

quantumdata™ 980 DisplayPort 1.4 Video Generator / Protocol Analyzer Module

Video Generation and Analysis
Testing up to 8.1Gb/s Link Rates

Now supports DSC Analysis!

Key Features

- Run functional tests on DisplayPort displays and monitors up to 8.1 Gb/s link rates with standard format library consisting of 600 standard timings and over 300 test patterns
- Configure link training parameters to test display's handling of various link training configurations
- View EDID and DPCD registers of connected display to verify contents
- Run functional tests on DisplayPort sources up to 8.1 Gb/s link rates; view incoming video and metadata from a source device in real time
- Capture and decode incoming video, protocol and control packets—**NEW!** including Display Stream Compression (DSC) streams—such as main stream attributes and secondary data on main link from a source device.
- **NEW!** Use a variety of trigger conditions to capture precisely the data you need.
- **Monitor Aux Channel** while emulating either a DP source or display to view Link training, HDCP and EDID with the Auxiliary Channel Analyzer feature
- **Passively monitor Aux Channel** between a DP source and display to view Link training, HDCP and EDID transactions between devices
- **NEW!** DP 1.4 HBR3 Link Layer compliance tests on DisplayPort sources and sinks
- Run DCP-approved HDCP 2.2 compliance tests on DisplayPort sources, sinks and repeaters
- Run DP 1.2 Core Link Layer compliance tests on DisplayPort sinks
- Run audio tests using programmable LPCM sine wave audio tones

The Teledyne LeCroy quantumdata 980 DP 1.4 Video Generator / Protocol Analyzer module supports video, audio and protocol functional testing of high-end DP displays and sources. The module supports HBR3 data rates including 1.62, 2.7, 5.4 & 8.1 Gb/s on 1, 2 & 4 lanes on both its Tx ports and its Rx port. The module's Rx analyzer port **NEW!** supports analysis of incoming DSC compressed streams.

The module features a DisplayPort output for testing displays. The module is equipped with all the standard video timings and test patterns necessary for testing modern displays.

The 980 DP 1.4 Video Generator / Protocol Analyzer module can be equipped in either the 980B or 980R Advanced Test Platform. The module can be controlled either through the PC-based 980 GUI Manager or through the embedded 980 GUI Manager running on the 980 platform itself. The 980's built-in color touch screen provides a graphical user interface (GUI) to control the module.

An optional Adjunct Aux Chan monitoring board supports passive monitoring of the DP aux channel between a source and display. This enables analysis of link training and HDCP interoperability between devices. The solution uses a custom cable provided by Teledyne LeCroy.

Source Testing

The DP 1.4 module's optional Rx analyzer port emulates a DisplayPort display device (sink) including EDID and DPCD emulation, Rx Link Training function and MST Rx function. The analyzer supports HDCP 2.2 compliance testing for DisplayPort source devices. There are two options for the analysis function for testing DisplayPort source devices:

- Basic Analyzer – Provides real time viewing of video and metadata for functional testing.
- Capture/Store Protocol Analyzer – Provides capture and store of the main link including protocol and control packets, main stream attributes and secondary data.

Display Testing

The 980 DP 1.4 Video Generator / Analyzer module supports video, audio and protocol functional testing high-end DP displays. The module supports HBR2 data rates including 1.62, 2.7, 5.4 & 8.1 Gb/s on 1, 2 & 4 lanes on both its Tx ports and its Rx port. The DisplayPort module is equipped with all the standard video timings and test patterns necessary for testing modern displays.

The DP video generator also supports HDCP 2.2 compliance testing for DisplayPort source, sink and repeater devices and link layer compliance testing for sink devices.



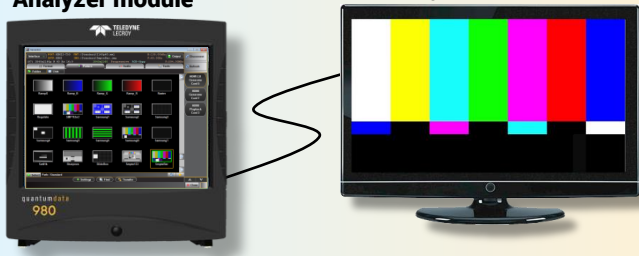
DISPLAY TESTS - VIDEO PATTERN TESTING FOR UHD TVS

Video Testing

The 980 DP 1.4 Video Generator / Analyzer module supports video and audio functional testing at link rates up to 8.1 Gb/s on 1, 2 and 4 lanes to support high resolution formats. The module has an extensive set of video formats and library of test patterns. You can set any pattern in motion to test motion artifacts with the Image Shift feature.

980 with
DP Video Generator /
Analyzer module

DisplayPort Monitor



Test Setup for Sink Test

Link Training Control and Configuration

The module's link training control feature enables you to configure the link training parameters during testing. You can set limits on the lane count and link rate and allow the link training engine to establish link training based on those limitations or you can force link training parameters—lane count, link rate, voltage swing, pre-emphasis.

Audio Testing

The module offers a programmable LPCM audio sine wave generator enabling you to set the number of channels (up to 8), the amplitude, frequency, sampling rate and bit depth for uncompressed formats.

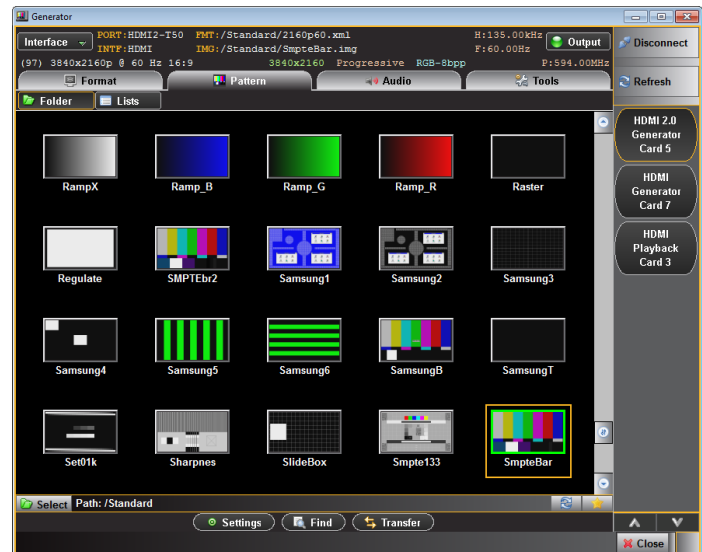
LPCM Audio Testing



Format Selection



Test Pattern Selection



Link Training Control and Configuration



DISPLAY TESTS - PROTOCOL TEST FEATURES

Protocol Testing

The 980 DP 1.4 Video Generator / Analyzer module offers a variety of features for testing DisplayPort protocols. You can verify HDCP 1.3 and HDCP 2.2 authentication transactions between the module's Tx port and a DP display. The module's EDID Decode feature enables you to examine the EDID of the connected display in text. The DPCD Decode feature enables you to examine the DPCD registers of the connected display. You can read the EDID and/or the DPCD of downstream MST nodes.

980 with DP Video Generator / Analyzer module



DisplayPort Monitor



Test Setup for Sink Test

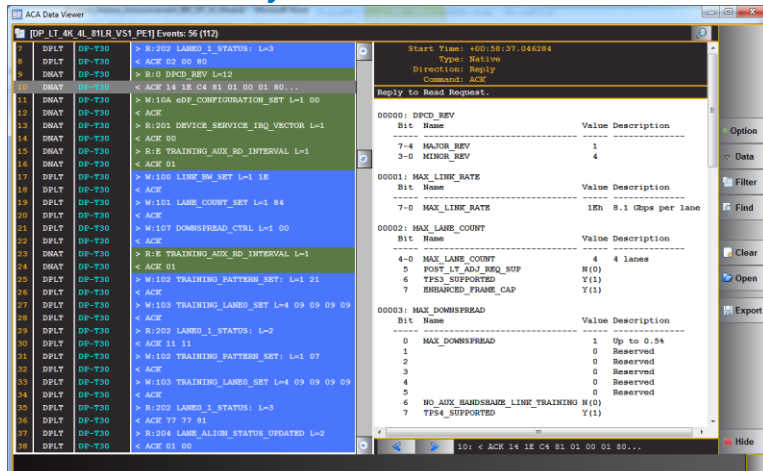
Multi-Stream Transport

The DP 1.4 Video Generator / Analyzer module emulates an MST source for testing an MST branch device or MST-capable monitor. Up to four (4) streams are supported with a depth of one. The Auxiliary Channel Analyzer (ACA) utility depicts the MST negotiations with the connected MST Rx device.

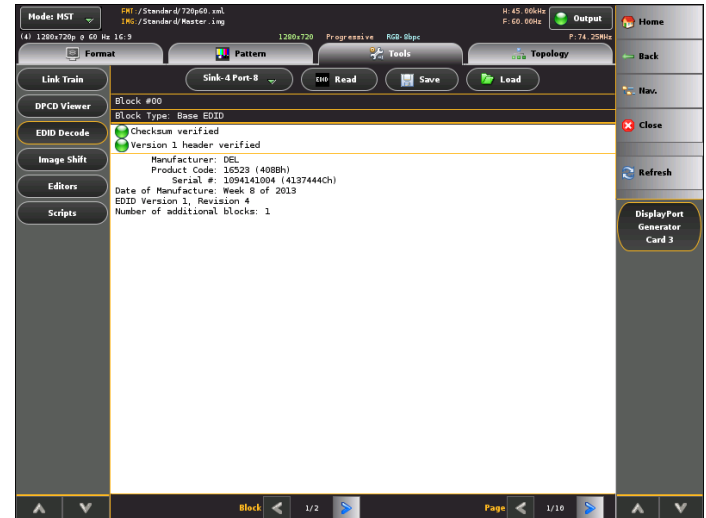
Auxiliary Channel Analyzer

The 980 DP 1.4 Video Generator / Analyzer module's Auxiliary Channel Analyzer (ACA) feature enables you to monitor the DP Aux Channel for link training and MST negotiations, HDCP transactions and EDID exchanges between the module and a connected display. The ACA logs these events and assigns precise timestamps to them. You can view the details of each transaction. These ACA logs can be saved and disseminated for further analysis by colleagues and other subject matter experts.

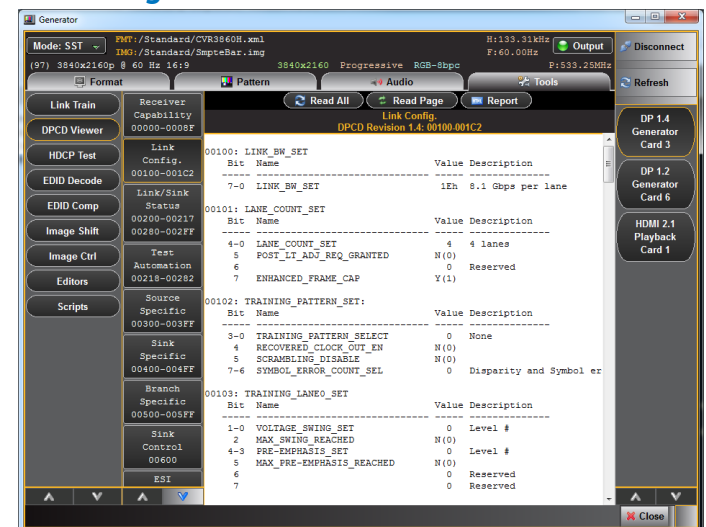
Aux Channel Analyzer



EDID Decode View



DPCD Register View



HDCP 2.2 Test

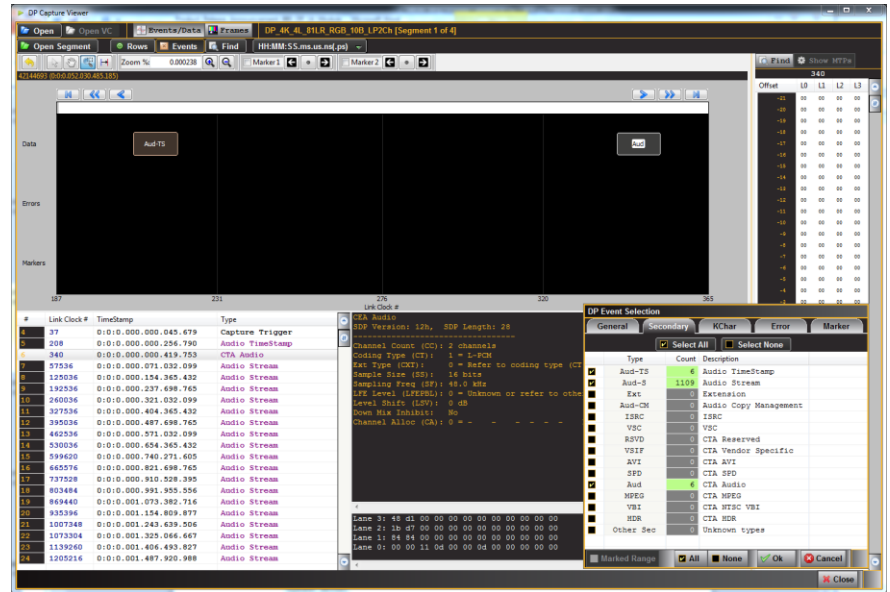


SOURCE TESTS – CAPTURE & DECODE

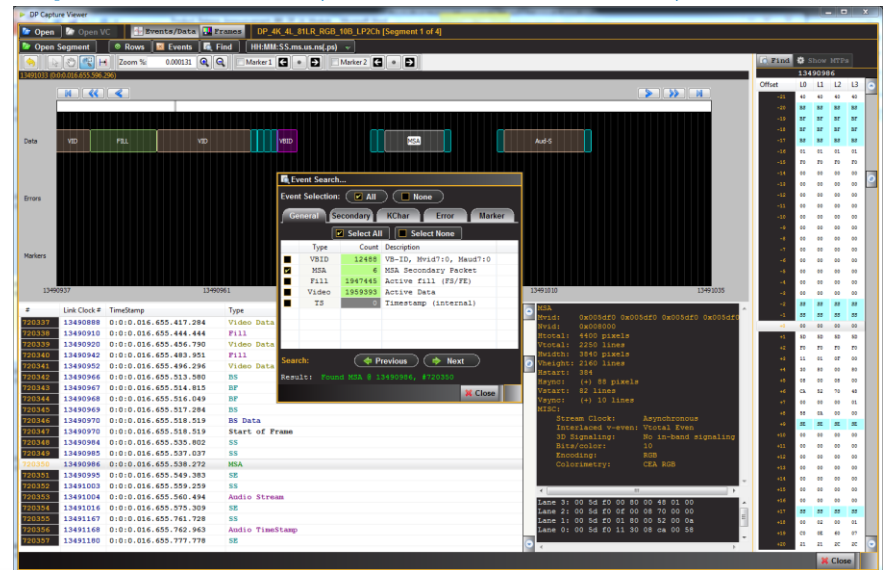
Capture and Decode

The 980 DP 1.4 Video Generator / Analyzer module captures and decodes the main link attributes in order to diagnose interoperability issues related to them. The Protocol Analyzer captures and stores main link data and provides visibility into main stream attributes, secondary data elements, K-Characters and protocol errors. The Protocol Analyzer presents these elements on a graphical timeline and in a table. You can search for data and select any transaction in the table to view its details. The capture utility also enables you to capture specific MST streams from the source.

Capture and Decode (Filter View showing only Audio Packets)



Capture and Decode (Search for MSA Packets)



DP Source



980 DP 1.4 Video Generator / Analyzer module



Test Setup for Source Analysis (Capture/Decode)

DP Source



DisplayPort Monitor



980 with DP 1.4 Video Generator / Analyzer module



Test Setup for Passive Aux Channel Monitoring

(Passive) Auxiliary Channel Analyzer

The 980 DP 1.4 Video Generator / Analyzer module's Adjunct Auxiliary Channel Analyzer board enables you to monitor the DP Aux Channel for link training and MST negotiations, HDCP transactions and EDID exchanges between a DisplayPort source and display device. This enables developers to investigate interoperability problems between DisplayPort devices involving link training, HDCP and EDID. Solution is provided using a custom cable provided by Teledyne LeCroy. The ACA logs these events and assigns precise timestamps to them. You can view the details of each transaction. These ACA logs can be saved and disseminated for further analysis by colleagues and other subject matter experts.

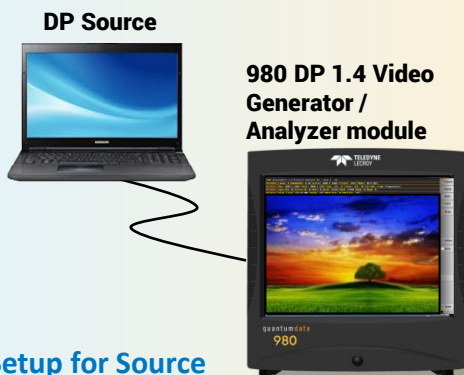
SOURCE TESTS - REAL TIME & AUX CHANNEL ANALYSIS

Real Time Analysis (Basic Analyzer)

The 980 DP 1.4 Video Generator / Analyzer module's Real Time analysis feature enables you to view the incoming video, lanes and link rate, timing, colorimetry and various other metadata in real time at a glance. The Real Time mode provides a basic confidence test to verify that the incoming video is essentially correct. The Rx port emulates any EDID on to test a source devices handling of various EDIDs. You can also configure DPCD registers for emulating on the DP Rx port using the DPCD Editor (below).

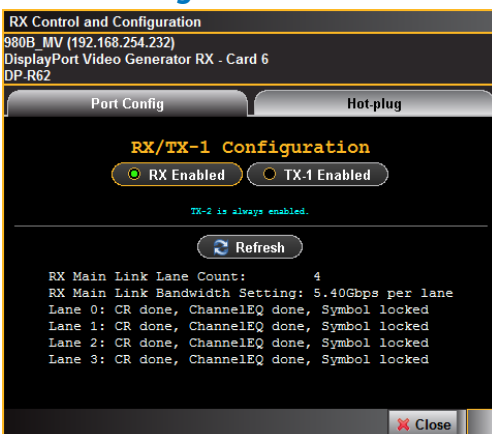
Aux Channel Analyzer

The 980 DP HBR3 Video Generator / Analyzer module's Auxiliary Channel Analyzer (ACA) feature enables you to monitor the DP Aux Channel for link training and MST negotiations, HDCP transactions and EDID exchanges between the module and a connected source. The ACA logs these events and assigns precise timestamps to them. You can view the details of each transaction. These ACA logs can be saved and disseminated for further analysis by colleagues and other subject matter experts.

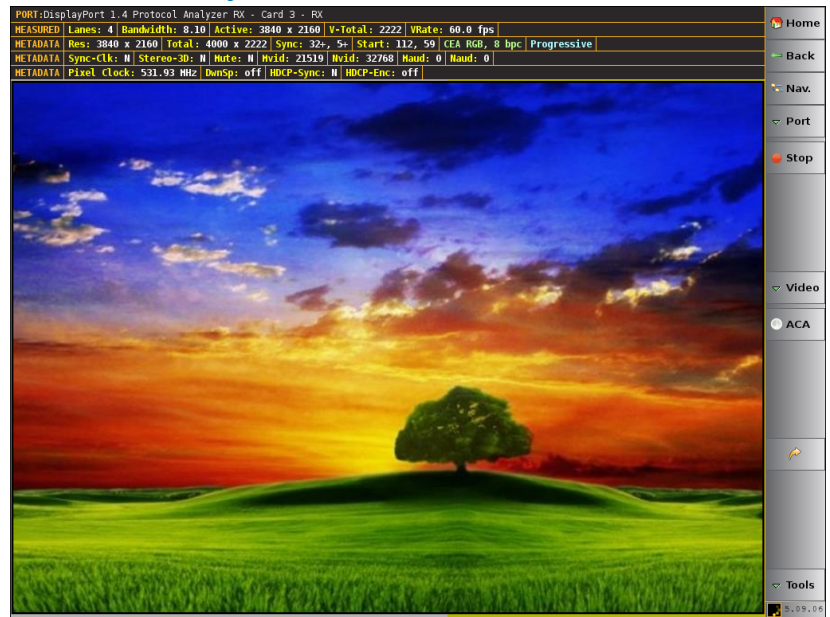


Test Setup for Source Real Time and ACA Tests

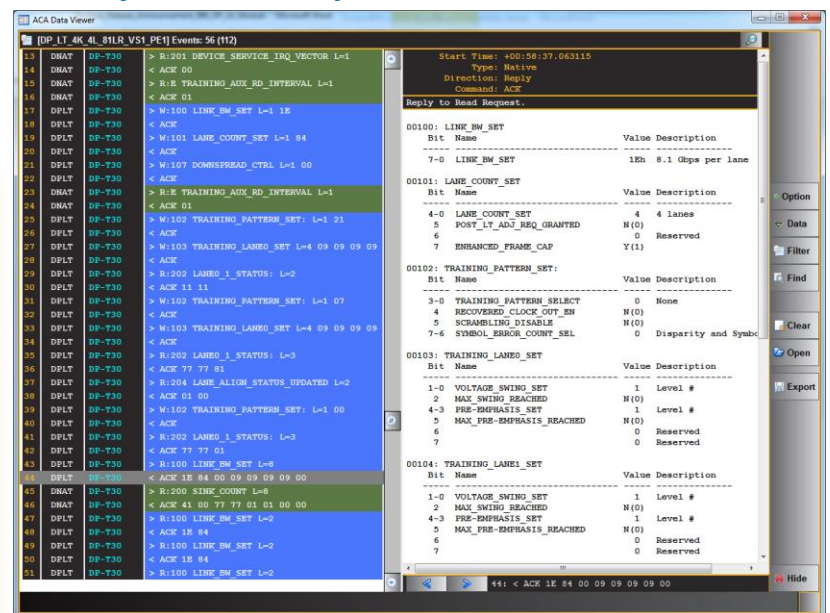
Link Training Status



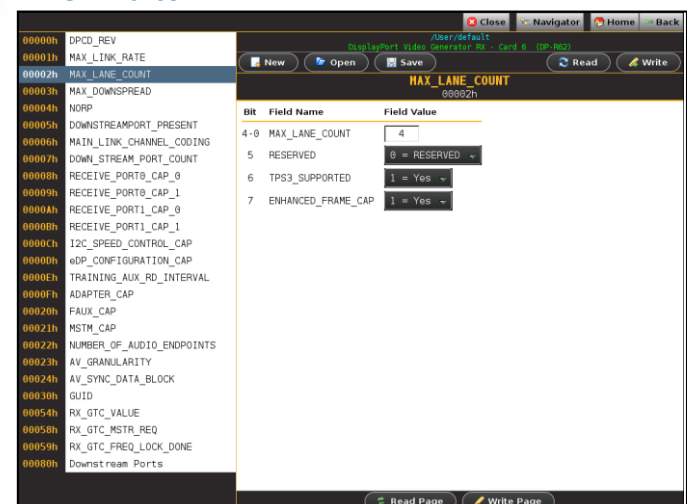
Real Time Analysis

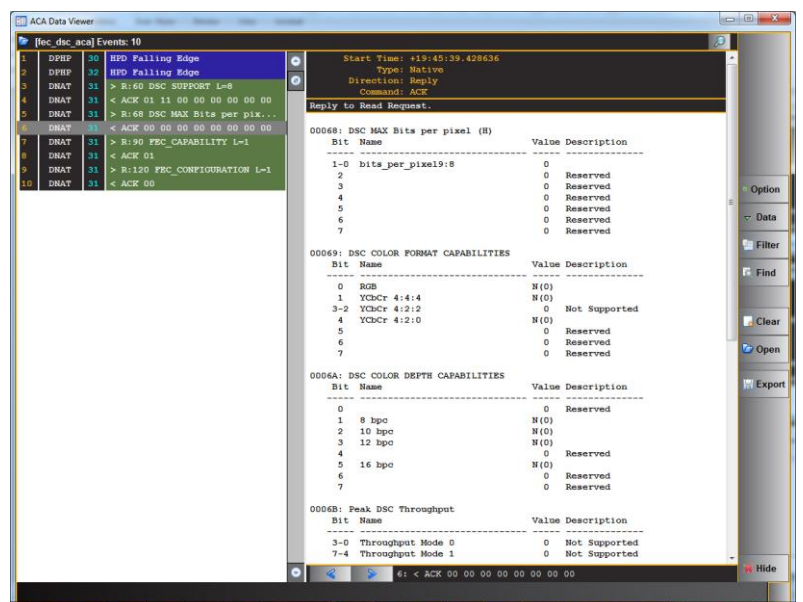


Auxiliary Channel Analyzer



DPCD Editor





DP 1.4 LINK LAYER SOURCE COMPLIANCE

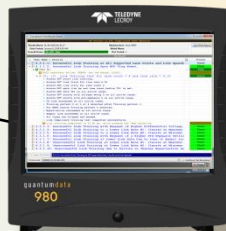
DisplayPort 1.4 Source LL Compliance

The 980 DP source HBR3 link layer compliance tests are ideal for pre-testing your HBR3-capable DisplayPort 1.4 source product prior to submission to an Authorized Test Center for approval. Pre-testing provides added assurance that your product will pass at the ATC when submitted. The compliance tests (below right) enable you to view the captured data and detailed test results which help pinpoint the cause of compliance test failures. You can link to the aux channel traces in the Aux Channel Analyzer (ACA) to view the root cause of failures (below).

DP Source

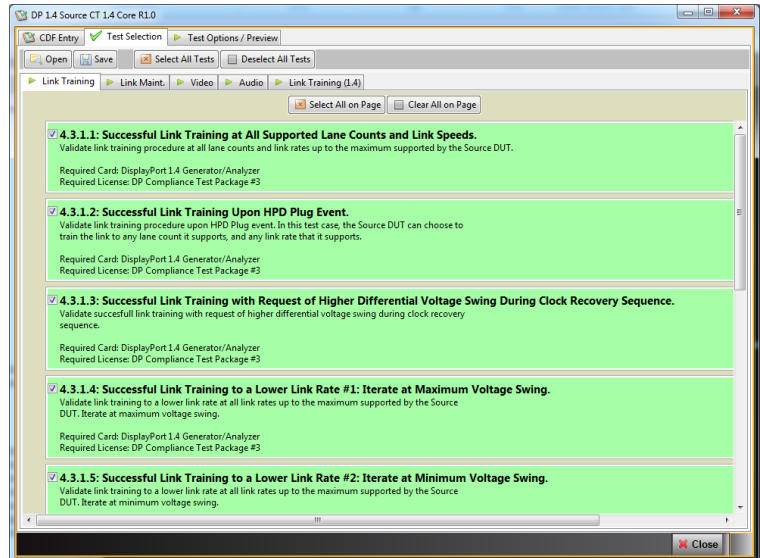


980 DP 1.4 Video Generator / Analyzer module

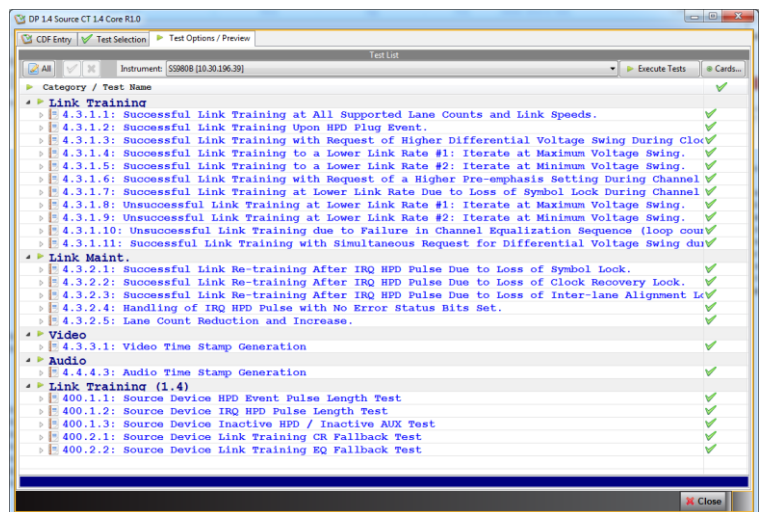


Test Setup for Source Compliance (Capture/Decode)

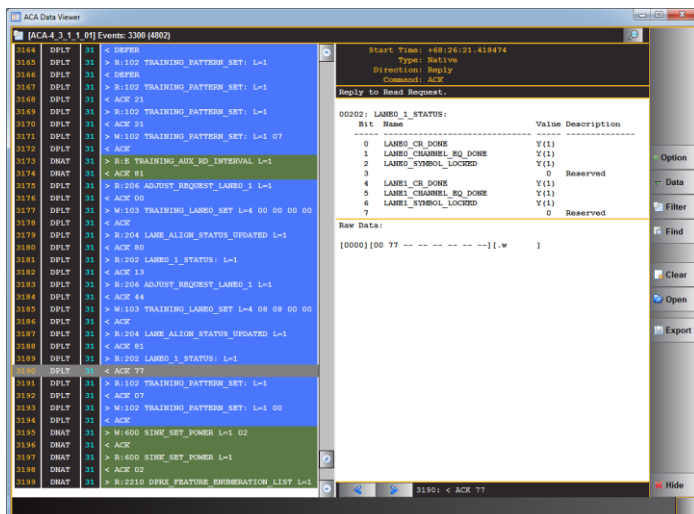
DP 1.4 Source Link Layer Compliance - Test Selection



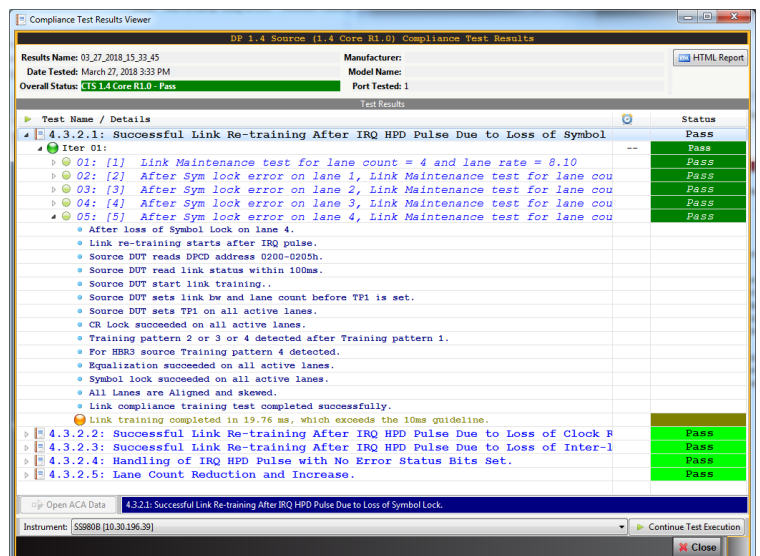
DP 1.4 Link Layer Source Compliance – Test Suite



DP Aux Channel Traces – From LLC Test



DP 1.4 Source Link Layer Compliance Test Results



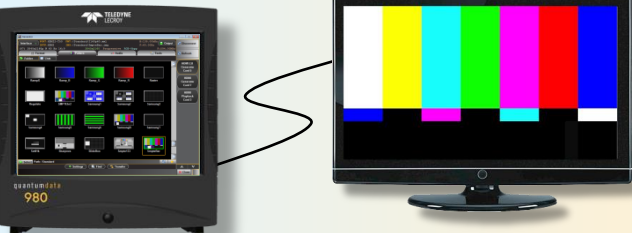
DP 1.4 LINK LAYER SINK COMPLIANCE

DisplayPort 1.4 Sink Link Layer Compliance

The 980 DP sink (display) link layer compliance tests are ideal for pre-testing your DisplayPort 1.4 display product prior to submission to an Authorized Test Center for approval. Pre-testing provides added assurance that your product will pass at the ATC when submitted. The compliance tests (below right) enable you to view the captured data and detailed test results which help pinpoint the cause of compliance test failures. You can link to the aux channel traces in the Aux Channel Analyzer (ACA) to view the root cause of failures (below).

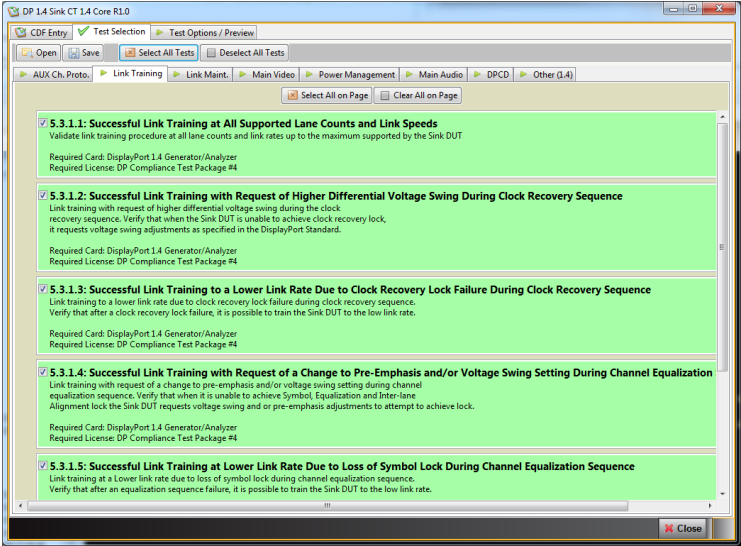
980 with
DP 1.4 Video Generator
/ Analyzer module

DisplayPort Monitor

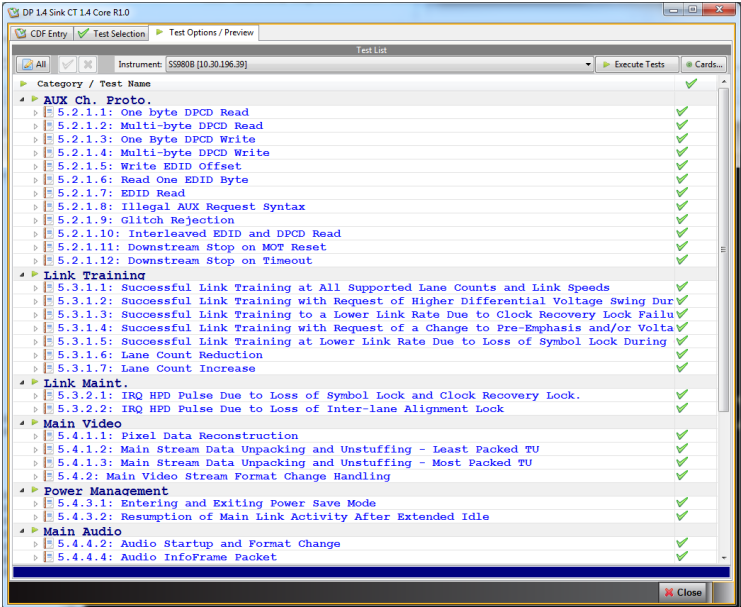


Test Setup for Sink Test

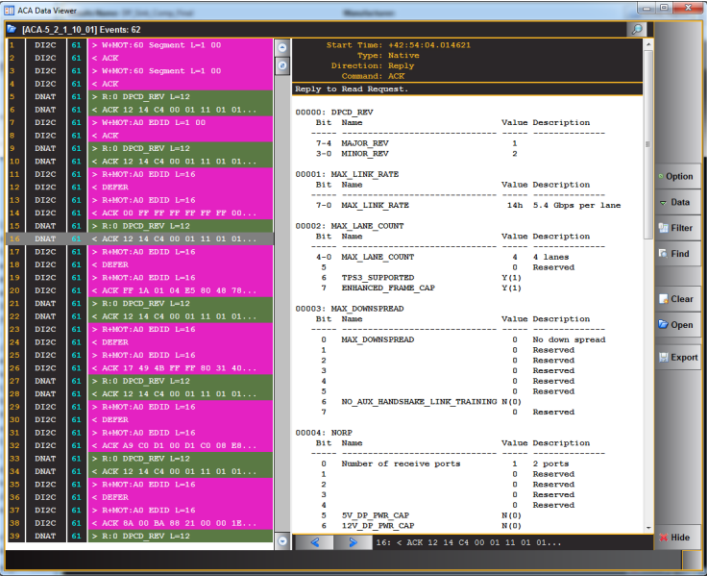
DP 1.4 Link Layer Compliance - Test Selection



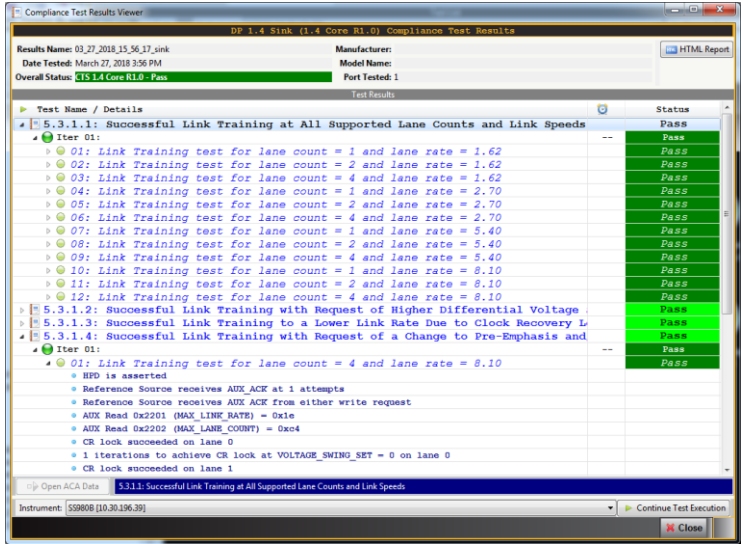
DP 1.4 Link Layer Compliance – Test Suite



DP Aux Channel Traces – From LLC Test



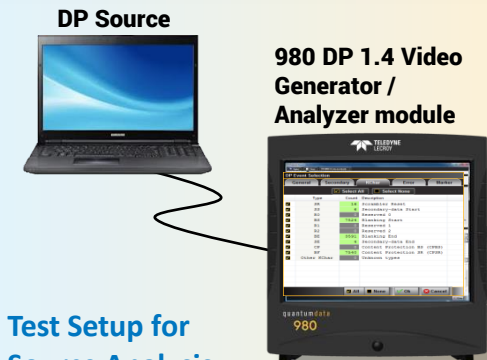
DP 1.4 Link Layer Compliance - Test Results



HDCP 2.2 SOURCE, SINK & REPEATER COMPLIANCE

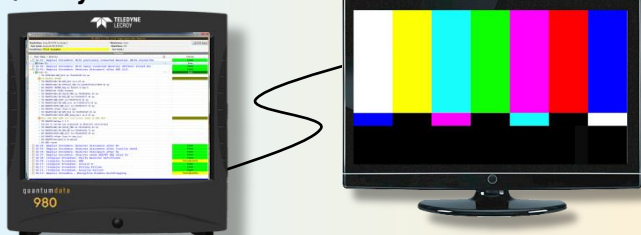
HDCP 2.2 Compliance (DCP Approved)

The 980 HDCP 2.2 compliance tests are ideal for pre-testing your DisplayPort source, sink or repeater product prior to submission to an Authorized Test Center for approval. Pre-testing provides assurance that your product will pass at the ATC when submitted. The compliance tests enable you to view the auxiliary channel analyzer traces logged during the test to help diagnose the cause of compliance test failures.



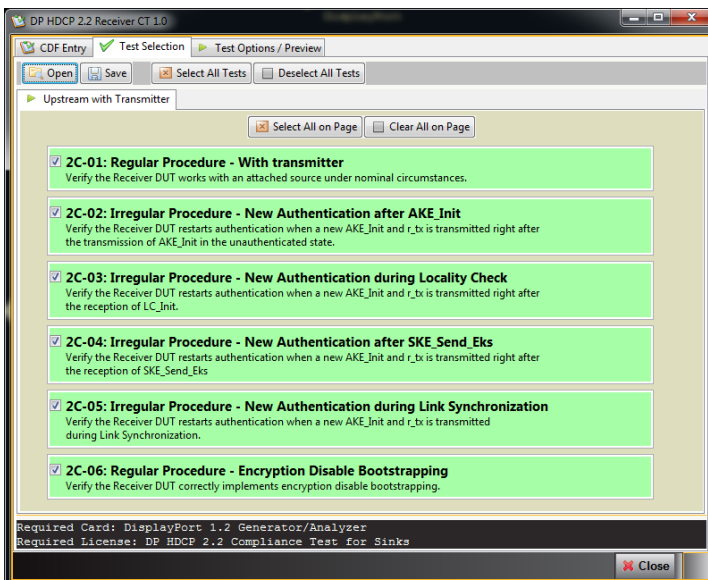
Test Setup for Source Analysis (Capture/Decode)

980 with DP 1.4 Video Generator / Analyzer module

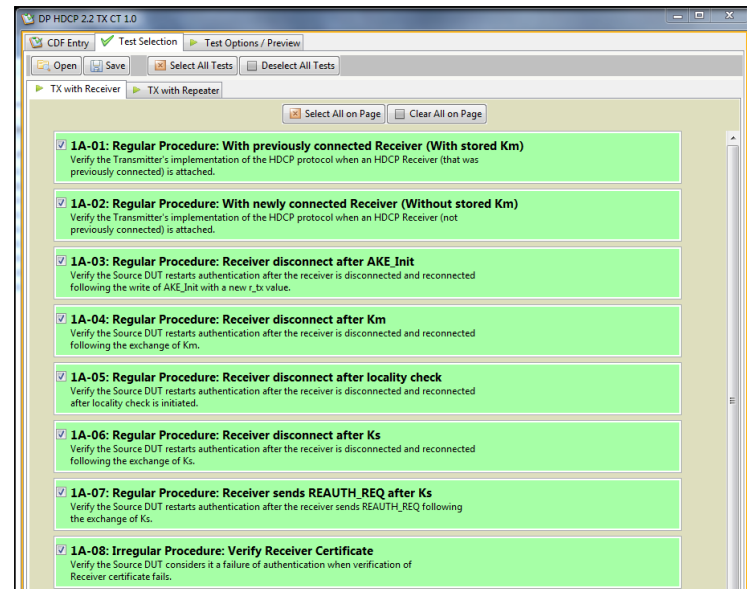


Test Setup for Sink Test

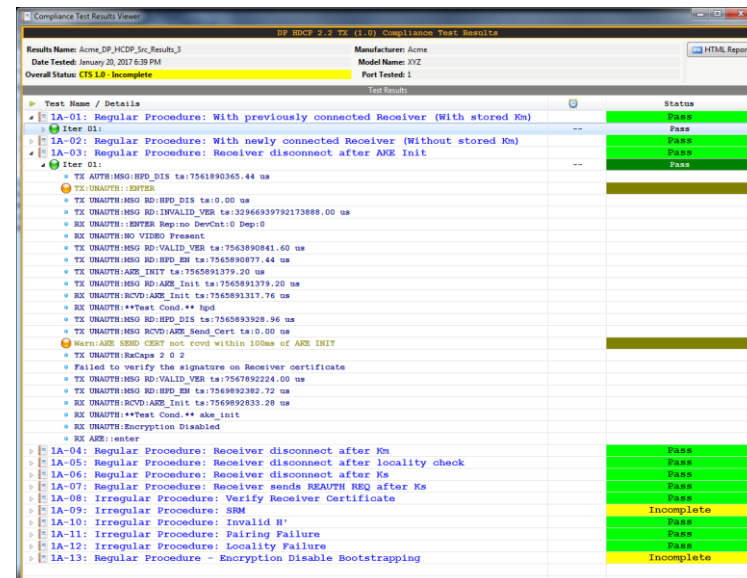
HDCP 2.2 Sink Tests - Test Selection



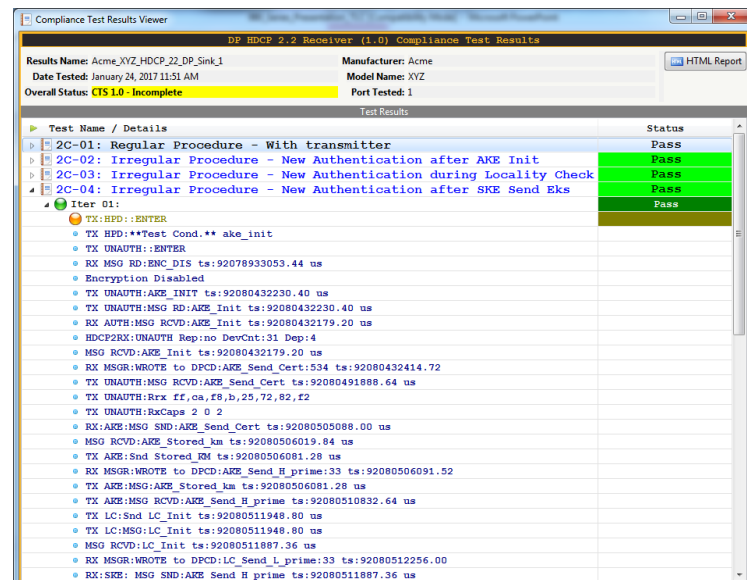
HDCP 2.2 Source Tests - Test Selection



HDCP 2.2 Source Tests - Test Results



HDCP 2.2 Sink Tests - Test Results



SPECIFICATIONS

DisplayPort Tx and Rx Ports

Version	DisplayPort 1.3 currently; support DP HBR3 features in future release
Standard Formats	VESA
Connectors	Tx (1) DP Standard; Rx (1) DP Standard
Aux Chan Adjunct Board	Tx (1), Rx (1)
Protocol	DisplayPort
Video Data Rates	1.62, 2.7, 5.4, 8.1 Gb/s Link rates 1, 2, 4 Lanes
Color Depths	8, 10, 12, 16 bits
Video Encoding	RGB, YCbCr
Video Sampling Modes	4:4:4, 4:2:2
HDCP	Versions 2.2 & (1.3 on 1 & 2 lanes only)
Audio	8 Channel LPCM programmable sine wave
Capture memory	8 GBytes

Options

DisplayPort Tx / Rx	Either or both: - DP Tx for display testing - DP Rx port, two options: - Basic Analyzer - Capture/Store Protocol Analyzer (requires Basic analyzer option)
DP Aux Channel Analyzer	Monitor DisplayPort Aux Channel transactions in real time either while emulating a source or sink.
DP Passive Aux Channel Analyzer	Monitor DisplayPort Aux Channel transactions in real time passively between a source or sink. Includes custom cable and Aux Adjunct board.
NEW DP Capture Analysis of DSC Streams	Capture and analyze incoming Display Stream Compression (DSC) streams. Note: FEC analysis will be supported in a future release.
DP HDCP 2.2 Functional Test	Run HDCP 2.2 functional test on DisplayPort sources, sinks and repeaters
DP HDCP 2.2 Compliance Test	Run HDCP 2.2 compliance test on DisplayPort sources, sinks and repeaters (3 separate options) – Now Approved by DCP.
NEW DP 1.4 Source Link Layer Compliance (Package #3)	Run DisplayPort 1.4 source Link Layer compliance test. (Sections: 4.3.1, 4.3.2, 4.3.3, 4.4.4, 400.1, 400.2)
NEW DP 1.4 Sink Link Layer Compliance (Package #4)	Run DisplayPort 1.4 sink Link Layer compliance test (displays). (Sections: 5.2.1, 5.3.1, 5.3.2, 5.4.1, 5.4.3, 5.4.4, 7.2.1.)
DP Link Layer Draft Tests	Run new VESA draft Link Layer tests for Reduced Lane Fallback, Error Counting, and Hot Plug Detect

980 Test Platforms

Embedded Display	980B: 15" diagonal; Resolution: 1024(H); x 768 (V) resolution; 24 bit RGB color. 980R: 7" diagonal; Resolution: 800 (H) x 480 (V); 24 bit RGB color.
Power	90-264 VAC, 47-63Hz
Weight	23.76 LBS; 10.78 Kg
Size	980B: Height: 15.25 in. (38.7 cm) Width: 14.57 in. (36.5 cm) Depth: 6.29 in. (15.9 cm) 980R: Height: 6.29 in. (15.9 cm); Width: 15.25 in. (38.7 cm); Depth: 14.57 in. (36.5 cm)
Command Line Control	Ethernet (RJ-45) for external GUI and telnet
Environmental	Operating Temp: 32 to 104 (F); 0 to 40 (C)



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