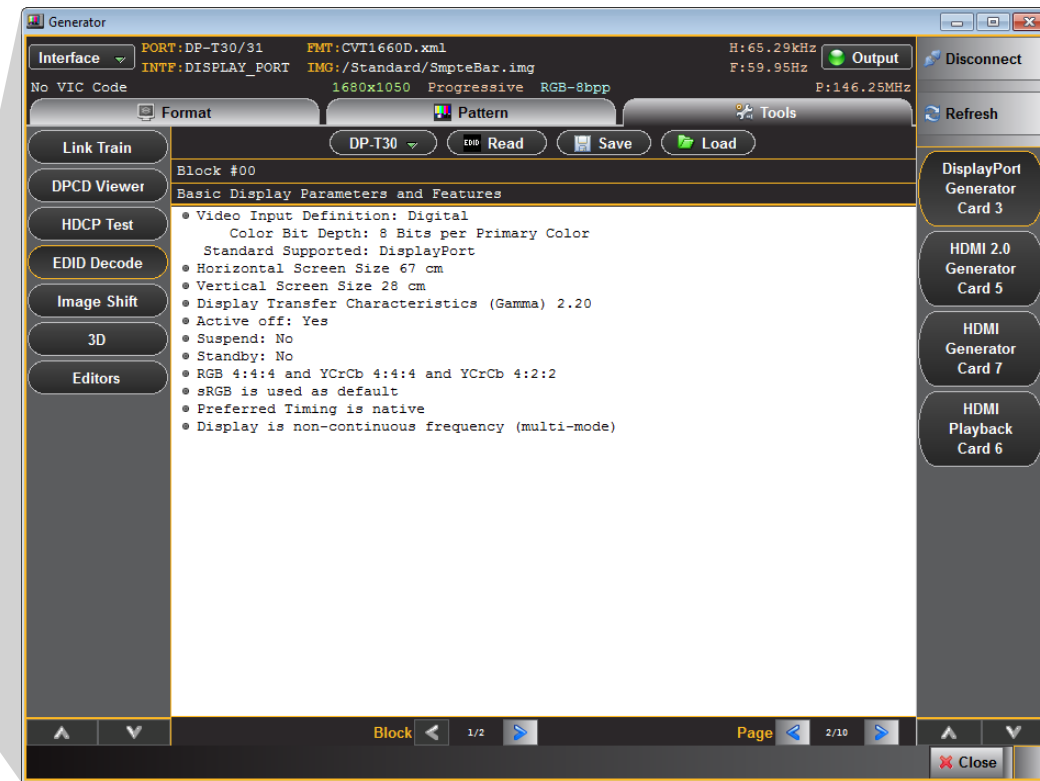
980 DP1.2 Video Gen Application – EDID Test

- DP 1.2 EDID verification test of an DP 1.2 sink device
 - View the entire EDID in human readable text.
 - Check for checksum and header errors.

980B w/ DP 1.2
Video Generator
module



DP 1.2 Display



980 DP1.2 Video Gen Application – DPCD Test

- DP 1.2 DPCD verification test of an DP 1.2 sink device
- View display's DPCD registers in human readable text.

980B w/ DP 1.2 Video Generator module



DP 1.2 Display



Generator

Interface: PORT: DP-T30/31 FMT: CVT1660D.xml H: 65.29kHz Output
INTF: DISPLAY_PORT IMG: /Standard/SmpteBar.img F: 59.95Hz
No VIC Code 1680x1050 Progressive RGB-8bpp P: 146.25MHz

Format Pattern Tools

Link Train DPCD Viewer HDCP Test EDID Decode Image Shift 3D Editors

DP-T30 Read All Read Page Report

Receiver Capability
DPCD Revision 1.2: 00000-0008F

Bit Name	Value	Description
00000: DPCD_REV		
7-4 MAJOR_REV	1	
3-0 MINOR_REV	2	
00001: MAX_LINK_RATE		
7-0 MAX_LINK_RATE	14h	5.4 Gbps per lane
00002: MAX_LANE_COUNT		
4-0 MAX_LANE_COUNT	4	4 lanes
5	1	Reserved
6	Y(1)	TPS3_SUPPORTED
7	Y(1)	ENHANCED_FRAME_CAP
00003: MAX_DOWNSPREAD		
0	1	Up to 0.5%
1	0	Reserved
2	0	Reserved
3	0	Reserved
4	0	Reserved
5	0	Reserved
6	N(0)	NO_AUX_HANDSHAKE_LINK_TRAINING
7	0	Reserved

DisplayPort Generator Card 3
HDMI 2.0 Generator Card 5
HDMI Generator Card 7
HDMI Playback Card 6

Close

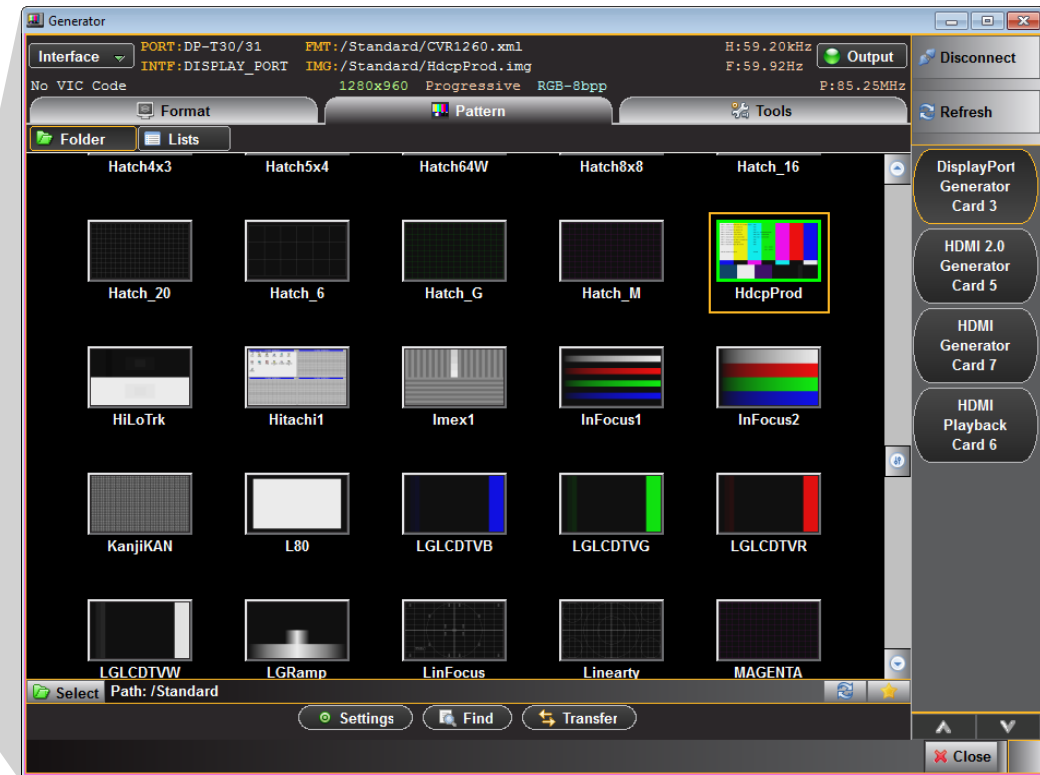
980 DP1.2 Video Gen Application – HDCP Test

- HDCP verification test of an DP 1.2 sink device
 - Verify HDCP authentication.
 - View results on connected display.

980B w/ DP 1.2
Video Generator
module



DP 1.2 Display



980 DP1.2 Video Gen Application – HDCP Test

- HDCP verification with an DP 1.2 sink device
 - Verify HDCP authentication transactions on Auxiliary Channel Analyzer (ACA) utility.
 - Save results and disseminate to colleagues at other locations.

980B w/ DP 1.2
Video Generator
module



DP 1.2 Display



The screenshot shows the ACA Remote Control software interface. The main window displays a list of events with columns for time, channel, and data. A detailed view of a specific event is shown on the right, including the register value and bit names.

Time	Channel	Data
01:30:30.5405	70	R Ri' (72.39 kbps)
01:30:30.5407	70	< FACB (72.39 kbps)
01:30:31.5737	70	R Ri' (72.39 kbps)
01:30:31.5738	70	< FACB (72.39 kbps)
01:30:31.5902	70	R Ri' (72.39 kbps)
01:30:31.5906	70	< C9D9 (72.39 kbps)
01:30:33.8461	70	W Segment 00 (78.39 kbps)
01:30:33.8463	70	R EDID 00 (78.27 kbps)
01:30:33.8466	70	< 128 bytes (78.39 kbps)
01:30:33.8630	70	R Bksv (72.39 kbps)
01:30:33.8633	70	< 628BABA687 (72.39 kbps)
01:30:33.8641	70	R Bcaps (72.39 kbps)
01:30:33.8643	70	< 83 (72.39 kbps)
01:30:33.8679	70	W Segment 00 (78.27 kbps)
01:30:33.8681	70	R EDID 80 (78.27 kbps)
01:30:33.8684	70	< 128 bytes (78.39 kbps)
01:30:34.2390	70	R Bksv (72.39 kbps)
01:30:34.2393	70	< 628BABA687 (72.50 kbps)
01:30:34.2400	70	R Bcaps (72.50 kbps)
01:30:34.2403	70	< 83 (72.39 kbps)
01:30:36.0173	70	R Bksv (72.50 kbps)
01:30:36.0176	70	< 628BABA687 (72.50 kbps)
01:30:36.0184	70	R Bcaps (72.50 kbps)
01:30:36.0186	70	< 83 (72.39 kbps)
01:30:36.1572	70	W An 4D439A467CB147CD (7...
01:30:36.1585	70	W Aksv 9DCA9C4BA8 (72.39...
01:30:36.3843	70	R Ri' (72.50 kbps)
01:30:36.3846	70	< 633C (72.39 kbps)
01:30:38.5517	70	R Ri' (72.39 kbps)
01:30:38.5518	70	< 633C (72.39 kbps)
01:30:40.6178	70	R Ri' (72.39 kbps)
01:30:40.6182	70	< 633C (72.39 kbps)

Register: 40h
Name: Bcaps (HDCP B Capability Bits)
Value: 83h

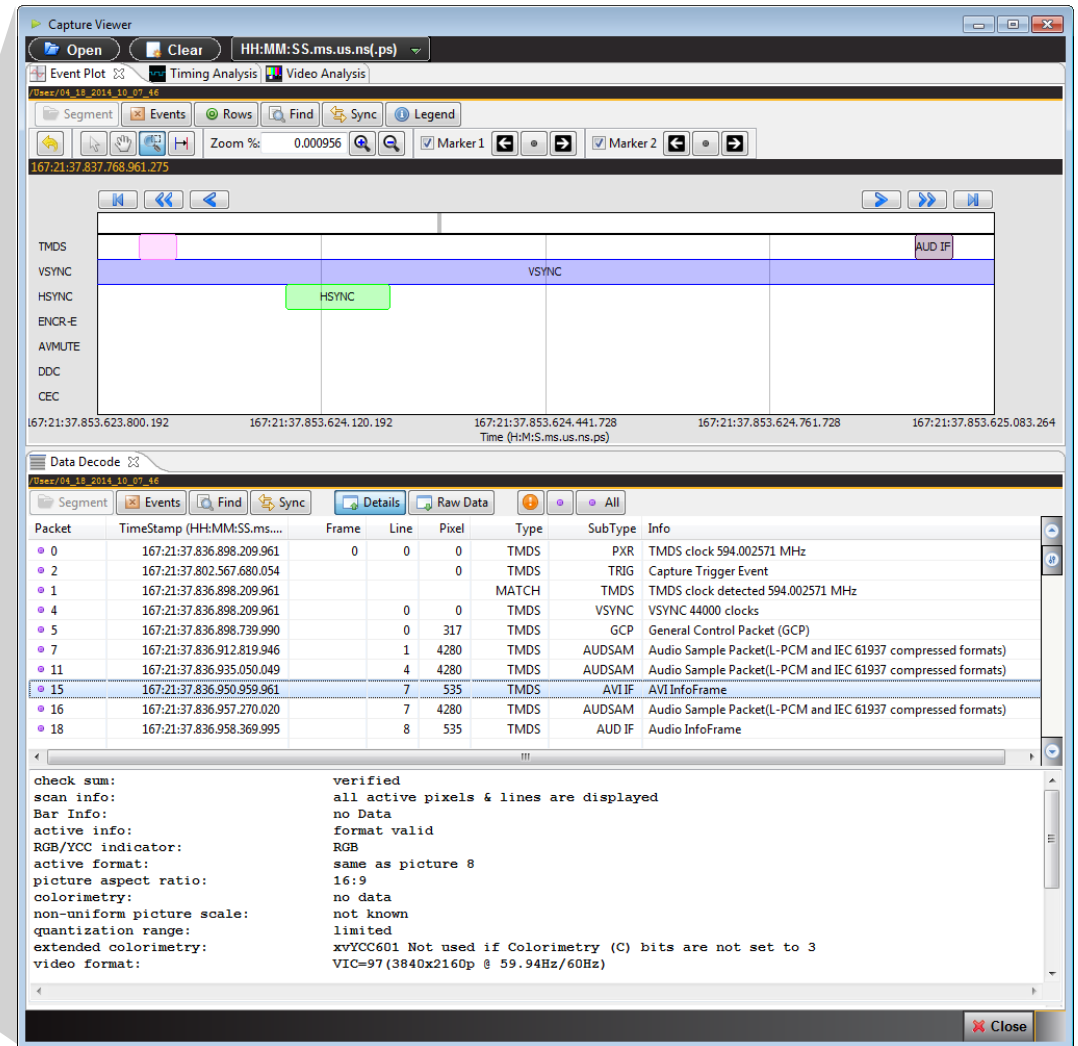
Bit	Name	Value	Description
0	FAST_REAUTHENTICATION	Y(1)	
1	1.1_FEATURES	Y(1)	
2		0	Reserved
3		0	Reserved
4	FAST	N(0)	
5	READY	N(0)	KSV FIFO
6	REPEATER	N(0)	
7		1	Reserved

Applications

HDMI 2.0 Protocol Analyzer module

980 HDMI 2.0 Protocol Analyzer App – Capture/Store

- HDMI 2.0 Source Analysis (Metadata)
 - Discover root cause of interoperability issues.
 - Set triggers to capture specific sets of data.
 - Analyze HDMI metadata, timing, auxiliary data including HDMI 2.0 4K UHD video streams.
 - View data in graphical timeline or table form.
 - View precise time stamps for all data.
 - Verify data island packets values.
 - Locate data through filtering and search utilities.



980 HDMI 2.0 Protocol Analyzer App – Timing Analysis

- HDMI Source Analysis – Timing Analysis
 - View summary timing for multiple frames.
 - View frame timing parameters.
 - View line timing parameters.
 - Identify timing errors.



Capture Viewer

Open Clear HH:MM:SS.ms.us.ns(.ps)

Event Plot Timing Analysis Video Analysis

Frame Stats Line Stats

Video Format

BPP	HFreq (kHz)	Interlaced	Htotal	Vtotal	Hactive	Hfront	HSync Width	VActive	Vfront	VSync Width	HSync Polarity	VSync Polarity	HToVPulse Del...	Pix Freq (M...
24	135.0	No	4400	2250	3840	176	88	2160	8	44000	Positive	Positive	0	594.002

Frame Statistics: Sync

ation (HH:M...	VFreq (Hz)	HFreq (kHz)	Vtotal	Vactive	Pix Freq (M...	HSync Wi...	VSync	Start Video ...	HToVDelay	Encr Start Pixel	Encr Pulse Line	Encr Length
0.016.666.000	60.00	135.00	2250	2160	594.002	88	10	90	0	0	0	0
0.016.666.000	60.00	135.00	2250	2160	594.003	88	10	90	0	0	0	0
0.016.666.000	60.00	135.00	2250	2160	594.003	88	10	90	0	0	0	0
0.016.666.000	60.00	135.00	2250	2160	594.003	88	10	90	0	0	0	0
0.016.666.000	60.00	135.00	2250	2160	594.003	88	10	90	0	0	0	0

Line Statistics: Sync

Frame	Line	TimeStamp (HH:MM:SS.ms...	Duration (HH:MM:SS.ms.us...	HTotal	TMDS HTotal	HSync Width	HBack	HActive
2	000	167:21:37.886.838.740	0:0:0.000.007.407	4400	4400	88	0	0
2	001	167:21:37.886.846.147	0:0:0.000.007.408	4400	4400	88	0	0
2	002	167:21:37.886.853.555	0:0:0.000.007.407	4400	4400	88	0	0
2	003	167:21:37.886.860.962	0:0:0.000.007.405	4400	4400	88	0	0
2	004	167:21:37.886.868.367	0:0:0.000.007.407	4400	4400	88	0	0
2	005	167:21:37.886.875.775	0:0:0.000.007.407	4400	4400	88	0	0
2	006	167:21:37.886.883.182	0:0:0.000.007.407	4400	4400	88	0	0
2	007	167:21:37.886.890.590	0:0:0.000.007.408	4400	4400	88	0	0
2	008	167:21:37.886.897.997	0:0:0.000.007.407	4400	4400	88	0	0
2	009	167:21:37.886.905.405	0:0:0.000.007.407	4400	4400	88	0	0
2	010	167:21:37.886.912.812	0:0:0.000.007.407	4400	4400	88	0	0

Data Decode

Segment Events Find Sync Details Raw Data All

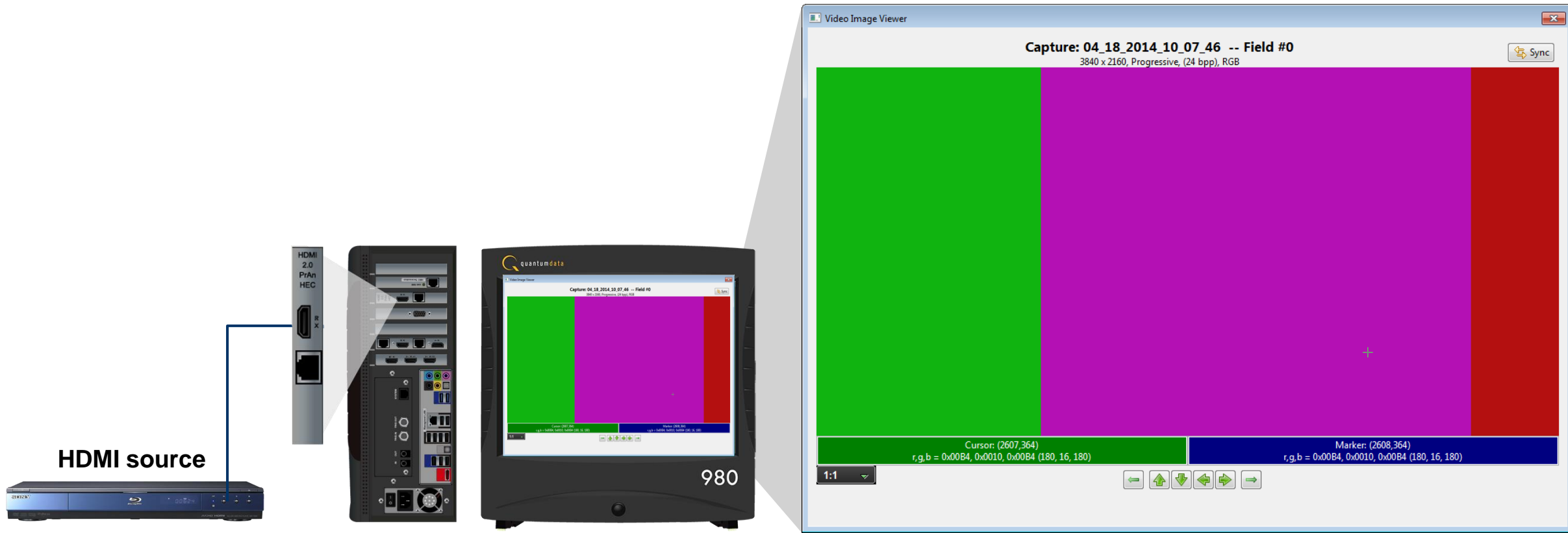
Packet	TimeStamp (HH:MM:SS.ms...	Frame	Line	Pixel	Type	SubType	Info
5427	167:21:37.854.394.430.054	0	120	0	TMDS	HSYNC	HSYNC 88 clocks
5428	167:21:37.854.395.079.956	0	120	382	TMDS	VIDEO	Active Video 3840 clocks
5429	167:21:37.854.401.839.966	0	121	0	TMDS	HSYNC	HSYNC 88 clocks

audio clock regeneration: N = 5824, Cycle Time Stamp (CTS) = 563063

HB: 01 00 00 4a |

980 HDMI 2.0 Protocol Analyzer App – Video Analysis

- HDMI 2.0 Source Analysis – Video Analysis
 - View video frame thumbnails.
 - View pixel values for any frame.



980 HDMI 2.0 Protocol Analyzer App – Source Compliance

- HDMI Source Analysis – Real Time Analysis (auxiliary data)
 - View EDID exchange data in real time.
 - View HDCP authentication transactions in real time.
 - View details of each transaction.



[-] Events: 106

80	HDCP	00	Reply 0F83
81	HDCP	00	Read Ri'
82	HDCP	00	Reply 9875
83	HDCP	00	Read Ri'
84	HDCP	00	Reply DDD8
85	HDCP	00	Read Ri'
86	HDCP	00	Reply 43E3
87	HDCP	00	Read Ri'
88	HDCP	00	Reply 7060
89	EDID	00	Segment 0x00
90	EDID	00	Req at Offset 0x00
91	EDID	00	Read 128 bytes
92	EDID	00	Segment 0x00
93	EDID	00	Req at Offset 0x80
94	EDID	00	Read 128 bytes
95	HDCP	00	Read Bcaps
96	HDCP	00	Reply 80
97	HDCP	00	Write An B32C7F3F46DD5E19
98	HDCP	00	Write Aksv 357E2C0E4E
99	HDCP	00	Read Bksv
100	HDCP	00	Reply 9A7D605AC9
101	HDCP	00	Read Ri'
102	HDCP	00	Reply D2F1

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)) = 0x80
REPEATER: 0
READY: 0
FAST: 0
1.1 FEATURES: 0
FAST_REAUTHENTICATION: 0

* START *
0000 75 80- | u .
* STOP *

96: Reply 80

980 HDMI 2.0 Protocol Analyzer App – Source Compliance

- Run HDMI 2.0 Compliance tests for 4K UHD resolutions running at 6Gbps
- Pre-test your HDMI 2.0 sink device.
- Self-test your HDMI 2.0 sink device to reduce costs and meet product time to market requirements.



HDMI 2.0 Src CT 2.0

CDF Entry Test Selection Test Options / Preview

Open Save Select All Tests Deselect All Tests

TMDS Protocol Pixel Encoding Video Timing AVI-IF/GCP

Select All on Page Clear All on Page

HF1-10: TMDS Protocol - 6G - TMDS Bit Clock Ratio
Confirm that the Source changes the TMDS Bit Clock Ratio correctly according to the output signal.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #1)

HF1-11: Source TMDS Protocol - 6G Legal Codes
Confirm that the Source only outputs legal 10-bit codes.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)

HF1-12: TMDS Protocol - 6G - Basic Protocol and Scrambling
Confirm that the Source only outputs code sequences for Control Periods, Data Island Periods and Video Data Periods corresponding to basic HDMI protocol rules.

Compliance Test Results Viewer

HDMI 2.0 Src (2.0) Compliance Test Results

Results Name: HF1-12 Manufacturer: ACME
Date Tested: May 26, 2014 12:34 PM Model Name: XYZ
Overall Status: **CTS 2.0 - Pass** Port Tested: Output1

HTML Report

Test Name / Details	Status
HF1-12: TMDS Protocol - 6G - Basic Protocol and Scrambling	Pass
HF1-13: TMDS Protocol - Scrambling <= 3.4Gbps	Pass

Open Capture

Instrument: 980B_JB [192.168.254.161] Continue Test Execution

Close

980 Protocol Analyzer App – Source Compliance Test

- Run HDMI 2.0 Compliance tests for 4K UHD resolutions running at 6Gbps
- Pre-test your HDMI 2.0 source device.
- Self-test your HDMI 2.0 source device to reduce costs and meet product time to market requirements.



The screenshot shows the "HDMI 2.0 Src CT 2.0" software interface. The top menu includes "CDF Entry", "Test Selection", and "Test Options / Preview". Below the menu are buttons for "Open", "Save", "Select All Tests", and "Deselect All Tests". The main area displays a list of tests under the "Video Timing" category. Two tests are highlighted in green:

- HF1-14: Video Timing - 6G - 2160p 24-bit Color Depth**
Confirm that the Source, whenever transmitting any 24bits Deep Color 2160p Video Format with a TMDs Character Rate greater than 340Mscs, complies with all of the required Pixel and line counts.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)
- HF1-15: Video Timing - 6G -Deep Color**
Confirm that the Source outputs correct Deep Color Video Format for TMDs Character Rates greater than 340Mscs.
(Required License: HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #3)

Below the test list is the "Compliance Test Results Viewer" window. It displays the following information:

- Results Name:** HF1-14
- Date Tested:** May 23, 2014 4:36 PM
- Manufacturer:** ACME
- Model Name:** XYZ
- Overall Status:** CTS 2.0 - Incomplete
- Port Tested:** Output1

The "Test Results" table is as follows:

Test Name / Details	Status
HF1-14: Video Timing - 6G - 2160p 24-bit Color Depth	Incomplete
Iter 01: (96) 3840x2160p @ 50 Hz, 24 bit/Pixel	Pass
Iter 02: (97) 3840x2160p @ 60 Hz, 24 bit/Pixel	Pass
Iter 03: (106) 3840x2160p @ 50 Hz, 24 bit/Pixel	User Skipped
Iter 04: (107) 3840x2160p @ 60 Hz, 24 bit/Pixel	Fail

At the bottom of the results viewer, there is an "Open Capture" button, an "Instrument" dropdown menu showing "980B_JB [192.168.254.161]", and a "Continue Test Execution" button.