980 DP1.2 Video Generator / Analyzer Module

User Guide

Rev: A8

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1 About the 980 DP Video Generator / Analyzer Module

This chapter provides an overview of features of the 980 DP Video Generator / Analyzer module and the 980 GUI Manager. The module can be equipped in either of the following 980 Advanced Test Platforms:

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

The 980 DP Video Generator / Analyzer module supports video pattern testing and audio testing of DP 1.2 capable displays at 5.4Gb/s link rates per 4 lanes. It is equipped with two (2) Tx ports and an Rx port. The two DP Tx ports are both active simultaneously which enables you to test multiple sinks and displays at the same time. The Rx port is for the optional DP analyzer for testing DisplayPort source devices up to 5.4Gb/s link rates per 4 lanes.

The 980 GUI Manager is a PC application to manage and use the 980 DP Video Generator / Analyzer module.

1.1 Scope of this User Guide

This User Guide provides descriptive and procedural information on the 980 DP Video Generator / Analyzer module for testing DP display devices.

Although you can operate the 980 DP Video Generator / Analyzer module through the “embedded GUI,” most of the examples used in the procedures in this User Guide are taken from the external standalone PC 980 GUI Manager. The procedures are nearly identical between the embedded GUI running through the 980B/980R front panel display and the external standalone PC application but the look and feel is slightly different.

There are separate User Guides for the other 980B/980R modules. The following is a list of the User Guides available with the 980B/980R and its modules. These are available from the downloads and product web pages of the Quantum Data website http://www.quantumdata.com/products/980.asp:

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

- 980 HDMI Protocol Analyzer Gen 3 System – Covers source analysis testing for HDMI and MHL source devices as well as various transmitter features. This user guide is specifically for the functions of the 980 HDMI Protocol Analyzer Gen 3 system sold through 2012.
- 980 HDMI Protocol Analyzer module – Covers source analysis features of the 980 HDMI Protocol Analyzer module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide for purchases in 2013.
- 980 Advanced Test Platform Quick Start Guide – Covers startup procedures for the 980/980B platform. Used in conjunction with the 980 HDMI Protocol Analyzer Module User Guide for purchases in 2013.
- 980 HDMI Protocol Analyzer module – Covers source analysis testing for HDMI and MHL source devices as well as various transmitter features. This user guide is specifically for the functions of the 980 HDMI Protocol Analyzer module equipped in one of the 980 Advanced Test Platform slots (980 Gen 3 or 980B). Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Protocol Analyzer HDMI/MHL Source Compliance Test – Covers source compliance testing for both MHL and HDMI sources. These compliance test applications are provided by the 980 HDMI Protocol Analyzer module or the 980 HDMI Protocol Analyzer Gen 3 system. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Protocol Analyzer HDMI/MHL Sink Compliance Test – Covers sink compliance testing for both MHL and HDMI sinks (and MHL dongles). These compliance test applications are provided by the 980 HDMI Protocol Analyzer module or the 980 HDMI Protocol Analyzer Gen 3 system. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 MHL CBUS Compliance Test Module - Covers MHL CBUS compliance testing for both MHL sources as well as sinks and dongles. This compliance test applications are provided by the 980 CBUS Compliance Test module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI Video Generator module – Covers the features and functions offered by the 980 HDMI Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI 2.0 Video Generator module – Covers the features and functions offered by the 980 HDMI 2.0 Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 HDMI 2.0 Protocol Analyzer module – Covers source analysis features of the 980 HDMI 2.0 Protocol Analyzer module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.
- 980 DP Video Generator module (This User Guide) – Covers the features and functions offered by the 980 DP Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.

1.2 Changes to this User Guide

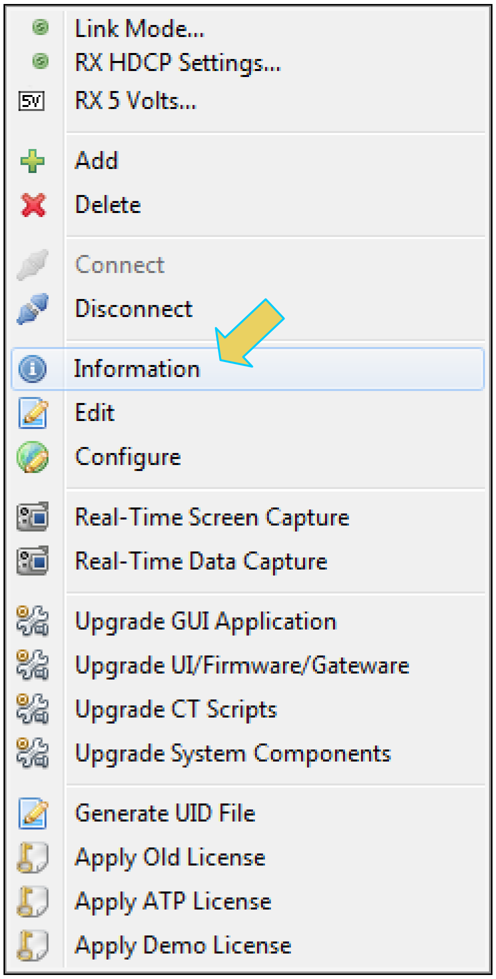
The following changes were made to this document:

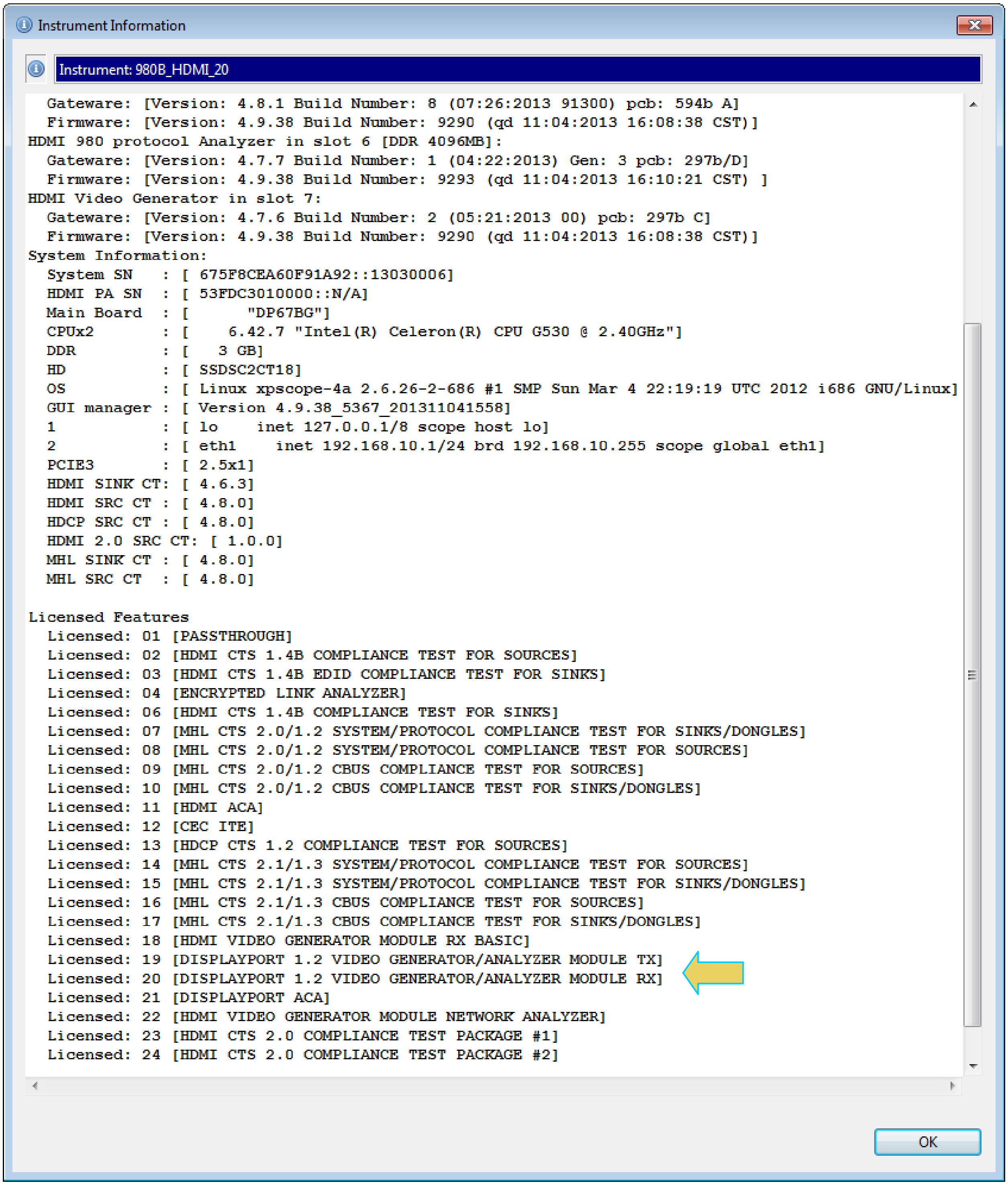
- Added procedures for the optional HDCP 2.2. functional tests for DisplayPort sources, sinks and repeaters.
- Added procedures for the Protocol Analyzer option for capturing DisplayPort incoming streams from source devices.

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

1.3 What options are available with the 980?

You can determine what options the 980 DP Video Generator / Analyzer is equipped with by accessing the Instrument Information screen on either the built-in or external 980 GUI manager. Currently there are no options available with this module. When using the external 980 GUI Manager you must be connected to the 980B/980R in order to read the Instrument Information.




Instrument Information
Instrument: 980B_HDMI_20
Gateware: [Version: 4.8.1 Build Number: 8 (07:26:2013 91300) pcb: 594b A]
Firmware: [Version: 4.9.38 Build Number: 9290 (qd 11:04:2013 16:08:38 CST)]
HDMI 980 protocol Analyzer in slot 6 [DDR 4096MB]:
Gateware: [Version: 4.7.7 Build Number: 1 (04:22:2013) Gen: 3 pcb: 297b/D]
Firmware: [Version: 4.9.38 Build Number: 9293 (qd 11:04:2013 16:10:21 CST)]
HDMI Video Generator in slot 7:
Gateware: [Version: 4.7.6 Build Number: 2 (05:21:2013 00) pcb: 297b C]
Firmware: [Version: 4.9.38 Build Number: 9290 (qd 11:04:2013 16:08:38 CST)]
System Information:
System SN : [675F8CEA60F91A92::13030006]
HDMI PA SN : [53FDC3010000::N/A]
Main Board : ["DP67BG"]
CPUx2 : [6.42.7 "Intel(R) Celeron(R) CPU G530 @ 2.40GHz"]
DDR : [3 GB]
HD : [SSDSC2CT18]
OS : [Linux xpscope-4a 2.6.26-2-686 #1 SMP Sun Mar 4 22:19:19 UTC 2012 i686 GNU/Linux]
GUI manager : [Version 4.9.38_5367_201311041558]
1 : [lo inet 127.0.0.1/8 scope host lo]
2 : [eth1 inet 192.168.10.1/24 brd 192.168.10.255 scope global eth1]
PCIE3 : [2.5x1]
HDMI SINK CT: [4.6.3]
HDMI SRC CT : [4.8.0]
HDCP SRC CT : [4.8.0]
HDMI 2.0 SRC CT: [1.0.0]
MHL SINK CT : [4.8.0]
MHL SRC CT : [4.8.0]
Licensed Features
Licensed: 01 [PASSTHROUGH]
Licensed: 02 [HDMI CTS 1.4B COMPLIANCE TEST FOR SOURCES]
Licensed: 03 [HDMI CTS 1.4B EDID COMPLIANCE TEST FOR SINKS]
Licensed: 04 [ENCRYPTED LINK ANALYZER]
Licensed: 06 [HDMI CTS 1.4B COMPLIANCE TEST FOR SINKS]
Licensed: 07 [MHL CTS 2.0/1.2 SYSTEM/PROTOCOL COMPLIANCE TEST FOR SINKS/DONGLES]
Licensed: 08 [MHL CTS 2.0/1.2 SYSTEM/PROTOCOL COMPLIANCE TEST FOR SOURCES]
Licensed: 09 [MHL CTS 2.0/1.2 CBUS COMPLIANCE TEST FOR SOURCES]
Licensed: 10 [MHL CTS 2.0/1.2 CBUS COMPLIANCE TEST FOR SINKS/DONGLES]
Licensed: 11 [HDMI ACA]
Licensed: 12 [CEC ITE]
Licensed: 13 [HDCP CTS 1.2 COMPLIANCE TEST FOR SOURCES]
Licensed: 14 [MHL CTS 2.1/1.3 SYSTEM/PROTOCOL COMPLIANCE TEST FOR SOURCES]
Licensed: 15 [MHL CTS 2.1/1.3 SYSTEM/PROTOCOL COMPLIANCE TEST FOR SINKS/DONGLES]
Licensed: 16 [MHL CTS 2.1/1.3 CBUS COMPLIANCE TEST FOR SOURCES]
Licensed: 17 [MHL CTS 2.1/1.3 CBUS COMPLIANCE TEST FOR SINKS/DONGLES]
Licensed: 18 [HDMI VIDEO GENERATOR MODULE RX BASIC]
Licensed: 19 [DISPLAYPORT 1.2 VIDEO GENERATOR/ANALYZER MODULE TX]
Licensed: 20 [DISPLAYPORT 1.2 VIDEO GENERATOR/ANALYZER MODULE RX]
Licensed: 21 [DISPLAYPORT ACA]
Licensed: 22 [HDMI VIDEO GENERATOR MODULE NETWORK ANALYZER]
Licensed: 23 [HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #1]
Licensed: 24 [HDMI CTS 2.0 COMPLIANCE TEST PACKAGE #2]
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1.4 980 User Interface

The 980B/980R provide a graphical user interface for operation. This GUI can run both on the 980B/980R through the built-in color touch screen display or as a standalone application running on a PC. The look and feel and functions are similar but not identical. The first illustration below shows a PC (left) connected to the 980B through an Ethernet cable for operation through the external 980 GUI Manager. The second illustration depicts the embedded 980 GUI Manager.

1.4.1 External 980 GUI Manager

The external 980B GUI Manager provides convenient operation of the 980 DP Video Generator module from your PC. The larger screen size on the external 980 GUI Manager enables you to use multiple panels at the same time.

1.4.2 Embedded 980 GUI Manager

You can operate the 980B/980R fully through the built-in color touch screen display.

2 Getting Started

This chapter explains what is involved in getting your 980B/980R system up and operating to capture data.

2.1 What is shipped with the 980 DP Video Generator / Analyzer module?

The 980 DP Video Generator / Analyzer module can optionally be equipped in the 980B/980R Advanced Test Platforms. The following items are included with the 980 DP Video Generator / Analyzer module:

- DP cable (P/N 30-00162) – used for connecting to the 980 DP Video Generator / Analyzer module to the device under test.

2.2 Operational workflow for DP Video Pattern Testing

The following are the high level steps you will need to follow to get your 980 DP Video Generator / Analyzer module up and running.

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

The following list of activities are described in the 980 Quick Start Guide.

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

2.2.2 Procedures covered in this User Guide:

1. Connect the sink device under test to the DP Tx port on the 980 DP Video Generator / Analyzer module.

2. Selecting video formats (resolutions).
3. Setting the colorimetry and video mode.
4. Selecting the test patterns.
5. Running other tests on DP sink devices.

3 Testing DP Displays with the 980 DP Video Generator / Analyzer module

This chapter describes how to operate the 980 DP Video Generator / Analyzer module to test DP display devices (HDTVs, PC monitors).

3.1 Workflow for running the video pattern testing of DP displays

The workflow below is a high level set of tasks for operating the 980 DP Video Generator / Analyzer module. Note that the installation of the external 980 GUI Manager and the Ethernet session are optional; you can run the tests through the embedded GUI Manager.

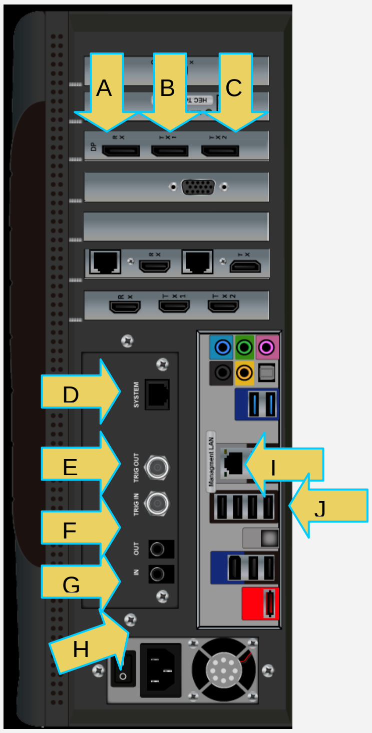
1. Power up the 980. Refer to the procedures in Powering up the 980.

   Note: The power switch in the front is used when you are turning off the 980 for a short period of time. For extended periods of off time, it is best to power the 980 down by first using the power button on the front and then the rocker switch on the back.

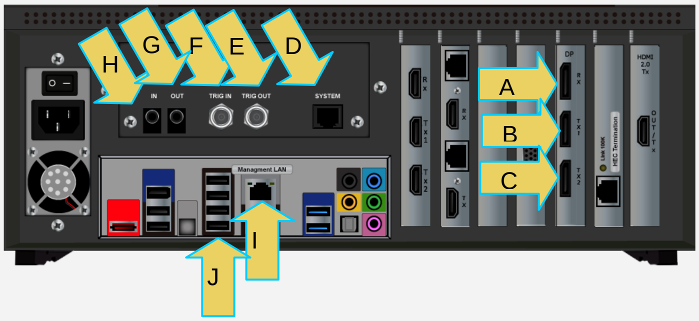
2. (Optional) Establish an Ethernet/IP connection between the external 980 GUI Manager and the 980B/980R Advanced Test Platform using the procedures in the 980 Advanced Test Platform Quick Start Guide.
3. Connect the DP sink device under test to one of the module's Tx ports.
4. Access the module's interface through the 980 GUI Manager.
5. Select DP.
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. Select the audio format.
10. Monitor the sink DUT for any anomalies.

3.2 Connector Description

Use the following table to identify the connector function and descriptions on your 980 DP Video Generator module.

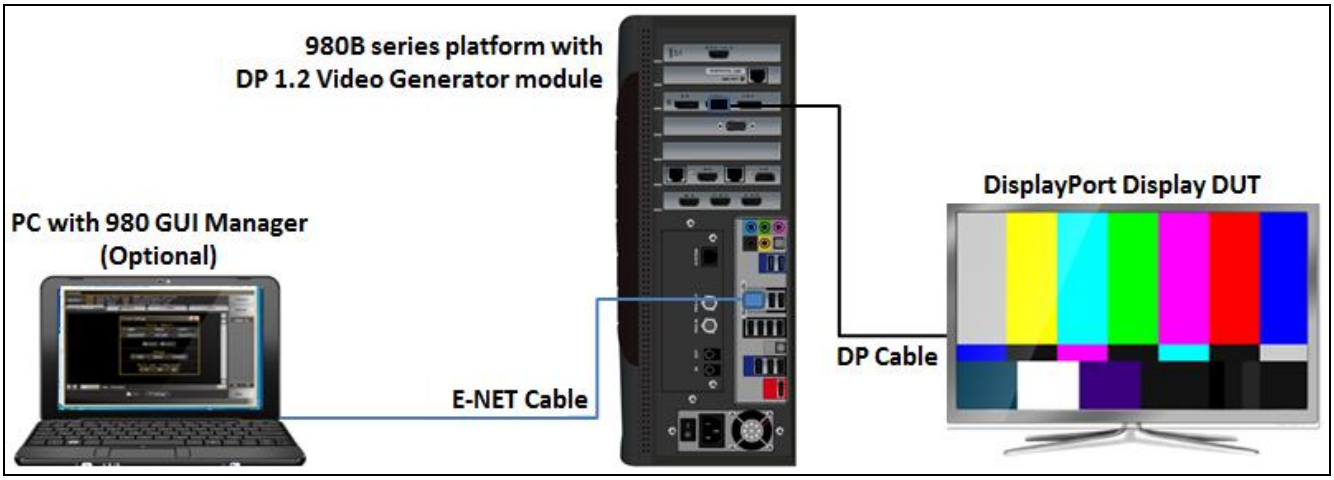
980 Configurations	Information / Function
DP Video Generator module – 980B  	The following is a description of each connector: **980 DP Video Generator / Analyzer module:** ▪ A – DP Rx port for analyzing DP sources (optional feature). ▪ B – DP Tx1 port for DP video/audio generation. ▪ C – DP Tx2 port for DP video/audio generation (same output as Tx1). **Note**: DP Video Generator can be installed in slots 3 or 6. **980B QD Bus Board:** ▪ D – Internal Ethernet Tx connector; not used. ▪ E – BNC Trig OUT connector. Not used for this module. ▪ F – BNC Trig IN connector. Not used for this module. ▪ G – RCA OUT connector for SPDIF function. Not used for this module. ▪ H – RCA IN connector for SPDIF function. Not used for this module. **980B Lower Panel:** ▪ I – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line control and FTP for transferring files. ▪ J – Various USB ports for transferring files and restoring system.

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

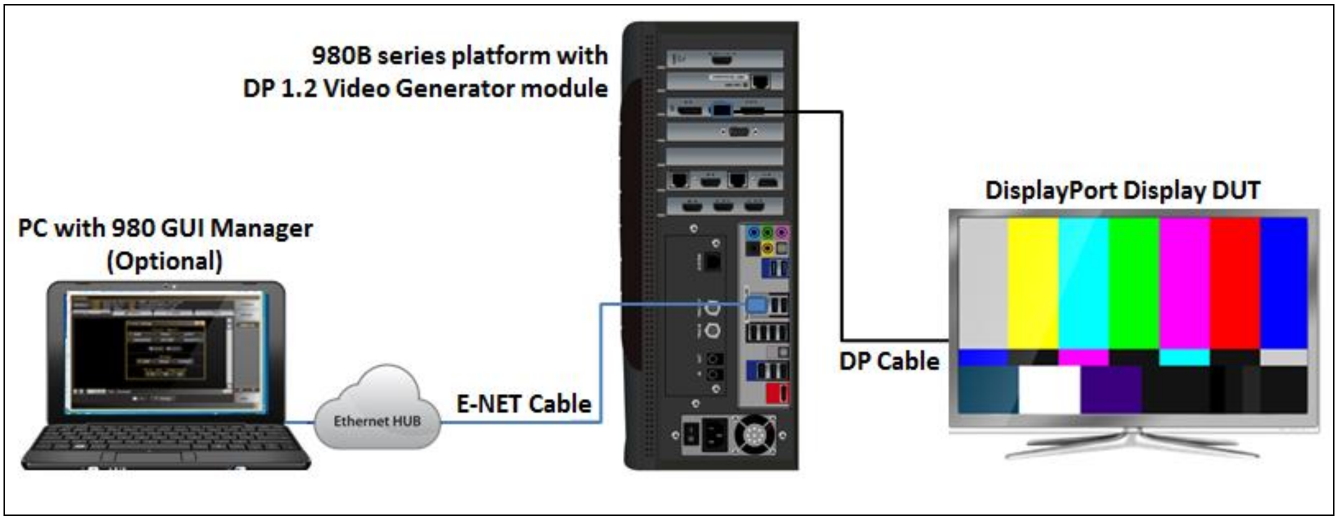
980B Configurations	Information / Function
DP Video Generator module – 980R 	The following is a description of each connector: **980 DP Video Generator / Analyzer module:** ▪ A – DP Rx port for HDMI video analysis (optional feature). ▪ B – DP Tx1 port for HDMI video generation. ▪ C – DP Tx2 port for HDMI video generation. **Note**: DP Video Generator can be installed in slots 1, 3 or 6. **980R QD Bus Board:** ▪ D – Internal Ethernet Tx connector; not used. ▪ E – BNC Trig OUT connector. Not used for this module. ▪ F – BNC Trig IN connector. Not used for this module. ▪ G – RCA OUT connector for SPDIF function. Not used for this module. ▪ H – RCA IN connector for SPDIF function. Not used for this module. **980R Lower Panel:** ▪ I – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line control and FTP for transferring files. ▪ J – Various USB ports for transferring files and restoring system.

3.3 Making the physical DP connections

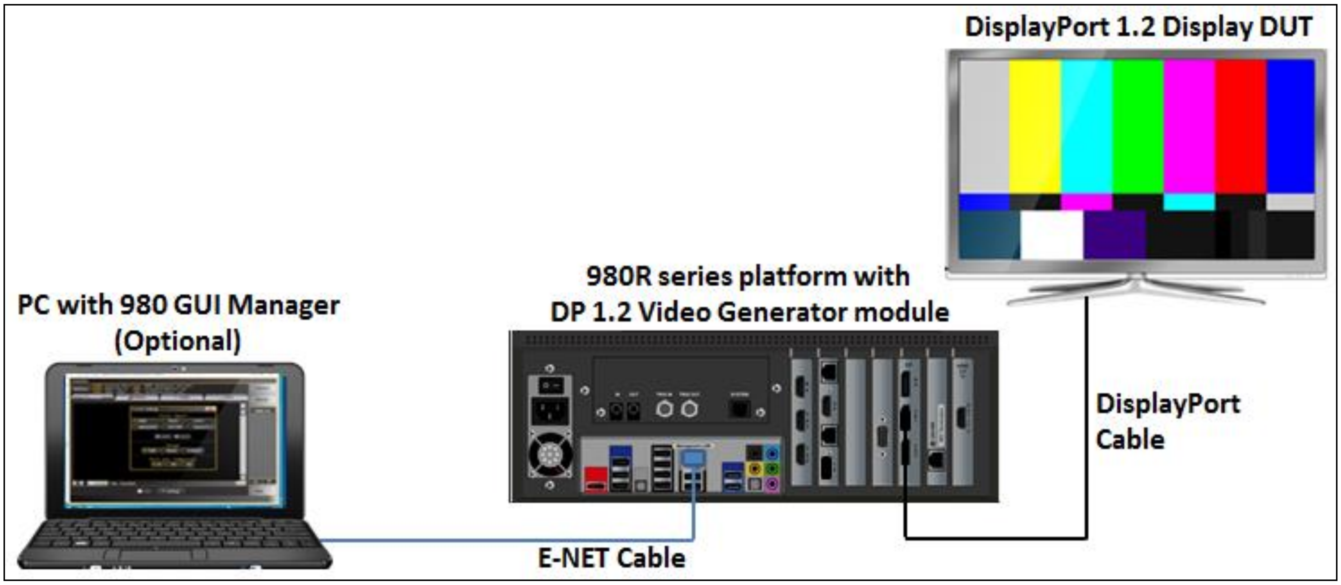
This subsection describes the physical DP connections required to run the video pattern tests on a DP display.



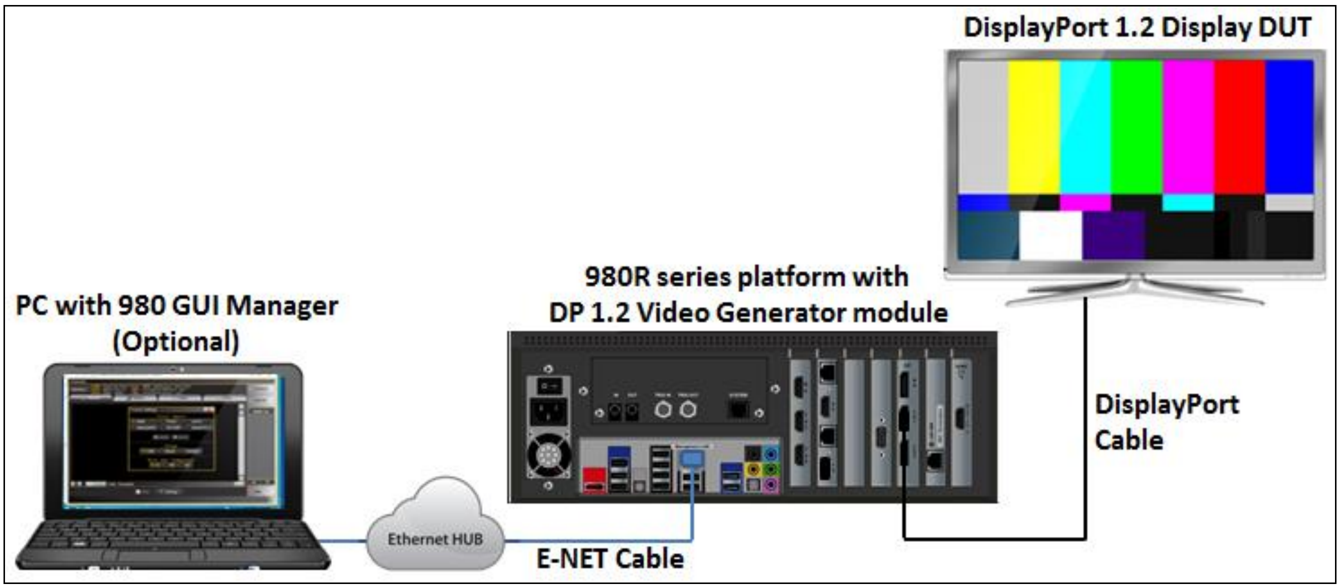
Connection for video testing – 980B Direct Connection (Side View)



Connection for video testing – 980B Ethernet hub or corporate LAN example (Side View)



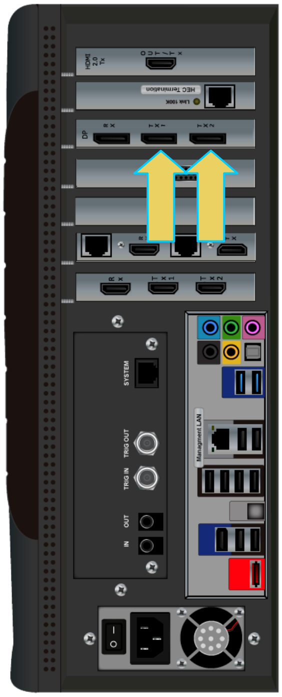
Connection for video testing – 980R Direct Connection (Rear View)

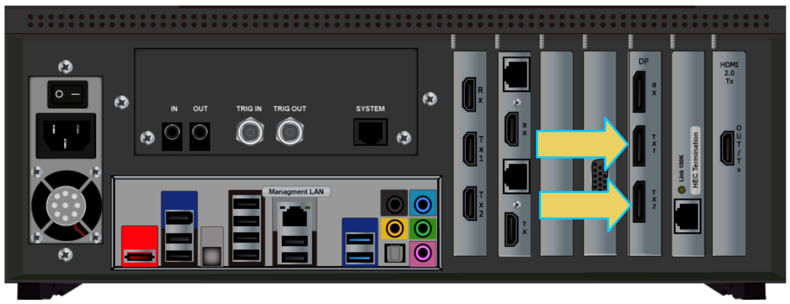


Connection for video testing – 980R Ethernet hub or corporate LAN example (Rear View)

To make the physical DP connections:

This procedure assumes that you have assembled the 980B/980R with the 980 DP Video Generator / Analyzer module and the DP display device under test and applied power to all these devices. Refer to the procedures below and the diagram above.





1. Connect your DP display device under test to one of the DP Tx connectors on the 980 DP Video Generator / Analyzer module. Use a DP-compliant cable.

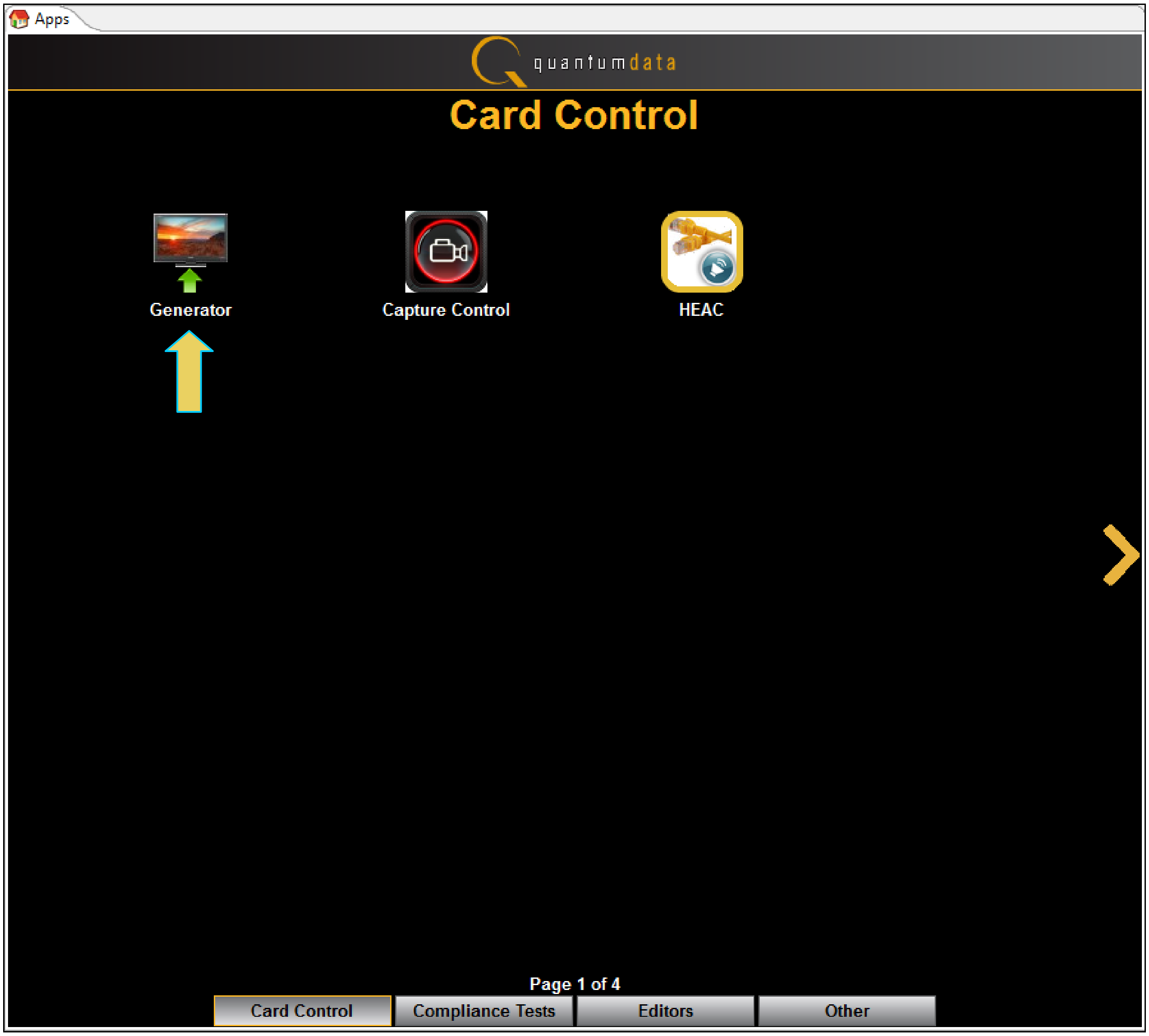
   Note: The DP Video Generator module can be installed in either slot 3 (shown) or slot 6 of the 980B and slot 1, 3 or 6 in the 980R.

3.4 Navigating through the 980 GUI Manager interface

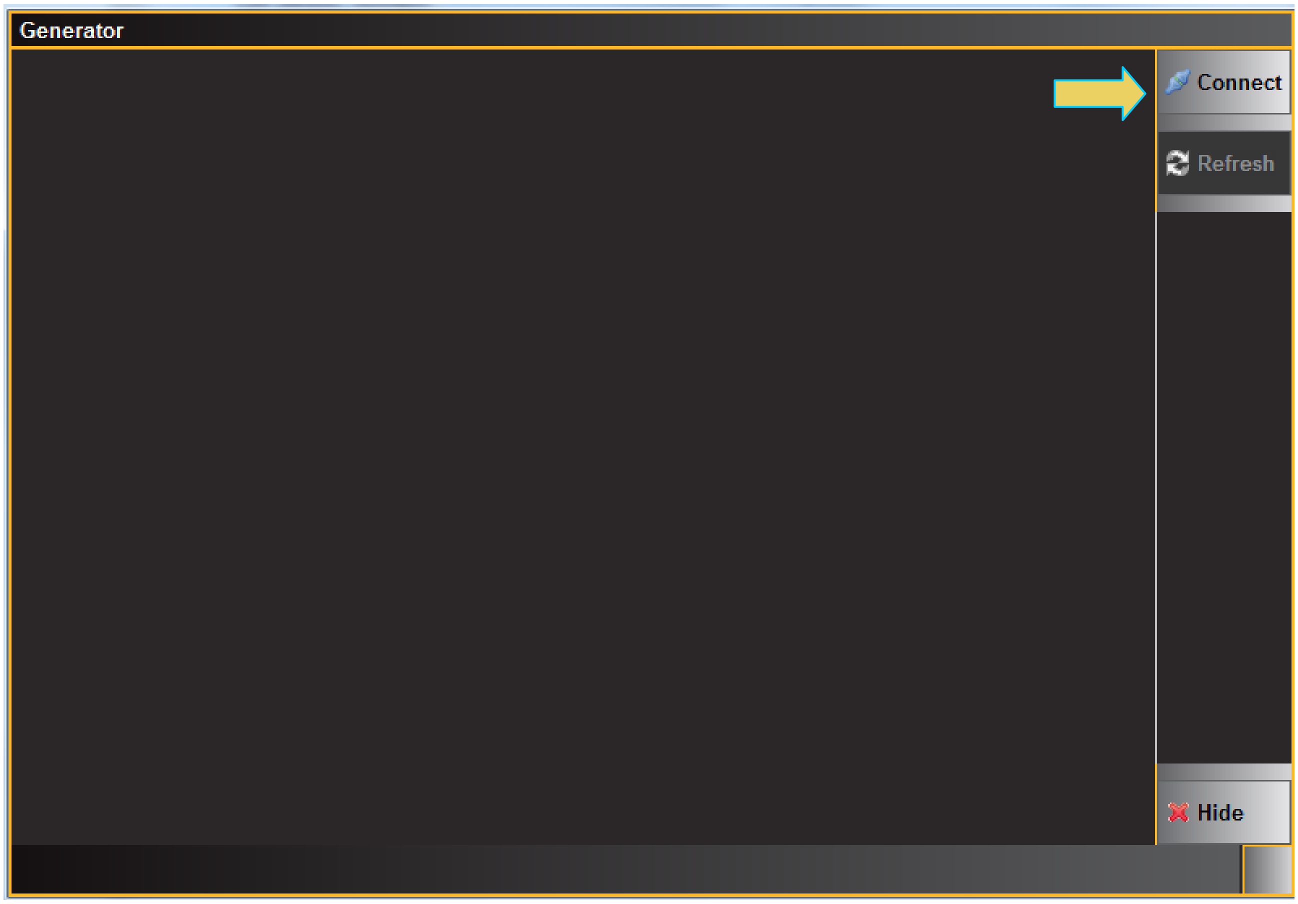
Use the following procedures to navigate to the 980 DP Video Generator / Analyzer module testing functions. You can access the 980 DP Video Generator / Analyzer module functionality through the Card Control tab (Page 1 of 4) of the Apps panel. Use the procedures provided below.

To navigate to the video test functions:

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

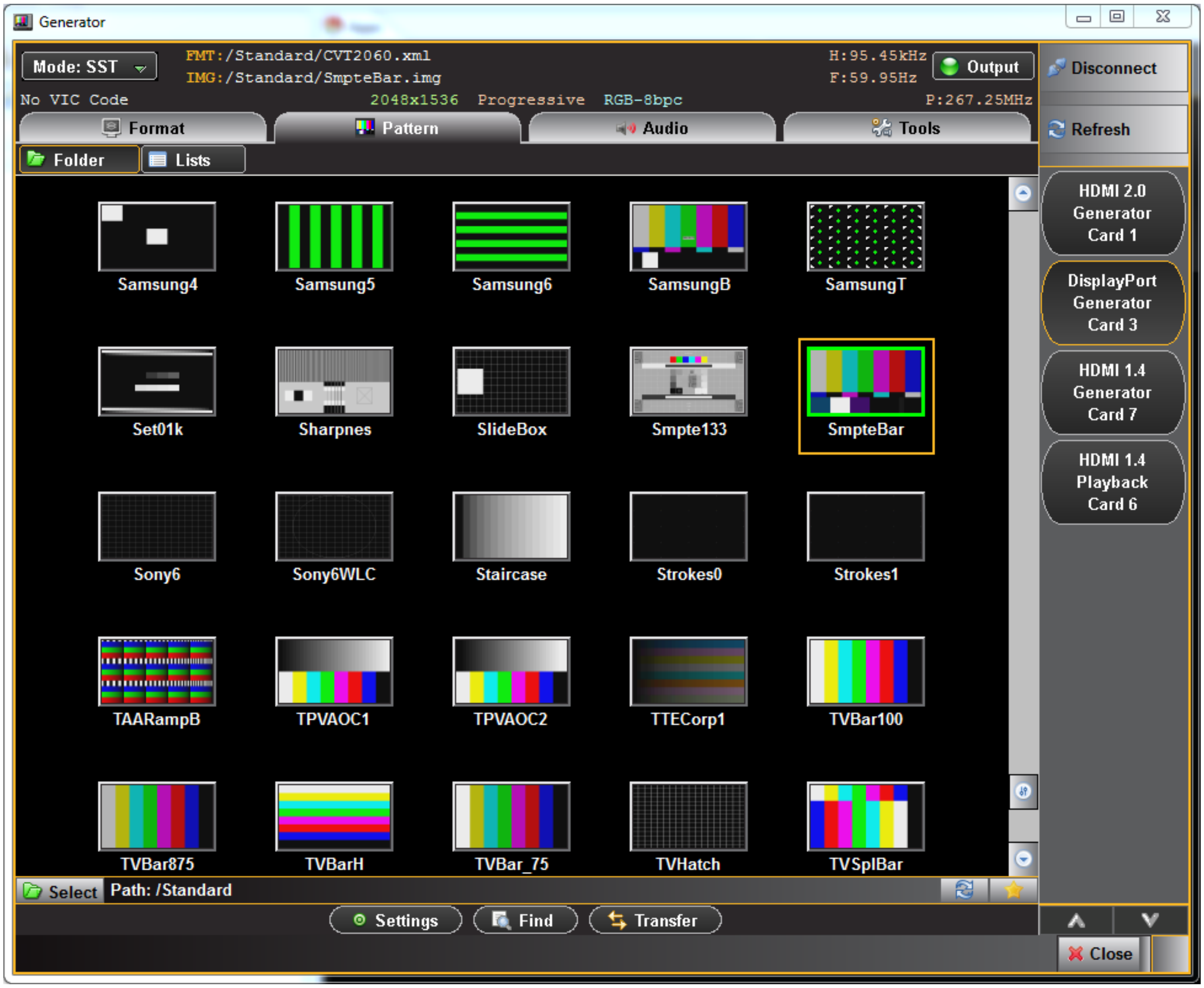

Apps
quantumdata
Card Control
Generator
Capture Control
HEAC
Page 1 of 4
Card Control
Compliance Tests
Editors
Other

A blank **Generator** panel appears as shown below asking you to connect to the 980B/980R.

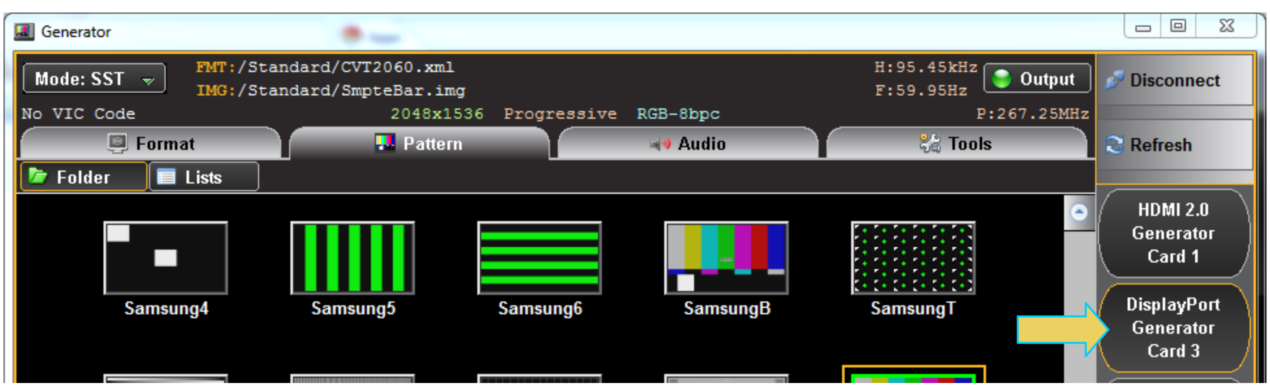


2. Click on the **Connect** button to initiate a connection between the 980 GUI Manager and the 980 Generator application.

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



There are a set of port selector/indicator buttons on the right side of the panel (indicated below). The module will be in one of slots 1 through 7 on the 980B/980R.



The Generator screen has a status area on the top of its panel. The status area provides the following information:

Generator Status Area (Top)	
Item	**Description**

Generator Status Area (Top)	
Item	**Description**
Port	Active port, in this case the two Tx connectors (T30 and T31).
INTF	The currently selected interface type for the module. This could be either, DP, HDMI or DVI. The 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	The resolution, scan and colorimetry type 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.

3.5 Selecting and Activating Interfaces

The 980 DP Video Generator / Analyzer module has two (2) transmitter ports and one receiver port. The second DP Tx port (Port 2) is always active. But you have to select which of the other two ports are active: Tx Port 1 or Rx Port 1. If you have activated both Tx ports, both are transmitting the same content simultaneously unless MST is active.

To Enable Tx Port 1:

1. From the **Tools** menu of the 980 DP Video Generator / Analyzer module, click the **Port Config** button on the right.
2. Select **TX-1 Enabled** to enable the Port 1 Tx.

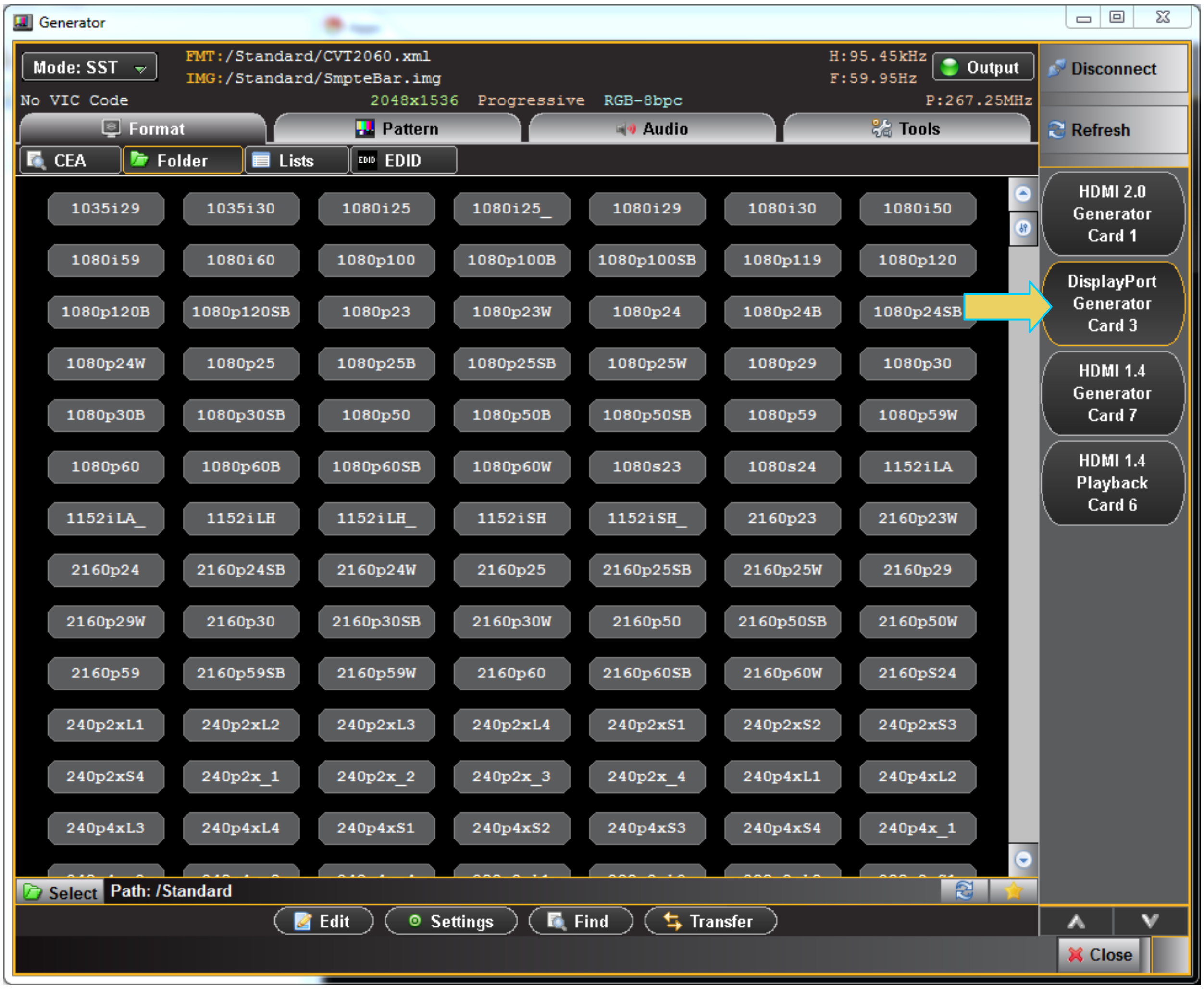
3.6 Selecting DP formats

Use the following procedures to select the mode, DP, in the 980 DP Video Generator / Analyzer module.

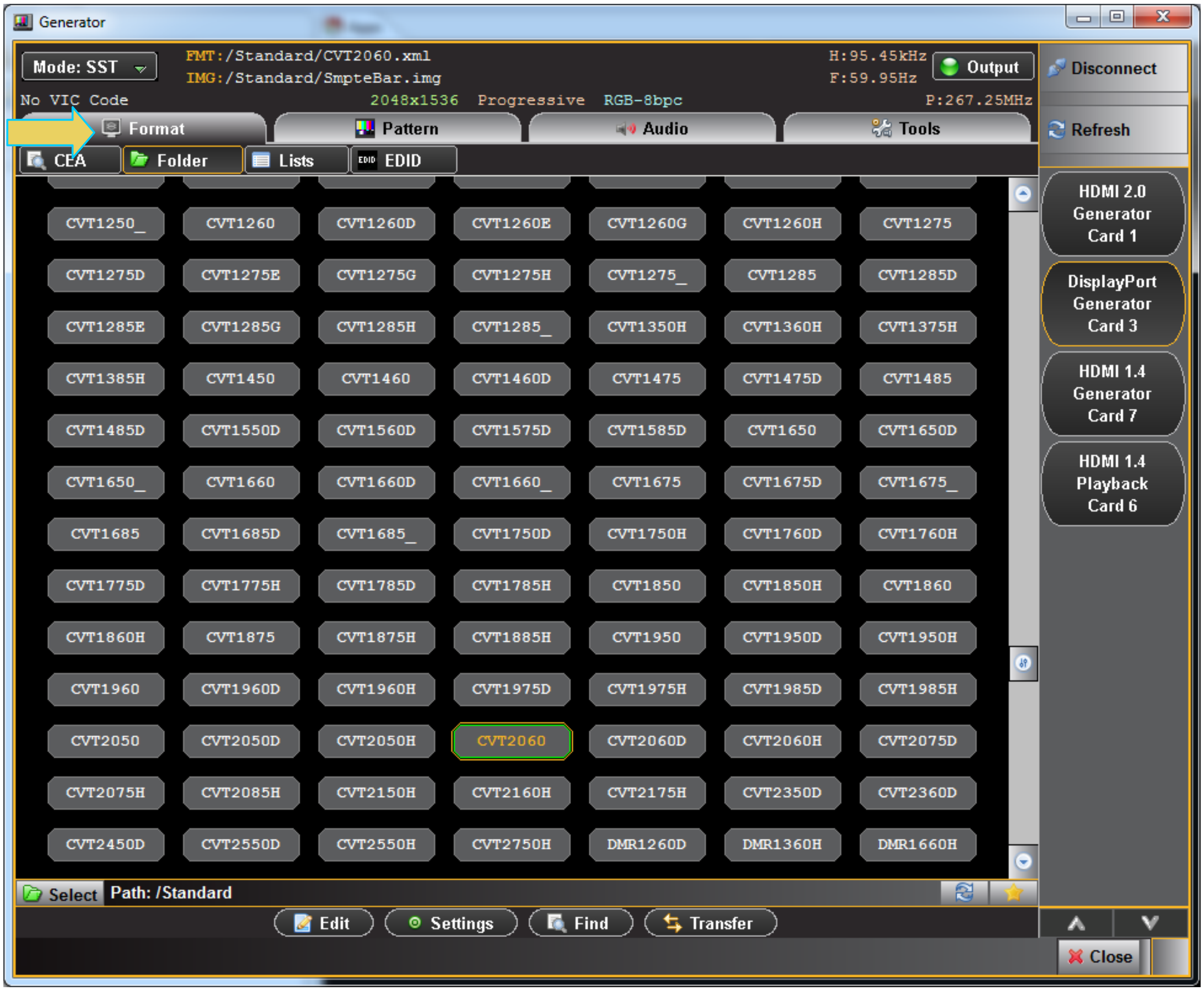
Note: There are two DP transmitter ports and one DP receiver port. Both transmitters are active and transmitting the same content simultaneously.

To select interface (DP):

1. From the **Main** menu of the 980 DP Video Generator / Analyzer module, click the **DisplayPort Generator Card** button on the right.



When you select the DP module you will get a listing of DP formats in the main window.



3.7 Selecting formats (resolutions)

You can select formats (timings) from the 980 DP Video Generator / Analyzer's format library or from the CEA parameter filters. When selecting from the Format Library list, you can select either from the entire list of formats or you can select from a subset or reduced set of the formats. 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).

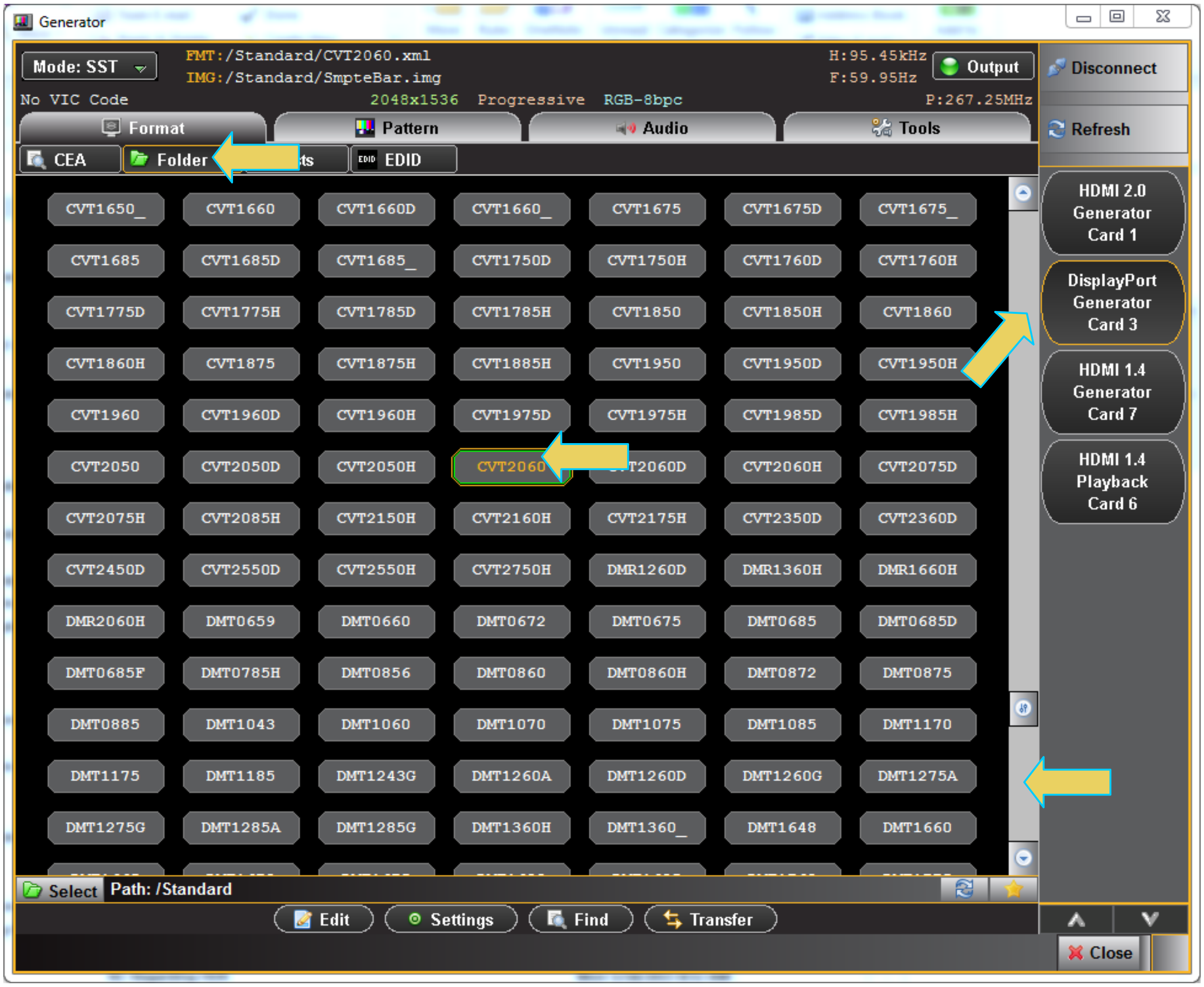
3.7.1 Selecting formats using the Library list

Use the following procedures to select a video resolution (format) using the Library List method. The procedure assumes that you have already selected the DP interface.

To select a format from the library list:

1. From the main window of the 980 DP Video Generator / Analyzer module, click the **Format** tab.

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

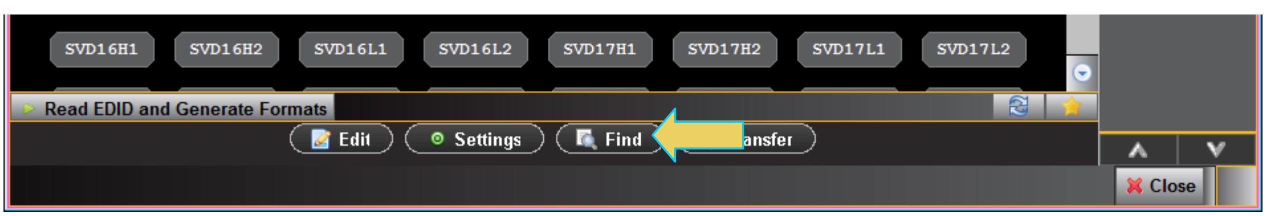


The highlighted format is the format that is active. You can also determine this from the status information at the top of the panel. Alternatively you can click on the Star  button to show the selected format. When you click on the Star button the list of formats will be repositioned such that the selected format is shown on the top line.

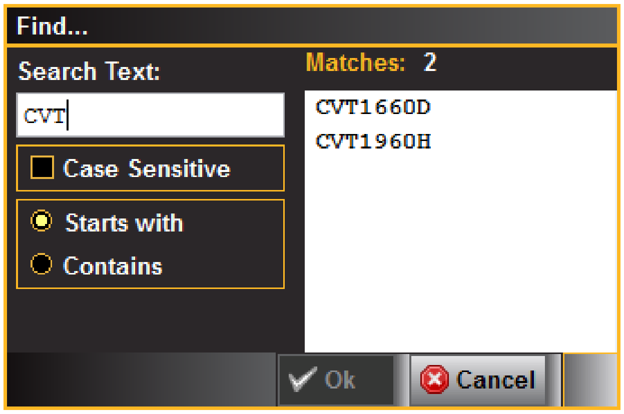
2. Note that you can browse for a format using the scroll bar. You can also search for a format using a test strings on the Find Format dialog box.

3. Select a format from the list by clicking on it.

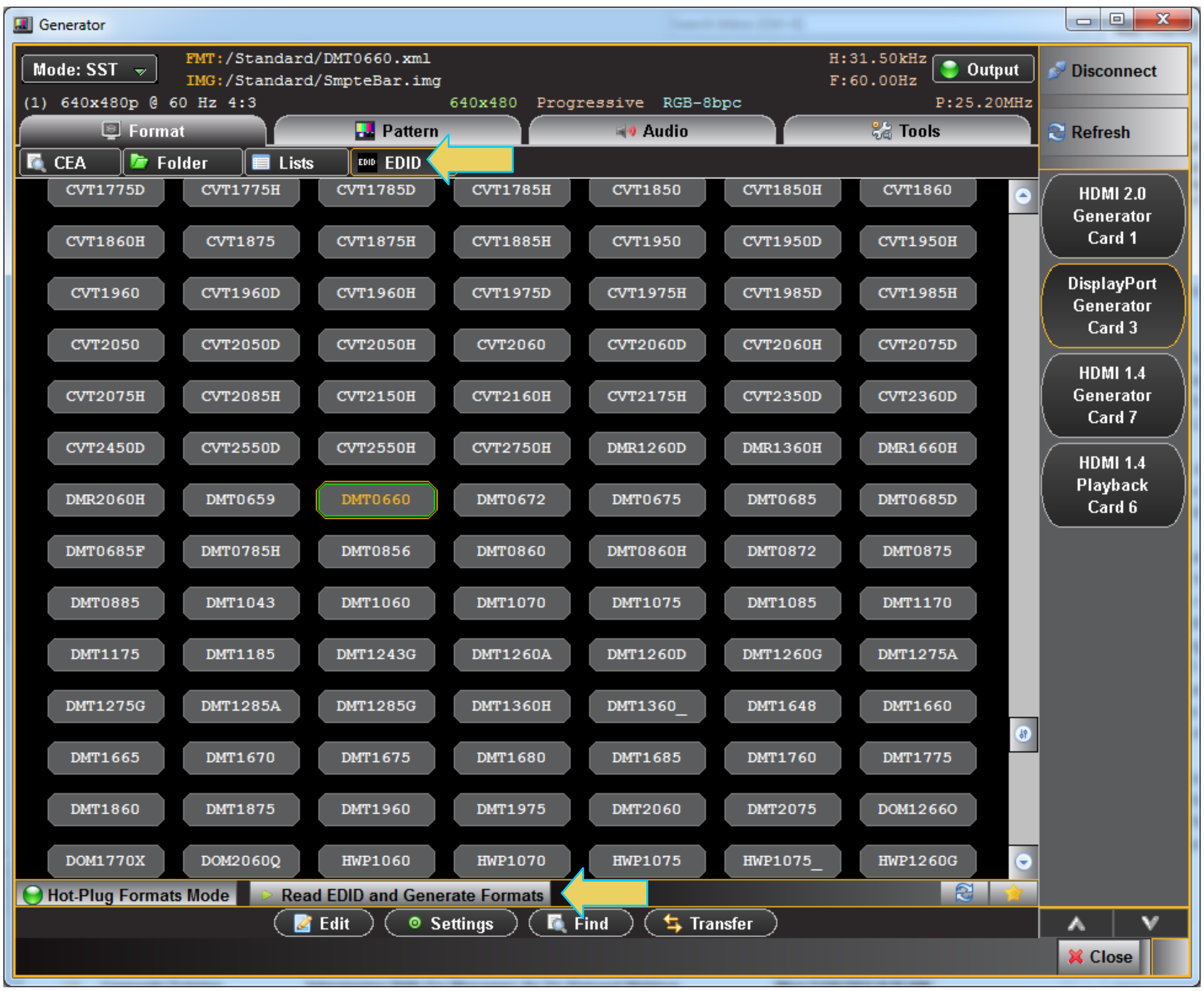
4. Click on the Find activation button on the lower portion of the Format panel.



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.

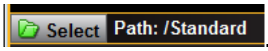


5. Click on the EDID smart activation button on the top left to configure the list of formats in accordance with the EDID for the connected display.

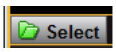


You can determine if the list of formats displayed is derived from the EDID of the connected display by looking at lower status area of the panel 

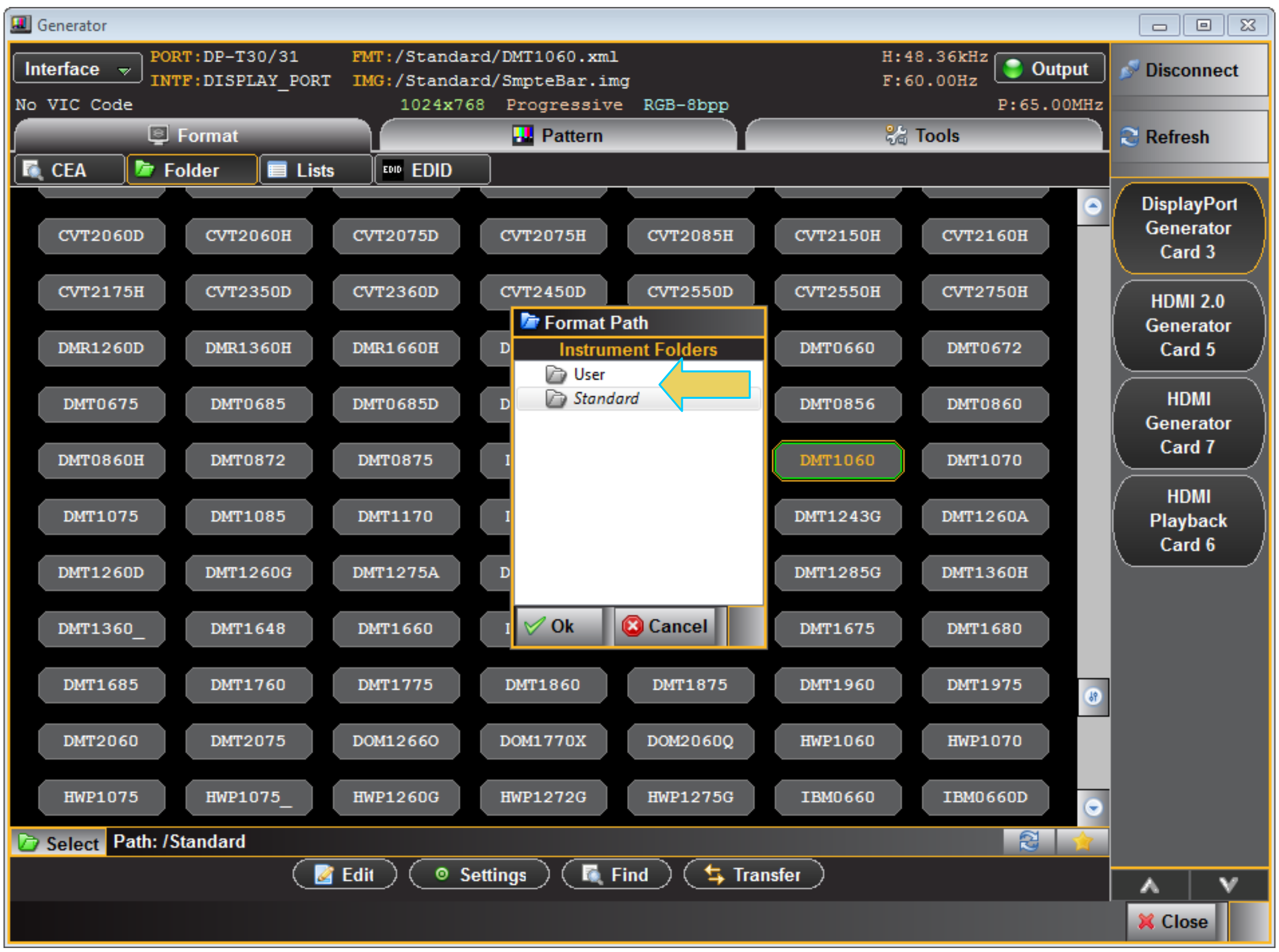
.

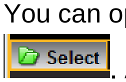
When EDID formats are not active, the directory whose formats are being displayed is listed in the lower panel 

. Typically this would be the Standard directory where the 980 module's format list is stored. The default path is the Standard path.

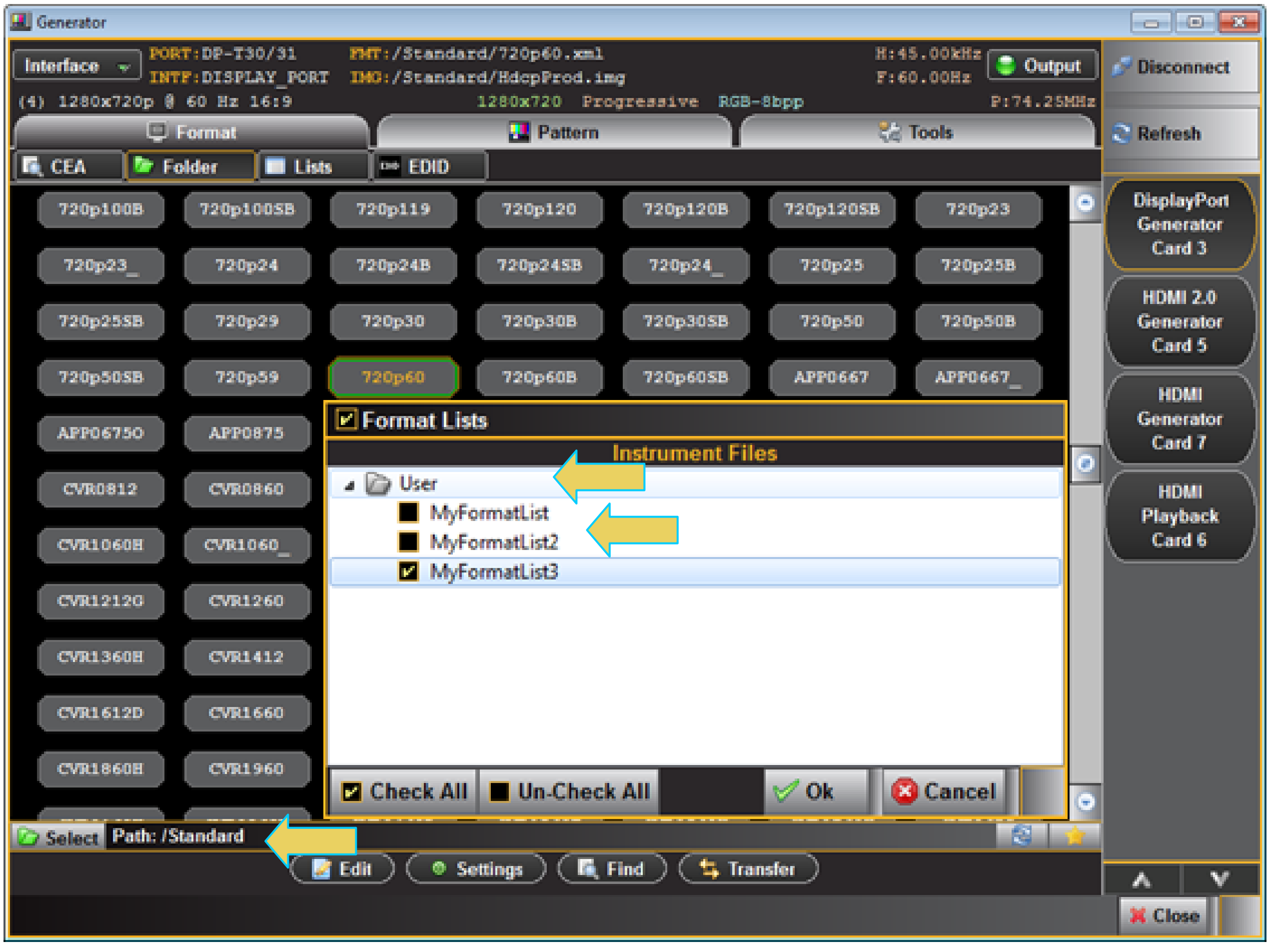
You might wish to change the directory path if you have created your own custom formats using the Format Editor to create custom formats. Note also that you can configure a smaller list of formats to choose from using the **Format List Edit**; refer to Format List Editor. By default when you create a custom format, the new format will be saved in the User path. You can change the directory by clicking on the Select activation button 

on the bottom of the panel which opens up a in the dialog box below.

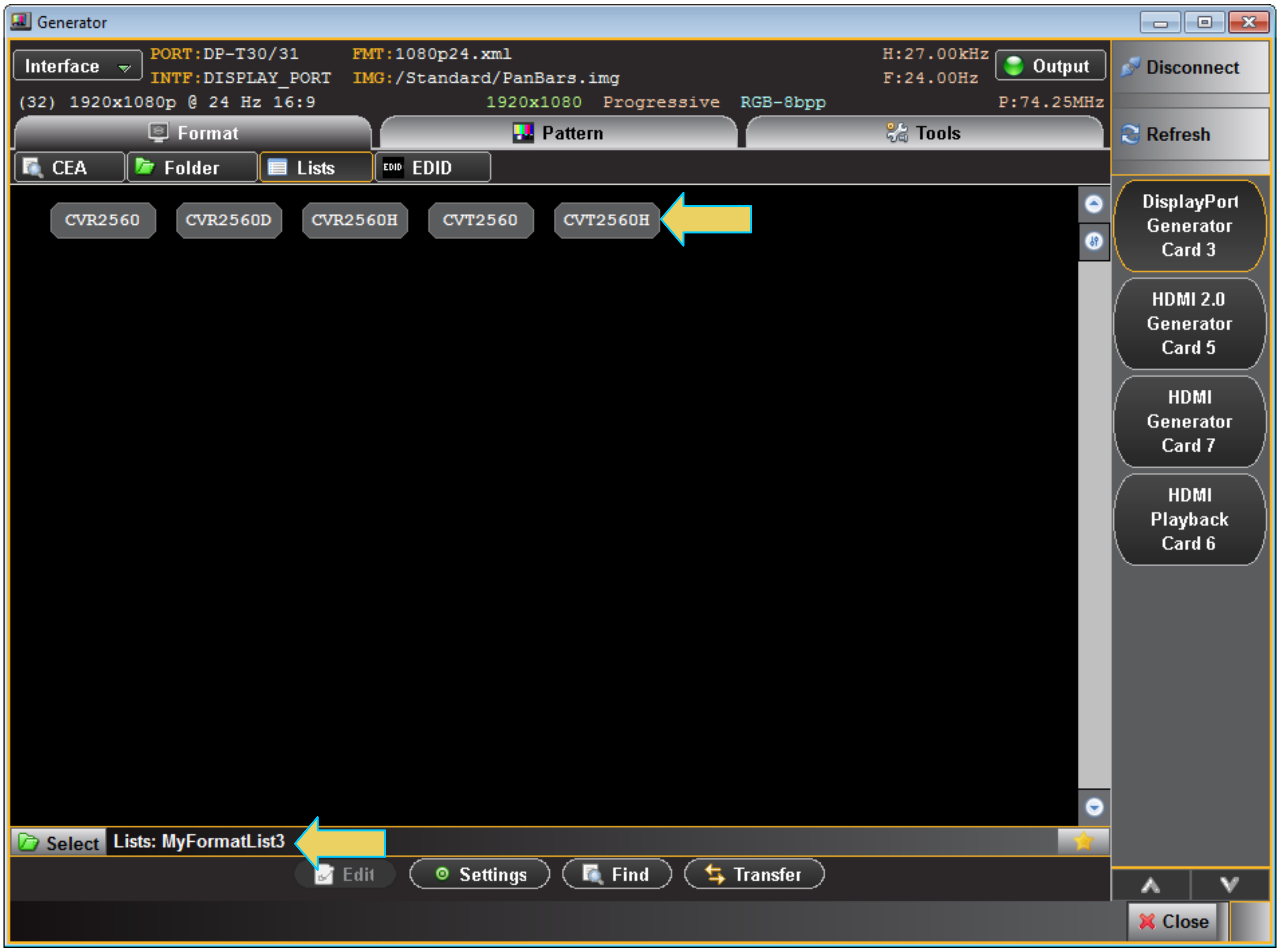


You can open up and activate any custom Format Lists you have previously defined with the associated icon 

. A dialog box will appear enabling you to select a custom format list or lists (below).


Generator
Interface
PORT:DP-T30/31
INTF:DISPLAY_PORT
FMT:/Standard/720p60.xml
IMG:/Standard/HdcpProd.img
H:45.00kHz
F:60.00Hz
Output
Disconnect
(4) 1280x720p @ 60 Hz 16:9
1280x720 Progressive RGB-8bpp
P:74.25MHz
Format
Pattern
Tools
Refresh
CEA
Folder
Lists
EDID
720p100B
720p100SB
720p119
720p120
720p120B
720p120SB
720p23
720p23_
720p24
720p24B
720p24SB
720p24_
720p25
720p25B
720p25SB
720p29
720p30
720p30B
720p30SB
720p50
720p50B
720p50SB
720p59
720p60
720p60B
720p60SB
APP0667
APP0667_
APP06750
APP0875
CVR0812
CVR0860
CVR1060H
CVR1060_
CVR12120
CVR1260
CVR1360H
CVR1412
CVR1612D
CVR1660
CVR1860H
CVR1960
DisplayPort Generator Card 3
HDMI 2.0 Generator Card 5
HDMI Generator Card 7
HDMI Playback Card 6
Format Lists
Instrument Files
User
MyFormatList
MyFormatList2
MyFormatList3
Check All
Un-Check All
Ok
Cancel
Select
Path: /Standard
Edit
Settings
Find
Transfer
Close

You can select all or one custom Format List any combination if you have several defined. The example above 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).



3.7.2 Selecting formats using the CEA smart filtering button

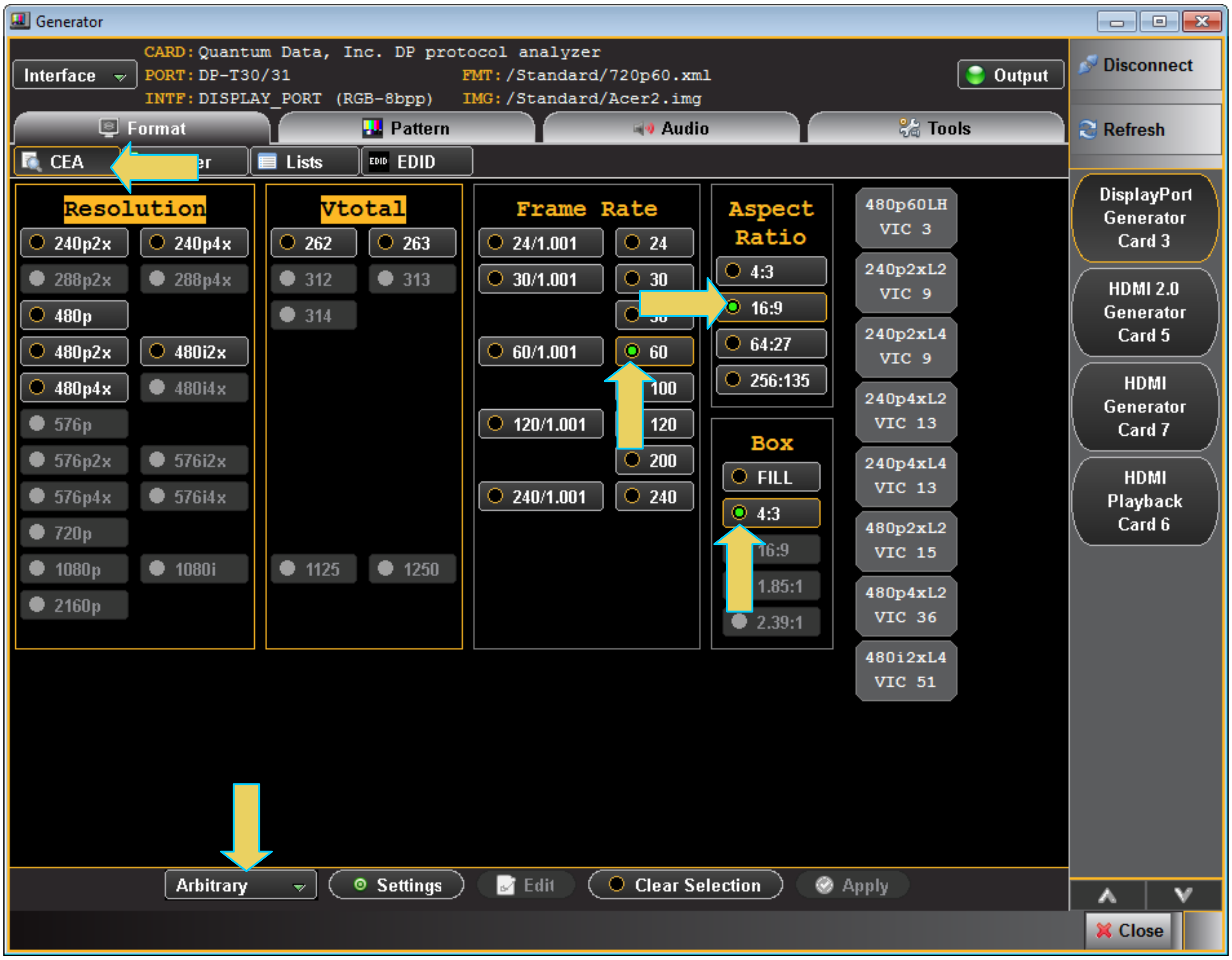
Use the following procedures to select a video resolution (format) using the CEA smart filtering button. The procedure assumes that you have already selected the DP interface.

To select a format from the CEA smart filtering button:

1. From the main window of the 980 DP Video Generator / Analyzer module, click the **Format** tab.

   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 CEA formats through filtering of various vide 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.

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.

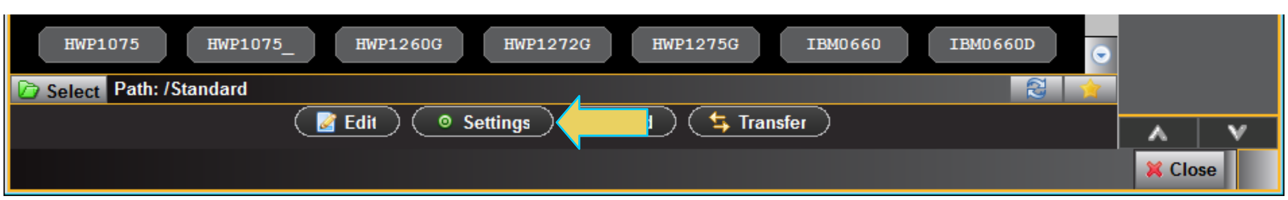


3.8 Configuring the format Settings

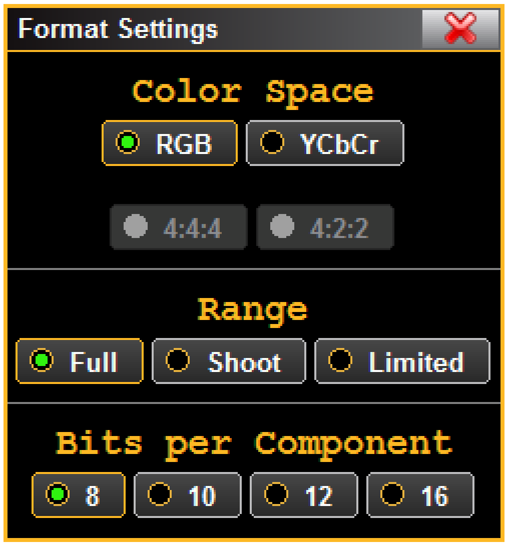
Use the following procedures to configure the format settings. The Settings dialog box enables you to configure the Color Space, Range and Bits per Component.

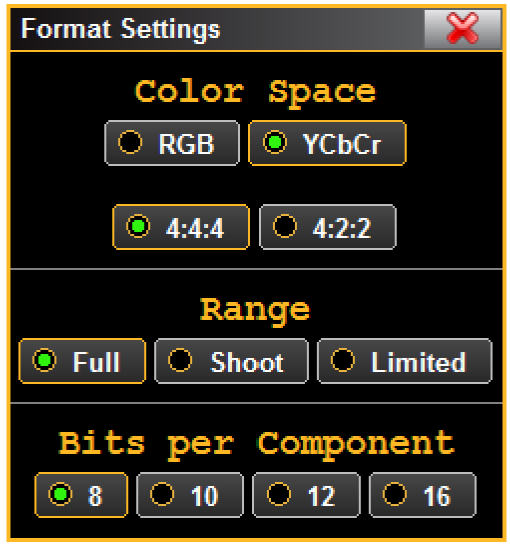
To select a format:

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



The **Settings** dialog box appears as shown below. Two examples are shown below; the first with RGB selected and the second with YCbCr selected.





2. Select the Color Space, Range and Bits per Component from the **Format Settings** dialog box in accordance with your requirements.

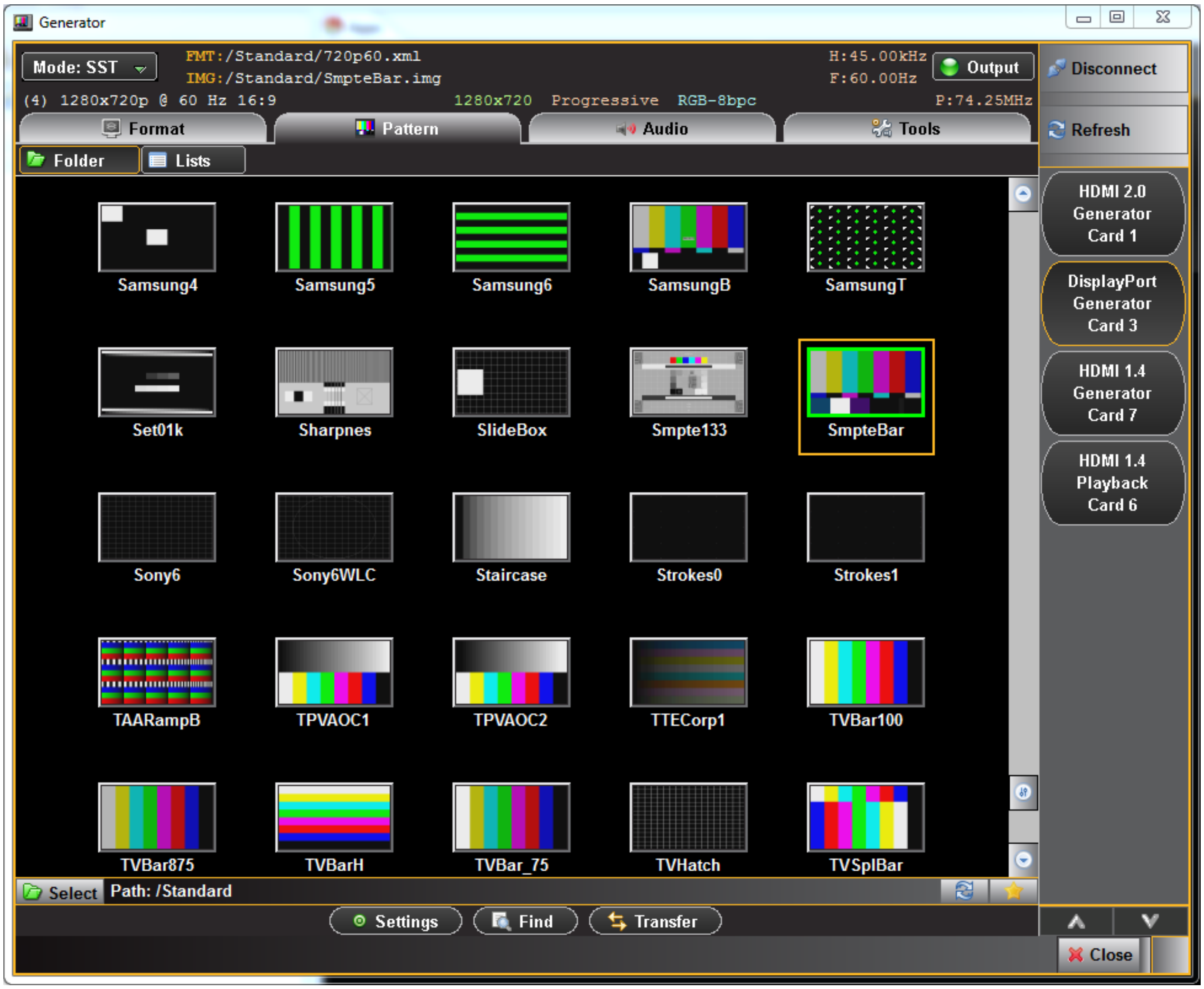
Format Settings		
Parameter	**Description**	**Options**
Color Space	Colorimetry and video pixel encoding settings.	• RGB – Uses 4:4:4 sampling. • YCbCr – Uses either 4:4:4, 4:2:2 sampling.
Range	These values are described in CEA-861E. They pertain to the number of levels for RGB and YCbCr mode.	• Limited – Use for CEA formats. Please refer to the 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 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.

3.9 Selecting Test Patterns

Use the following procedures to select a test pattern.

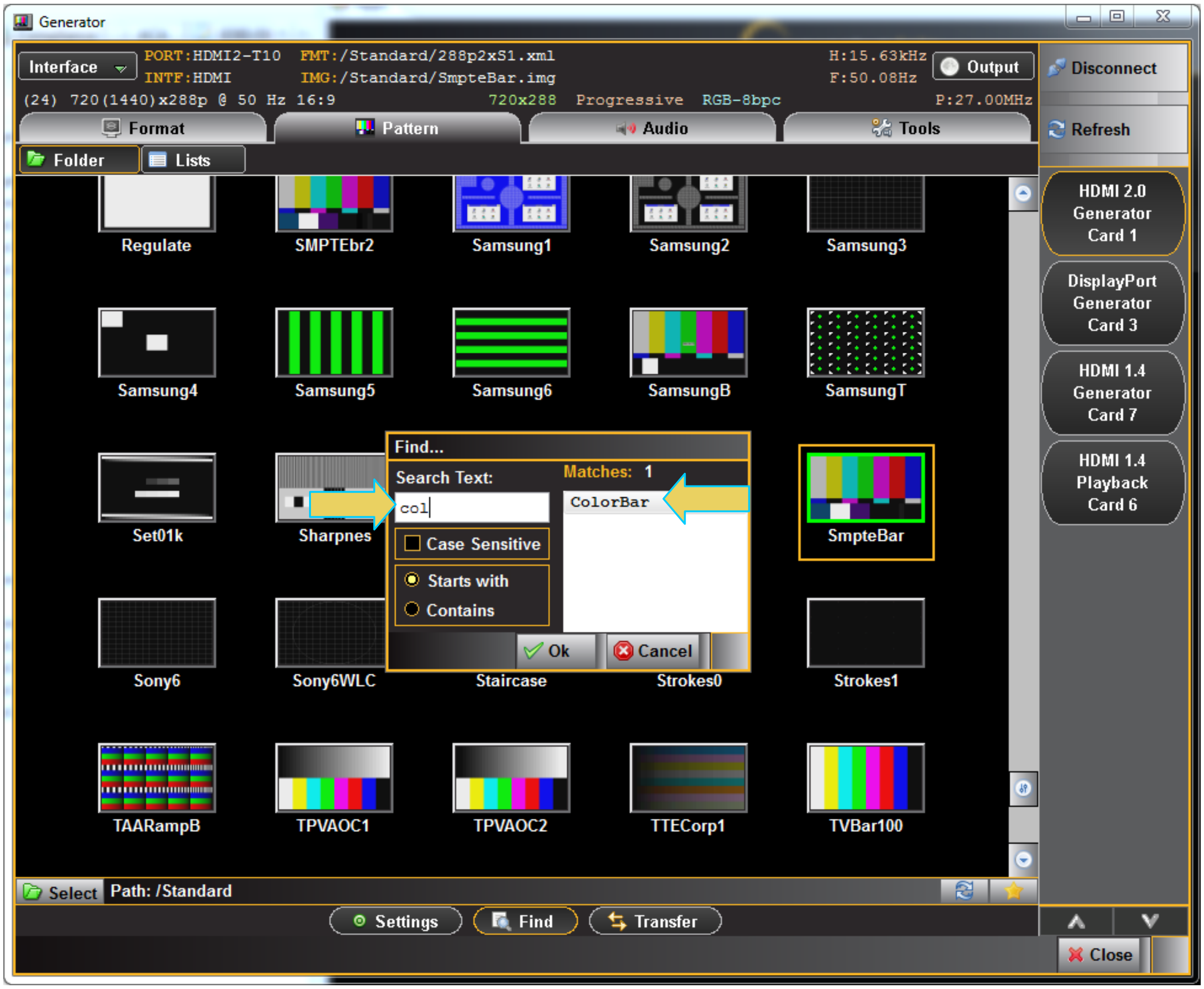
To select a test pattern:

1. From the main window of the 980 DP Video Generator / Analyzer module, click the **Pattern** tab to access the list of test patterns.



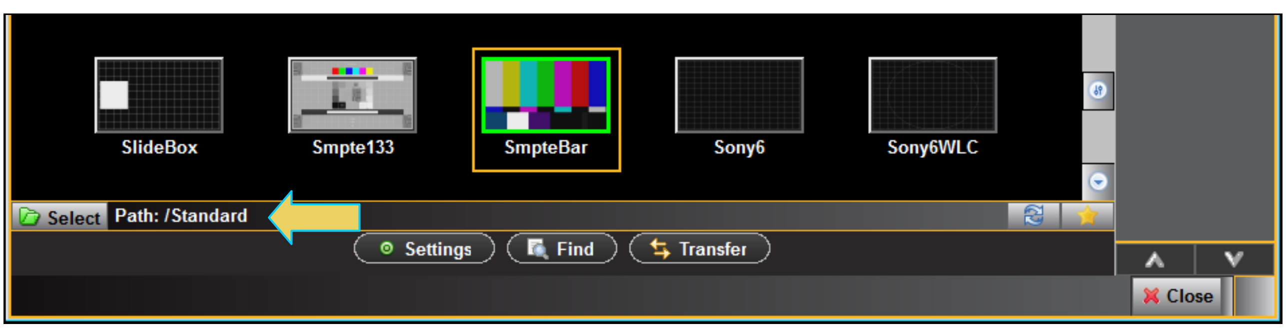
2. Select a test pattern from the list by clicking or selecting it. There is a scroll bar on the right to allow access to the entire list by browsing.

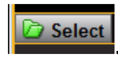
   You can either scroll through the list of test patterns or use the **Find** feature to search for patterns. When you press the **Find** activation button, you are presented with a dialog window where you can search for a pattern by name using initial and mid string partial searches (below).



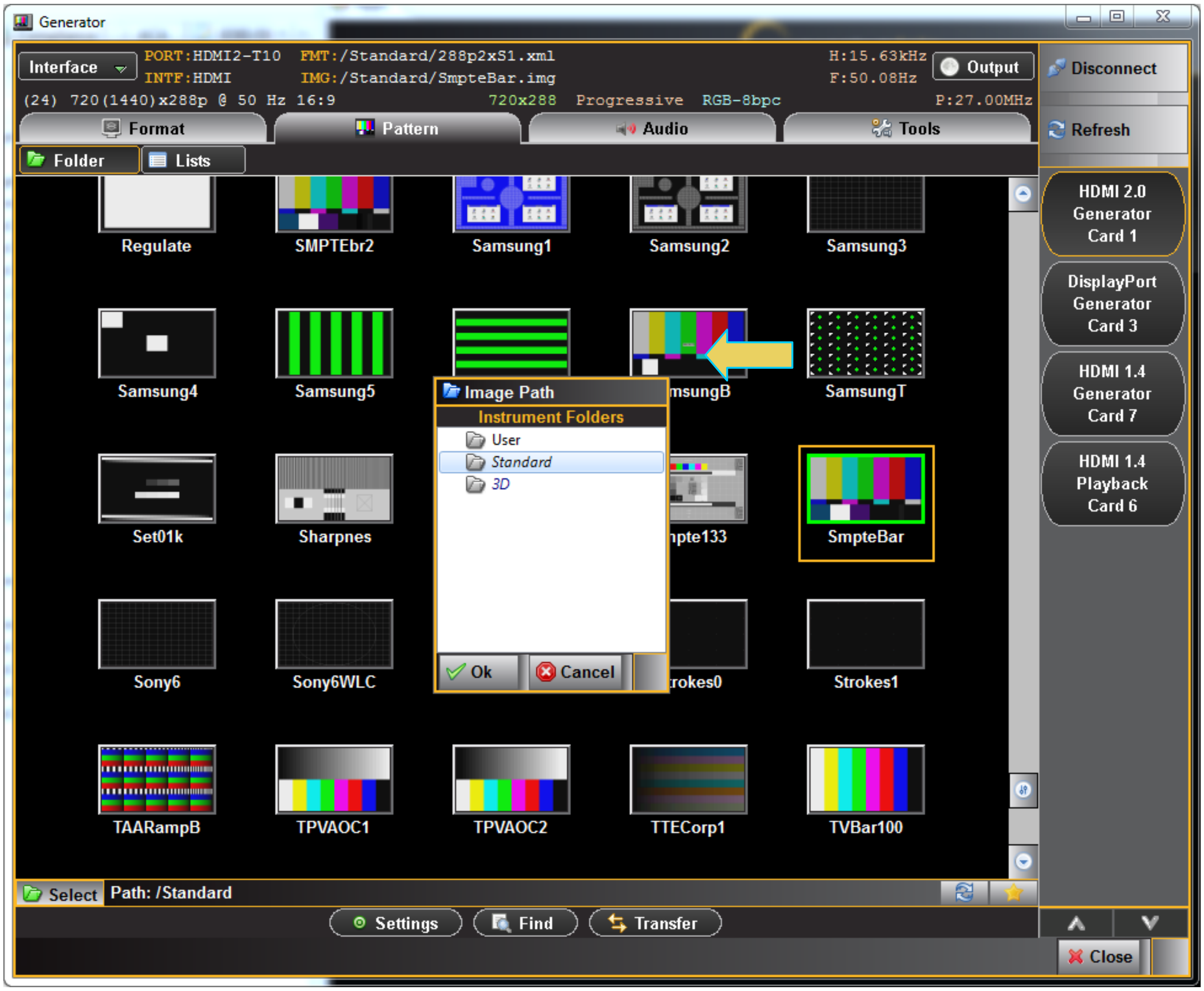
The directory whose images (patterns) are being displayed is listed in the lower panel as indicated below. In the example below, the path is set to Standard which will display the entire test pattern library and is the default path.

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 Pattern List Editor for details on creating a custom Pattern List.

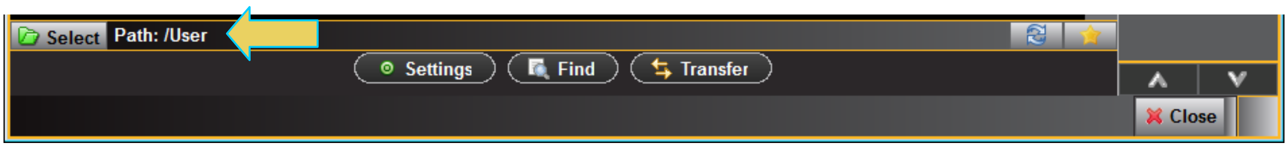


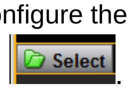
You can change the directory path with the directory icon 

. 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.

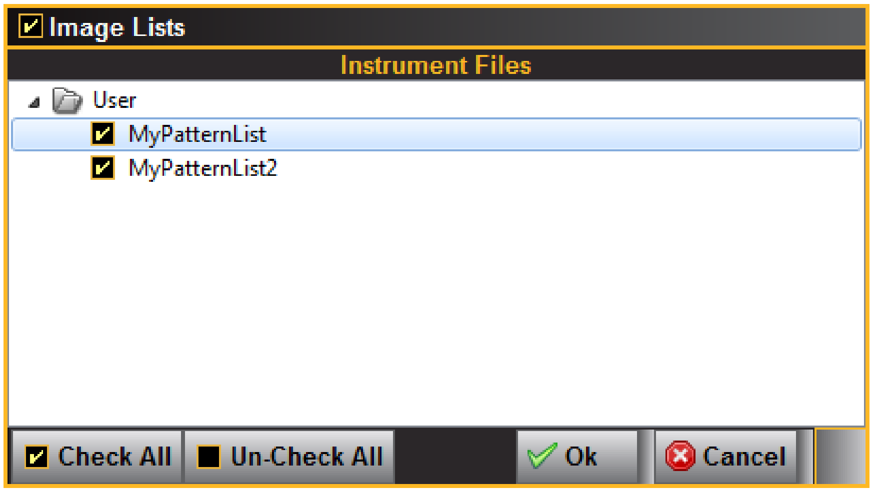


When you have changed the directory the User directory will be indicated on the lower panel beside the associated icon as shown below.

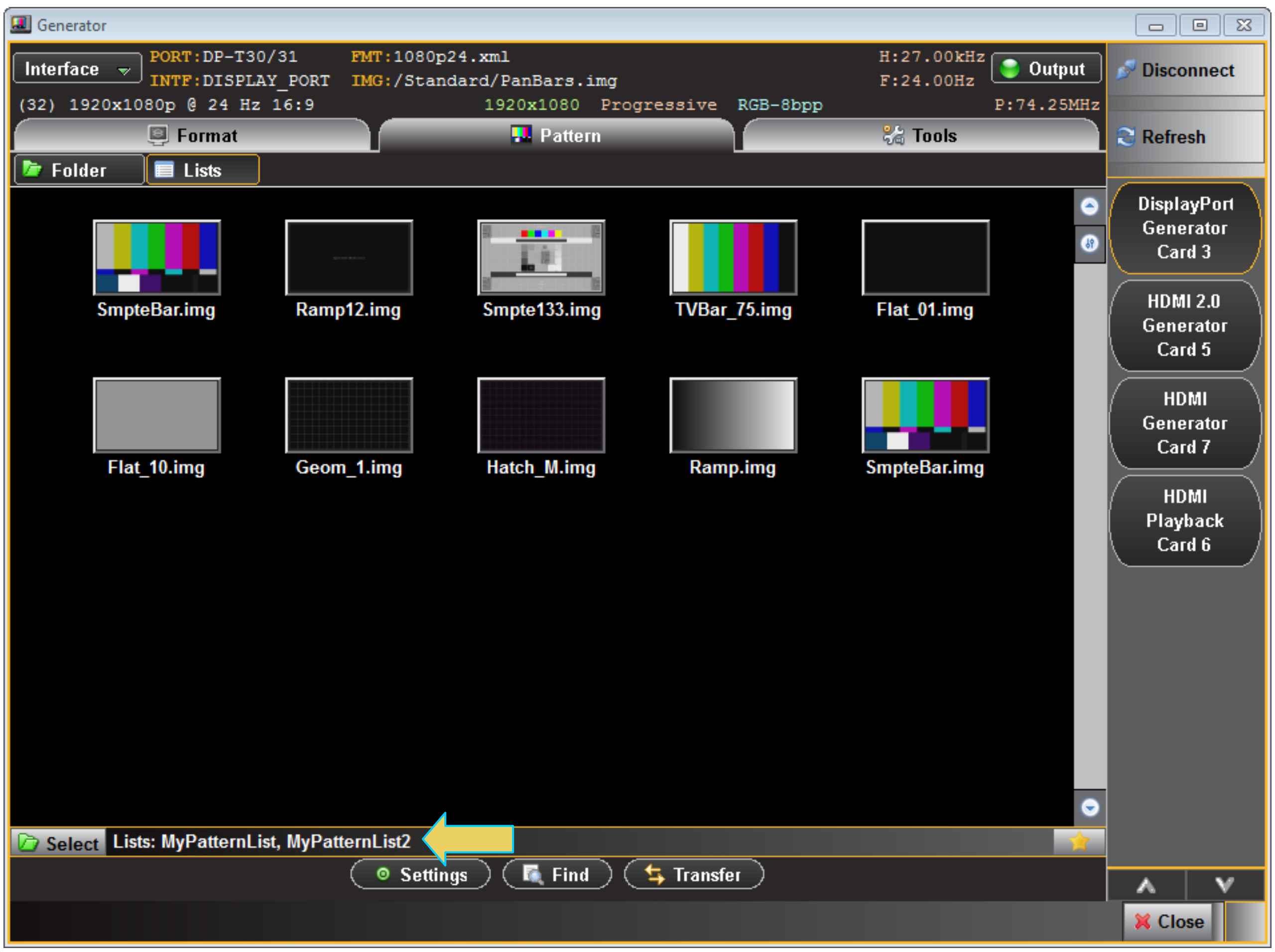


Now you can configure the list of patterns in accordance with a custom Pattern List by clicking on the associated icon 

. A dialog box will appear enabling you to select a custom image list (below).



You can select all or one custom Pattern List 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).

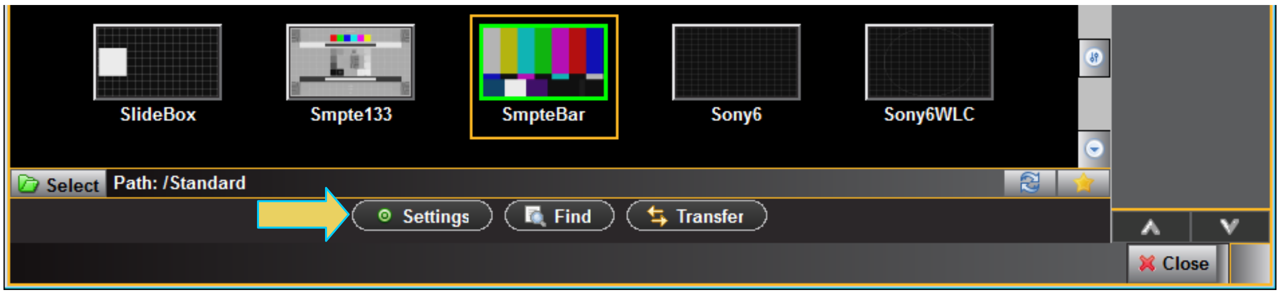


3.10 Selecting Test Patterns Settings

Use the following procedures to select a test pattern.

To specify test pattern settings:

1. From the main window of the 980 DP Video Generator / Analyzer module, 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.



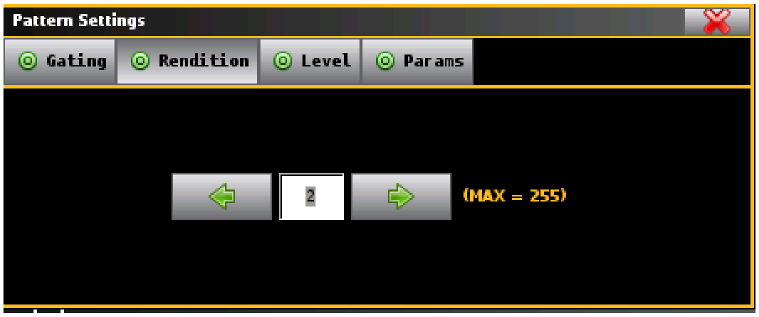
The **Settings** dialog box appears as shown below:

3. 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.	• On • Off
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.



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.

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

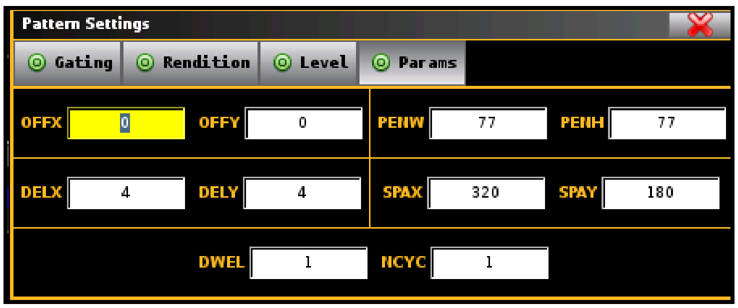
   PELD establishes the number of data bits that represent each active pixel in video memory (frame buffer). Parameter. The default setting and setting of 8 allows 256 colors on an image (test pattern) to be rendered. This is suitable for the majority of test patterns. However, some test patterns contain 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 980 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

Pattern Settings - Parameters	Description
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



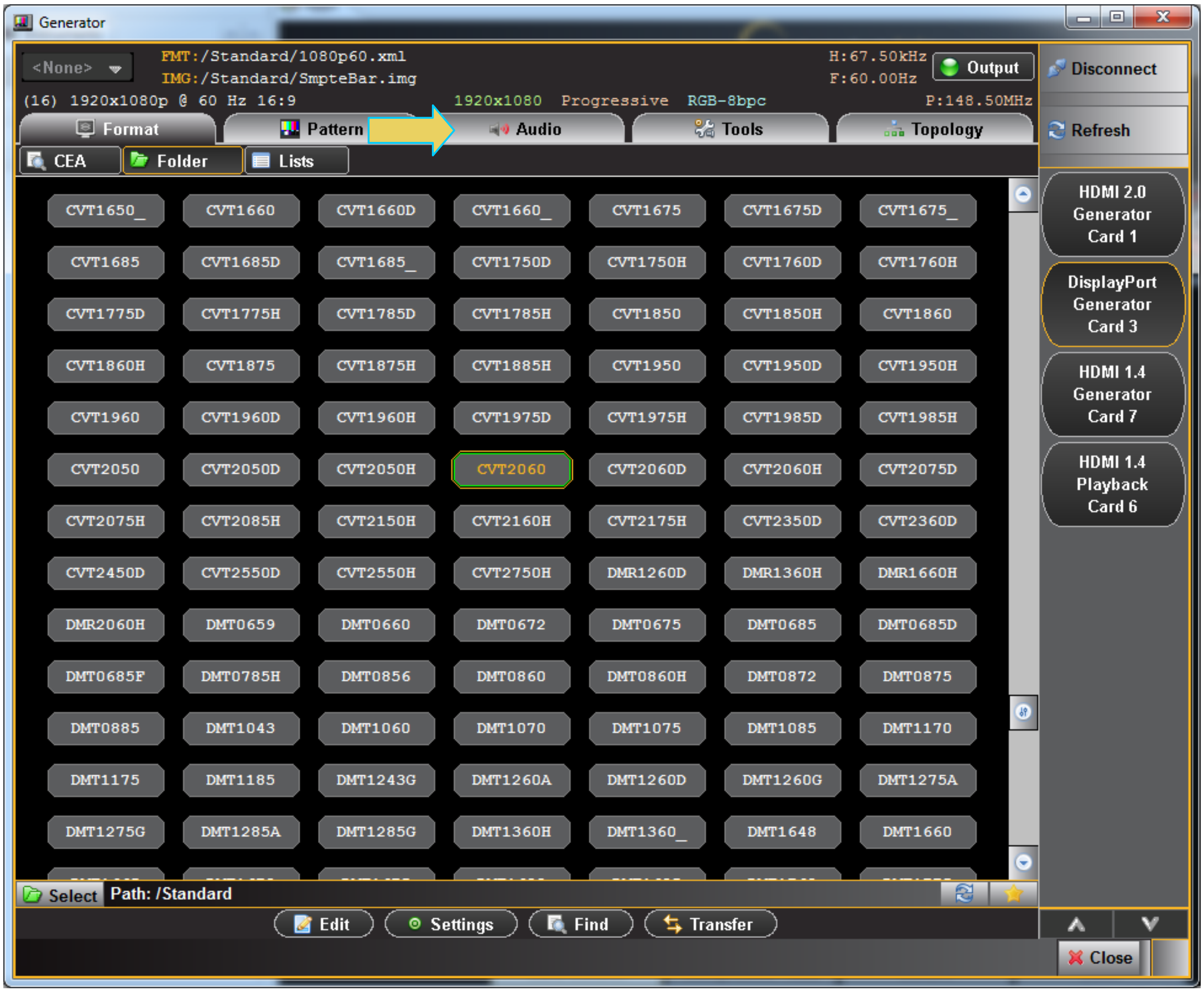
3.11 Testing audio on an audio rendering device

The 980 DP Video Generator / Analyzer module supports audio testing for sink audio rendering devices. You can output LPCM audio over 8 channels at user selectable sampling rates, bits per sample. The audio signal is a sine wave. You can also specify the amplitude and the frequency of the sine wave. You can also specify the amplitude and frequency of each channel separately. Use the following procedures to test a DP audio rendering device.

Note: When testing MST-capable audio rendering devices, the audio signal that you specify will be transmitted to all downstream MST sinks.

To test an audio rendering device:

1. From the main window of the 980 DP Video Generator module, select the **Audio** tab.



The audio tab interface appears as shown below.

The table below summarizes the 980 DP 1.2 Video Generator / Analyzer 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

LPCM Programmable Sine Wave options		
Parameter	**Description**	**Options**
		• 176.4kHz • 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.	• FL – Front Left • FR – Front Right • LFE – Low Frequency Effects • FC – Front Center • RL – Rear Left • RR – Rear Right • RLC – Rear Left Center • RRC – Rear Right Center
Level (dB)	This is the amplitude of the audio sine wave test tone.	• Increments in 3dB throughout a range of – 0dB to -99dB (per channel).
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 • 100Hz • 1kHz

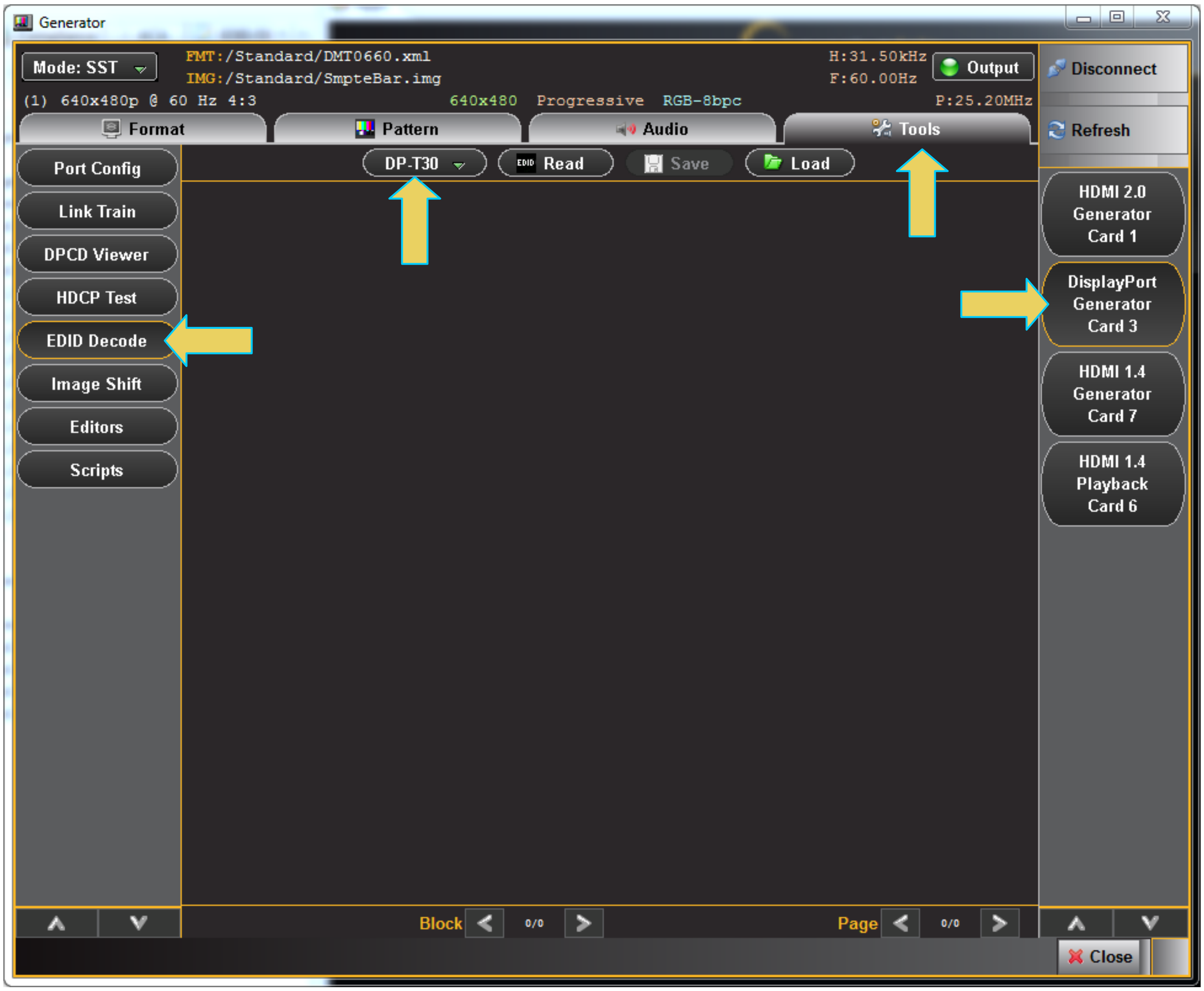
3.12 Viewing the EDID of a connected display

Use the following procedures to select DP formats.

Note: When testing MST-capable sink devices, you can read the EDID of any specific downstream MST sink. This is addressed in Reading the EDID of a downstream MST node.

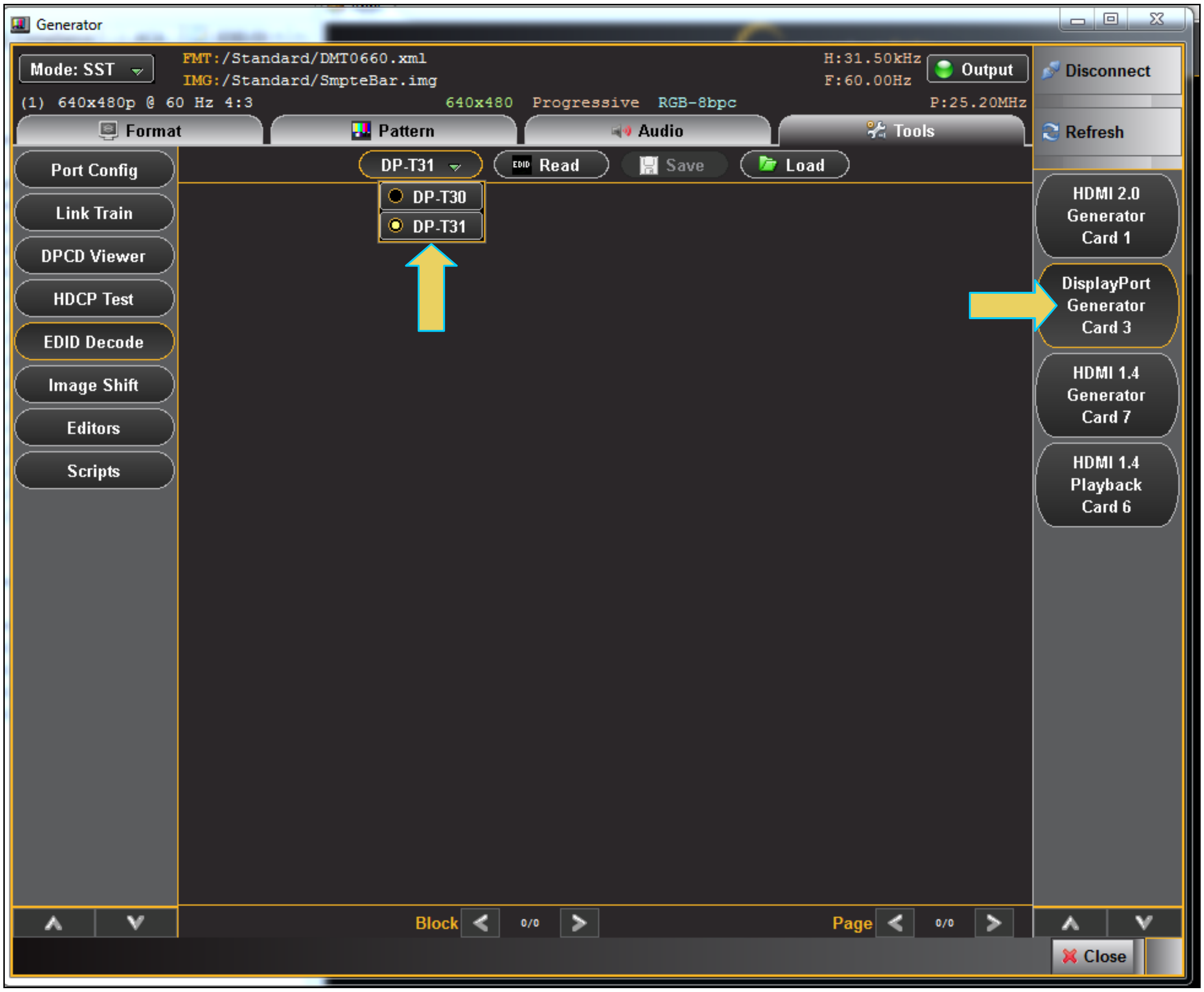
To view the EDID of a connected display:

1. From the main window of the 980 DP Video Generator / Analyzer module, select the **Tools** tab.



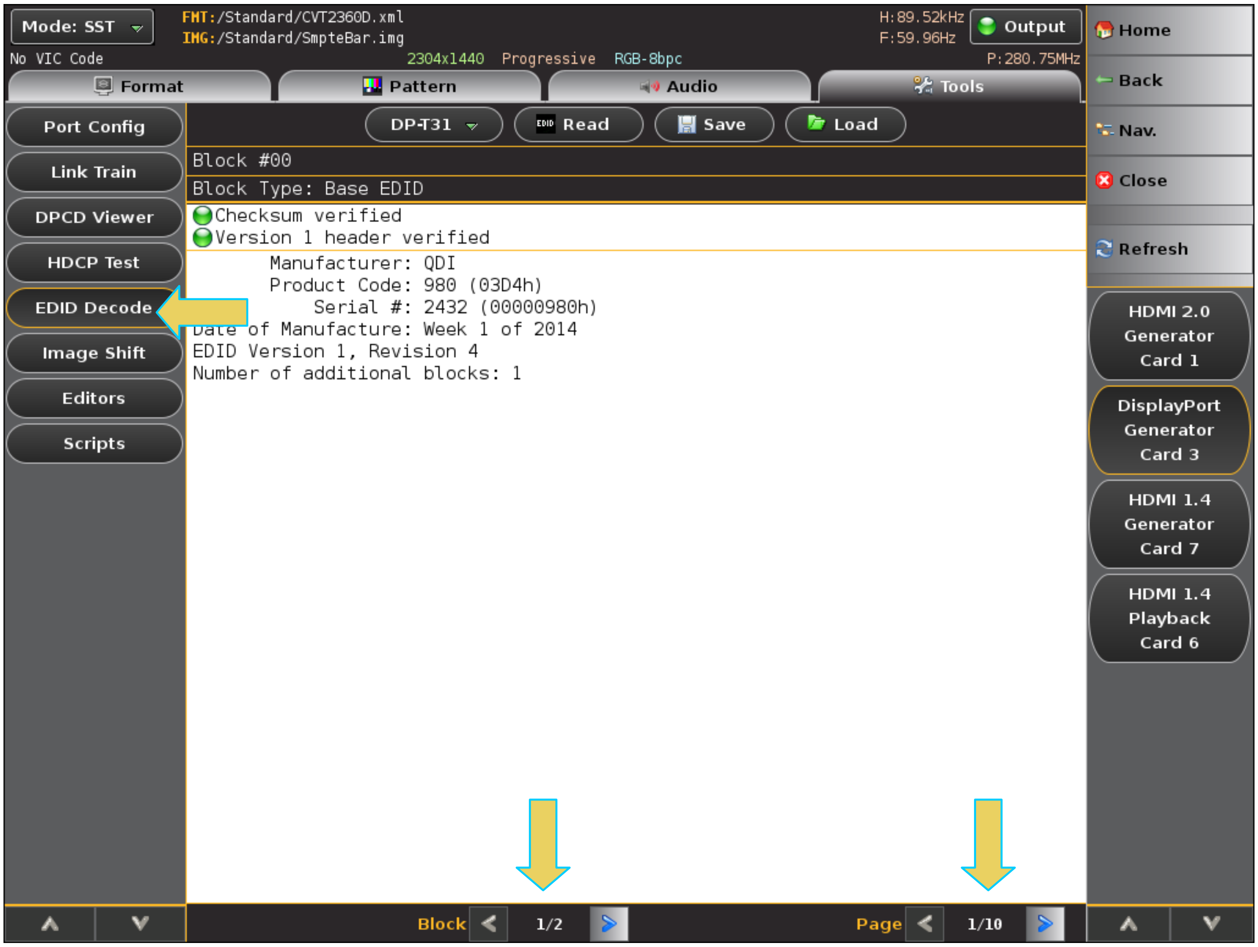
Make sure the DP Generator Card is selected.

2. Select the DP Tx port that is connected to the sink DUT from the pull-down menu provided (below). The naming convention used is:


Generator
Mode: SST
FMT:/Standard/DMT0660.xml
IMG:/Standard/SmpteBar.img
H:31.50kHz
F:60.00Hz
Output
Disconnect
(1) 640x480p @ 60 Hz 4:3
640x480 Progressive RGB-8bpc
P:25.20MHz
Format
Pattern
Audio
Tools
Refresh
Port Config
Link Train
DPCD Viewer
HDCP Test
EDID Decode
Image Shift
Editors
Scripts
DP-T31
Read
Save
Load
DP-T30
DP-T31
HDMI 2.0 Generator Card 1
DisplayPort Generator Card 3
HDMI 1.4 Generator Card 7
HDMI 1.4 Playback Card 6
Block
0/0
Page
0/0
Close

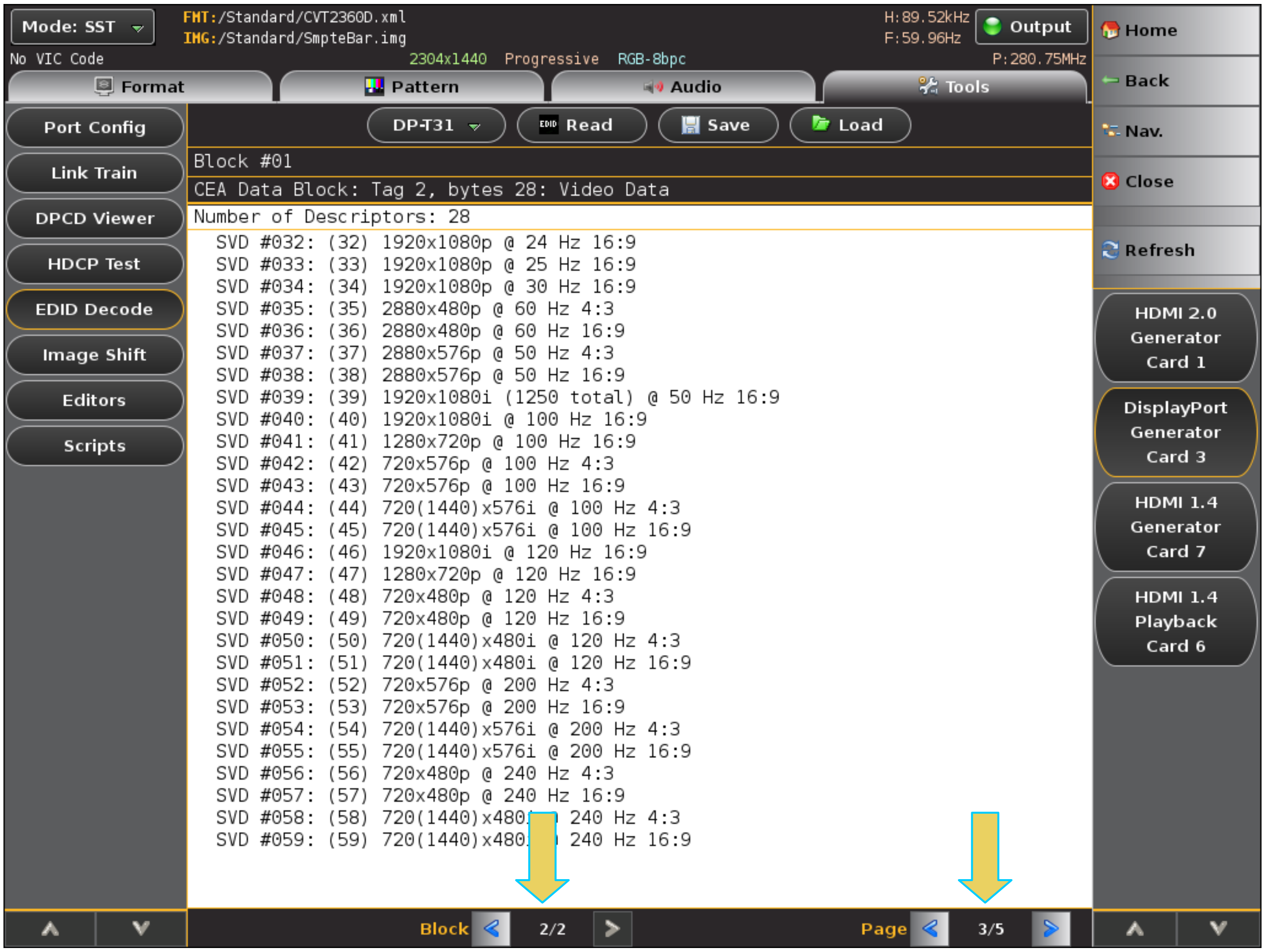
3. Activate the **EDID Decode** button on the upper left (indicated below).

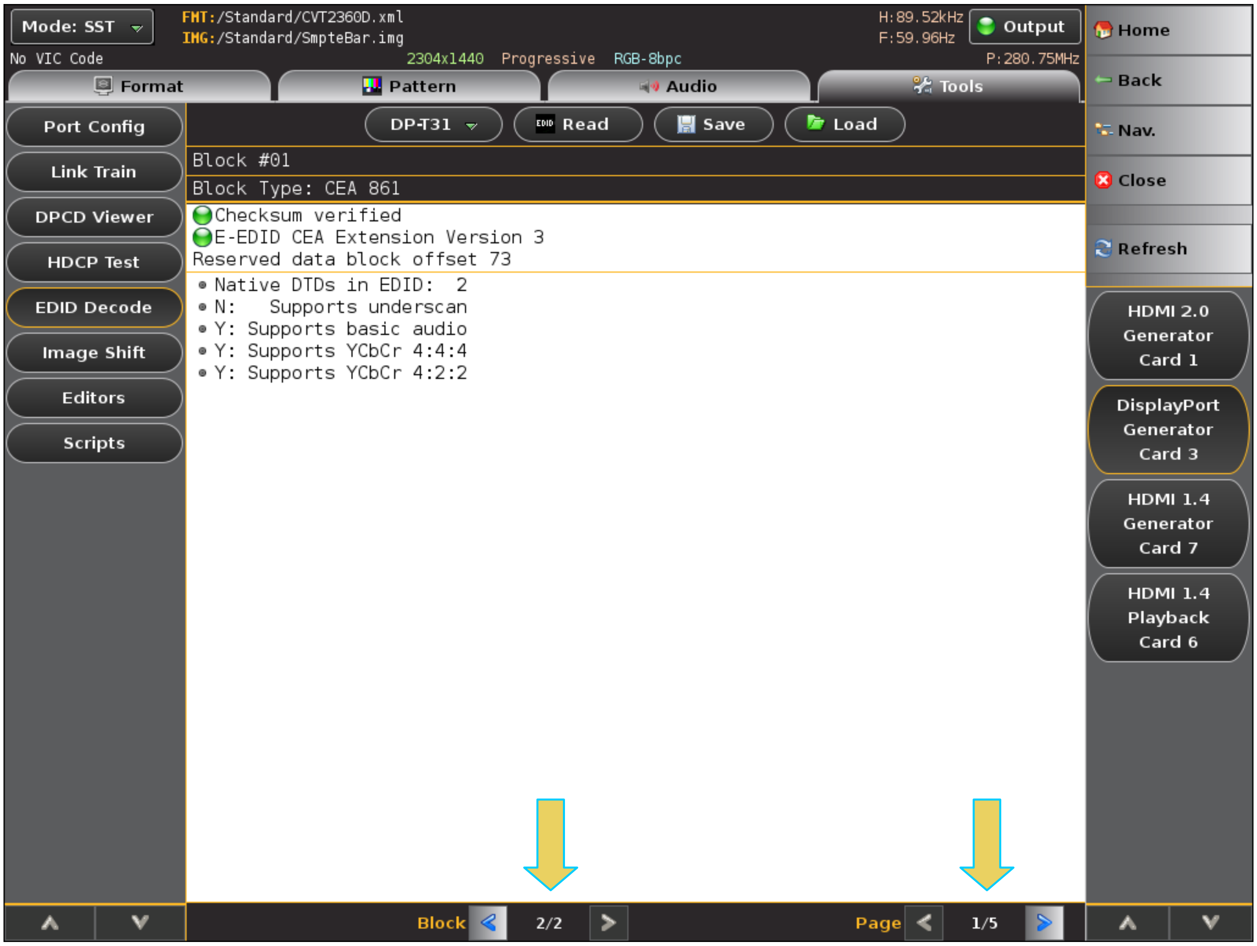
   Contents of the initial data in the first block of the EDID will be displayed (below).



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.




Mode: SST
FMT:/Standard/CVT2360D.xml
IMG:/Standard/SmpteBar.img
H:89.52kHz
F:59.96Hz
Output
No VIC Code
2304x1440 Progressive RGB-8bpc
P:280.75MHz
Format
Pattern
Audio
Tools
Home
Back
Nav.
Close
Refresh
Port Config
Link Train
DPCD Viewer
HDCP Test
EDID Decode
Image Shift
Editors
Scripts
DP-T31
Read
Save
Load
Block #01
Block Type: CEA 861
Checksum verified
E-EDID CEA Extension Version 3
Reserved data block offset 73
Native DTDs in EDID: 2
N: Supports underscan
Y: Supports basic audio
Y: Supports YCbCr 4:4:4
Y: Supports YCbCr 4:2:2
HDMI 2.0 Generator Card 1
DisplayPort Generator Card 3
HDMI 1.4 Generator Card 7
HDMI 1.4 Playback Card 6
Block
2/2
Page
1/5

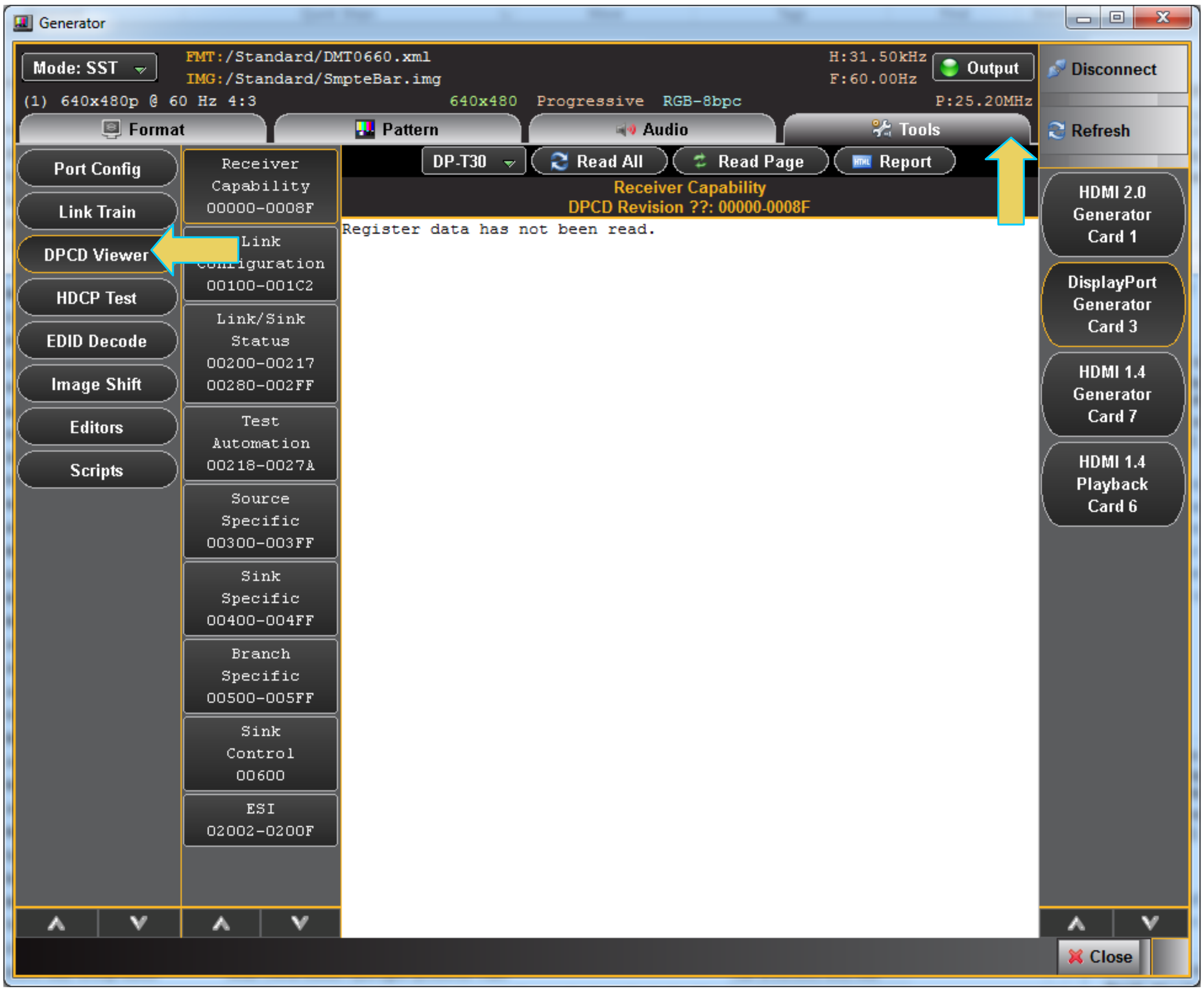
3.13 Viewing the DPCD of a connected display

Use the following procedures to view a displays DPCD registers.

Note: When testing MST-capable sink devices, you can read the EDID of any specific downstream MST sink. This is addressed in Reading the DPCD of a downstream MST node. You can also produce an HTML report of the DPCD registers.

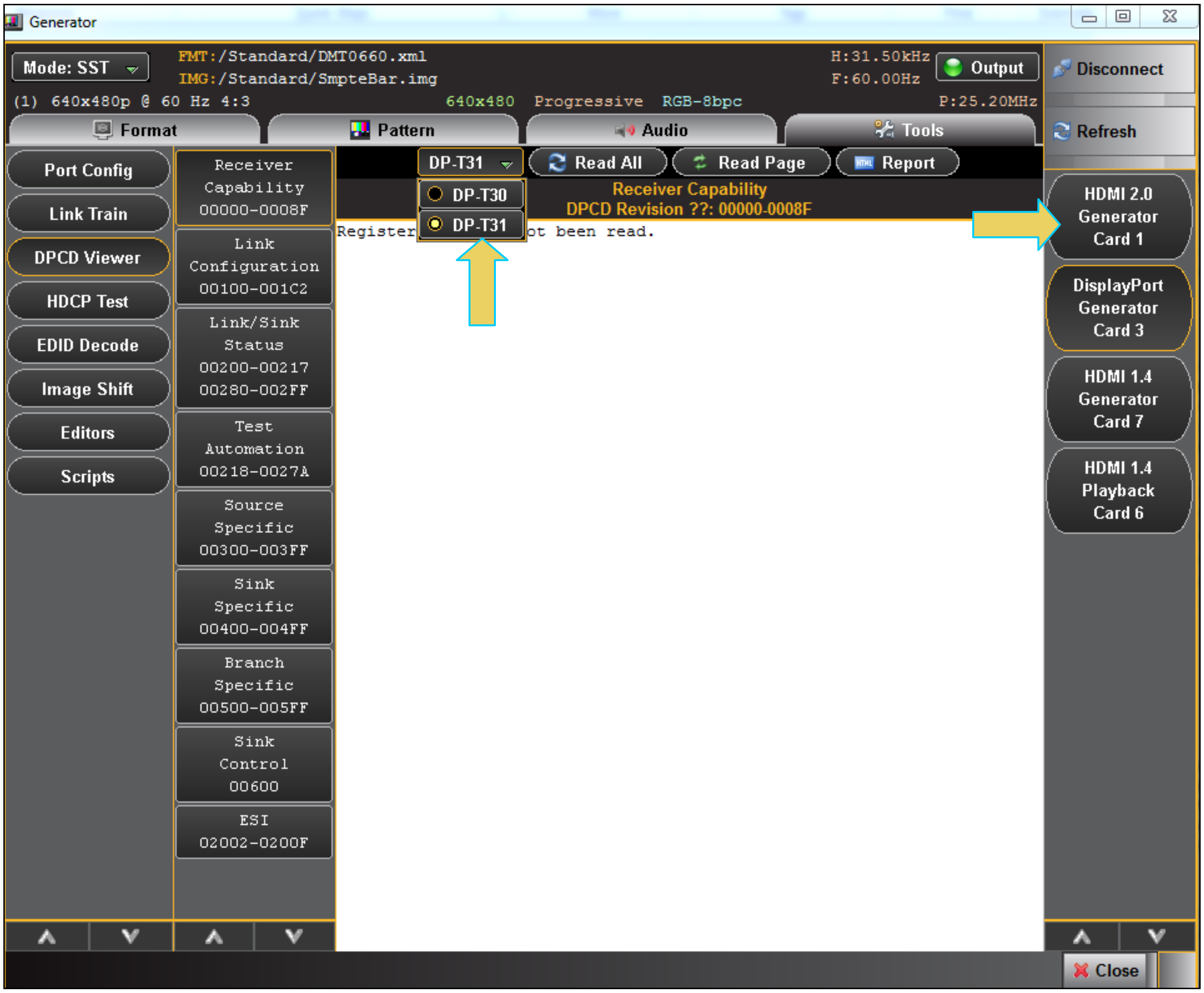
To view the DPCD of a connected display:

1. From the main window of the 980 DP Video Generator / Analyzer module, select the **Tools** tab.



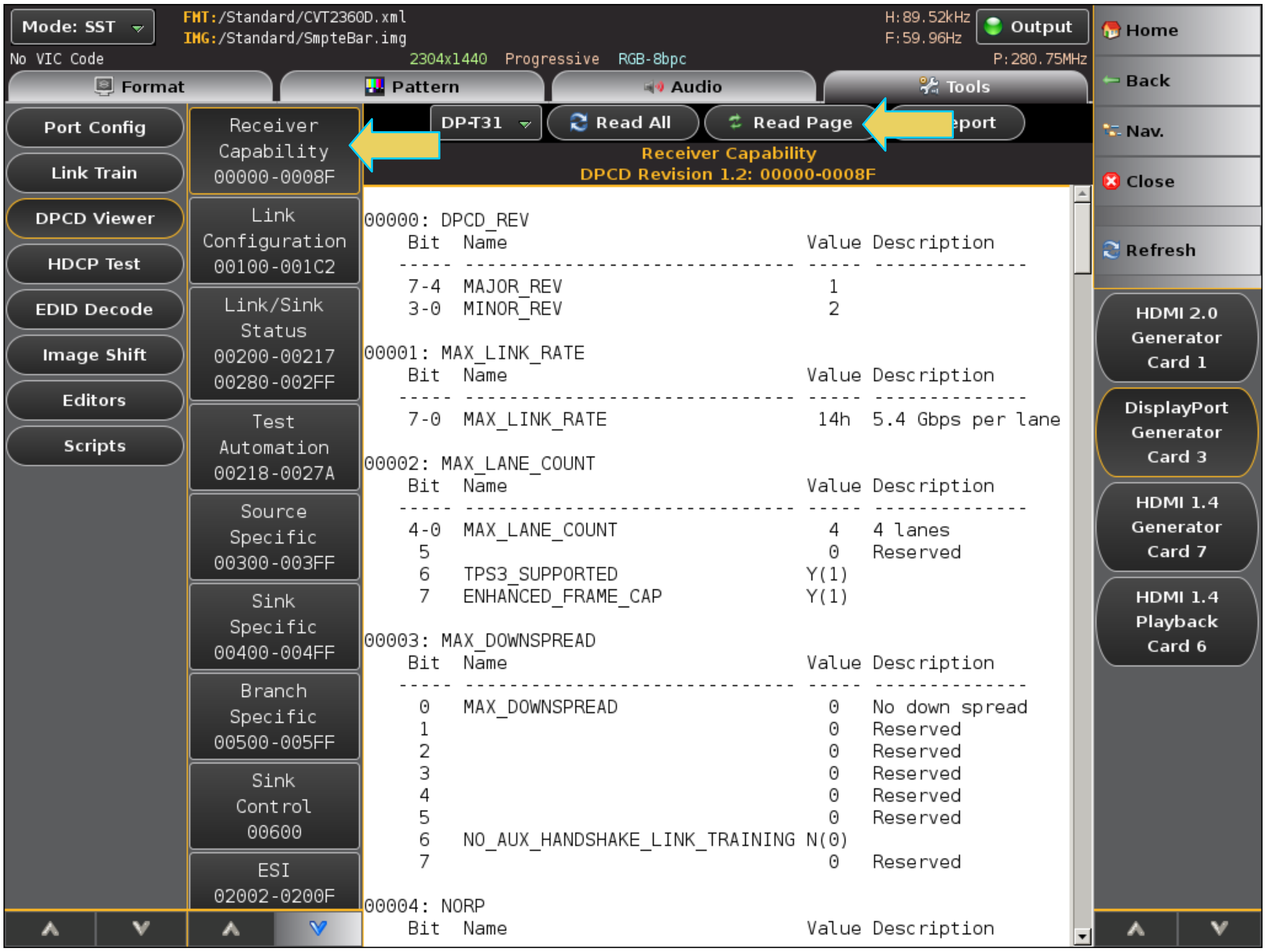
Note: Make sure the DP Video Generator Card is selected.

2. Select the DP Tx port that is connected to the sink DUT from the pull-down menu provided (below). The naming convention used is:
3. **DP** is the interface selected, **T** indicates that it is a *Transmit* port (there will be a *Receiver* port on this module in the near future); **3** indicates the *Slot* number (starting at 1); 1 or 0 indicates the *Port* number (starting at 0).


Generator
Mode: SST
FMT:/Standard/DMT0660.xml
IMG:/Standard/SmpteBar.img
H:31.50kHz
F:60.00Hz
Output
Disconnect
(1) 640x480p @ 60 Hz 4:3
640x480 Progressive RGB-8bpc
P:25.20MHz
Format
Pattern
Audio
Tools
Refresh
Port Config
Link Train
DPCD Viewer
HDCP Test
EDID Decode
Image Shift
Editors
Scripts
Receiver Capability 00000-0008F
Link Configuration 00100-001C2
Link/Sink Status 00200-00217 00280-002FF
Test Automation 00218-0027A
Source Specific 00300-003FF
Sink Specific 00400-004FF
Branch Specific 00500-005FF
Sink Control 00600
ESI 02002-0200F
DP-T31
Read All
Read Page
Report
DP-T30
DP-T31
Receiver Capability
DPCD Revision ??: 00000-0008F
Register
ot been read.
HDMI 2.0 Generator Card 1
DisplayPort Generator Card 3
HDMI 1.4 Generator Card 7
HDMI 1.4 Playback Card 6
Close

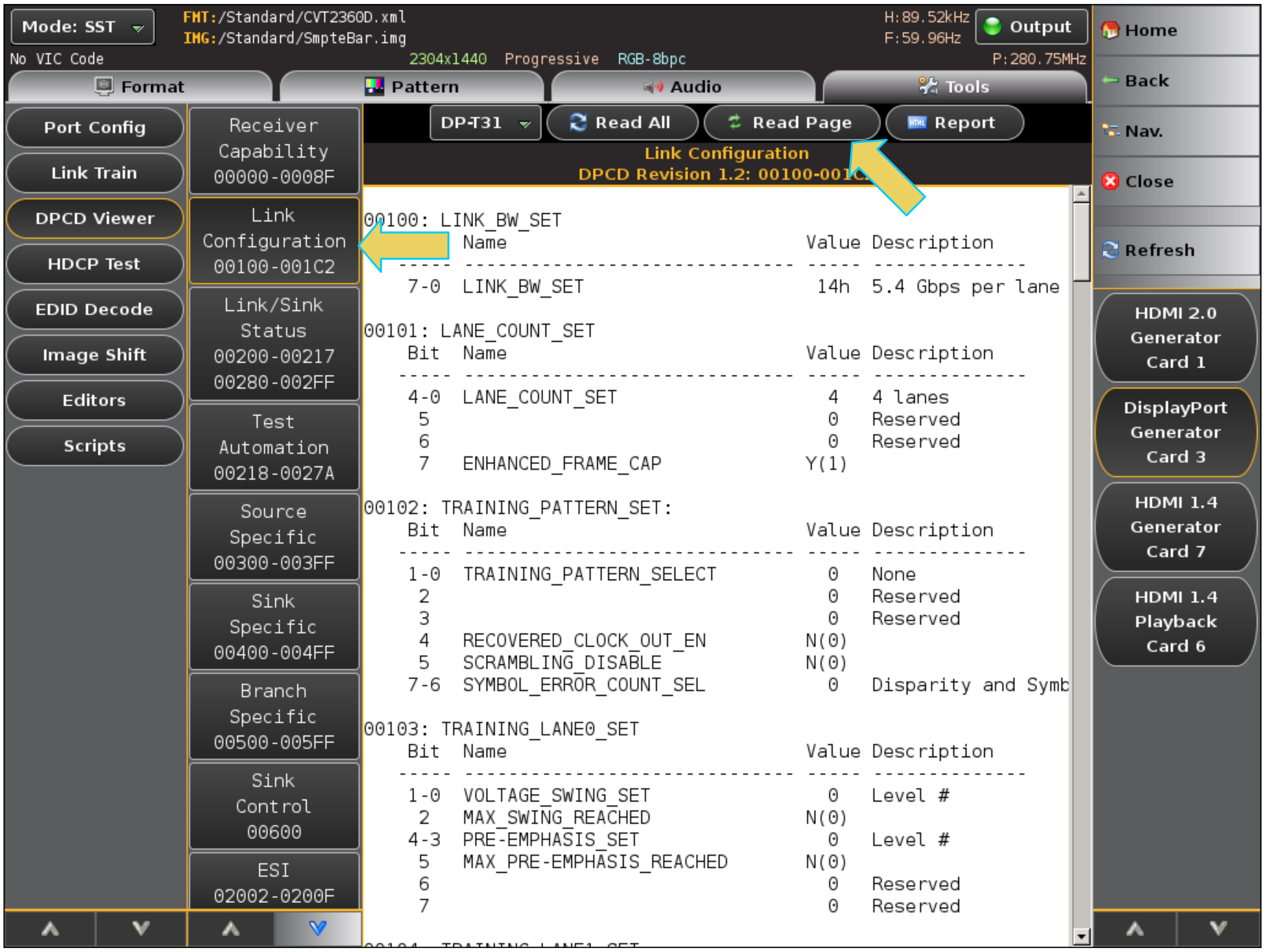
4. Activate the **DPCD Viewer** button on the upper left (indicated below).

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

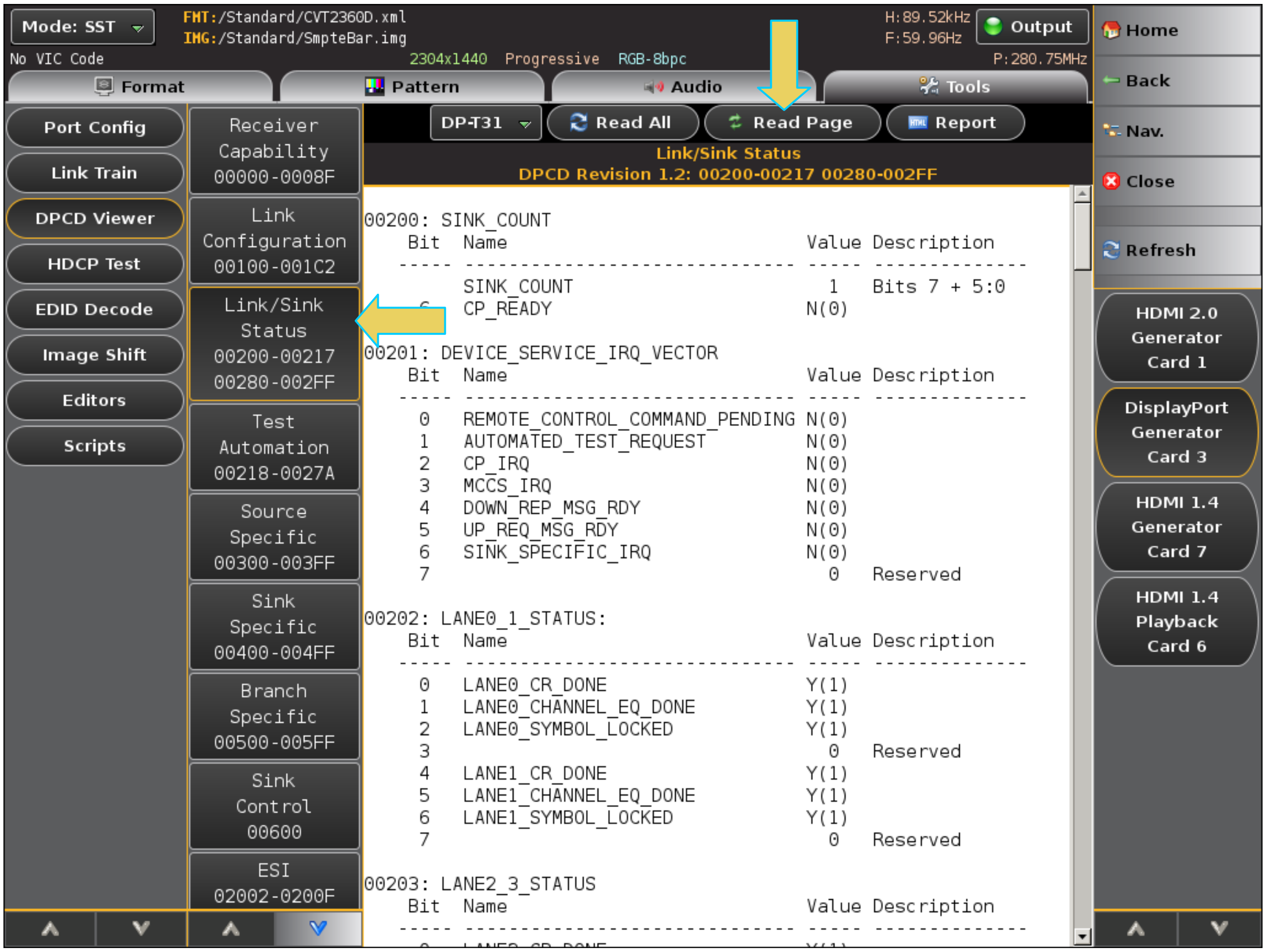


Navigate through the blocks and pages of the DPCD using the arrow buttons on the lower panel (indicated above).

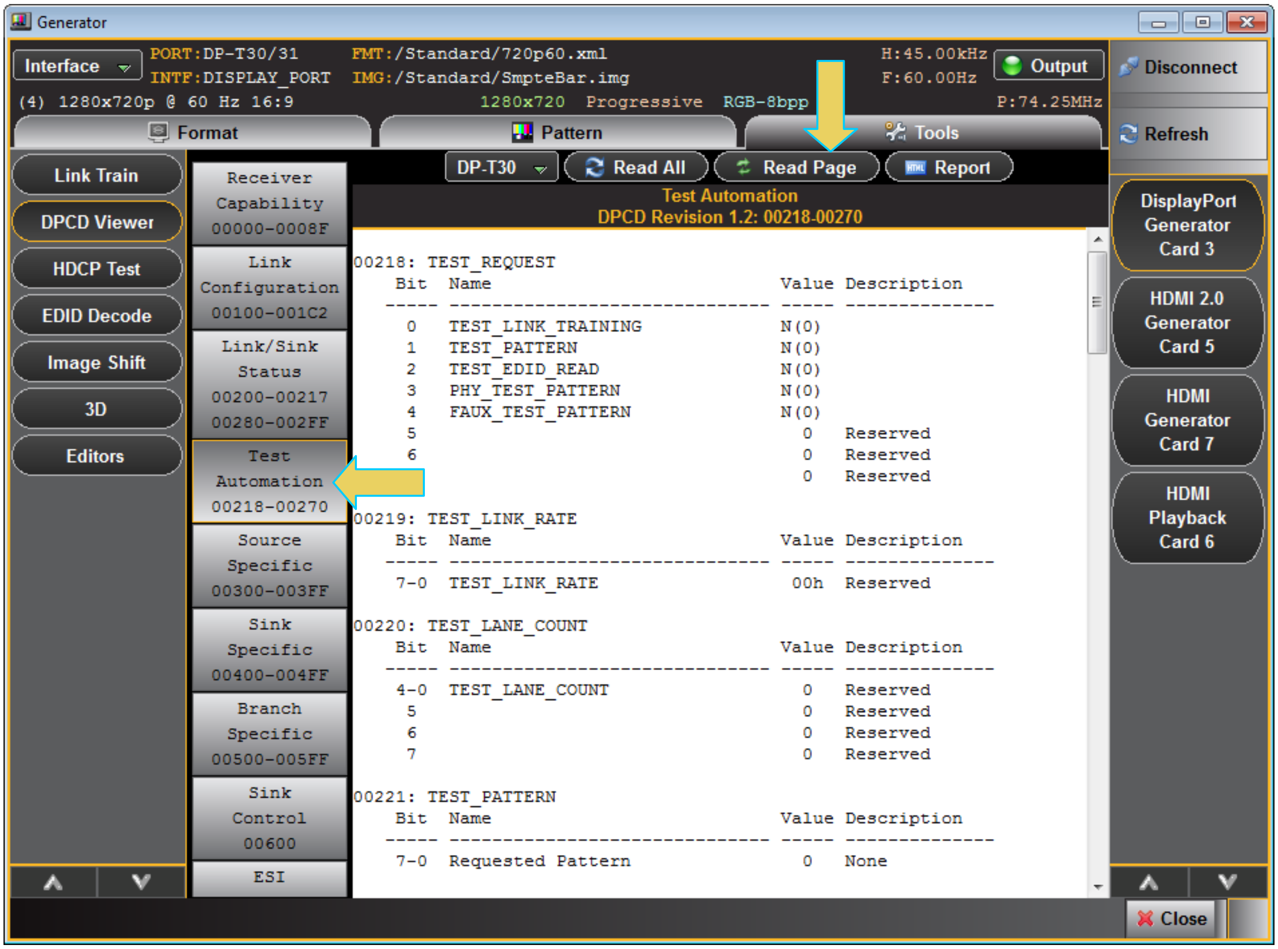
6. Examples of the **DPCD Viewer** content are shown in the following screens.



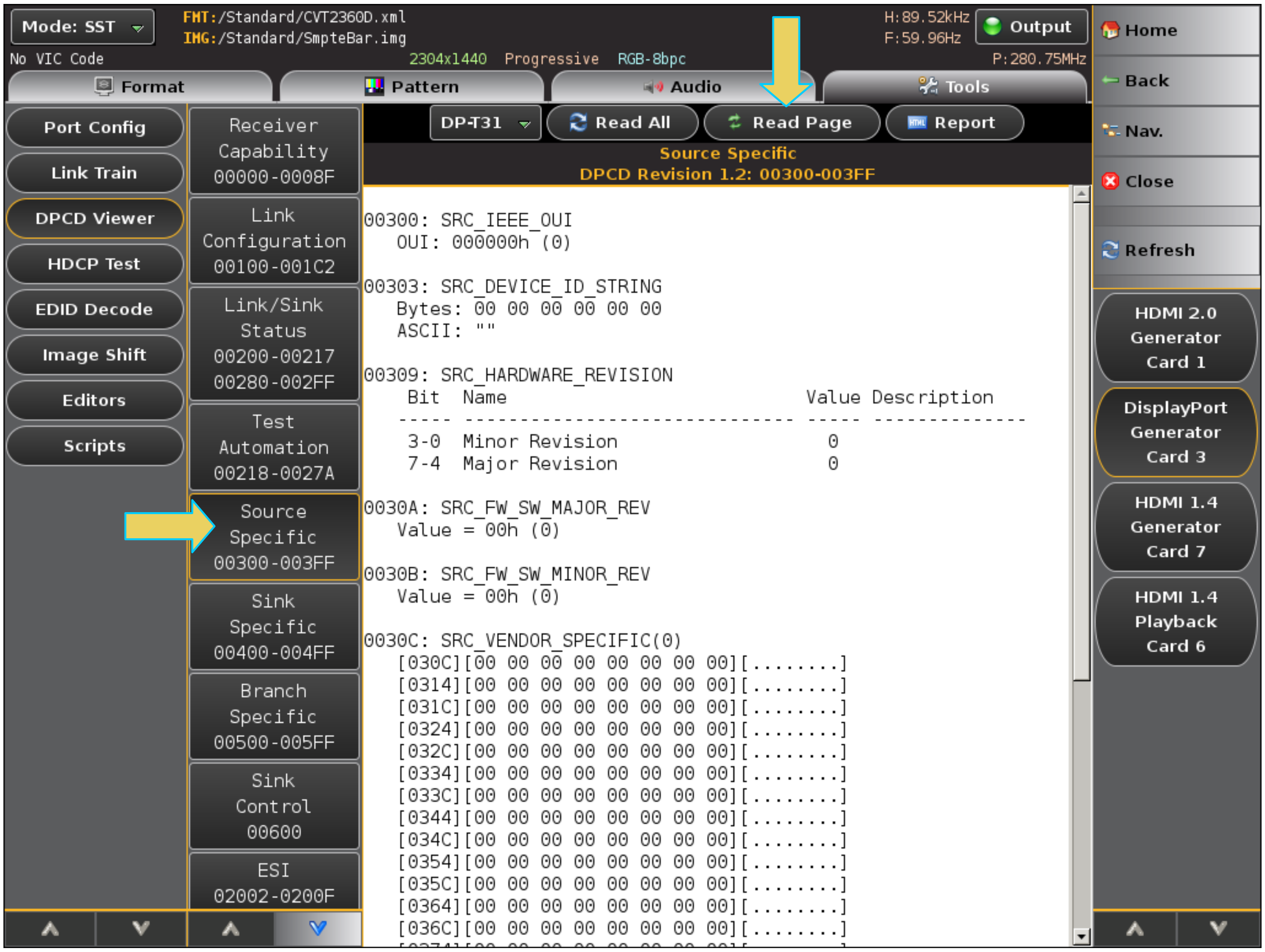
View the Link/Sink Status registers.



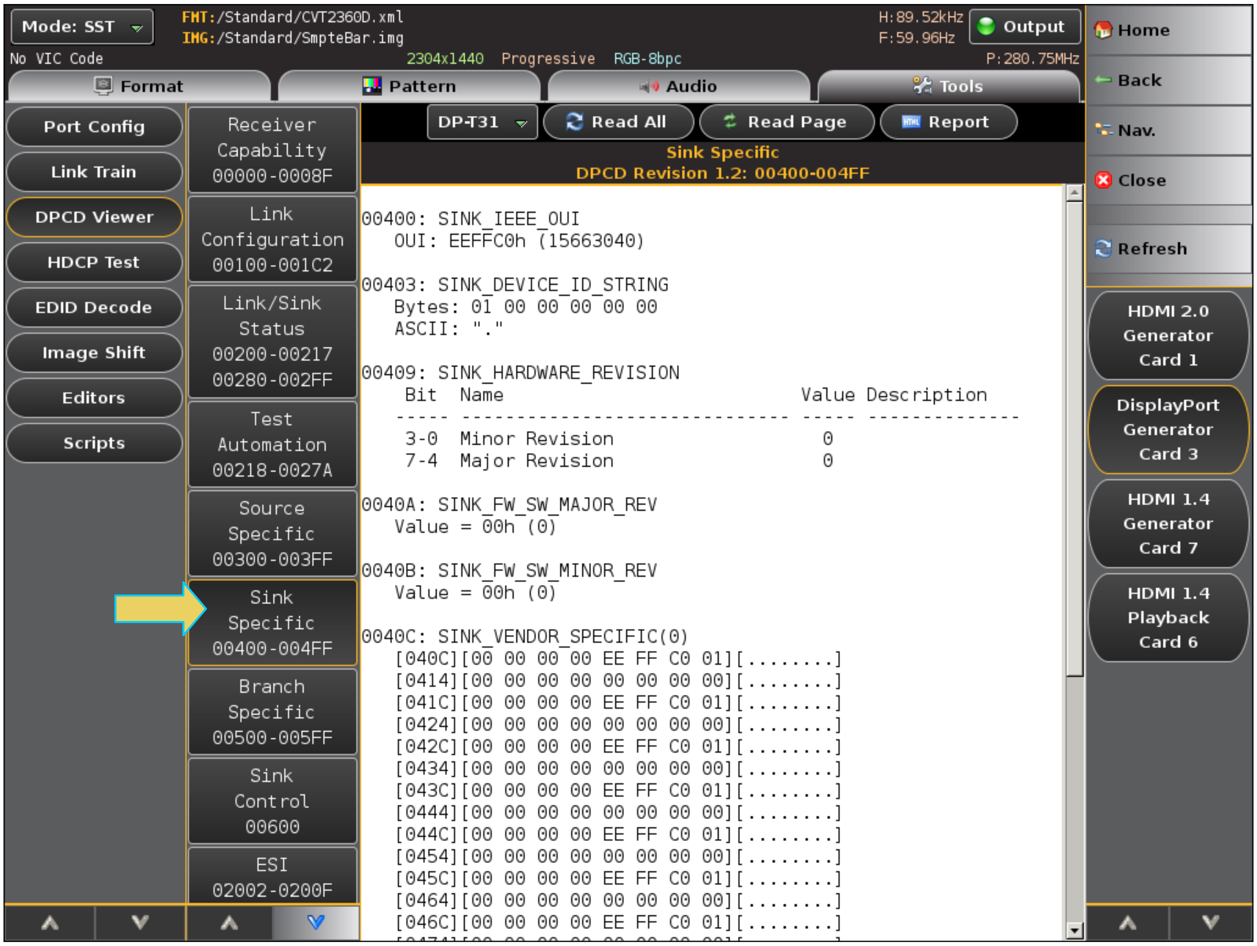
View the Test Automation registers.



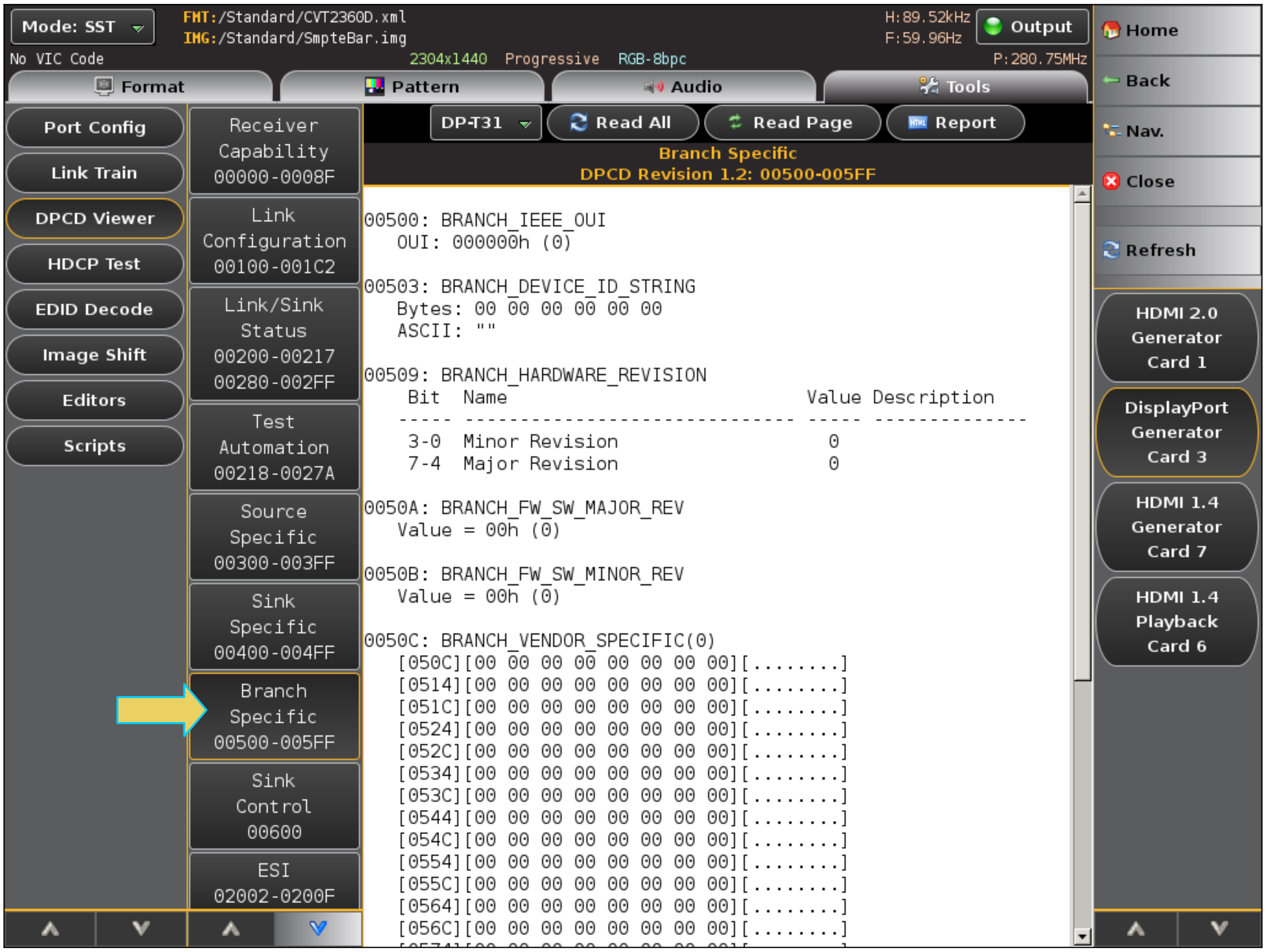
View the Source Specific registers.



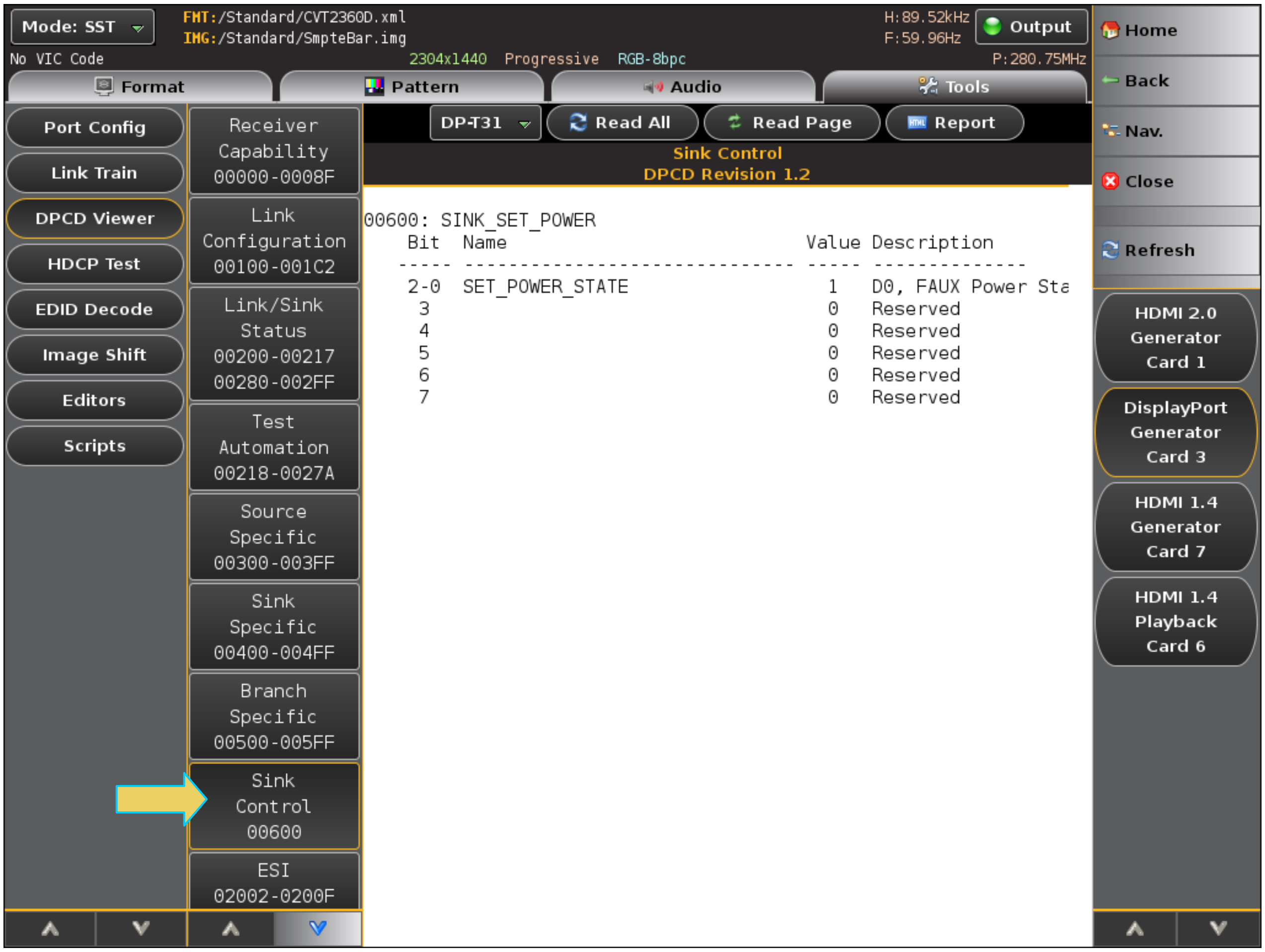
View the Sink Specific registers.



View the Branch Specific register.

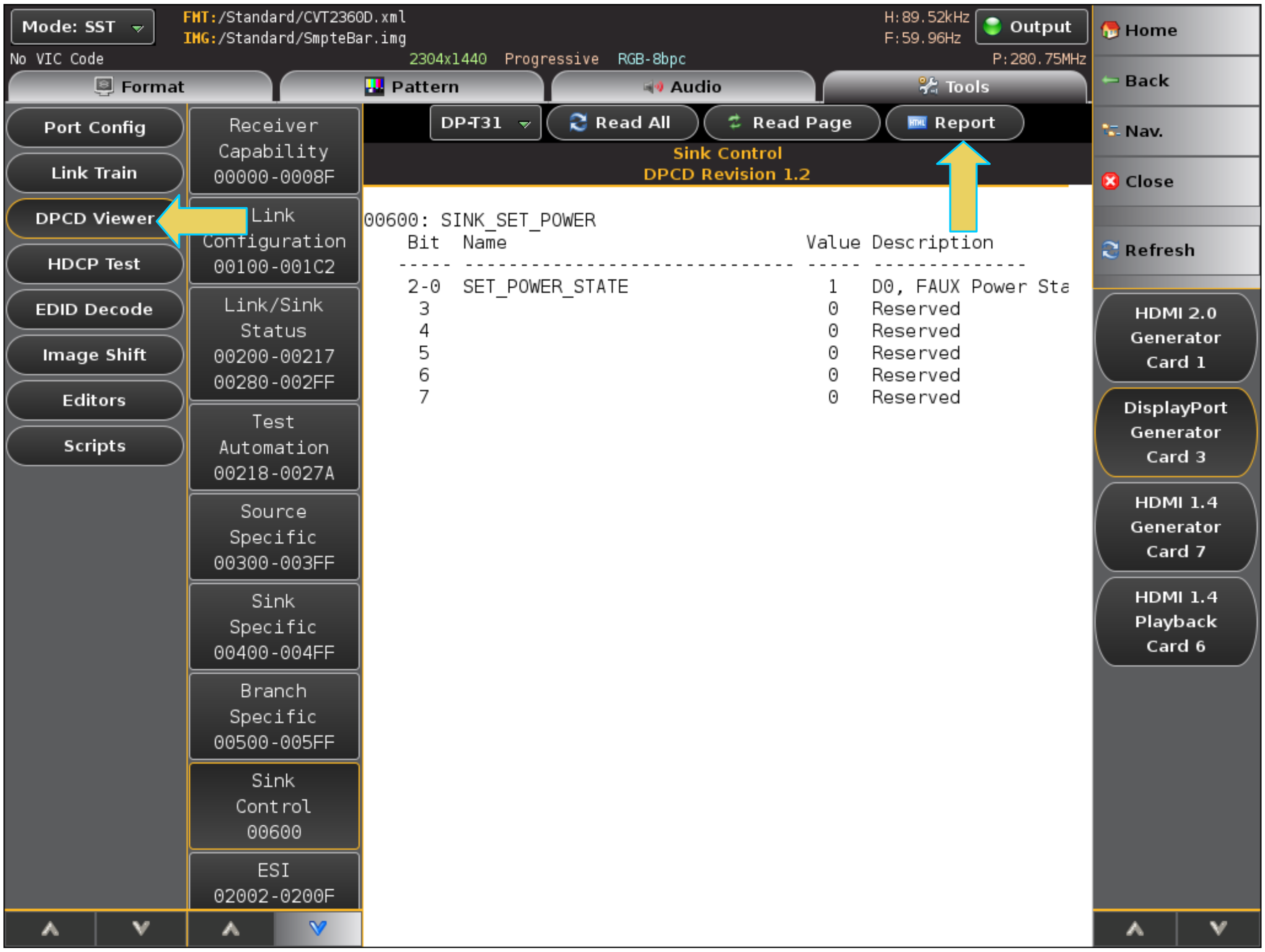


View the Sink Control registers.

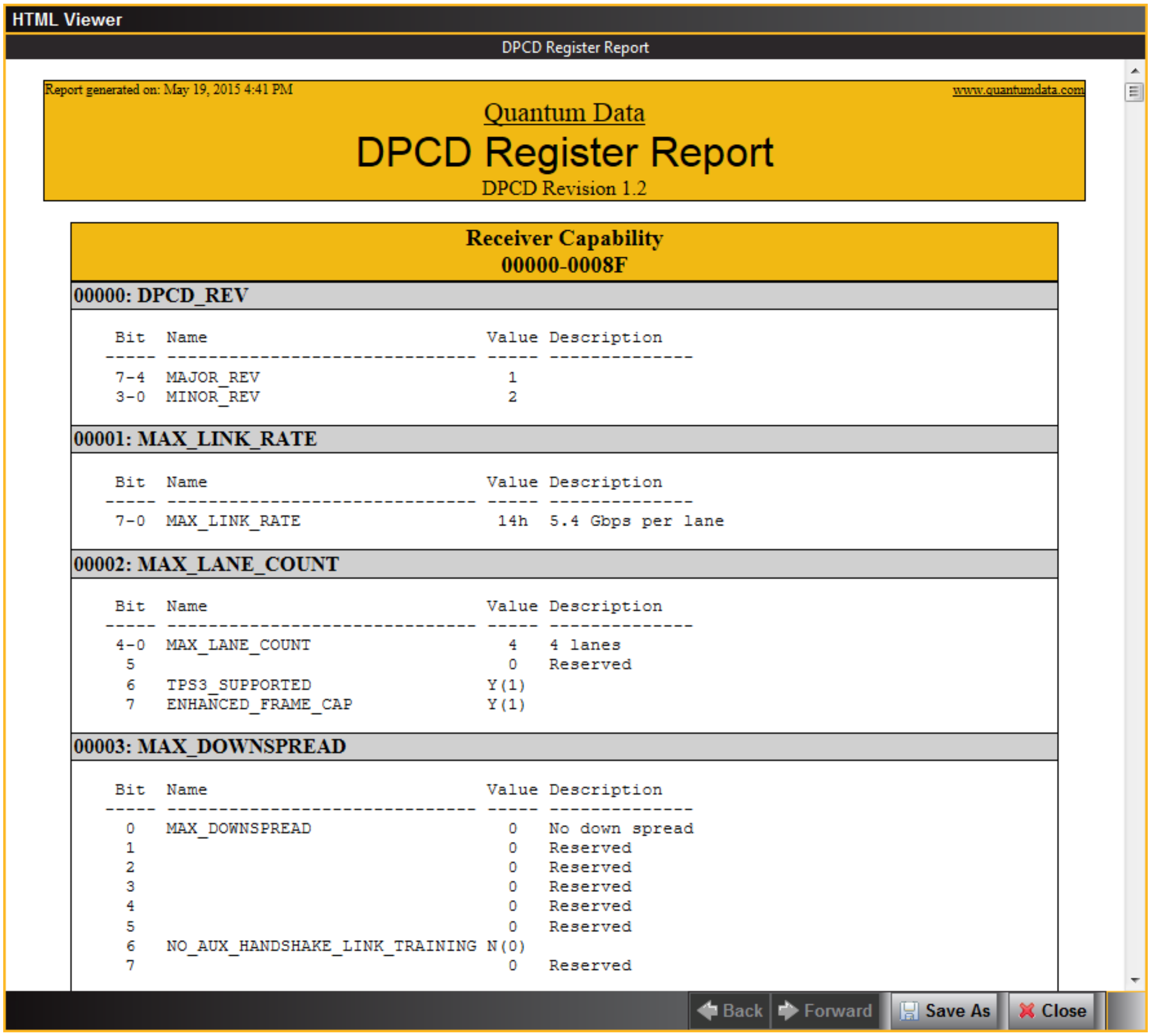


To view the DPCD of a connected display:

1. From the **DPCD Tool** select **Report** on the upper right.



The following are sample screen shots from the DPCD HTML report.



HTML Viewer

DPCD Register Report

Report generated on: May 19, 2015 4:41 PM

www.quantumdata.com

Quantum Data

DPCD Register Report

DPCD Revision 1.2

Receiver Capability
00000-0008F

00000: DPCD_REV

```
 Bit  Name                           Value Description
----- ------------------------------ ----- --------------
 7-4  MAJOR_REV                        1
 3-0  MINOR_REV                        2
```

00001: MAX_LINK_RATE

```
 Bit  Name                           Value Description
----- ------------------------------ ----- --------------
 7-0  MAX_LINK_RATE                   14h  5.4 Gbps per lane
```

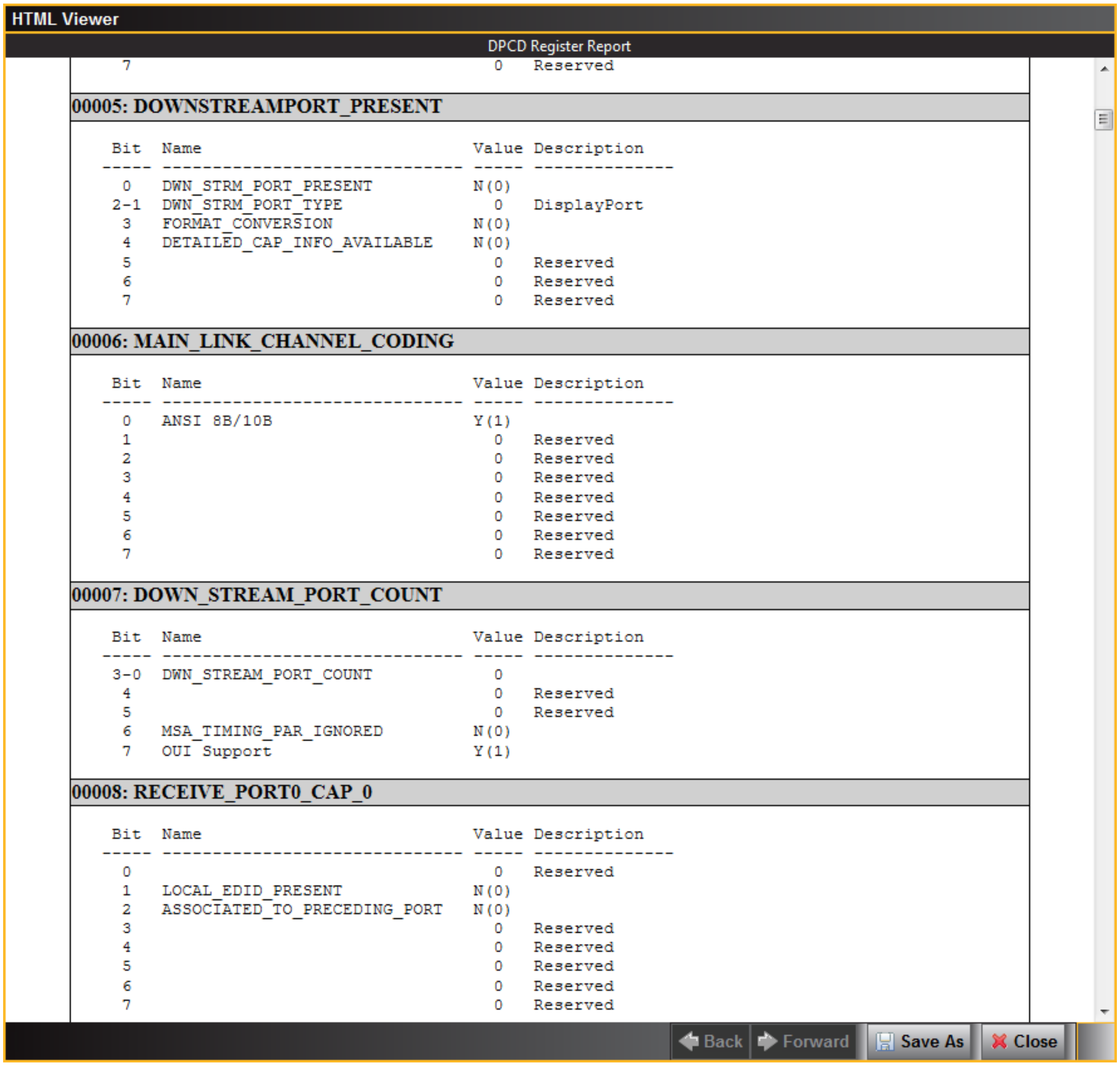
00002: MAX_LANE_COUNT

```
 Bit  Name                           Value Description
----- ------------------------------ ----- --------------
 4-0  MAX_LANE_COUNT                   4   4 lanes
  5                                    0   Reserved
  6   TPS3_SUPPORTED                 Y(1)
  7   ENHANCED_FRAME_CAP             Y(1)
```

00003: MAX_DOWNSPREAD

```
 Bit  Name                           Value Description
----- ------------------------------ ----- --------------
  0   MAX_DOWNSPREAD                   0   No down spread
  1                                    0   Reserved
  2                                    0   Reserved
  3                                    0   Reserved
  4                                    0   Reserved
  5                                    0   Reserved
  6   NO_AUX_HANDSHAKE_LINK_TRAINING N(0)
  7                                    0   Reserved
```

Back Forward Save As Close




```
  7                                   0    Reserved
```

00005: DOWNSTREAMPORT_PRESENT

```
 Bit  Name                           Value Description
----- ------------------------------ ----- -------------
  0   DWN_STRM_PORT_PRESENT          N(0)
 2-1  DWN_STRM_PORT_TYPE               0   DisplayPort
  3   FORMAT_CONVERSION              N(0)
  4   DETAILED_CAP_INFO_AVAILABLE    N(0)
  5                                    0   Reserved
  6                                    0   Reserved
  7                                    0   Reserved
```

00006: MAIN_LINK_CHANNEL_CODING

```
 Bit  Name                           Value Description
----- ------------------------------ ----- -------------
  0   ANSI 8B/10B                    Y(1)
  1                                    0   Reserved
  2                                    0   Reserved
  3                                    0   Reserved
  4                                    0   Reserved
  5                                    0   Reserved
  6                                    0   Reserved
  7                                    0   Reserved
```

00007: DOWN_STREAM_PORT_COUNT

```
 Bit  Name                           Value Description
----- ------------------------------ ----- -------------
 3-0  DWN_STREAM_PORT_COUNT            0
  4                                    0   Reserved
  5                                    0   Reserved
  6   MSA_TIMING_PAR_IGNORED         N(0)
  7   OUI Support                    Y(1)
```

00008: RECEIVE_PORT0_CAP_0

```
 Bit  Name                           Value Description
----- ------------------------------ ----- -------------
  0                                    0   Reserved
  1   LOCAL_EDID_PRESENT             N(0)
  2   ASSOCIATED_TO_PRECEDING_PORT   N(0)
  3                                    0   Reserved
  4                                    0   Reserved
  5                                    0   Reserved
  6                                    0   Reserved
  7                                    0   Reserved
```

3.14 Testing HDCP on a connected display

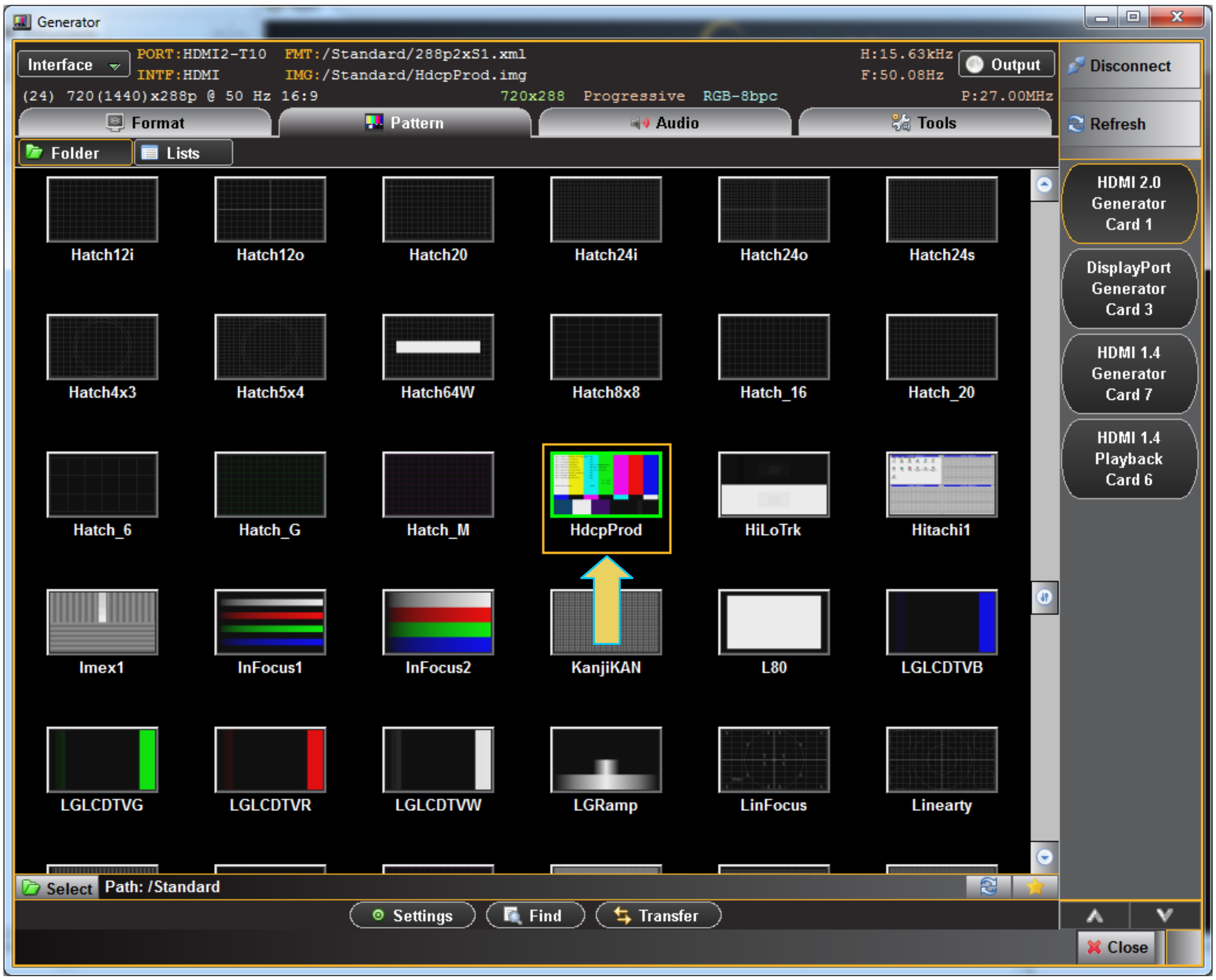
Use the following procedures to test HDCP 1.3 authentication on a connected display. HDPC is tested using a special test image called HDCPProd and HDCP2. You can also run the HDCP test using the HDCP test utility. When running the test with the HDCPprod test image you can view the results of the test on the connected DP display. These test images are selectable through the **Pattern** tab.

3.14.1 Running the HDCP test using the HDCPprod test image

Use the procedures below to run an HDCP test on a connected display using the HDCPprod test image.

To test HDCP on a connected display:

1. Access the **Pattern** tab to view the test patterns and select HDCPprod test image.



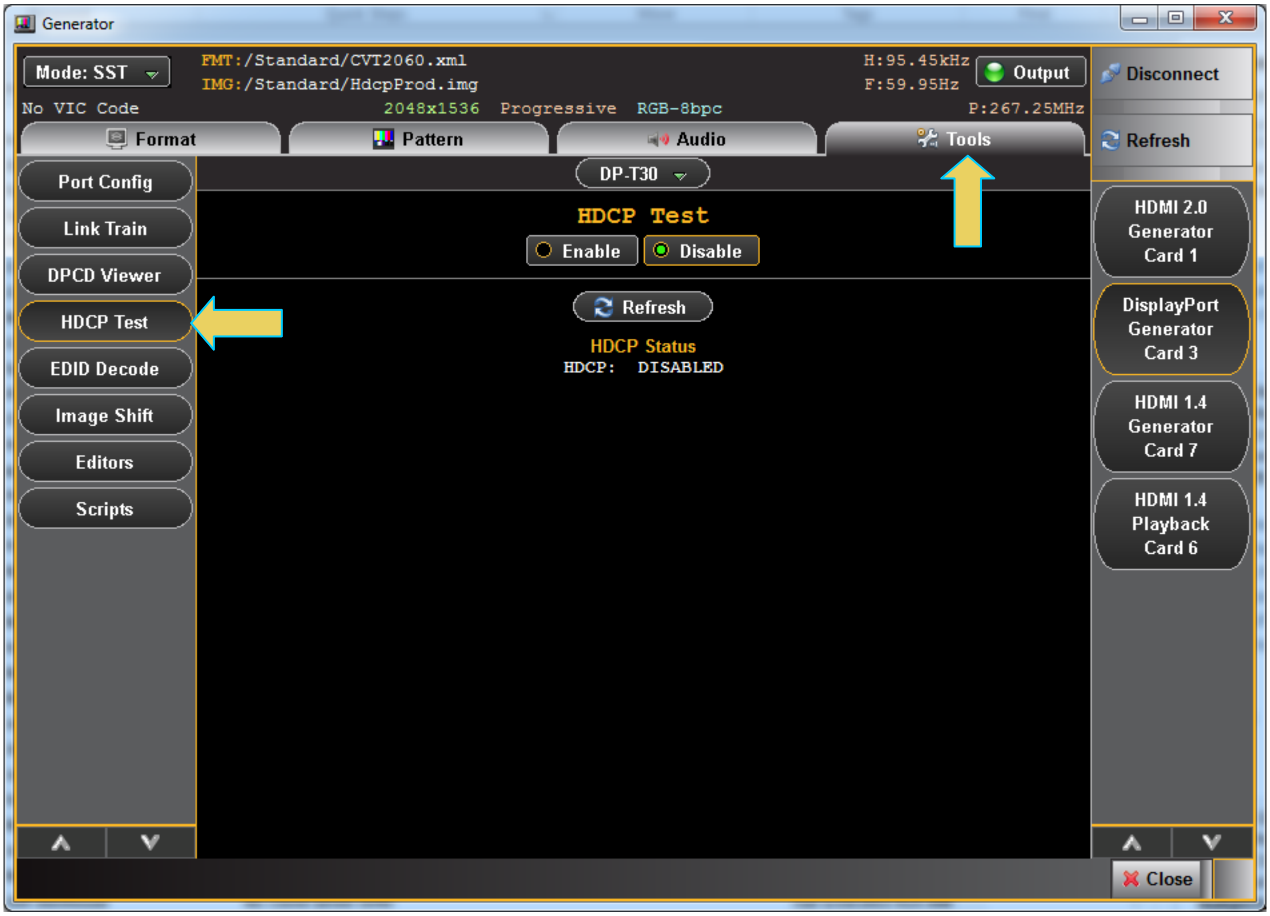
The results and status of the test can be viewed in the connected DP display.

A typical result is shown below.

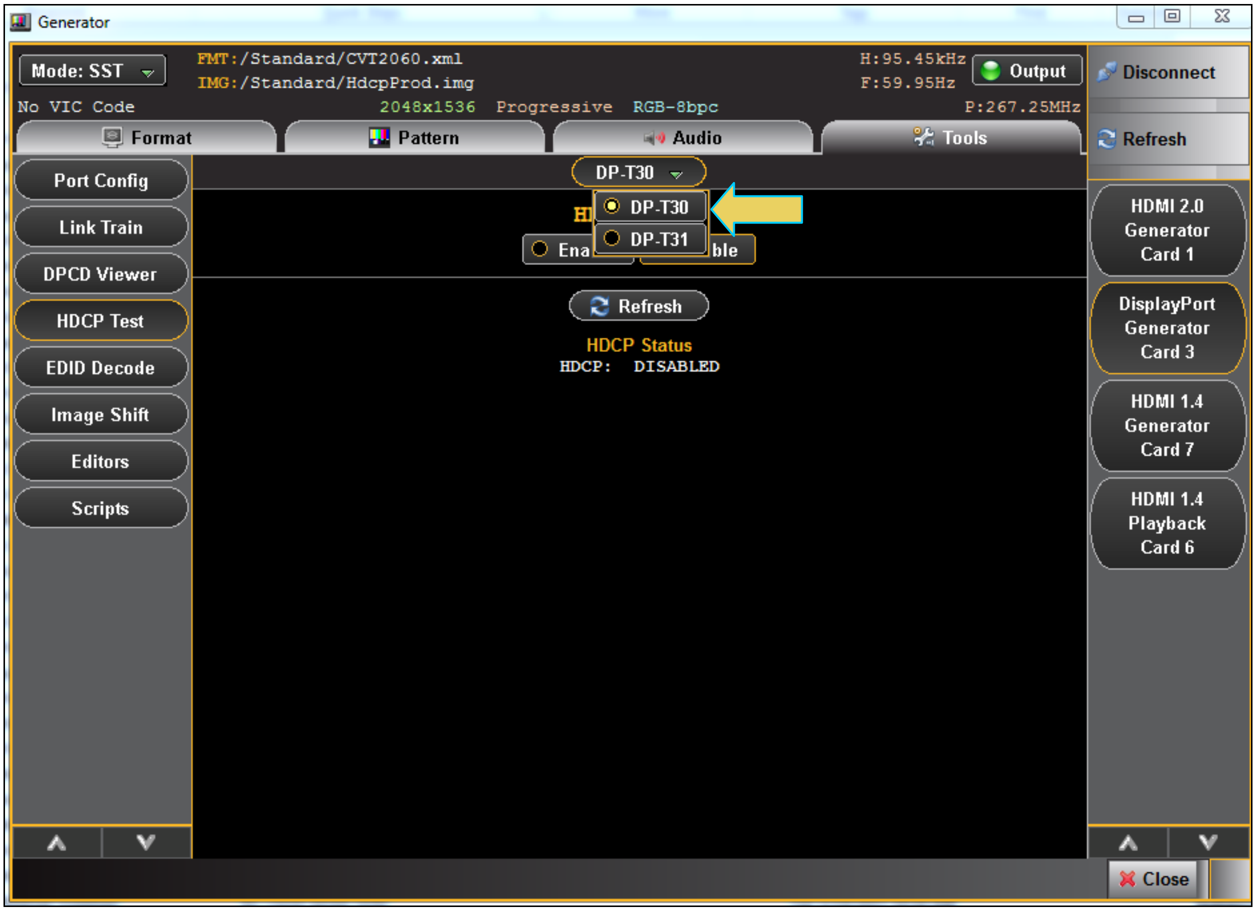
2. Select the HdcpProd test image if your sink device under test is connected to Port 0 (Tx1); select Hdcp2 if your sink device under test is connected to Port 1 (Tx2).

To test HDCP on a connected display using the Tools HDCP utility:

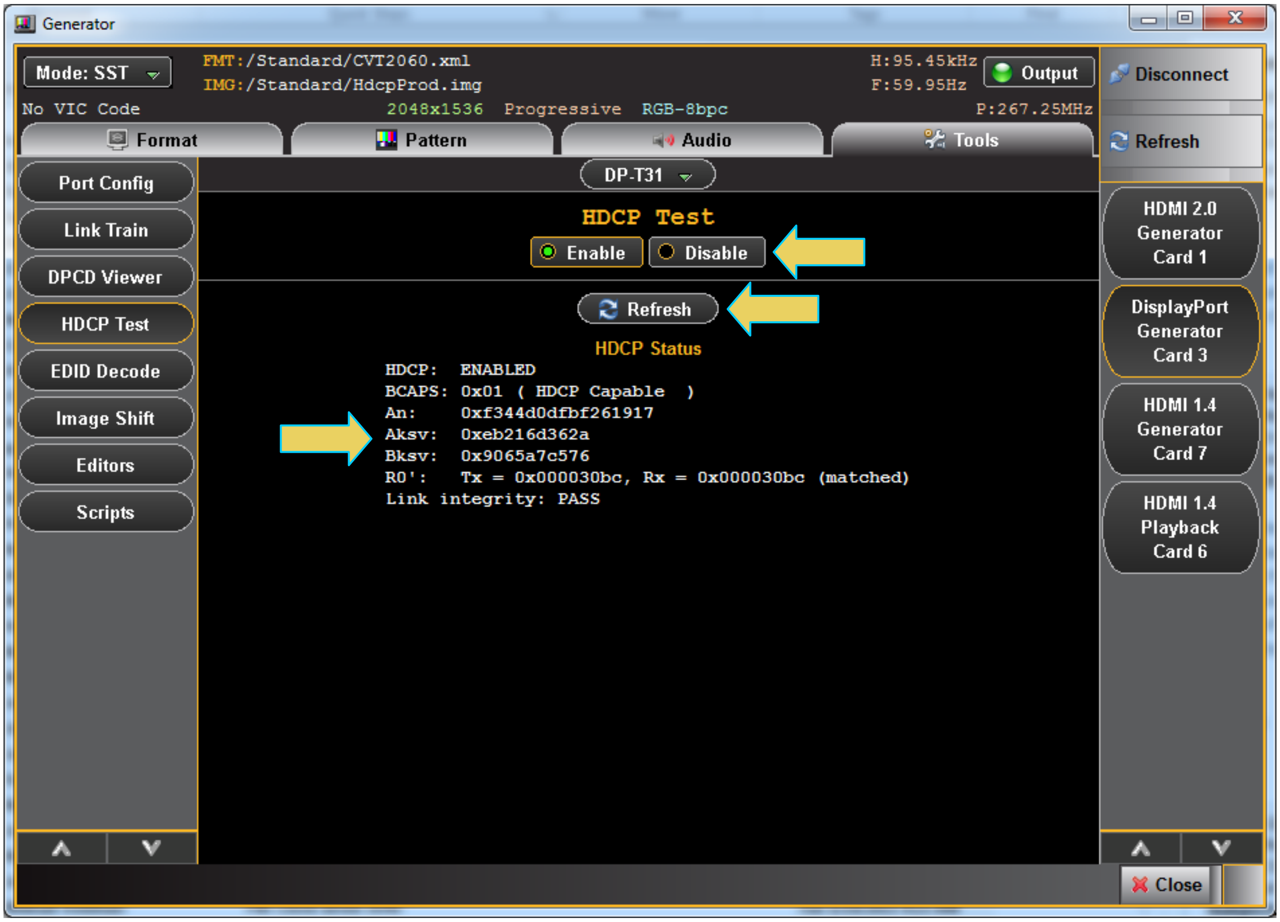
1. Access the **HDCP Test** through the **Tools** tab as shown below.



2. Select the desired DP Tx port using the pull down menu.



3. Enable HDCP using the **Enable** radio button. Then hit the **Refresh** button. View the results and status of the test through the HDCP Test screen as shown below.



3.14.2 Understanding the HDCP test

The DP HDCP test sequence performed by the 980 DP Video Generator is listed below.

1. Reset the transmitter HDCP engine.
2. Initialize the transmitter.
3. Check Bcaps over the DDC bus to determine if the sink is a receiver or a repeater and generate a new An value (8 byte random session number) in the transmitter.
4. Transmitter writes An to the receiver using the DDC bus.
5. Transmitter writes Aksv to the receiver using the DDC bus.
6. Read Bksv from the receiver over the DDC bus and validate that it has exactly 20 zeroes and 20 ones in it. You can query this value with the following command:
7. The display may return a value such as the following which is:

   07BE05CEA9

8. The value in binary is 0000011110111110000001011100111010101001 which contains 20 zeros and 20 ones.
9. Write the Bksv value to the transmitter to trigger calculation of R0.
10. Wait for the R0 calculation in the transmitter to complete.
11. Wait for at least 100 milliseconds and then read the R0' value out of the receiver over the DDC bus and compare the value with the R0 calculation in the transmitter. If this step fails, then go to step 1.
12. Enable encryption and read Ri' from the receiver over the DDC bus every 128 frames and compare it to the Ri value calculated in the transmitter. As long as the Ri value matches the Ri' value from the receiver continue to check these every 128 frames.

4 HDCP 2.2 Tests

This chapter describes how to use the 980 DisplayPort Video Generator / Analyzer module to test your DisplayPort 1.2 source, sink or repeater for proper HDCP 2.2 authentication. The HDCP 2.2 functional tests are optional features and require the purchase of a license to run.

The module's DisplayPort 1.2 Tx port emulates a DisplayPort 1.2 source device with HDCP 2.2 capabilities. The module's DisplayPort Rx port emulates either a DisplayPort 1.2 sink device with HDCP 2.2 capabilities or a repeater device to test a source against an HDCP 2.2 repeater functionality.

The solutions enable you to quickly verify the HDCP authentication function of your HDCP 2.2-capable DisplayPort 1.2 device. Functional testing early in the development cycle is important for assessing and ensuring basic functionality. You can view a summary of the authentication status at a glance from the dialog boxes and from the Real Time status bar at the top of the 980 GUI window.

Whether testing a source, sink or repeater you can view the HDCP 2.2 authentication transactions in real time using the Auxiliary Channel Analyzer (ACA) utility. You can save the ACA trace records and disseminate them to subject matter experts for further analysis.

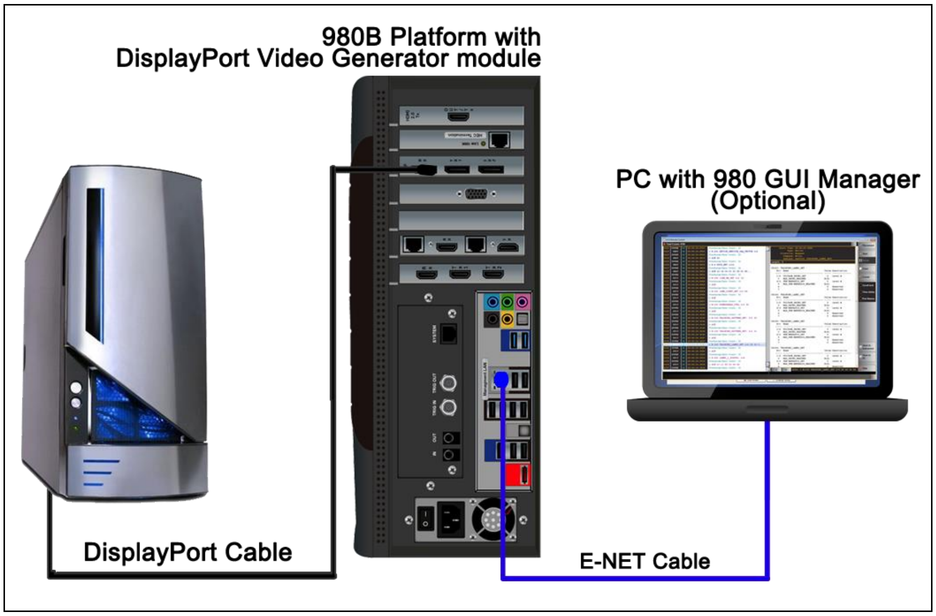
4.1 Running an HDCP 2.2 source test

The procedures below describe how to run the HDCP 2.2 authentication on a DisplayPort source device.

To run the HDCP 2.2 authentication test on a source:

1. Connect the DP source device to the DP module's Rx Analyzer port as shown below.

   Note the second PC shown is used for the external 980 GUI Manager application. In this case you will use the embedded 980 GUI Manager application on the 980 Test Platform.



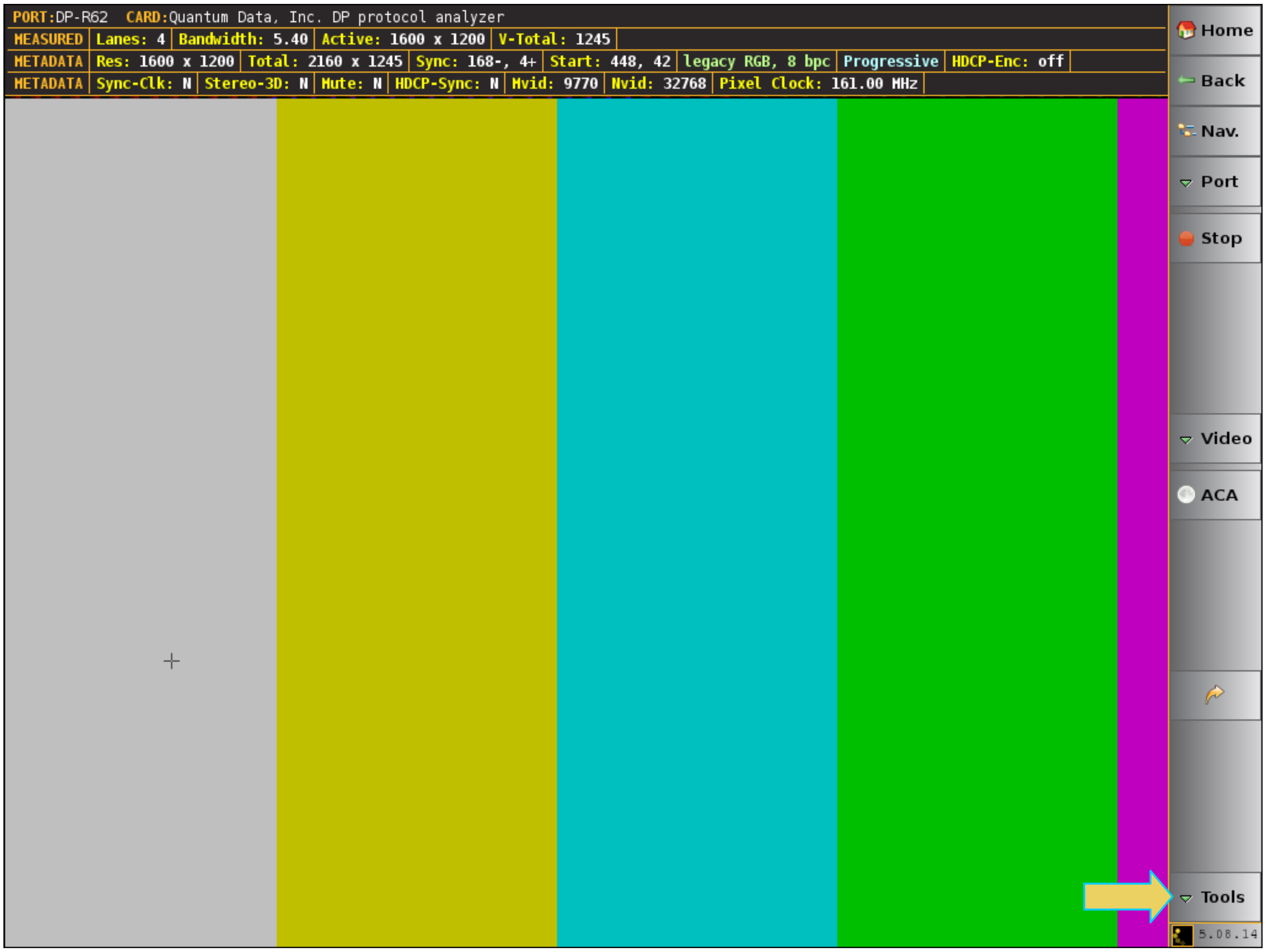
2. Enable HDCP 2.2 on the source device under test. Note that you can either enable HDCP 2.2 prior to enabling HDCP 2.2 on the 980 Video Generator / Analyzer module's Rx card or you can enable HDCP on the source after you enable HDCP on the DP module.

3. Touch select the **DP RX-PA** icon on the **Card Control** page of the **Apps** panel on the *embedded* 980 GUI Manager (see below).

   Note: The Real Time viewing windows are not available on the PC-based external GUI Manager. Therefore to enable HDCP 2.2 on the DP module's Rx port, please use the 980's embedded touch screen.

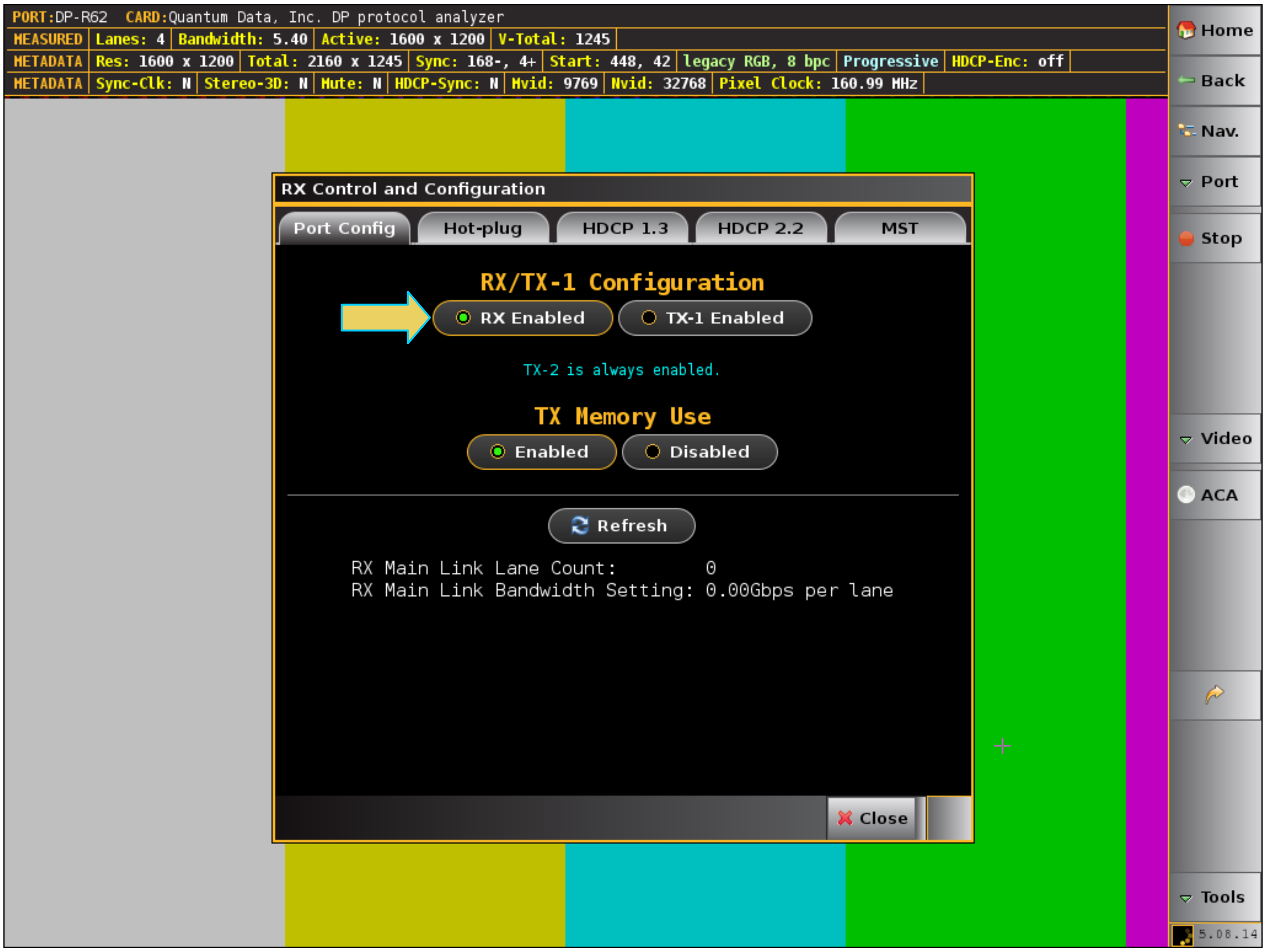
   The Receiver "Real Time" panel appears as shown below.

   Please note that the video shown on the window in these examples is a colorbars test pattern. Typically in an application where you are testing a source, you will see video from a computer screen or other DP 1.2 source device.

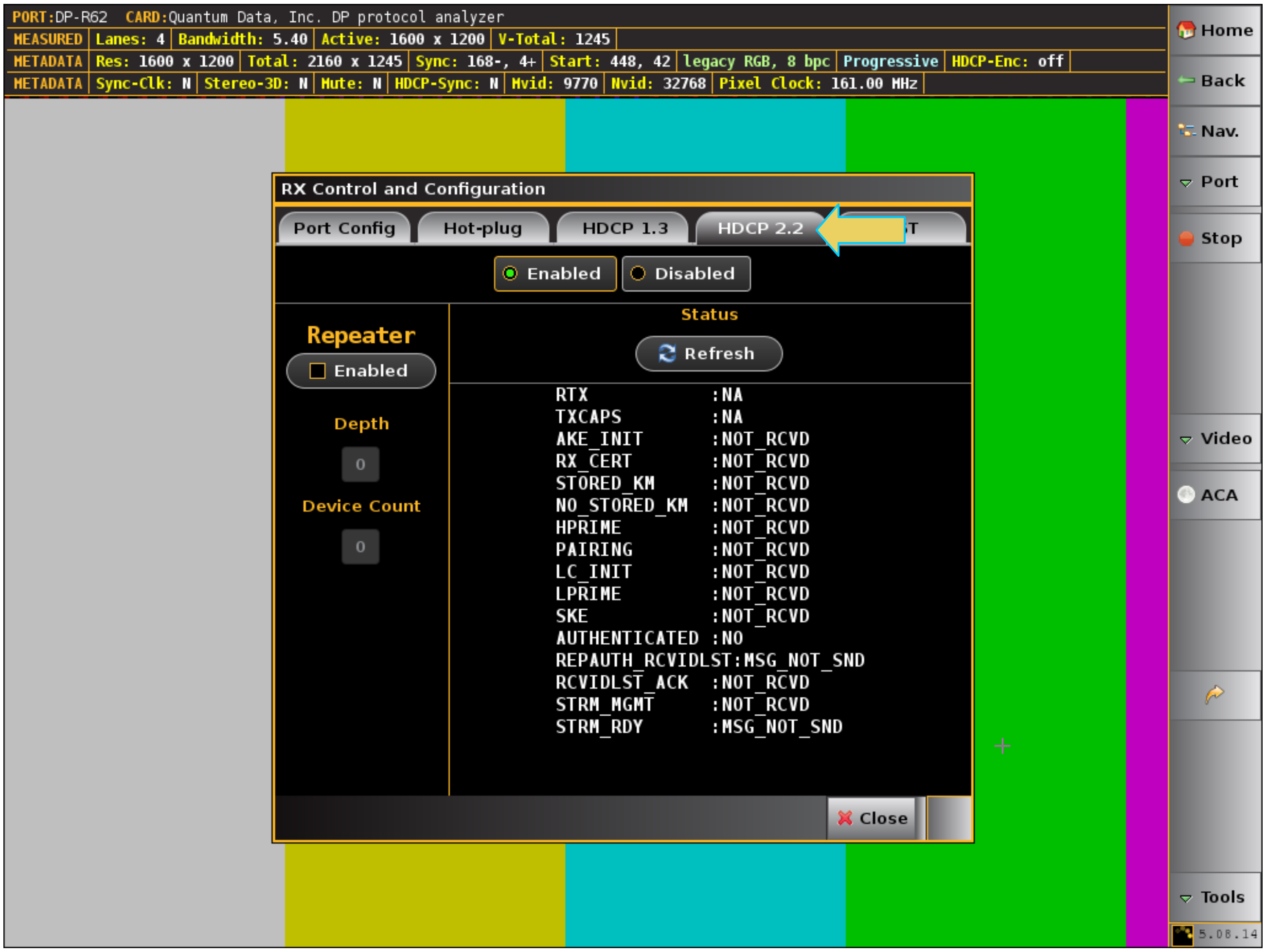


4. Access the **RX Control and Configuration** dialog box to enable HDCP 2.2 on the DisplayPort Rx port. You access this dialog box through the **Tools** flyout menu (indicated by the arrow in the screen shot above).

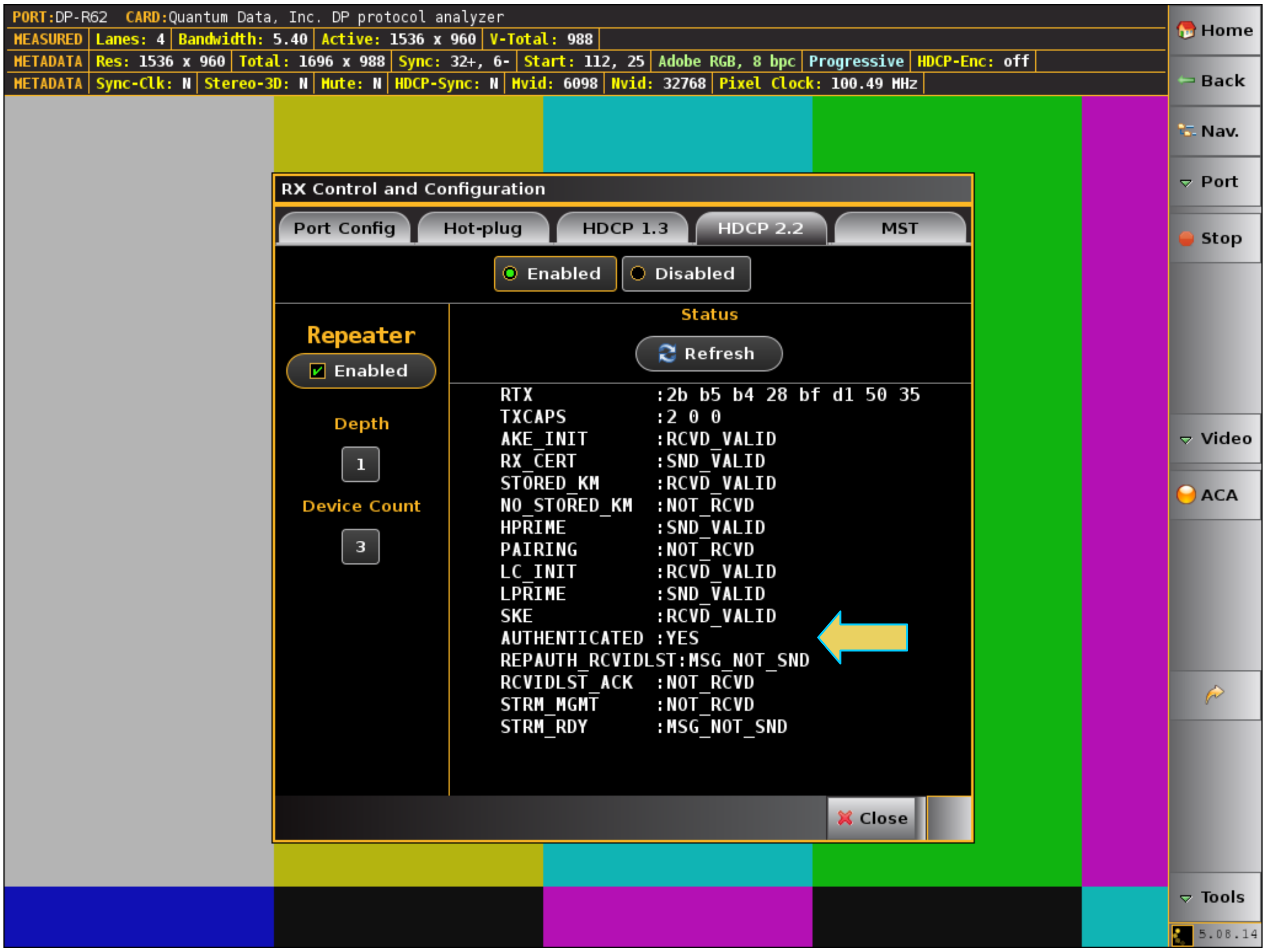
5. Enable the Rx port from the **Port Config** tab of **the Rx Control and Configuration** dialog box as shown below.



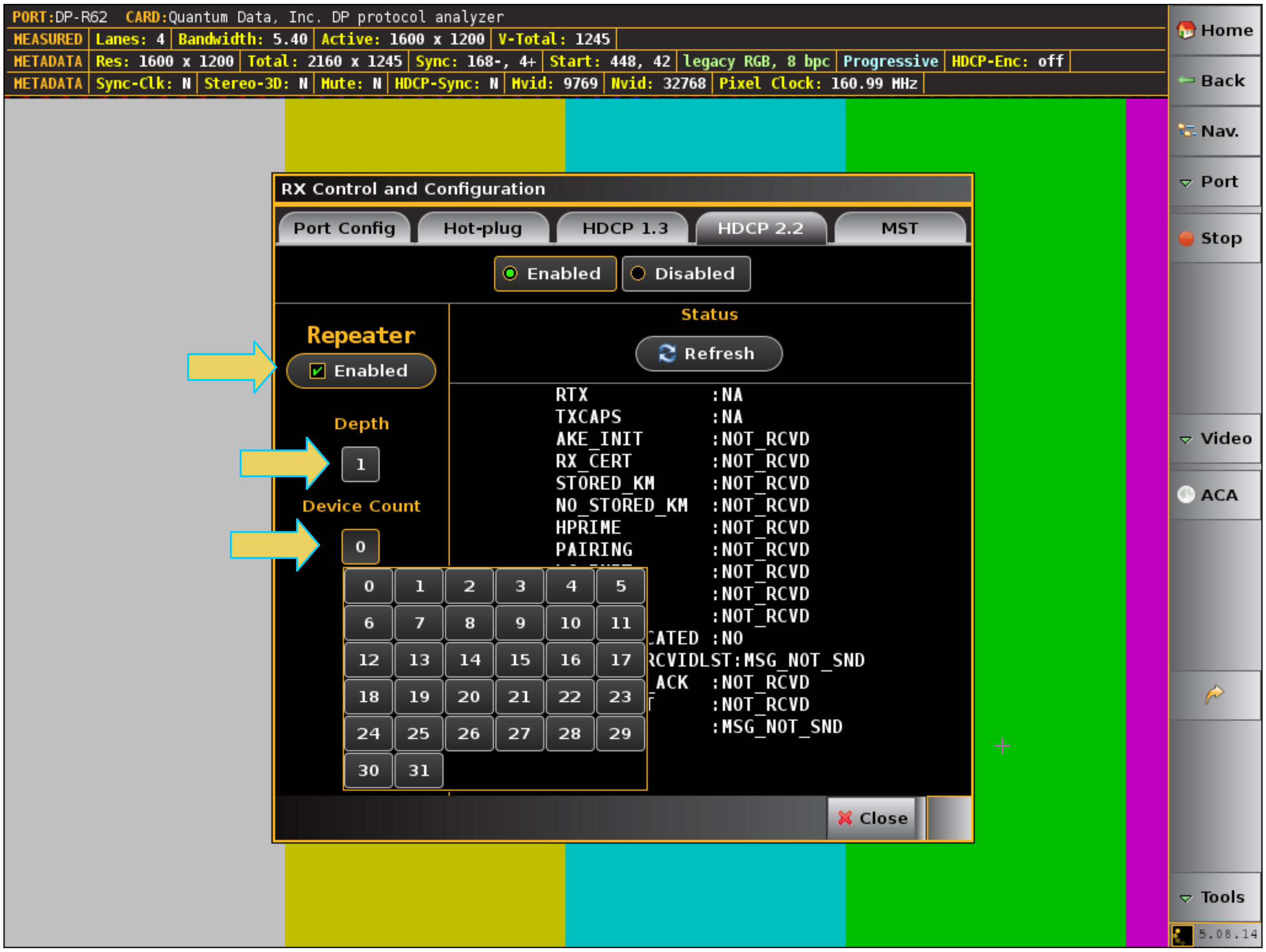
6. Enable HDCP 2.2 from the **HDCP 2.2** tab of the **Rx Control and Configuration** dialog box.



7. If HDCP 2.2 authentication is not enabled on the DP source device under test, please enable it now.
8. Touch select the **Refresh** button on the **Rx Control and Configuration** dialog box to view the HDCP 2.2 authentication status.



Note: If you are testing a source device by emulating a repeater function you will have to enable the repeater using the **Repeater** enable checkbox and then enter in the depth and the downstream device count using the **Depth** and **Device Count** pop up menus.


PORT:DP-R62 CARD:Quantum Data, Inc. DP protocol analyzer
MEASURED | Lanes: 4 | Bandwidth: 5.40 | Active: 1600 x 1200 | V-Total: 1245
METADATA | Res: 1600 x 1200 | Total: 2160 x 1245 | Sync: 168-, 4+ | Start: 448, 42 | legacy RGB, 8 bpc | Progressive | HDCP-Enc: off
METADATA | Sync-Clk: N | Stereo-3D: N | Mute: N | HDCP-Sync: N | Mvid: 9769 | Nvid: 32768 | Pixel Clock: 160.99 MHz
Home
Back
Nav.
Port
Stop
Video
ACA
Tools
5.08.14
RX Control and Configuration
Port Config
Hot-plug
HDCP 1.3
HDCP 2.2
MST
Enabled
Disabled
Repeater
Enabled
Depth
1
Device Count
0
Status
Refresh
RTX :NA
TXCAPS :NA
AKE_INIT :NOT_RCVD
RX_CERT :NOT_RCVD
STORED_KM :NOT_RCVD
NO_STORED_KM :NOT_RCVD
HPRIME :NOT_RCVD
PAIRING :NOT_RCVD
:NOT_RCVD
:NOT_RCVD
:NOT_RCVD
CATED :NO
RCVIDLST:MSG_NOT_SND
ACK :NOT_RCVD
:NOT_RCVD
:MSG_NOT_SND
0 1 2 3 4 5
6 7 8 9 10 11
12 13 14 15 16 17
18 19 20 21 22 23
24 25 26 27 28 29
30 31
Close

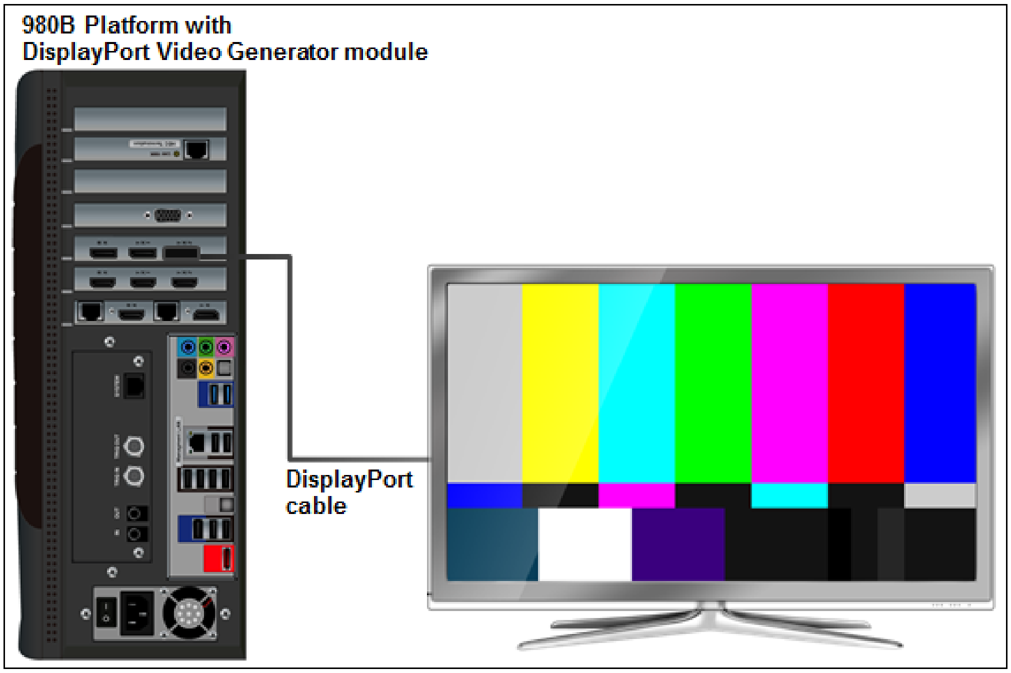
4.2 Running an HDCP 2.2 sink test

The procedures below describe how to run the HDCP 2.2 authentication on a DP 1.2 sink device. For testing DisplayPort display devices (sinks), the 980 DP 1.2 Video Generator / Analyzer module emulates an HDCP 2.2-capable DisplayPort 1.2 source device. You can either verify the simple case with the module acting as a source to test a display or you can test the input of an HDCP 2.2-capable DisplayPort 1.2 repeater device to verify its handling of downstream display devices. You can optionally view the HDCP 2.2 authentication transactions over the DDC using the Auxiliary Channel Analyzer (ACA) utility. Procedures for monitoring the HDCP 2.2 transactions through the ACA are in the next section.

To run the HDCP 2.2 authentication test on a sink:

1. Connect the DP sink device to the DP module's Tx Analyzer port 2 as shown below.

   Note the second PC shown is used for the external 980 GUI Manager application. In this case you will use the embedded 980 GUI Manager application on the 980 Test Platform.



2. Touch select the DP **Generator** icon on the **Card Control** page 1 of the **Apps** panel on the embedded 980 GUI Manager:

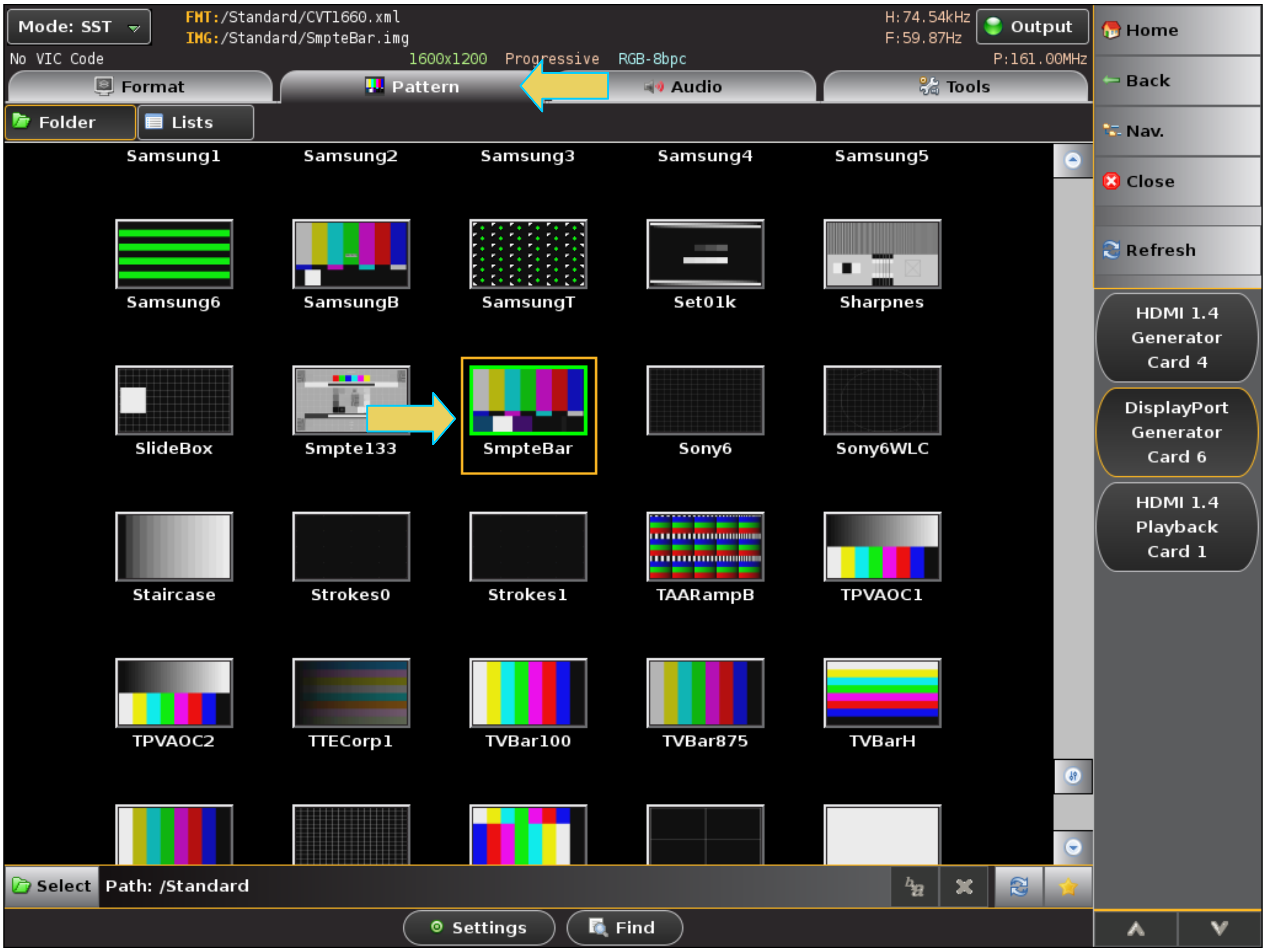
   Note: The **Generator** window appear as shown below.

Note: The Generator window appears as shown below.

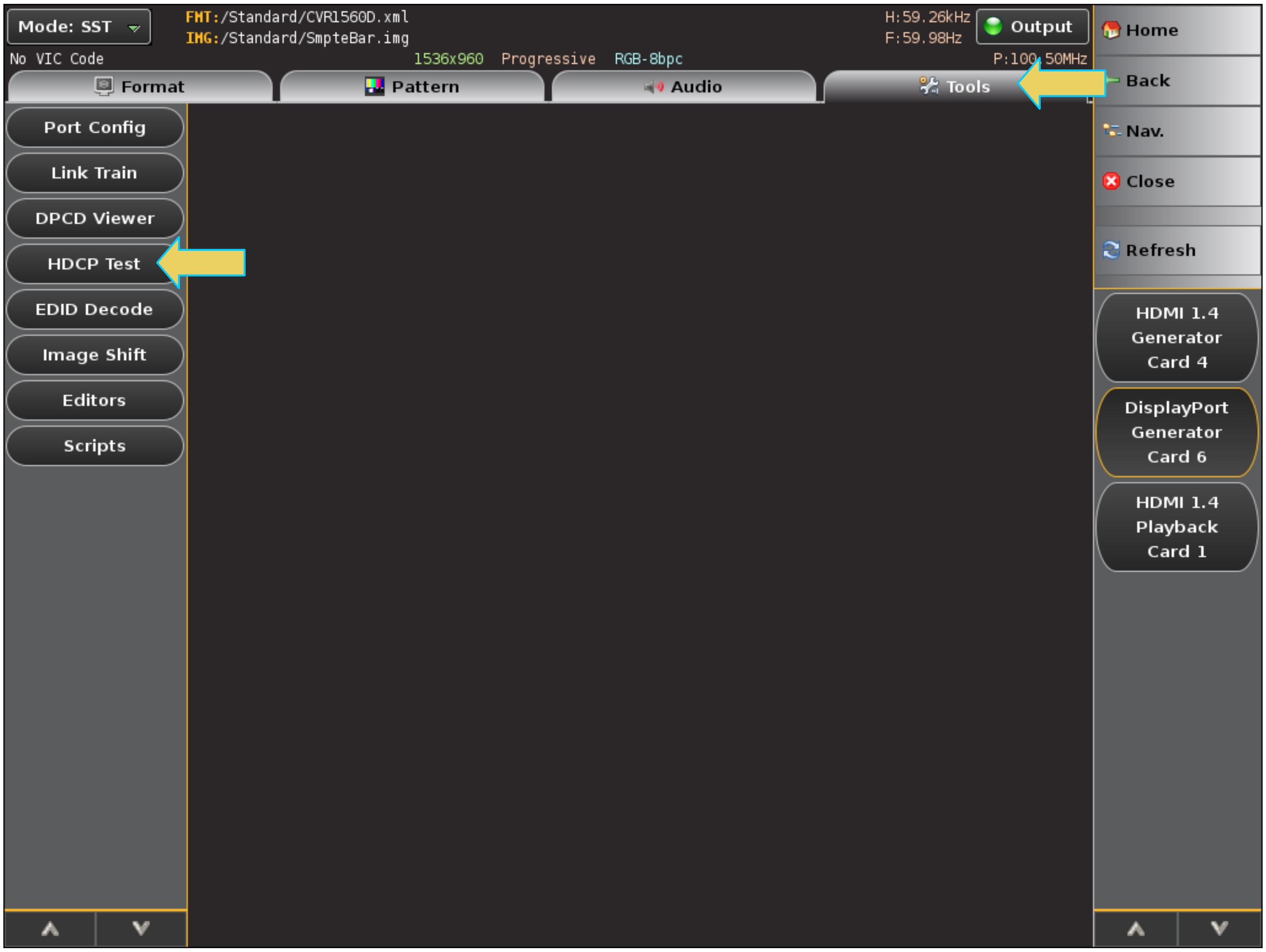
3. Select the **Format** tab. Make sure that the DisplayPort module is selected as the active card in the Generator window. Use the selection items on the right. Refer to the following screen example. In this case the DisplayPort module is in slot 6.

4. Select the video format timing using the **Format** tab shown below. The format timing does not matter for the HDCP 2.2 test.

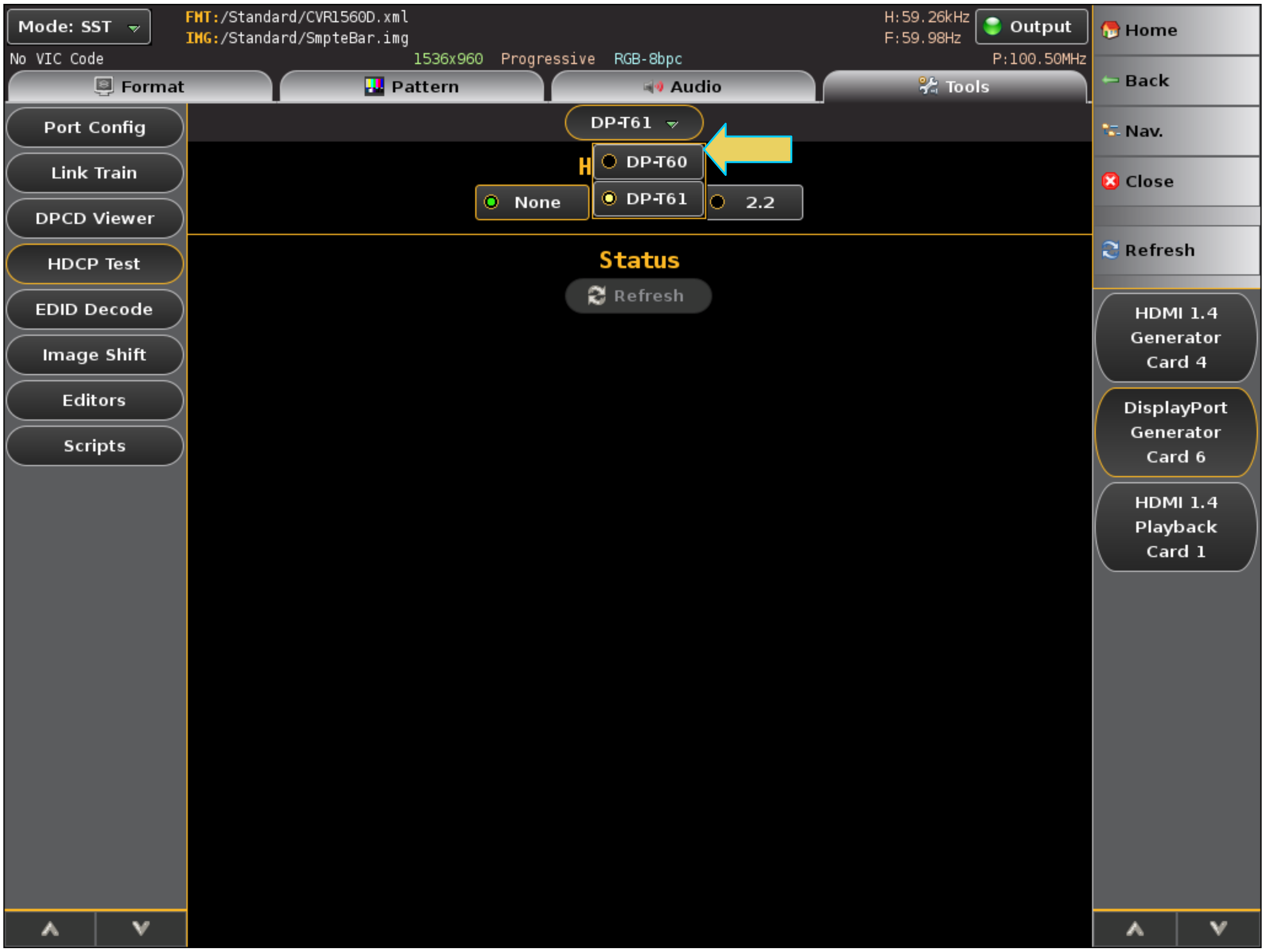
5. Select the video test pattern using the **Pattern** tab shown below (SMPTEBar shown in the example). It does not matter which test pattern you use when HDCP 2.2 testing.



6. Select the **HDCP Test** button from **Tools** tab as shown below.



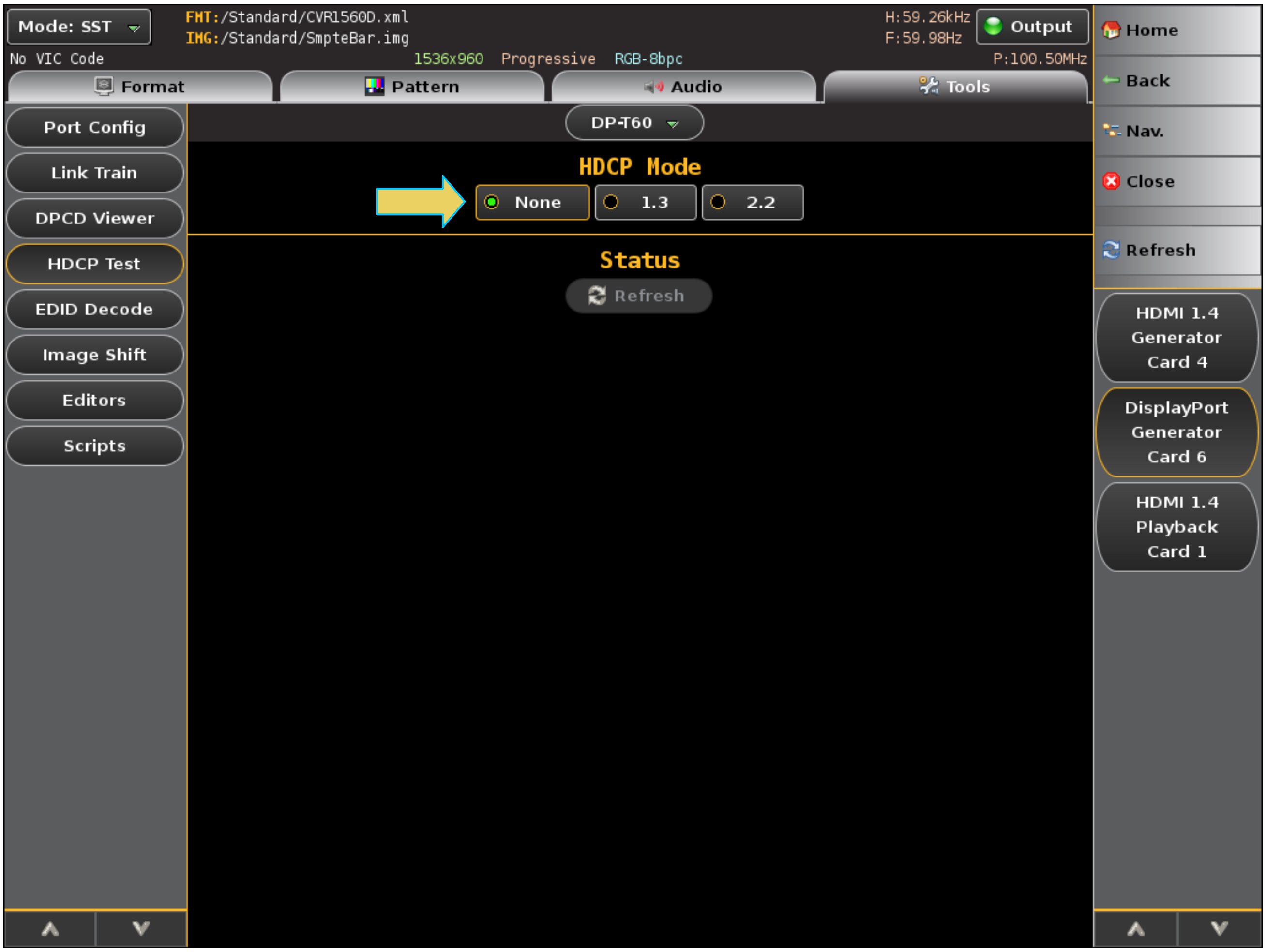
7. Select the DisplayPort Tx 2 port (DP-T61) using the pull-down menu as shown below. The “6” in the DP-T61 selection in the pull-down is an indication of the slot number in the 980B Test Platform chassis.



8. Enable HDCP 2.2 authentication using the **HDCP Mode Enable** radio button as shown below. Note that status is shown in the tab below the control buttons but you need to hit the **Refresh** button.


Mode: SST
FMT:/Standard/CVR1560D.xml
IMG:/Standard/SmpteBar.img
H:59.26kHz
F:59.98Hz
Output
No VIC Code
1536x960 Progressive RGB-8bpc
P:100.50MHz
Format
Pattern
Audio
Tools
Home
Back
Nav.
Close
Refresh
Port Config
Link Train
DPCD Viewer
HDCP Test
EDID Decode
Image Shift
Editors
Scripts
DP-T61
HDCP Mode
None
1.3
2.2
Status
Refresh
HDCP2ENABLED :YES
RXHDCP2ENABLED:YES
RCV ID :e1 bc 68 5c 47
RXCAPS :2 0 2
AKE_INIT :SND_VALID
RX_CERT :RCVD_VALID
STORED_KM :SND_VALID
NO_STORED_KM :NOT_RCVD
HPRIME :RCVD_VALID
PAIRING :NOT_RCVD
LC_INIT :SND_VALID
LPRIME :RCVD_VALID
SKE :SND_VALID
AUTHENTICATED :YES
REPAUTH_RCVIDLST:NOT_RCVD
RCVIDLST_ACK :MSG_NOT_SND
STRM_MGMT :MSG_NOT_SND
STRM_RDY :NOT_RCVD
HDMI 1.4 Generator Card 4
DisplayPort Generator Card 6
HDMI 1.4 Playback Card 1

9. Disable HDCP when done testing. Refer to the screen example below.



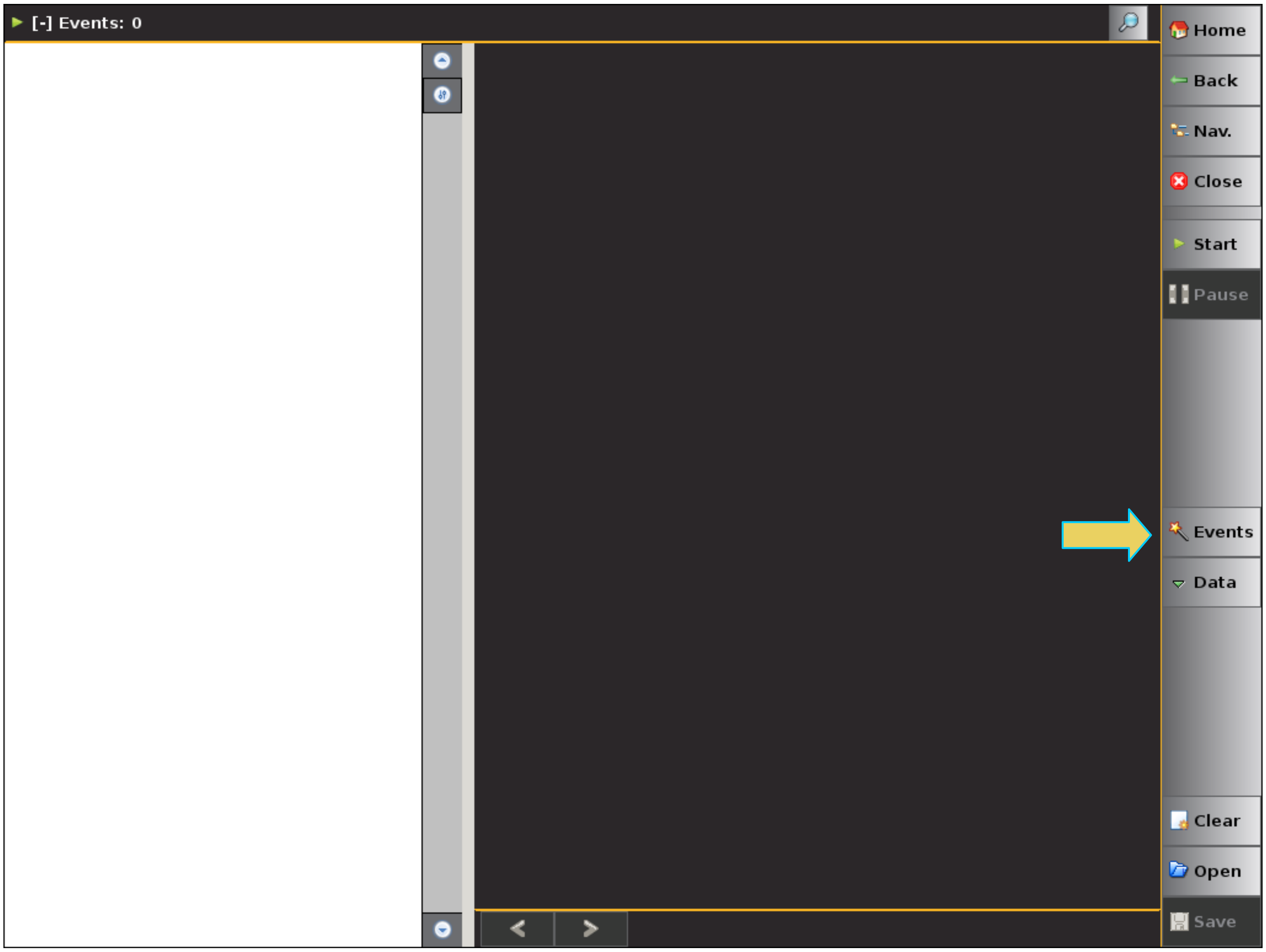
4.3 Viewing the HDCP 2.2 authentication transaction using the Auxiliary Channel Analyzer (ACA) utility

The following procedures describe how to view the HDCP 2.2 authentication transactions over the DisplayPort Aux Channel using the Auxiliary Channel Analyzer (ACA) utility. You can view the HDCP 2.2 authentication transactions either while testing a DP HDCP 2.2 source or sink; the general operation is the same. The following example describes how to view the transactions with the 980 DP module emulating an HDCP 2.2 Receiver.

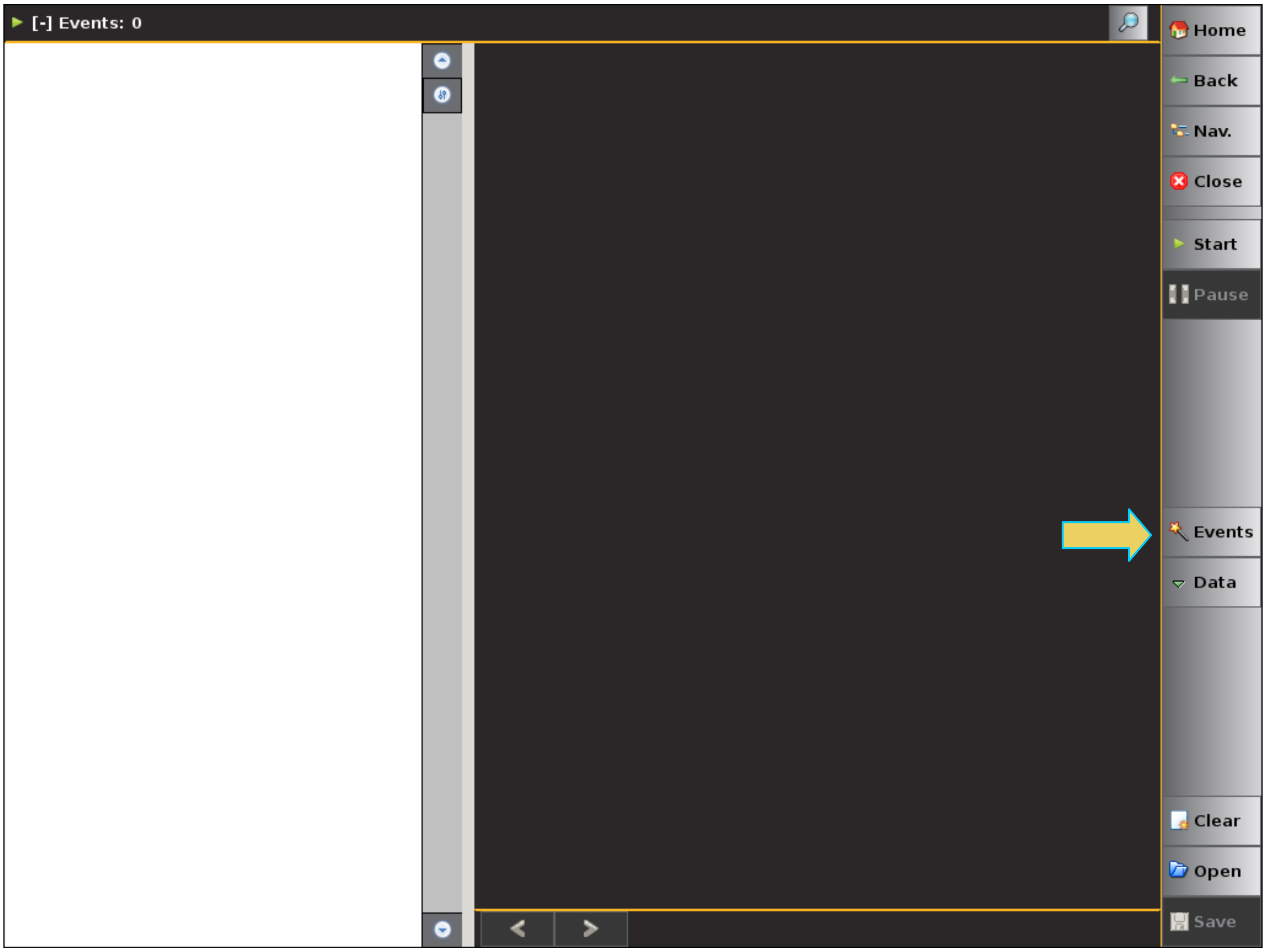
Note: For detailed operating instructions on the ACA utility please refer to Auxiliary Channel Analyzer (ACA) Utilities.

To view the HDCP 2.2 authentication transactions:

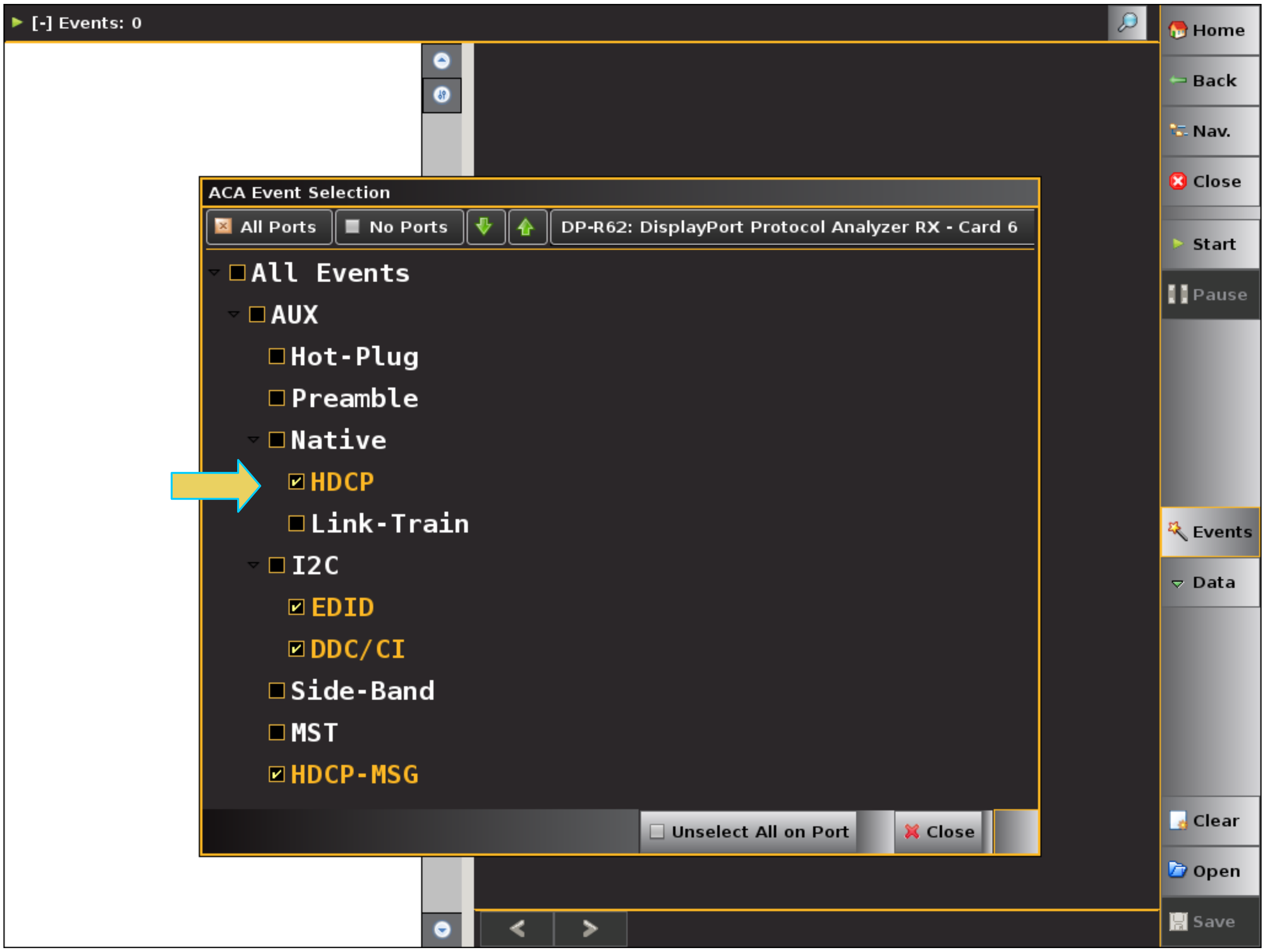
1. Open up the Auxiliary Channel Analyzer panel form the **Card Control** page as indicated below.



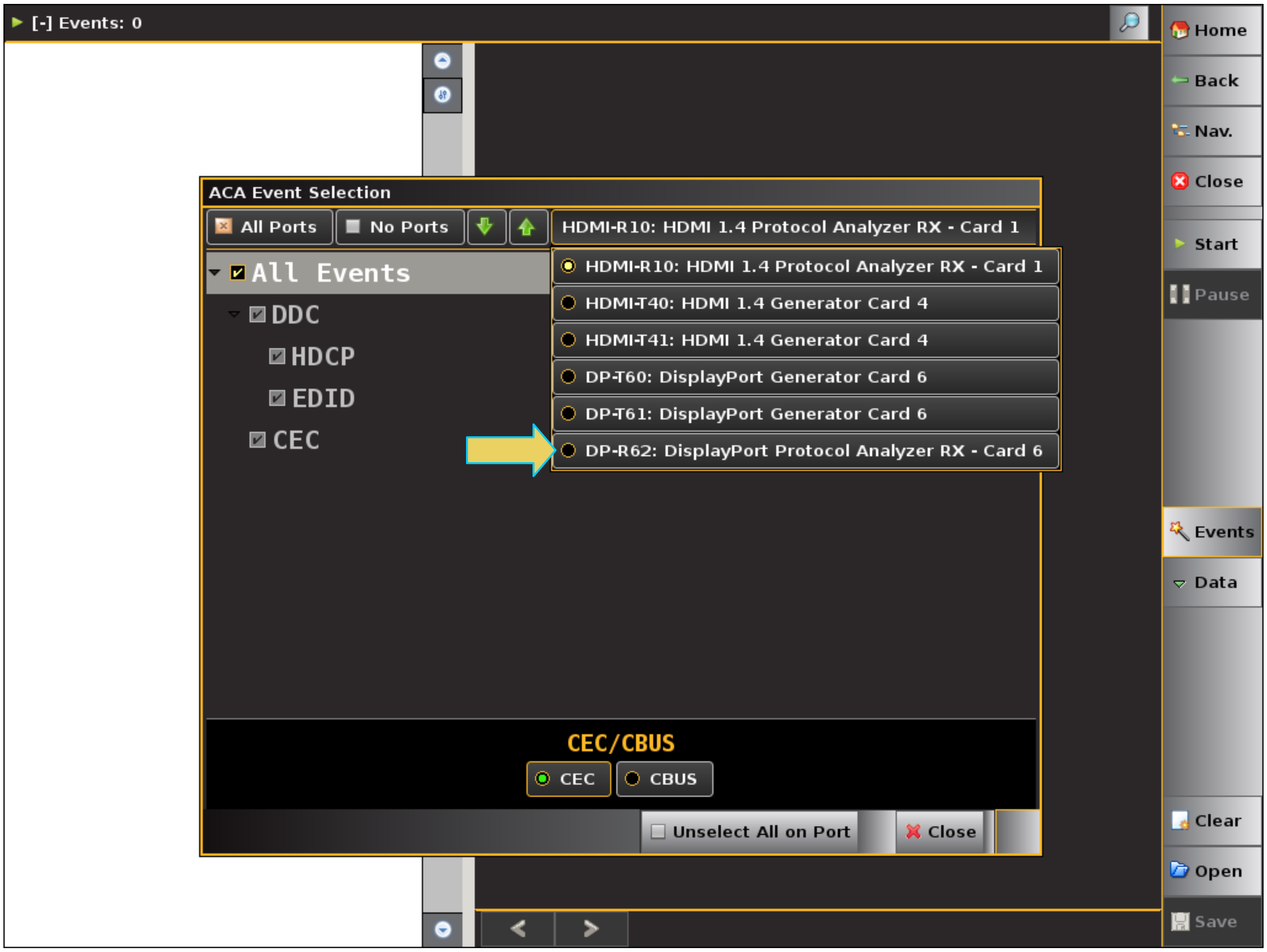
2. Access the **ACA Event Selection** dialog box from the **Events** flyout menu (indicated by the arrow below) to configure the port to monitor and to select the event types to monitor.

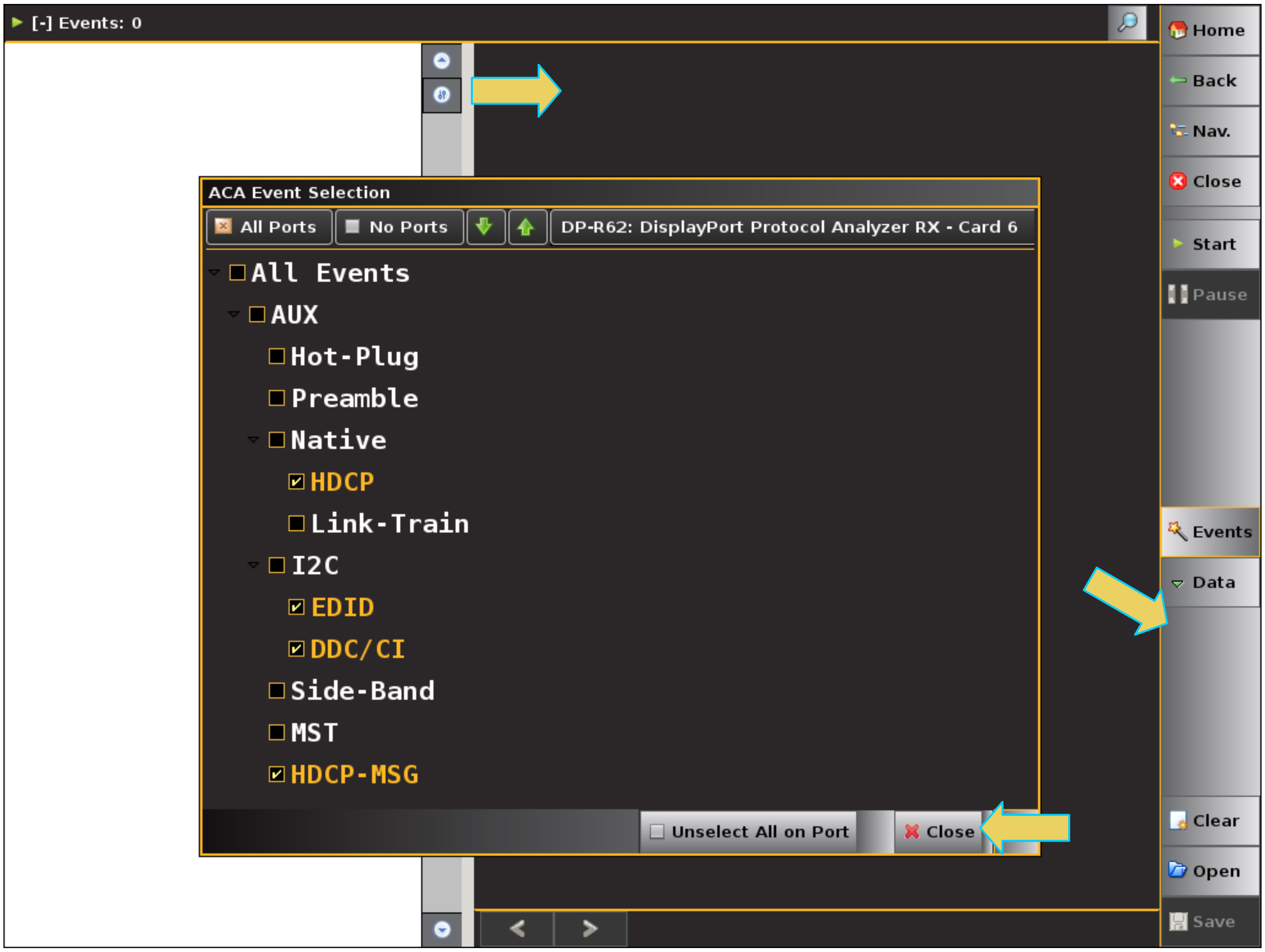


The **Events** dialog box will appear as shown below.

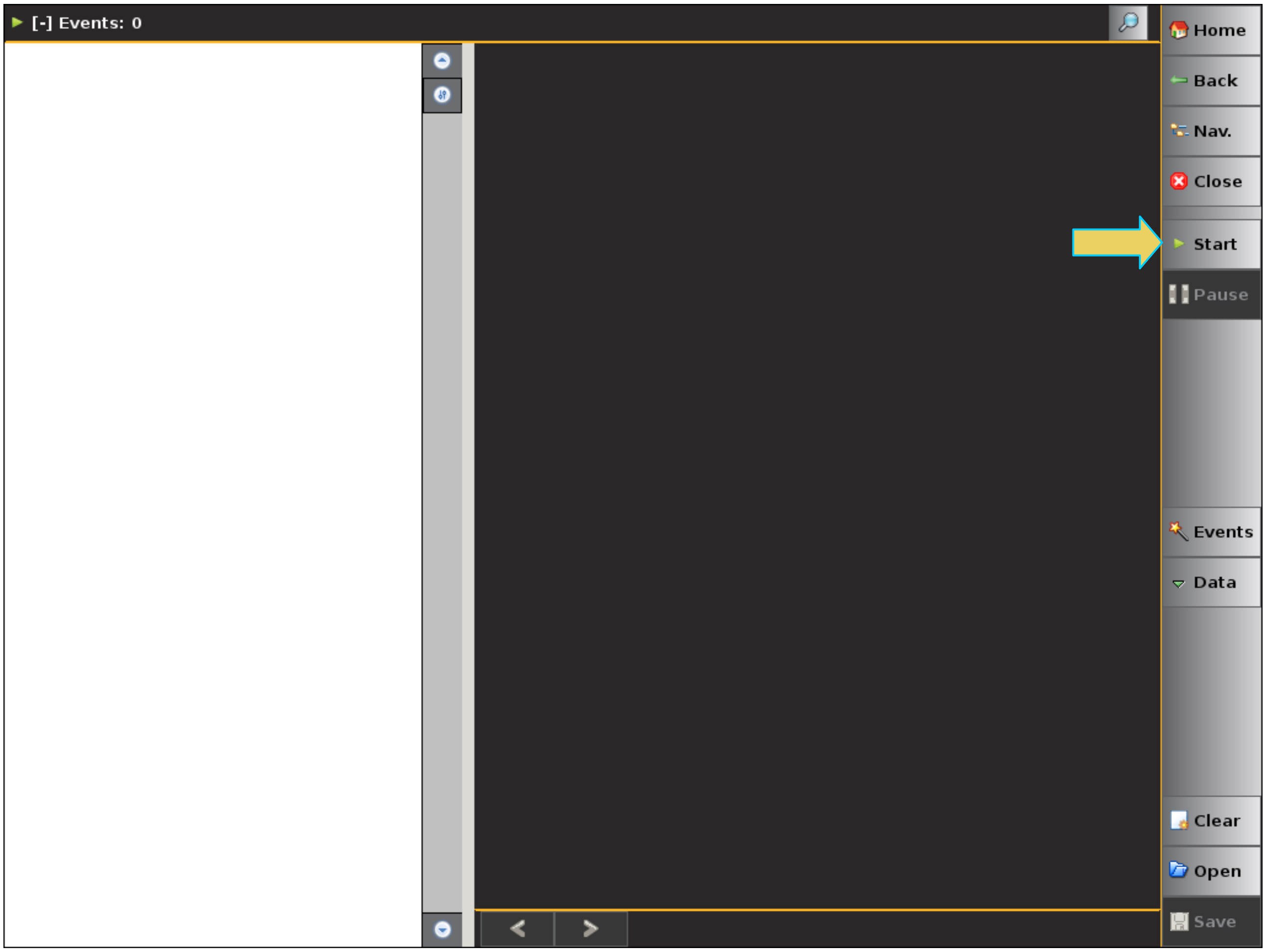


3. Chose the DisplayPort port (Rx port [DP-Rx Analyzer port, i.e. DP-R62] in the example below) from the pull-down menu of the **ACA Event Selection** dialog box. Then select the HDCP events to monitor. Refer to the screen shots below.

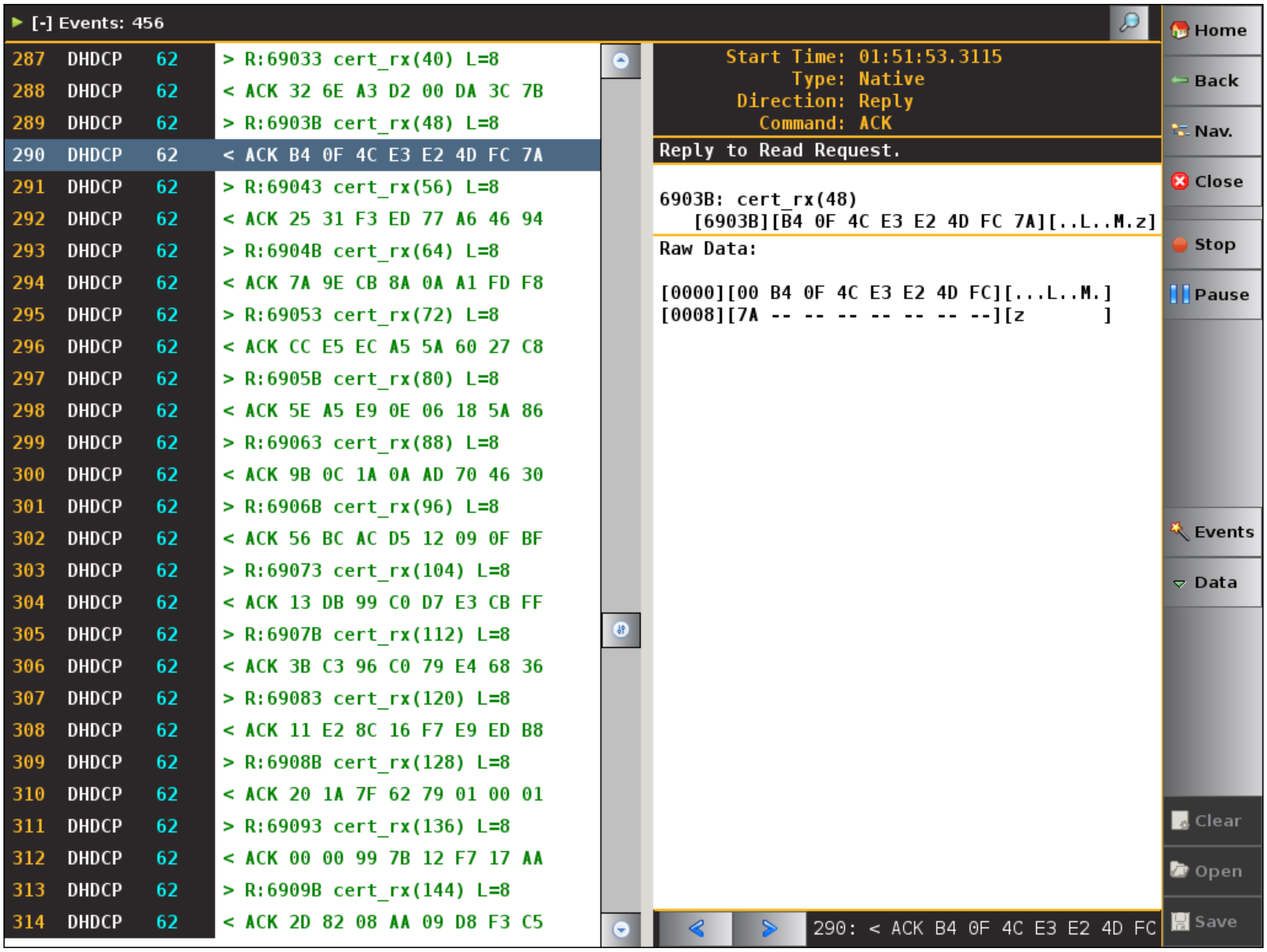

[-] Events: 0
Home
Back
Nav.
Close
Start
Pause
Events
Data
Clear
Open
Save
ACA Event Selection
All Ports
No Ports
HDMI-R10: HDMI 1.4 Protocol Analyzer RX - Card 1
All Events
DDC
HDCP
EDID
CEC
HDMI-R10: HDMI 1.4 Protocol Analyzer RX - Card 1
HDMI-T40: HDMI 1.4 Generator Card 4
HDMI-T41: HDMI 1.4 Generator Card 4
DP-T60: DisplayPort Generator Card 6
DP-T61: DisplayPort Generator Card 6
DP-R62: DisplayPort Protocol Analyzer RX - Card 6
CEC/CBUS
CEC
CBUS
Unselect All on Port
Close



4. Select the Close button on the lower right to close out the dialog box.
5. Touch select the **Start** button to initiate the collection of HDCP 2.2 transactions. Refer to the screen shot example below.

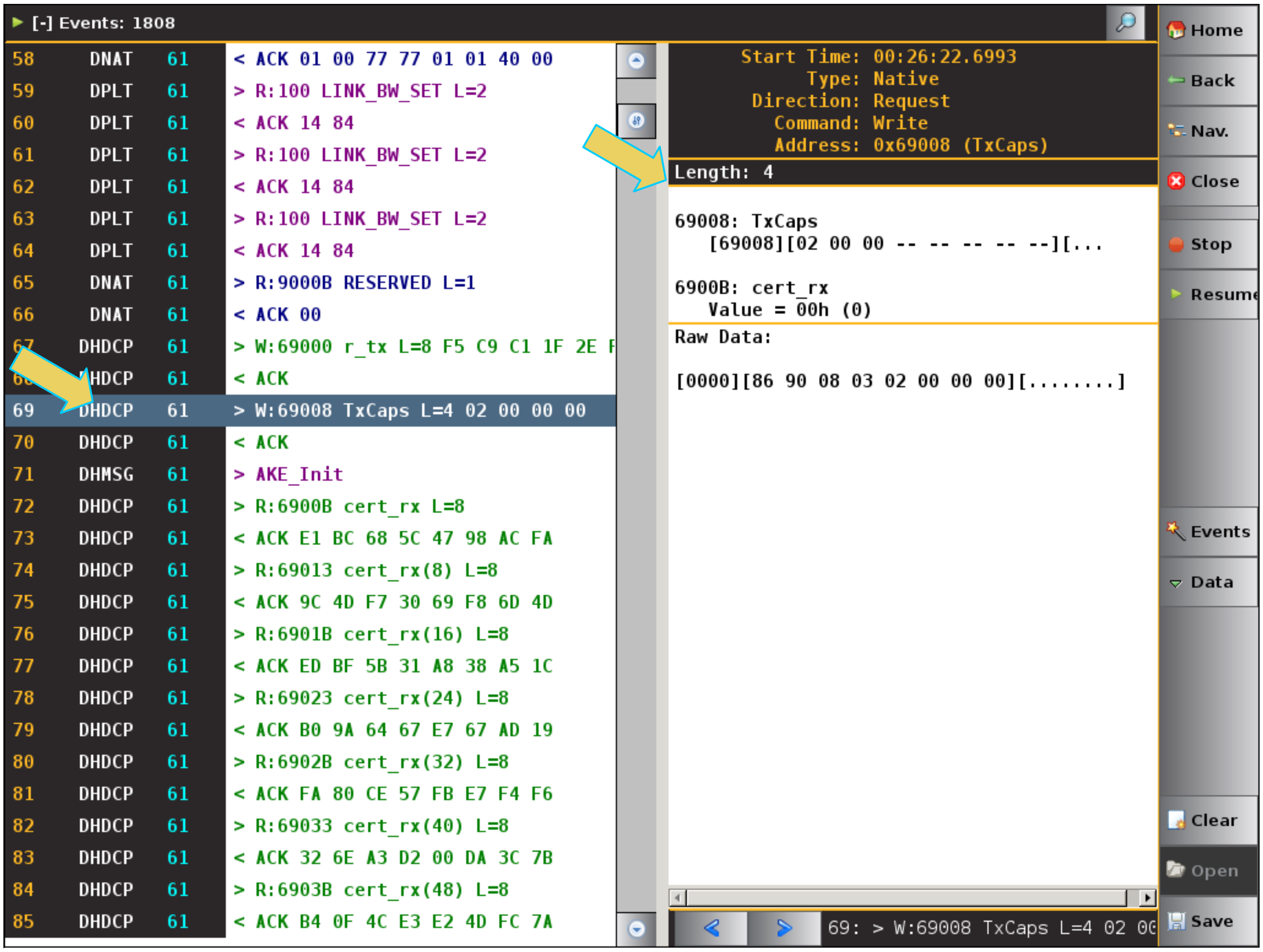


View transaction through the Auxiliary Channel Analyzer as shown below.



Note that you can Pause and Resume at any time. You can scroll through the transactions using the scroll bar. For detailed information on the ACA please refer to Auxiliary Channel Analyzer (ACA) Utilities.

6. Select a record and touch select **Details** to view the details of any particular transaction.



7. Stop the transactions by touch activating the **Stop** button.
8. Optionally, save the transactions to a file using the **Save** button on the lower right.

5 DP Link Training Control

The 980 DP Video Generator / Analyzer module enables you to control the link training with a DisplayPort sink device. The Link Train application enables you to control the link training process. There are two modes: 1) Adaptive Training and 2) Non Adaptive training. Adaptive Training enables you to train based on Lane Count and Link Rates capabilities that you define in the application. When you set the Lane Count and Link Rate in the Adaptive training mode you are emulating a DP source with those capabilities. The link will be established with the appropriate voltage swing level and pre-emphasis necessary to establish a proper link. In the Non-Adaptive mode, you are forcing the Lane Count and Link Rate as well as the voltage swing level and pre-emphasis and bypassing the typical link training function.

Note that you can monitor the Aux Chan link transactions during these link training tests.

5.1 Accessing the Link Training Control application

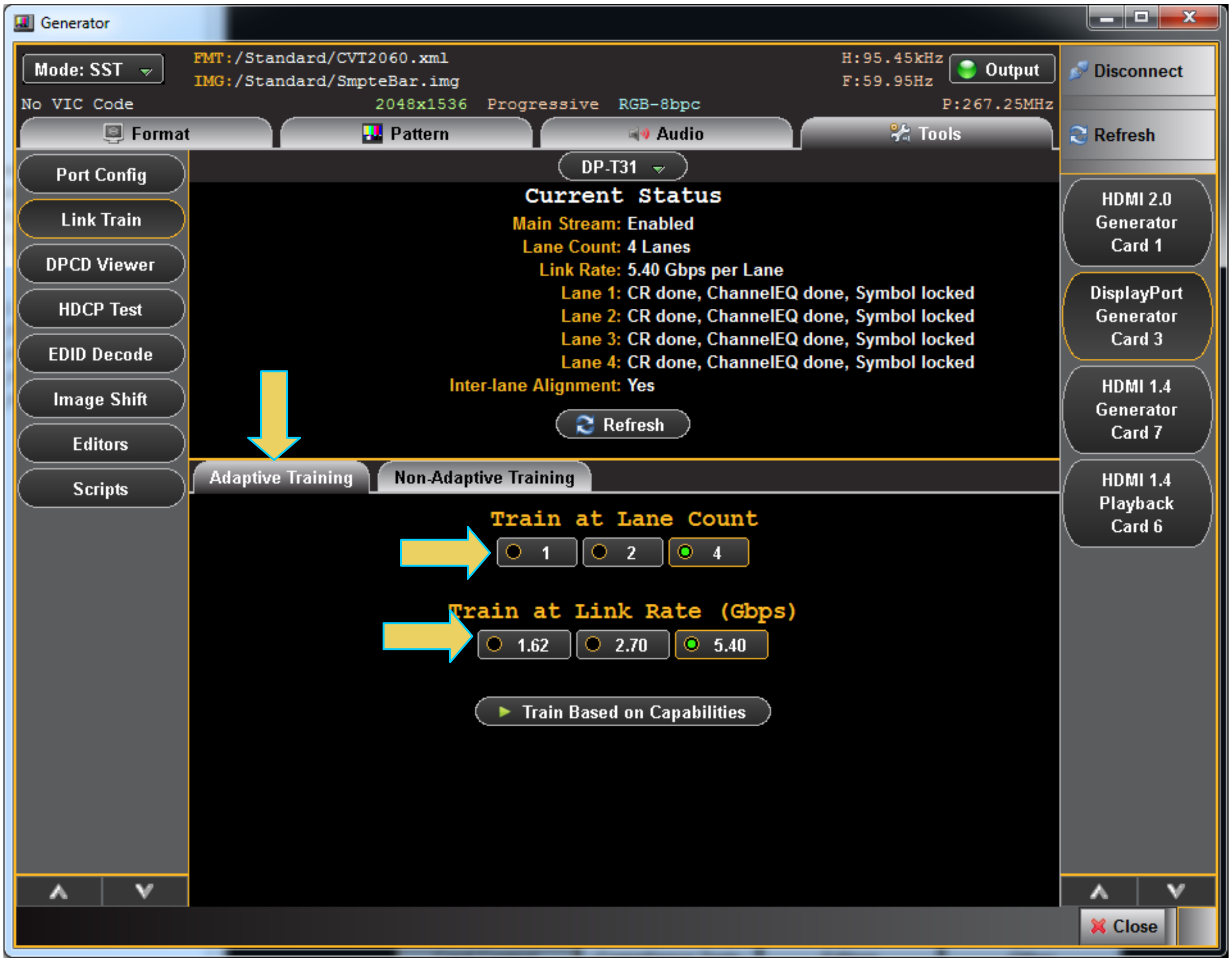
Use the following procedure to test link training with your DP display device. This procedure assumes that you have already selected a DP VESA format and a test pattern to meet your test application requirements.

1. Access the **Link Train** control application through the **Tools** tab on the 980 DP Video Generator / Analyzer module interface as shown below.

2. Select the DP Tx port on the module from the pull-down menu. Use the port that is connected to the DP display that you are testing.

   The Link Train application screen is shown below.

3. Select the link training mode tab (Adaptive or Non-Adapative) in accordance with your requirements. Adaptive selection shown in the screen below.



4. Select the **Train at Lane Count** and **Train at Link Rate** parameters using the radio buttons provided (4 lanes and 5.4Gbps link rate shown in the example below).

5. Click on the **Train Based on Capabilities** activation button to initiate the link training.

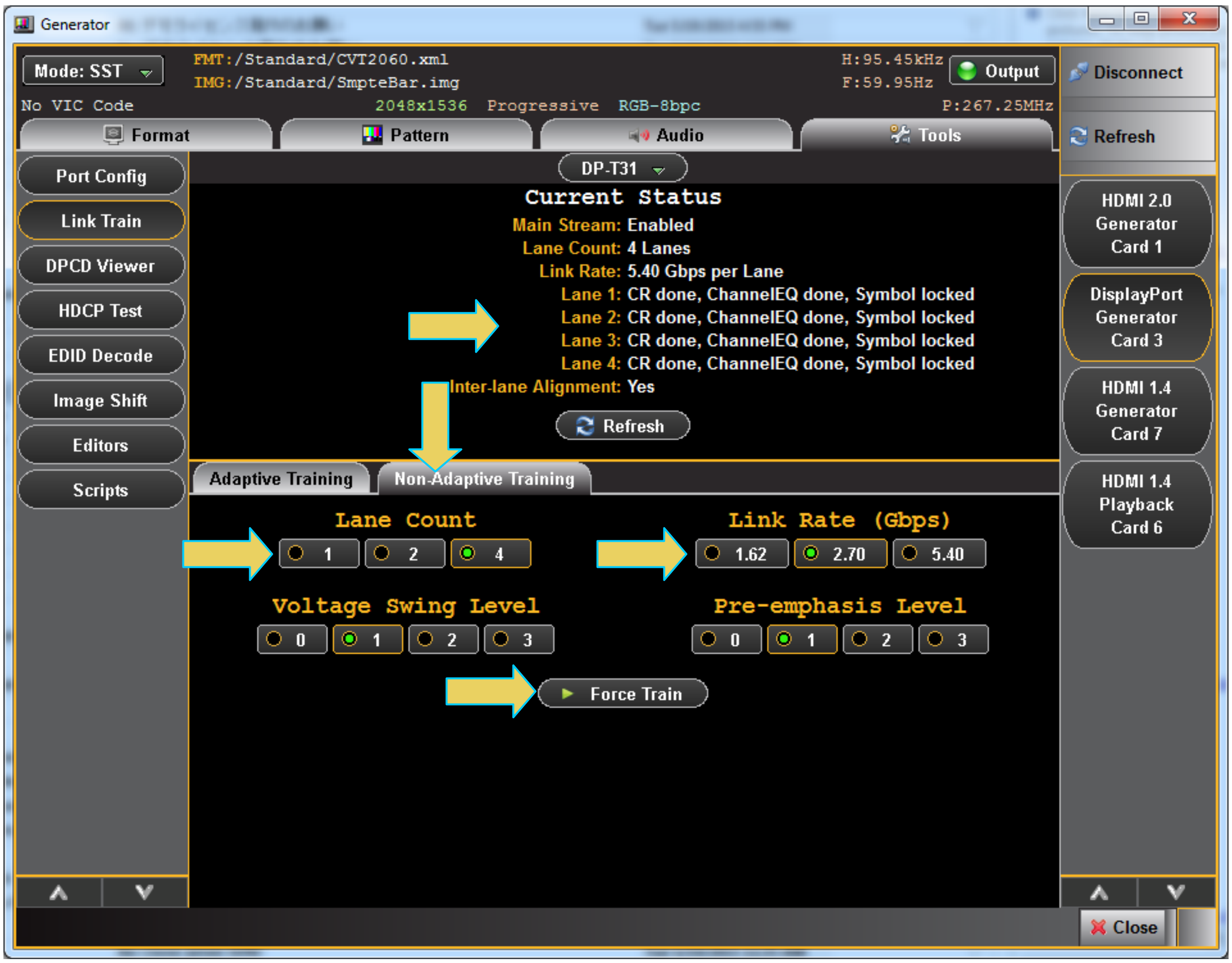
   The results and status of the link training will be shown on the Link Train application screen as shown below.

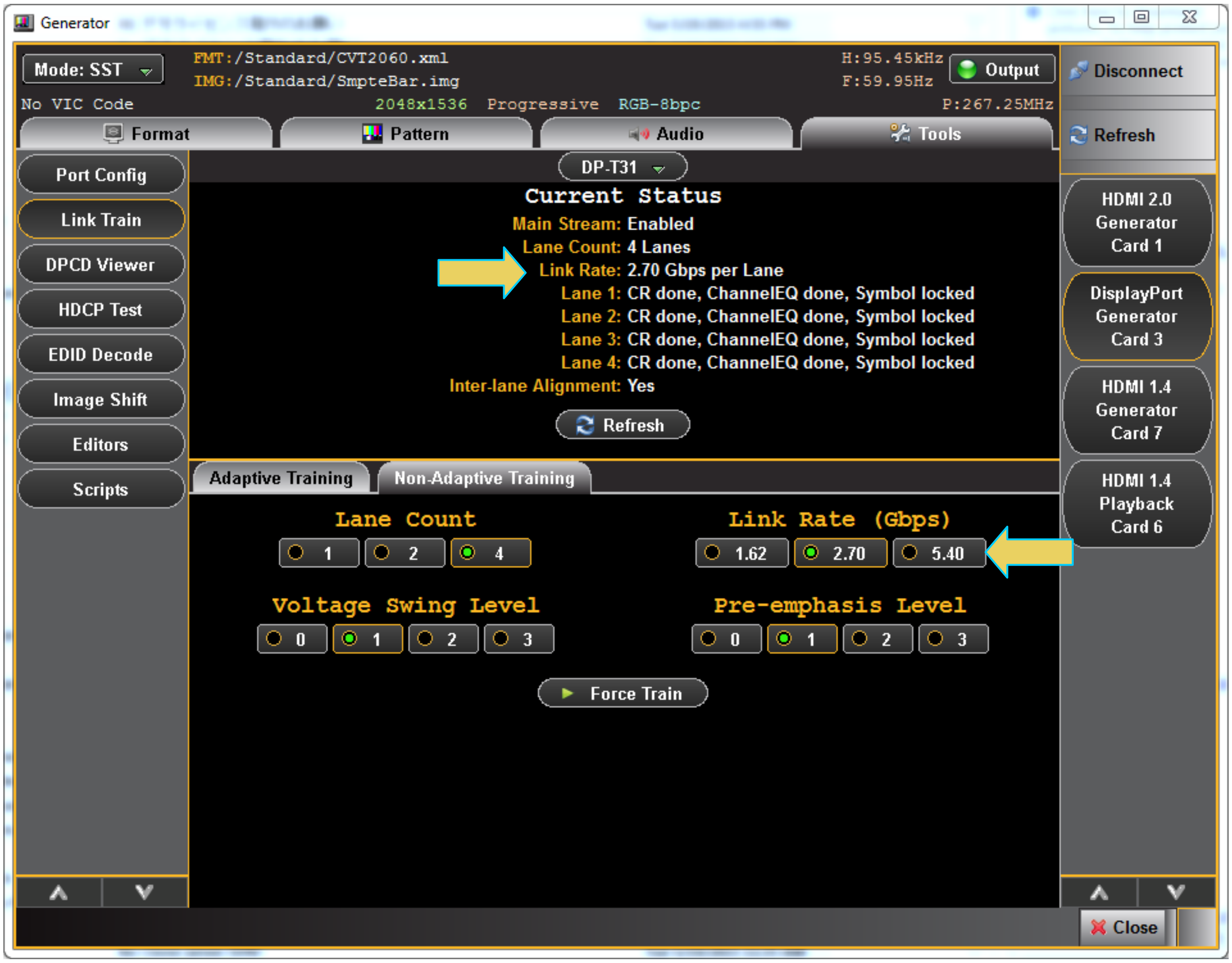
   Note: You can monitor the link training transactions with the Auxiliary Channel Analyzer (ACA) Auxiliary Channel Analyzer (ACA) Utilities if desired.

6. Optionally, select the **Non-Adapative** link training mode using the tab provided.
7. Specify the **Lane Count**, **Link Rate**, **Voltage Swing Level** and **Pre-emphasis** level parameters.
8. Click on the **Force Train** activation button to initiate the link establishment using the parameters you have specified.

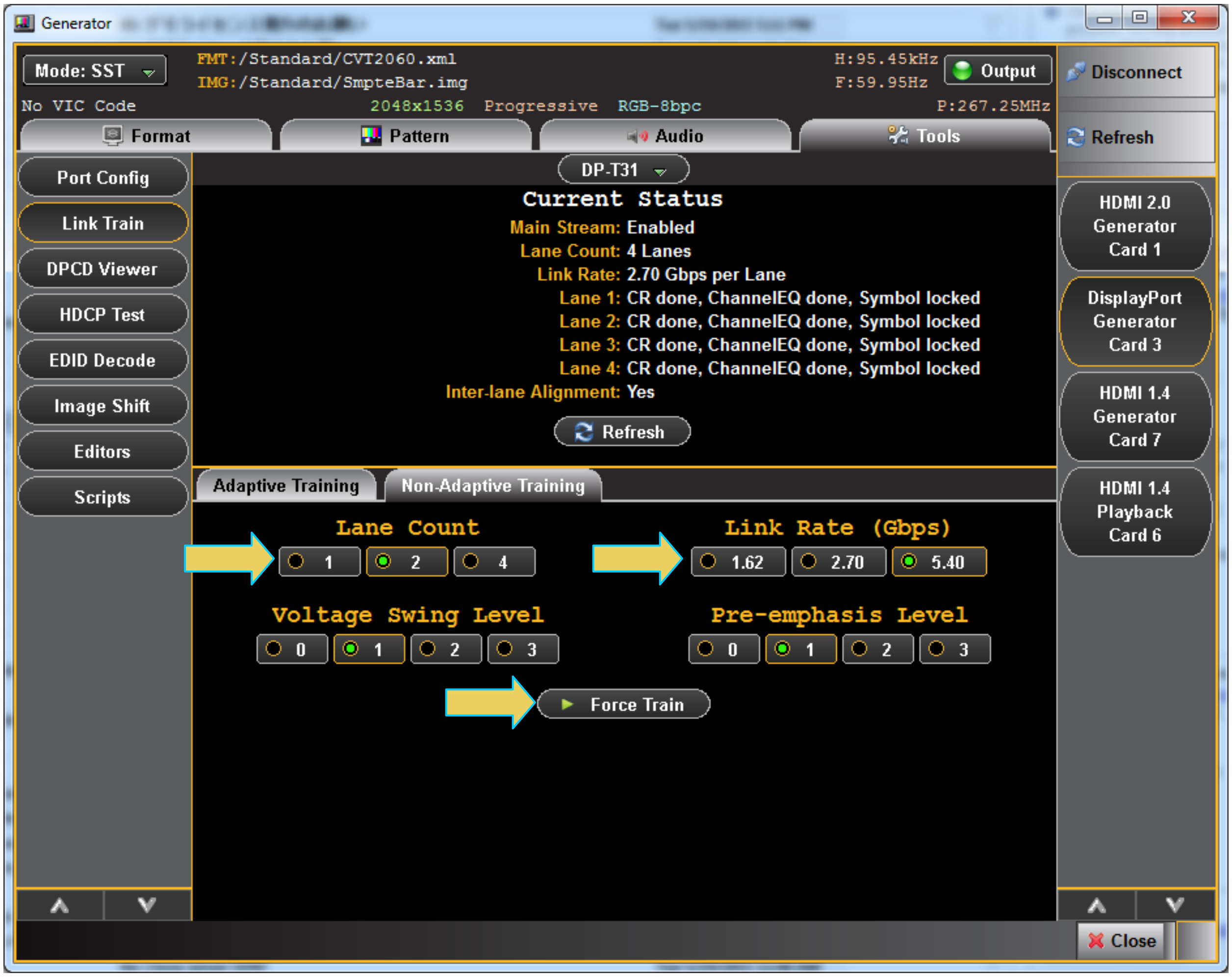
   Note: You can monitor the link training transactions with the Auxiliary Channel Analyzer (ACA) Auxiliary Channel Analyzer (ACA) Utilities if desired.

   A few examples are shown below with various settings and the resulting status.

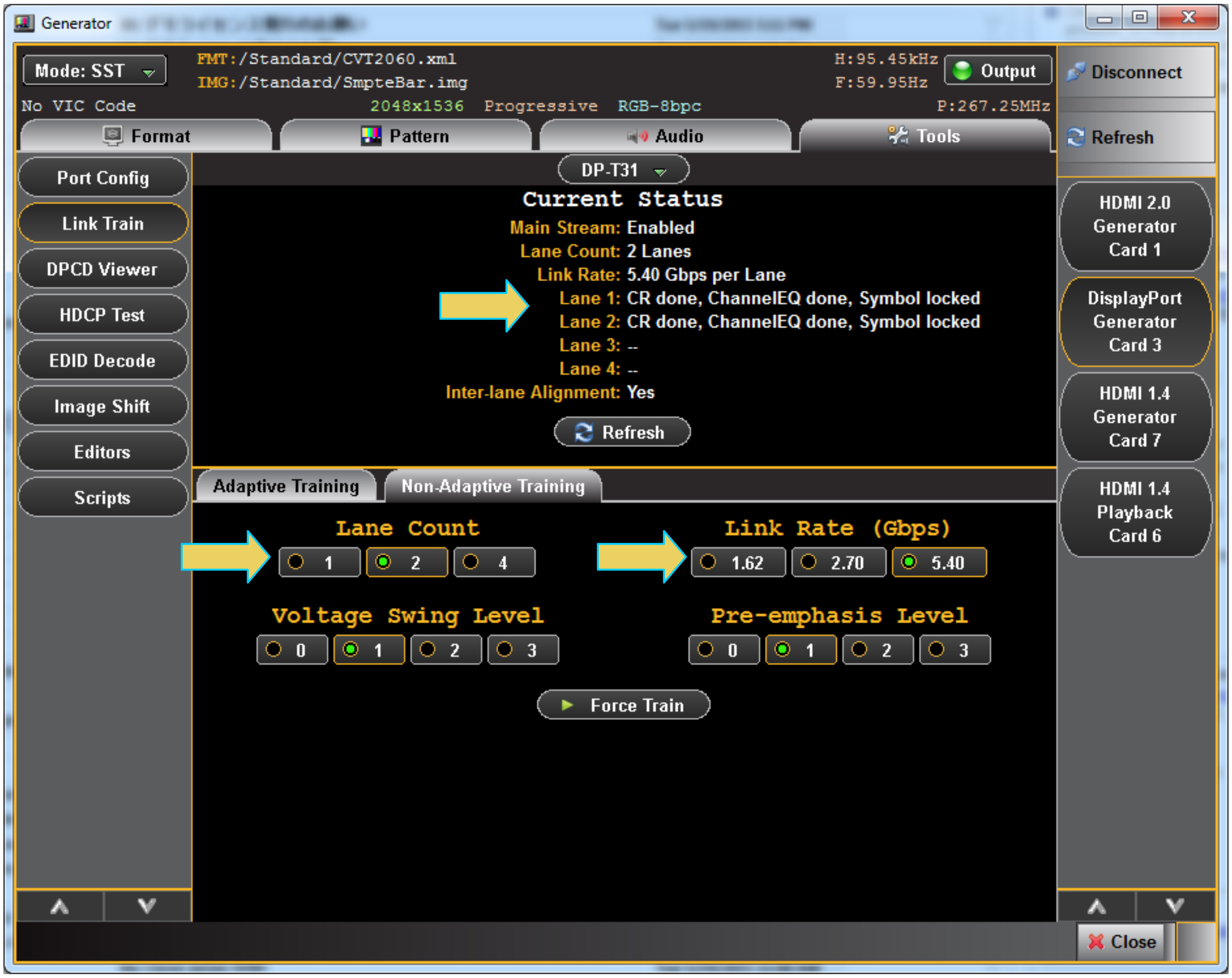




A second example with 2 lanes at 5.4Gb/s:



The result of the above configuration after forcing link training:



Generator
Mode: SST
FMT:/Standard/CVT2060.xml
IMG:/Standard/SmpteBar.img
H:95.45kHz
F:59.95Hz
Output
Disconnect
No VIC Code
2048x1536 Progressive RGB-8bpc
P:267.25MHz
Format
Pattern
Audio
Tools
Refresh
Port Config
Link Train
DPCD Viewer
HDCP Test
EDID Decode
Image Shift
Editors
Scripts
DP-T31
Current Status
Main Stream: Enabled
Lane Count: 2 Lanes
Link Rate: 5.40 Gbps per Lane
Lane 1: CR done, ChannelEQ done, Symbol locked
Lane 2: CR done, ChannelEQ done, Symbol locked
Lane 3: --
Lane 4: --
Inter-lane Alignment: Yes
Refresh
HDMI 2.0 Generator Card 1
DisplayPort Generator Card 3
HDMI 1.4 Generator Card 7
HDMI 1.4 Playback Card 6
Adaptive Training
Non-Adaptive Training
Lane Count
1 2 4
Link Rate (Gbps)
1.62 2.70 5.40
Voltage Swing Level
0 1 2 3
Pre-emphasis Level
0 1 2 3
Force Train
Close

6 DP Multi-Stream Transport (MST) Testing

The 980 DP1.2 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 depending on bandwidth (resolutions) with a depth of one. You can configure the MST topology using a graphical interface. The optional Auxiliary Channel Analyzer (ACA) utility depicts the MST negotiations with the connected MST Rx device.

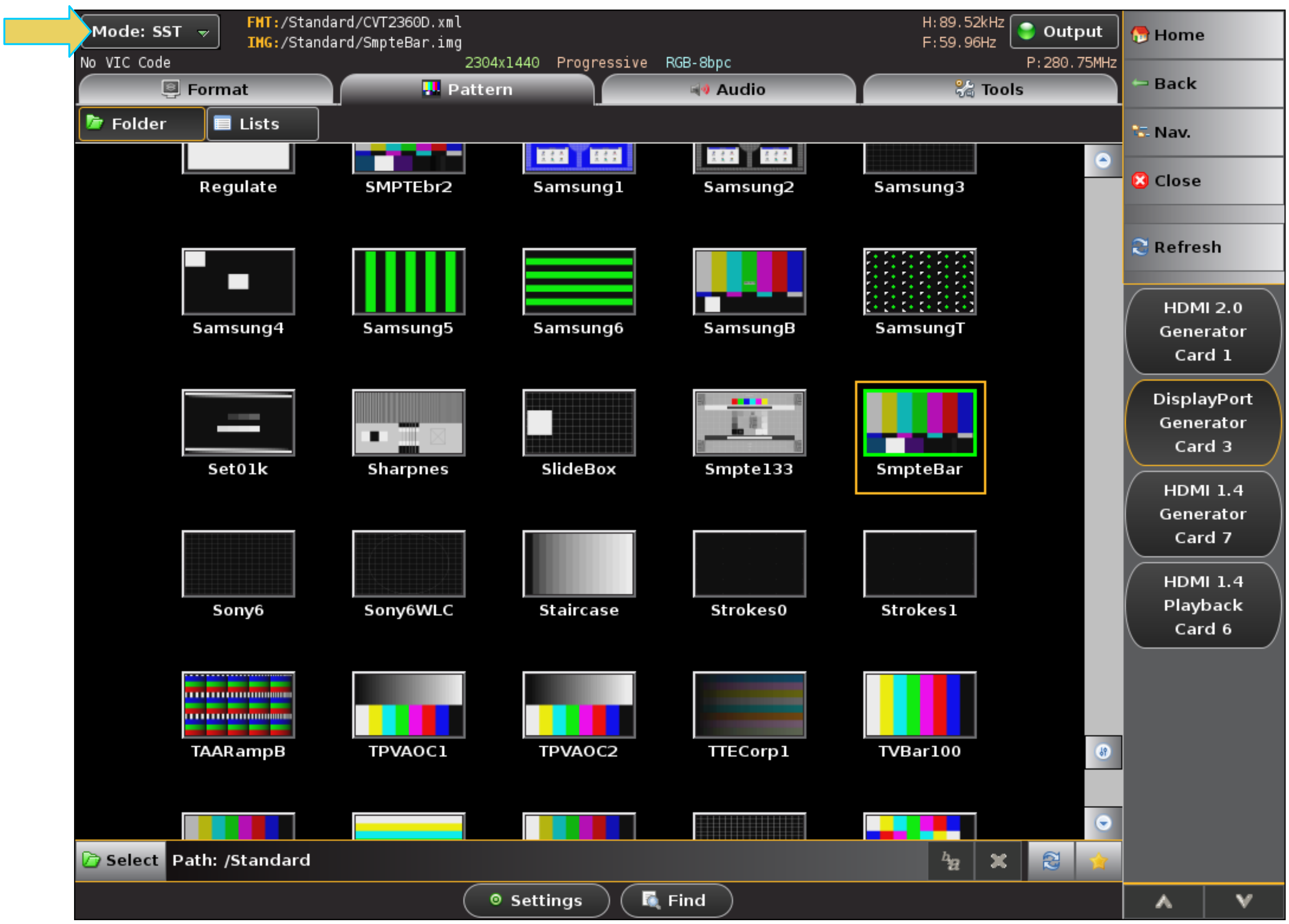
When MST is configured, the same video pattern and audio signal is transmitted to all downstream nodes. There is a number indicator that appears on the upper left screen of the downstream MST sink that identifies which stream is being delivered.

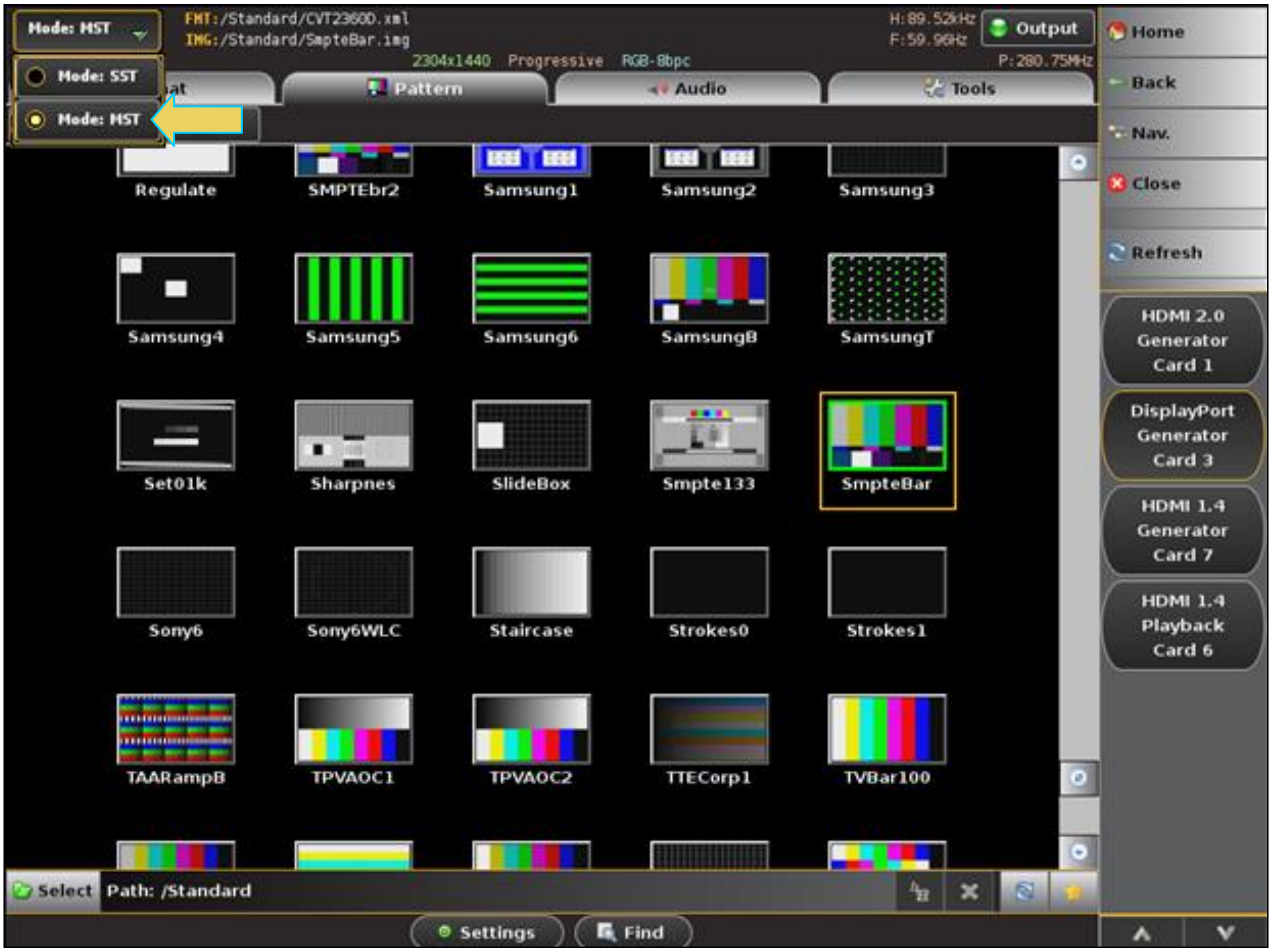
Note: Only video generator Port 2 supports the MST function.

6.1 Accessing the MST Topology window

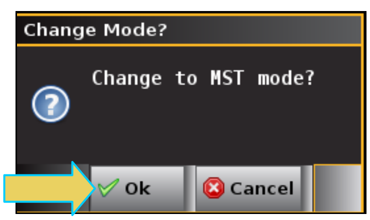
Use the following procedure to test MST on a connected MST-Capable sink device.

1. At the Generator dialog box, select MST from the Interface drop down menu. Refer to the screen example below.



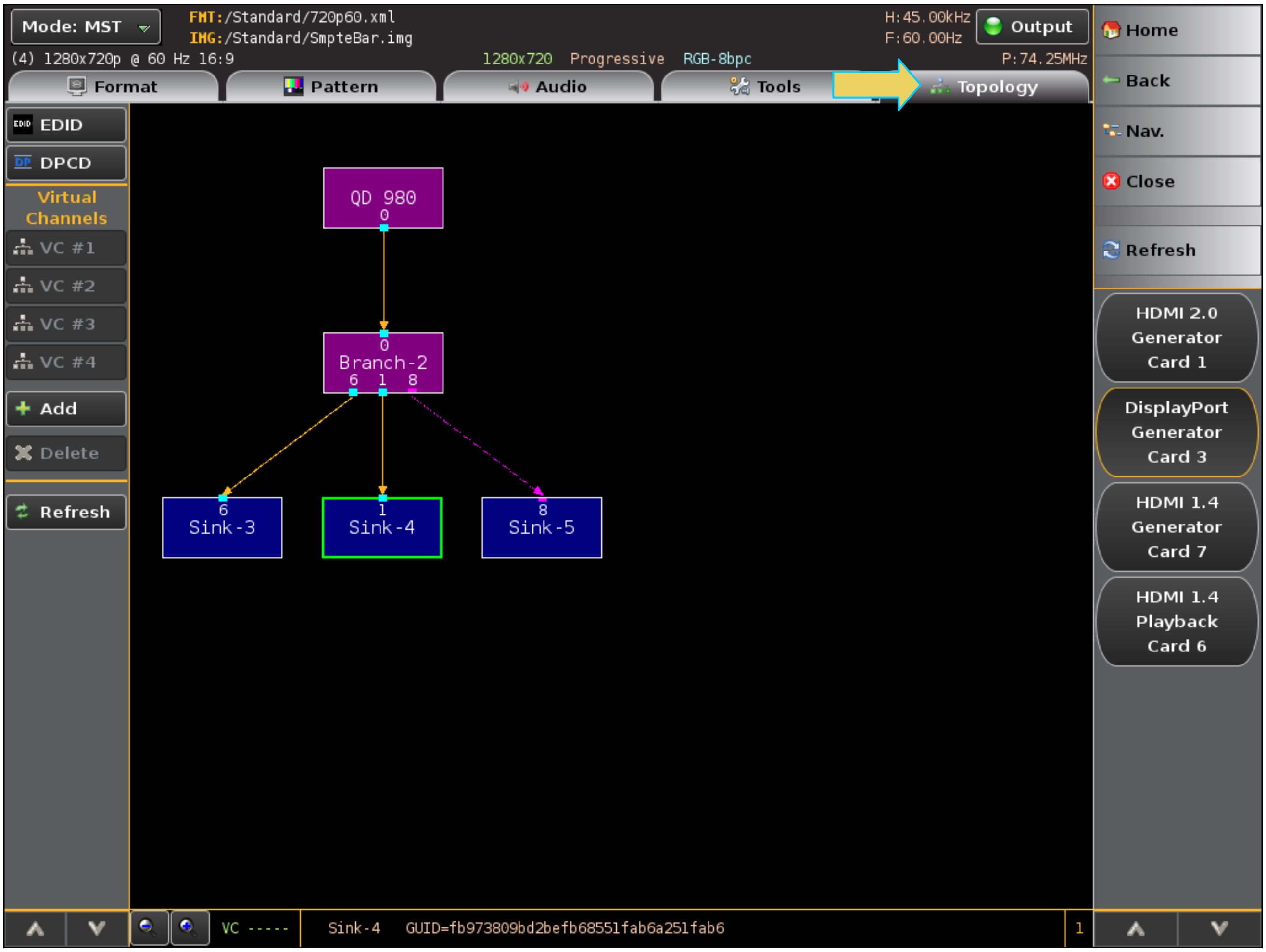


The following confirmation dialog box appears:



Click OK.

2. From the Generator window, access the **Topology** tab to control the MST application as shown below.



3. Access the **Topology** control application through the **Tools** tab on the 980 DP Video Generator module interface as shown below.

   The table below summarizes the graphical controls of the MST Topology window.

MST Topology Window	
Button	**Description**
EDID	Enables you to read the EDID of the selected downstream MST Rx node. **Note**: This activation button is not currently functional. To read the EDID of a downstream MST node, you must use the EDID read in the **Tools** menu.
DPCD	Enables you to read the DPCD of the selected downstream MST Rx node. **Note**: This activation button is not currently functional. To read the DPCD of a downstream MST node, you must use the DPCD read in the **Tools** menu.
Virtual Channels **VC #1…VC #4**	This capability is future.
Add	Enables you to add a downstream MST Rx node.
Delete	Enables you to delete a downstream MST Rx node.

MST Topology Window	
Button	**Description**
Refresh	Refreshes the view.

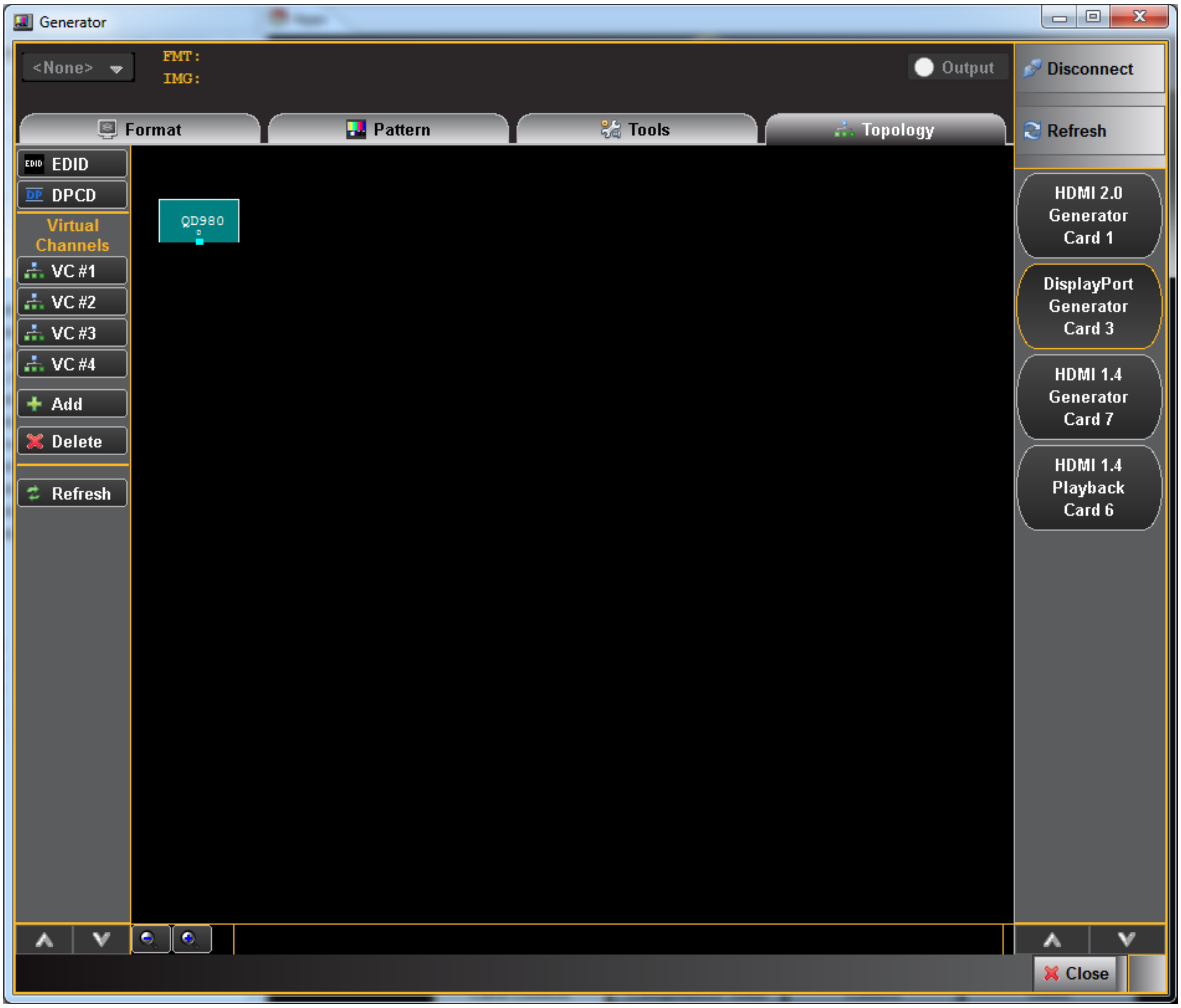
6.2 Configuring the number of downstream MST nodes.

Use the following procedure to configure the number of downstream MST nodes.

To add an MST node(s):

1. Click on the **Add** 

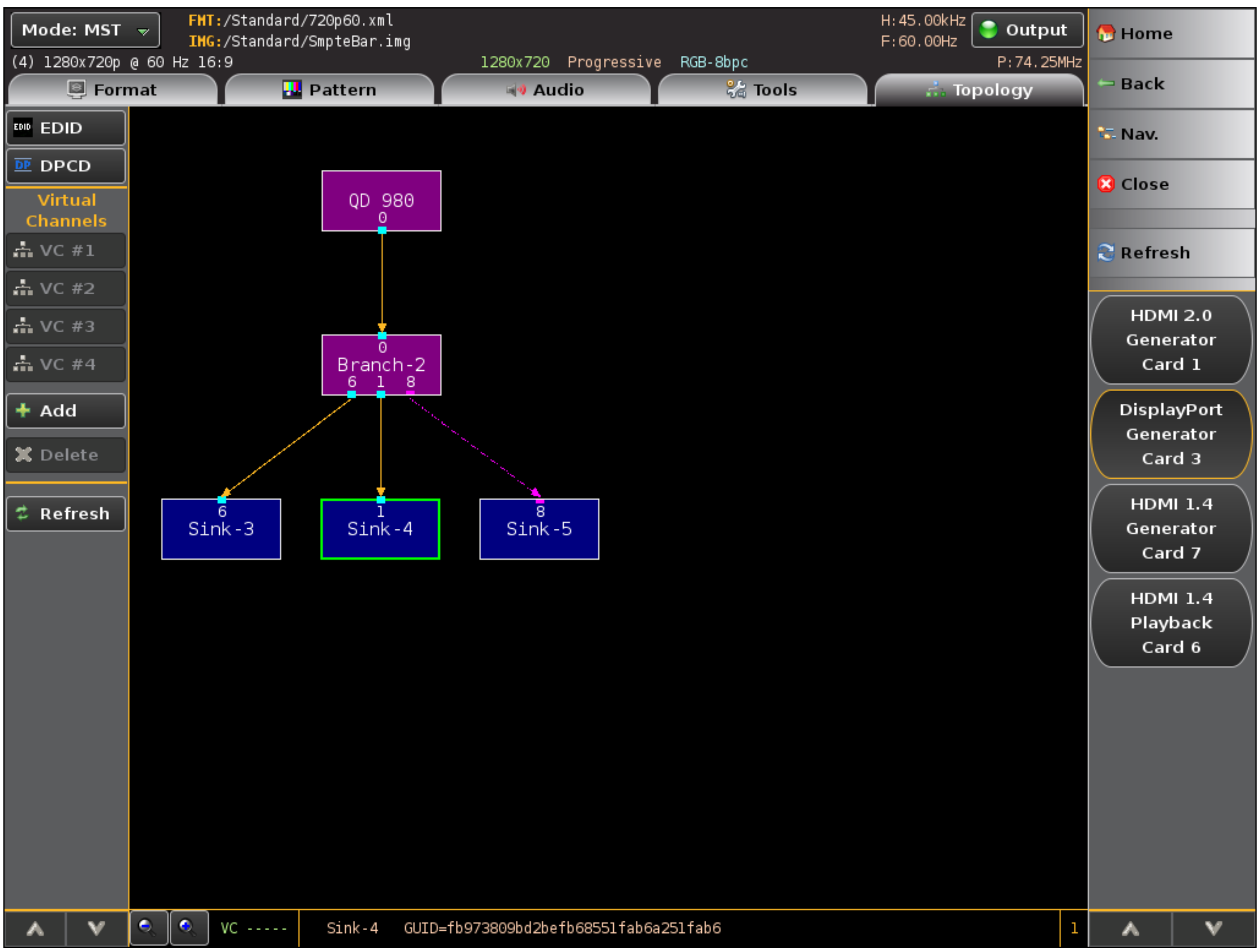
activation button on the left to add an MST node. The downstream nodes are shown in blue. Click Refresh if necessary. Refer to the screen example below.

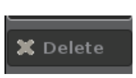


Note: The **VC #x** buttons and the **EDID** and **DPCD** activation buttons are not currently functional.

The following dialog box appears enabling you to select the number of downstream MST nodes (Virtual Channels).

The topology appears as shown below.



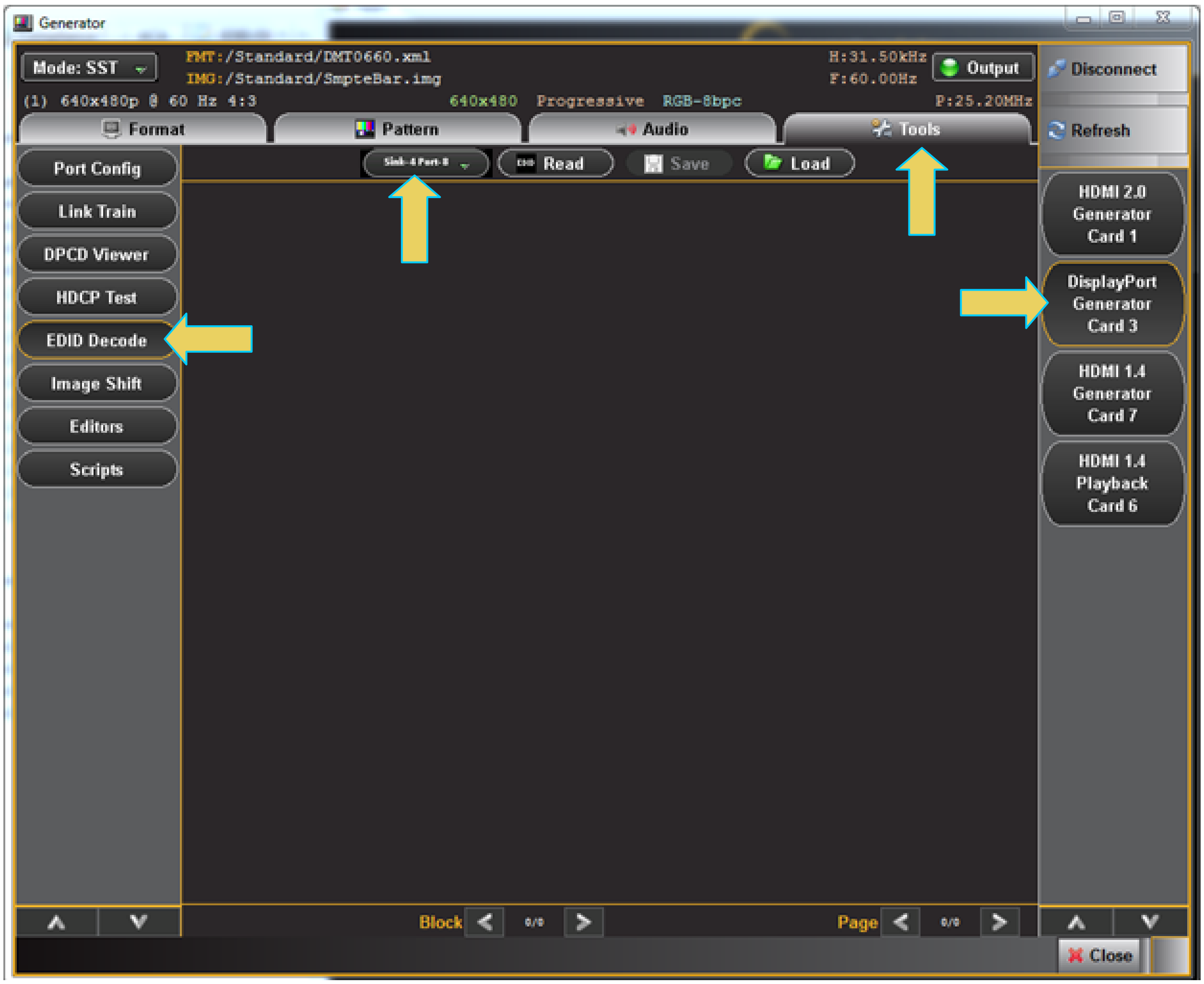
2. Click on the **Delete**  activation button on the left to delete an MST node. Click Refresh if necessary. Refer to the screen example above. A confirmation dialog box will appear. Click OK.

6.3 Reading the EDID of a downstream MST node.

Use the following procedures to read the EDID of any downstream MST Rx node. Currently the EDID button shown on the left panel of the **Topology** window is not functional. To read the EDID of a downstream not you have to use the EDID read function in the **Tools** menu.

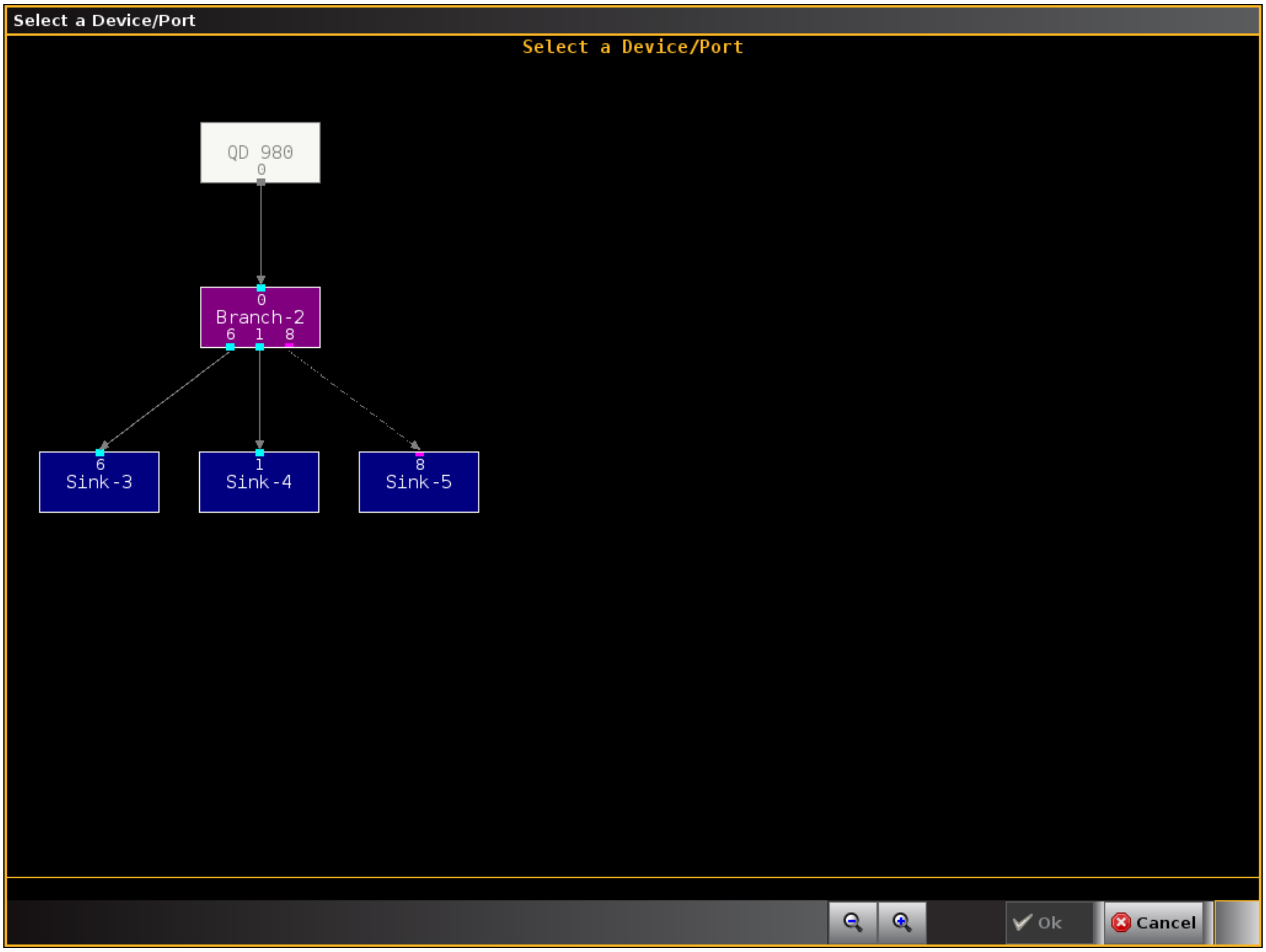
To read the EDID of a downstream MST Rx node:

1. From the main window of the 980 DP Video Generator / Analyzer module, select the **Tools** tab.
2. Select EDID Decode and select the virtual port (downstream MST node) whose EDID you wish to read. Refer to the following screen example.

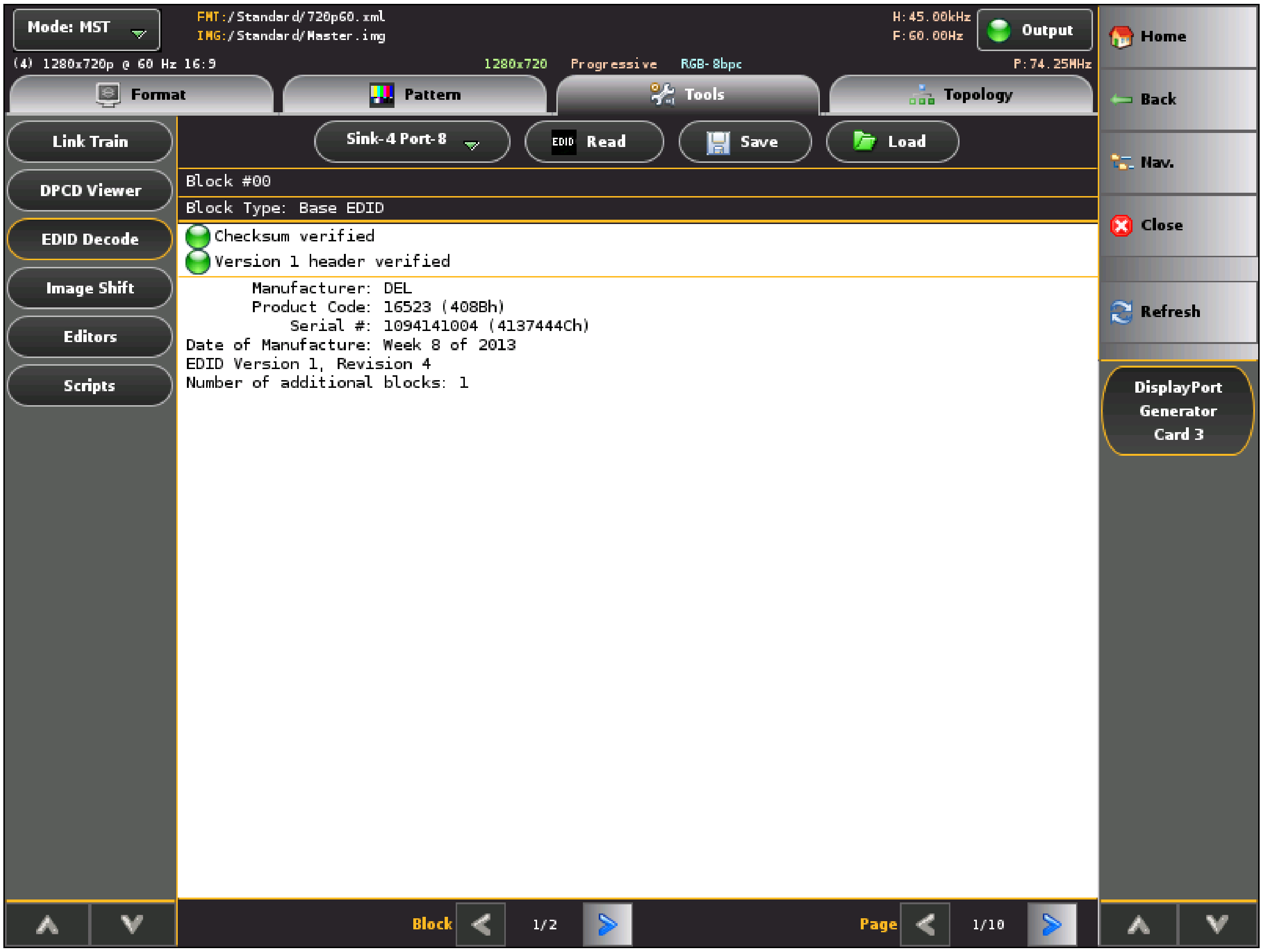


A window showing all the MST topology will appear.

3. The downstream nodes are shown in blue. Click Refresh if necessary. Select the desired downstream MST Rx node (Sink-3, Sink-4, Sink-5 in the example below).



The EDID will appear as shown in the following screen example. Follow procedures provided earlier in this User Guide to read each page of the EDID.

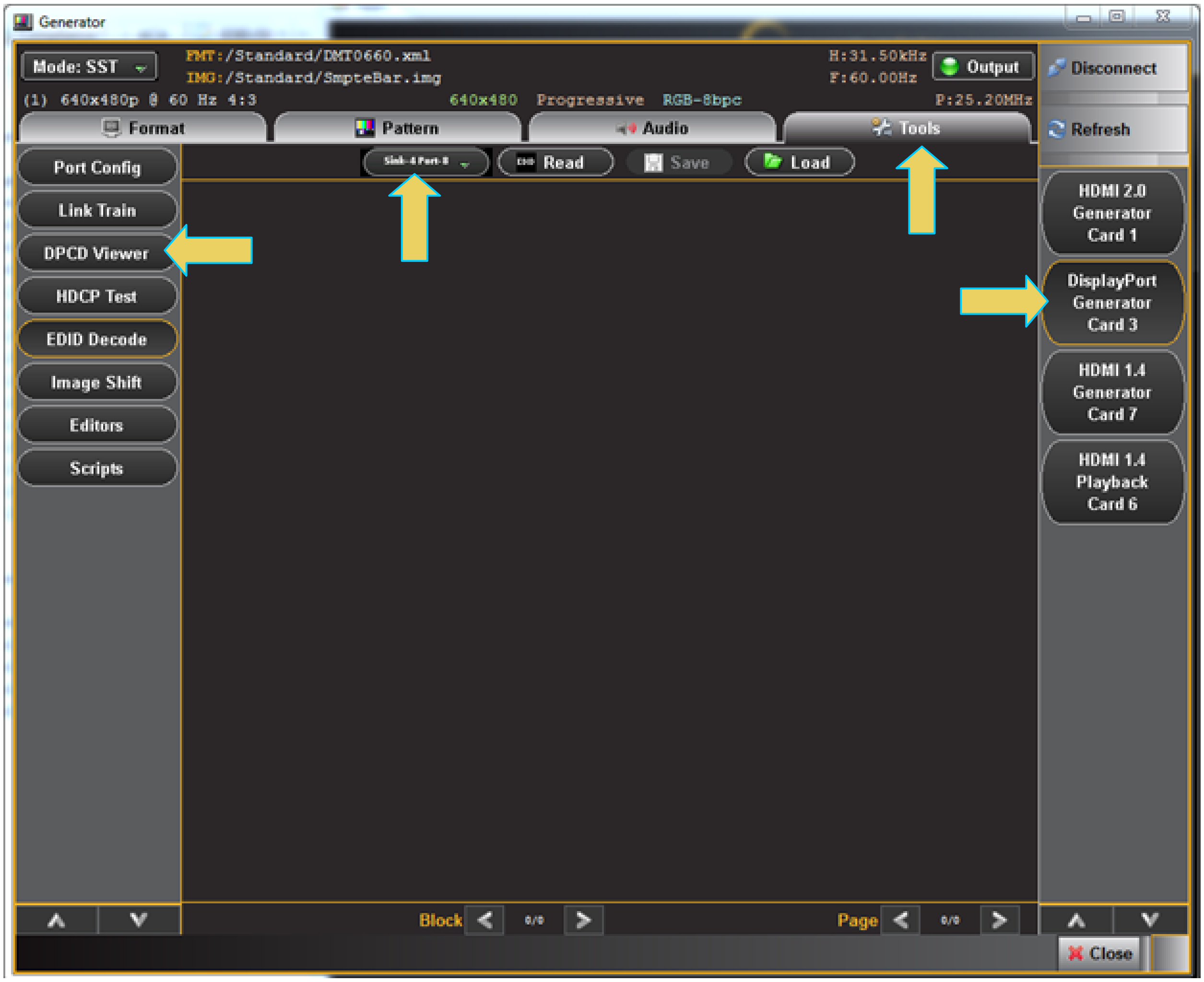


6.4 Reading the DPCD of a downstream MST node.

Use the following procedures to read the EDID of any downstream MST Rx node. Currently the DPCD button shown on the left panel of the **Topology** window is not functional. To read the DPCD of a downstream not you have to use the DPCD read function in the **Tools** menu.

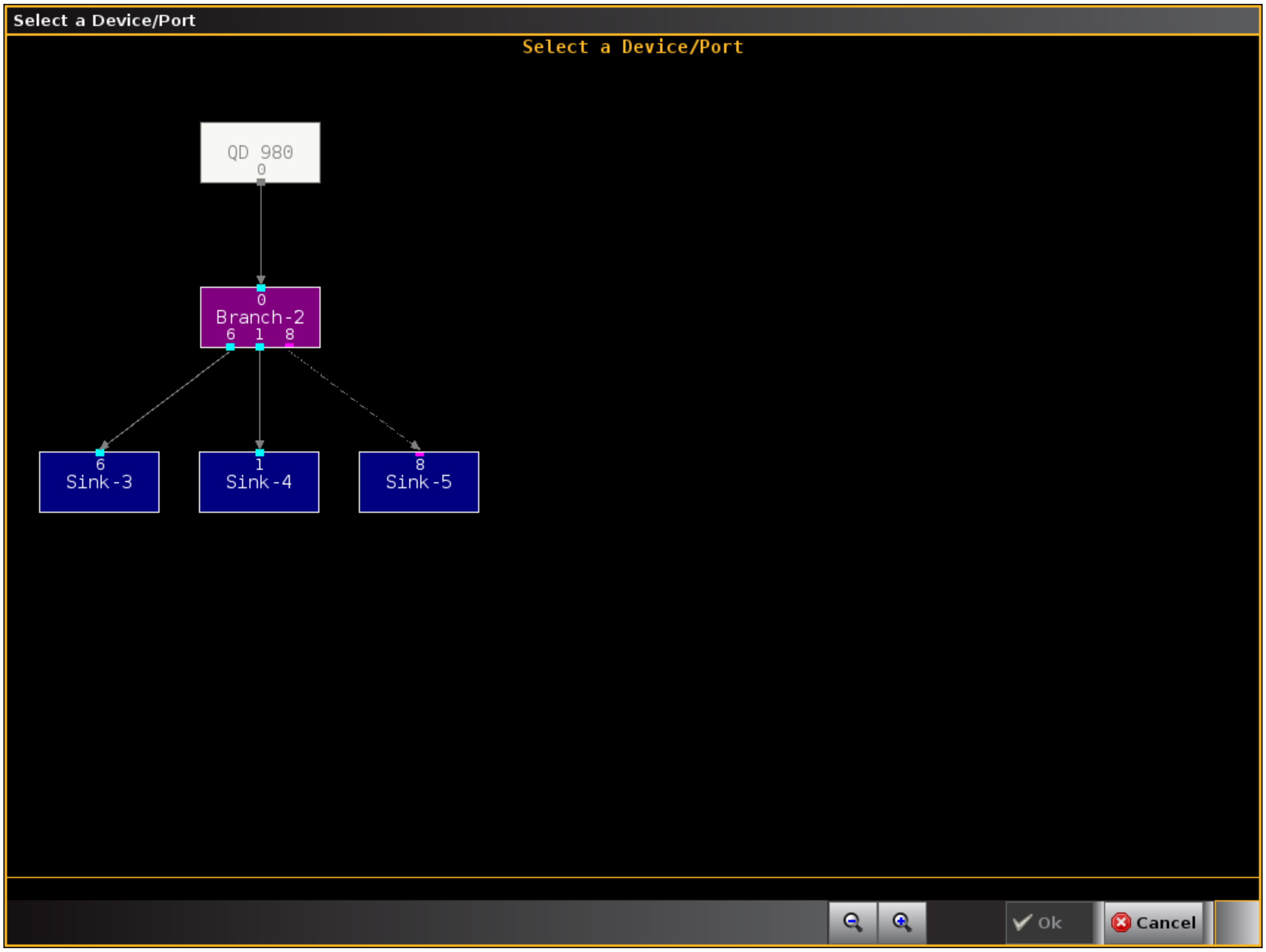
To read the DPCD of a downstream MST Rx node:

1. From the main window of the 980 DP Video Generator / Analyzer module, select the **Tools** tab.
2. Select DPCD Decode and select the virtual port (downstream MST node) whose DPCD you wish to read. Refer to the following screen example.

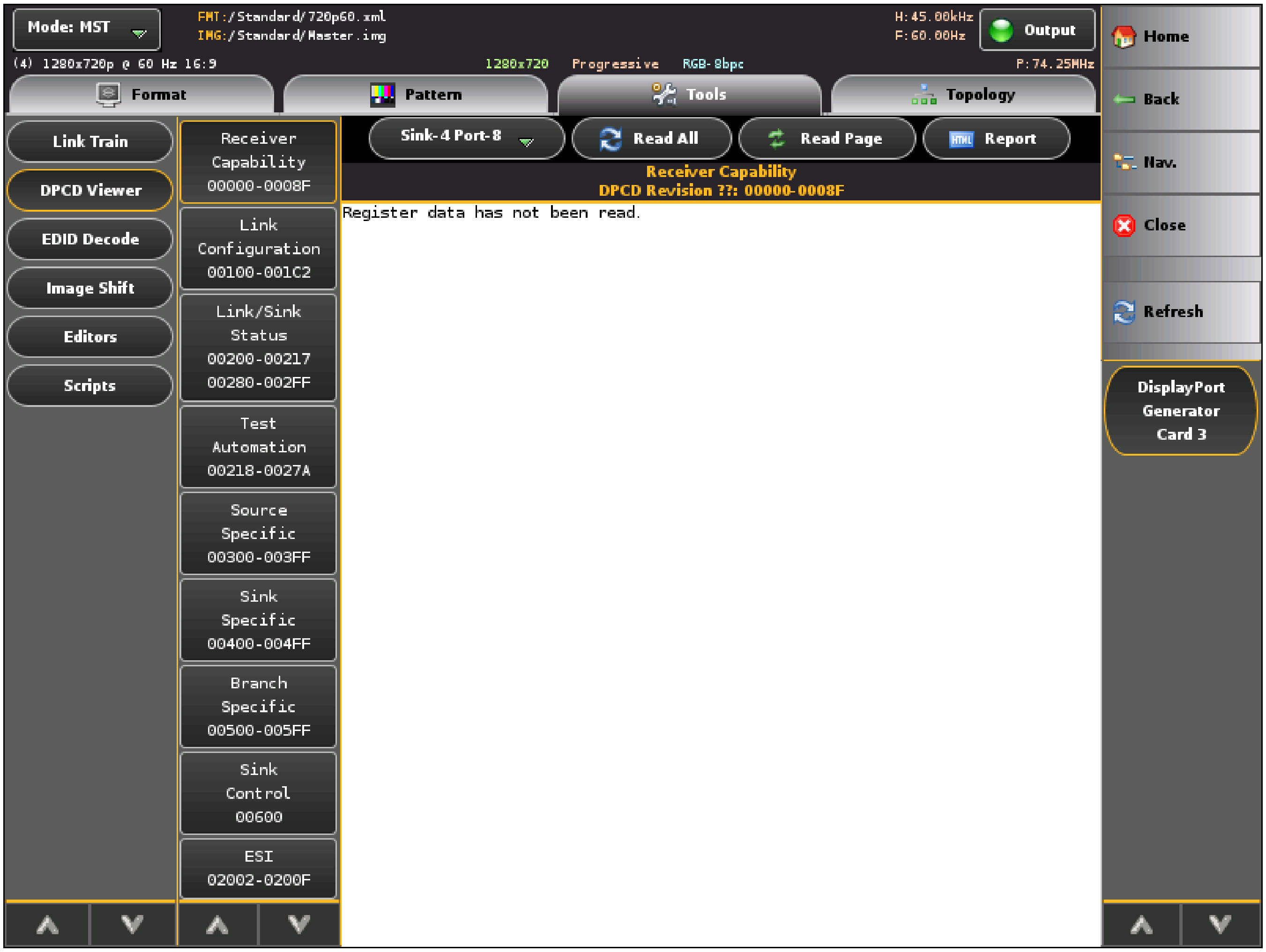


A window showing all the MST topology will appear.

3. The downstream nodes are shown in blue. Click Refresh if necessary. Select the desired downstream MST Rx node (Sink-3, Sink-4, Sink-5 in the example below).

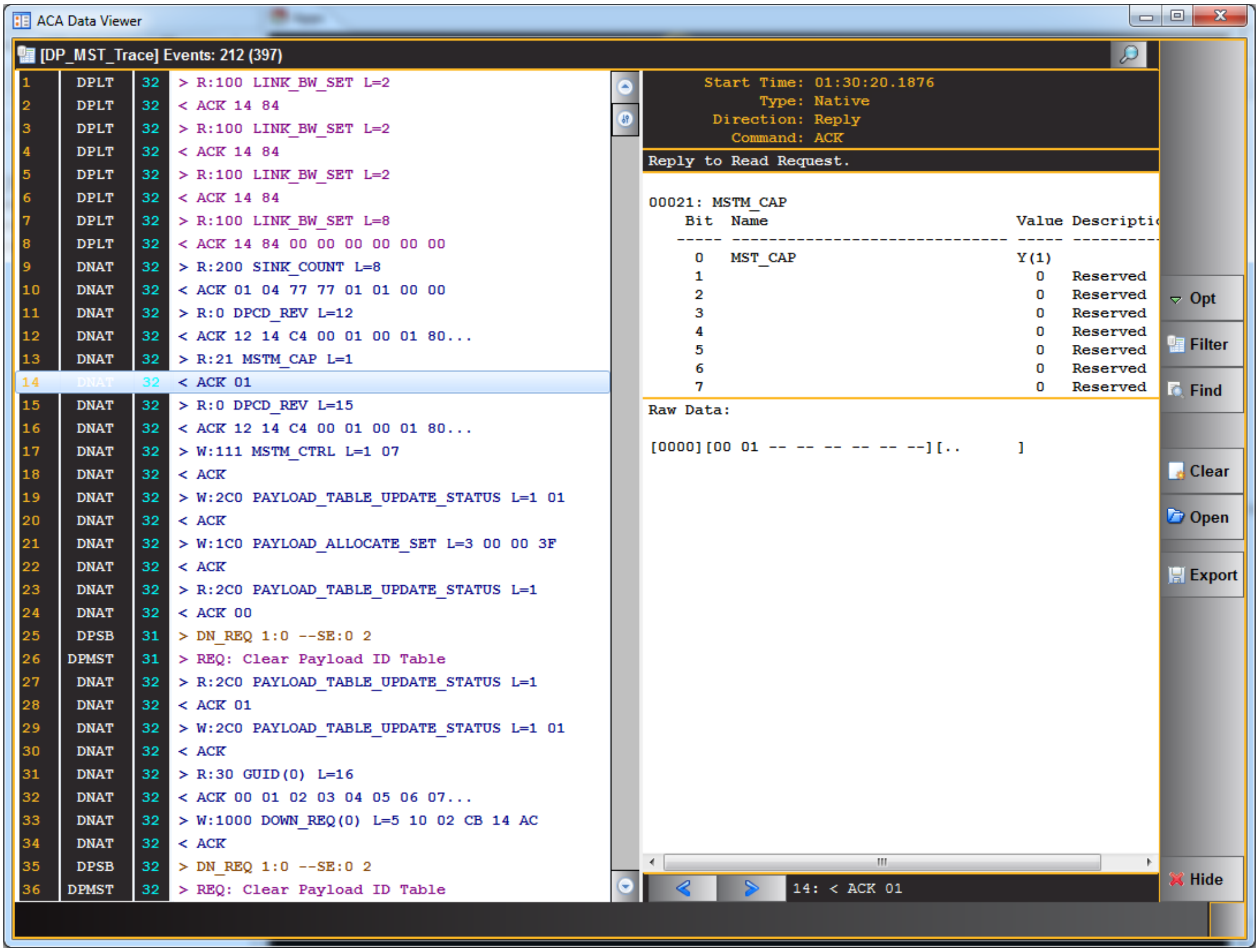


The DPCD will appear as shown in the following screen example. Follow procedures provided earlier in this User Guide to read each register set Viewing the DPCD of a connected display.



6.5 View the MST transactions on the Auxiliary Channel Analyzer (ACA).

Refer to the ACA section Monitoring the DisplayPort auxiliary channels with the ACA utilities for procedures in monitoring the MST transactions associated with the MST negotiations. A sample screen shot is shown below.


ACA Data Viewer
[DP_MST_Trace] Events: 212 (397)
1 DPLT 32 > R:100 LINK_BW_SET L=2
2 DPLT 32 < ACK 14 84
3 DPLT 32 > R:100 LINK_BW_SET L=2
4 DPLT 32 < ACK 14 84
5 DPLT 32 > R:100 LINK_BW_SET L=2
6 DPLT 32 < ACK 14 84
7 DPLT 32 > R:100 LINK_BW_SET L=8
8 DPLT 32 < ACK 14 84 00 00 00 00 00 00
9 DNAT 32 > R:200 SINK_COUNT L=8
10 DNAT 32 < ACK 01 04 77 77 01 01 00 00
11 DNAT 32 > R:0 DPCD_REV L=12
12 DNAT 32 < ACK 12 14 C4 00 01 00 01 80...
13 DNAT 32 > R:21 MSTM_CAP L=1
14 DNAT 32 < ACK 01
15 DNAT 32 > R:0 DPCD_REV L=15
16 DNAT 32 < ACK 12 14 C4 00 01 00 01 80...
17 DNAT 32 > W:111 MSTM_CTRL L=1 07
18 DNAT 32 < ACK
19 DNAT 32 > W:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1 01
20 DNAT 32 < ACK
21 DNAT 32 > W:1C0 PAYLOAD_ALLOCATE_SET L=3 00 00 3F
22 DNAT 32 < ACK
23 DNAT 32 > R:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1
24 DNAT 32 < ACK 00
25 DPSB 31 > DN_REQ 1:0 --SE:0 2
26 DPMST 31 > REQ: Clear Payload ID Table
27 DNAT 32 > R:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1
28 DNAT 32 < ACK 01
29 DNAT 32 > W:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1 01
30 DNAT 32 < ACK
31 DNAT 32 > R:30 GUID(0) L=16
32 DNAT 32 < ACK 00 01 02 03 04 05 06 07...
33 DNAT 32 > W:1000 DOWN_REQ(0) L=5 10 02 CB 14 AC
34 DNAT 32 < ACK
35 DPSB 32 > DN_REQ 1:0 --SE:0 2
36 DPMST 32 > REQ: Clear Payload ID Table
Start Time: 01:30:20.1876
Type: Native
Direction: Reply
Command: ACK
Reply to Read Request.
00021: MSTM_CAP
Bit Name Value Descripti
0 MST_CAP Y(1)
1 0 Reserved
2 0 Reserved
3 0 Reserved
4 0 Reserved
5 0 Reserved
6 0 Reserved
7 0 Reserved
Raw Data:
[0000] [00 01 -- -- -- -- -- --] [..]
14: < ACK 01
Opt
Filter
Find
Clear
Open
Export
Hide

7 Auxiliary Channel Analyzer (ACA) Utilities

The Auxiliary Channel Analyzer **(ACA)** utilities enable you to view the DDC and aux channel traffic for DisplayPort 1.2 streams in real time or from stored real time files. For DisplayPort, you can view the HDCP authentication transactions, EDID exchanges, Link Training transactions and MST negotiations in real time with the ACA either through the embedded 980 GUI (or the external 980 GUI with release 4.9.35 or later). You can view the transactions between the 980 DP Video Generator ports and a connected DP display device and you can monitor the transactions between the 980 DP Video Generator's Analyzer port and a connected DP source device.

There are three (3) Auxiliary Channel Analyzer utilities:

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

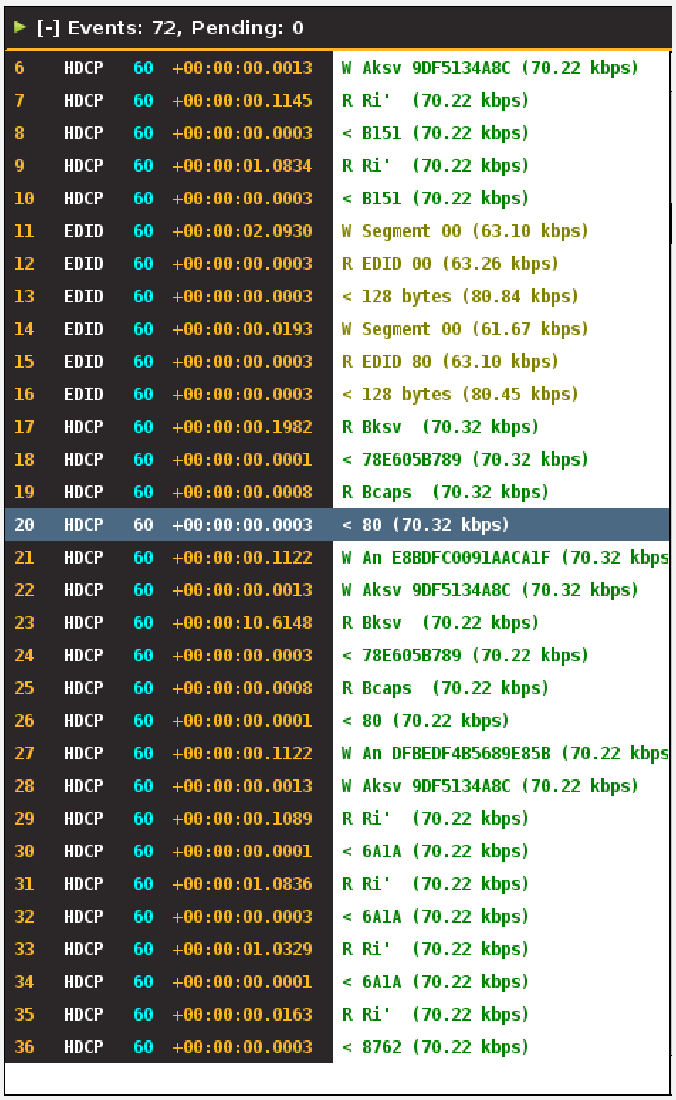
The look and feel of each utility is somewhat different.

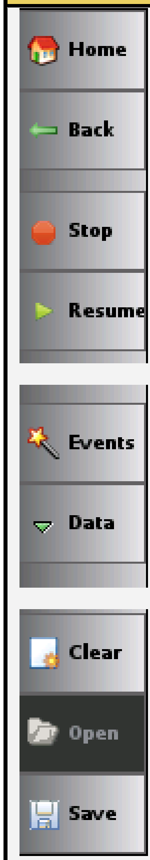
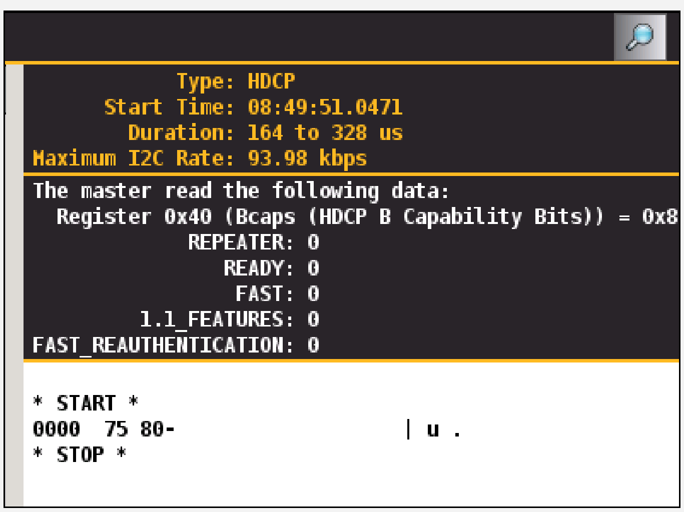
7.1 Aux Channel Analyzer and ACA Remote Control – For Real Time Viewing of DisplayPort Aux Channel Data

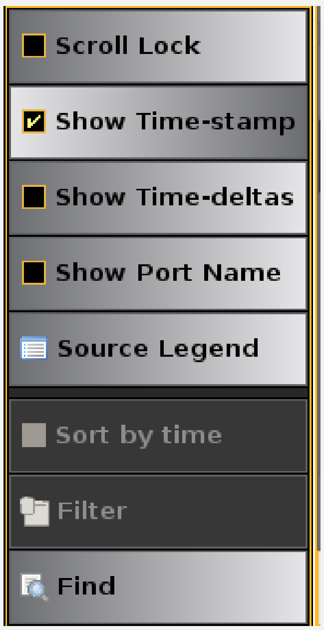
This subsection describes the **Aux Channel Analyzer** utility and the **ACA Remote Control** utility used for viewing the real time DisplayPort Aux Channel transactions through the 980 GUI Manager.

7.1.1 Aux Channel Analyzer – Panel Description

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

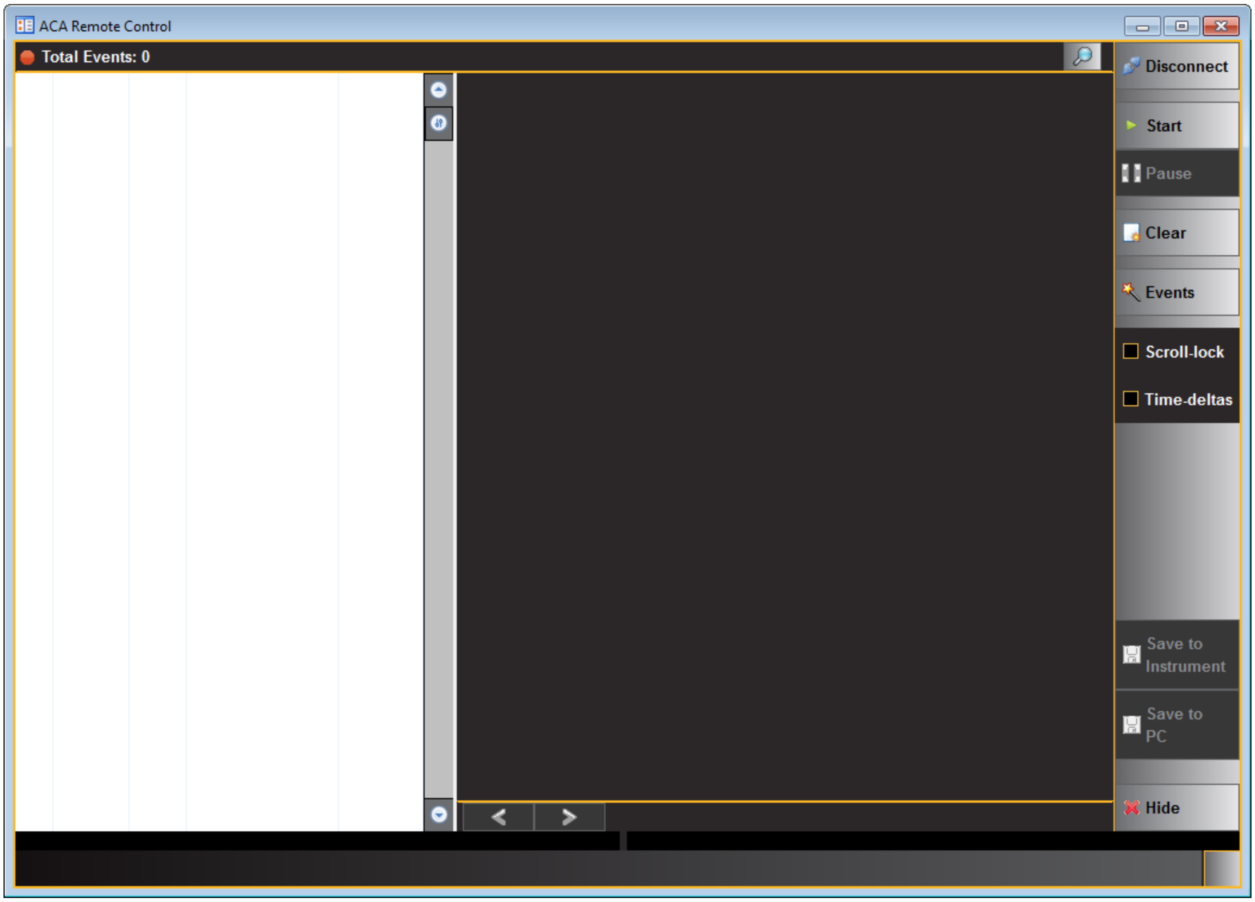
Real Time – ACA	Information / Function
Auxiliary Channel Analyzer  	The following information is provided in the ACA data dialog box for each Event: ▪ Item number – This is a unique sequence number of the transaction. ▪ Type – The type of transaction; either EDID, HDCP or Link Training. ▪ 980 Port number, slot number. ▪ Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the 980 system clock or relative time (Time -deltas) referenced from the initial transaction in the trace. ▪ Transaction Description – A description of the transaction.
ACA Control Menu	There is a menu associated with the ACA Info panel. It is location on the right side of the panel.

Real Time – ACA	Information / Function
	The ACA pull-down menu provides the following functions: ▪ Home – Navigates you back to the Home menu screen of the embedded 980 GUI Manager. ▪ Back – Navigates back to the previous screen in the Real Time mode. ▪ Start/Stop – Starts and Stops the collection of DDC data. ▪ Resume/Pause – Halts the updates of the data to the ACA panel and allows you to resume. ▪ Events – Shows or hides events enabling you to configure what events you see in the real time panel. ▪ Data – Opens up flyout menu described below. ▪ Clear – Clears the ACA trace panel. ▪ Open – Opens an existing trace file stored on the 980 or the PC. ▪ Save – Saves a current trace file to the 980.
	The following information is provided in the ACA Event Details dialog box: ▪ Type – The type of event, one of HDCP, Link Training, or EDID. ▪ Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. ▪ Duration – The duration in milliseconds of the transaction. ▪ Maximum I2C Rate – The rate that the DDC channel clock is operating. ▪ Details (text) – The contents of the transaction in human readable text. ▪ Details (hex) – The contents of the transaction in hex data.
	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

Real Time – ACA	Information / Function
	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.
Data Flyout Menu  	The Data flyout menu items are described below: ▪ Scroll Lock – The left arrow allows you to see the details of the next transaction. ▪ 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. ▪ Show Port Name – Enables you to display or not display the Port number. ▪ Show Legend – Displays a dialog box listing the interface cards on the 980 Instrument and their slot and port numbers, e.g. 32 is Slot 3, Port 2. ▪ Sort by time – Greyed out. ▪ Filter – Grayed out. ▪ Find – Open up the Find dialog box described in the ACA procedures section below.

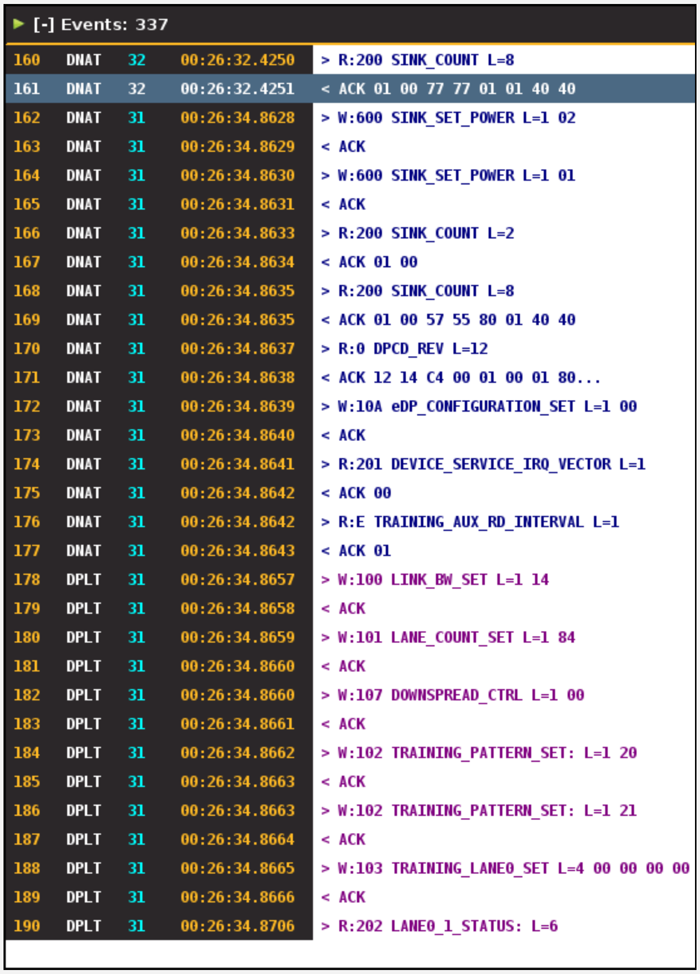
7.1.2 ACA Remote Control – Panel Description

The ACA Remote Control panel application is available only on the external 980 GUI Manager. It enables you to view the ACA transactions in real time. The control panel elements are described in the table below.



ACA Remote Control	Information / Function

Auxiliary Channel Analyzer

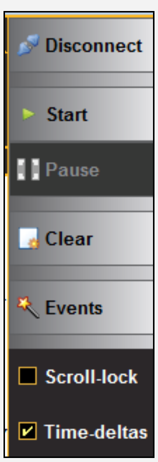


[-] Events: 337				
160	DNAT	32	00:26:32.4250	> R:200 SINK_COUNT L=8
161	DNAT	32	00:26:32.4251	< ACK 01 00 77 77 01 01 40 40
162	DNAT	31	00:26:34.8628	> W:600 SINK_SET_POWER L=1 02
163	DNAT	31	00:26:34.8629	< ACK
164	DNAT	31	00:26:34.8630	> W:600 SINK_SET_POWER L=1 01
165	DNAT	31	00:26:34.8631	< ACK
166	DNAT	31	00:26:34.8633	> R:200 SINK_COUNT L=2
167	DNAT	31	00:26:34.8634	< ACK 01 00
168	DNAT	31	00:26:34.8635	> R:200 SINK_COUNT L=8
169	DNAT	31	00:26:34.8635	< ACK 01 00 57 55 80 01 40 40
170	DNAT	31	00:26:34.8637	> R:0 DPCD_REV L=12
171	DNAT	31	00:26:34.8638	< ACK 12 14 C4 00 01 00 01 80...
172	DNAT	31	00:26:34.8639	> W:10A eDP_CONFIGURATION_SET L=1 00
173	DNAT	31	00:26:34.8640	< ACK
174	DNAT	31	00:26:34.8641	> R:201 DEVICE_SERVICE_IRQ_VECTOR L=1
175	DNAT	31	00:26:34.8642	< ACK 00
176	DNAT	31	00:26:34.8642	> R:E TRAINING_AUX_RD_INTERVAL L=1
177	DNAT	31	00:26:34.8643	< ACK 01
178	DPLT	31	00:26:34.8657	> W:100 LINK_BW_SET L=1 14
179	DPLT	31	00:26:34.8658	< ACK
180	DPLT	31	00:26:34.8659	> W:101 LANE_COUNT_SET L=1 84
181	DPLT	31	00:26:34.8660	< ACK
182	DPLT	31	00:26:34.8660	> W:107 DOWNSPREAD_CTRL L=1 00
183	DPLT	31	00:26:34.8661	< ACK
184	DPLT	31	00:26:34.8662	> W:102 TRAINING_PATTERN_SET: L=1 20
185	DPLT	31	00:26:34.8663	< ACK
186	DPLT	31	00:26:34.8663	> W:102 TRAINING_PATTERN_SET: L=1 21
187	DPLT	31	00:26:34.8664	< ACK
188	DPLT	31	00:26:34.8665	> W:103 TRAINING_LANE0_SET L=4 00 00 00 00
189	DPLT	31	00:26:34.8666	< ACK
190	DPLT	31	00:26:34.8706	> R:202 LANE0_1_STATUS: L=6

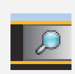
The following information is provided in the ACA Remote Control Panel data dialog box for each Event:

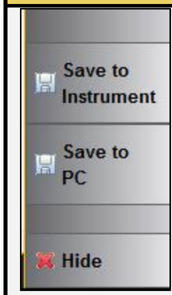
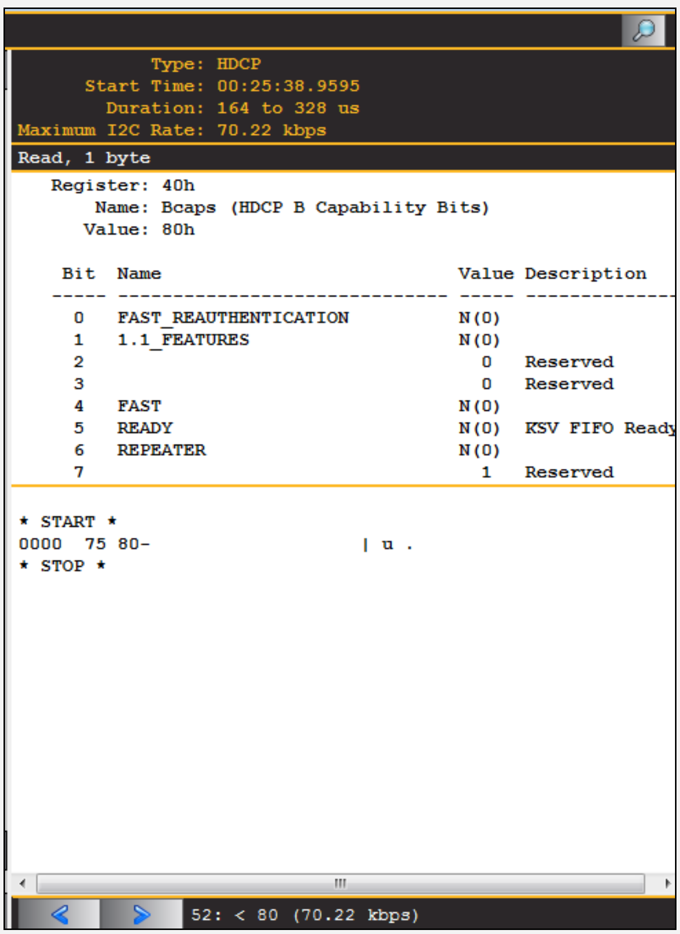
- Item number – This is a unique sequence number of the transaction.
- Type – The type of Aux Chan transaction; either EDID, HDCP DPLT (Link Training), DNAT (DP native Aux transactions).
- 980 Card number, Interface number.
- Time stamp (optional viewing field) – Shows the timestamp of each transaction. Can either be absolute time based (shown) on the 980 system clock or relative time (Time-deltas) referenced from the initial transaction in the trace.
- Transaction Description – A description of the transaction.

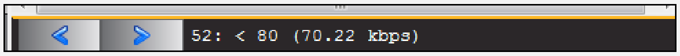
ACA Control Menu



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.
- Disconnect – Navigates you back to the Home menu screen of the embedded 980 GUI Manager.
- Start/Stop – Starts and Stops the collection of DDC data.

ACA Remote Control	Information / Function
	▪ Resume/Pause – Halts the updates of the data to the ACA panel. ▪ Clear – Clears the ACA trace panel. ▪ Events – Shows or hides events enabling you to configure what events you see in the real time panel. ▪ Events – Opens up the Events dialog box. ▪ Scroll-lock – Stops the trace files from scrolling. ▪ Time-deltas – Presents the time stamps in relation to time stamp of the previous item. ▪ Save to Instrument – Saves the file to the 980 system that the host PC is connected to. ▪ Save to PC – Saves a current trace file to the Host PC.
Details Panel 	The following information is provided in the ACA Event Details dialog box: ▪ Type – The type of event, one of HDCP, EDID or Link Training. ▪ Start Time – This the start time of the transaction in microseconds from a reference time determined when the capture of real time data began. ▪ Duration – The duration in milliseconds of the transaction. ▪ Maximum I2C Rate – The rate that the DDC channel clock is operating. ▪ Details (text) – The contents of the transaction in human readable text. ▪ Details (hex) – The contents of the transaction in hex data.

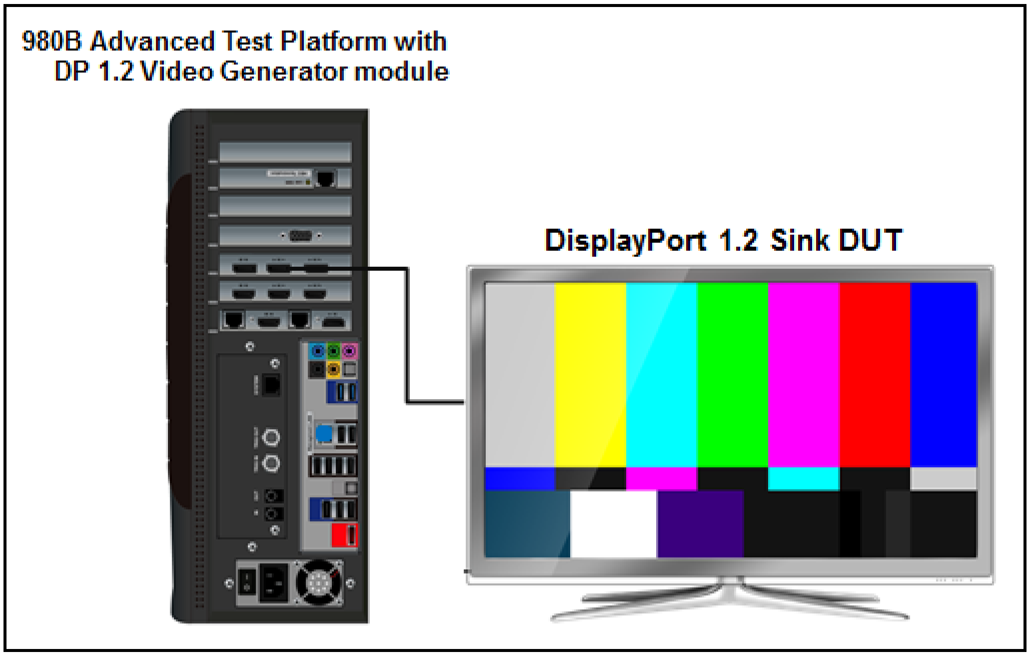
ACA Remote Control	**Information / Function**
	There are some control arrows and a status panel on the bottom of the ACA Event Details panel. These are as follows: ▪ Left arrow – The left arrow allows you to see the details of the next transaction. ▪ Right arrow – The right arrow allows you to see the details of the previous transaction. ▪ Status field – Shows the sequence number and the description of the selected transaction.

7.2 Monitoring the DisplayPort auxiliary channels with the ACA utilities

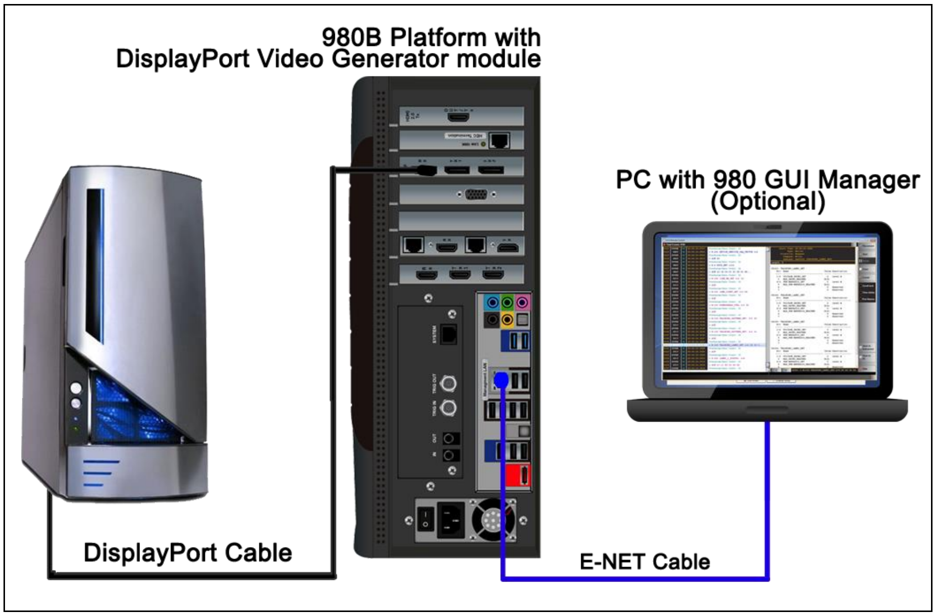
This subsection describes the procedures for monitoring the auxiliary channel data through the 980 GUI Manager using the Aux Channel Analyzer real time utilities. You can monitor the DisplayPort transactions in real time when module is emulating a DisplayPort source device. If you have the optional DP Rx Analyzer port you can emulate a DisplayPort sink device to test a DisplayPort source device. Most of the screen examples are from the Aux. Channel Analyzer utility which is the embedded 980 GUI utility.

7.2.1 Making the physical connections

The following diagrams depict the test setups for testing a DisplayPort display device and a DisplayPort source device. The operation of the ACA is the same when testing a source or a sink.



Connection for testing a DP display while DP Video Generator is emulating a DP source device – 980B



Connection for testing a DP source while DP Analyzer is emulating a sink emulation – 980B

7.2.2 Monitoring the DisplayPort Aux Channel Transactions in Real Time mode

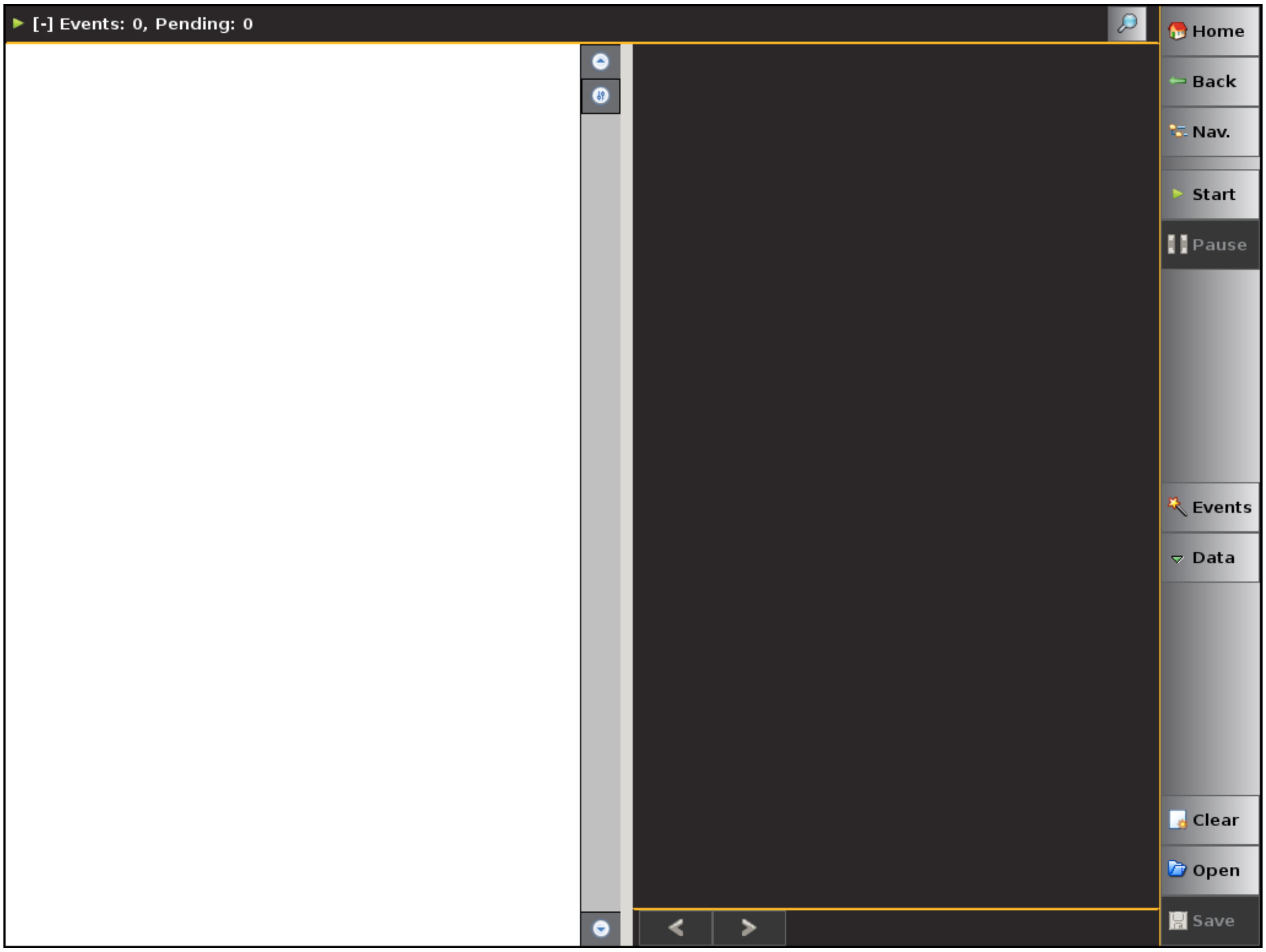
Use the following procedures to monitor the DisplayPort Aux Chan transactions with a DisplayPort 1.2 device in real time. The procedures assume that the DP device under test is powered up and connected to one of the 980 DP 1.2 Video Generator / Analyzer ports. The operation of the ACA is the same when testing a source or a sink.

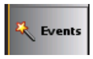
To monitor the DisplayPort DDC transactions:

1. Touch select the **Aux Channel Analyzer** on the page 1 (Card Control) of the **Apps** panel:


quantumdata
Card Control
Generator
HDMI
Protocol Analyzer
RX - Card 6
HDMI
Video Generator
RX - Card 0
Aux. Channel
Analyzer
Capture Control
HEAC
Page 1 of 4
Card Control
Compliance Tests
Editors
Other
Back
Navigator
DHCP: 192.168.254.143
ATP Version: 4.9.38 (4 cards detected)

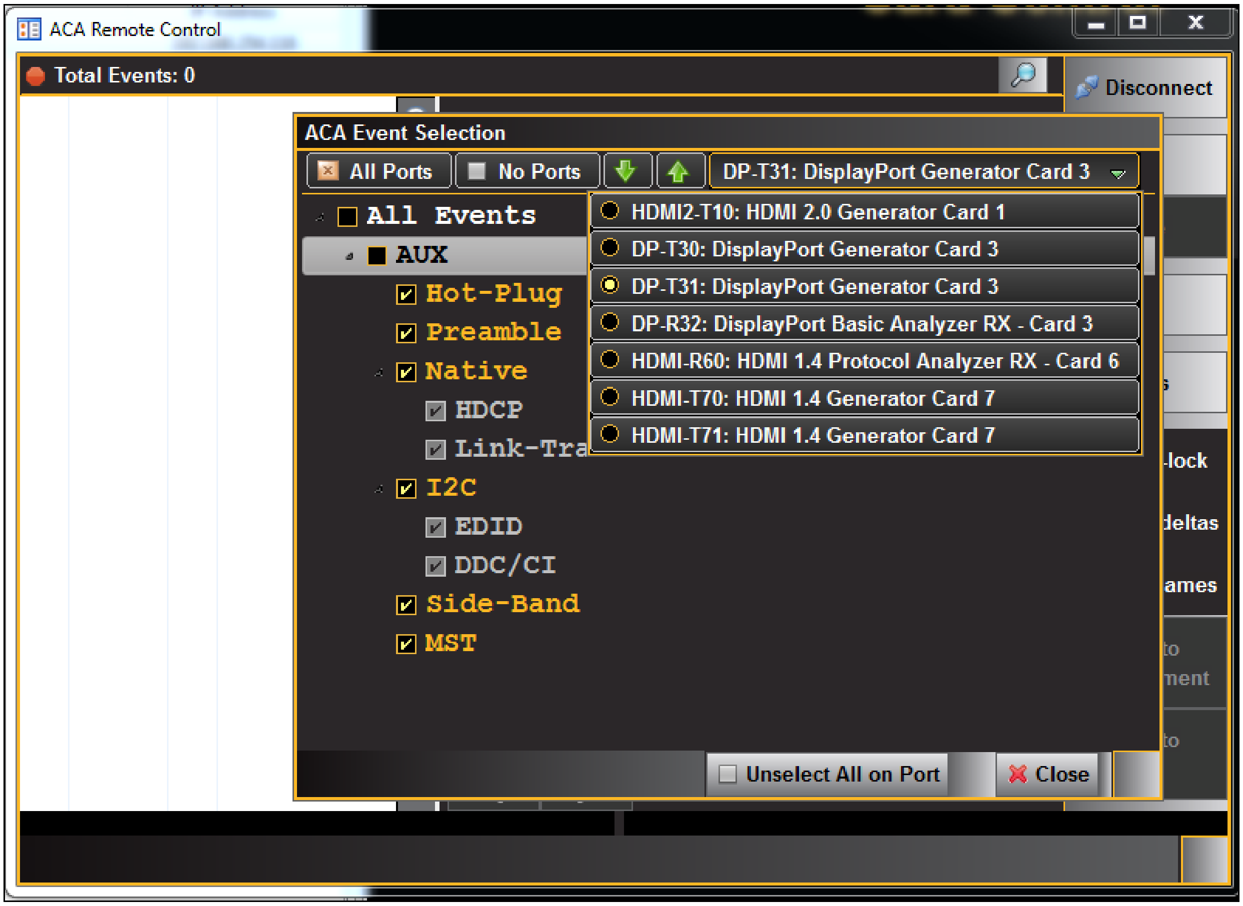
The **Aux Channel Analyzer** panel appears as shown below:



2. From the **Events** 

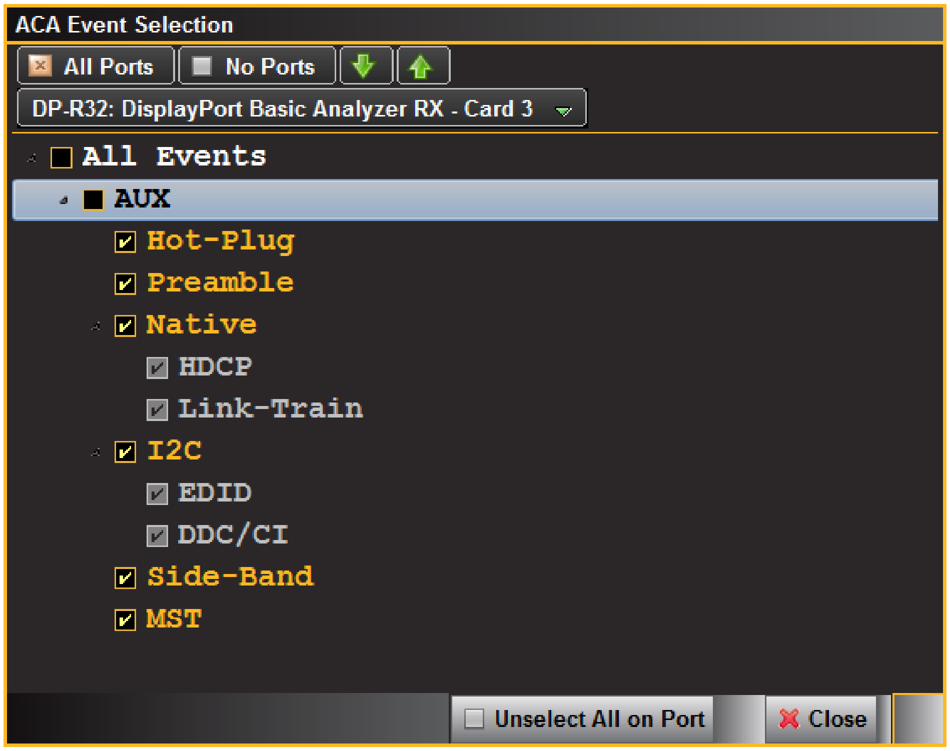
button on the ACA panel, select the DP module's port that you are monitoring using the pull-down menu 

. Refer to the screen example below.



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

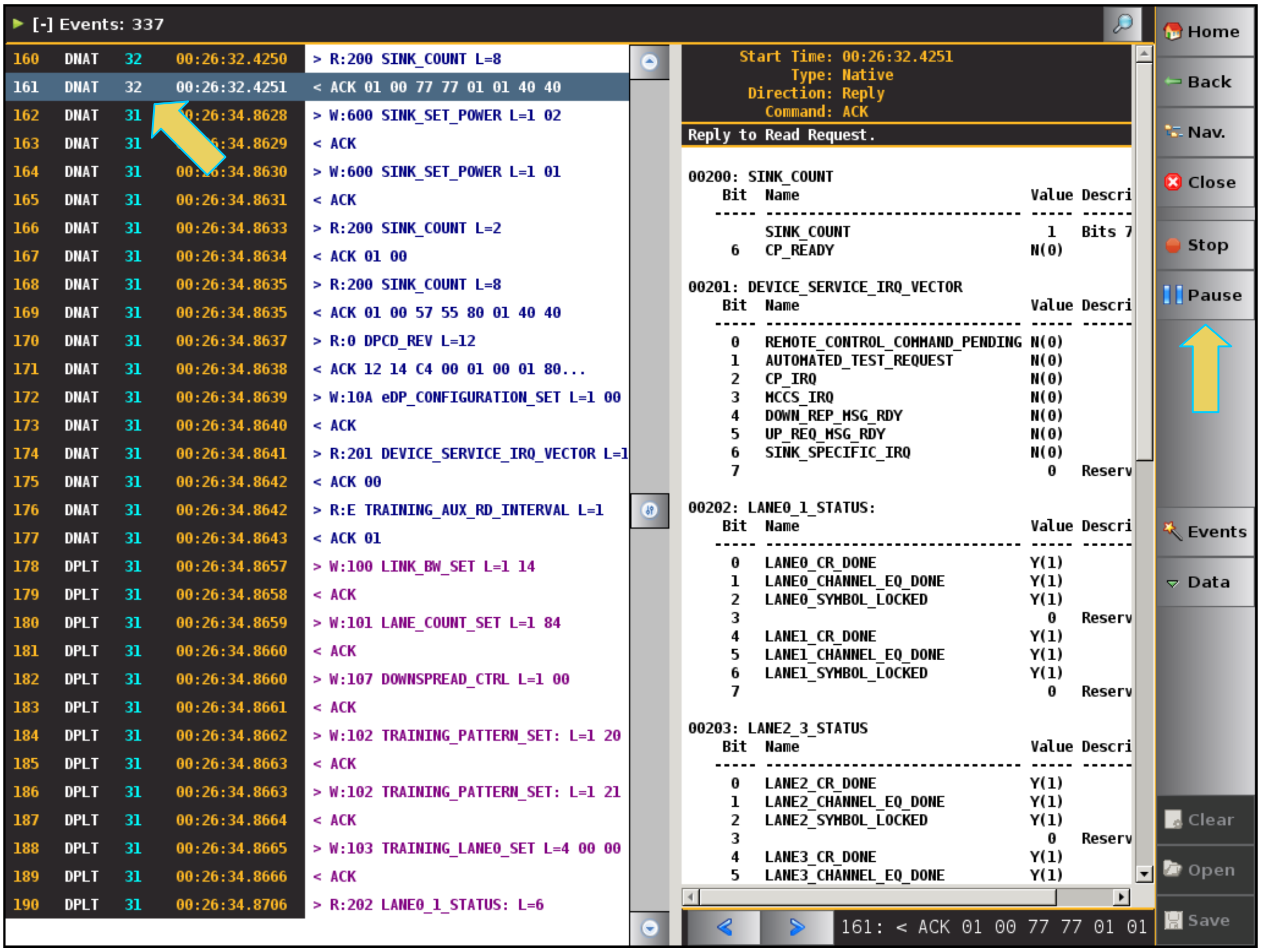
Specify which events you wish to monitor. You can select **All Events** of any set of individual events.



3. Take the necessary action—such as a hot plug—to initiate EDID, HDCP or Link Training transactions. You will see the Aux Chan transactions in the ACA panel as shown below.

4. Touch select the **Start** 

button on the ACA Menu panel on the right to initiate the viewing of the DP Aux Chan transactions. An example showing monitored data is shown below. You can stop or pause the collection at any time using the buttons on the ACA menu panel on the right. These are indicated in the screen example below.



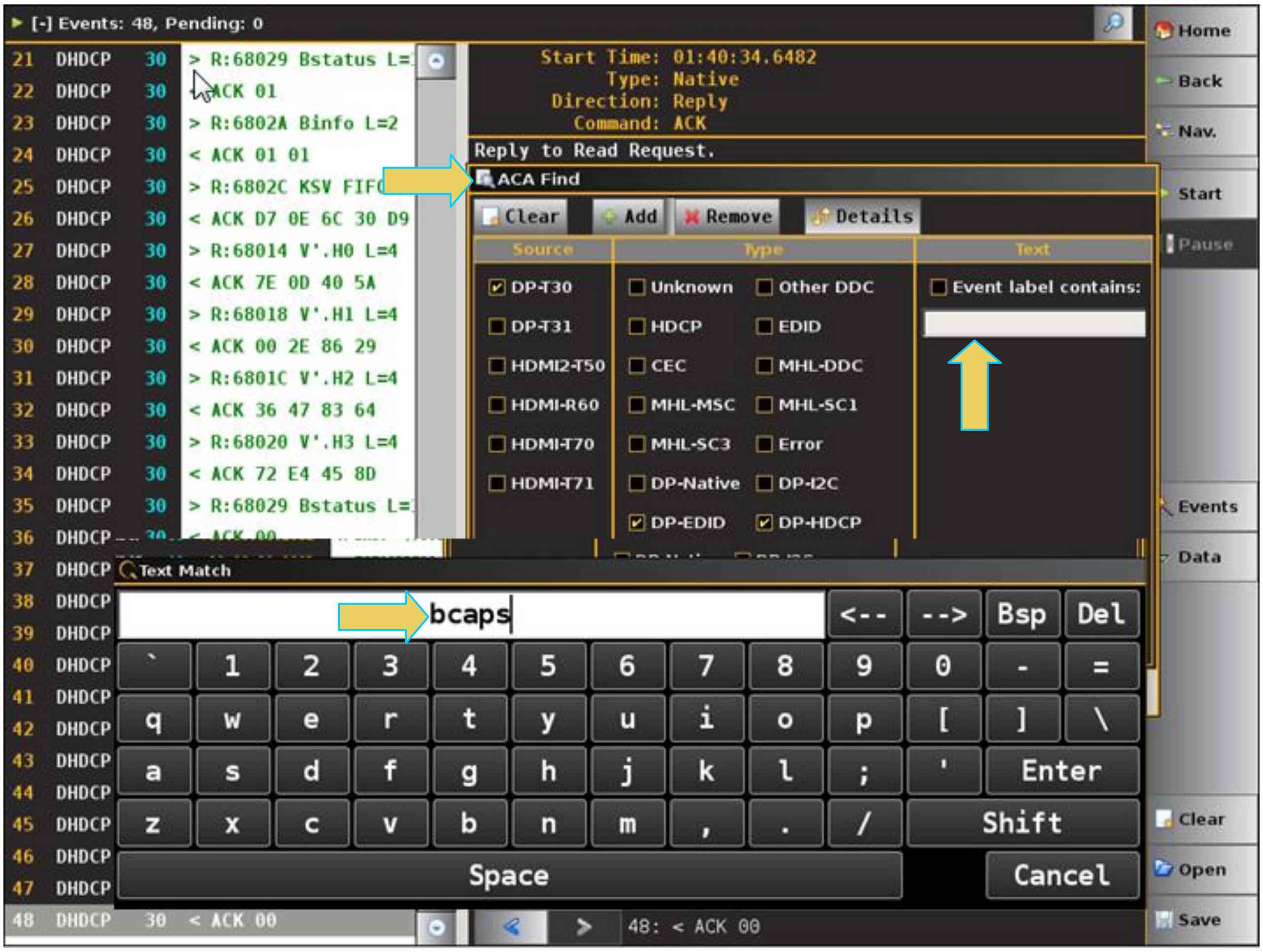
5. Scroll through the data to find specific events. The scroll bars are indicated in the screen example above.

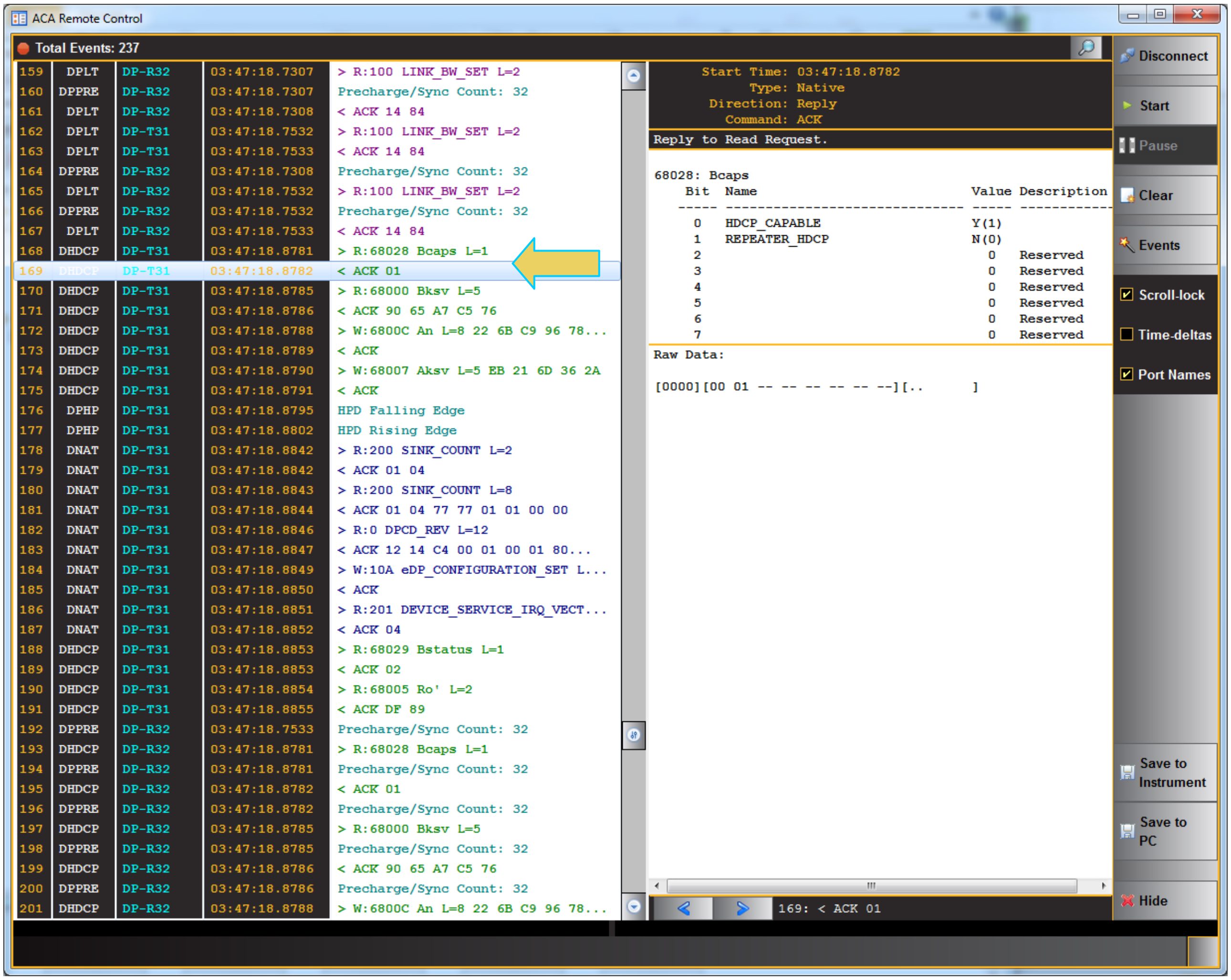
6. The **ACA Find** dialog box is accessible through the **Data** pop-out menu shown in the screen example below. The **ACA Find** function enables you to quickly locate different types of events.

   a) Click the **Add**  button to add a new search criteria.

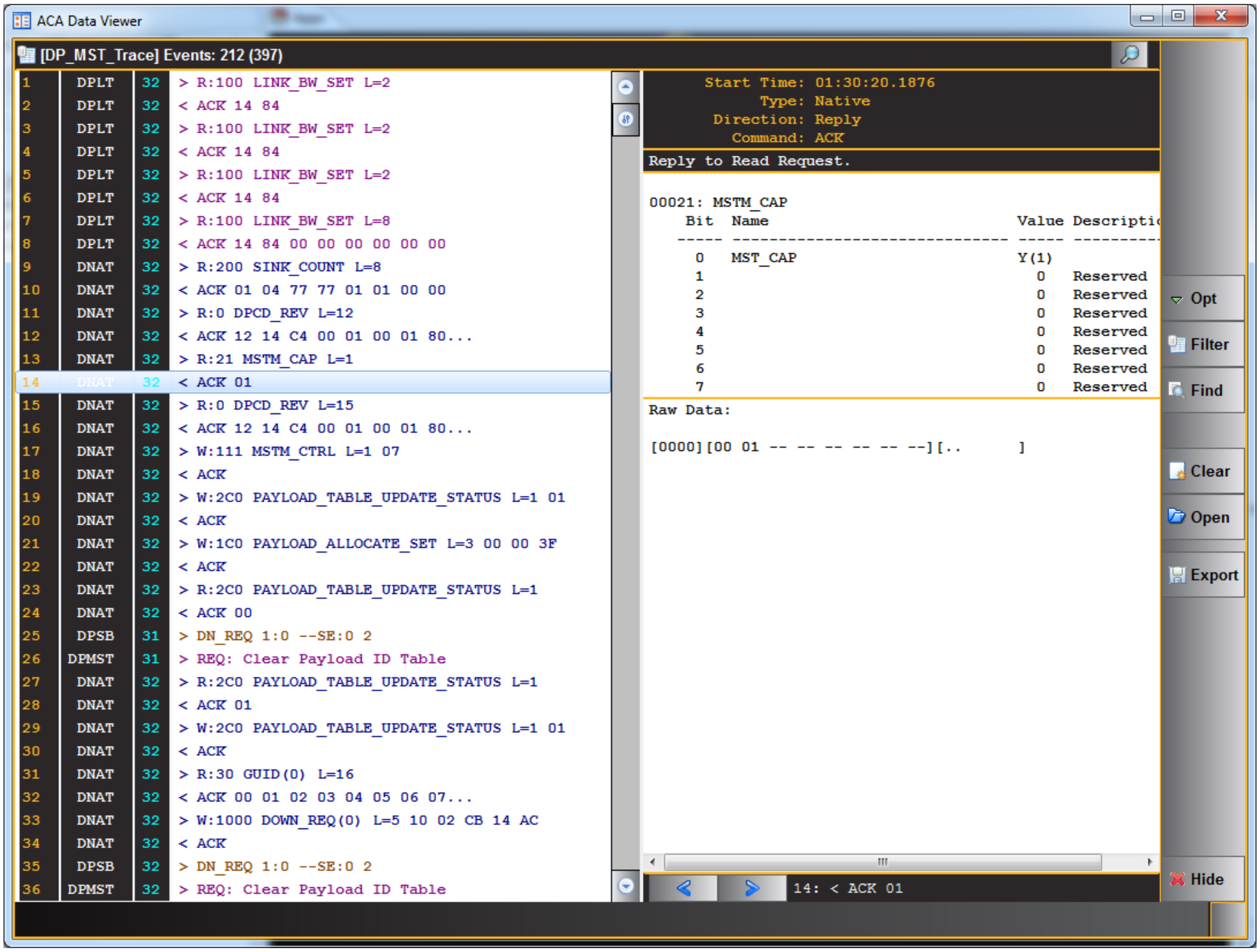
   b) Define the search by selecting the Source, Type and any Text on the Event.

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





The following example shows MST negotiations.

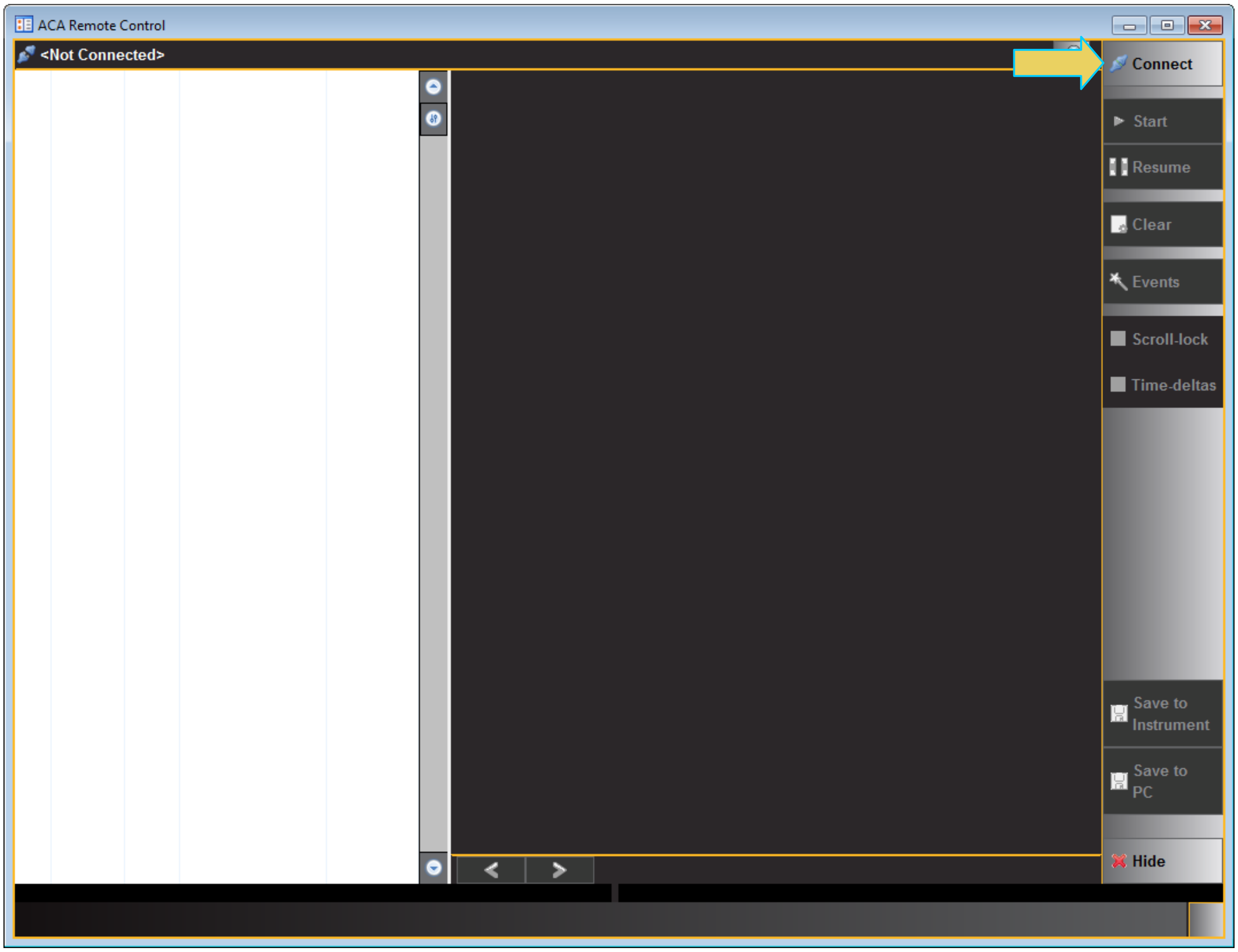

ACA Data Viewer
[DP_MST_Trace] Events: 212 (397)
1 DPLT 32 > R:100 LINK_BW_SET L=2
2 DPLT 32 < ACK 14 84
3 DPLT 32 > R:100 LINK_BW_SET L=2
4 DPLT 32 < ACK 14 84
5 DPLT 32 > R:100 LINK_BW_SET L=2
6 DPLT 32 < ACK 14 84
7 DPLT 32 > R:100 LINK_BW_SET L=8
8 DPLT 32 < ACK 14 84 00 00 00 00 00 00
9 DNAT 32 > R:200 SINK_COUNT L=8
10 DNAT 32 < ACK 01 04 77 77 01 01 00 00
11 DNAT 32 > R:0 DPCD_REV L=12
12 DNAT 32 < ACK 12 14 C4 00 01 00 01 80...
13 DNAT 32 > R:21 MSTM_CAP L=1
14 DNAT 32 < ACK 01
15 DNAT 32 > R:0 DPCD_REV L=15
16 DNAT 32 < ACK 12 14 C4 00 01 00 01 80...
17 DNAT 32 > W:111 MSTM_CTRL L=1 07
18 DNAT 32 < ACK
19 DNAT 32 > W:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1 01
20 DNAT 32 < ACK
21 DNAT 32 > W:1C0 PAYLOAD_ALLOCATE_SET L=3 00 00 3F
22 DNAT 32 < ACK
23 DNAT 32 > R:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1
24 DNAT 32 < ACK 00
25 DPSB 31 > DN_REQ 1:0 --SE:0 2
26 DPMST 31 > REQ: Clear Payload ID Table
27 DNAT 32 > R:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1
28 DNAT 32 < ACK 01
29 DNAT 32 > W:2C0 PAYLOAD_TABLE_UPDATE_STATUS L=1 01
30 DNAT 32 < ACK
31 DNAT 32 > R:30 GUID(0) L=16
32 DNAT 32 < ACK 00 01 02 03 04 05 06 07...
33 DNAT 32 > W:1000 DOWN_REQ(0) L=5 10 02 CB 14 AC
34 DNAT 32 < ACK
35 DPSB 32 > DN_REQ 1:0 --SE:0 2
36 DPMST 32 > REQ: Clear Payload ID Table
Start Time: 01:30:20.1876
Type: Native
Direction: Reply
Command: ACK
Reply to Read Request.
00021: MSTM_CAP
Bit Name Value Descripti
0 MST_CAP Y(1)
1 0 Reserved
2 0 Reserved
3 0 Reserved
4 0 Reserved
5 0 Reserved
6 0 Reserved
7 0 Reserved
Raw Data:
[0000][00 01 -- -- -- -- -- --][..]
14: < ACK 01
Opt
Filter
Find
Clear
Open
Export
Hide

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

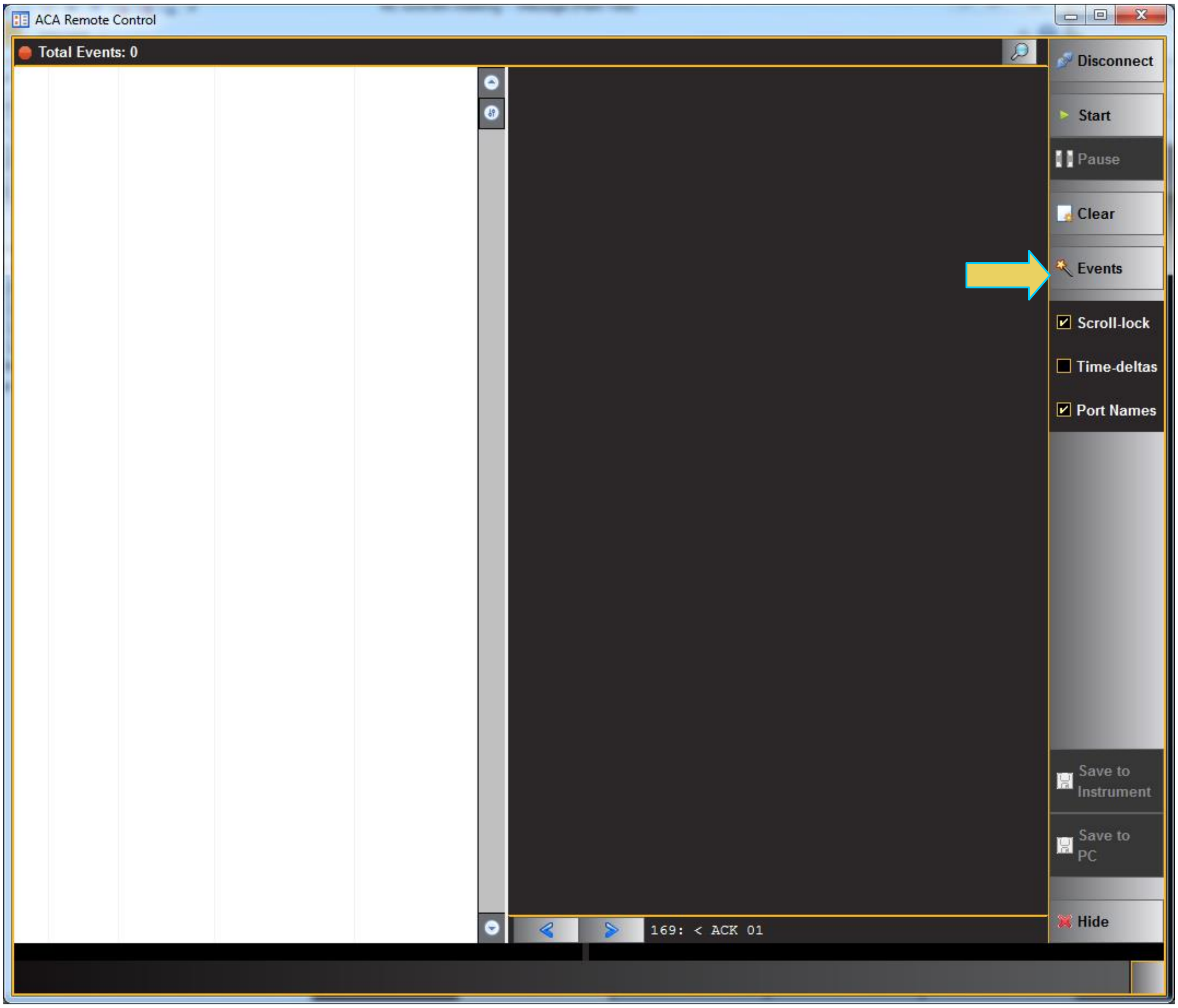
The **ACA Remote Control** panel enables you to view the ACA traces in real time from the external 980 GUI Manager. The **ACA Remote Control** tool operates in sync with the embedded ACA. The procedure between the two is essentially the same with a few differences in the screens.

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

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



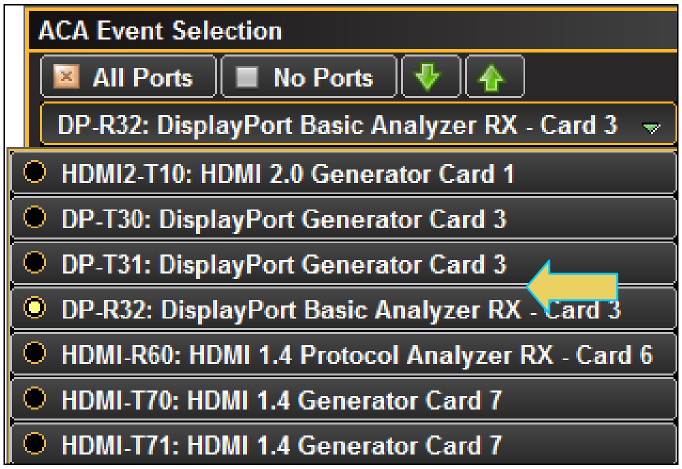
2. Touch select the **Connect** activation button (refer to the screen above) to connect to your 980 system.



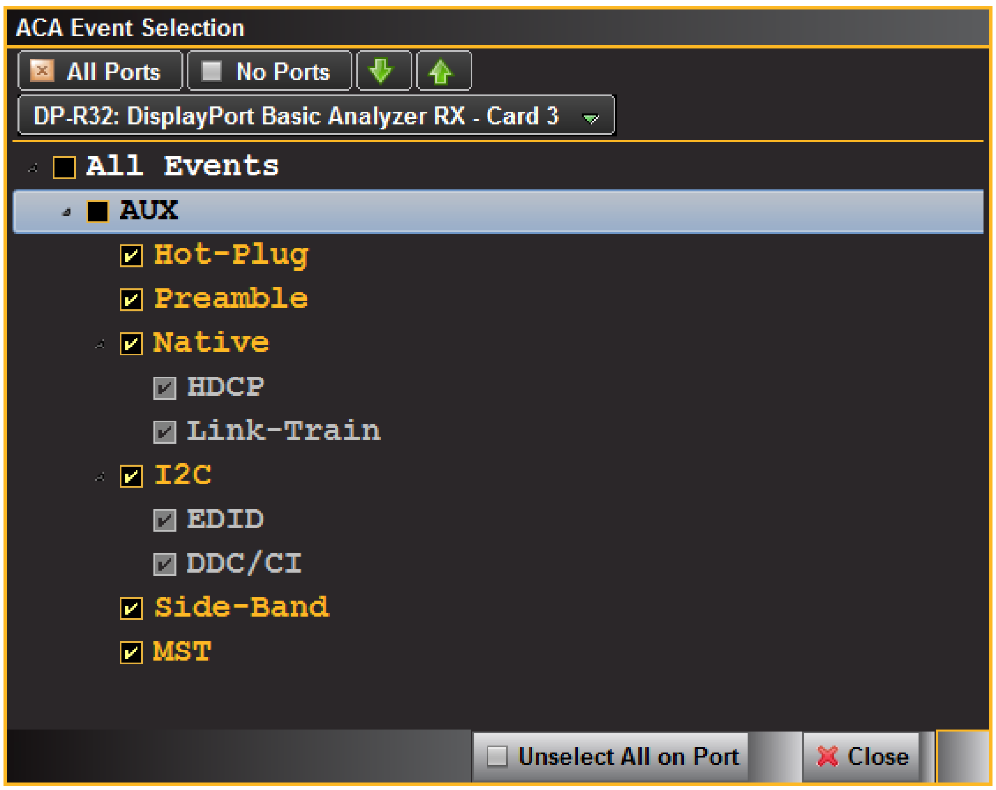
3. Touch select the **Events** activation button (refer to the screen above) to connect to your 980 system.

   A dialog box appears enabling you to select the module and interface to monitor on the Remote Control ACA. Note that you would select the DP-R32 port (not shown) if you are using the DP module's Rx port to emulate a DisplayPort sink and testing a DisplayPort source.

4. Select the DP Video Generator / Analyzer port (DP–T32).

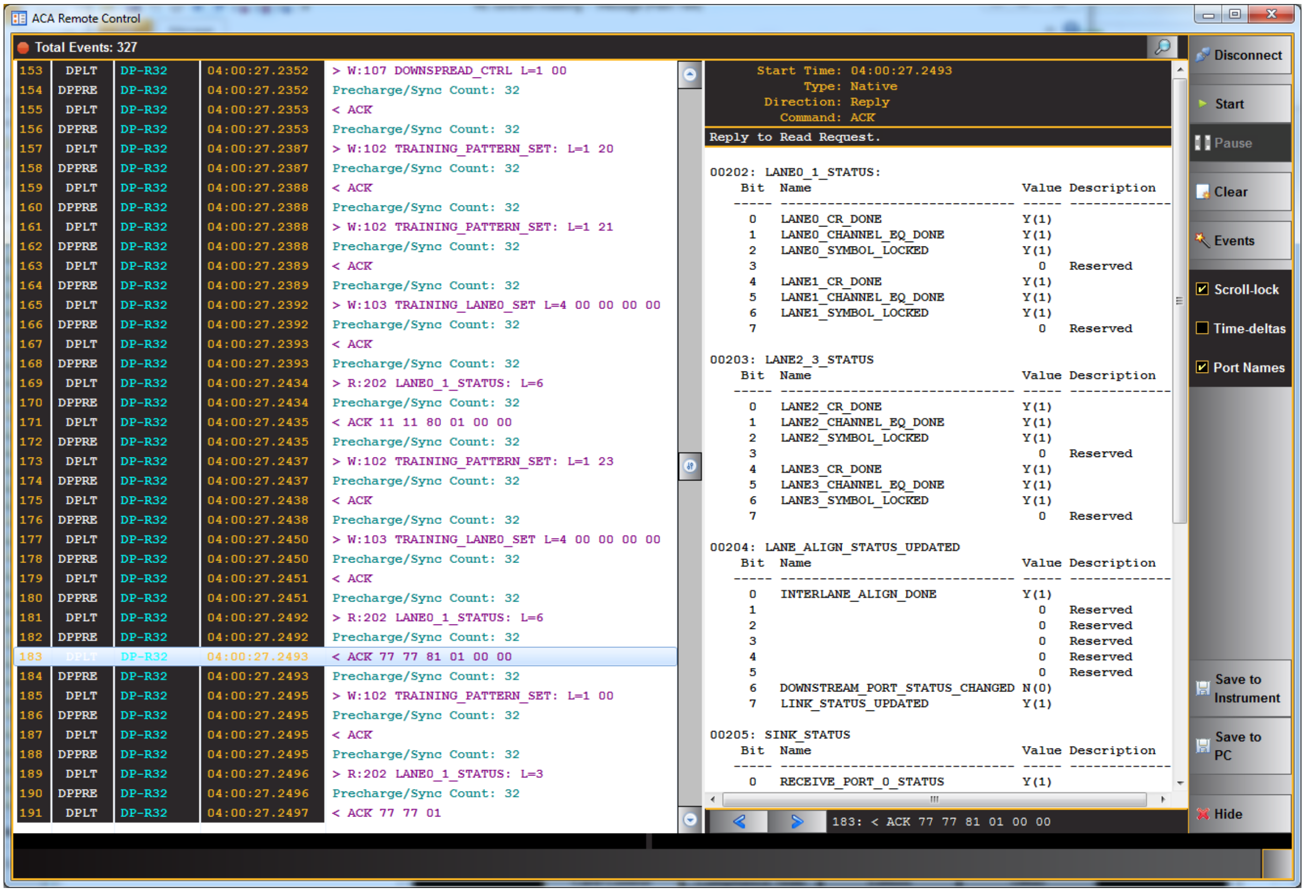


5. Select the types of transactions (Events) you wish to monitor. In the example below, all Aux Channel transactions are going to be logged. You can select **All Events** as well or any subset.



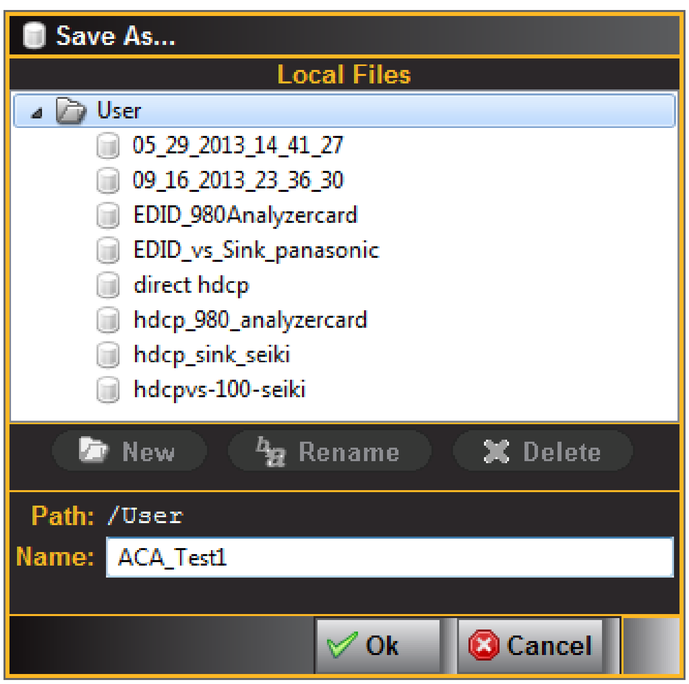
6. Click on the **Start** 

button to initiate the capturing of the transactions. An example of a trace file is shown below.



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

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



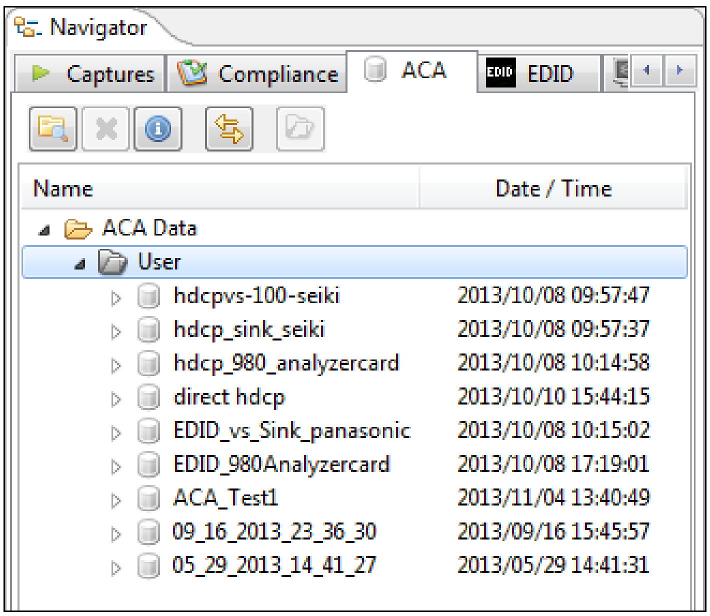
7.4 Viewing Stored DP Aux Chan traces on a PC with the ACA Data Viewer utility

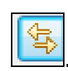
This subsection describes how you can view ACA traces using the ACA viewer off-line on your PC. In order to view the ACA files on your PC with the 980 GUI Manager application you will first have to transfer them to the PC using the **Data Transfer** utility.

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

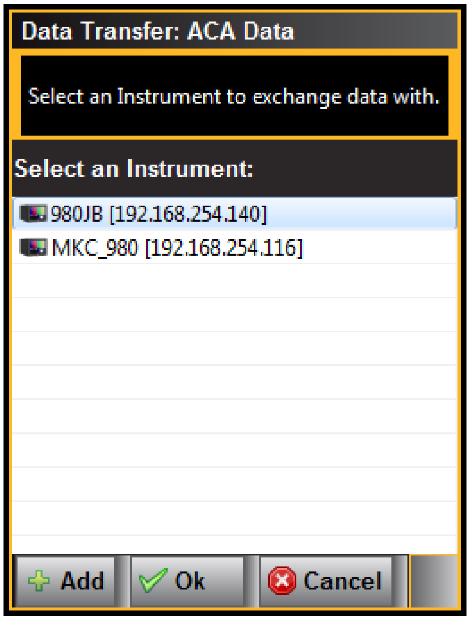
To view saved ACA trace files:

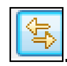
1. Make sure the 980 GUI Manager is installed on your PC. Use the procedures at Downloading and installing the 980 GUI Manager.
2. Access the ACA data from the **Navigator** panel and highlight a directory as shown below.

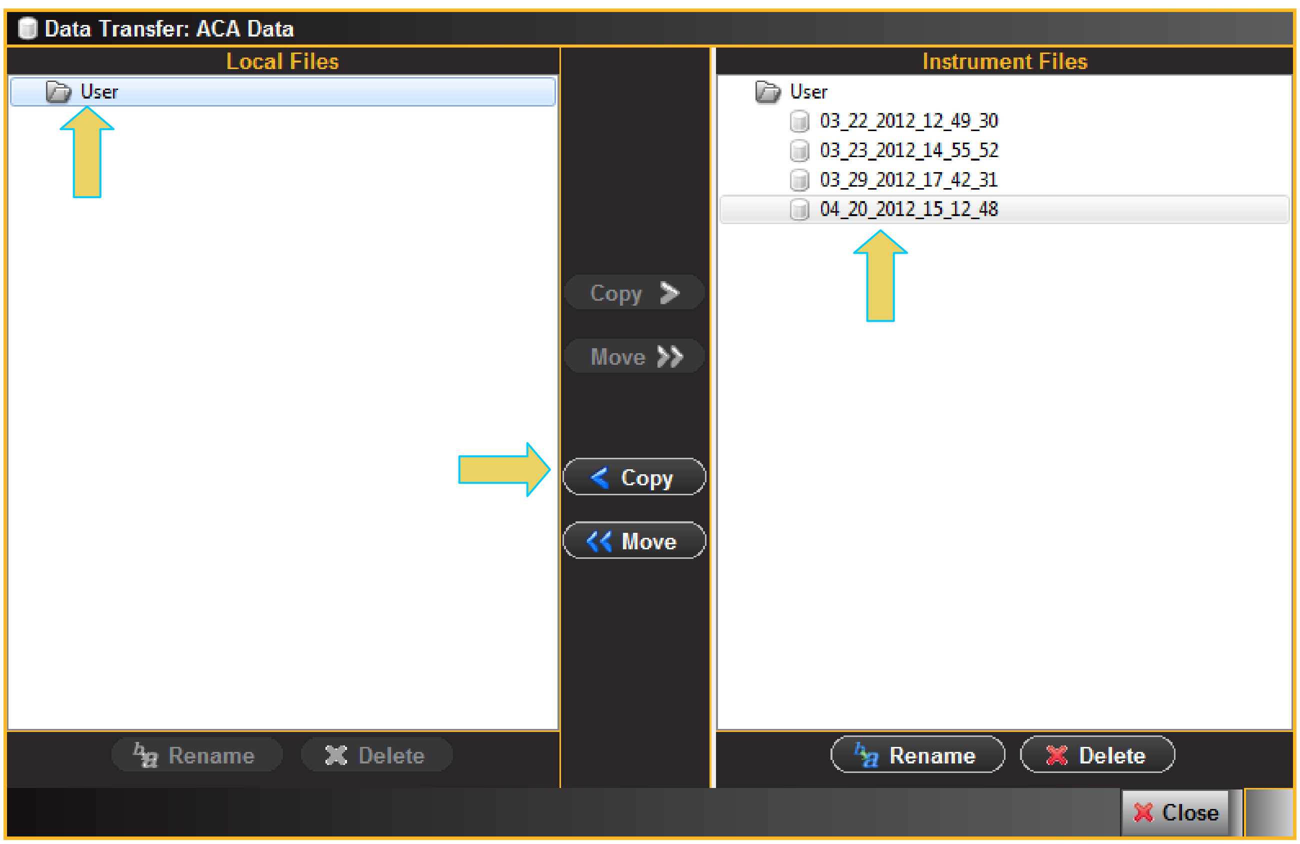


3. Access the **Data Transfer** utility by double clicking on the Transfer Data icon .

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

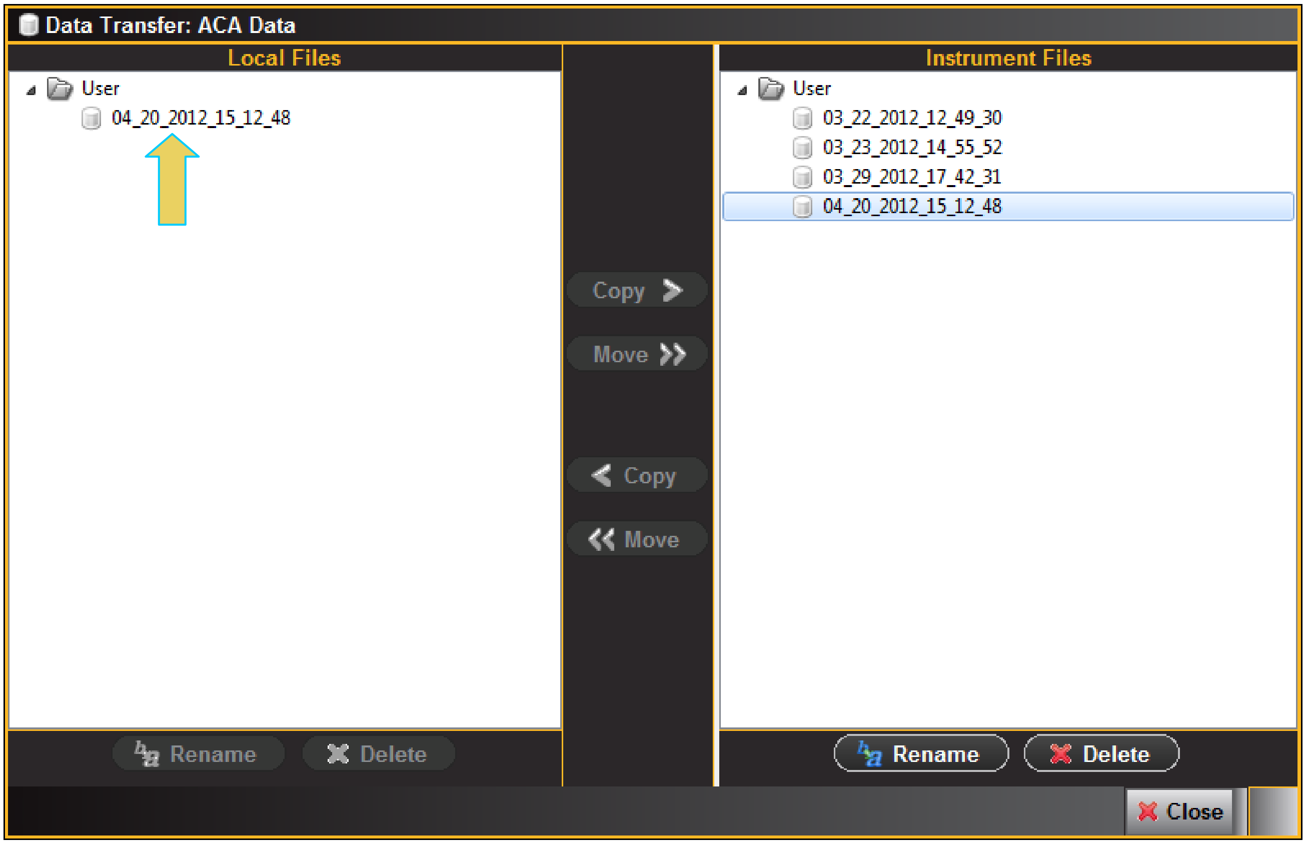


4. Access the **Data Transfer** panel by double clicking on the Transfer Data icon .
5. The **Data Transfer** panel appears in context with the ACA files on the 980 (Instrument) under the **Instrument Files** available as shown below.

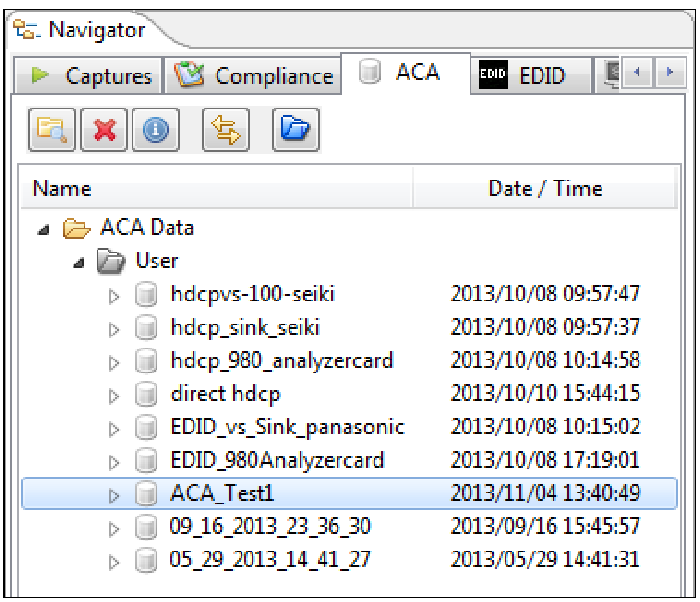


6. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.

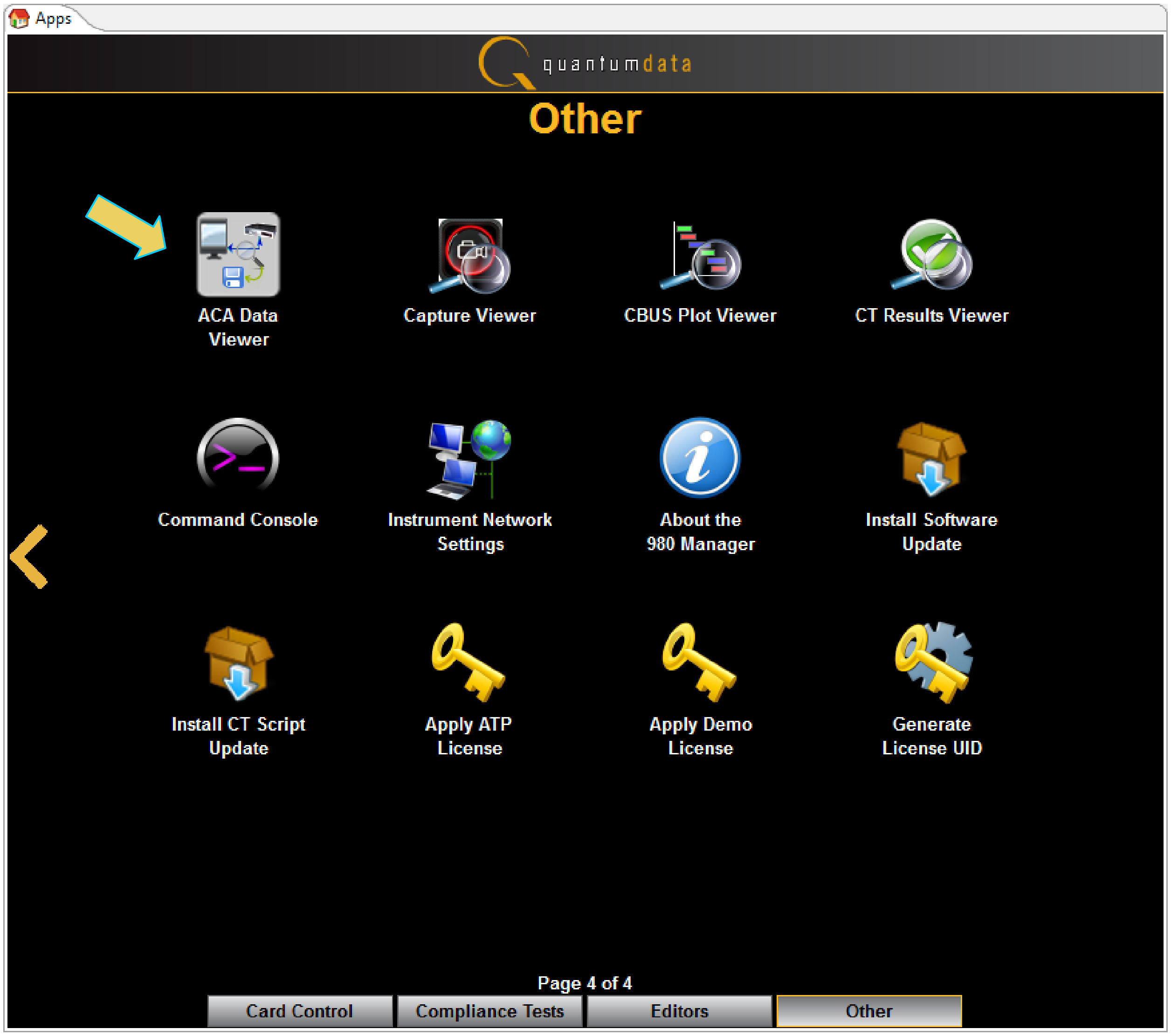
The file appears on the PC host **Local** Files (below).



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

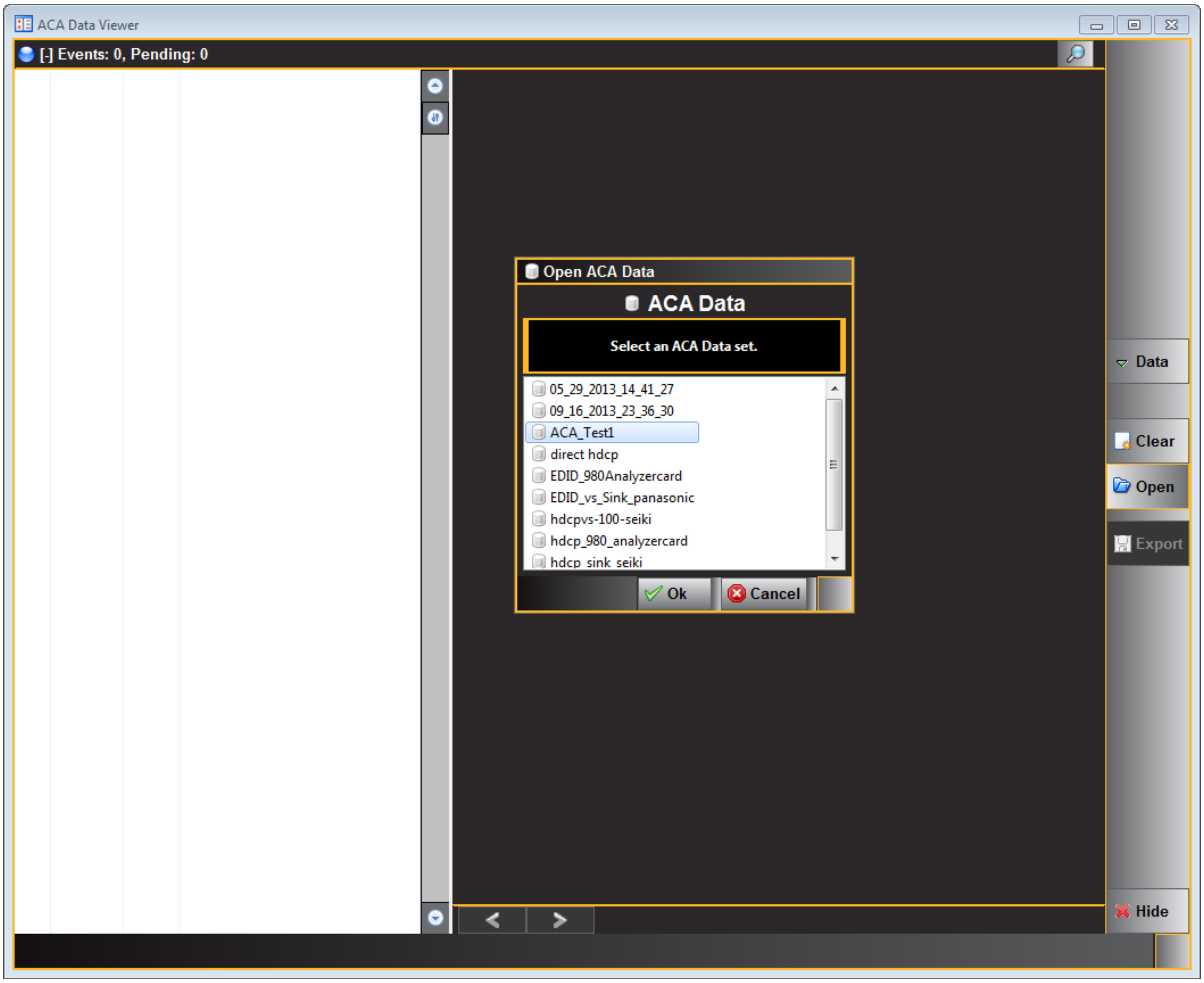


7. Open up the ACA panel to view the transferred file. You can access the ACA panel from the **Other** Apps panel (Page 4).

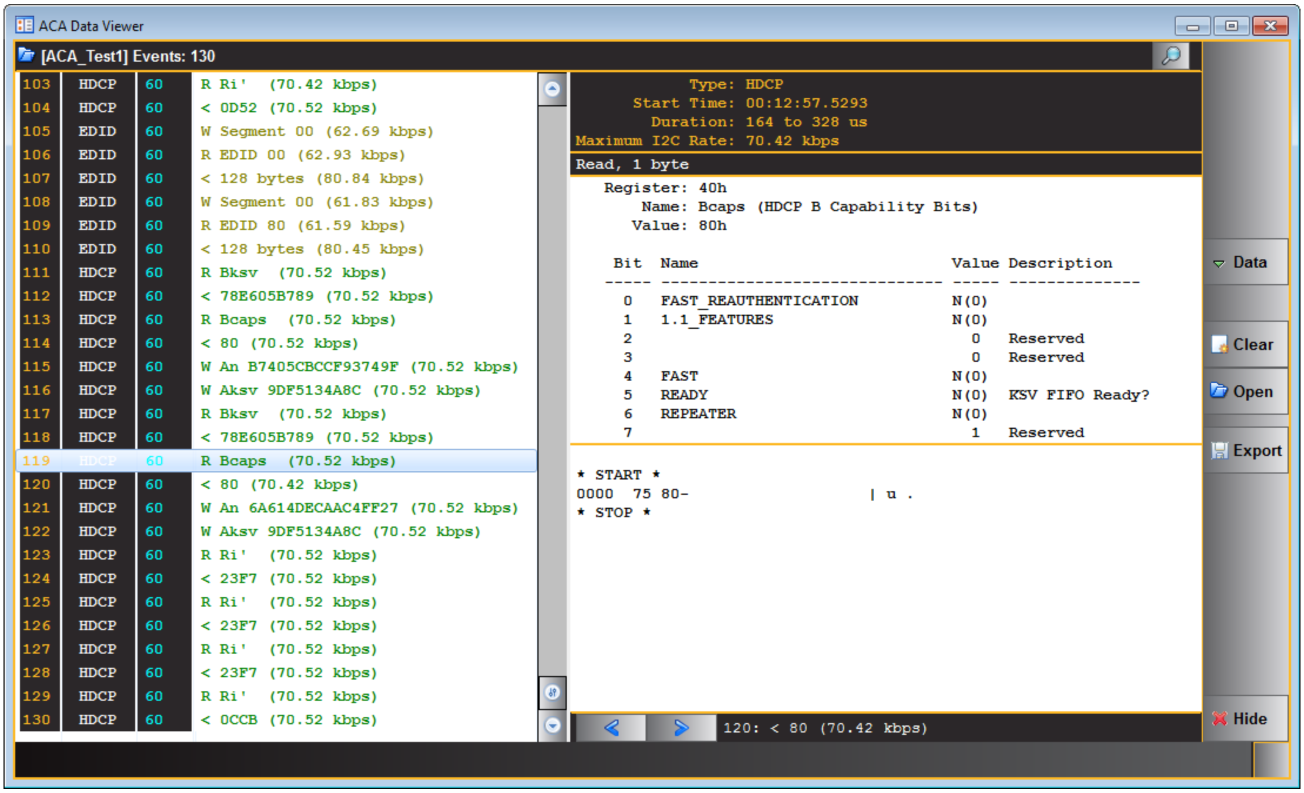


The **Aux Channel Analyzer** panel appears.

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



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


ACA Data Viewer
[ACA_Test1] Events: 130
103 HDCP 60 R Ri' (70.42 kbps)
104 HDCP 60 < 0D52 (70.52 kbps)
105 EDID 60 W Segment 00 (62.69 kbps)
106 EDID 60 R EDID 00 (62.93 kbps)
107 EDID 60 < 128 bytes (80.84 kbps)
108 EDID 60 W Segment 00 (61.83 kbps)
109 EDID 60 R EDID 80 (61.59 kbps)
110 EDID 60 < 128 bytes (80.45 kbps)
111 HDCP 60 R Bksv (70.52 kbps)
112 HDCP 60 < 78E605B789 (70.52 kbps)
113 HDCP 60 R Bcaps (70.52 kbps)
114 HDCP 60 < 80 (70.52 kbps)
115 HDCP 60 W An B7405CBCCF93749F (70.52 kbps)
116 HDCP 60 W Aksv 9DF5134A8C (70.52 kbps)
117 HDCP 60 R Bksv (70.52 kbps)
118 HDCP 60 < 78E605B789 (70.52 kbps)
119 HDCP 60 R Bcaps (70.52 kbps)
120 HDCP 60 < 80 (70.42 kbps)
121 HDCP 60 W An 6A614DECAAC4FF27 (70.52 kbps)
122 HDCP 60 W Aksv 9DF5134A8C (70.52 kbps)
123 HDCP 60 R Ri' (70.52 kbps)
124 HDCP 60 < 23F7 (70.52 kbps)
125 HDCP 60 R Ri' (70.52 kbps)
126 HDCP 60 < 23F7 (70.52 kbps)
127 HDCP 60 R Ri' (70.52 kbps)
128 HDCP 60 < 23F7 (70.52 kbps)
129 HDCP 60 R Ri' (70.52 kbps)
130 HDCP 60 < 0CCB (70.52 kbps)
Type: HDCP
Start Time: 00:12:57.5293
Duration: 164 to 328 us
Maximum I2C Rate: 70.42 kbps
Read, 1 byte
Register: 40h
Name: Bcaps (HDCP B Capability Bits)
Value: 80h
Bit Name Value Description
0 FAST_REAUTHENTICATION N(0)
1 1.1_FEATURES N(0)
2 0 Reserved
3 0 Reserved
4 FAST N(0)
5 READY N(0) KSV FIFO Ready?
6 REPEATER N(0)
7 1 Reserved
* START *
0000 75 80- | u .
* STOP *
120: < 80 (70.42 kbps)
Data
Clear
Open
Export
Hide

8 Pattern List Editor

Use the following procedures to create a custom list of test patterns. The **Pattern List Editor** can be used either on the embedded 980 GUI Manager or the external 980 GUI Manager. The examples in this procedure use the external 980 GUI Manager.

8.1 Creating a custom list of test patterns

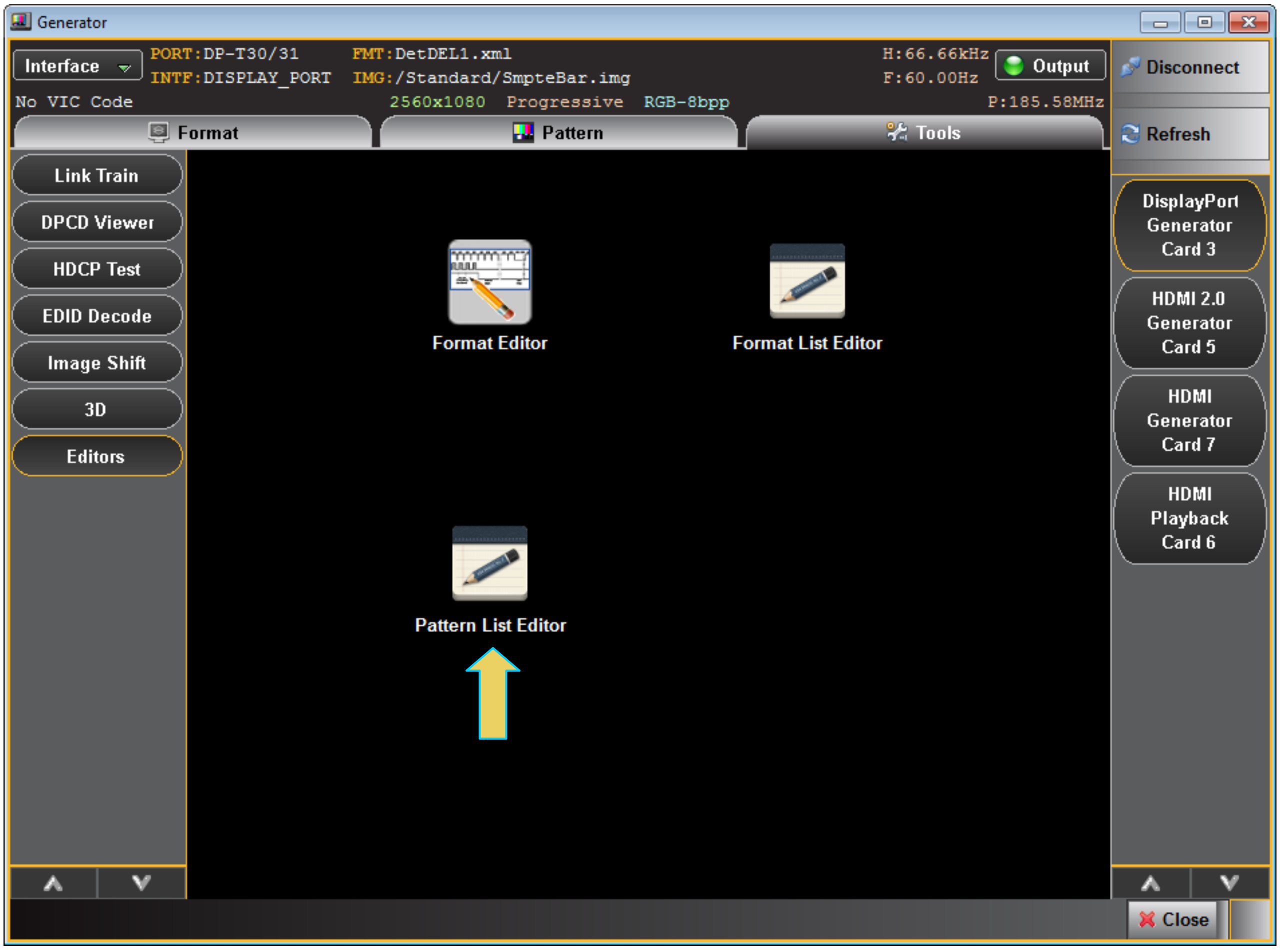
This subsection describes how you can create a custom pattern list.

To create a custom list of test patterns:

1. From the Editors Page of the Apps panel, select **Pattern List Editor** from the **View** menu as shown below.

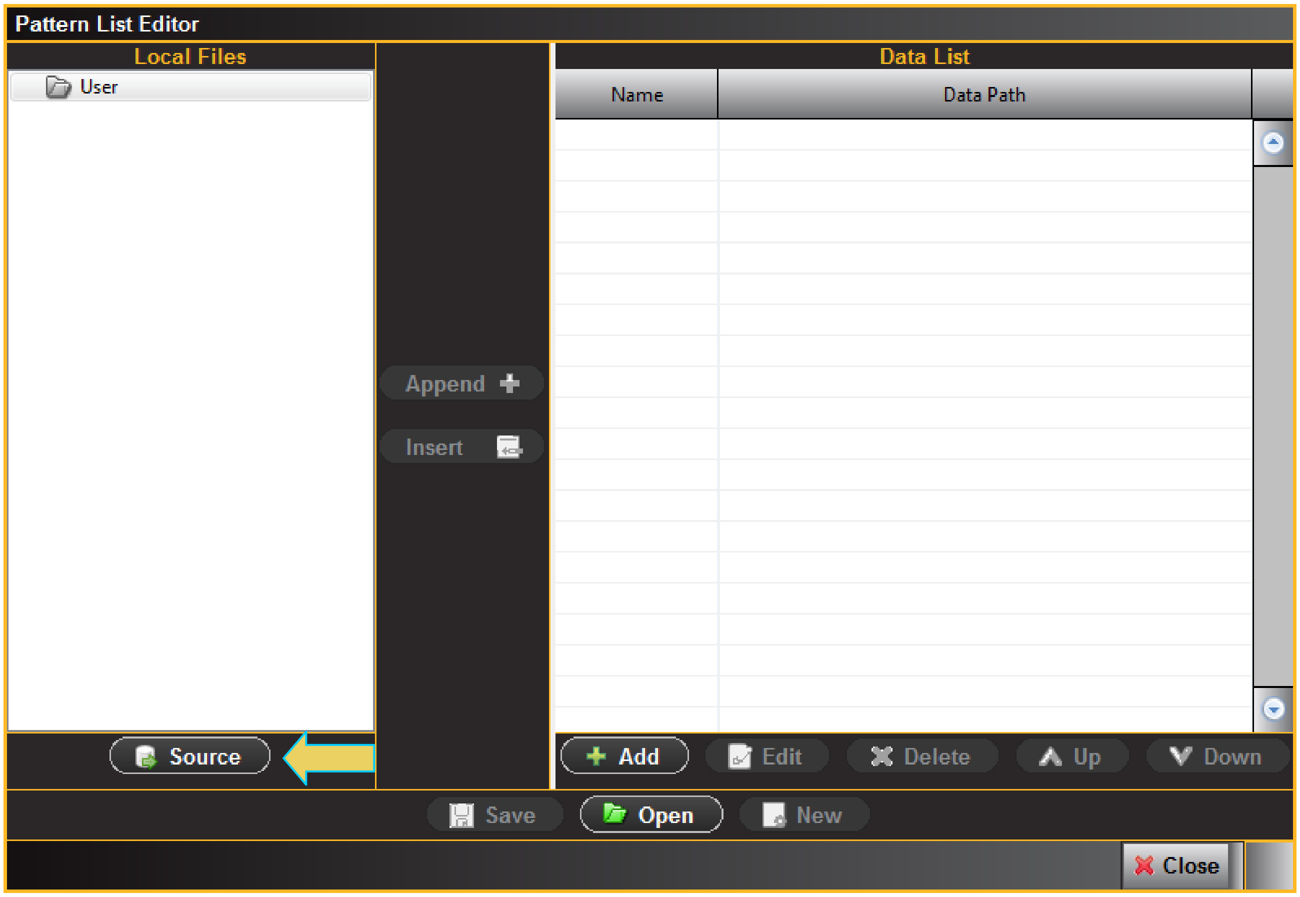
Alternatively, if you are using the embedded 980 GUI Manager you can access the **Pattern List Editor** from the **Generator Tools tab**. Be sure to select the correct Transmitter (Generator) port on the right side:

The list of editors appears as shown in the screen below.



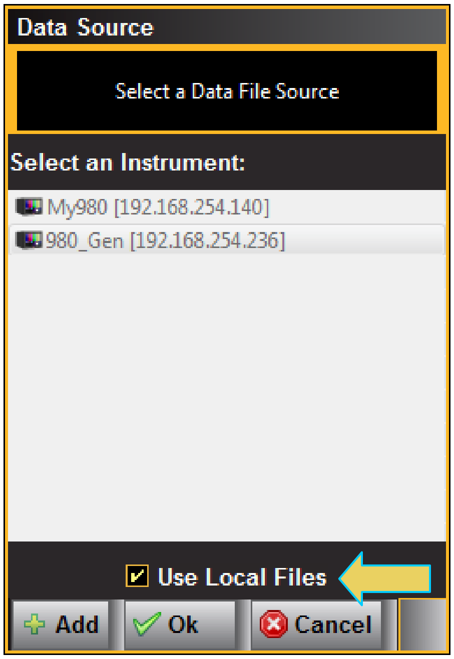
1. Select the Pattern List Editor icon.

   The **Pattern List Editor** appears as shown below.



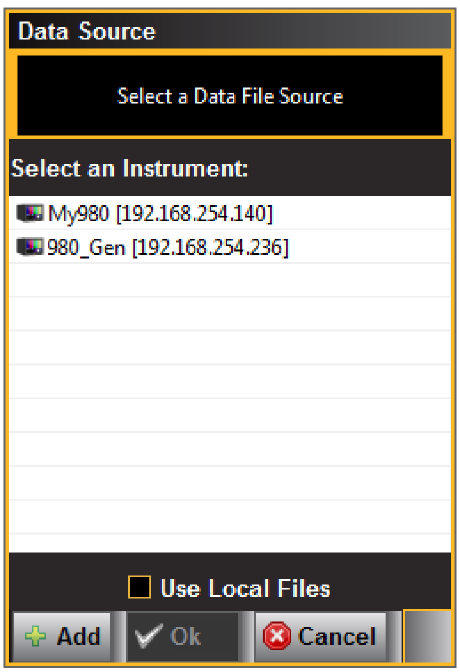
2. Click on the **Source** button on the lower left under Local Files (indicated in the diagram above). The Data **Source** dialog box will appear enabling you to select between using files on your PC or using files on the 980 DP Video Generator / Analyzer module to create your custom list. This dialog box also enables you to select the particular 980 (if there is more than one on the network). (You can also add a new 980 through this dialog box.)

   Note: "Local Files" when using the external 980 GUI Manager means that you are using the files stored locally on your host PC. If you deselect Local Files on the dialog box below you are viewing files on the 980 file system.



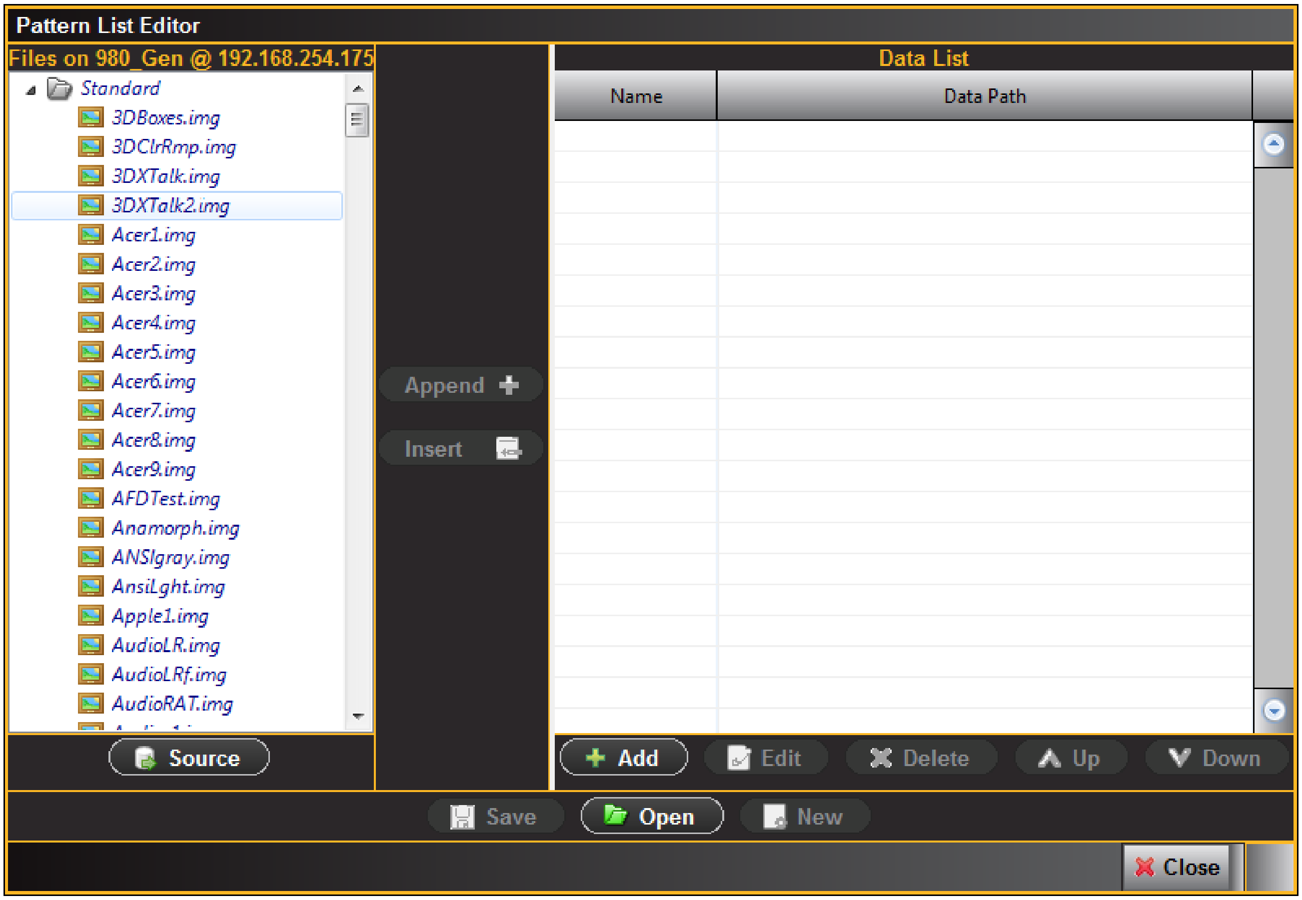
3. Select the instrument that you want to use as the source of your test patterns. (If there are multiple 980s on the network you will have to choose which one.) Note that if you are using the **Pattern List Editor** on the external 980 GUI Manager, the custom Pattern List is stored on the host PC not the 980 instrument itself.

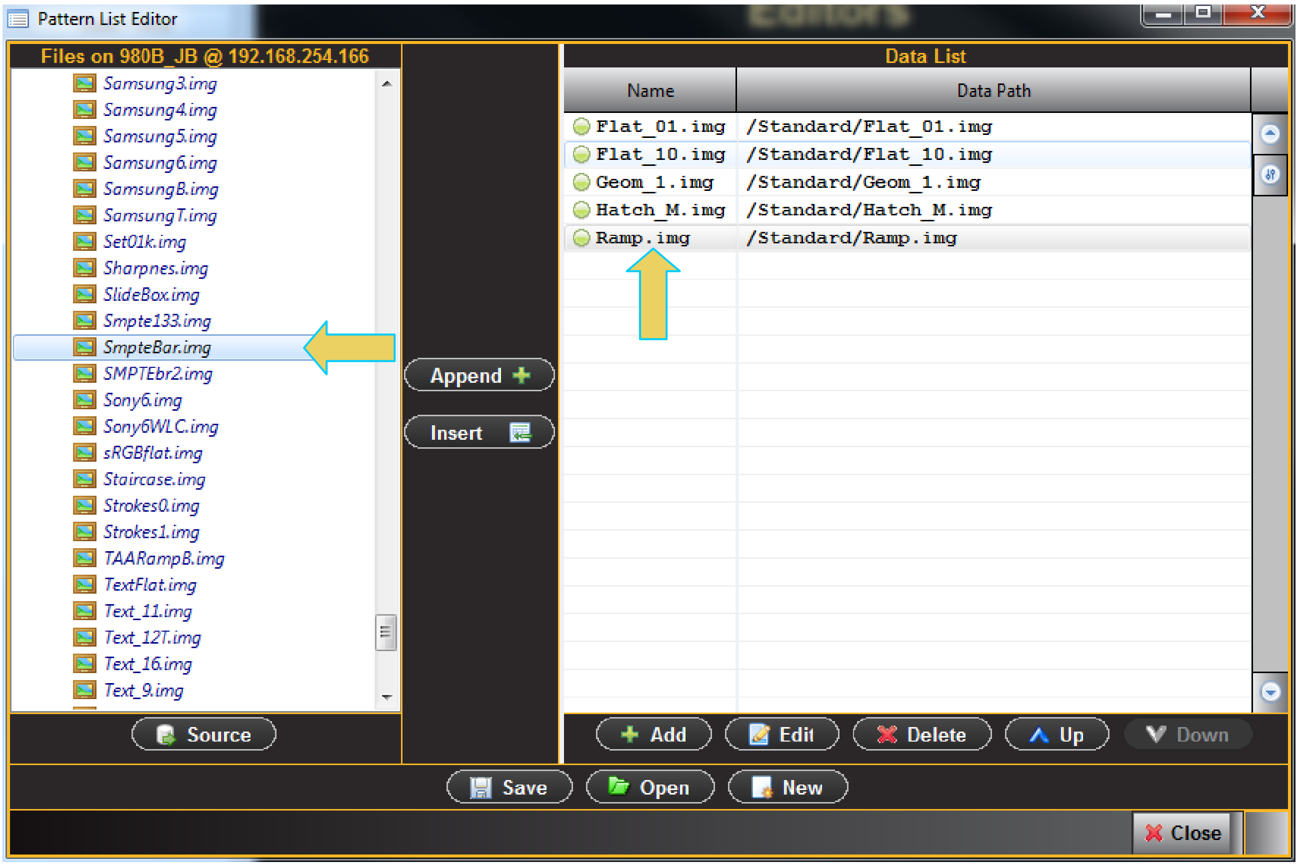
   Note that you will have to deselect **Use Local Files** in order to select a 980. If you do not de-select **Use Local Files**, then you will be using test patterns on your host PC to create your list.



4. Click **OK** to continue.

   The left side window of the **Pattern List Editor** will display the files on the 980 DP Video Generator module in the Standard directory. The panel on the right (**Data List**) is a list of test patterns in your custom list.


Pattern List Editor
Files on 980_Gen @ 192.168.254.175
Standard
3DBoxes.img
3DClrRmp.img
3DXTalk.img
3DXTalk2.img
Acer1.img
Acer2.img
Acer3.img
Acer4.img
Acer5.img
Acer6.img
Acer7.img
Acer8.img
Acer9.img
AFDTest.img
Anamorph.img
ANSIgray.img
AnsiLght.img
Apple1.img
AudioLR.img
AudioLRf.img
AudioRAT.img
Source
Append
Insert
Data List
Name
Data Path
Add
Edit
Delete
Up
Down
Save
Open
New
Close



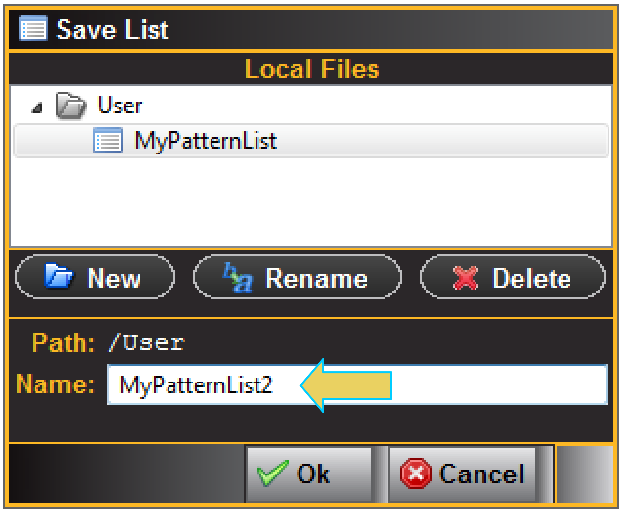
There are three buttons in the middle between the two windows that enable you to configure the test patterns in your Pattern List. These are defined as follows:

Append – Add a new test pattern to the end of your list.

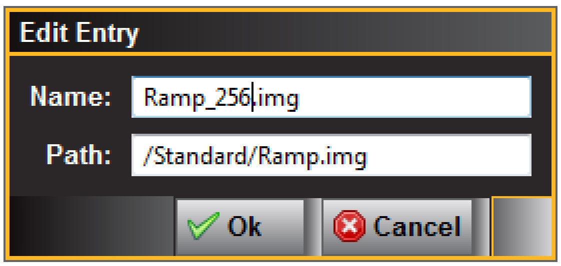
Insert – Insert a new test pattern into your accumulating list above the test pattern that is highlighted in the Data List on the right.

Delete – Delete or remove a test pattern from your list.

5. Click on the **Save** activation button when you are done configuring your custom list. You will be asked to enter a name for your new Pattern List. Use the **Name** field provided (below).



6. Click on the pattern name if you wish to rename it.

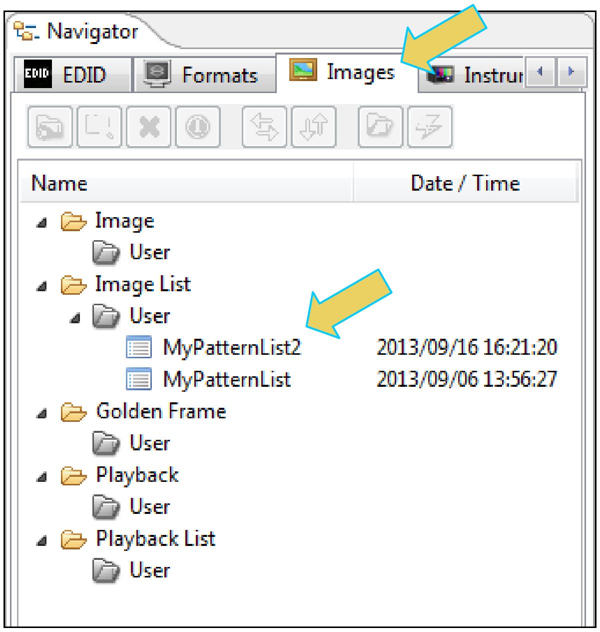


8.2 Applying a custom Pattern List

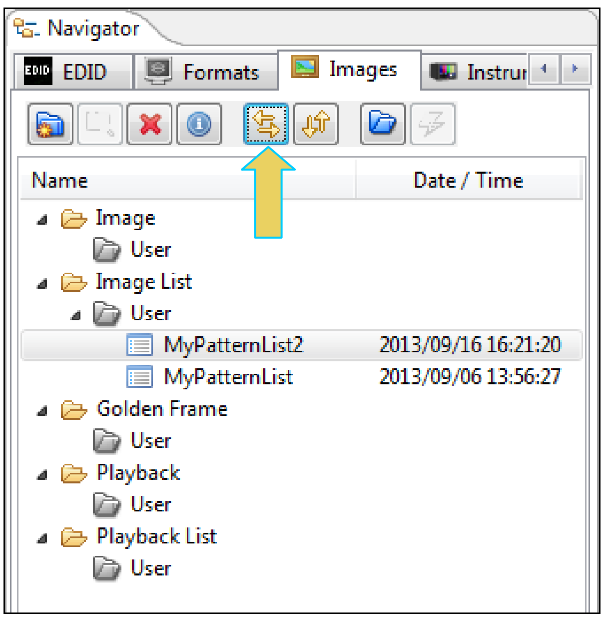
This subsection describes how you can apply a custom pattern list that you have created. Often you will have created the pattern list on your host PC but you may wish to apply it on the 980 instrument itself. In order to do this you will have to transfer the pattern list from your host PC to the 980/980B prior to using it. The procedure below describes these steps.

To apply an existing Pattern List:

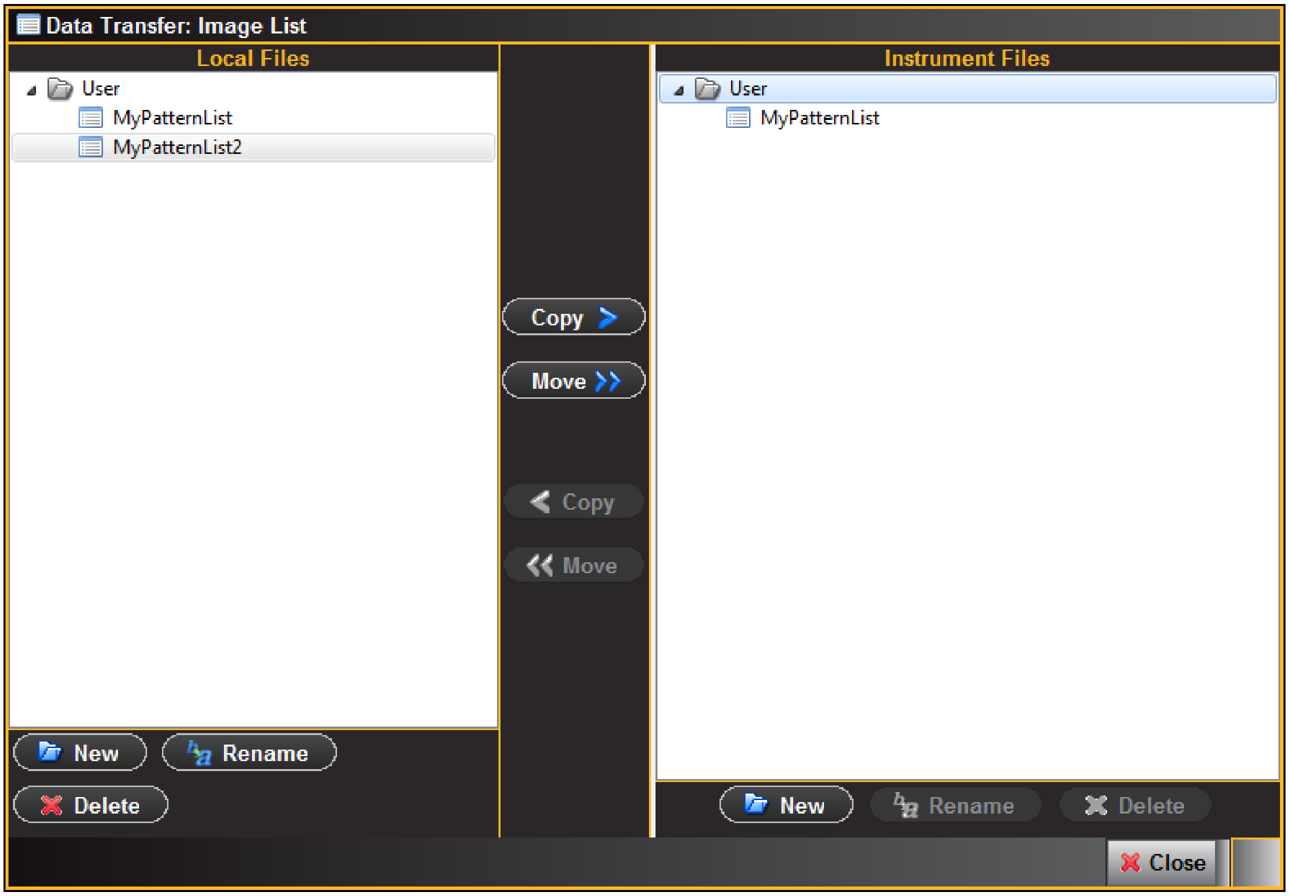
1. Navigate to the Navigate/Images tab.



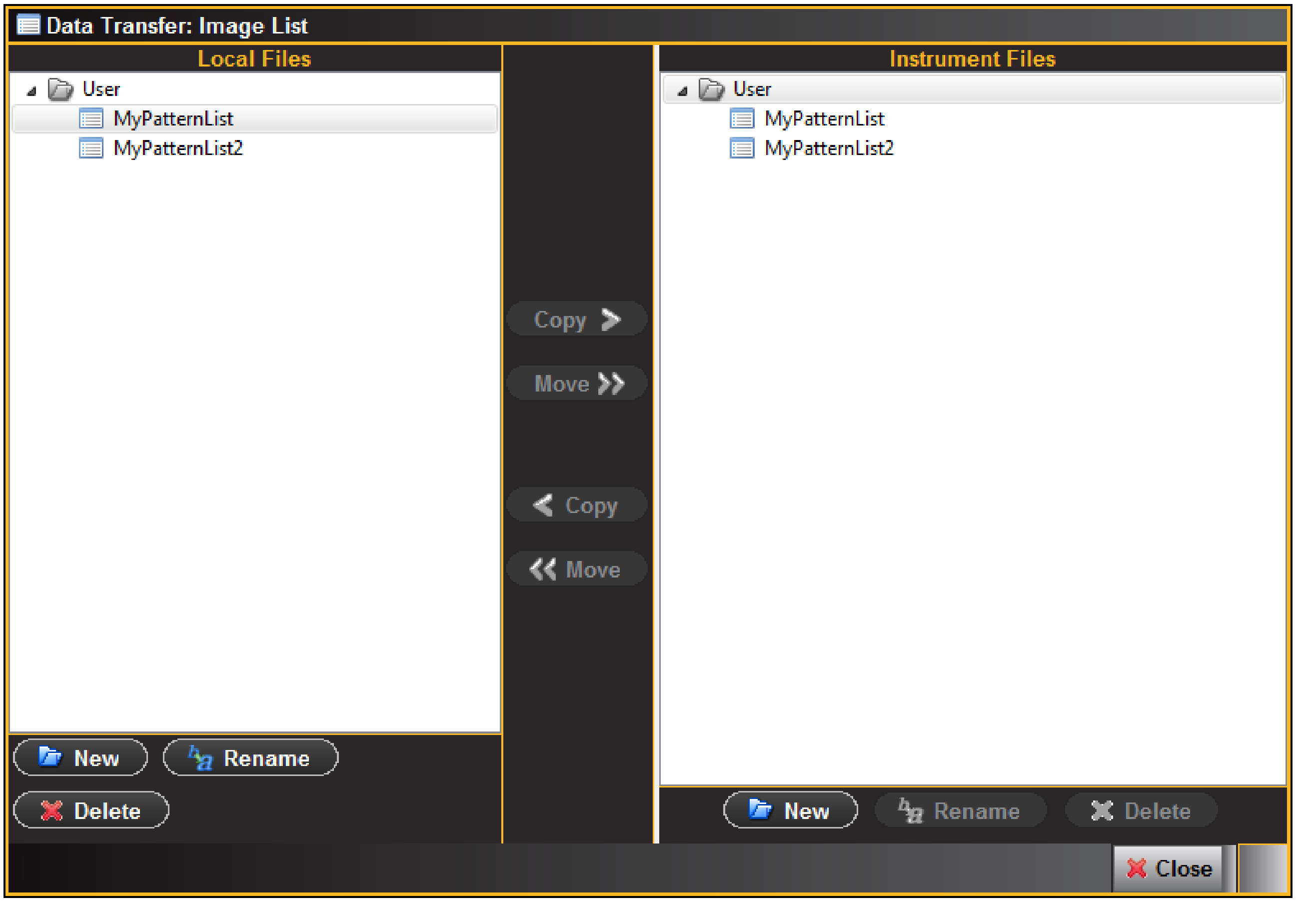
2. Transfer the Pattern List from your Host PC to the 980/980B by invoking the transfer icon indicated below.



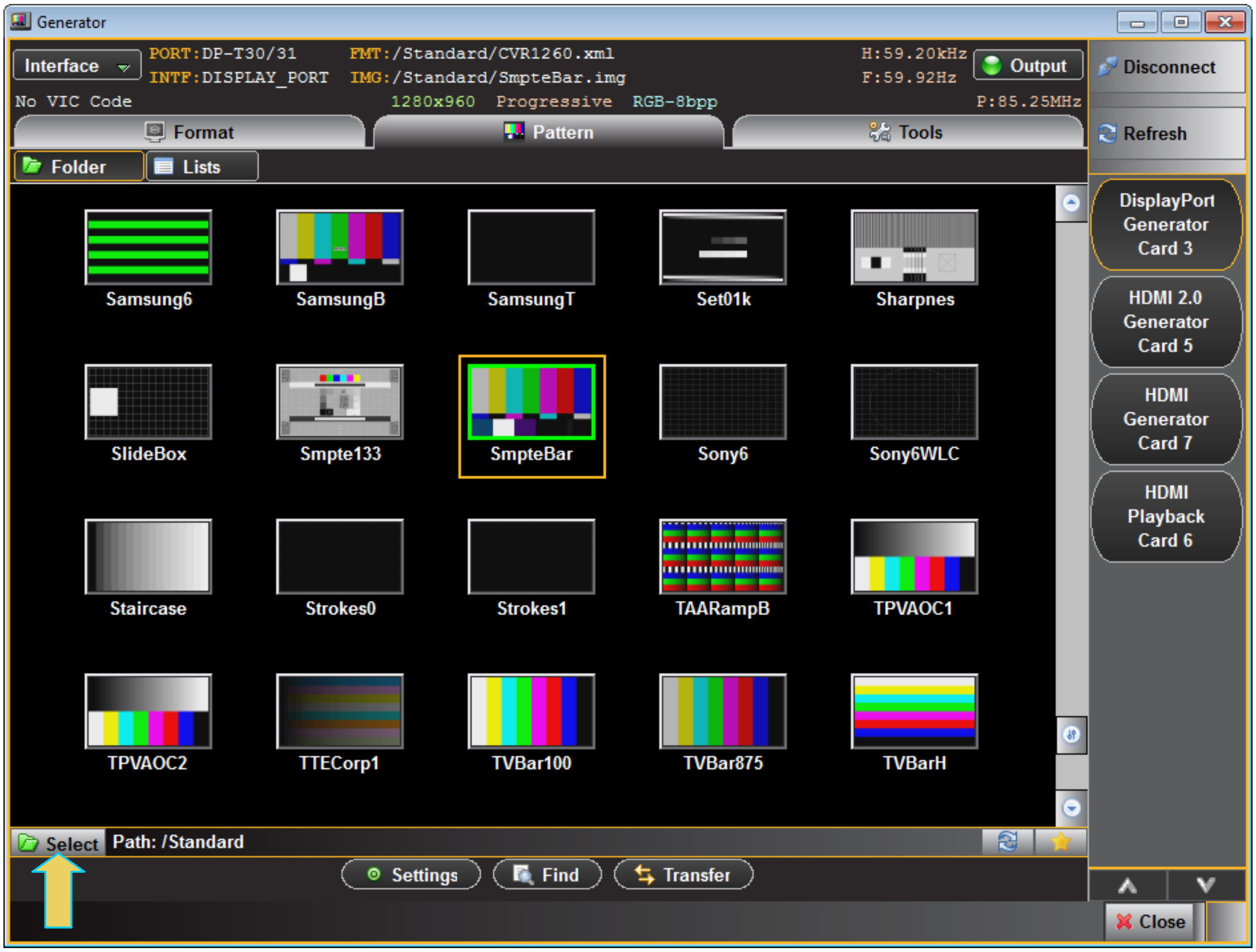
The File Transfer panel appears as shown below:



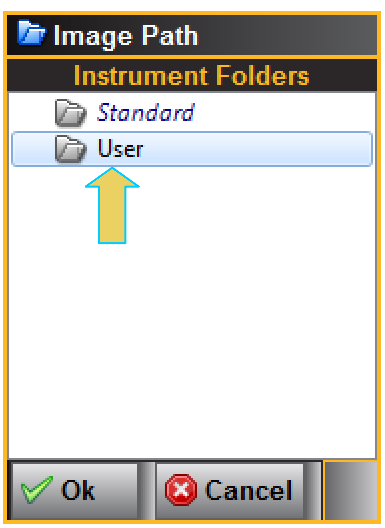
3. Transfer the Pattern list from the Local Files on the left side to the Instrument files using the Copy or Move button. Note that you will have to highlight a directory on the Instrument Files panel in order to enable the Copy or Move button. In this case since you are using the external 980 GUI Manager, the “Local Files” are the files stored on the Host PC. The following screen shows the result:


Data Transfer: Image List
Local Files
User
MyPatternList
MyPatternList2
Instrument Files
User
MyPatternList
MyPatternList2
Copy
Move
Copy
Move
New
Rename
Delete
New
Rename
Delete
Close

4. Navigate to the **Pattern** Tab on the Generator panel and select your list using the Pattern List icon on the bottom status panel as shown below.



The Pattern Lists dialog box will appear as shown below.



5. Select the Pattern Lists icon and then the desired Pattern List as shown below:

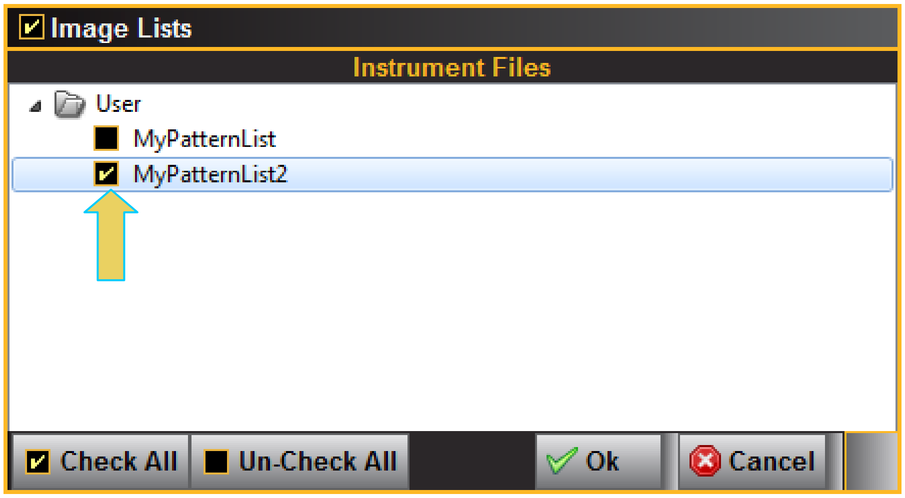
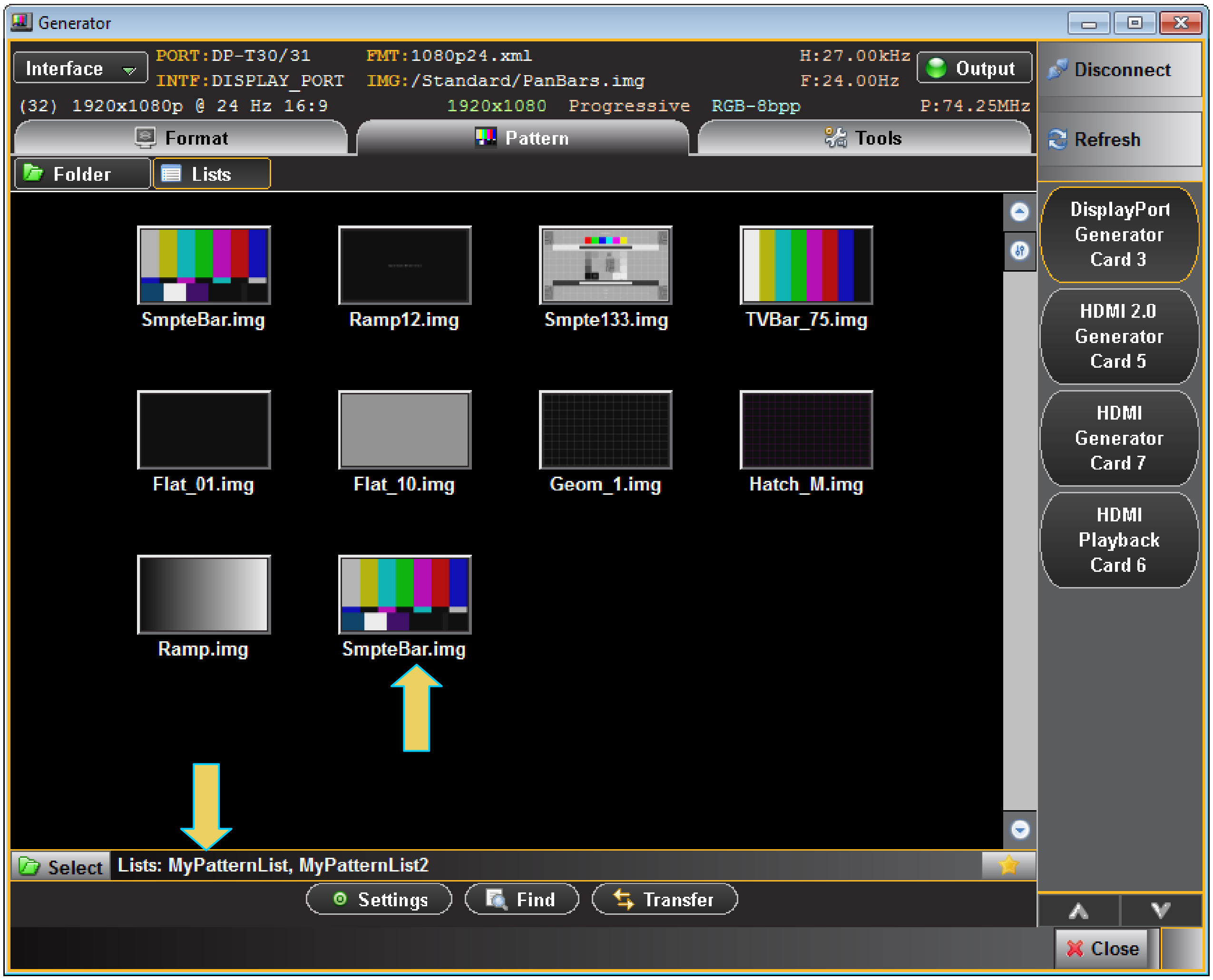


Image Lists
Instrument Files
User
MyPatternList
MyPatternList2
Check All
Un-Check All
Ok
Cancel

The result is that there will be a restricted list of test patterns available and display in the **Pattern** tab window (below). The Path icon on the bottom status panel will display that new list.

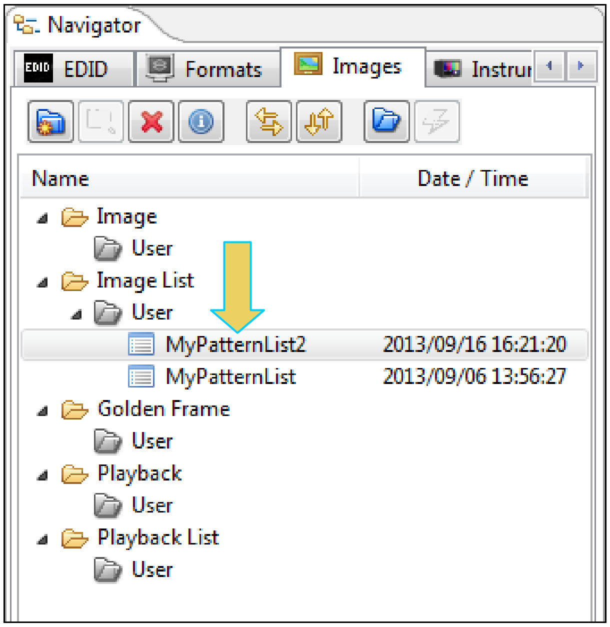


8.3 Viewing a custom Pattern List

This subsection describes how you can view a custom pattern list that you have created.

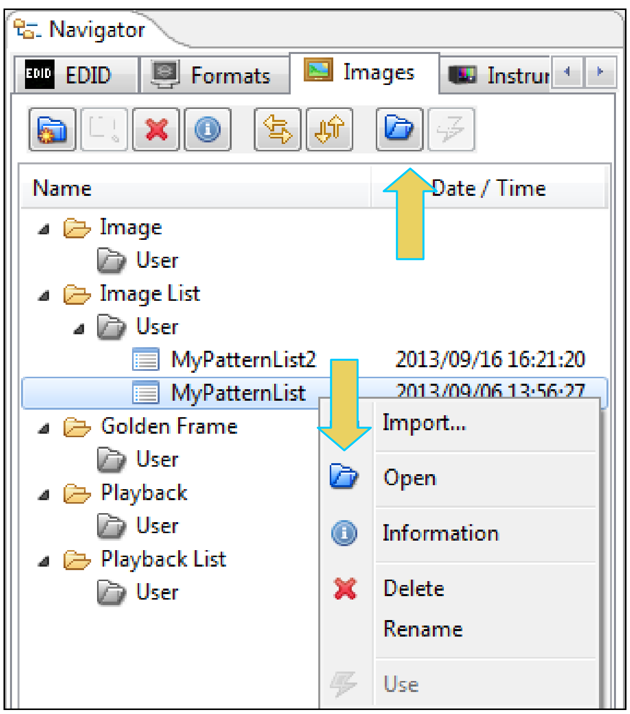
To view an existing Pattern List:

1. View the new Image List through the **Navigator** panel. Select the Pattern List folder.

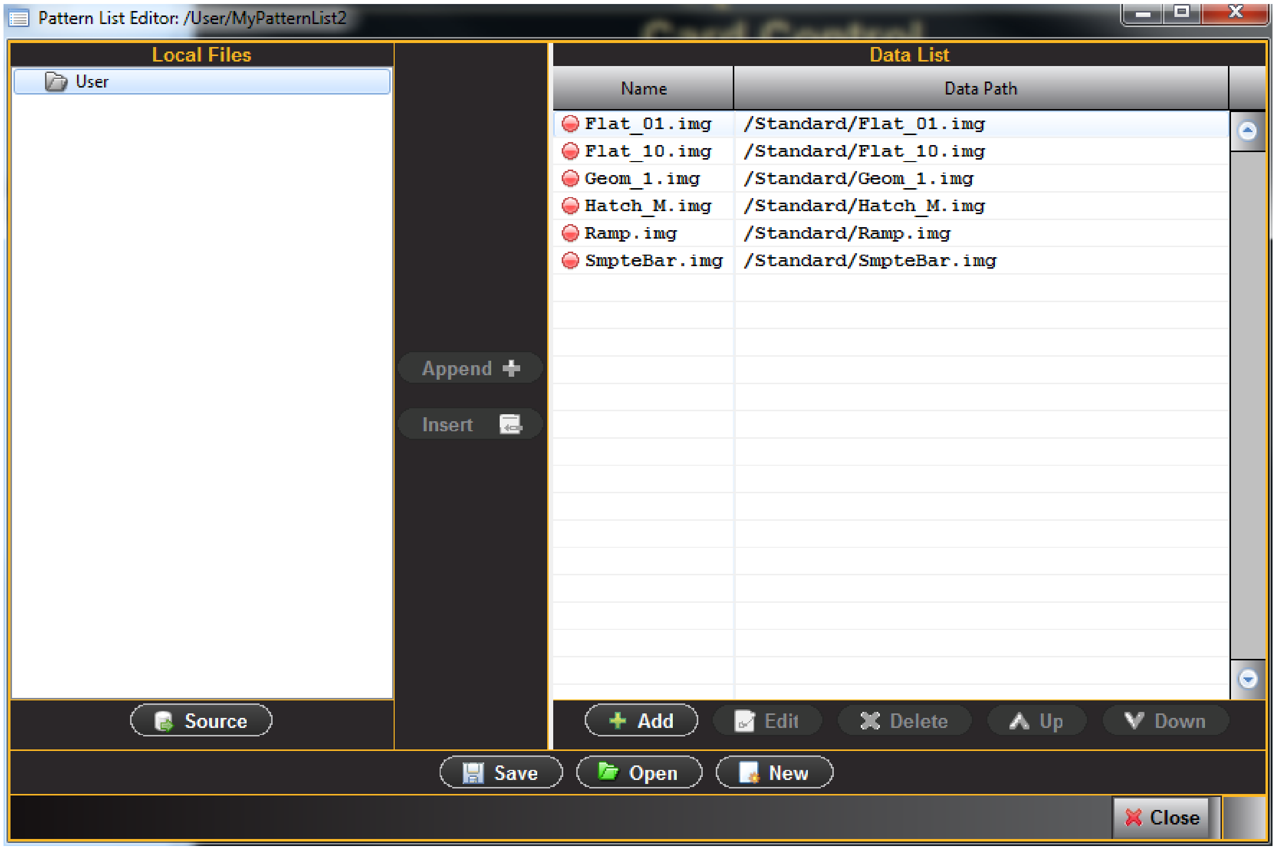


2. The new Pattern List will appear under User in the Local Files panel as shown above.

3. Right click on the desired pattern list or select the Open icon to open up the viewing window. Refer to the screen example below:



The Pattern List will appear in the panel as shown below:

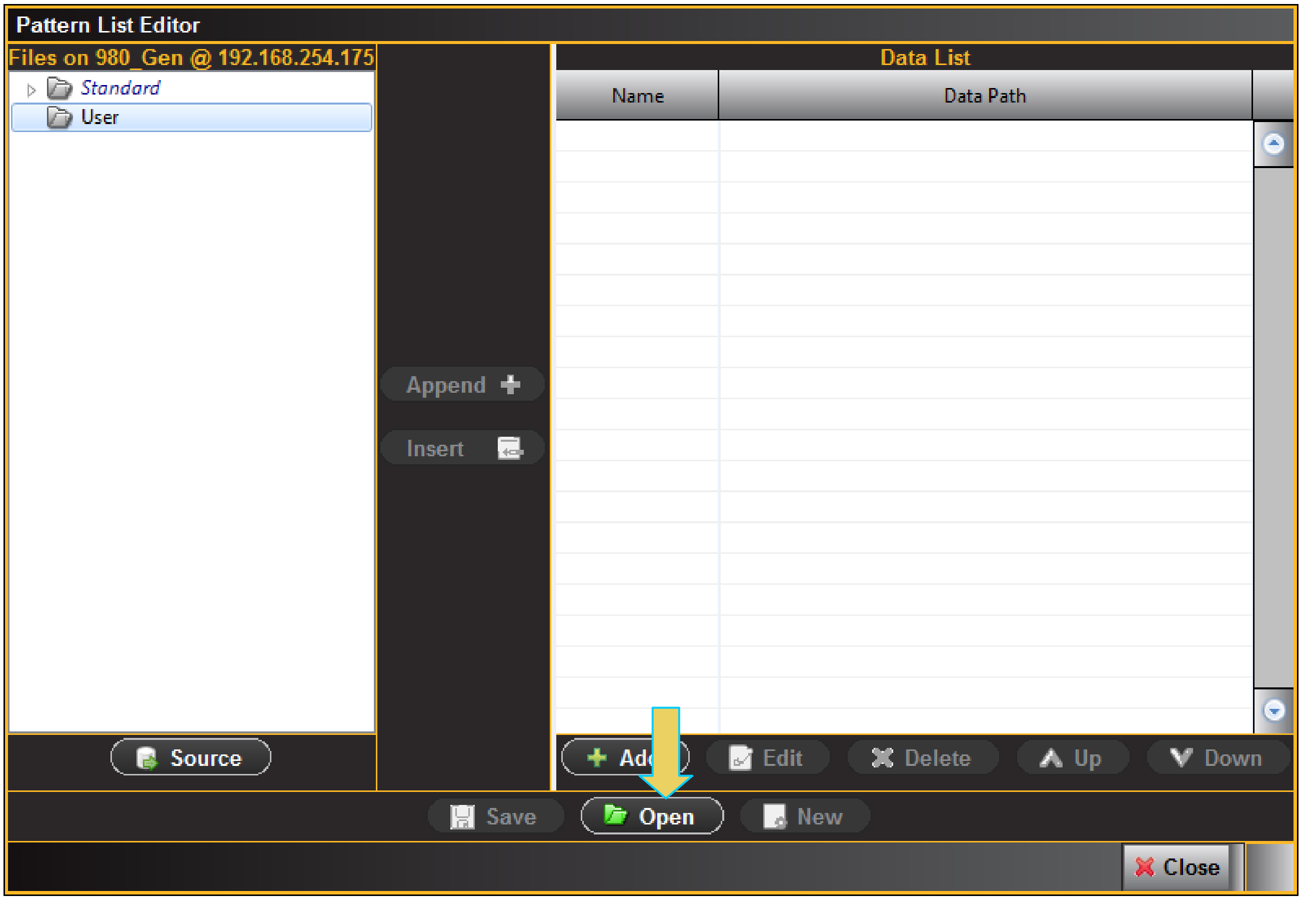

Pattern List Editor: /User/MyPatternList2
Local Files
User
Append
Insert
Source
Data List
Name
Data Path
Flat_01.img
/Standard/Flat_01.img
Flat_10.img
/Standard/Flat_10.img
Geom_1.img
/Standard/Geom_1.img
Hatch_M.img
/Standard/Hatch_M.img
Ramp.img
/Standard/Ramp.img
SmpteBar.img
/Standard/SmpteBar.img
Add
Edit
Delete
Up
Down
Save
Open
New
Close

8.4 Opening a custom Patten List from the Pattern List Editor

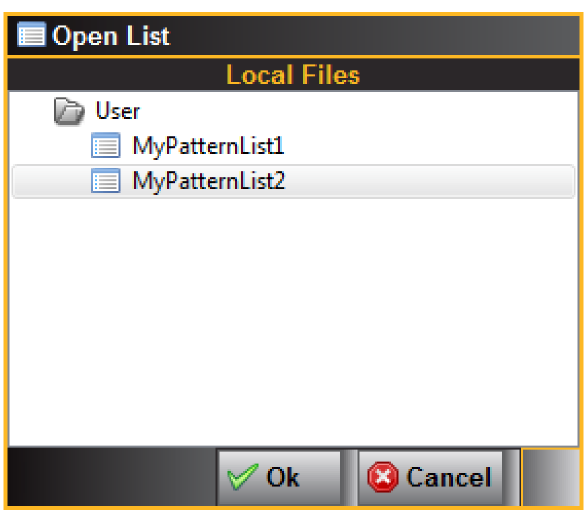
This subsection describes how you can open a custom pattern list that you have created in the Pattern List Editor.

To open an existing Pattern List:

1. Click on the **Open** activation button on the lower panel of the **Pattern List Editor** window.

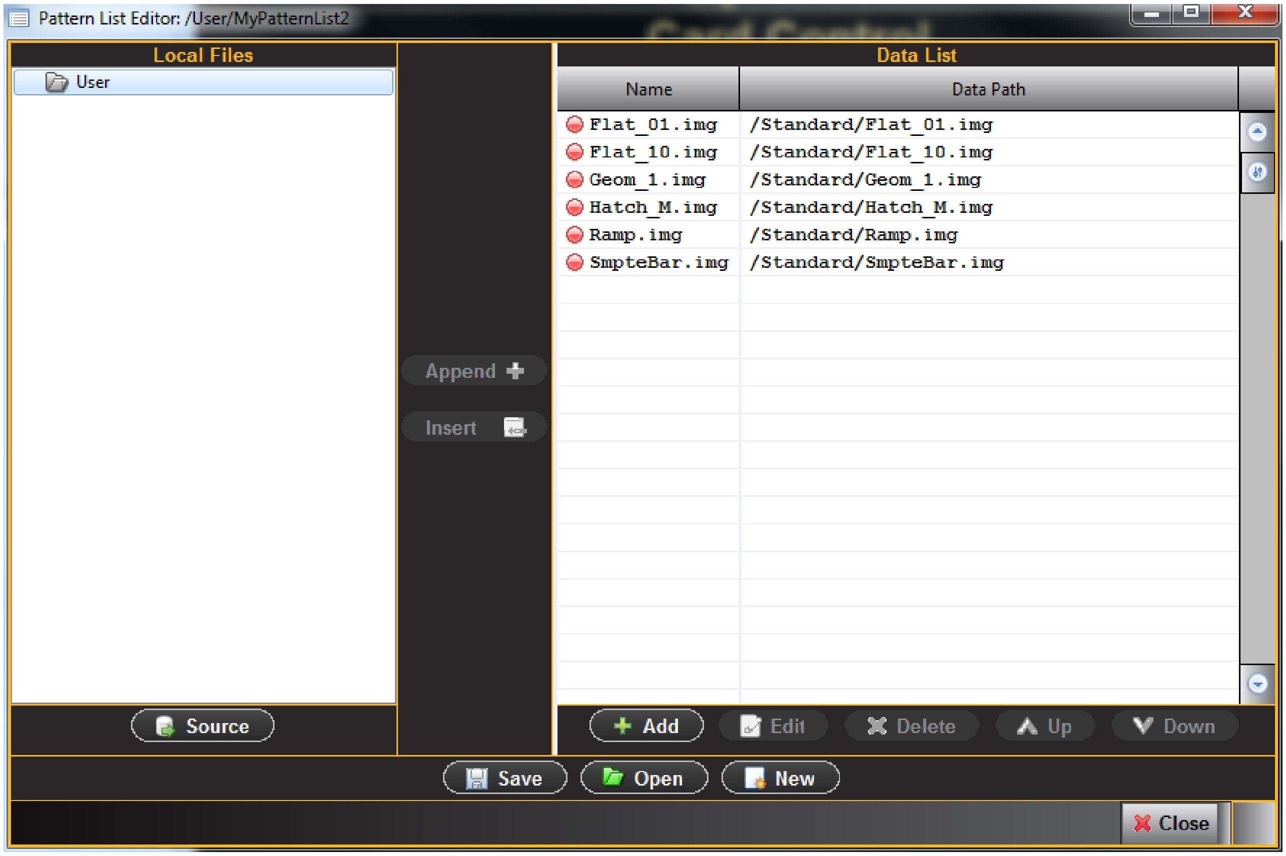


The **Open List** dialog box appears enabling you to select a Pattern List (below).



2. Select the list you wish to open (only one list is shown in the **Open List** dialog box example above). The Pattern List will appear in the Pattern List Editor window as shown below.

   You can now edit the list as desired using the same techniques that you used to create the list.



9 Format List Editor

Use the following procedures to create a custom format list. The **Format List Editor** can be used either on the embedded 980 GUI Manager or the external 980 GUI Manager. The examples in this procedure use the external 980 GUI Manager

9.1 Opening a custom Format List

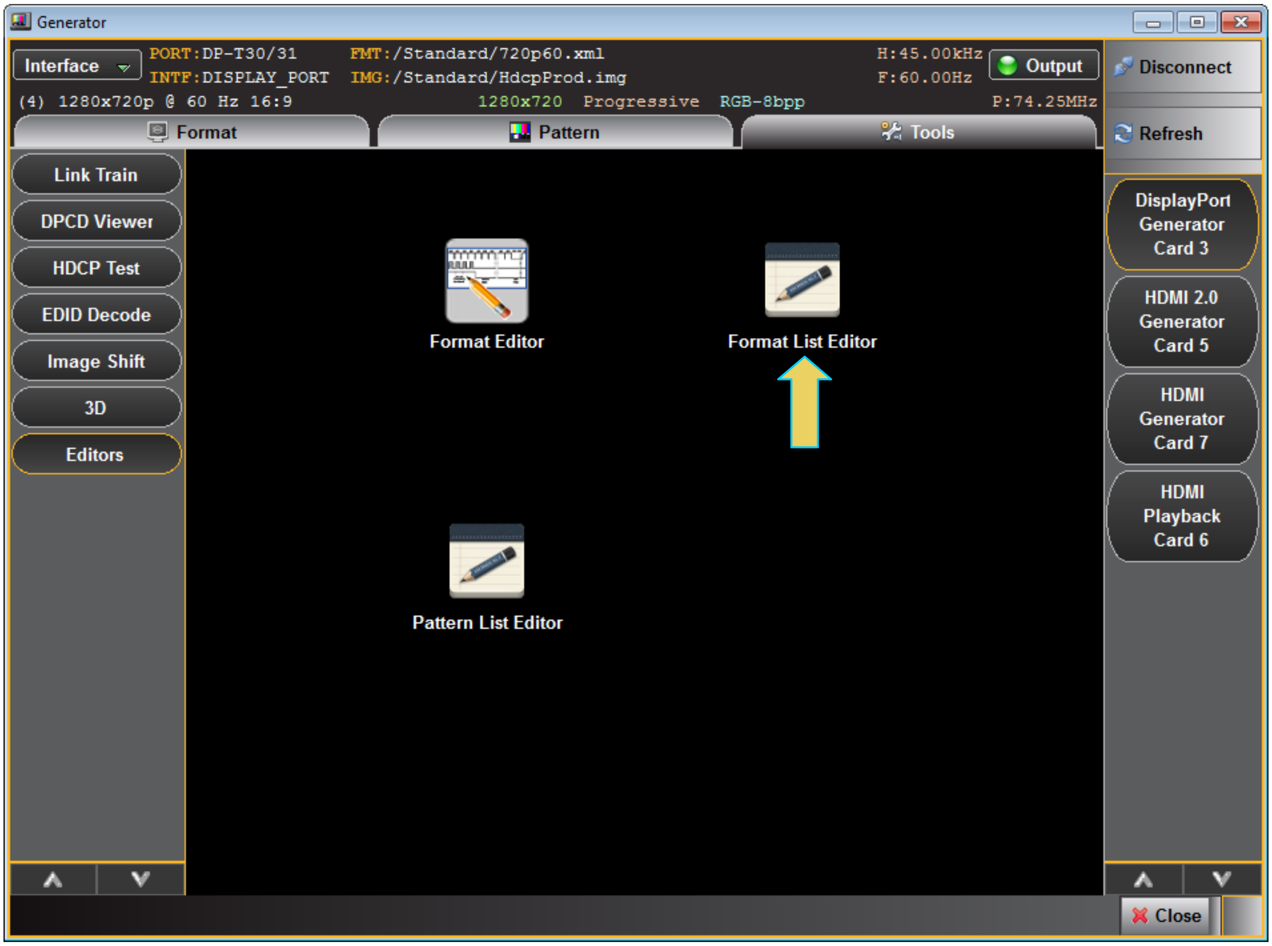
This subsection describes how you can create a custom format list.

To create a custom list of test patterns:

1. From the Editors Page of the Apps panel, select **Format List Editor** from the **View** menu as shown below.

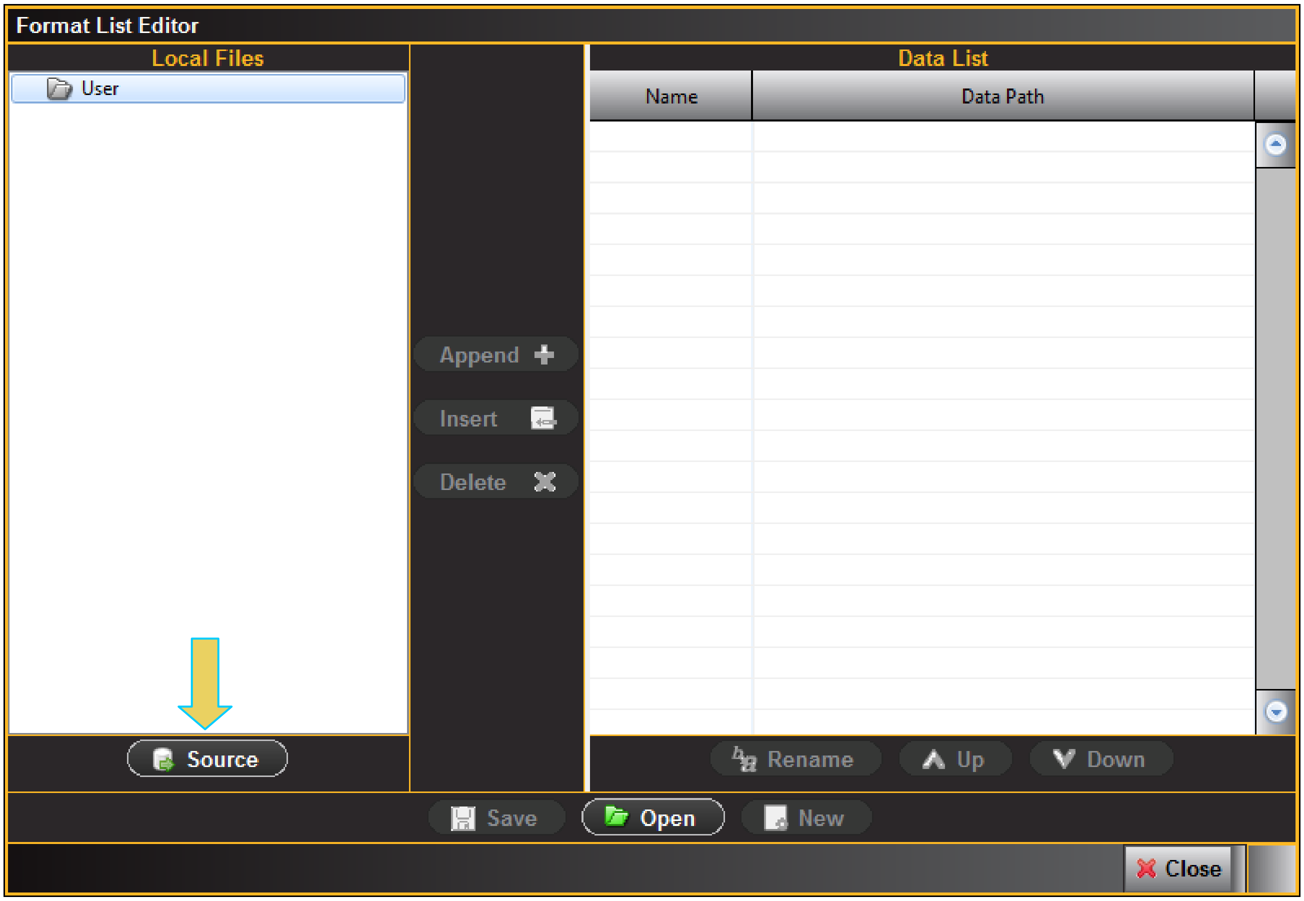
Alternatively, if you are using the embedded 980 GUI Manager you can access the **Format List Editor** from the **Generator Tools tab**. Be sure to select the correct Transmitter on the right side.

The list of editors appears as shown in the screen below.



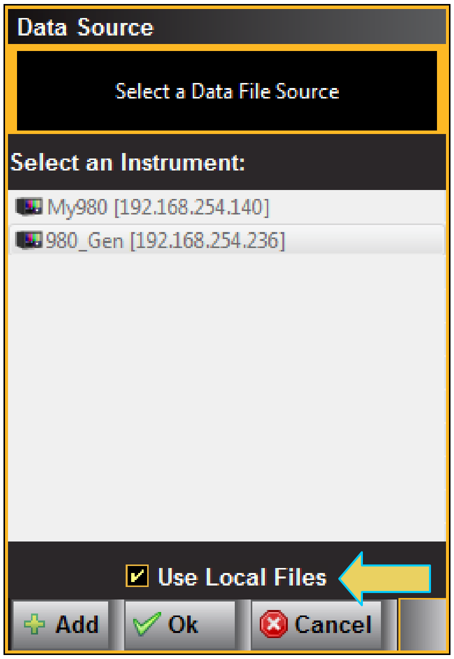
1. Select the Format Editor icon.

The **Format List Editor** appears as shown below:



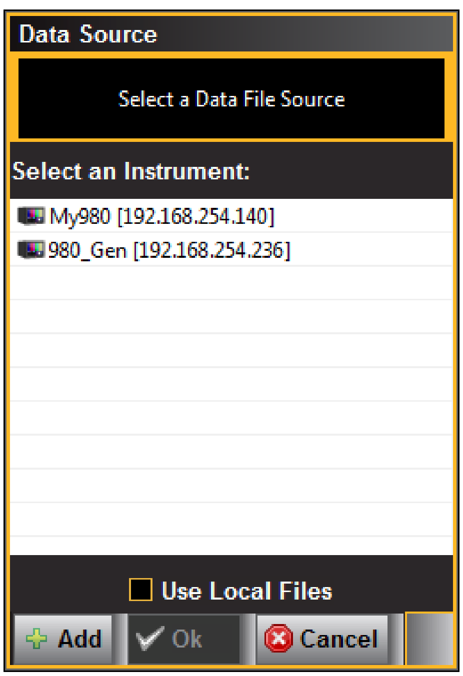
2. Click on the **Source** button on the lower left under Local Files (indicated in the diagram above). The Data **Source** dialog box will appear enabling you to select between using files on your PC or using files on the 980 DP Video Generator module to create your custom list. This dialog box also enables you to select the particular 980B (if there are more than one on the network). (You can also add a new 980 through this dialog box.)

   Note: "Local Files" when using the external 980 GUI Manager means that you are using the files stored locally on your host PC. If you deselect Local Files on the dialog box below you are viewing files on the 980B file system.



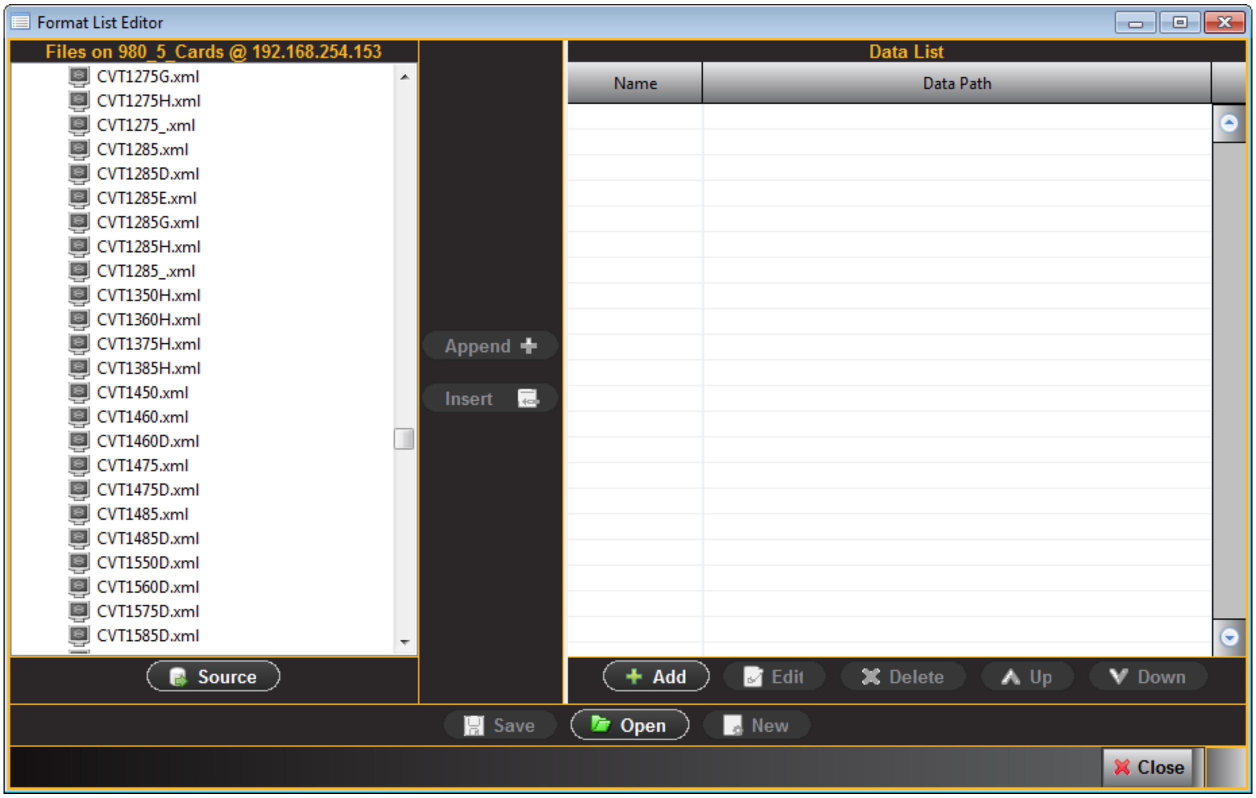
3. Select the instrument that you want to use as the source of your formats. (If there are multiple 980s on the network you will have to choose which one.) Note that if you are using the **Format List Editor** on the external 980 GUI Manager, the custom Format List is stored on the host PC not the 980 instrument itself.

   Note that you will have to deselect **Use Local Files** in order to select a 980B. If you do not de-select **Use Local Files**, then you will be using formats on your host PC to create your list.



4. Click **OK** to continue.

   The left side window of the **Format List Editor** will display the files on the 980 DP Video Generator module in the Standard directory. The panel on the right (**Data List**) is a list of formats in your custom list.



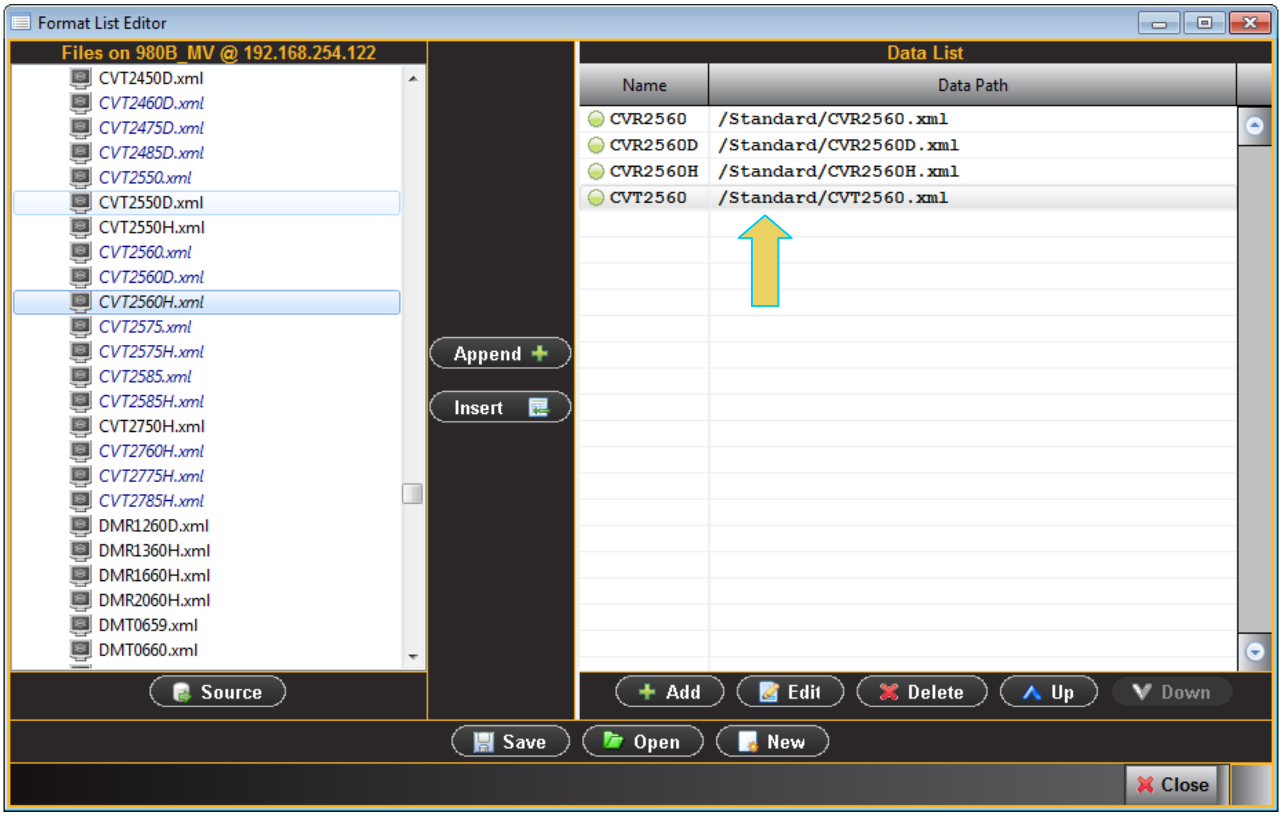
5. Select formats from the left side panel (Files on 980) and Append or Insert them to your Format List. They will accumulate on the Data List panel on the right side of the Format List Editor window.

   There are three buttons in the middle between the two panels that enable you to configure the formats in your Format List. These are defined as follows:

   Append – Add a new format to the end of your list.

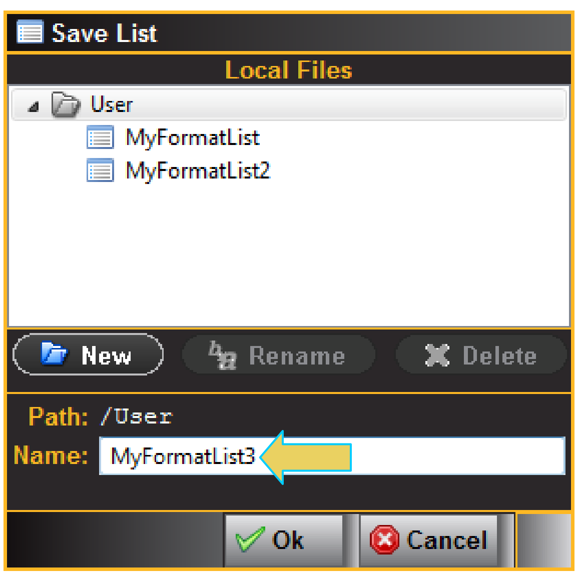
   Insert – Insert a new format into your accumulating list above the test pattern that is highlighted in the Data List on the right.

   Delete – Delete or remove a format from your list.

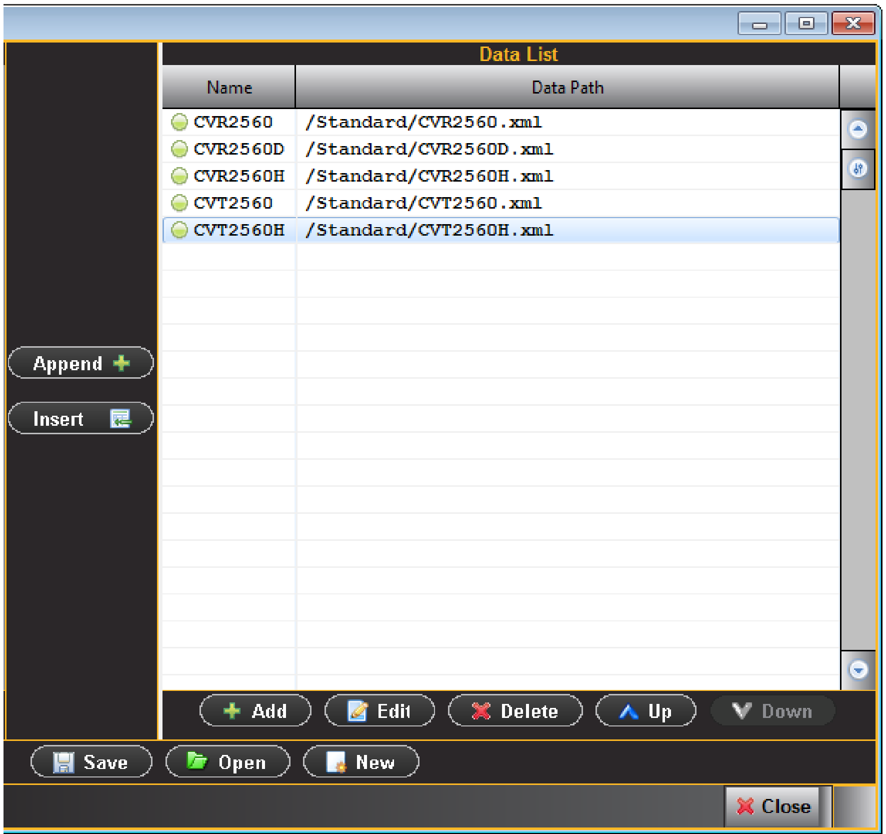


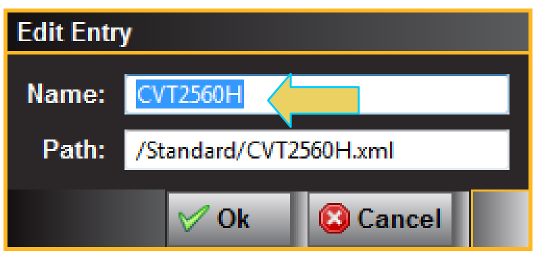
Note: The formats listed in blue are formats that are in the EDID of the connected display.

6. Click on the **Save** activation button when you are done configuring your custom list. You will be asked to enter a name for your new Format List. Use the **Name** field provided (below).



7. Click on any format if you wish to rename it for convenience.


Data List
Name
Data Path
CVR2560
/Standard/CVR2560.xml
CVR2560D
/Standard/CVR2560D.xml
CVR2560H
/Standard/CVR2560H.xml
CVT2560
/Standard/CVT2560.xml
CVT2560H
/Standard/CVT2560H.xml
Append
Insert
Add
Edit
Delete
Up
Down
Save
Open
New
Close

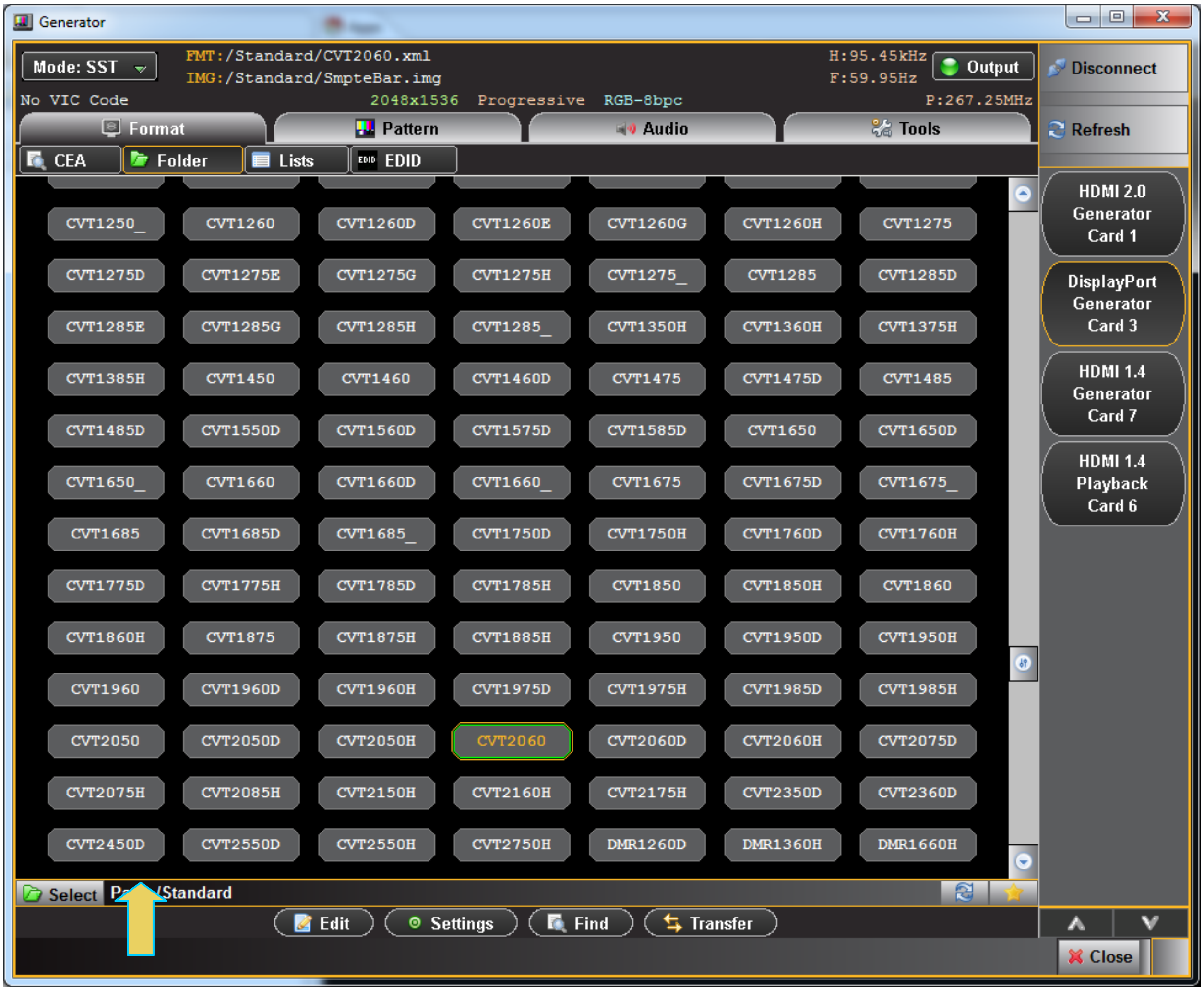

Edit Entry
Name:
CVT2560H
Path:
/Standard/CVT2560H.xml
Ok
Cancel

9.2 Applying a custom Format List

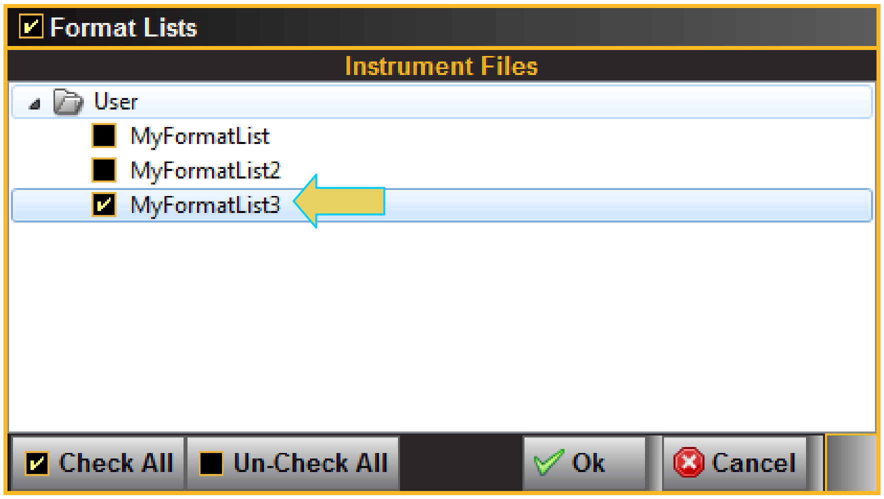
This subsection describes how you can apply a custom format list that you have created.

To apply an existing Format List:

1. Navigate to the **Formats** Tab and select your list using the Format List icon on the bottom status panel as shown below.

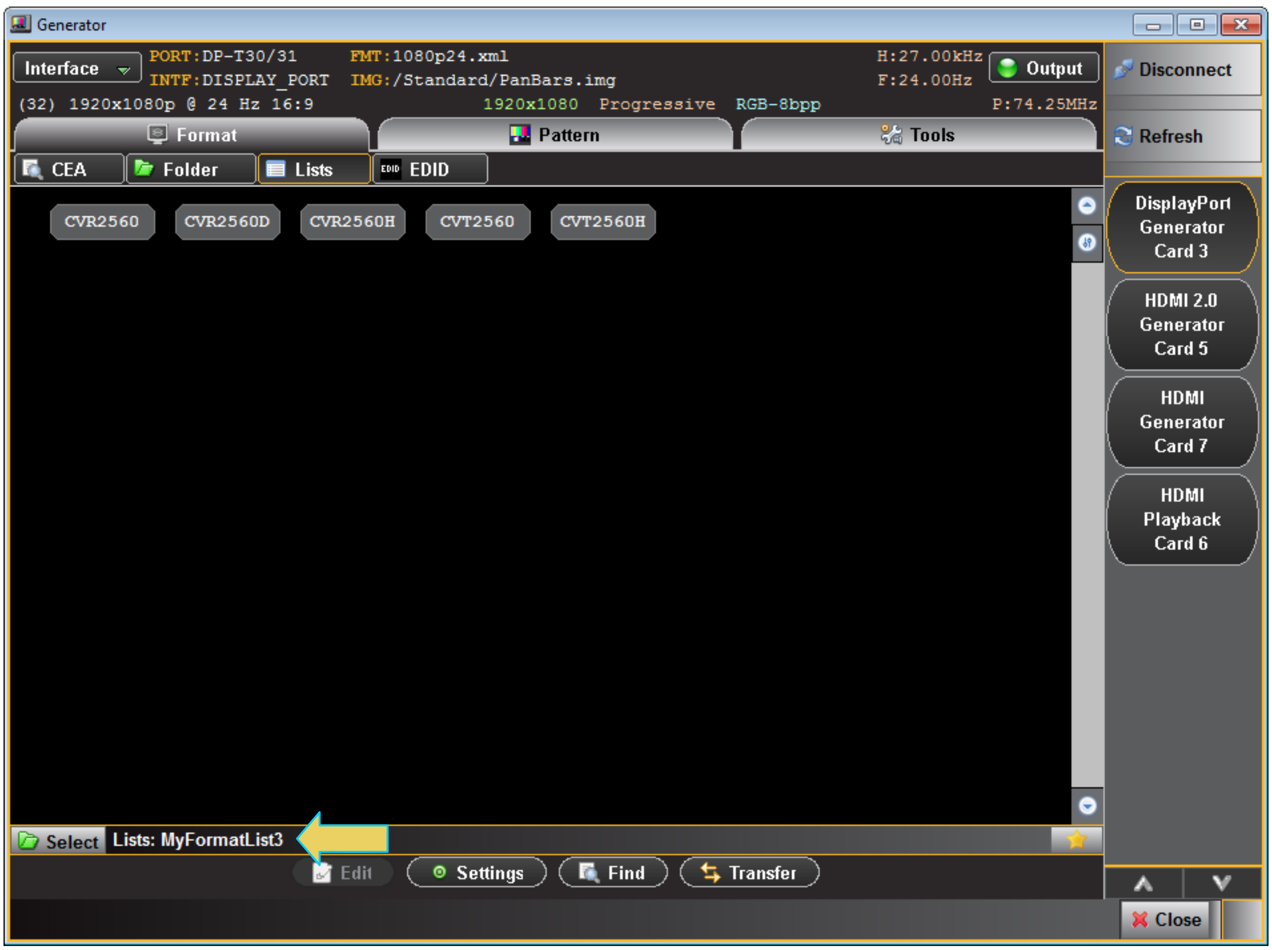


The Format Lists dialog box will appear as shown below.



2. Select the desired format list.

   The result is that there will be a restricted list of formats available and display in the **Format** tab window (below). The Path icon on the bottom status panel will display that new list.

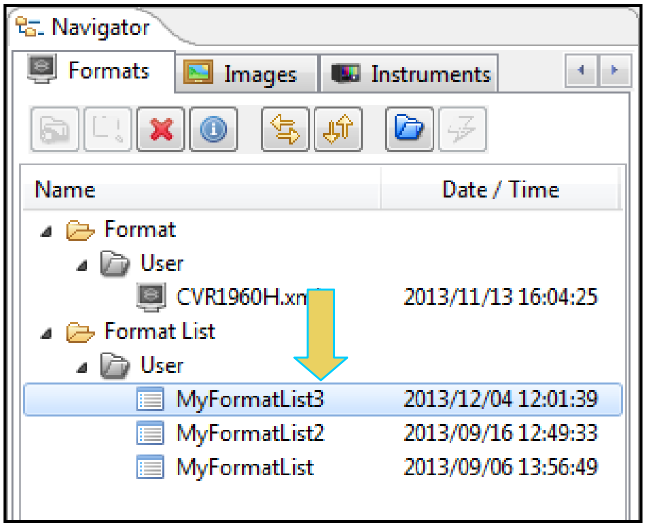


9.3 Viewing a custom Format List

This subsection describes how you can view a custom format list that you have created.

To view an existing Format List:

1. View the new Format List through the **Navigator** panel. Select the Format List folder.



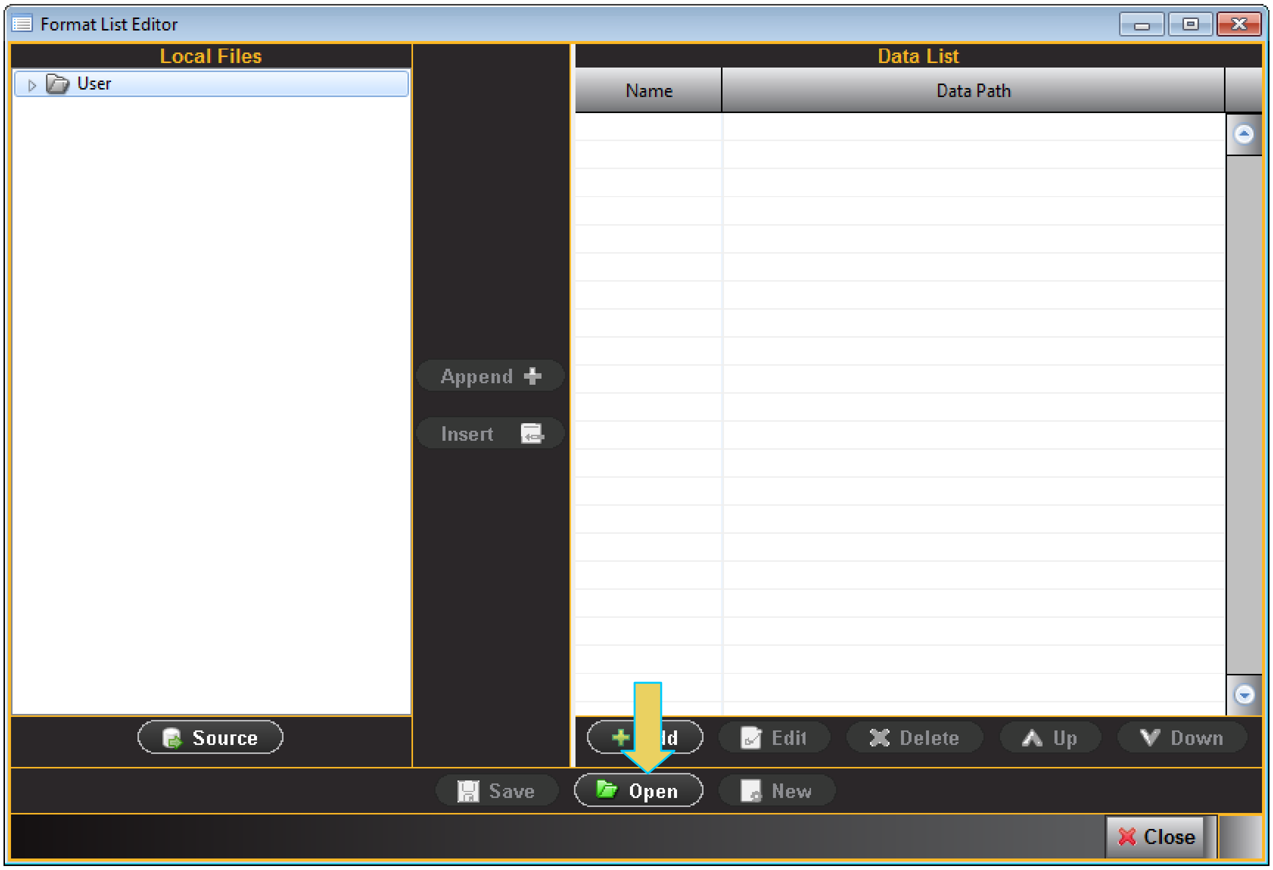
2. The new Format List will appear under User in the Local Files panel as indicated above.

9.4 Opening a custom Format List

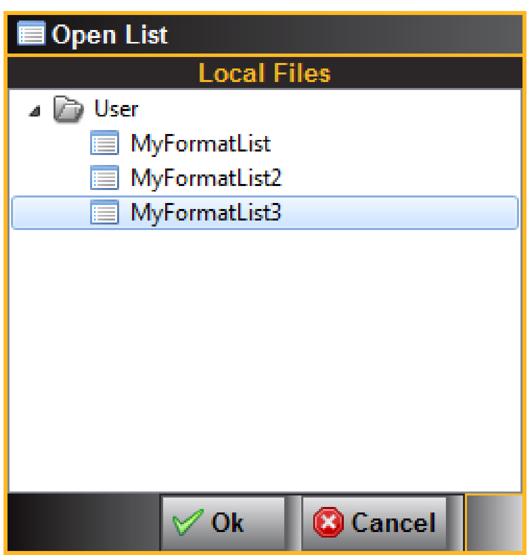
This subsection describes how you can open a custom format list that you have created.

To open an existing Format List for editing:

1. Click on the **Open** activation button on the lower panel of the **Format List Editor** window.

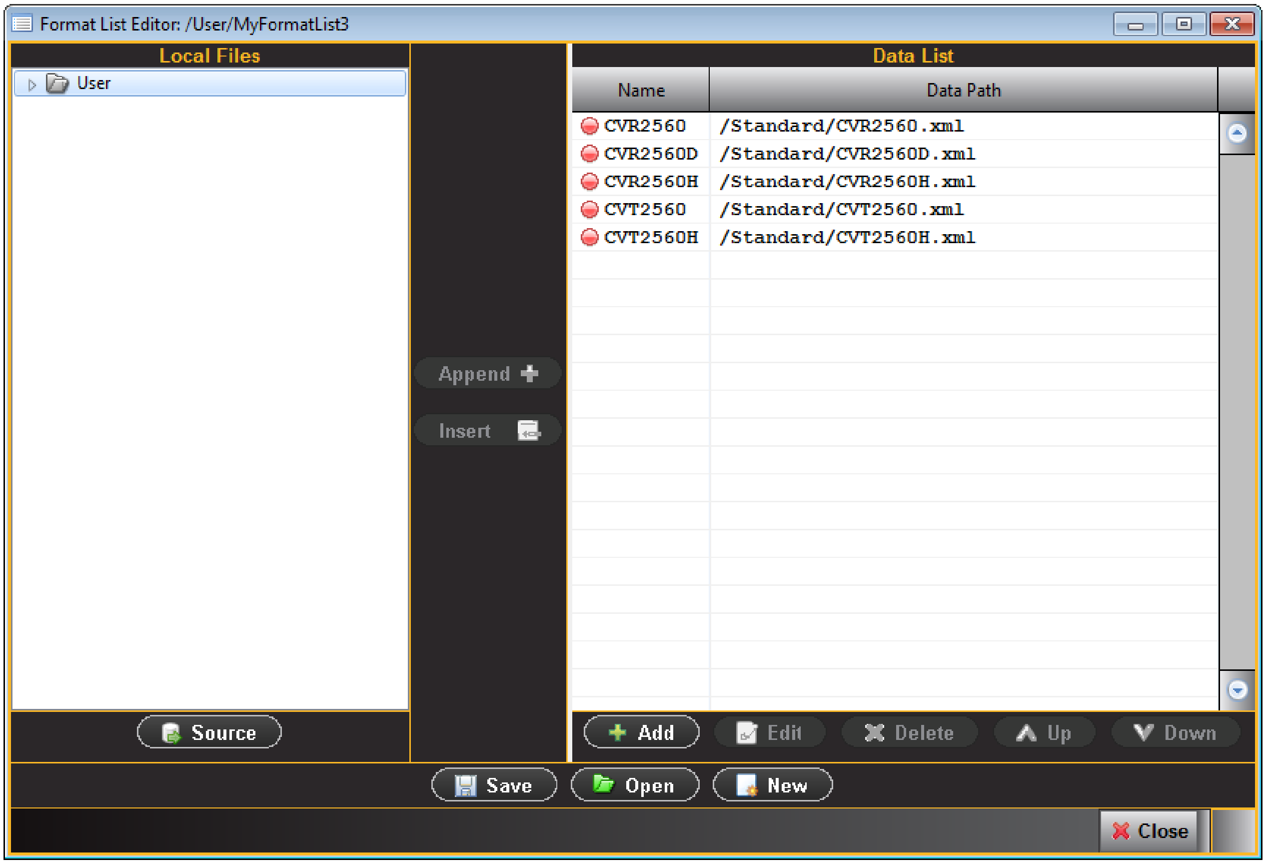


The **Open List** dialog box appears enabling you to select a Format List (below).



2. Select the list you wish to open (only one list is shown in the **Open List** dialog box example above). The Format List will appear in the **Format List Editor** window as shown below.

   You can now edit the list as desired.



10 Format Editor

The **Format Editor** provides a graphical user interface for modifying existing formats, creating custom formats and viewing format parameters. The **Format Editor** can be run on the embedded 980 GUI Manager or on the external 980 GUI Manager.

10.1 Accessing the Format Editor

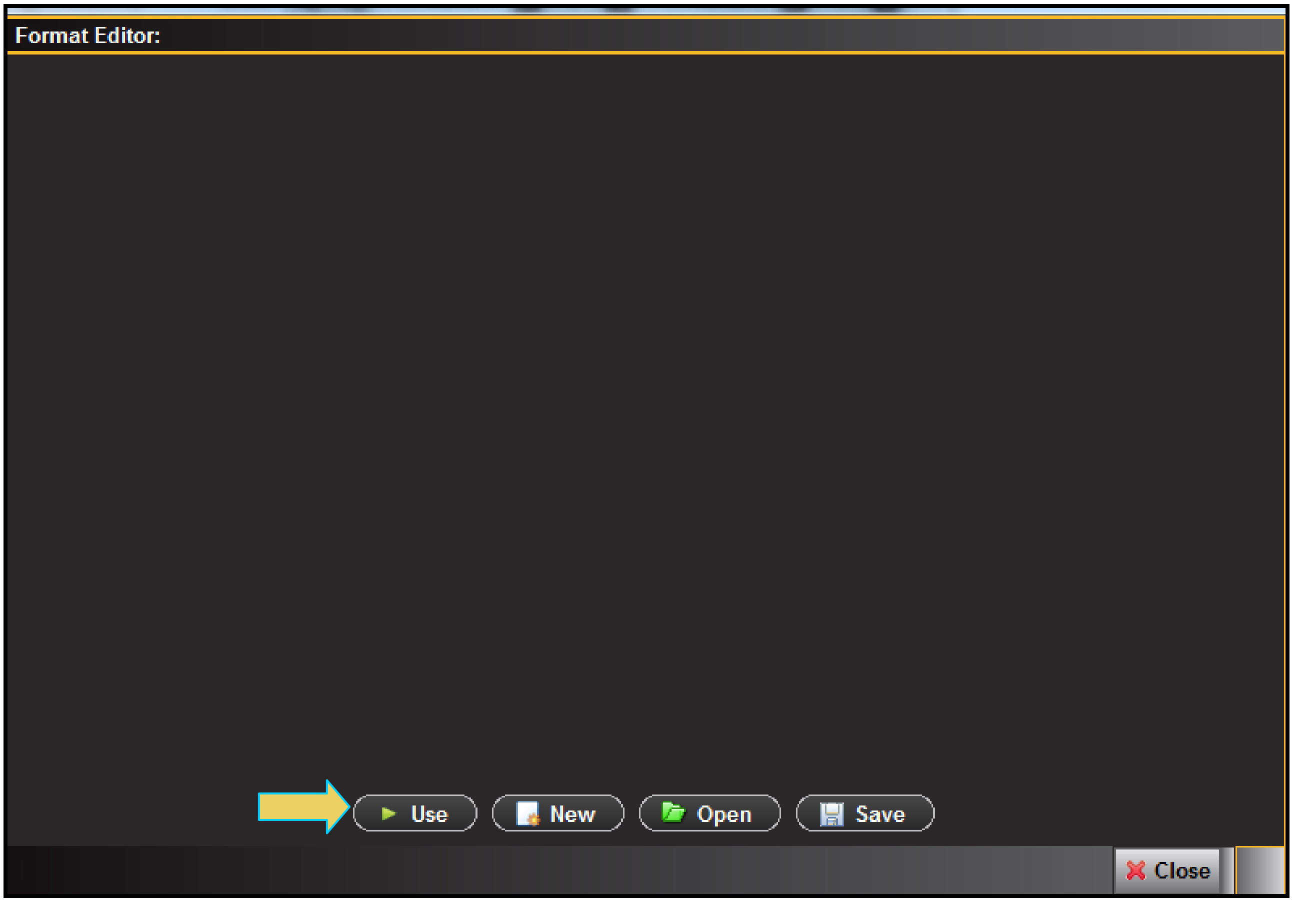
Use the following procedures to access the Format Editor.

To access the Format Editor:

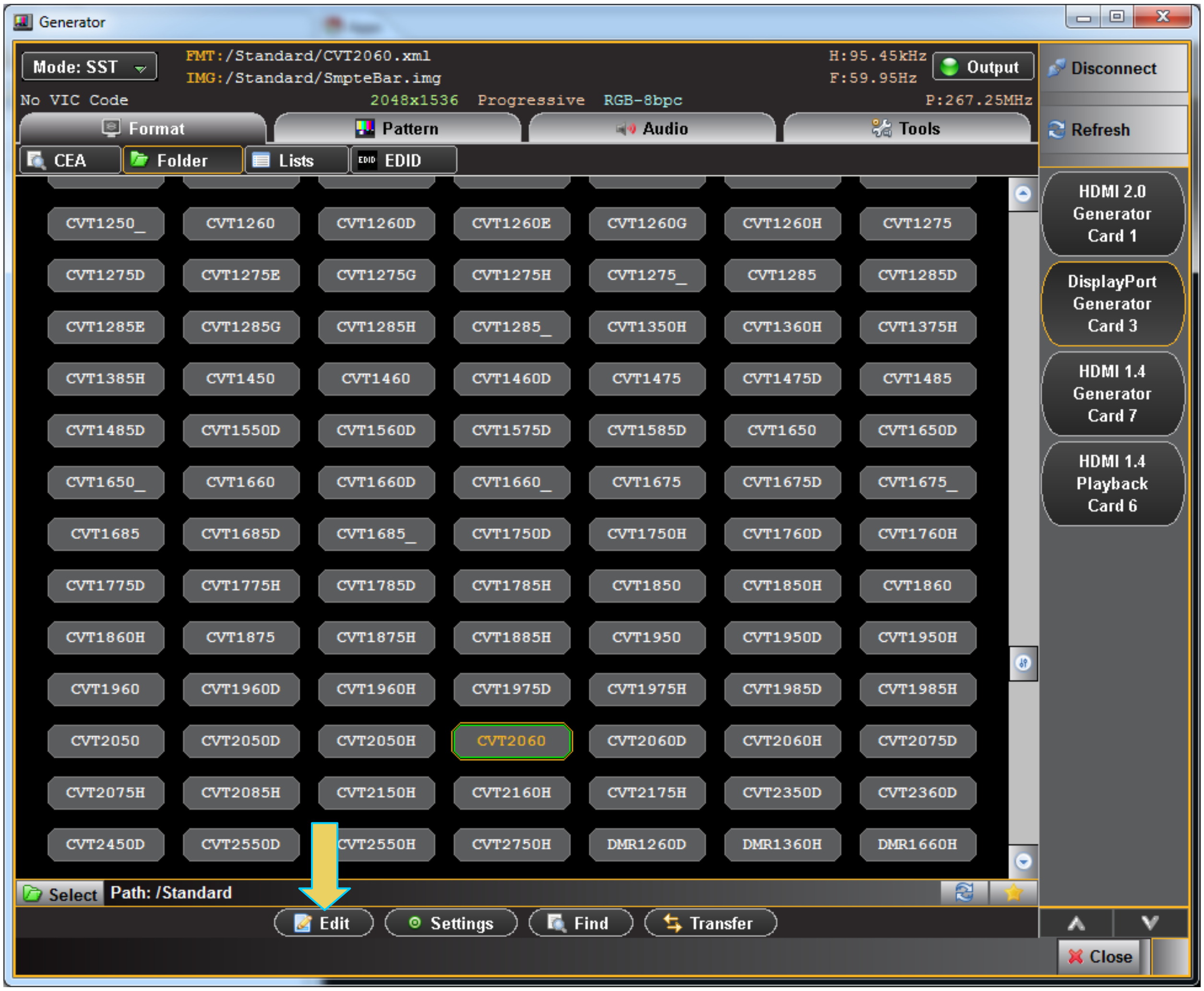
1 Access the **Format Editor** through the **Editors Page** of the **Apps** panel as shown below.

(Optionally) access the **Format Editor** through the **Format** tab using the **Edit** button on the bottom of the window (indicated below).

When you first open the **Format Editor**, the window will be blank as shown below. There are a set of activation buttons on the bottom of the screen that enable you to load, save and create formats.



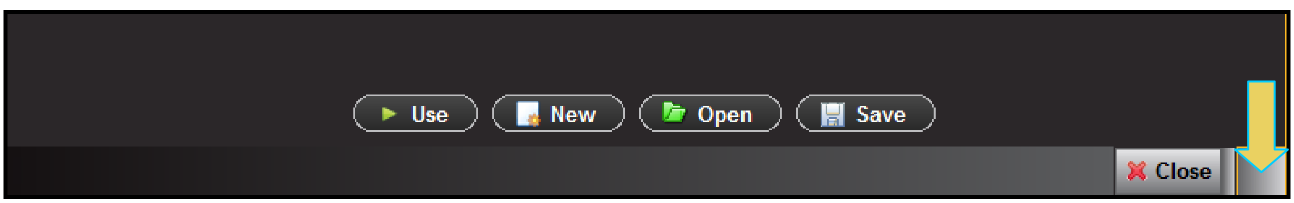
Please note that you can also invoke the **Format Editor** from the Generator panel's Format tab as shown below.



In this case the Format Editor is provisioned with the format timing settings of the format that had been selected in the Format tab window. This is shown below.

10.1 Format Editor - Basic Window Configuration and Operation

You can resize the window using the square area on the lower right side (indicated below).



10.1.1 Format Editor – Lower Activation Buttons

The following table describes the **Format Editor** menu buttons.

Button	Description
Use	Activates the custom format you create.
New Format	Opens up the New Format at the Timing tab. Enables you to create new formats. This is equivalent to selecting the **New Format** from the **File** menu.
Open	Enables you to browse to and open an xml format file on your PC. This is equivalent to clicking on the **Open** activation button.
Save	Enables you to save an xml format file on your PC. This is equivalent to clicking on the **Save** activation

Button	Description
	button.

10.1.2 Format Editor – Top Level Tabs

When you select the New activation button a populated window will appear as shown below.

There are a series of tabs on the top as shown below.

The following table describes the top level tabs in the Format Editor.

Tab	Description / Function
Timing	Selecting the Timing tab opens up an application screen that enables you to define the timing parameters for a custom format or modify the timing parameters of an existing format.

Tab	Description / Function
General	Selecting the General tab opens up an application screen that enables you to define the sync, level, pixel depth, gamma and pedestal parameters for a custom format or modify these parameters of an existing format.
Digital Video	Selecting the Digital Video tab opens up an application screen that enables you to define the digital video parameters for a custom format or modify these parameters of an existing format.
Digital Audio	Selecting the Digital Audio tab opens up an application screen that enables you to define the digital audio parameters for a custom format or modify these parameters of an existing format.
AFD	Selecting the AFD tab opens up an application screen that enables you to define the AFD parameters for a custom format or modify these parameters of an existing format.

10.2 Format Editor – New Format

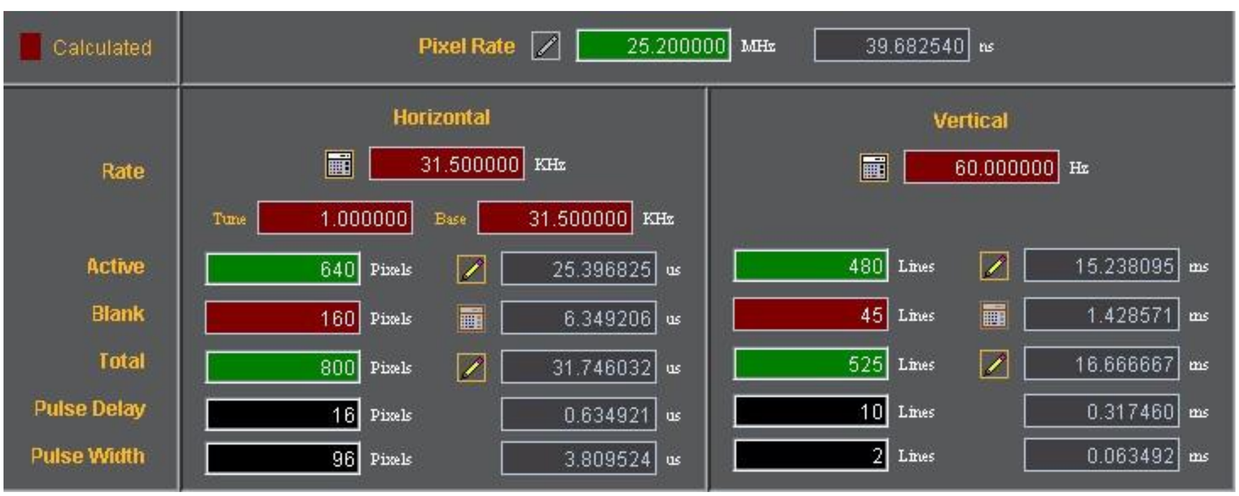
This subsection defines the tabs and status panels available with Format Editor shown below.

Important Note: Many of the settings and parameters in the Format Editor screens apply only to HDMI or analog and do not apply to DisplayPort.

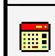
10.2.1 New Format - Timing Tab

The **Timing** window of the **Format Editor** is shown below. This window is activated by pressing the **Timing** tab.

The main panel of the **Timing** tab is shown below.



The table that follows describes each of the fields in the main panel of the **Timing** tab.

Tab	Field	Description / Function
Pixel Rate		Sets the pixel rate in pixels (Machine) or microseconds (Time) of the format.
Horizontal	Rate	The horizontal line rate of the format. The HRAT is the fundamental frequency in the 882. Parameter: HRAT.
	Tune	The tunning value of the base frame rate (base/tune) for NTSC color broadcast compatibility. The tuning value is base/1.001
	Base	The base frame rate.
	Active	The number of active pixels (machine) or microseconds (Time) of the horizontal video. Parameter: HRES.
	Blank	The number of active pixels (Machine) or microseconds (Time) of the horizontal video. This parameter is calculated.
	Total	The total number of active pixels (Machine) or microseconds (Time) of the horizontal video. The total is the sum of the Active and Blanking. Parameter: HTOT.
	Pulse Delay	The number of pixels (Machine) or microseconds (Time) in the blanking preceding the horizontal sync pulse. Parameter: HSPD.
	Pulse Width	The number of pixels (Machine) or microseconds (Time) of the horizontal sync pulse. Parameter: HSPW.
Vertical	**Rate**	The vertical frame rate of the format. Parameter: VRAT.
	Active	The number of active lines (machine) or milliseconds (Time) of the vertical video. Parameter: VRES.
	Blank	The number of active lines (Machine) or milliseconds (Time) of the vertical video. This parameter is calculated.
	Total	The total number of active lines (Machine) or milliseconds (Time) of the vertical video. The total is the sum of the Active and Blanking. Parameter: VTOT.
	Pulse Delay	The number of lines (Machine) or milliseconds (Time) in the blanking preceding the vertical sync pulse. Parameter: VSPD.
	Pulse Width	The number of lines (Machine) or milliseconds (Time) of the vertical sync pulse. Parameter: VSPW.
 (green calculator)		Indicates that the value in the field is calculated by the Format Editor.
 (red calculator)		Indicates that the value in the field is calculated by the Format Editor, and that the new value has replaced the value previously in the field.
		Indicates that the values in this field are settable in the current configuration.
Red Field		Indicates that the fields are in the read only mode. These fields will show a change in value when the value in a field affecting these fields is modified.

Tab	Field	Description / Function
Green Field		Indicates that the fields are in the read/write mode. When you make a change and hit the enter key new values will be calculated.
Black Field		Indicates that the fields can be modified directly and are calculated when other related fields are modified.
Grey Field		Indicates that the fields are disabled because the Entry Units are selected such that the fields are not used. However these fields will show a change when the value in a field affecting these fields is modified.

10.2.2 New Format - Timing Tab (Right Side Panel)

The right side panel of the **Timing** tab in the Format Editor is shown below. The table that follows describes each of the fields in the panel.

The table that follows describes each of the fields in the main panel of the **Timing** tab.

Tab	Field	Description / Function
Pixel Rate	Machine	Activates the fields in the timing tab window such that the timing parameter values are expressed and settable in terms of pixels and lines.
	Time	Activates the fields in the timing tab window such that the timing parameter values are expressed and settable in terms of time increments such as milliseconds and microseconds.
Scan Type	Progressive	Sets the format scan type to Progressive. Parameter: SCAN = 2

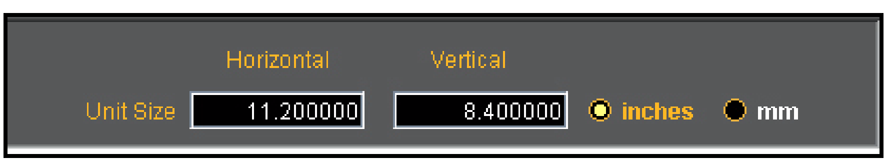
Tab	Field	Description / Function
	Interlace	Sets the format scan type to Interlaced. Parameter: SCAN = 1
Check boxes	Back Porch	Toggles the Pulse Delay field so that the value is provided for the back porch rather than the front porch.
	Clock Pulse	Enables and disables the pixel clock pulse output on generators that have a pixel clock output available. The pixel clock output appears on the special sync BNC connector.
	Pre-Emphasis Not applicable to DP	Enables and disables adding pre-emphasis to the Open LVDI digital outputs on generators that support LVDI outputs.
	DC Balance	Not used.
	Flat Front Porch Not applicable to DP	Determines if composite sync will have all equalization pulses removed in the vertical sync front porch (delay) period as required by certain military HOBO and Maverik video formats.
	Tri-Level Sync	Enables or disables Tri-Level sync.
	Repeat Field	Determines if identical video information is output for each field of an interlaced (SCAN = 2) format.

10.2.3 New Format - General Tab

The **Format Editor General** tab is shown below. The table that follows describes each of the fields in the tab.

10.2.4 New Format - General Tab (Top Left Panel)

The top left panel of the General tab in the Format Editor is shown below.



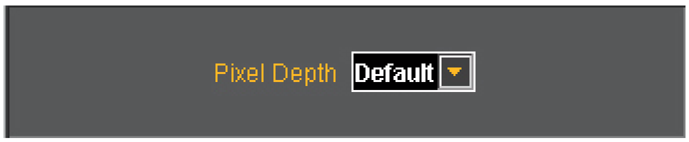
The table that follows describes each of the fields in the top left panel of the General tab.

Field / Entity	Type	Description / Function
Horizontal	Entry field	The horizontal aperture of the display under test.
Vertical	Entry field	The vertical aperture of the display under test.
Unit Size	**Radio Buttons:**	

Field / Entity	Type	Description / Function
	inches	Selects the unit size of the Horizontal and Vertical Size entities to be expressed in inches.
	mm	Selects the unit size of the Horizontal and Vertical Size entities to be expressed in millimeters.

10.2.5 New Format - General Tab (Top Right Panel)

The top right panel of the **General** tab in the **Format Editor** is shown below.

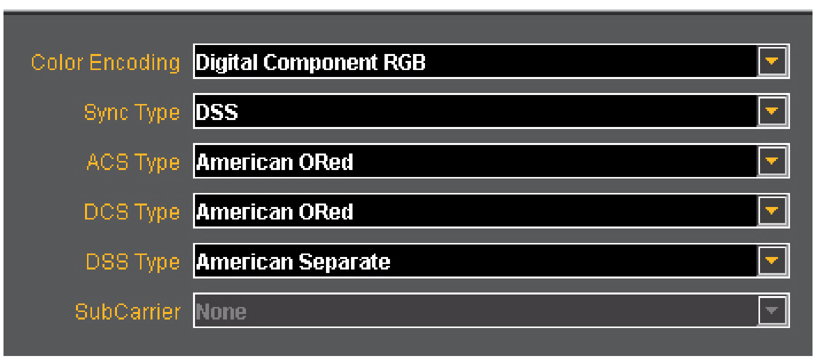


The table that follows describes each of the fields in the top right panel of the **General** tab.

Field / Entity	Type	Description / Function
Pixel Depth	Pull-down menu	Establishes the number of data bits that represent each active pixel in video memory (frame buffer). Parameter: PELD. There are three settings: • Default - uses the generator default • 8 - 8 bits-per-pixel (256 colors) • 24 - 24 bits-per-pixel (16,777,216 colors)

10.2.6 New Format – General Tab (Center Panel)

The center panel of the **General** tab in the **Format Editor** is shown below.



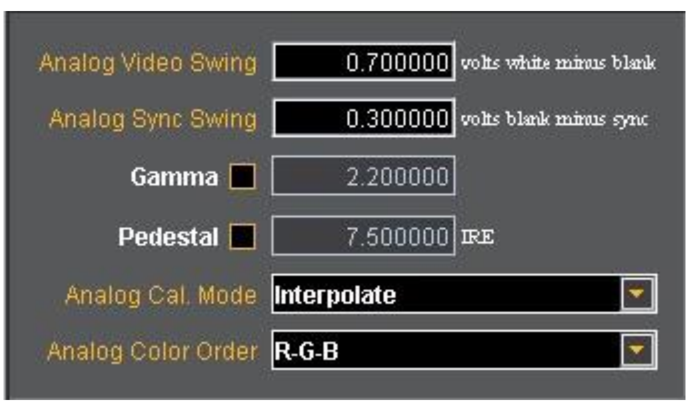
The table below describes the pull-down menus in the center panel of the **General** tab.

Field / Entity	Description / Function
Color Encoding	Sets the colorimetry of the format. The parameter is AVST or DVST. The following are the selections: • Digital Component RGB • Digital Component YCbCr SDTV (ITU-R BT.601-5) • Digital Component YCbCr HDTV Legacy (SMPTE 240M) • Digital Component YCbCr HDTV Modern (ITU-R BT.709-5)

Field / Entity	Description / Function
	• Digital BT.601 xvYCC • Digital BT.709 xvYCC **Note**: Several options are not shown and are not applicable to HDMI.
Sync Type **Not used for HDMI**	Sets the sync type of the format. The following are the selections: • (0) None • (1) DSS - Digital Separate Sync • (2) DCS - Digital Composite Sync • (3) ACS - Analog Composite Sync • (4) ACS, DSS - Analog Composite Sync, Digital Separate Sync • (5) ACS, DCS - Analog Composite Sync, Digital Composite Sync • (6) ACS, DCS, DSS - Analog Composite Sync, Digital Composite Sync and Digital Separate Sync • (7) DPMS OFF • (8) DPMS Suspend • (9) DPMS Standby • (10) DPMS ON **Note**: Several options are not shown and are not applicable to HDMI.
ACS Type (Not used)	Not used for DP
DCS Type (Not used)	Not used for DP
SubCarrier (Not used)	Not used for DP

10.2.7 New Format - General Tab (Right Panel)

The right panel of the General tab in the Format Editor is shown below.



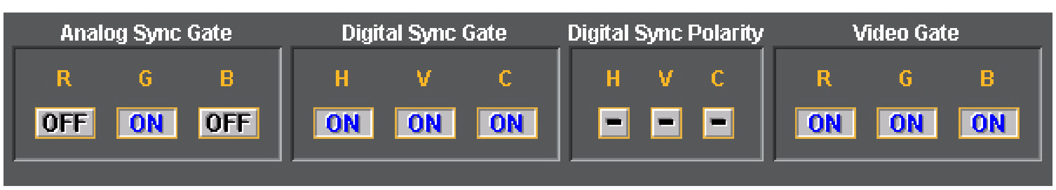
The table below describes the entities and fields of the right-side panel of the **General** tab.

Field / Entity	Entity Type	Description / Function
Analog Video Swing **Not used for HDMI**	Entry field	Sets the analog video swing.
Analog Sync Swing	Entry field	Sets the analog sync swing.

Field / Entity	Entity Type	Description / Function
Not used for HDMI		
Gamma Not used for HDMI	Check box	Enables or disables Gamma. Used with the entry field below.
	Entry field	Enables you to set the Gamma once the Gamma check box above is enabled (checked). The allowable ranges of values is 0.1 to 10.0.
Pedestal Not used for HDMI	Check box	Enables or disables the Pedestal. Used with the entry field below. Pedestal is only supported on NTSC format types.
	Entry field	Enables you to set the Pedestal once the Pedestal check box above is enabled (checked). The allowable ranges of values is 0 IRE to 100 IRE.
Analog Cal. Mode Not used for HDMI	Pull-down select	Sets the analog calibration mode. Determines how the generator tests and calibrates its analog video outputs. The following are the selections: • Interpolate • Measure Interpolate • Measure Set Absolute • Test Levels
Analog Color Order Not used for HDMI	Pull-down select	Sets the mapping of the analog video colors to the video output connections. Parameter: AVCO. The following are the selections: • RGB - R to R, G to G, B to B (default) • RBG - R to R, B to G, G to B • GRB - G to R, R to G, B to B • GBR - G to R, B to G, G to B • BRG - B to R, R to G, G to B • BGR - B to R, G to G, R to B

10.2.8 New Format - General Tab (Bottom Panel)

The bottom panel of the **General** tab in the **Format Editor** is shown below.



The table below describes the gating functions of the right-side panel of the **General** tab.

Field / Entity	Entity Name	Description / Function
Analog Sync Gate Not used for HDMI	Select buttons	Enables you to put the analog composite sync on one of the components when analog composite sync is selected as the sync type . Multiple selections can be made.
	R	Puts the analog composite sync on the Red component.
	G	Puts the analog composite sync on the Green

Field / Entity	Entity Name	Description / Function
		component.
	B	Puts the analog composite sync on the Blue component.
Digital Sync Gate **Not used for HDMI**	Select buttons	
	H	Enables and disables the digital horizontal sync output.
	V	Enables and disables the digital vertical sync output. To use digital vertical sync, the digital separate H and V sync must be selected.
	C	Enables and disables the digital vertical sync output.
Digital Sync Polarity **Not used for HDMI**	Select buttons	
	H	Determines whether the digital horizontal sync pulse polarity is positive going or negative going.
	V	Determines whether the digital vertical sync pulse polarity is positive going or negative going.
	C	Determines whether the digital composite sync pulse polarity is positive going or negative going.
Video Gate	Select buttons	Enables you to gate ON or OFF any of the video components. More than one can be selected.
	R	Gates ON or OFF the Red component. Parameter: REDG
	G	Gates ON or OFF the Green component. Parameter: GRNG.
	B	Gates ON or OFF the Blue component. Parameter: BLUG.

10.3 New Format - Digital Video Tab

The **Format Editor Digital Video** tab is shown below.

The table that follows describes each of the fields in the **Digital Video** tab.

Field / Entity	Entity Type	Description / Function
Range	Entry field	Specifies the quantization range for the digital video. Parameter: DVQM. The values available are described in CIA-861E: • 0 - Full Range for computer applications. • 1 – for testing the undershoot/overshoot signal code margins. • 2 – Limited range for reduced range required by television standards.
Clocks per Pixel	Entry field	Specifies the number of clocks per pixel (double clocking factor for whole line. Parameter: NCPP. This parameter is used to boost the clock rate to the minimum supported by TMDS interface. Allowable values are:

Field / Entity	Entity Type	Description / Function
		• 1 - one clock per pixel. • 2 - two clocks per pixel.
Pixels per Pixel	Entry field	Specifies the number of pixels per pixel. This parameter specifies the pixel repetition factor for the active portion of the line. Allowable values are: • 0 - disables repetition mode • 1 to 10 - enables pixel repetition (inserts extra left and right pixel repetition bars) Parameter: NPPP.
AVI Video Identification Code	Entry field	The digital video code corresponding to the EIA/CEA-861 standard. Parameter: DVIC.
Number of Links **Not used for DP**	Radio button	
	1	Sets the number of links to 1 by the DVI output.
	2	Sets the number of links to 2 for the DVI output
Protocol Type	Pull-down select	Specifies which digital output is active through the HDMI interface. Allowable values are: • DVI - Enables DVI mode out the DVI output or the HDMI output. • HDMI - Enables HDMI mode out the HDMI output. Parameter: XVSI
Sampling Mode	Pull-down select	Specifies the digital sampling mode. Allowable values are: • Default - RGB 4:4:4. • 4:2:2 - Color difference components are sampled at half the pixel rate. Luminance is sampled at the full pixel rate. Requires that the YCbCr color mode be selected with the DVST command. • 4:4:4 - Color difference components and luminance component is sampled at the full pixel rate. Requires that the YCbCr color mode be selected with the DVST command. Parameter: DVSM
Bits per Color Component	Pull-down select	Specifies the number of bits per component. Allowable values are: • Default - Use the default setting in the generator. • 6 - Six bits per component. • 8 - Eight bits per component. • 10 - Ten bits per component. • 12 - Twelve bits per component. Parameter: NBPC

10.4 New Format - Digital Audio Tab

The **Format Editor Digital Audio** tab is shown below. The table that follows describes each of the fields in the tab.

The table below describes each of the fields in the **Digital Audio** tab.

Field	Type	Description / Function
Signal Interface **Not used for DP**	Pull-down select	Sets the digital audio signal interface. The valid values are: • None - Use DP. • SPDIF. • AES3 (not used). • AESid (not used). • TOSlink optical (not used). • MiniPlug (not used).
Signal Type	Pull-down select	Sets the digital audio signal interface. The valid values are: • None

Field	Type	Description / Function
		• IEC 60958-3 Consumer LPCM. • IEC 60958-4 Professional LPCM. • IEC 61937 w/AC-3 (Dolby Digital). • MP2 (Video CD) (not used). • MP3 (MPEG1 Layer 3) (not used). • MPEG2 5.1 channels Advanced Audio Coding (AAC) • MPEG2 7.1 channel CBR or VBR • IEC 61937 w/'DTS • ATRAC
Level Shift	Entry field	Sets the digital audio level shift value for linear PCM. The valid values are: 0 - 15 dBFS. Parameter is: DALS
Sampling Rate	Entry field	Sets the digital audio sampling rate for linear PCM. The valid values are: • 32.0kHz • 44.1kHz • 48.0kHz • 88.2kHz • 96.0kHz • 176.4kHz • 192.0kHz Parameter is: ARAT
Number of Streams	Entry field	Sets the digital audio streams. The valid value is: 1. Parameter is: NDAS.
Number of Channels	Entry field	Sets the digital audio sampling rate for linear PCM. The valid values are: 2 through 8 Parameter is: NDAC.
Bits per Sample	Pull-down select	Sets the digital audio sampling rate for linear PCM. The valid values are: • 16 • 20 • 24 Parameter is: NBPA.
Contents Gated	Entry field	Sets the digital audio content gate. The valid values are: 0 through 4095. Refer to EIA/CEA-861-x.
Contents Available	Entry field	Sets the digital audio content available. The valid values are: 0 through 4095. Refer to EIA/CEA-861-x.
Mix Down Gate	Check box	Sets the digital audio down-mix gate. The valid values are: enabled (0)

Field	Type	Description / Function
Not applicable		or disabled (1).
Channels Available	Entry field	Sets the digital audio channels available. The valid values are: 0 through 255. Refer to EIA/CEA-861.
Channels Gated	Entry field	Sets the digital audio channel gate. The valid values are: 0 through 255. Refer to EIA/CEA-861.

10.5 New Format - AFD Tab

The **Format Editor AFD** tab is shown below. The table that follows describes each of the fields in the tab.

The table that follows describes each of the text entry fields in the **AFD** tab.

Heading	Field	Description / Function
Active Format	**Content Aspect Ratio**	Sets the aspect ratio of the source image content. The valid parameter range is: 0.75 to 2.39.
	Embedded Aspect Ratio	Sets the aspect ratio of the extended image content. The

Heading	Field	Description / Function
		valid parameter range is: 0.75 to 2.39.
	Signal Aspect Ratio	Sets the aspect ratio of the video signal image content. The valid parameter range is: 0.75 to 2.39.
	Extended From Content Apert. Map	Enables you to set the mapping type for mapping CXAR-shaped image content into the extended EXAR-shaped aperture.
	Signal from Extended Apert. Map	Enables you to set the mapping type for mapping EXAR-shaped image content into the SXAR-shaped signal interface.
Bars	**Left**	Sets the left side letterbox bars in pixels.
	Right	Sets the right side letterbox bars in pixels.
	Top	Sets the top letterbox bars in pixels.
	Bottom	Sets the bottom letterbox bars in pixels.

10.6 Format Editor - Open

This subsection defines the **Open Format** dialog box. The **Open Format** dialog box is shown below. This enables you to open an existing format file from your 980 instrument.

10.7 Format Editor - Save

This subsection defines the Save [File] dialog box. The Save dialog box is shown below. You use the Save function to store a format that you have defined. You can either save it to your PC (Local tab) or the 882 instrument (Remote tab).

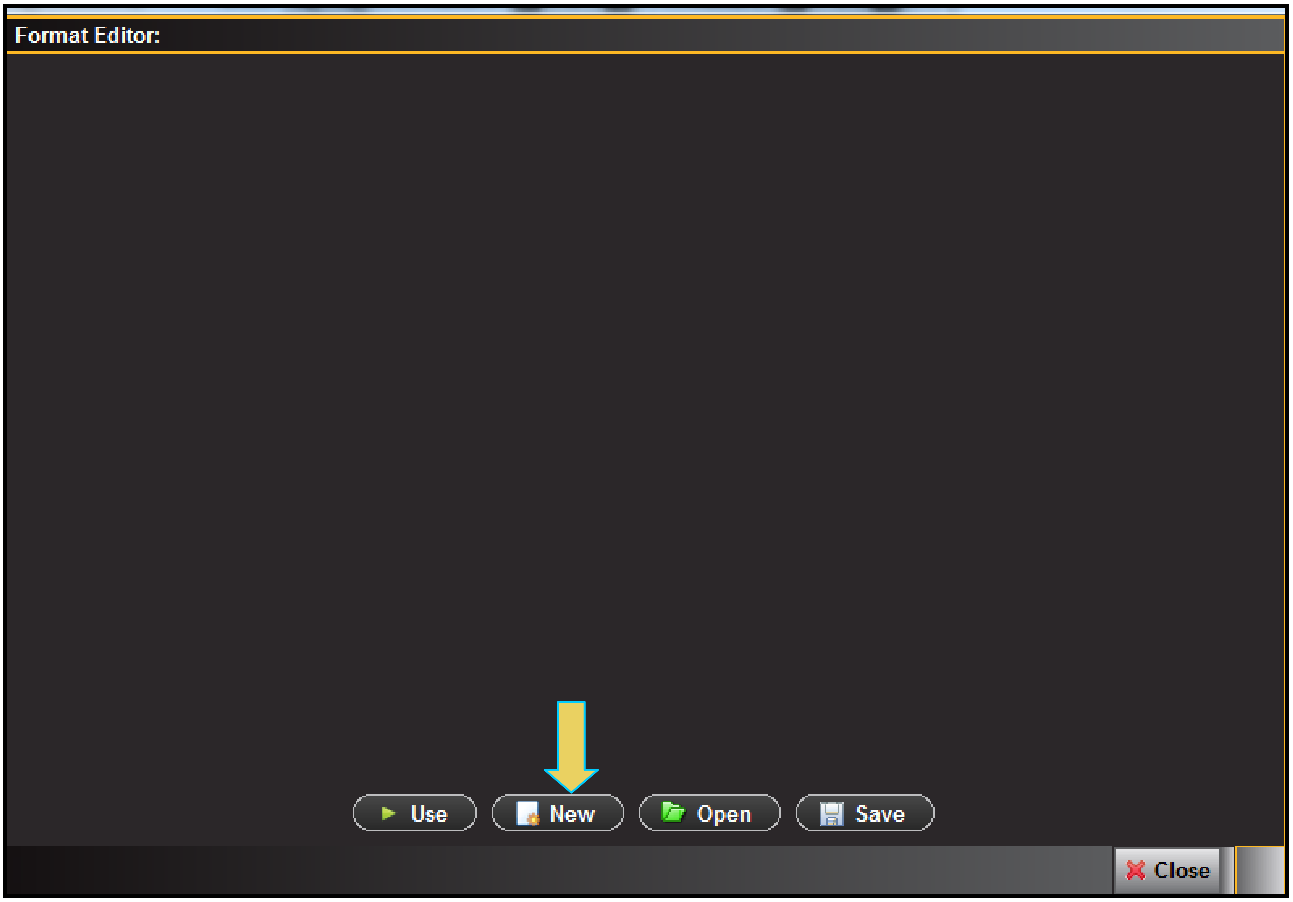
10.8 Creating a new format using the Format Editor

The procedure below describes how to create a new format using the Format Editor.

To create a new format using the Format Editor:

1. Access the Format Editor using the procedures described in Accessing the Format Editor.

   The **Format Editor** appears.

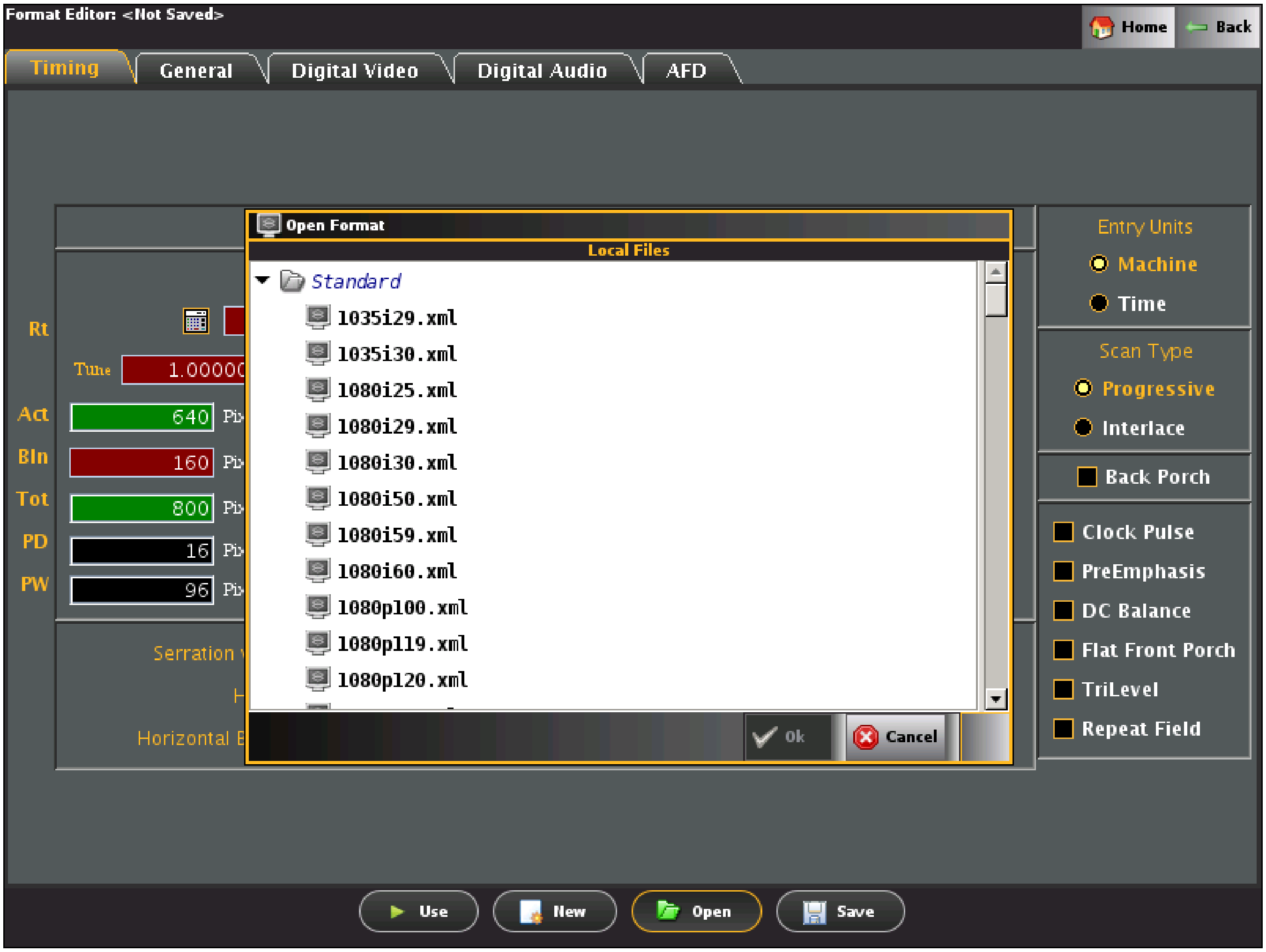


3. Click the **New** activation button on the bottom of the panel (indicated above).

   The **Timing** tab of the format definition page appears as shown below.

4. Open an existing file to work from by clicking on the **Open** activation button near the bottom of the window (indicated above).

   The open file dialog box appears as shown below.

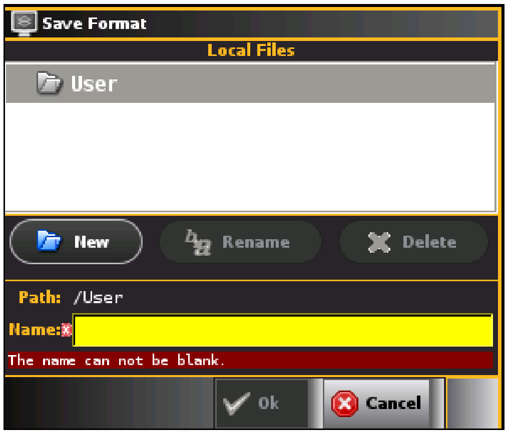


5. Scroll and select a format file to use as a starting point for defining your new format.
6. The format parameters of the selected format will appear in the new format **Timing** window as shown below.
7. Modify the parameters as required for the new format. You can reference the parameter definitions in the tables presented earlier in this chapter. The following guidelines will help you modify the format parameters.
   - When selecting a parameter to modify on the **Timing** tab, ensure that the value is editable. To be editable, the field either needs to have a pencil icon next to it or a black field background. Gray fields are disabled for editing. Fields in red (with the calculator icon) cannot be modified. However you can change whether a field can be modified by clicking on the calculator icon which will cause it to change to a pencil icon allowing you to change its value.
   - Upon modifying a format value hit the enter key to invoke the change. The Format Editor applies the new value to the timing algorithm and updates any values dependent on the value you entered (or changed).

     For example, to change the horizontal resolution to 660, enter the value in the
     Active field under Pixels in the Horizontal area.
     You will notice that the Format Editor has calculated and written values to the **Blank** and **Period** fields as indicated by the red calculator ( ) symbol. Although the Period value has not changed, the Format Editor still indicates it is a calculated value by displaying the red calculator.

8. Save the new format.

   a. Click the **Save** activation button or the select **Save** from the **File** pull-down menu to save the format. The Save dialog box appears as shown below.



   b. Enter new format name in Name field.

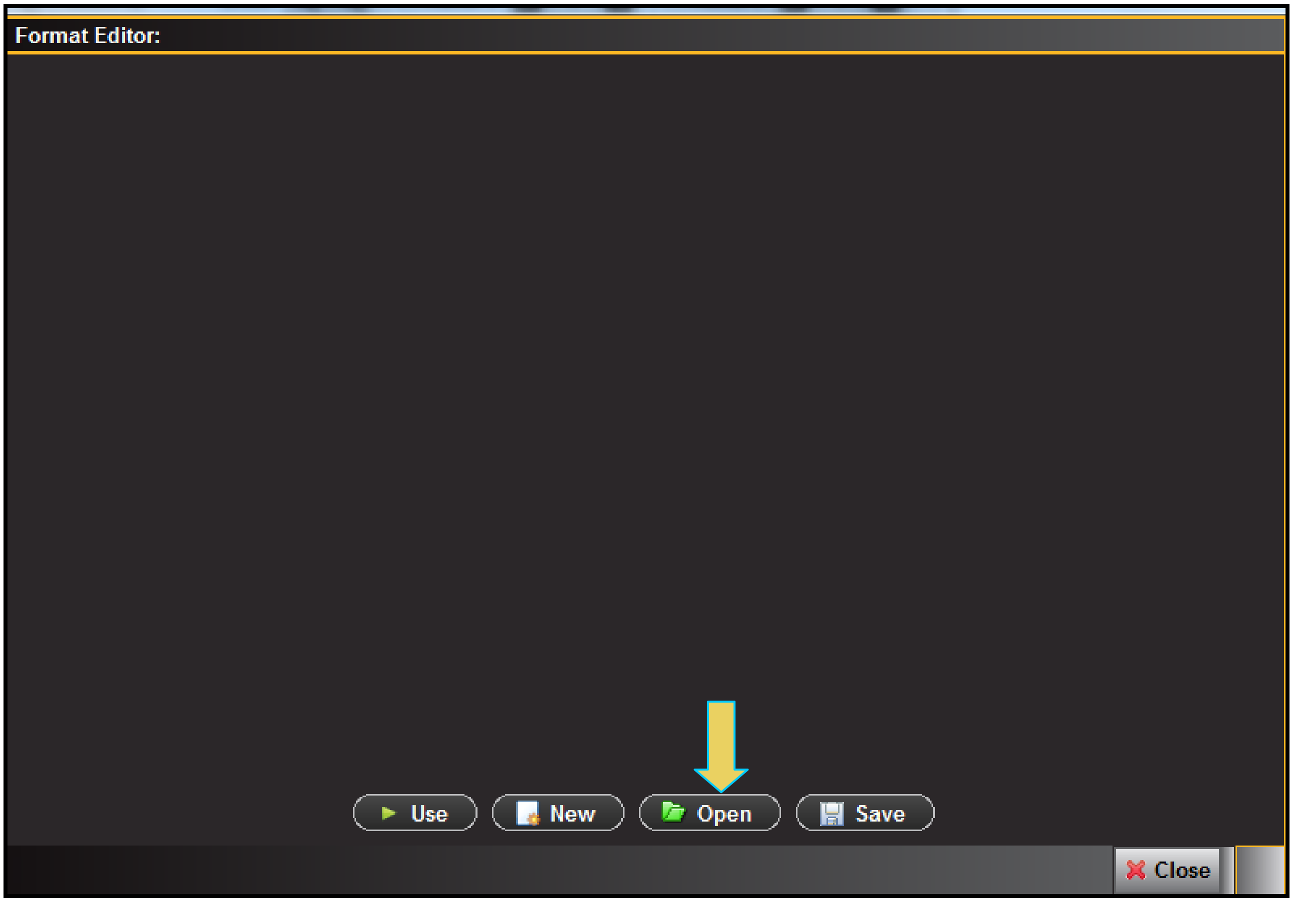
10.9 Modifying an existing format using the Format Editor

The procedure below describes how to make a few changes on an existing format using the **Format Editor**. This enables you to quickly run tests a display by tweaking a few timing parameters at a time.

To modify an existing format with the Format Editor:

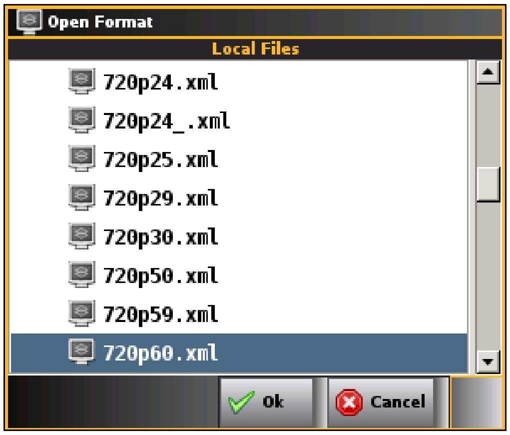
1. Access the **Format Editor** using the procedures described in Accessing the Format Editor.

   The **Format Editor** appears.



4. Click the **Open** activation button on the bottom of the panel (indicated above).

   A dialog box enabling you to scroll and select a format appears as shown below.



The format parameters of the selected format will appear in the new format **Timing** window as shown below.

7. Modify the parameters as required for the new format. The following guidelines will help you modify the format parameters.

   - When selecting a parameter to modify on the **Timing** tab, ensure that the value is editable. To be editable, the field either needs to have a pencil icon next to it or a black field background. Gray fields are disabled for editing. Fields in red (with the calculator icon) cannot be modified. However you can change whether a field can be modified by clicking on the calculator icon which will cause it to change to a pencil icon allowing you to change its value.

- Upon modifying a format value hit the enter key to invoke the change. The **Format Editor** applies the new value to the timing algorithm and updates any values dependent on the value you entered (or changed).

  For example, to change the horizontal resolution to 660, enter the value in the
  Active field under Pixels in the Horizontal area.
  You will notice that the Format Editor has calculated and written values to the **Blank** and **Period** fields as indicated by the red calculator () symbol. Although the Period value has not changed, the **Format Editor** still indicates it is a calculated value by displaying the red calculator.

- To apply the format settings on the generator, click the **Use** activation button on the lower right side.

8. Use (apply) the modified format by clicking on the **Use** activation button on the bottom of window.

   Monitor the display under test for roper operation.

11 Source Verification with Basic Analyzer (Optional)

The 980 DP Video Generator / Analyzer module is equipped with a DP 1.2 Rx port for the optional Network Analyzer features. There are two options available:

1) Basic Analyzer – Emulates a DP 1.2 sink device including EDID, DPCD, MST, Link Training emulation. Provides real time view of the incoming source video and metadata including status of mainstream attributes, secondary stream attributes, link training, MST, HDCP. Also provides support for viewing the Aux Channel transactions using the Quantum Data Auxiliary Channel Analyzer (ACA) application when testing a DP source.

2) Protocol Analyzer (requires the Basic Analyzer license to be installed) – Provides capture and store of the main link protocol, video and metadata including main stream attributes and secondary data from an incoming DP source device. **Note**: Description and procedures for this option is not included in this version of the User Guide.

11.1 Accessing the Basic Analyzer features

Use the following procedures to access the Network Analyzer feature.

To access the Network Analyzer:

1 Access the **Format Editor** through the **Card Control** Page of the **Apps** panel as shown below. Select the icon for the DP Video Generator Rx Card (not shown).

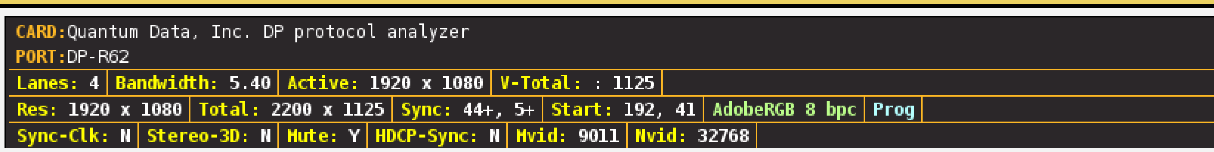

quantumdata
Card Control
Generator
HDMI
Protocol Analyzer
RX - Card 6
HDMI
Video Generator
RX - Card 7
Aux. Channel
Analyzer
Capture Control
HEAC
Page 1 of 4
Card Control
Compliance Tests
Editors
Other
Back
Navigator
DHCP: 192.168.254.143
ATP Version: 4.9.38 (5 cards detected)

The Analyzer panel appears showing the incoming video image. (Note a test pattern is shown in the example below). The module's Rx analyzer port provides periodic video frame captures enabling you to view frames of video. This feature provides a basic confidence test to verify that the incoming video is essentially correct.

There is a dashboard on the top of the panel indicating the essential video characteristics. There is a set of controls on the right.

11.2 Network Analyzer Dashboard

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

Network Analyzer – Dashboard Items

The following items are on the Real Time dashboard: **Top Row Items – Module and Port:**

Network Analyzer – Dashboard Items

- **Card** –The Card area shows the current module whose port is being displayed on the Network Analyzer `CARD:Quantum Data, Inc. DP protocol analyzer`. Currently the only analyzer module (card) is the 980 HDMI Video Generator module.
- **Port** –The Port area shows the current Rx port that is being displayed on the Network Analyzer.
- `PORT:DP-R62`. Currently the only analyzer port is the 980 HDMI Video Generator port.

Second Row Items:

- **Lanes** `Lanes: 4` **-** The number of lanes used during link training.
- **Bandwidth** `Bandwidth:` **-** The lane rate (per lane).
- **Active (video resolution)** `Active: 1920 x 1080` **-** This is the measured video resolution.
- **V Total** `V-Total: : 1125` **-** This is the measured total vertical video lines per frame.

Third Row Items:

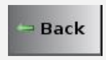
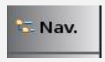
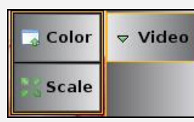
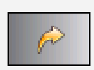
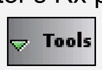
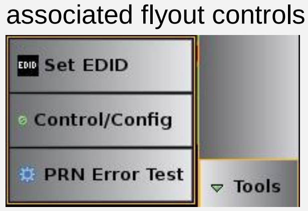
- **Res[olution]** `Res: 1920 x 1080` **-** The active video resolution in horizontal pixels and vertical lines determined from the main stream attributes.
- **Total (video) pixels and lines** `Total: 2200 x 1125` **-** The total video in horizontal pixels and vertical lines determined from the main stream attributes.
- **Sync** `Sync: 44+, 5+` **-** The number of horizontal pixels in the blanking and it polarity (e.g. 44 pixels, positive) and the number of vertical lines in the blanking and its polarity (e.g. 5 lines, positive).
- **Start** `Start: 192, 41` **-** The starting pixel and line in the active video determined from the main stream attributes.
- **Colorimetry and bit depth** `AdobeRGB 8 bpc` **-** The colorimetry and bit depth determined from the main stream attributes.
- **Scan** `Prog` **-** The scan type used, progressive (e.g. Prog) or interlaced (Inter) determined from the main stream attributes.

Fourth Row Items:

- **Sync -Clk** `Sync-Clk: N` **-** Indicates if the Link Clock and Main Video Stream clock are asynchronous or synchronous. A value of N means async; a value of Y means synchronous. This value is determined by the main stream attributes.
- **Stereo-3D** `Stereo-3D: N` **-** The status of 3D audio determined from the main stream attributes.
- **Mute** `Mute: Y` **-** The AudioMute flag status determined from the main stream attributes.
- **HDCP-Sync** `HDCP-Sync: N` **-** The HDCP sync detect of the Video Blanking VB-ID bits. Y for sync detected; No for HDCP sync not detected.
- **Mvid** `Mvid: 9011` **-** The Mvid value used for stream clock recover. This is determined from the main stream attributes.
- **Nvid** `Nvid: 32768` **-** The Nvid value used for stream clock recover. This is determined from the main stream attributes.

11.3 Main Control Panel

This subsection describes the main control panel for the Network Analyzer. Refer to the table below for a description of these controls.

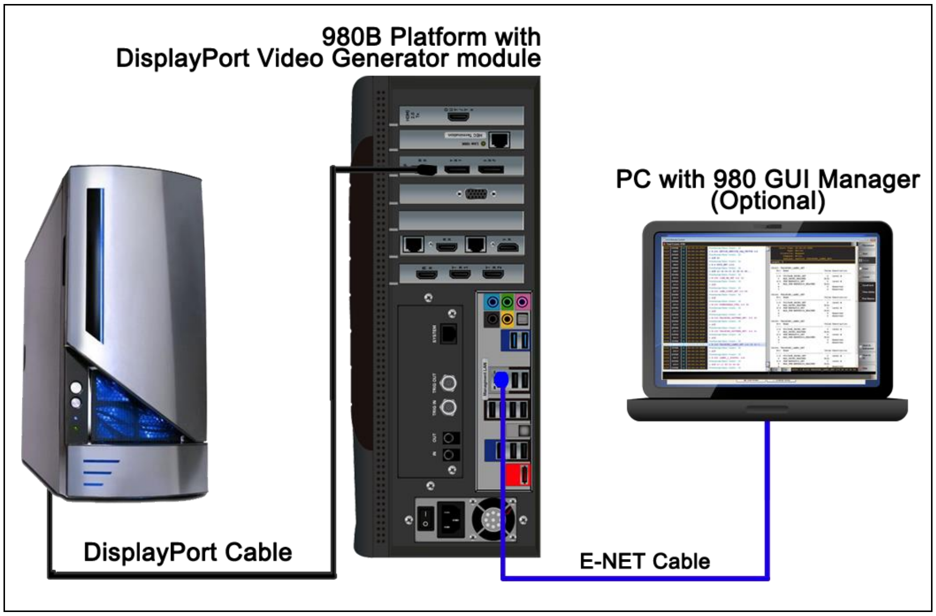
Network Analyzer – Control Panel	Control Button Descriptions
Main Control Panel (two views – Active / Inactive)  	The following controls are provided in the main control panel on the right edge of the Real Time mode interface. Each of the buttons have a pull-down menu associated with them. The purpose of each button and their basic control functions are described below: ▪ Home – The Home button  is a navigation button that when pressed takes you back to the home screen **Apps** Panel. ▪ Back – The Back button  is a navigation button that when pressed takes you back to the previously viewed screen. ▪ Nav – The Nav button  when pressed takes you to the navigation panel where you can access various data files. ▪ Port – The Port button  enables you to toggle back and forth between the Rx Network Analyzer function of the 980 HDMI Video Generator module and the Rx Real Time view of the 980 HDMI Protocol Analyzer module. ▪ Start/Stop –The Start / Stop button  /  is used to enable and disable the showing of the incoming video image. ▪ Video – The video button  and associated pull-down menu (not shown) is used to display the Video Info panel which provides timing, resolution and other basic information about the incoming video. ◦ Color – The Color button  and associated dialog box enables you to identify the color of any particular pixel. ◦ Scale – The Scale button and associated dialog box enables you to set the size, quality and aspect ratio of the incoming video image. ▪ Back - The arrow button  enables you to toggle between the current view and the previous view. ▪ Mode - The Mode button  enables you to toggle HDCP on or off on the 980 HDMI Video Generator's Rx port. ▪ Tools - The Tools button  enables you to set the EDID, configure the Tx and Rx ports, view link training status, generate a hot plug with the associated flyout controls and run a pseudo-random noise test on a cable: 

11.4 Connecting a DisplayPort source to the Rx Analyzer port

This subsection provides procedures on how to connect to the DP Rx Analyzer.

1. Connect the DP source device to the DP module's Rx Analyzer port as shown below.

   Note the second PC shown is used for the 980 GUI Manager application.



Connection for DP sink emulation – 980B

11.5 Controlling the Network Analyzer

This subsection provides procedures on how to control the Network Analyzer features.

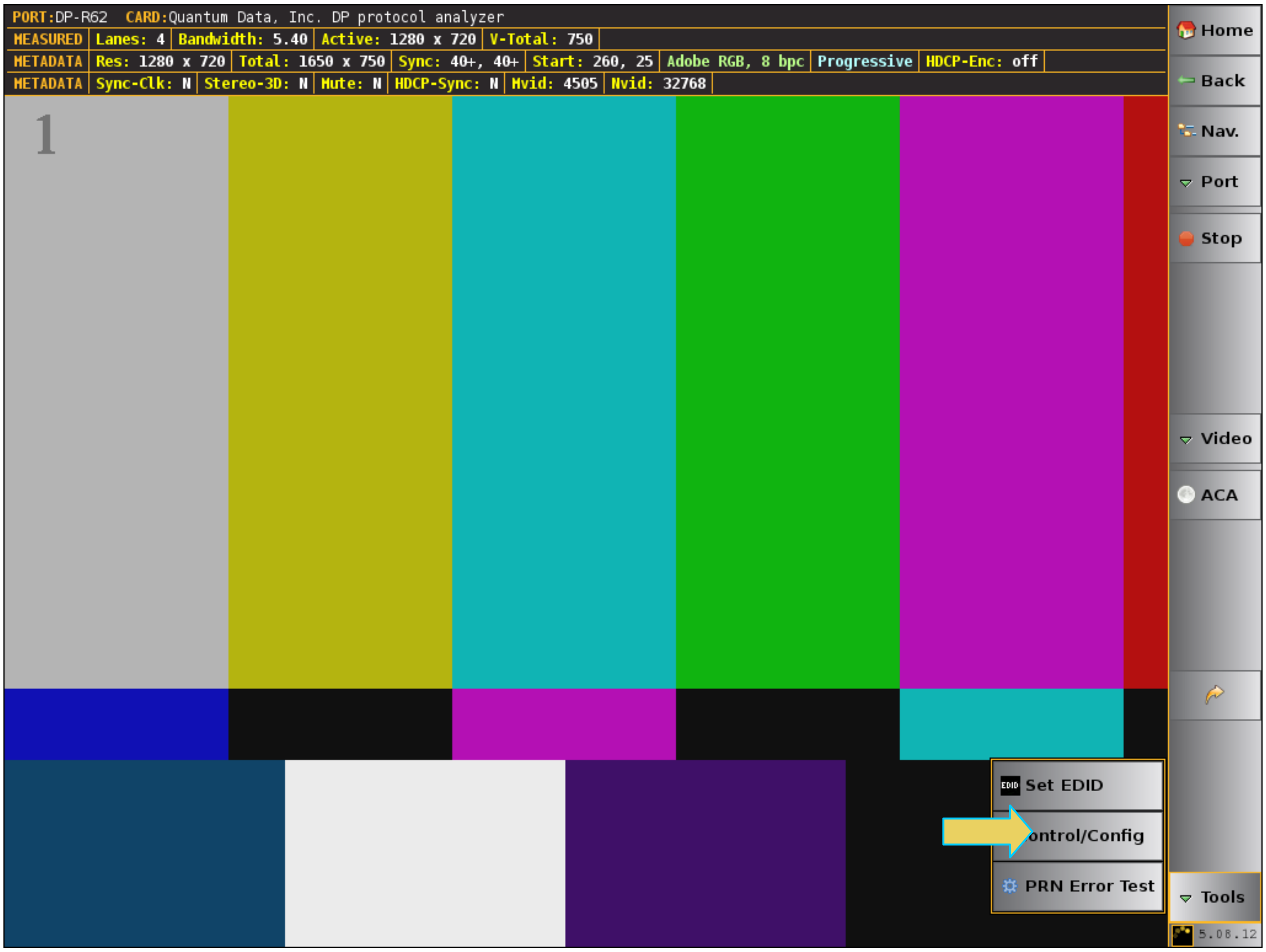
11.5.1 Selecting and Activating Interfaces and Viewing Link Training Status

The 980 DP Video Generator / Analyzer module has two (2) transmitter ports and one receiver port. The second DP Tx port (Port 2) is always active. But you have to select which of the other two ports are active: Tx Port 1 or Rx Port 1.

To Enable Rx Port 1:

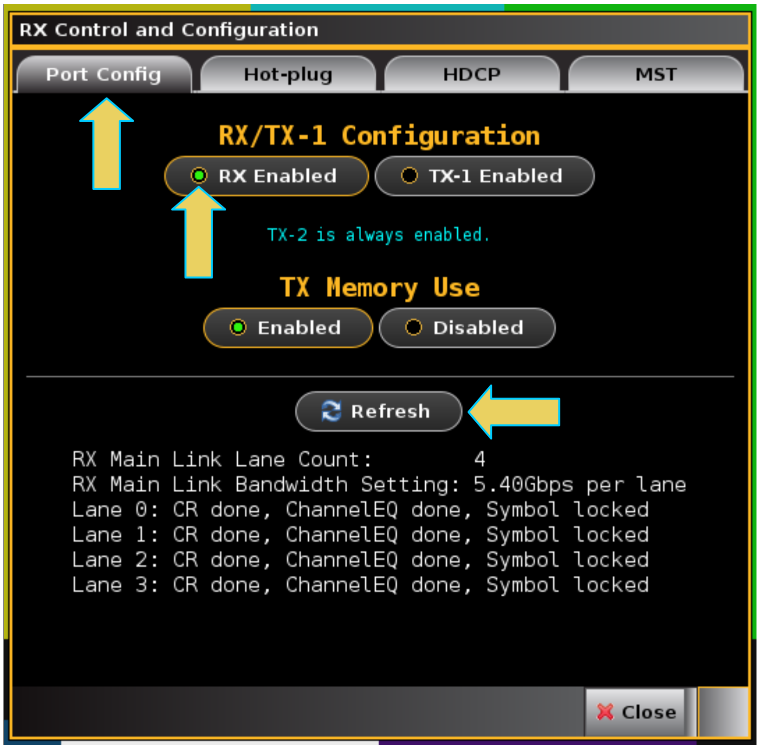
1. From the **Tools** flyout menu of the 980 DP Video Generator Analyzer module, click the **Control/Config** button on the lower right.

   The **Control/Config** dialog box appears.



2. Select the **Port Config** tab and then select **RX Enabled** to enable the Port 1 Rx.

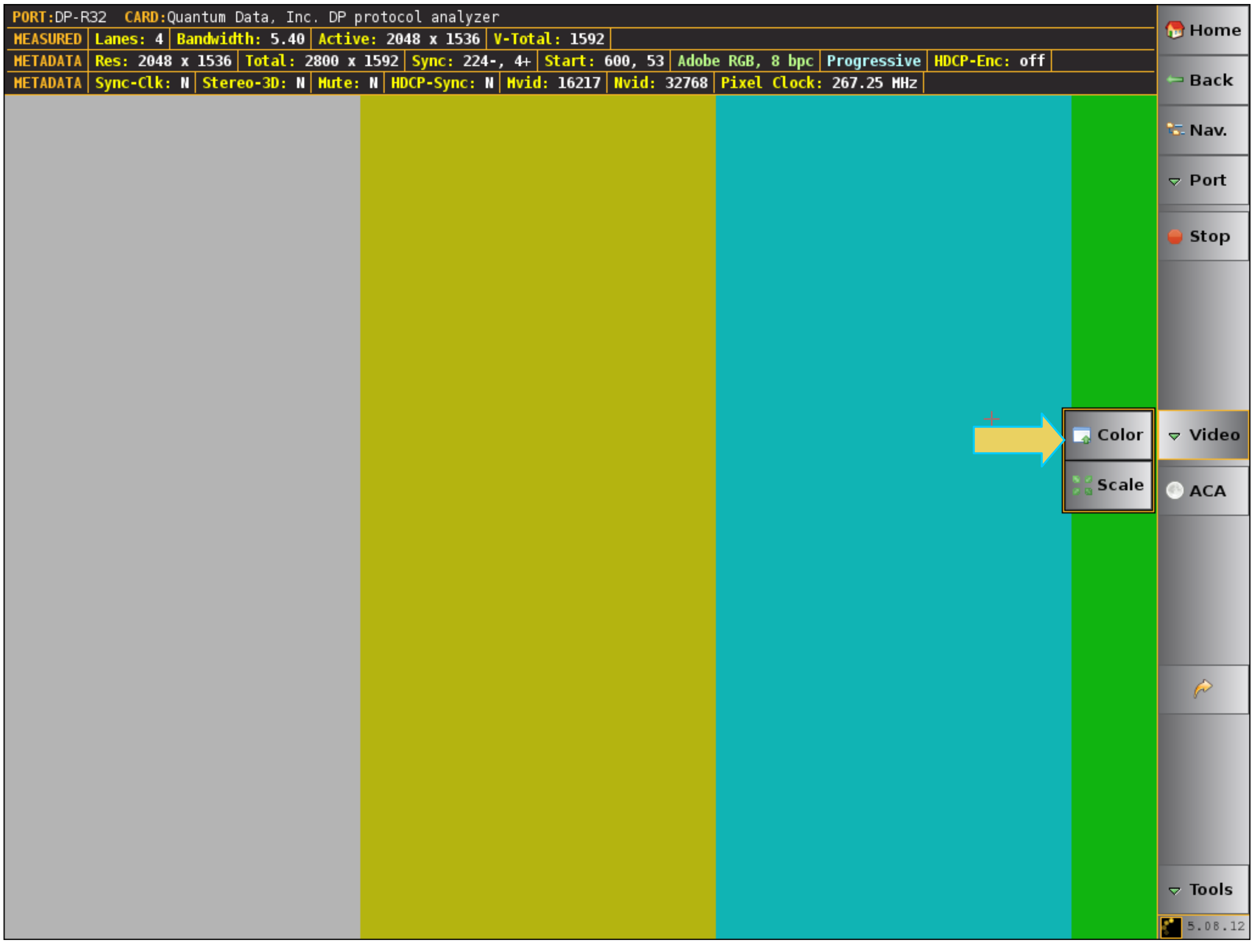
   Optionally refresh to view the link status by selecting the **Refresh** button.



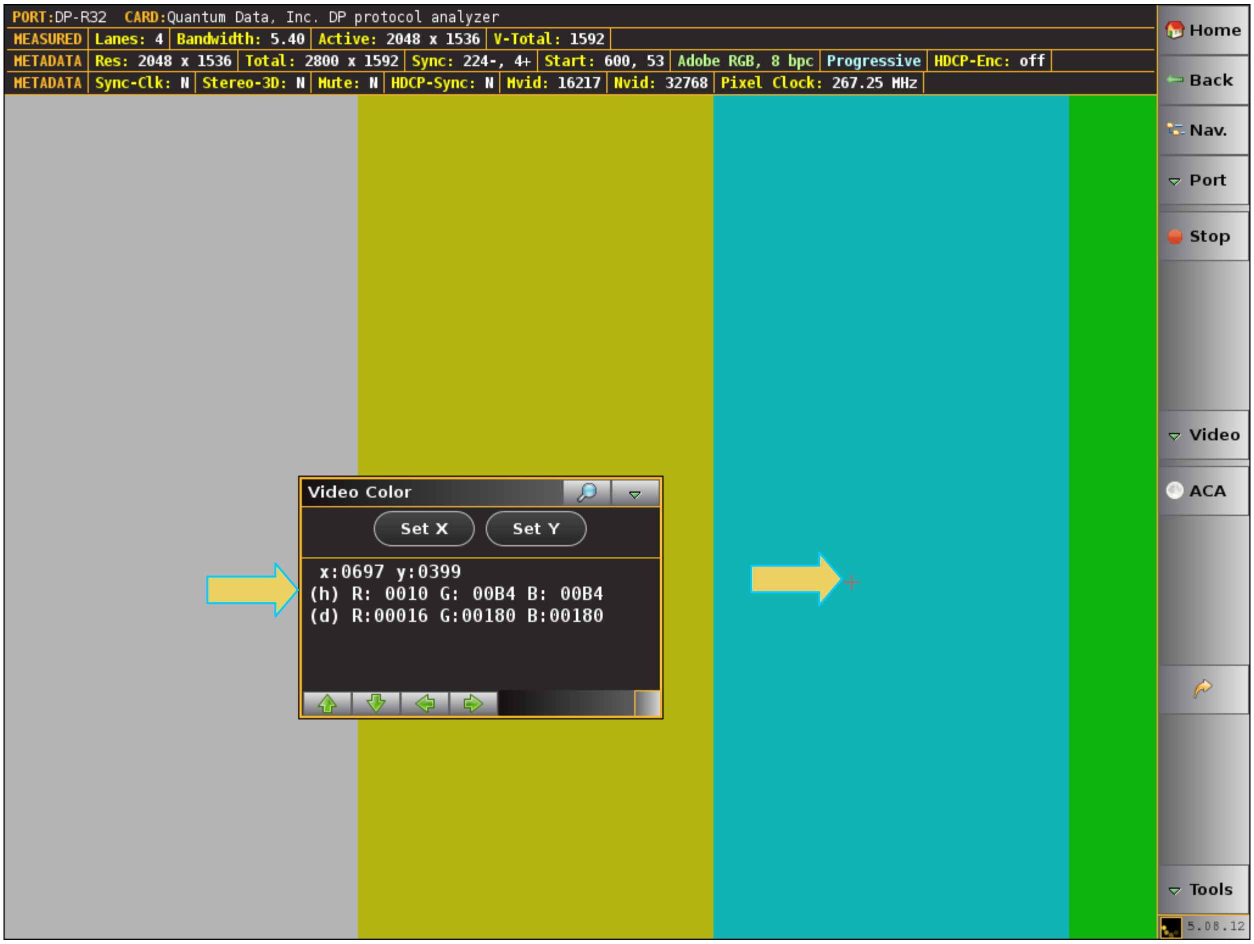
11.5.2 Viewing the Color values

The 980 DP Video Analyzer enables you to determine the color values of any particular pixel.

1. Access the Color dialog box from the Video fly-out menu.



2. Move your finger or stylus to a location on the video. You can also move to the adjacent pixels with the green arrow buttons provided in the dialog box.

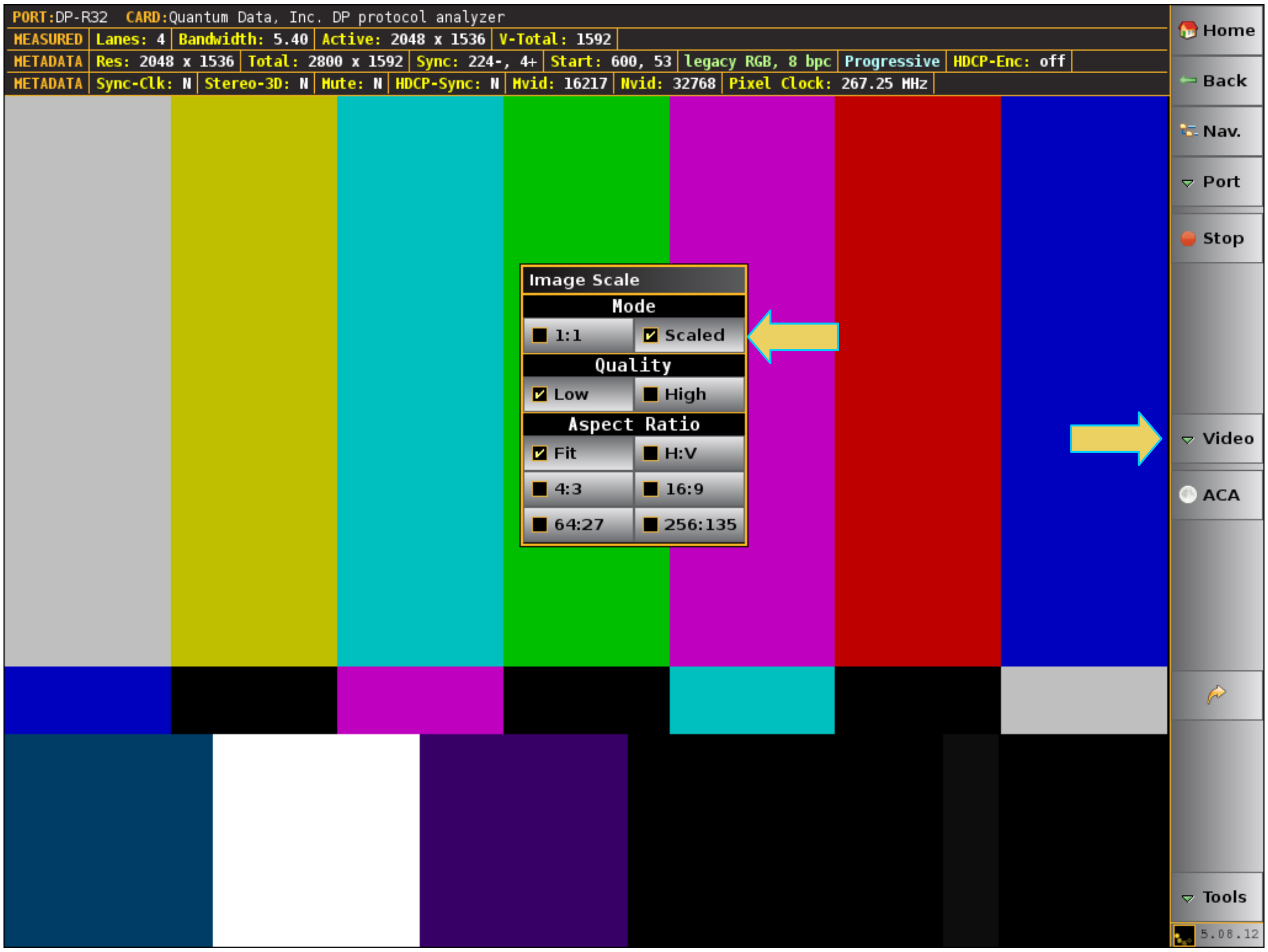


3. Read the pixel values on the dialog box provided. The pixel values (X for the horizontal – Y for the vertical) are provided in both hex and decimal.

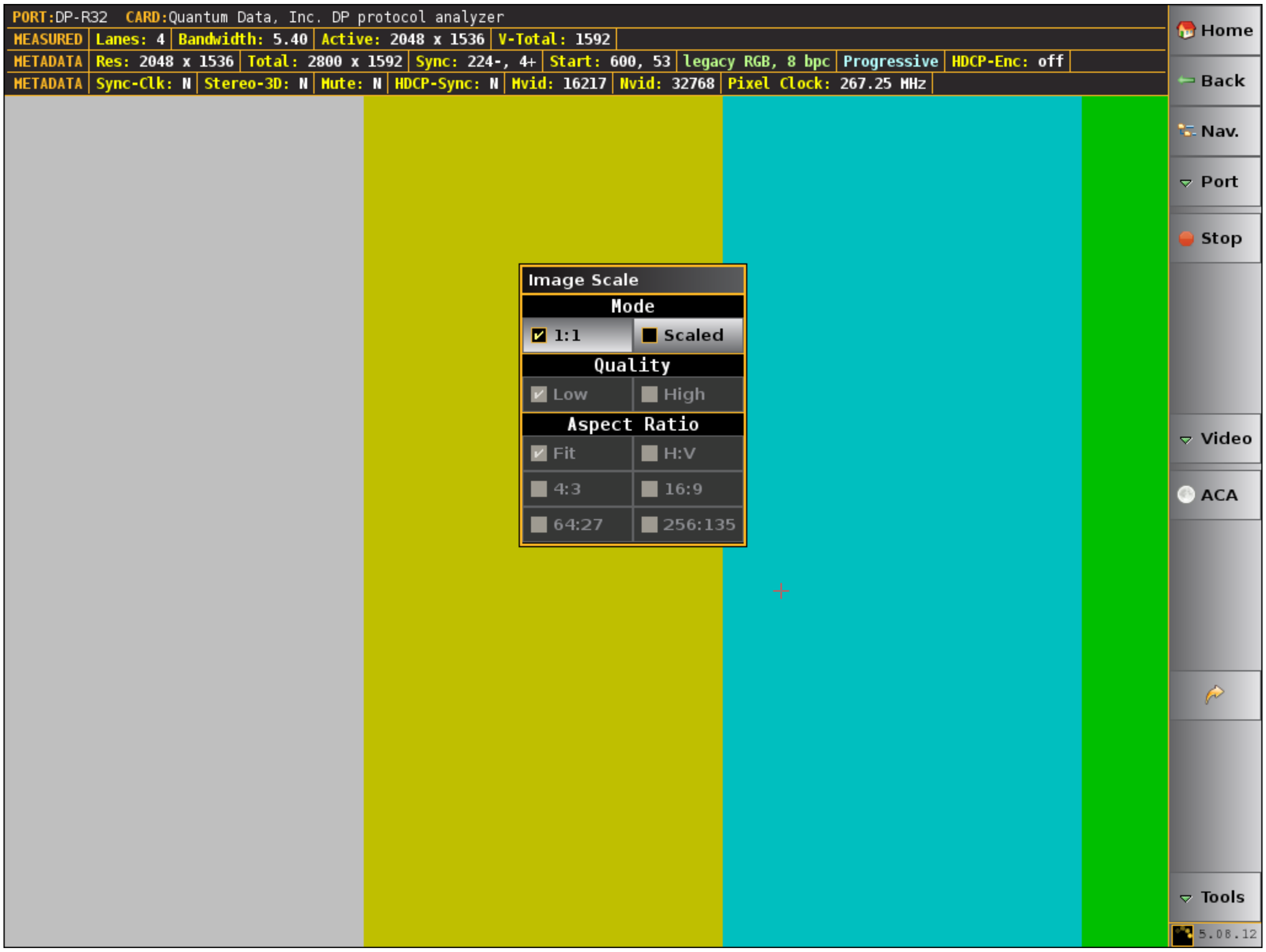
11.5.3 Setting the video image size and aspect ratio

The 980 DP Video Analyzer enables you to set the size and aspect ratio of the incoming video image.

1. Access the **Image Scale** dialog box from the Video fly-out menu.



The example below shows Image Scale set to Scaled.



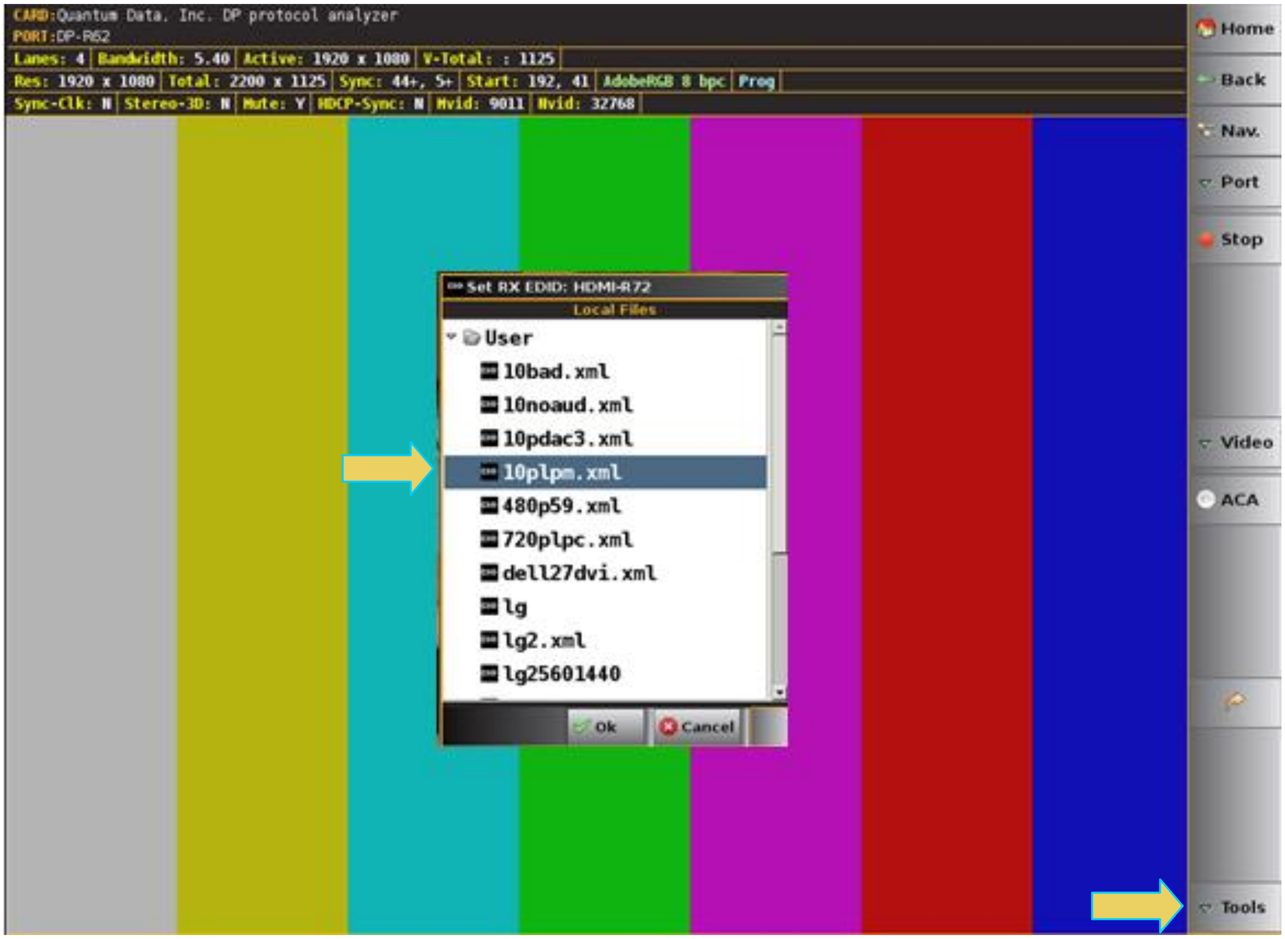
2. Set the size to either 1:1 or Scaled. The 1:1 setting means that the image appears in its true size. In this mode the image can be moved by dragging to view all areas of the image. The Scaled setting means that the image appears scaled to fit within the viewing area of the 980's embedded display.

   Note: In order to set the Quality and the Aspect Ratio you have to set the size to 1:1.

11.5.4 Setting the EDID for the Rx port

The 980 DP Video Analyzer enables you to set Rx ports EDID for emulation. The 980 GUI provides an EDID Editor enabling you to create your own custom EDIDs. You can also capture EDIDs from the 980 DP Video Generator's Tx ports and save them for testing on the Rx port. Also note that Quantum Data provides a free EDID Library available at: http://www.quantumdata.com/edid/.

1. Access the Set EDID dialog box from the Tools fly-out menu.



2. Select the EDID that you wish to emulate on the module's Rx port and then click on OK.

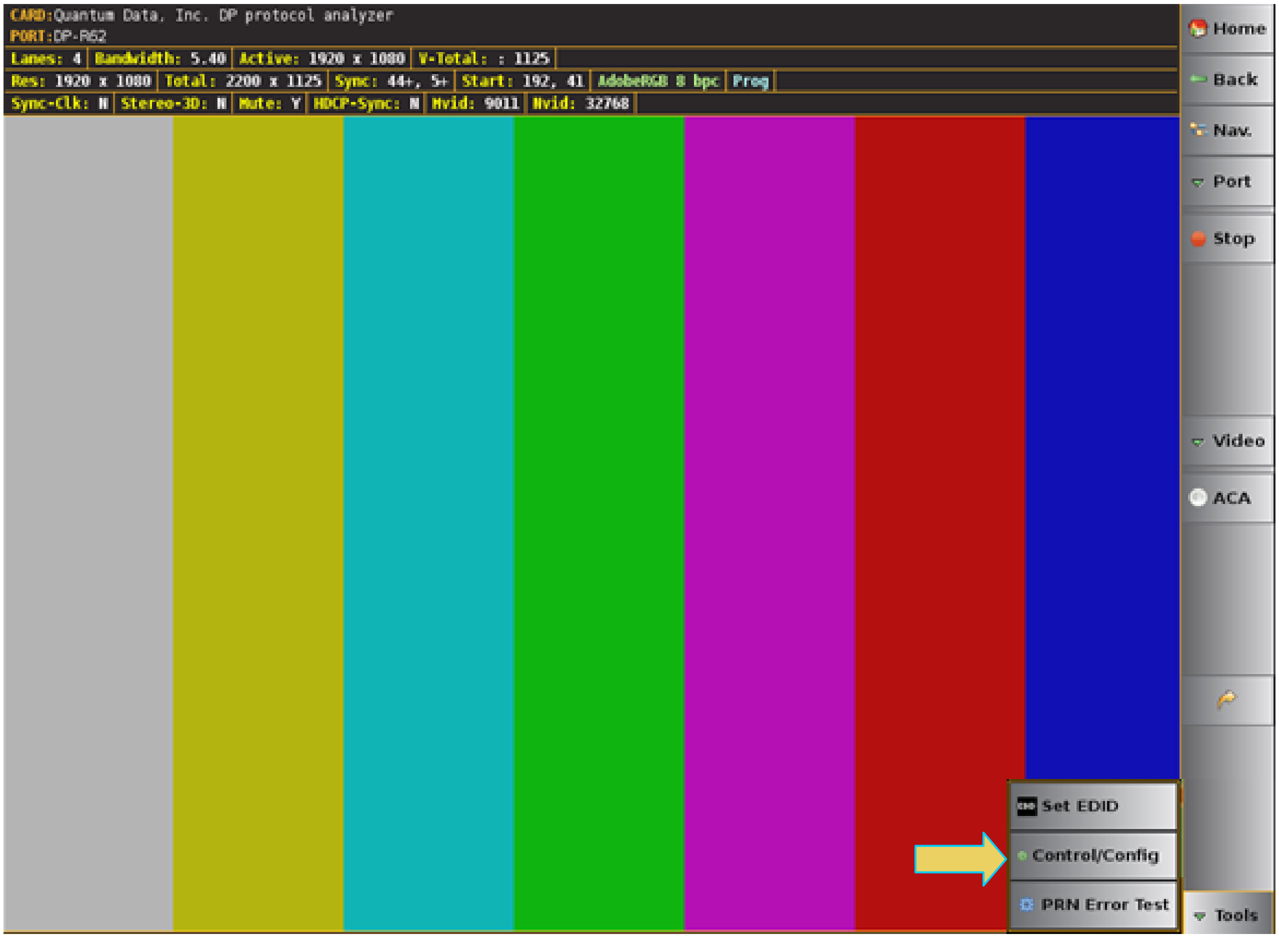
   The 980 DP Video Generator's Rx port will emulate the EDID you selected.

   Refer to the section in the User Guide entitled Capturing EDIDs of a connected display for instructions on how to capture EDIDs from HDTVs.

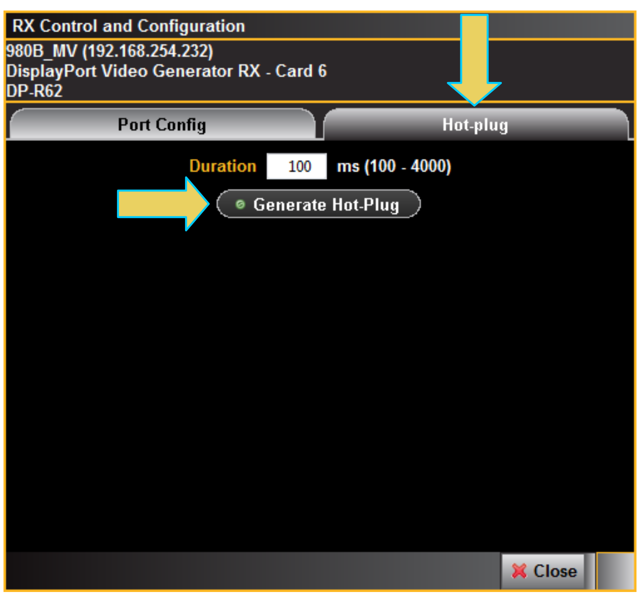
11.5.5 Generating Hot Plug

The 980 DP Video Analyzer enables you to generate a hot plug to cause a source device to read and EDID and initiate HDCP authentication.

1. Initiate a hot plug from the Tools fly-out menu.



2. Select the Hot Plug tab and click on the Generate Hot Plug activation button to initiate a hot plug. Refer to the dialog box below.



11.6 Running a Pseudo-Random Noise Test

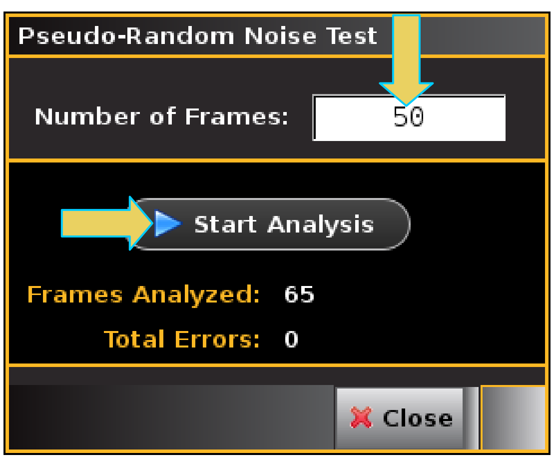
The 980 DP Video Analyzer enables you to run a test on a DP cable using a pseudo-random noise (PRN) test pattern. The PRN test pattern was designed to maximize the change in pixel values between adjacent pixels.

1. Select **PRN Error Test** from the Tools fly-out menu as indicated below.

The PRN dialog box appears as shown below.

2. Select the number of frames and click on the Start Analysis activation button to initiate the test.

Note: The number of frames specified may not match the number of frames tested.

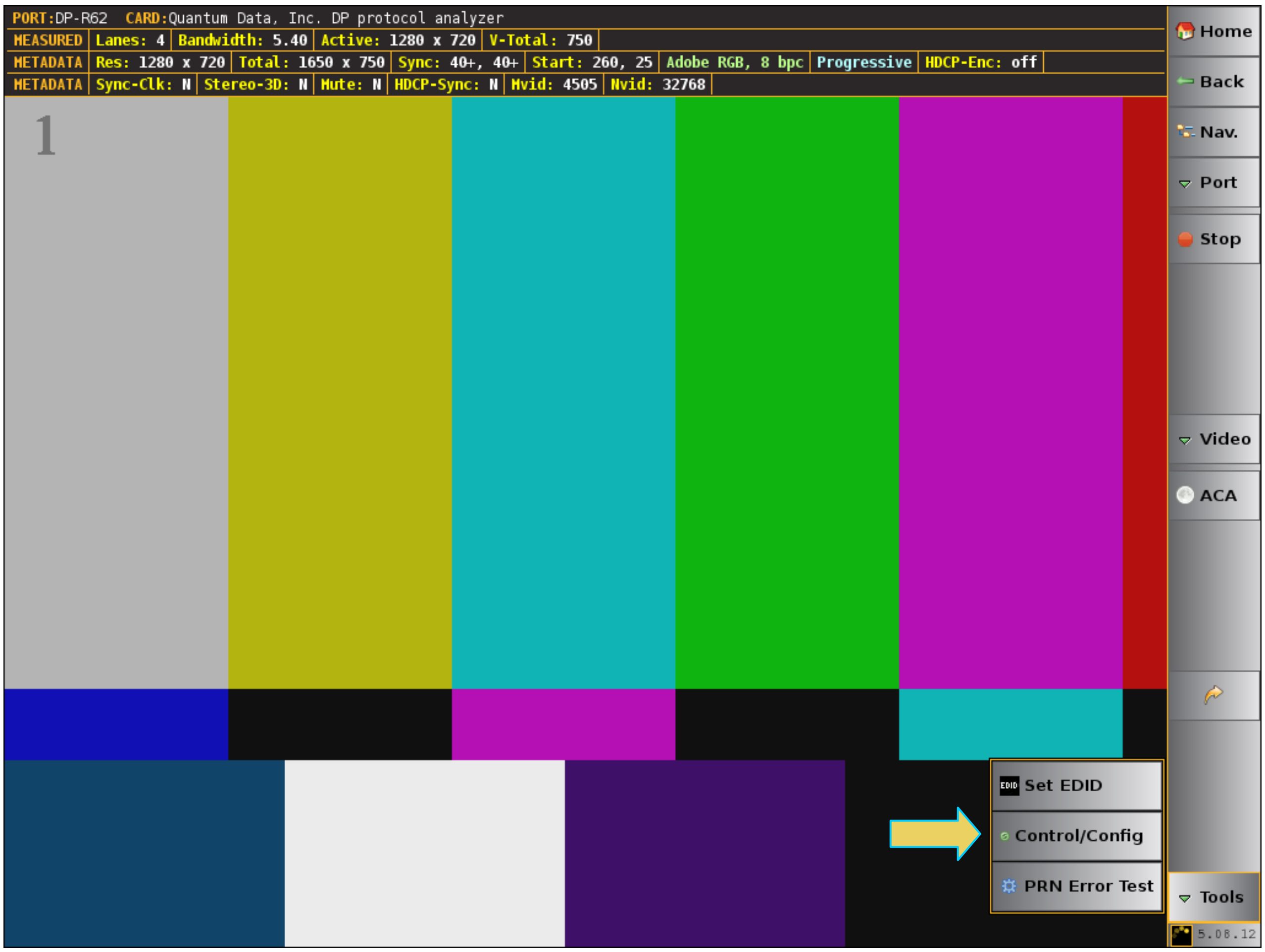


11.7 Emulating an MST Rx port

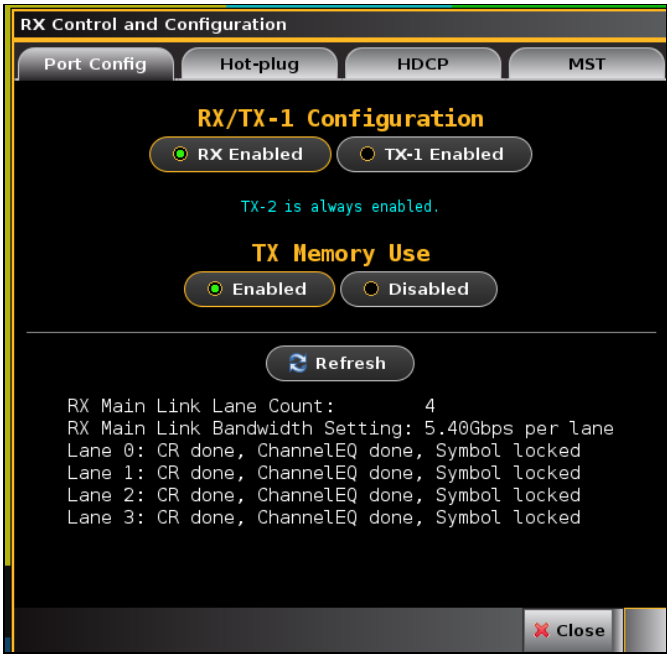
The 980 DP Video Generator / Analyzer module's Basic Analyzer option can emulate a DisplayPort Multi-Stream Transport (MST) branch device and MST sinks nodes. The emulation capability includes the ability to present EDIDs from downstream MST sink devices and to provide a response to DPCD reads. The DP Video Analyzer Rx port will respond to MST negotiation requests from MST-capable DP source devices. Currently the EDID presented will be the same for all downstream MST sink nodes. All DPCD reads will be NAKed.

To enable MST emulation:

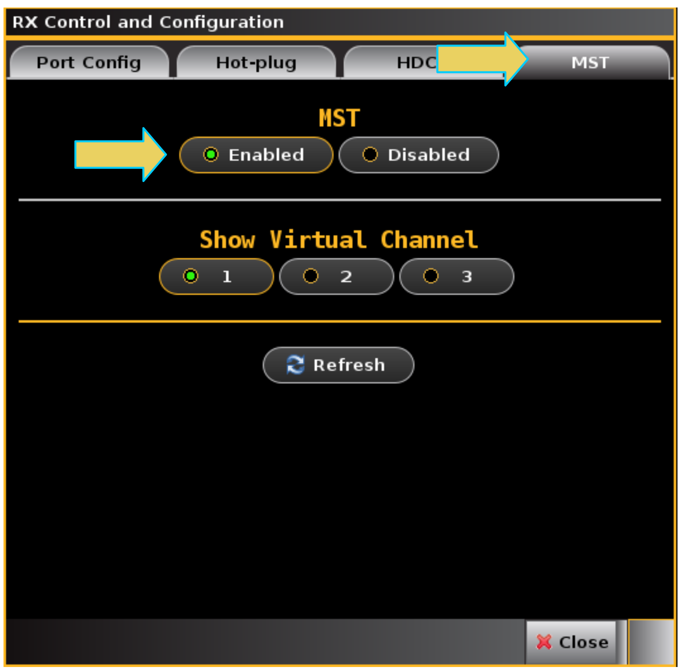
1. Select **Control/Config** from the Tools flyout menu as shown below.



The **Rx Control and Configuration** menu appears as shown below.



2. Enable the Rx port if not already done.
3. Access the MST tab from the **Rx Control and Configuration** dialog box as shown below.

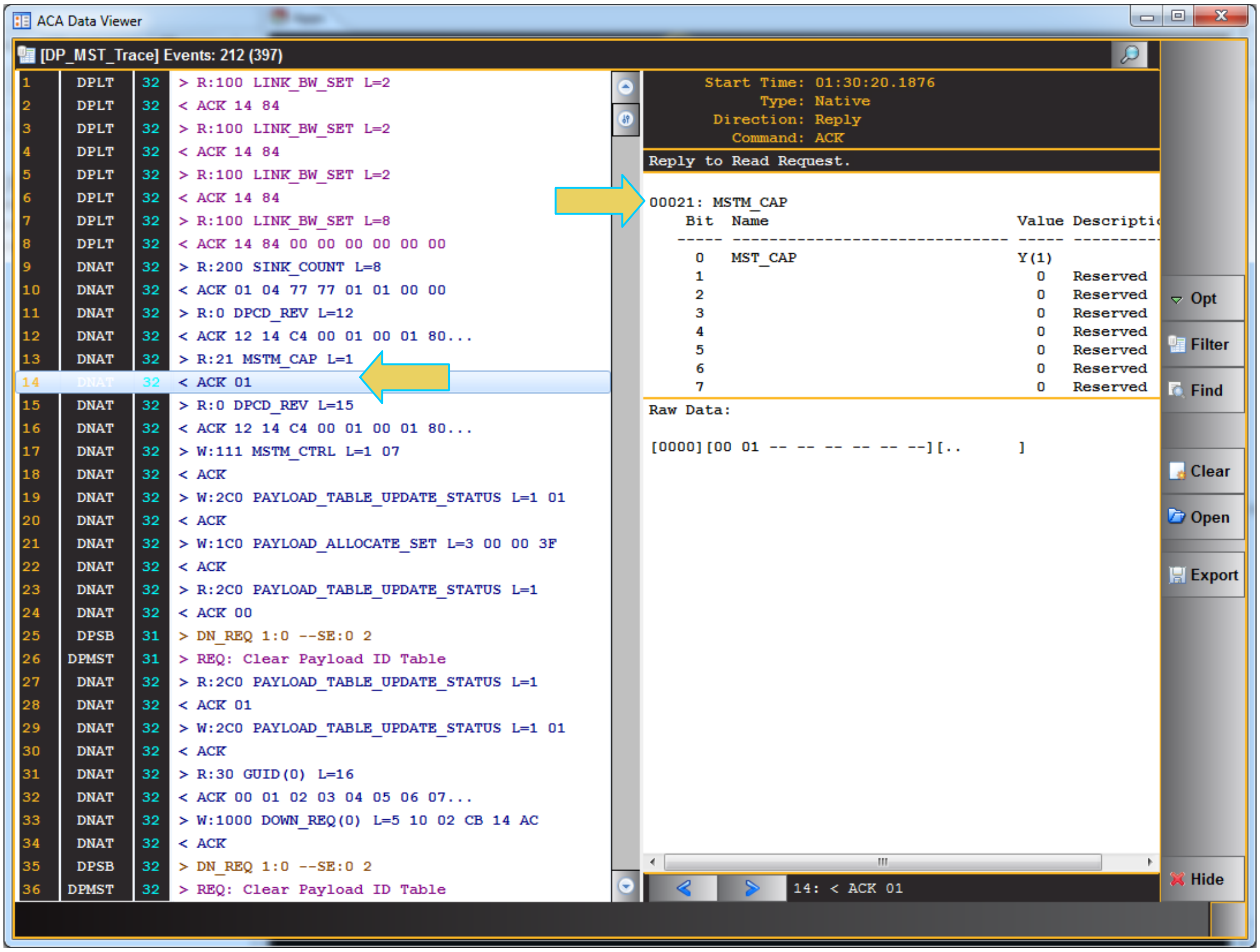


4. Enable MST and select the virtual channel to show on the Real Time display.

   In the example above, the video from MST stream 1 would appear on the 980 Real Time display window. The example below shows a special case where the 980 DP module Tx is looped back to the module's Rx port. In this case the module's Tx MST emulator places a 1 (or 2,3,4) in the upper left of the video.


PORT:DP-R62 CARD:Quantum Data, Inc. DP protocol analyzer
MEASURED | Lanes: 4 | Bandwidth: 5.40 | Active: 1280 x 720 | V-Total: 750
METADATA | Res: 1280 x 720 | Total: 1650 x 750 | Sync: 40+, 40+ | Start: 260, 25 | Adobe RGB, 8 bpc | Progressive | HDCP-Enc: off
METADATA | Sync-Clk: N | Stereo-3D: N | Mute: N | HDCP-Sync: N | Mvid: 4505 | Nvid: 32768
1
Home
Back
Nav.
Port
Stop
Video
ACA
Tools
5.08.12

Note: You can also monitor the MST sideband negotiations from the Quantum Data ACA utility as shown in the example below.

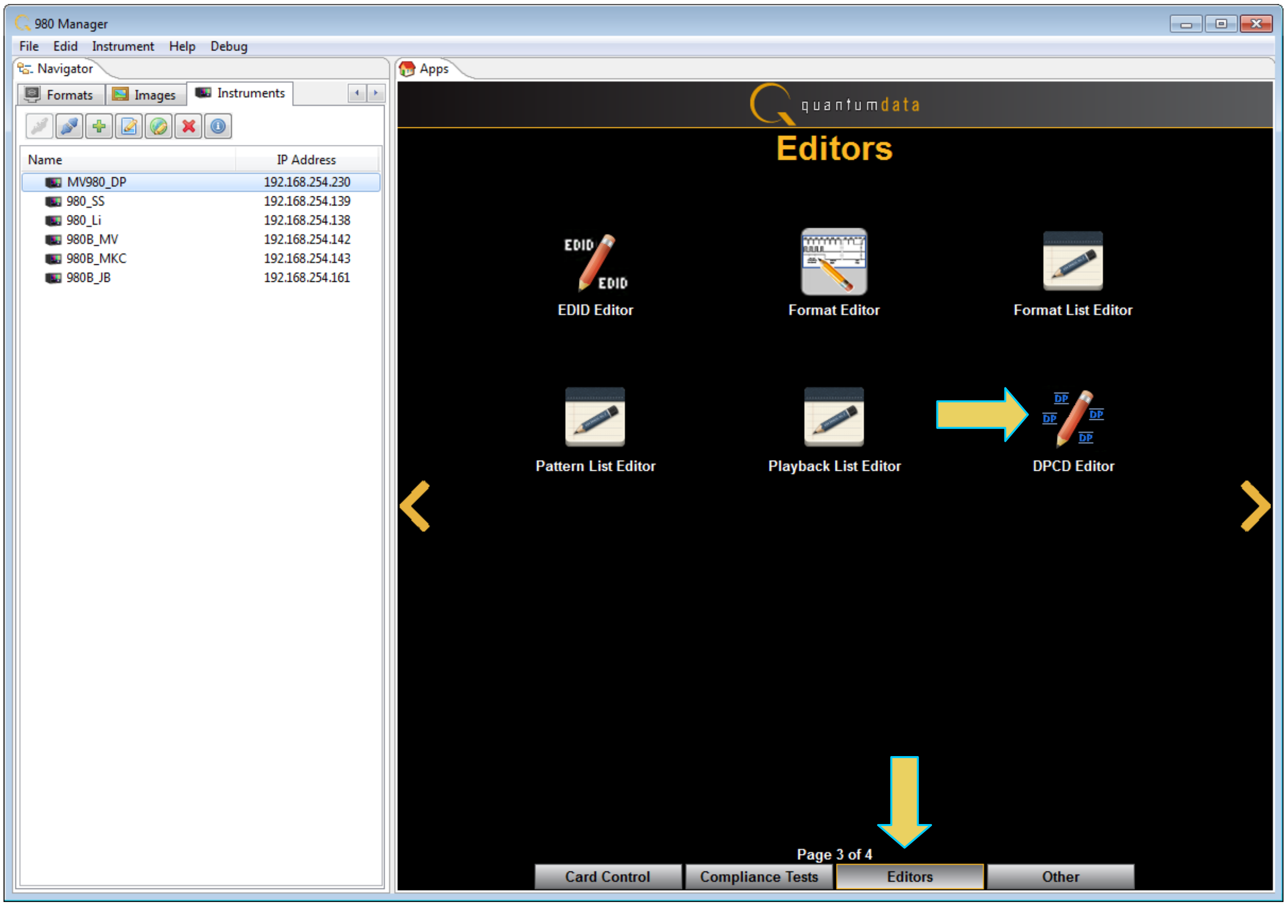


11.8 DPCD Editor

This subsection provides procedures on how to edit the DP Rx analyzer port's DPCD registers. The 980 DP Video Analyzer provides a set of dialog boxes that enable you to edit the DPCD registers through pull down menus and text fields. You can save these edited configurations for recall when testing DP sources. This enables you to emulate a variety of DPCD register configurations on the Rx port.

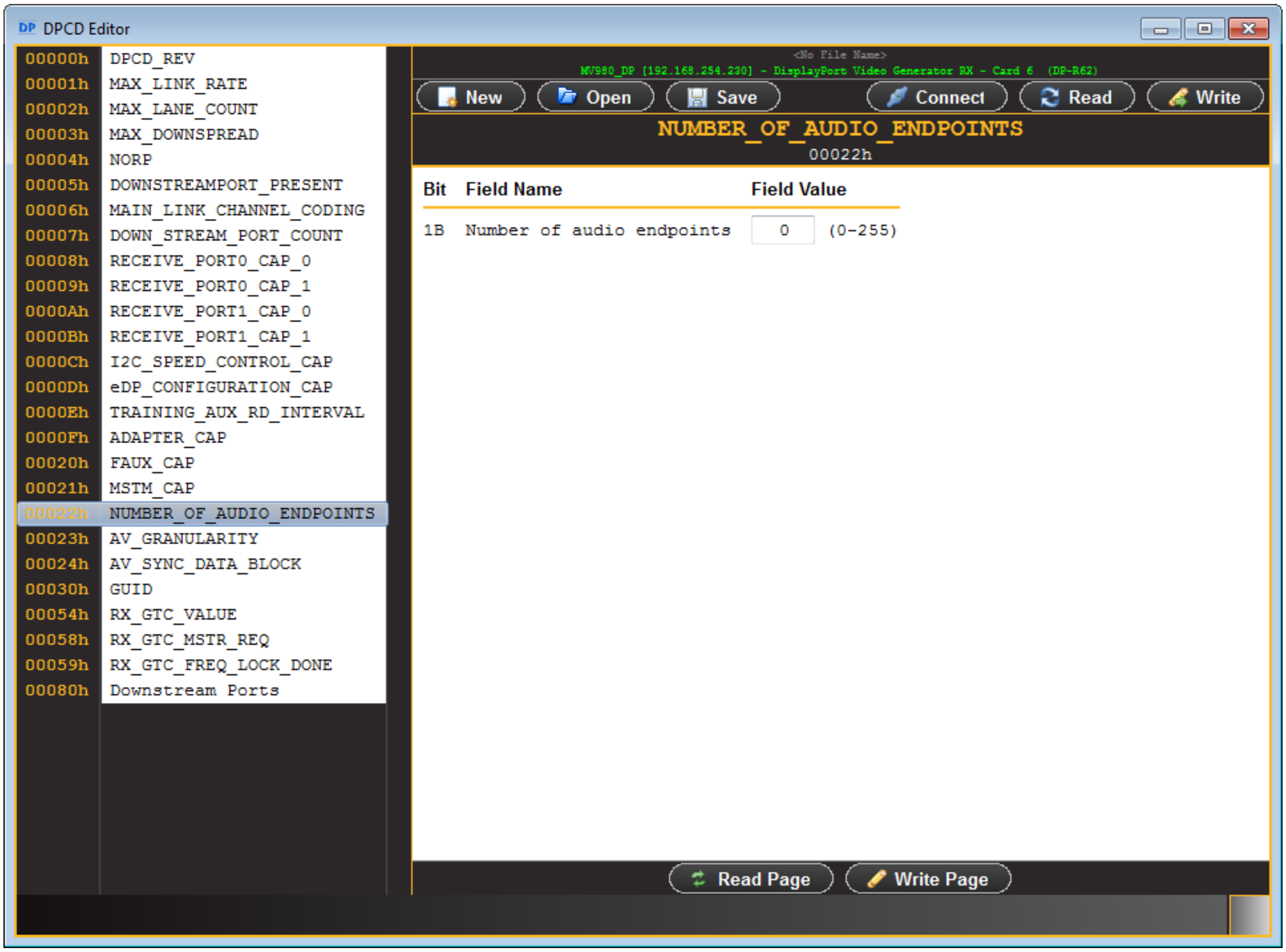
The DPCD Editor is available either the remote GUI or the embedded GUI.

1. Access the DPCD Editor from the Editors page.

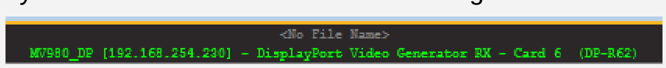
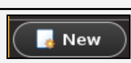
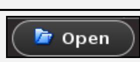


The following sample screen shots show some of the DPCD editing windows. Note that each register set is selected on the left and the editing tools are available on the main area of the dialog box on the right side.

The following screen shows the DPCD Editor main screen.

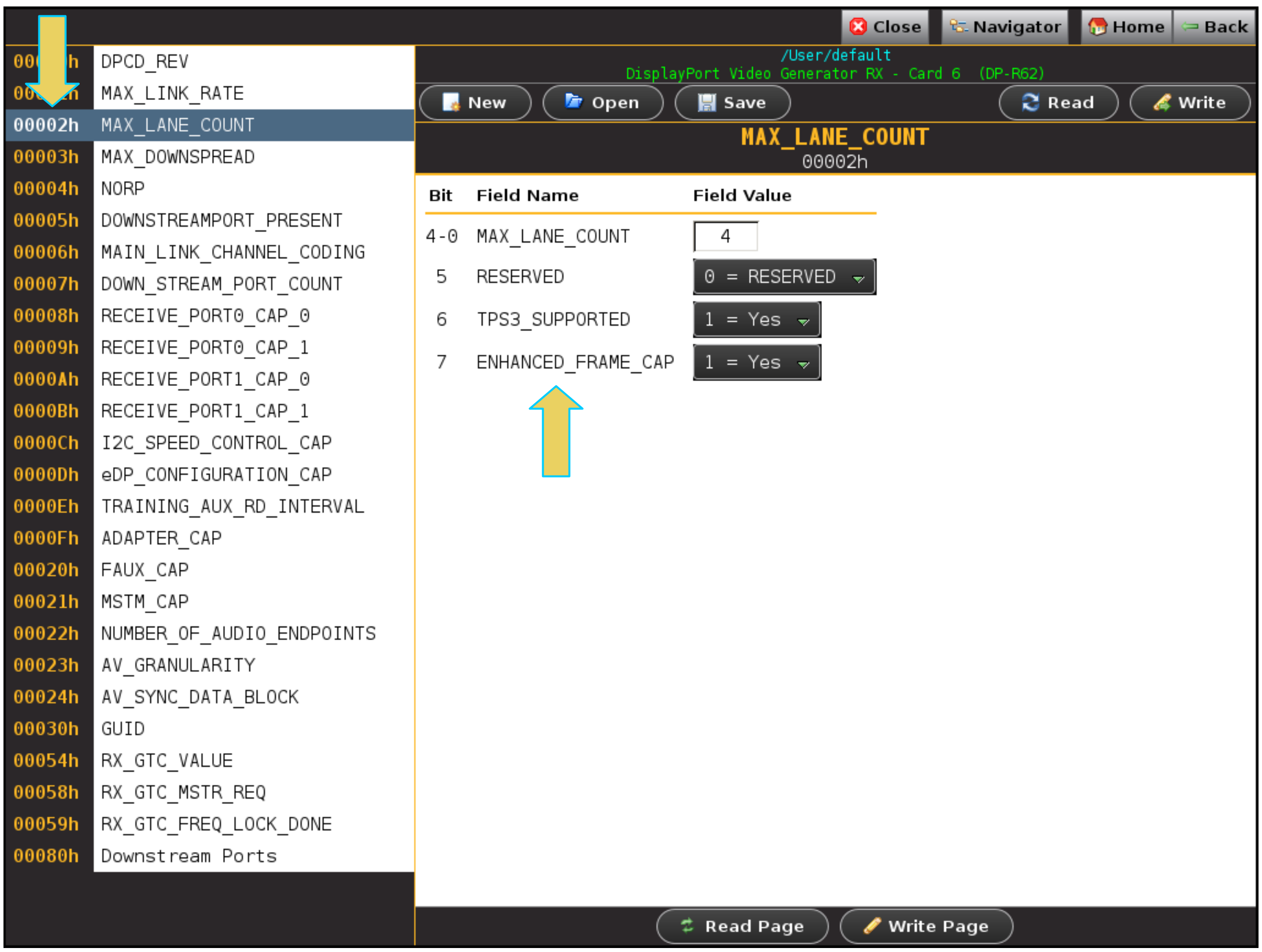


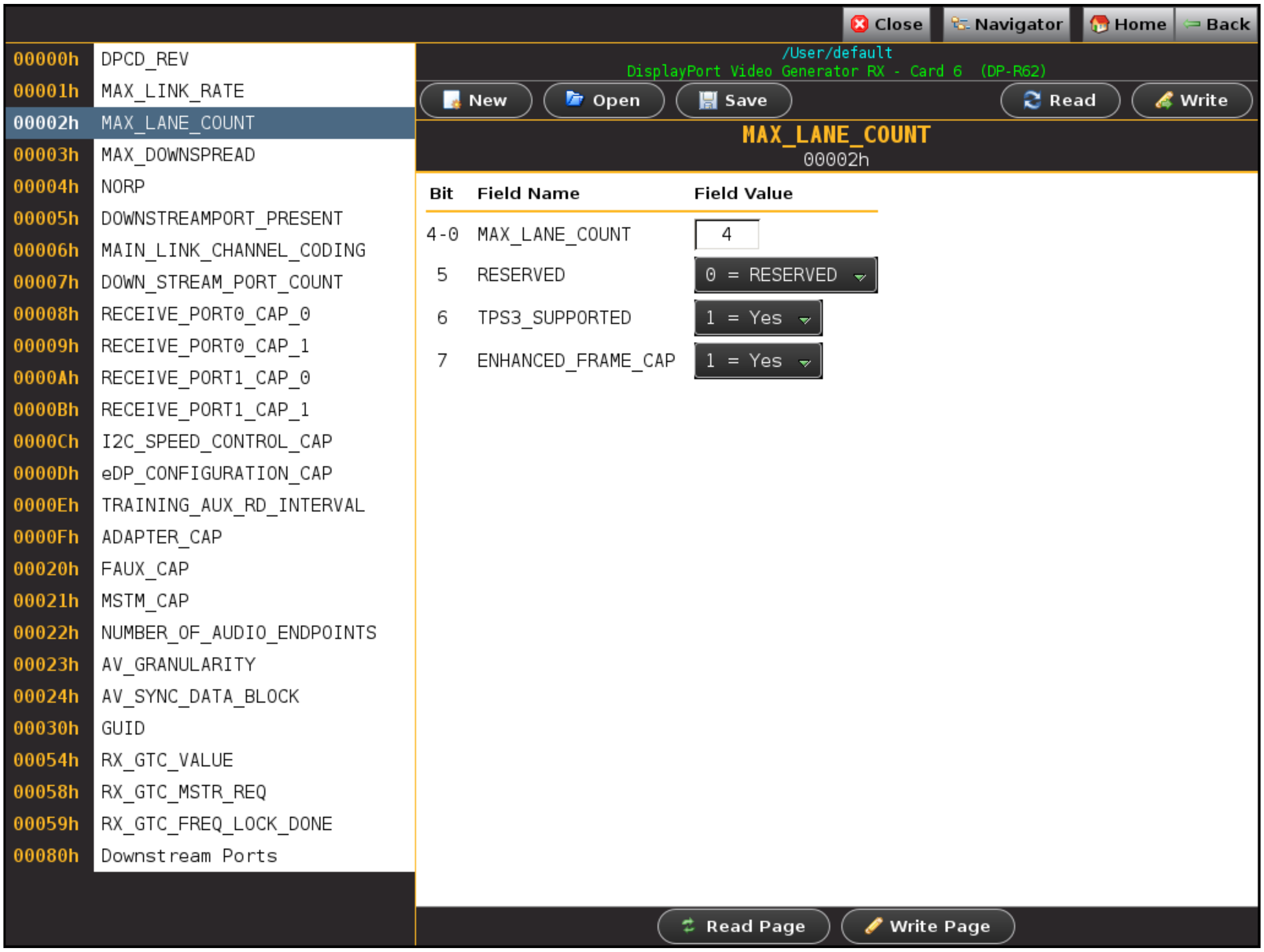
There are a set of controls available with the DPCD Editor. These are defined in the table below:

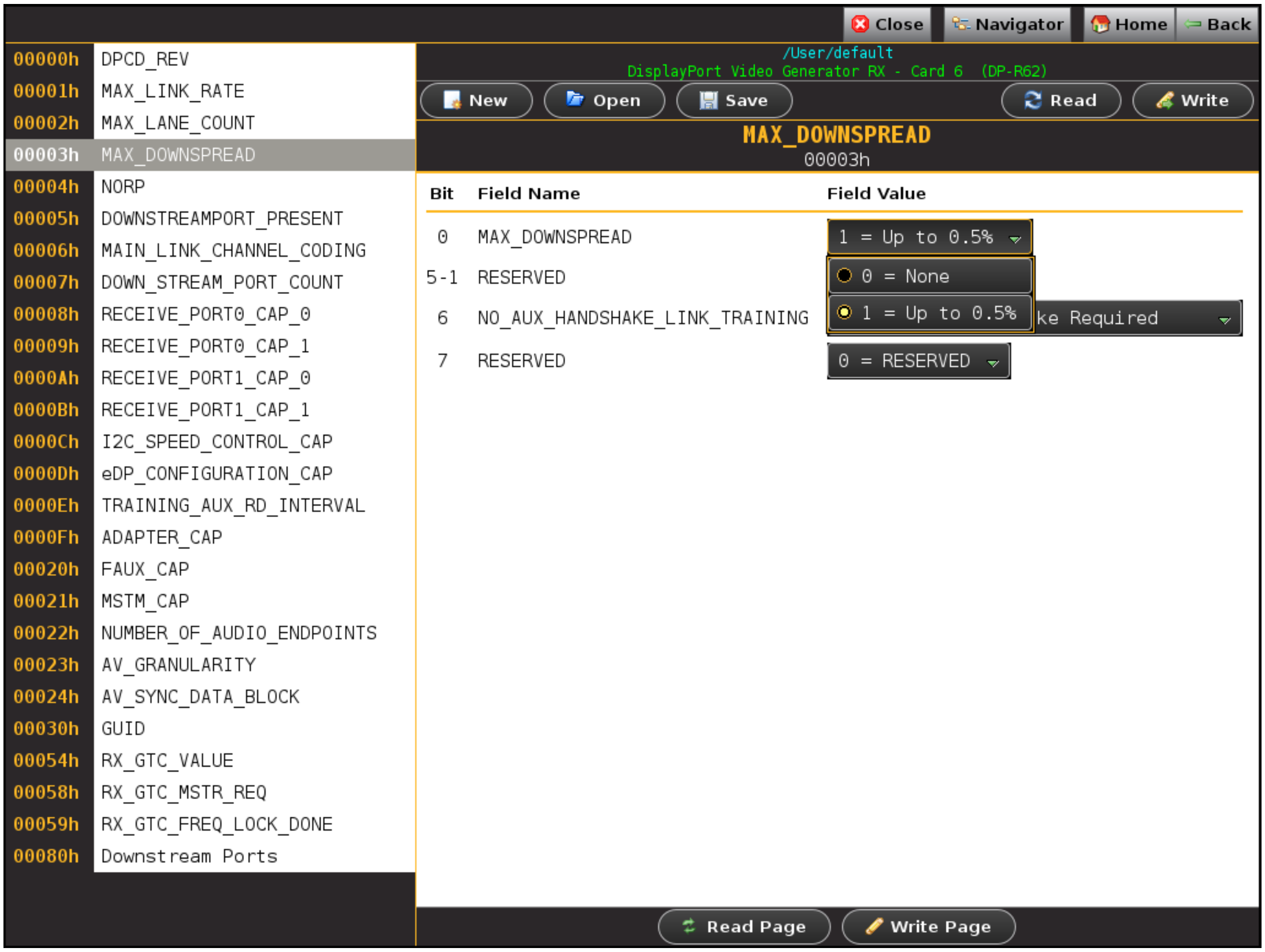
DPCD Editor controls	
Item	**Description**
Status Text Area	Indicates the current directory where the edited DPCD registers will be stored and opened from. Also, when using the external 980 GUI Manager from a host PC and connecting to a 980 system, this text area shows the IP address of the 980 system that the external 980 GUI Manager is connected to. 
	DP module description indicating the card slot location. Example slot 6.
Register Address 	Shows the various DPCD register blocks and enables selection of them for editing their contents.
New 	Enables you to create a new file for editing. A dialog box will appear enabling you to assign a name to the DPCD file.
Open 	Enables you to open a DPCD configuration file for editing.

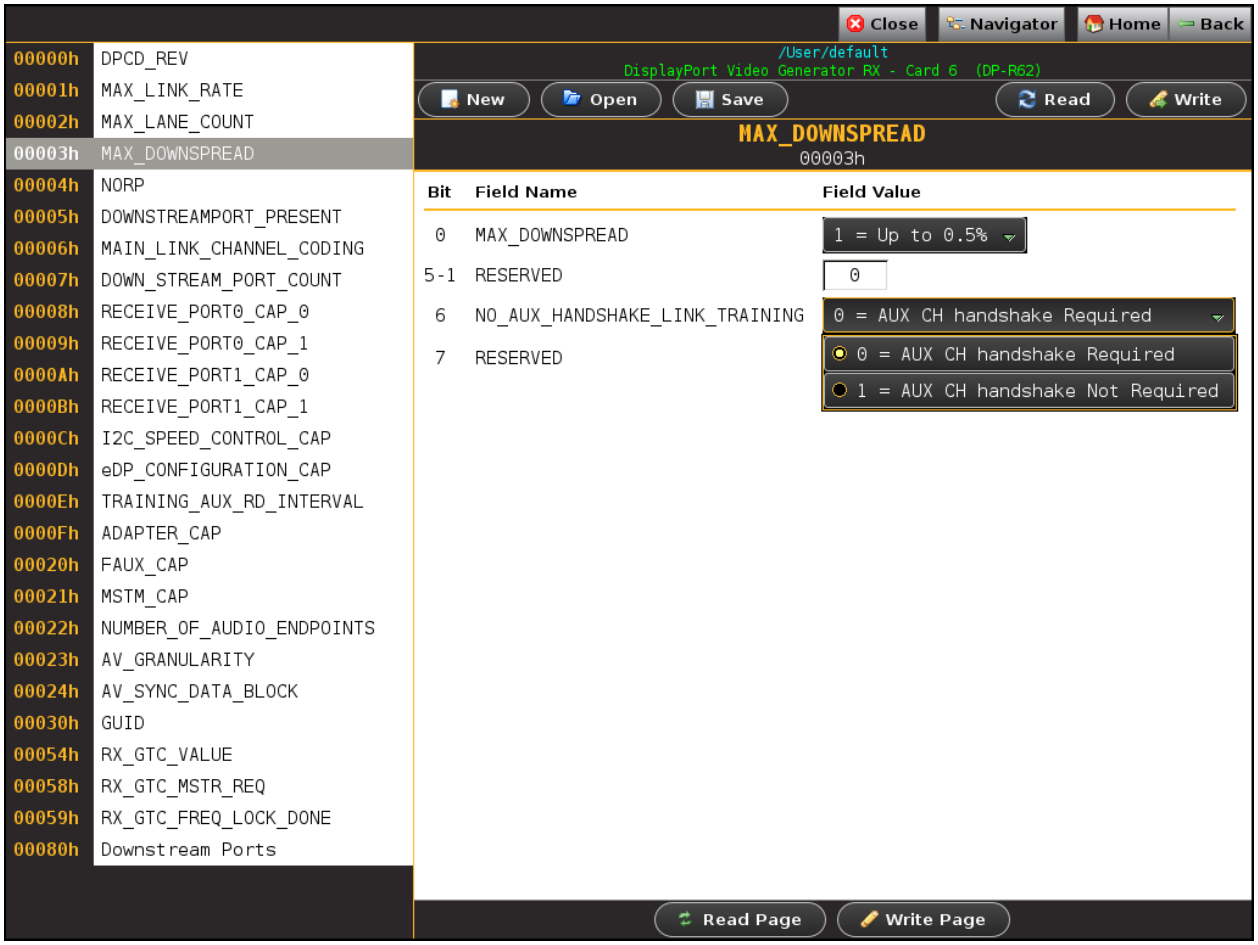
DPCD Editor controls	
Item	**Description**
Connect	Available only from the External 980 GUI Manager (not shown on the embedded GUI)
Save	Enables you to save a DPCD configuration file for later reuse. A dialog box will appear enabling you to assign a name to the DPCD file.
Read	Enables you to read the entire current DPCD configuration of the 980 DP Rx device. This populates dialog boxes with the current register settings.
Write	This writes the entire contents of the edited DPCD file to the 980 DP module's Rx port for emulation.
Read Page	Enables you to read the DPCD register values of the selected page of the 980 DP Rx device. This populates dialog boxes with the current register settings.
Write Page	This writes the contents of the register values on the selected page of the DPCD to the 980 DP module's Rx port for emulation.

The following screen examples show several of the DPCD Editor's address blocks (pages).



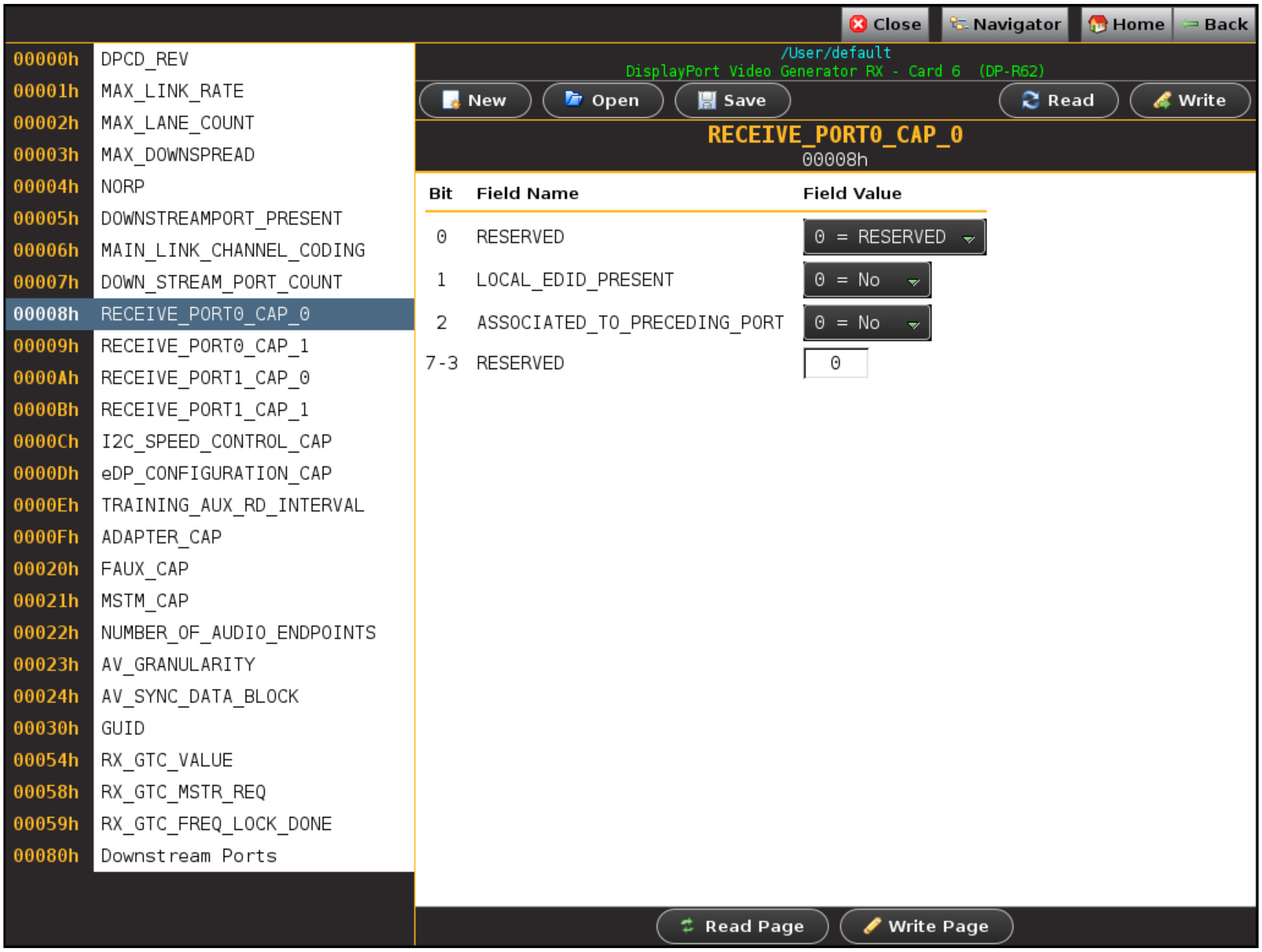

Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
MAX_LANE_COUNT
00002h
Bit
Field Name
Field Value
4-0 MAX_LANE_COUNT 4
5 RESERVED 0 = RESERVED
6 TPS3_SUPPORTED 1 = Yes
7 ENHANCED_FRAME_CAP 1 = Yes
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Read Page
Write Page


Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
MAX_DOWNSPREAD
00003h
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Bit Field Name Field Value
0 MAX_DOWNSPREAD 1 = Up to 0.5%
5-1 RESERVED 0 = None
6 NO_AUX_HANDSHAKE_LINK_TRAINING 1 = Up to 0.5% ke Required
7 RESERVED 0 = RESERVED
Read Page
Write Page


Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
MAX_DOWNSPREAD
00003h
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Bit Field Name Field Value
0 MAX_DOWNSPREAD 1 = Up to 0.5%
5-1 RESERVED 0
6 NO_AUX_HANDSHAKE_LINK_TRAINING 0 = AUX CH handshake Required
0 = AUX CH handshake Required
1 = AUX CH handshake Not Required
7 RESERVED
Read Page
Write Page


Close
Navigator
Home
Back
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
DOWNSTREAMPORT_PRESENT
00005h
Bit
Field Name
Field Value
0 DWN_STRM_PORT_PRESENT
0 = No
0 = No
1 = Yes
2-1 DWN_STRM_PORT_TYPE
Port
3 FORMAT_CONVERSION
4 DETAILED_CAP_INFO_AVAILABLE
0 = No
7-5 RESERVED
0
Read Page
Write Page


Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
DOWN_STREAM_PORT_COUNT
00007h
Bit
Field Name
Field Value
3-0 DWN_STRM_PORT_COUNT 0
5-4 RESERVED 0
6 MSA_TIMING_PAR_IGNORED 0 = No
7 OUI Support
0 = No
1 = Yes
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Read Page
Write Page


Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
RECEIVE_PORT0_CAP_0
00008h
Bit
Field Name
Field Value
0
RESERVED
0 = RESERVED
1
LOCAL_EDID_PRESENT
0 = No
2
ASSOCIATED_TO_PRECEDING_PORT
0 = No
7-3
RESERVED
0
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Read Page
Write Page


Close
Navigator
Home
Back
/User/default
DisplayPort Video Generator RX - Card 6 (DP-R62)
New
Open
Save
Read
Write
MSTM_CAP
00021h
Bit
Field Name
Field Value
0
MST_CAP
0 = No
7-1
RESERVED
0
00000h DPCD_REV
00001h MAX_LINK_RATE
00002h MAX_LANE_COUNT
00003h MAX_DOWNSPREAD
00004h NORP
00005h DOWNSTREAMPORT_PRESENT
00006h MAIN_LINK_CHANNEL_CODING
00007h DOWN_STREAM_PORT_COUNT
00008h RECEIVE_PORT0_CAP_0
00009h RECEIVE_PORT0_CAP_1
0000Ah RECEIVE_PORT1_CAP_0
0000Bh RECEIVE_PORT1_CAP_1
0000Ch I2C_SPEED_CONTROL_CAP
0000Dh eDP_CONFIGURATION_CAP
0000Eh TRAINING_AUX_RD_INTERVAL
0000Fh ADAPTER_CAP
00020h FAUX_CAP
00021h MSTM_CAP
00022h NUMBER_OF_AUDIO_ENDPOINTS
00023h AV_GRANULARITY
00024h AV_SYNC_DATA_BLOCK
00030h GUID
00054h RX_GTC_VALUE
00058h RX_GTC_MSTR_REQ
00059h RX_GTC_FREQ_LOCK_DONE
00080h Downstream Ports
Read Page
Write Page

12 Source Verification with Protocol Analyzer (Optional)

The 980 DP Video Generator / Analyzer module is equipped with a DP 1.2 Rx port for the optional Network Analyzer features. There are two analyzer options available:

1) Basic Analyzer – Emulates a DP 1.2 sink device including EDID, DPCD, MST, Link Training emulation. Provides real time view of the incoming source video and metadata including status of mainstream attributes, secondary stream attributes, link training, MST, HDCP. Also provides support for viewing the Aux Channel transactions using the Quantum Data Auxiliary Channel Analyzer (ACA) application when testing a DP source.

2) Protocol Analyzer (requires the Basic Analyzer license to be installed) – Provides capture and store of the main link protocol, video and metadata including main stream attributes and secondary data from an incoming DP source device.

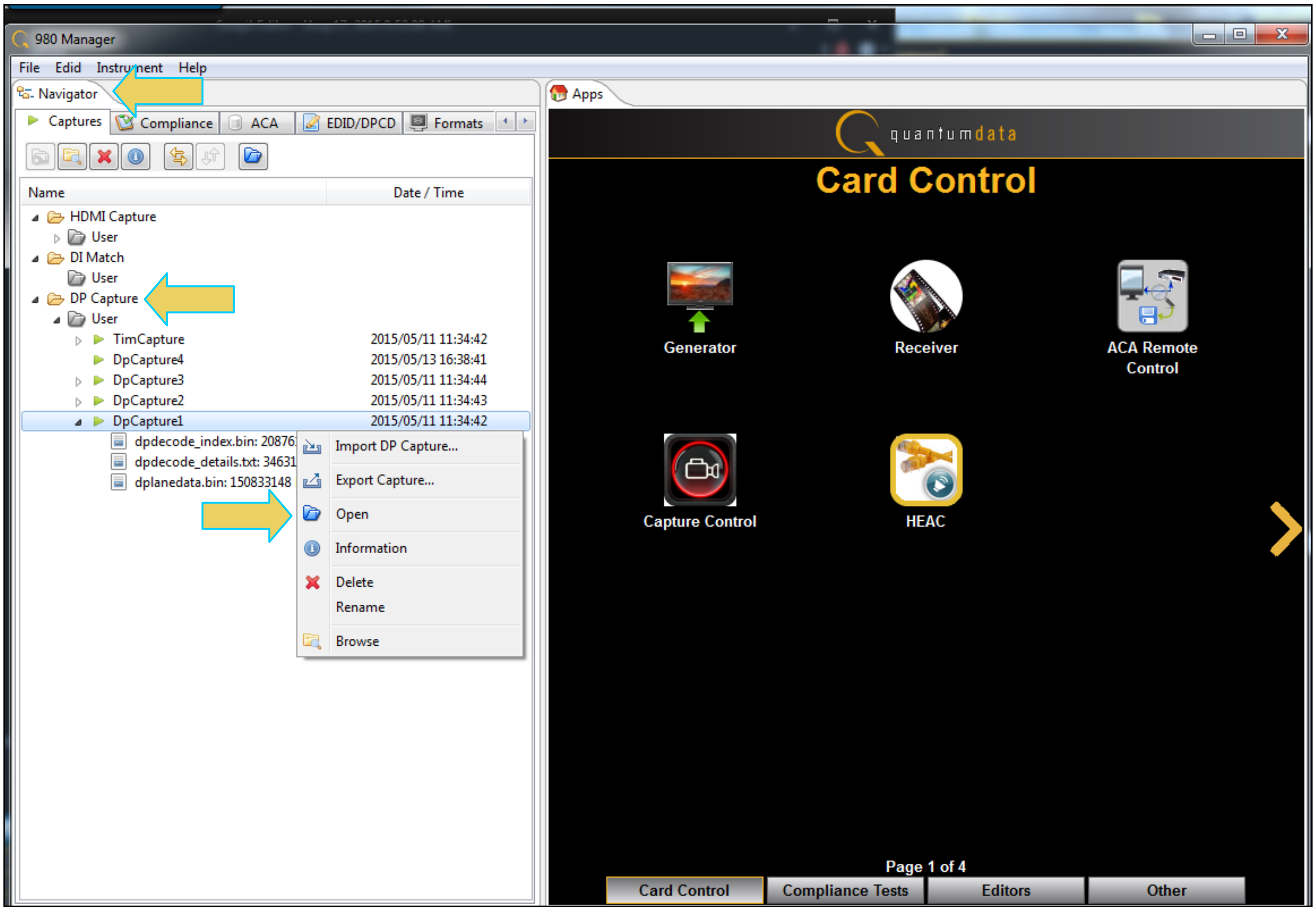
12.1 Operational workflow for capturing data with your 980 DP Protocol Analyzer

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

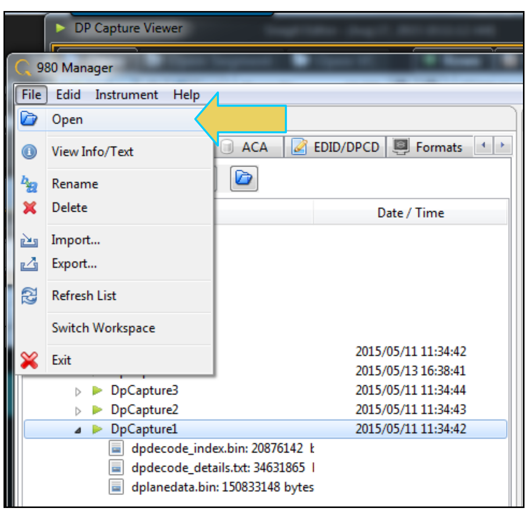
1. Configure the 980 DP Protocol Analyzer Rx port with the proper EDID.
2. Connecting the DP source device.
3. View the incoming video in real time to check the status of the device under test.
4. Specify a trigger method.
5. Initiate the capturing of the data.
6. Examine the test data through the 980 GUI Manager at the high level view on the **Event Plot** panel or the Video Analysis panel.
7. Drill down to examine the data at the lower level through the details of the **Data Decode** panel view.
8. (Optional) You may wish to capture and view the raw hex data.

12.2 Opening an Existing Capture

The DisplayPort Protocol Analyzer feature enables you to save capture data for later examination. You can access existing captures through the **Navigator** utility as shown in the screen shot below. The right click menu enables you to open a capture. You can also open a capture from the **Open** option on the **File** menu on top (shown below).

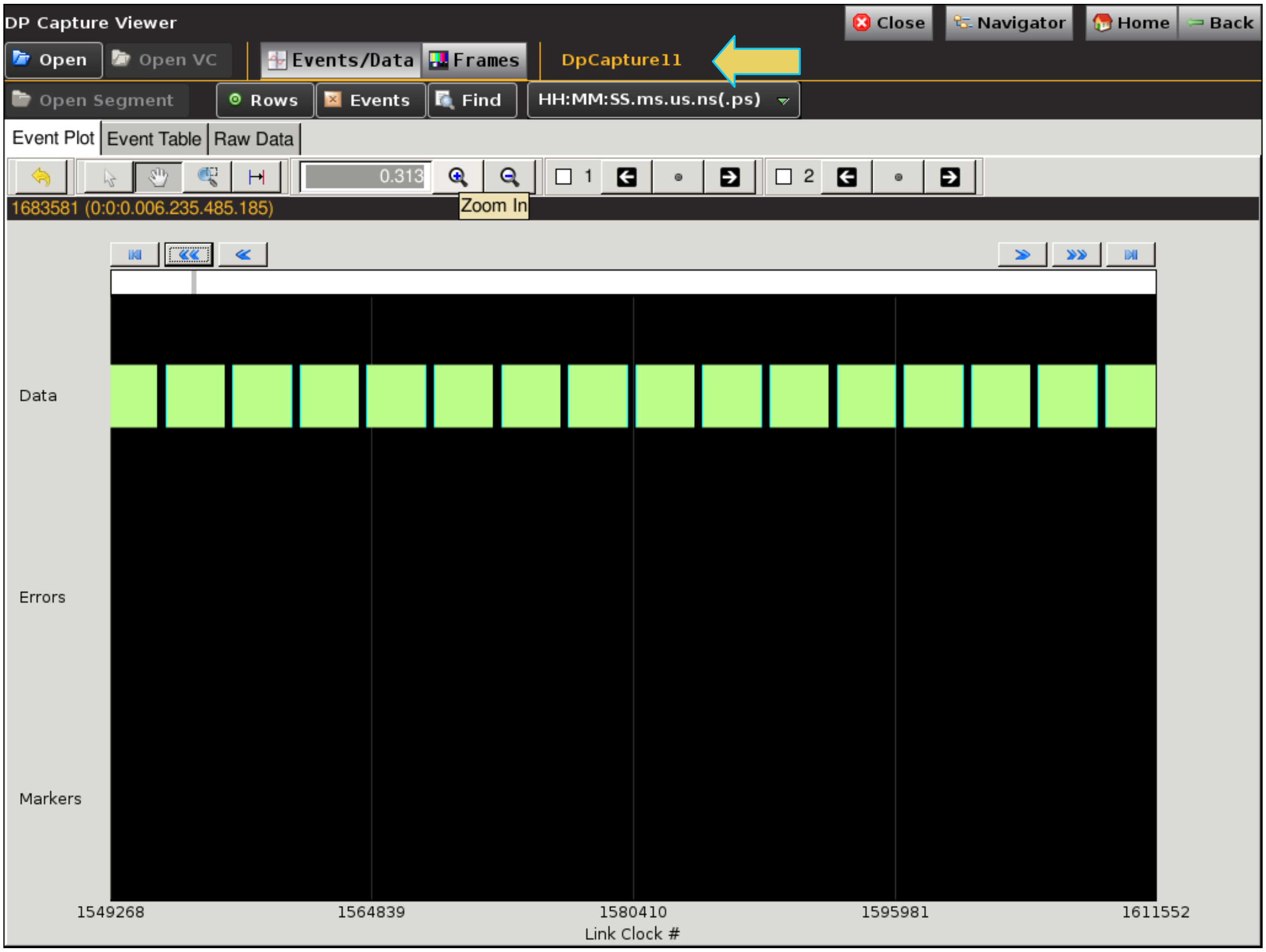


When you choose **Open** from the right click menu, or the **File** menu on the top set of tabs, the **Capture Viewer** window will open with the capture that was selected.



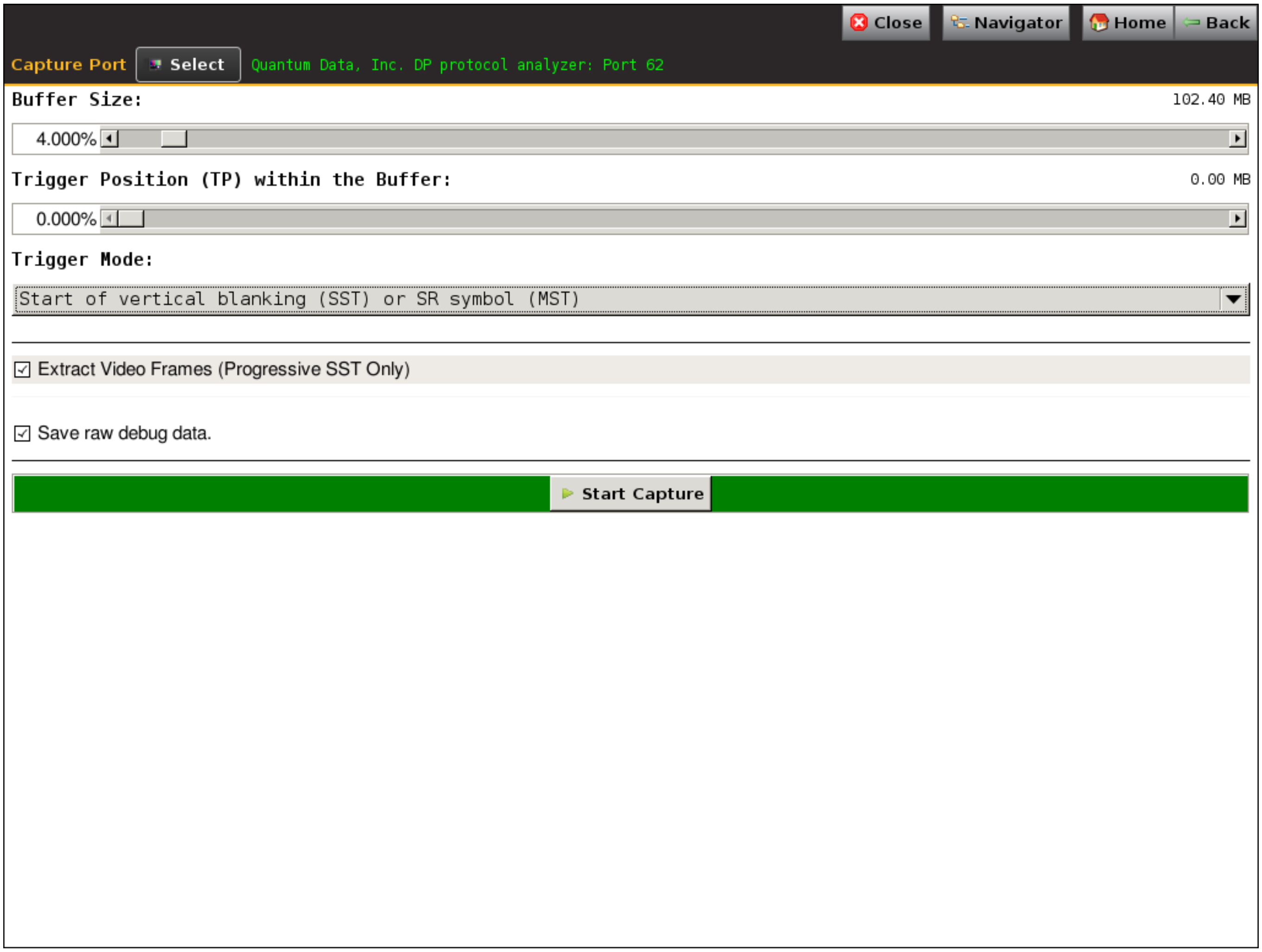
You can also **Delete** a capture through the **Navigator** from the right click menu or the **File** pull-down menu show in the examples above. You can rename a capture using the **Rename** option in the right click or **File** pull-down menu.

When a capture file opens, the name of the capture file is shown on the top as indicated below.



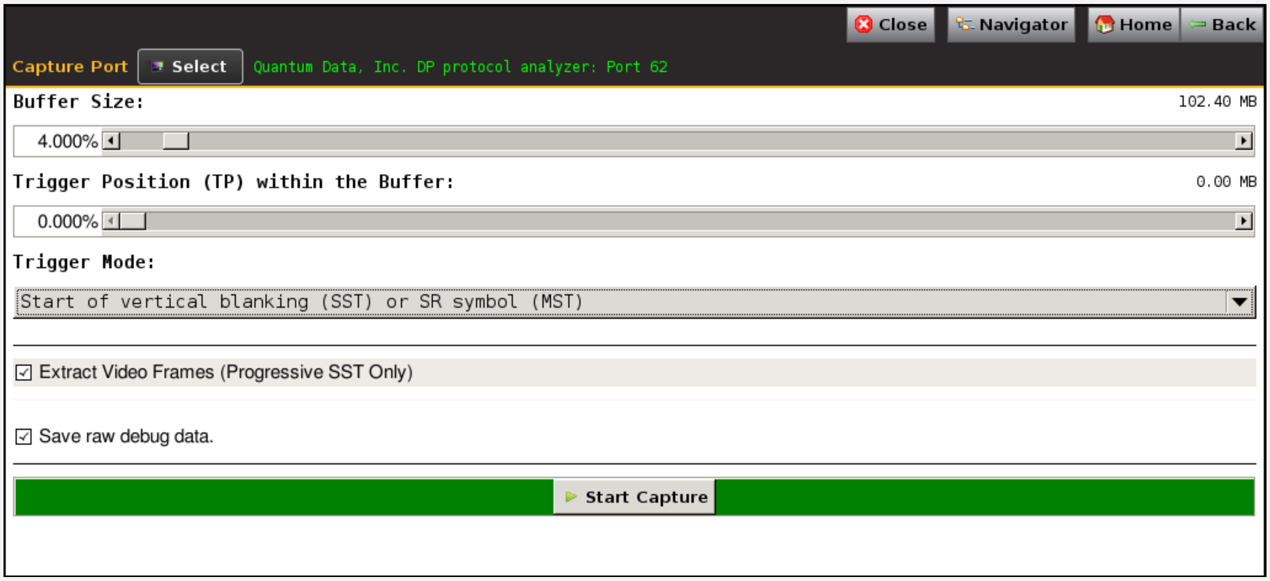
12.3 Capture Control Panel

You initiate a new capture through the **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.


Close
Navigator
Home
Back
Capture Port
Select
Quantum Data, Inc. DP protocol analyzer: Port 62
Buffer Size:
102.40 MB
4.000%
Trigger Position (TP) within the Buffer:
0.00 MB
0.000%
Trigger Mode:
Start of vertical blanking (SST) or SR symbol (MST)
Extract Video Frames (Progressive SST Only)
Save raw debug data.
Start Capture

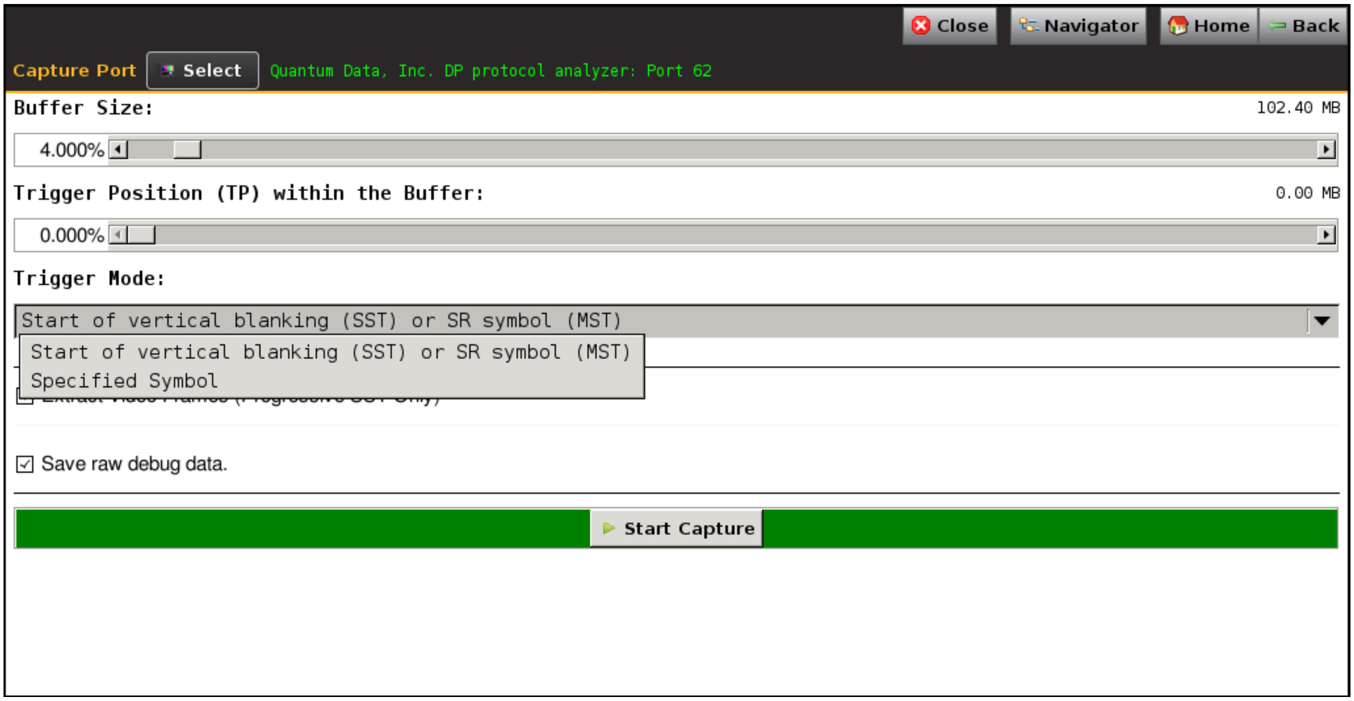
The following table describes the functions of the **Capture Control** panel.

<table>
<tr><th>Capture Control Panel - Function</th><th colspan="2">Item - Description</th></tr>
<tr><td colspan="3">Instrument Selection



</td></tr>
<tr><td>Capture Trigger Configuration</td><td colspan="2">Enables you to define the capture trigger criteria. Use the information below.</td></tr>
<tr><td></td><td>[Capture] Buffer Size Slidebar</td><td>Enables you to set the size of the captured data in percent. This is a slidebar that provides an indication (on the left) of the percent of the total possible size to be captured. A lower value will require less time for the captured data to accumulate.</td></tr>
<tr><td></td><td>[Capture] Trigger Position within Buffer Slidebar</td><td>Enables you to set the position of the trigger event within the captured data. This slidebar determines how much of the data that has accumulated in the capture buffer has occurred before the trigger event. The slidebar has an indication (on the left) of the location of the trigger event within the captured data. The value is expressed as a percent. A value of 0% indicates that the trigger event occurs at the beginning of the resulting captured data and 100% indicates that the trigger event occurs at the end of the resulting captured data. A value of 50% indicates that the trigger event is in the middle of the captured data.
Note: The Buffer Position Slidebar is not applicable when you select Vsync as the trigger condition.</td></tr>
</table>

Capture Control Panel - Function	Item - Description	
	Trigger Mode (Capture Tab)	Enables you to specify the type of data that you want to capture. This could be: • Start of Vertical Blanking (SST) or SR symbol MST. • Specified Symbol (see below).
	Trigger Symbol (Capture Tab)	If Specified Symbol is selected then select one of: • BS=Blanking Start • BE=Blanking End • BF=Blanking Fill • C0-C7=VC Payload Fill Control code sequence • CP=Content Protection • FE=Fill End, FS=Fill Start • R0-2 • SE=Secondary Data End • SR=Scrambler Reset, • SS=Secondary Data Start • Other.
	Start Capture (Capture Tab)	Initiates a capture using the criteria defined in the **Trigger Mode** and **Trigger Symbol**.
	Extract Video Frames	Enables you to view the video frames that were captured.
	Save raw debug data	Enables you to save raw hex debug data.



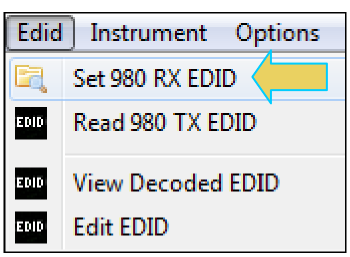
12.4 Configuring the 980 DP Protocol Analyzer with an EDID

Use the procedures below to provision the 980 DP Protocol Analyzer Rx port with an EDID to emulate a sink device.

To provision the EDID:

1. (optional) Load the EDID to use in the 980 DP Video Generator / Analyzer. This is the EDID that the module will be emulating on its Rx port.

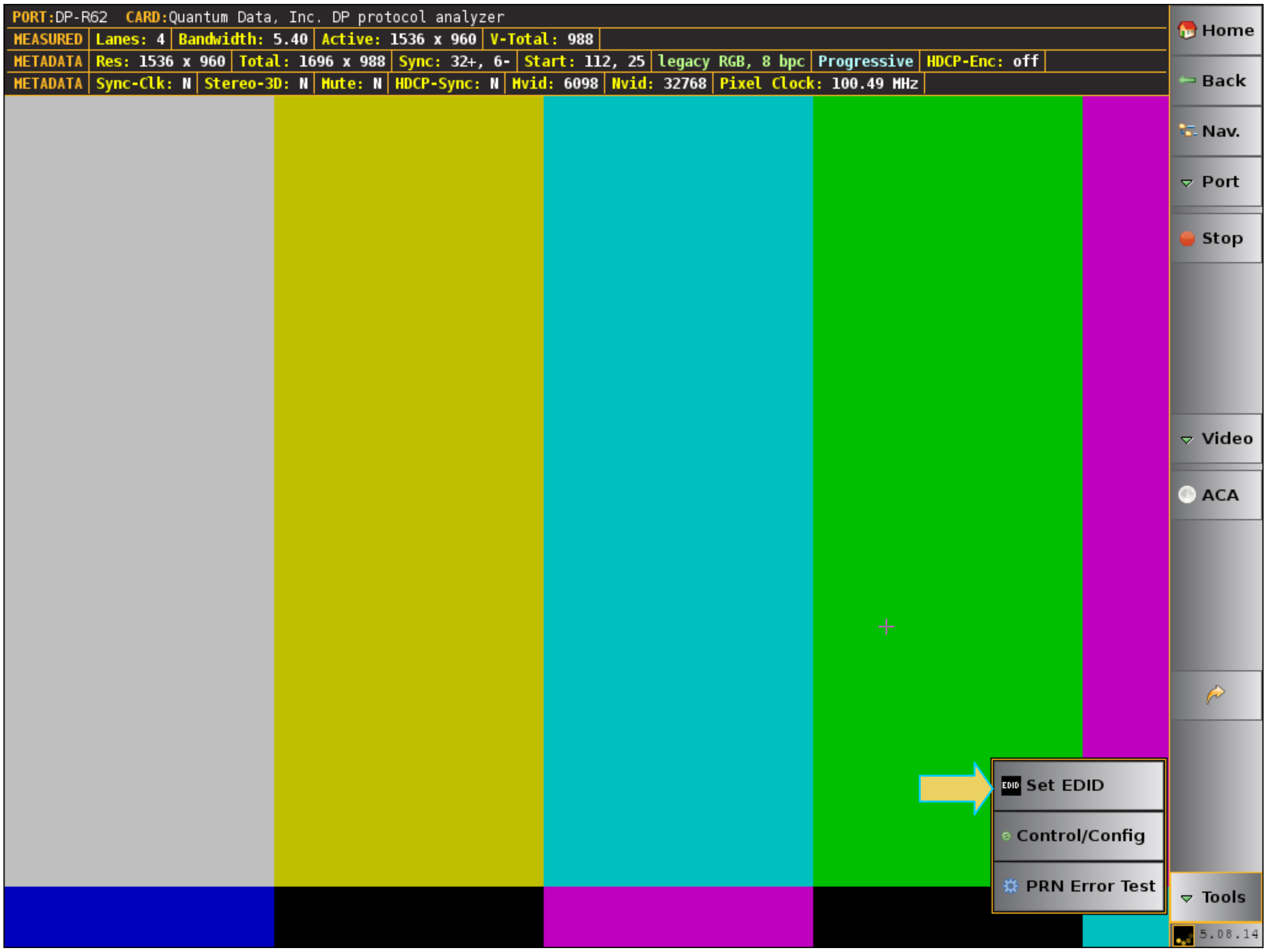
   The default EDID in the 980 DP Protocol Analyzer Rx has a preferred timing of 1080p60 with a maximum TMDS rate of 165MHz. You can provision the module with a different EDID. Sample EDIDs are available from the Quantum Data website on the downloads page (http://www.quantumdata.com/support/980readme.asp#edid).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

   The dialog box shown below opens up.

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

Note you can also set the EDID from the **Tools** menu of the **Real Time** mode.



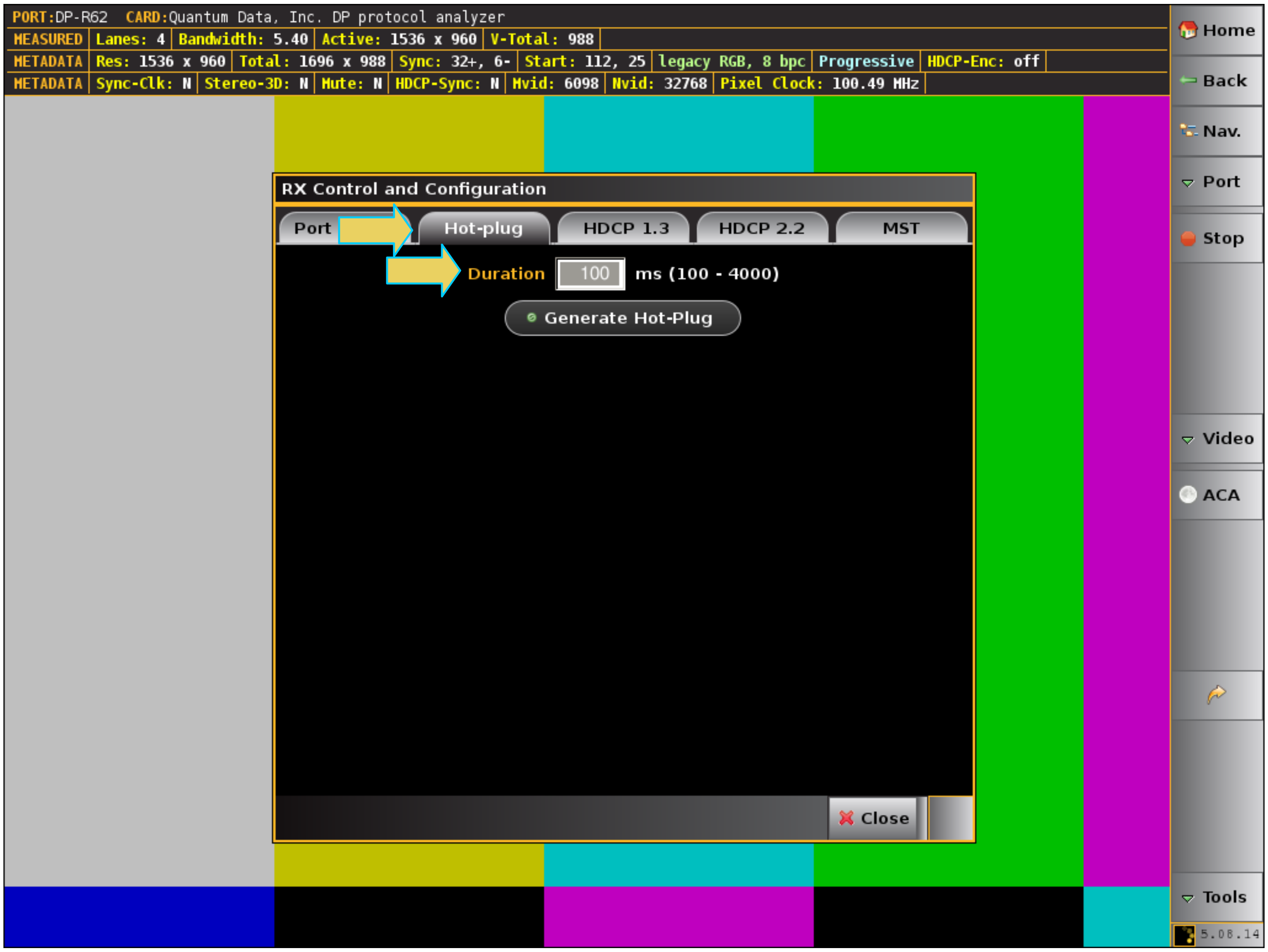
The same dialog box shown above appears when you select Set EDID.

2. Select an EDID to assign to the 980 DP Video Generator / Analyzer's Rx port. Click Ok after selecting the EDID.

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

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

3. (optional) Set the Hot Plug duration and generator a hot plug. Access the **Rx Control and Configuration** dialog box from the **Tools** flyout menu. The **Rx Control and Configuration** dialog box is shown below:

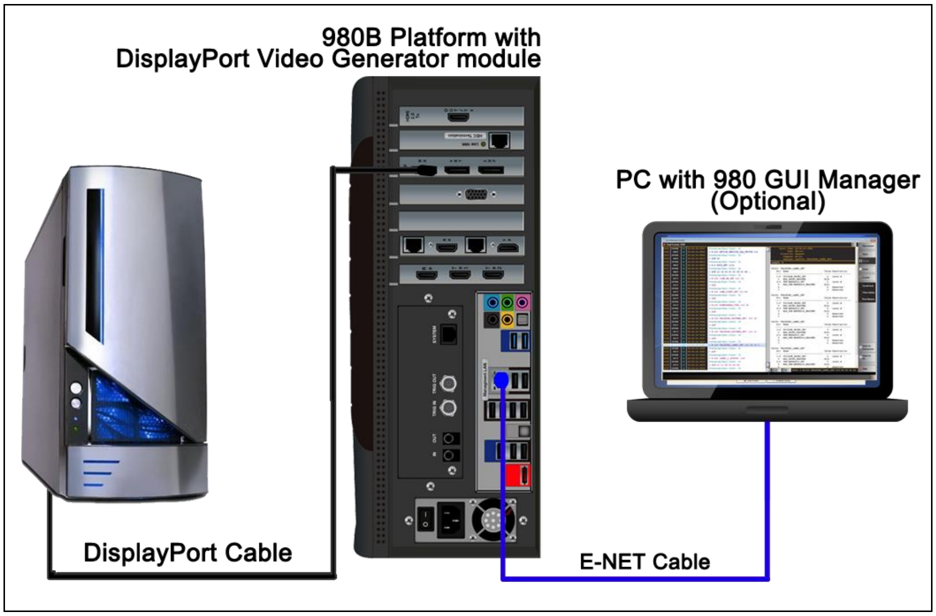


12.5 Connecting a DisplayPort source to the Rx Analyzer port

This subsection provides procedures on how to connect to the DP Rx Analyzer to the source device under test.

1. Connect the DP source device to the DP module's Rx Analyzer port as shown below.

   Note the second PC shown is used for the 980 GUI Manager application.

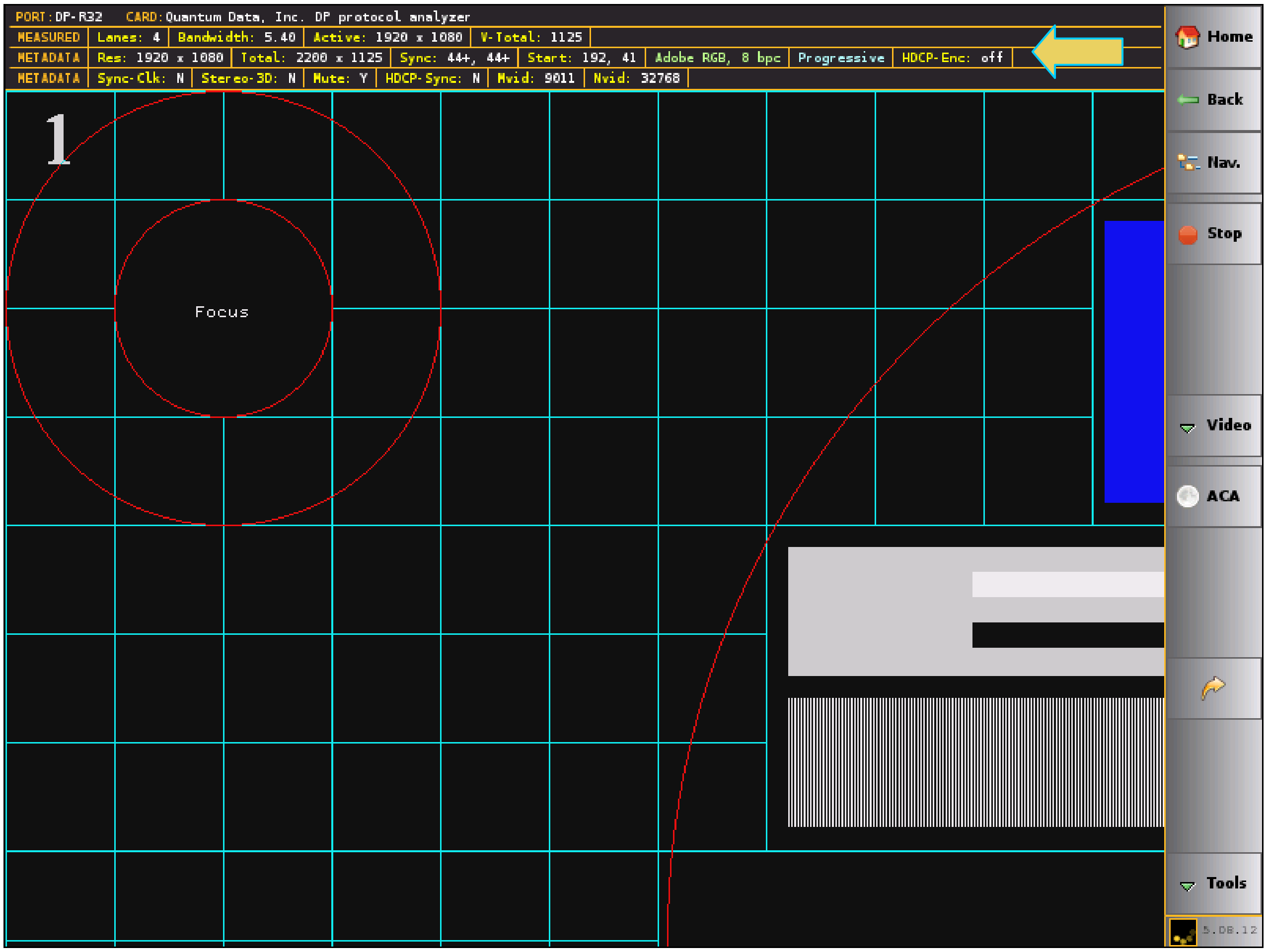


12.6 Verifying source video

Before you capture data you should verify that you are receiving DisplayPort video form the source.

Verifying incoming DisplayPort source data

1. Verify the incoming video of the DisplayPort source to verify that the source is outputting the proper video. In the screen example below the video shown is a test pattern. Typically, the video you will see will be from a PC or some other source. Verify the information in the top status bar.



12.7 Capturing DisplayPort source data

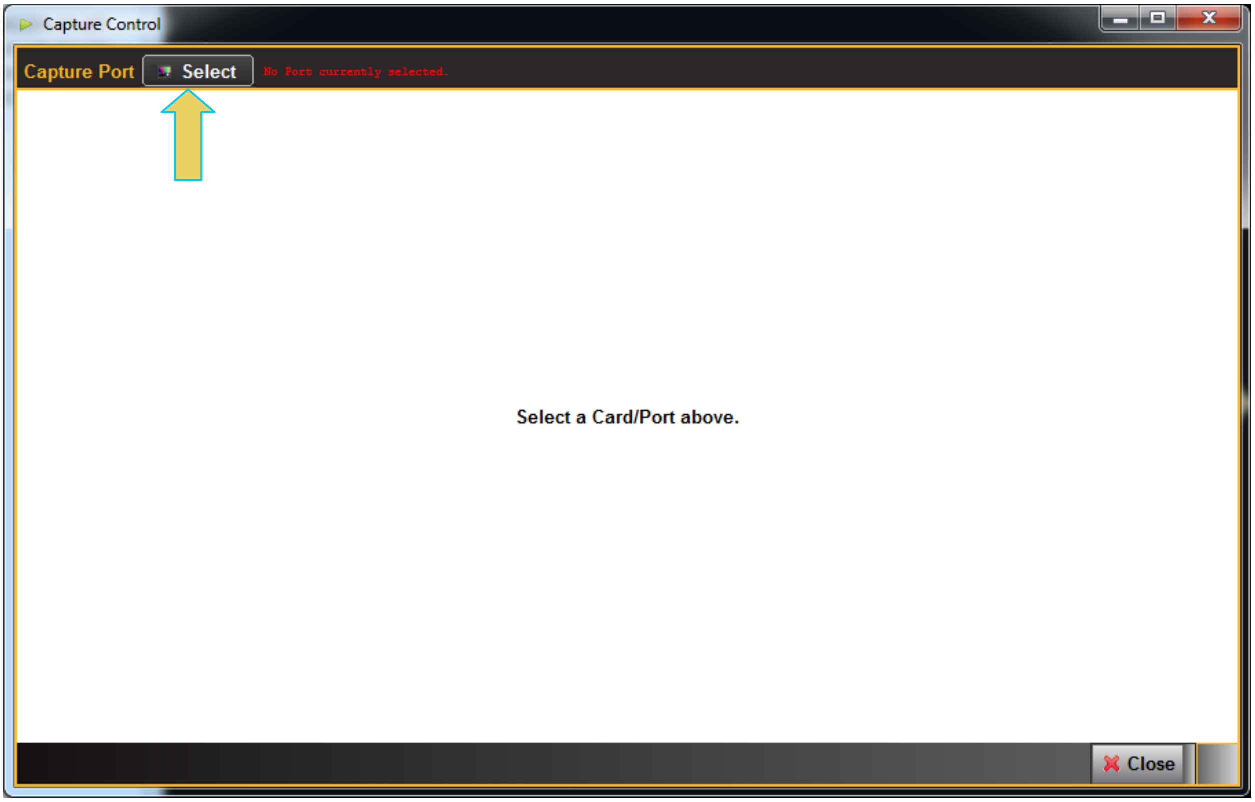
The procedures for running a capture of the DisplayPort source are described in this subsection. You can operate the Protocol Analyzer either through the 980s embedded display or via a PC through the external GUI Manager. Most of the examples in this section are taken from the embedded 980 GUI but the look and feel are quite similar between the two.

Capturing DisplayPort source data

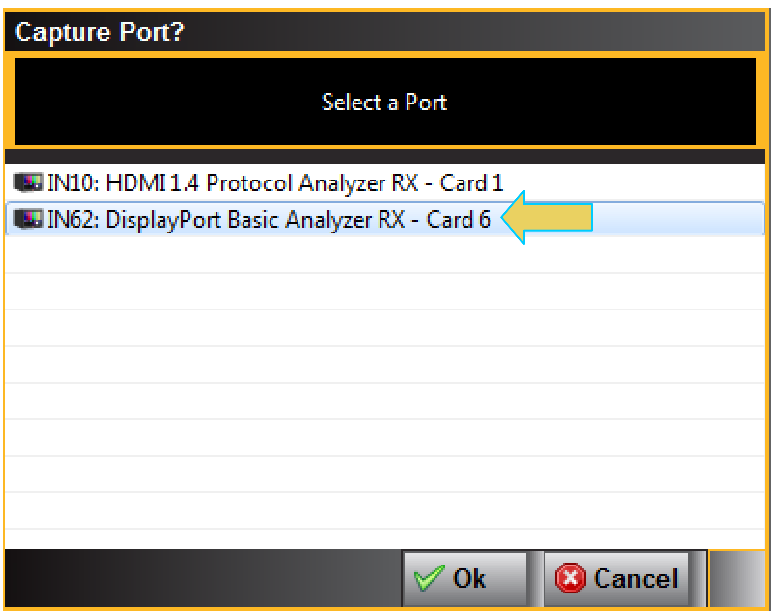
1. Access the **Capture Control** application from the main window as shown below.

The **Capture Control** window opens as shown below.

2. Select the port using the **Select**  activation button as shown below.

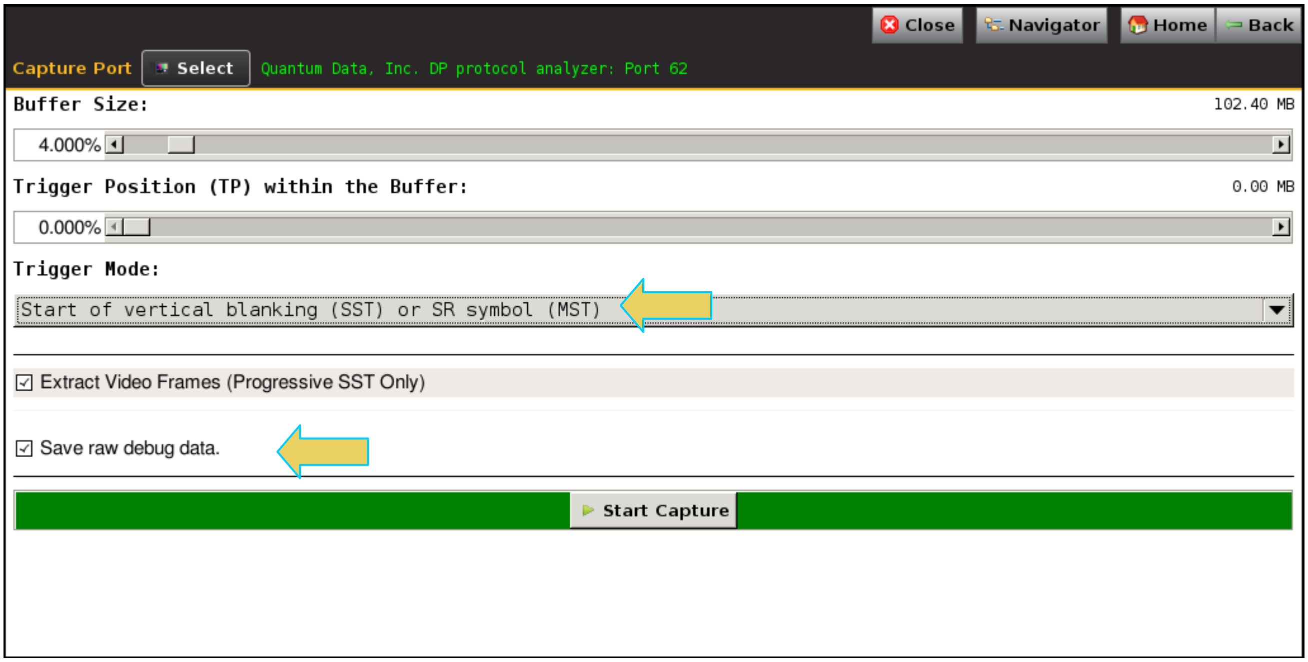


The **Capture Port** dialog box will appear enabling you to select which Protocol Analyzer module you wish to use. In this case it will be the DisplayPort Analyzer.

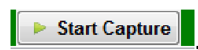


The **Capture Control** window opens as shown below.

3. Specify the **Buffer Size**, **Trigger Position** and **Trigger Mode** in accordance with the information provided earlier in this chapter.



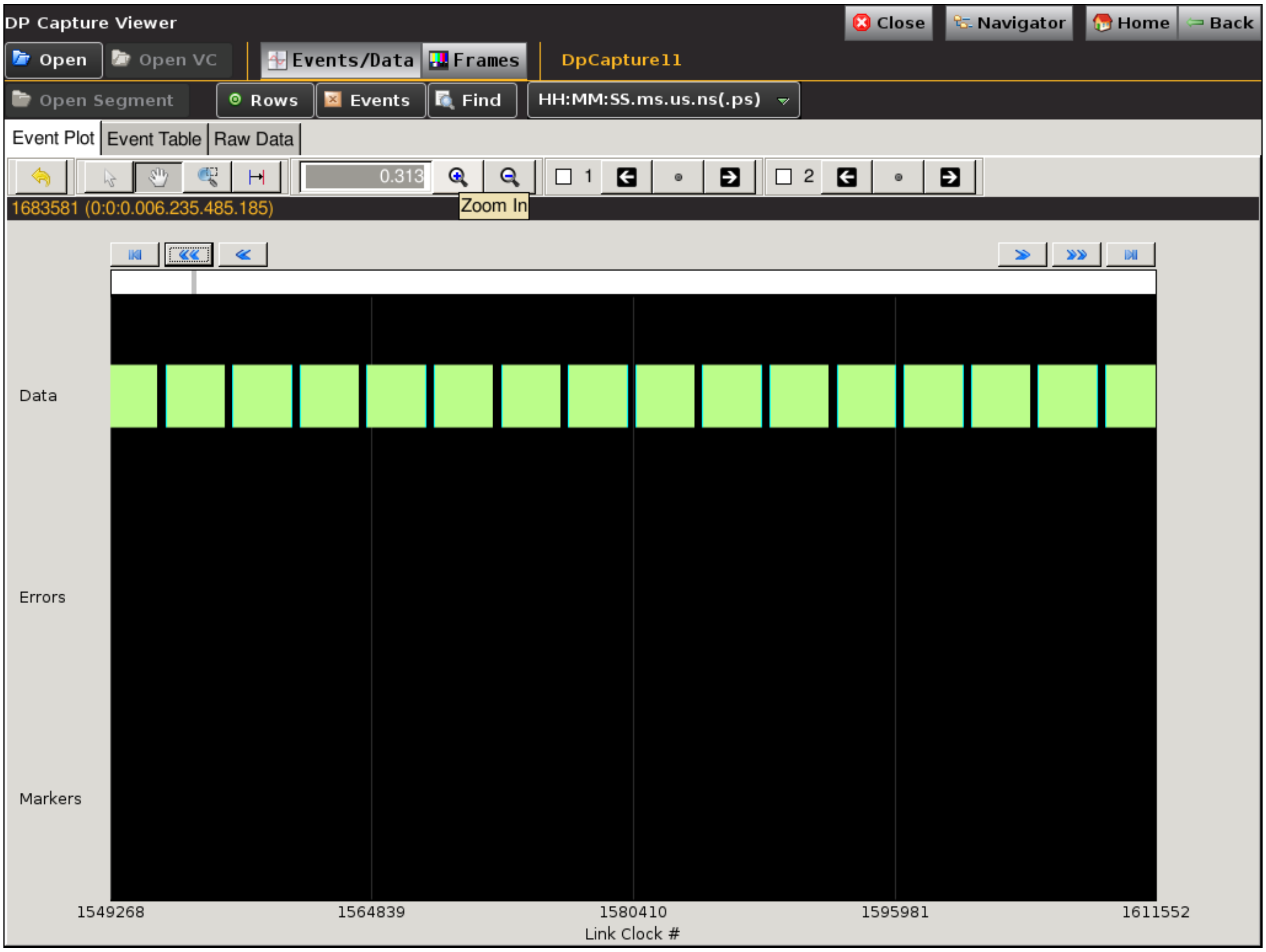
4. Specify whether or not you want to save the raw debug data as well (Save raw debug data).

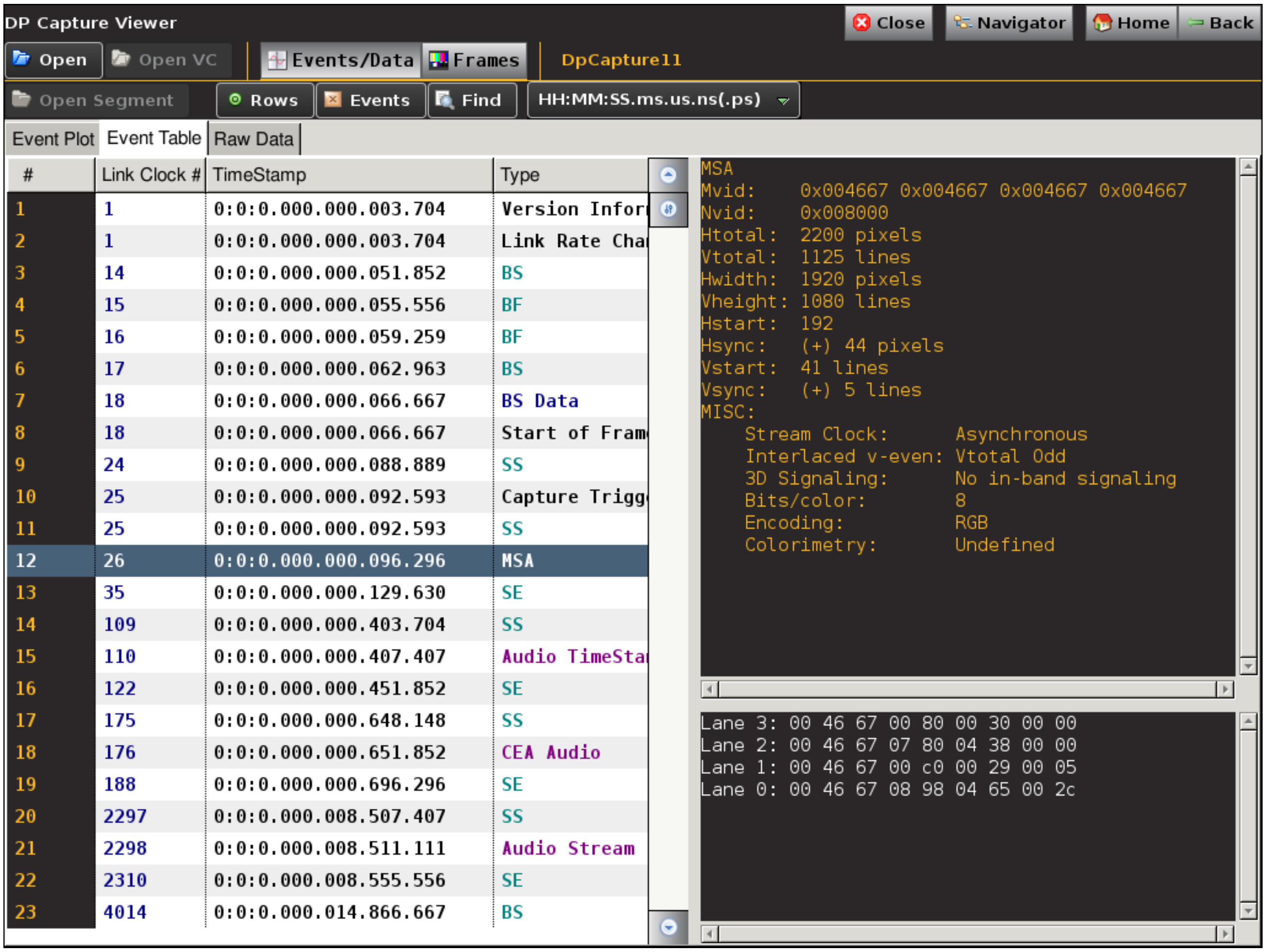
5. Initiate the capture by clicking on the **Start Capture** activation button .

   You will be prompted with a **New Capture** dialog box (below) given you an opportunity to assign a name to the capture file.

6. Enter a name in the space provided in the **New Capture** dialog box.

   The capture begins. When the capture is complete, the data is presented. An example of the captured data is shown in the screen shot examples below. Note that there is an **Event Plot** which is a graphical timeline depiction of the data. Alternatively you can view the data as a table in the **Event Table**. You can zoom in and out using the hour glass widgets.


DP Capture Viewer
Close
Navigator
Home
Back
Open
Open VC
Events/Data
Frames
DpCapture11
Open Segment
Rows
Events
Find
HH:MM:SS.ms.us.ns(.ps)
Event Plot
Event Table
Raw Data
0.313
1
2
Zoom In
1683581 (0:0:0.006.235.485.185)
Data
Errors
Markers
1549268
1564839
1580410
1595981
1611552
Link Clock #



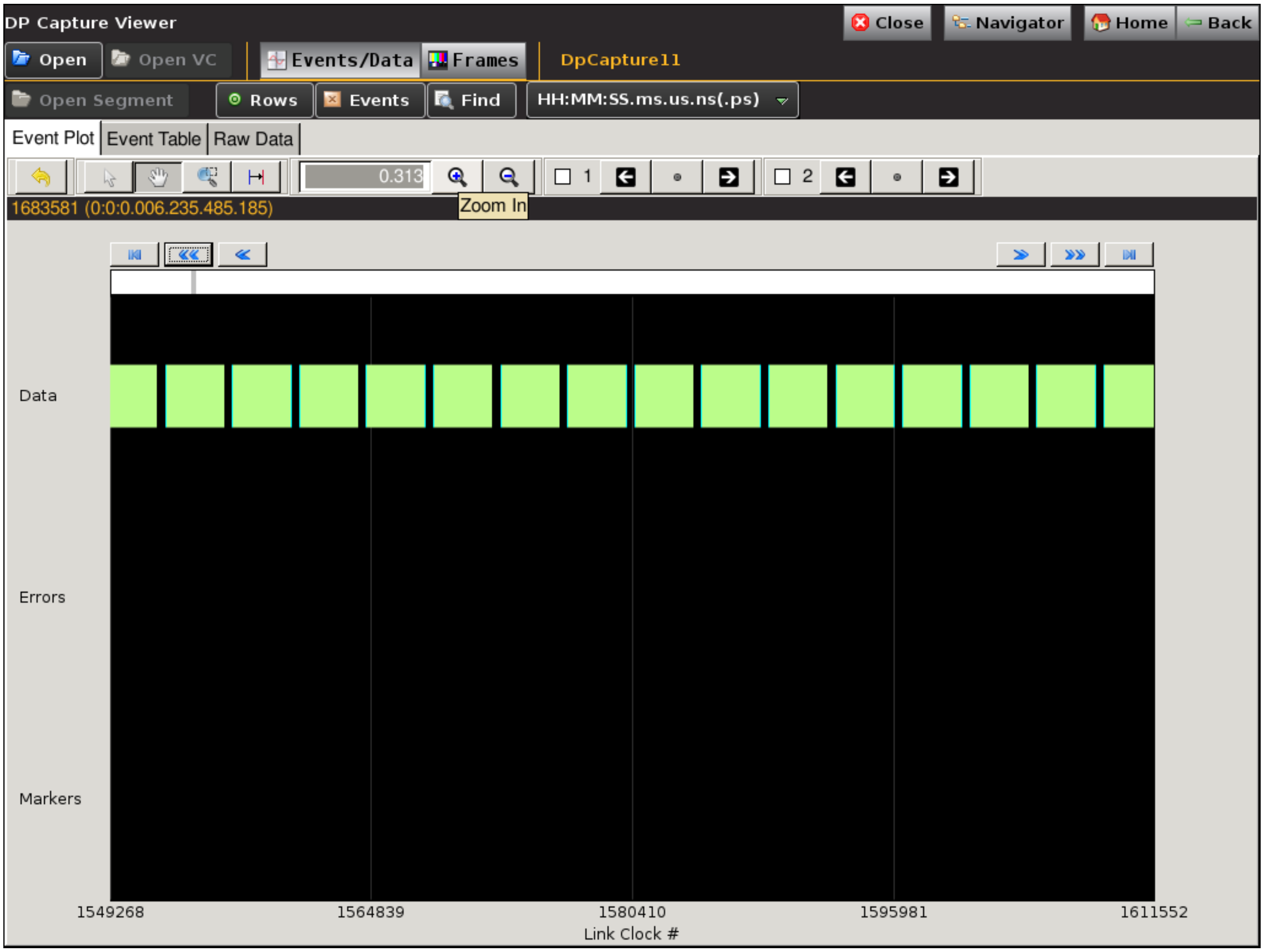
12.8 Event Plot Panel

There are three panels in the **Capture Viewer**: 1) **Event Plot**, 2) **Event Data**, 3) **Raw Data** panel. These are indicated with the arrows in the screen example below.

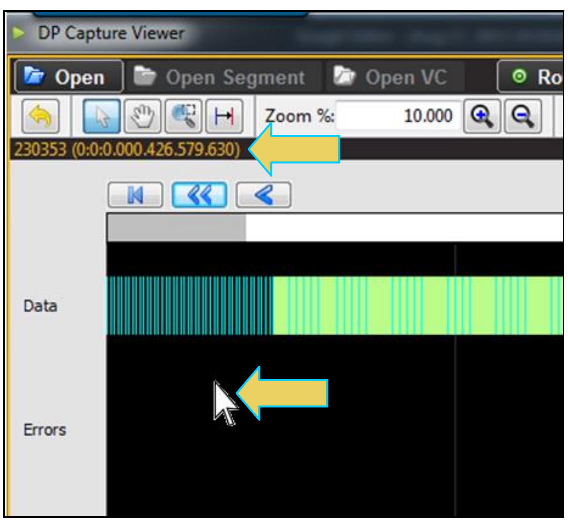
The **Capture Viewer** enables you to locate data by searching for specific data types, panning, scrolling and zooming using various techniques. You can filter the data by type to limit the amount of data to sift through. When you locate a particular item on the **Event Plot**, it will automatically appear in **Event Table**. Each **Capture Viewer** panel is described in the following subsections.

12.9 Event Plot Panel

The **Event Plot** is shown below. The **Event Plot** provides a graphical view of the captured data symbols. The vertical axis is the data types. The scale along the bottom shows the Link Clock number.



The timestamp of the cursor is shown near the top of the panel. As you move the pointer tool throughout the **Event Plot** panel the timestamp of the pointer's location is provided on the top of the panel as indicated below:



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

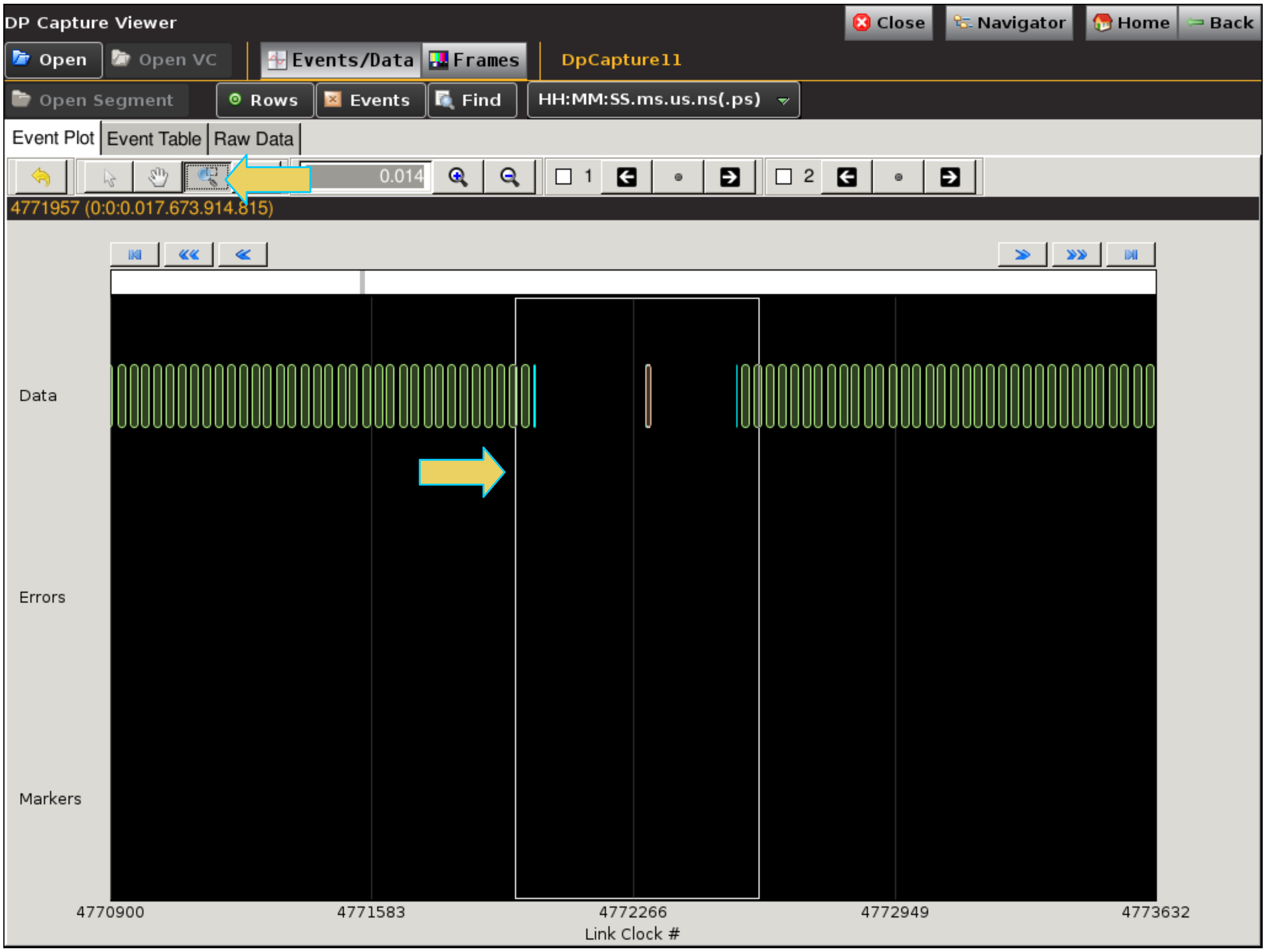
12.9.1 Zooming in the Graphical Timeline Panel

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.

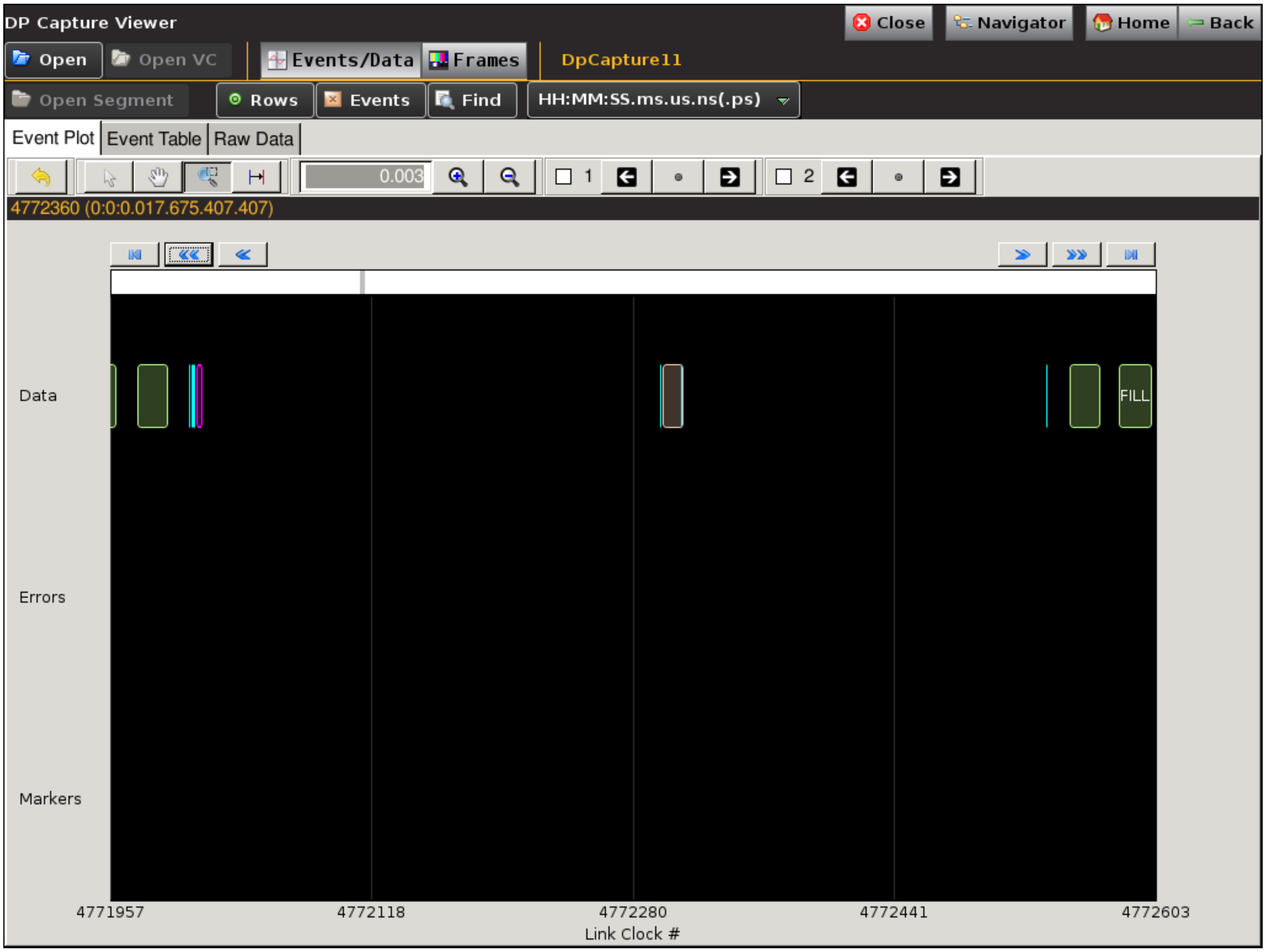
Even Plot Zoom & Panning Icons	Function
Icons – Zoom and Panning  	▪ Back – The back icon enables you to return to the previous view. ▪ Pointer – The pointer icon enables you to click on any point and obtain information such as the data packet type and the timestamp, about that data packet. The information is displayed in a dark panel just above the scroll bar and below the icons. ▪ Panning – The panning function enables you scan across the data quickly by clicking and dragging. ▪ 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. ▪ Surround activation button – You can select an area of the Event Plot by clicking and dragging across. When you do this the new view will be limited to the horizontal range that you selected. The midpoint of the selection will become the new center of the data displayed. ▪ Zoom % – The Zoom % function enables you to enter a specific zoom amount in the associated field provided. ▪ Zoom In/Out icons – The Zoom In/Out function buttons enables you to zoom in and zoom out by clicking on the activation button. The centered point will remain the same. ▪

12.9.2 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 rectangle indicates the resultant section that is surrounded. The second view shows the resulting view.

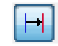
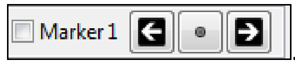


The resulting screen is as follows:

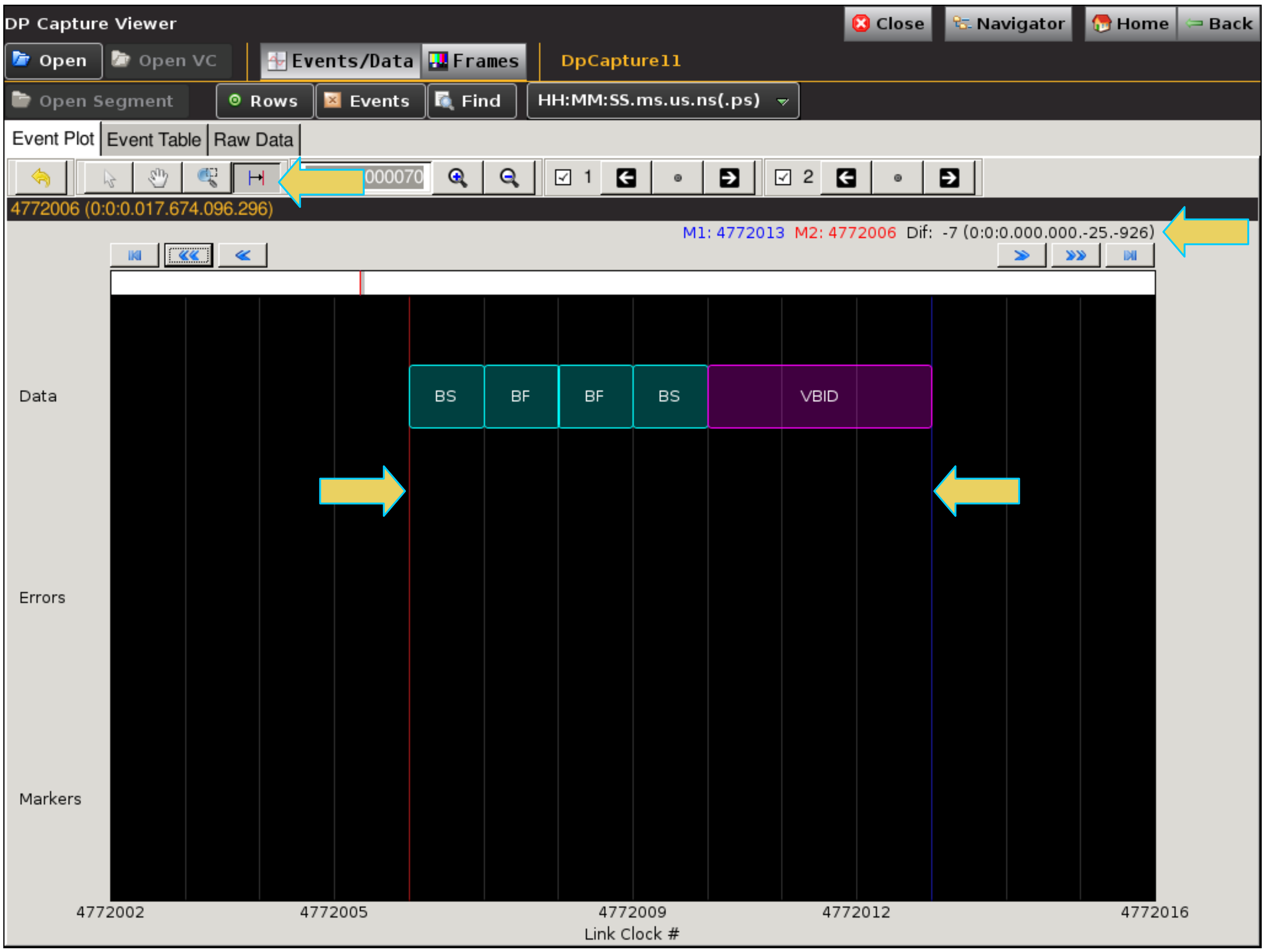

DP Capture Viewer
Close
Navigator
Home
Back
Open
Open VC
Events/Data
Frames
DpCapture11
Open Segment
Rows
Events
Find
HH:MM:SS.ms.us.ns(.ps)
Event Plot
Event Table
Raw Data
0.003
1
2
4772360 (0:0:0.017.675.407.407)
Data
FILL
Errors
Markers
4771957
4772118
4772280
4772441
4772603
Link Clock #

12.9.3 Working with Markers

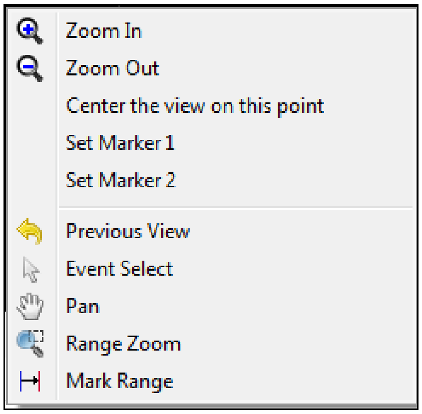
The **Event Plot** panel enables you to view the data at a high level and identify points of interest for further analysis.

You can set two cursors or "markers" at particular points of interest using the Markers activation button . The **Event Plot** will show you the time difference between the two cursors. You can fine tune the position of the cursors with the left and right arrows associated with each marker . The  center icon allows you to center the particular marker on the center of the **Event Plot** window. The screens below show the markers being set and the resulting markers placed in the **Event Plot** panel.

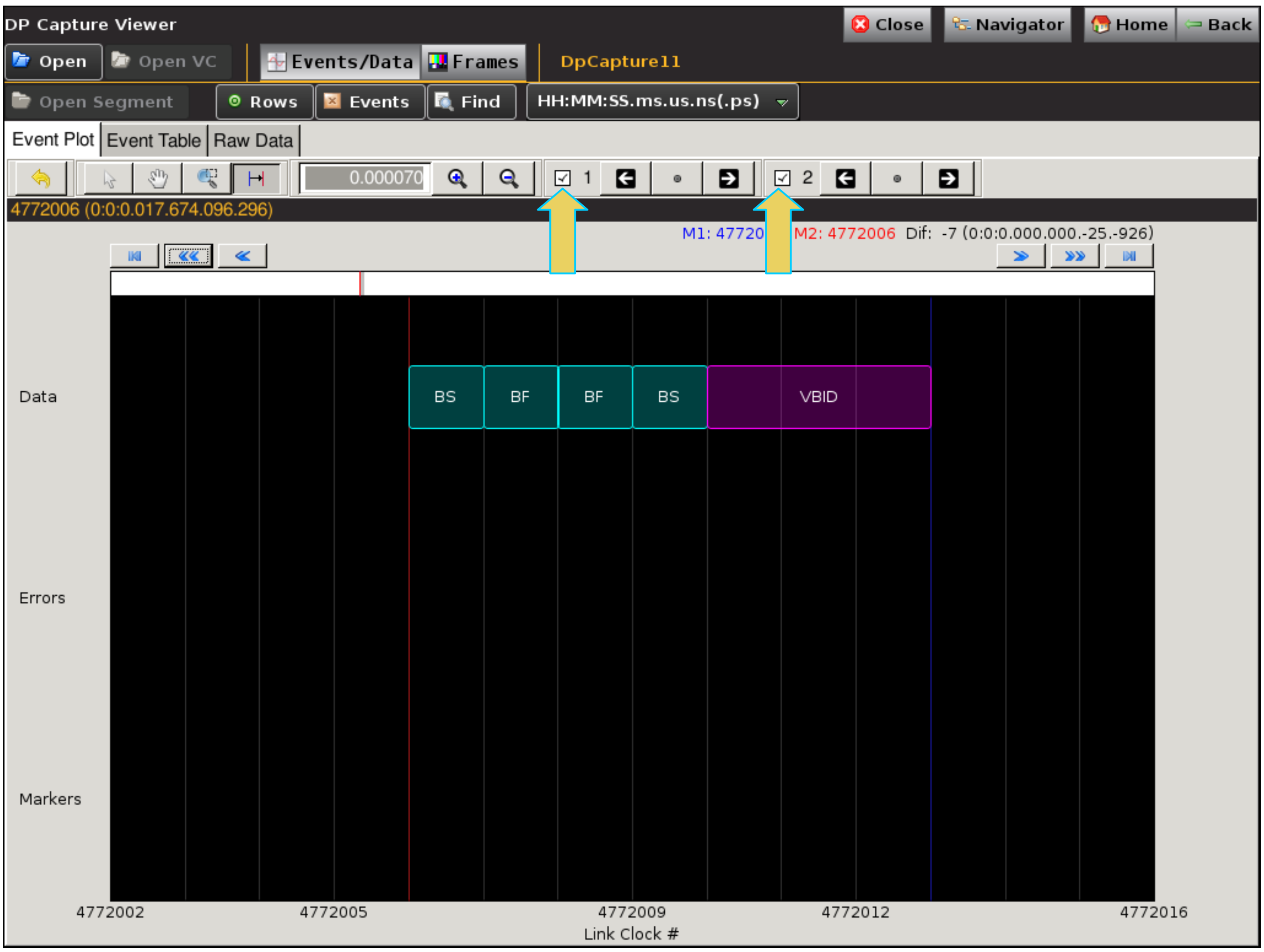
You can see the timestamp associated with each marker which are color coded (blue and red) just above the area where the data is shown. The dark text to the right shows the difference in microseconds and pixels between the two markers.



Note that you can also set the markers using the right click menu shown below:

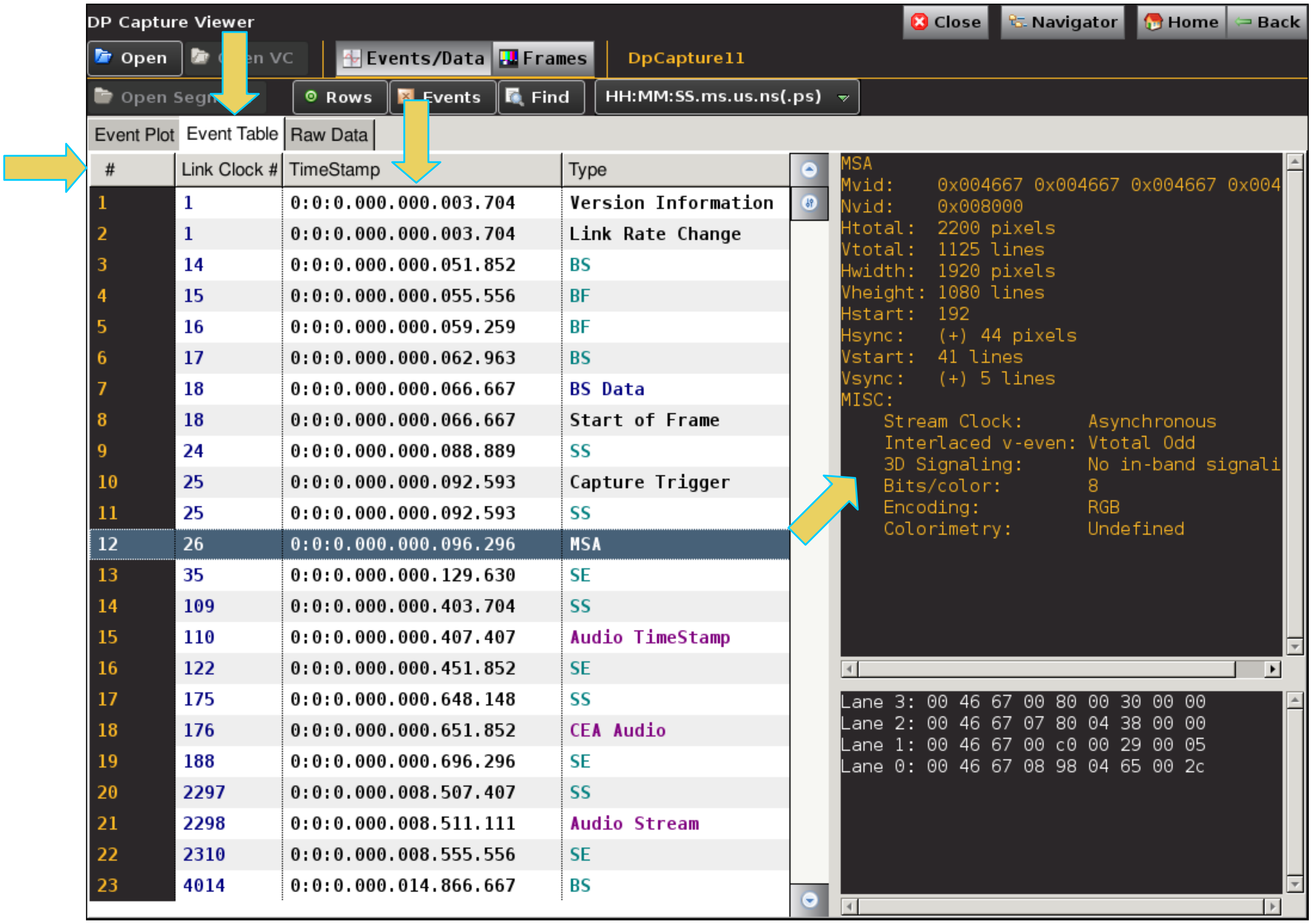


You can remove the markers using the checkboxes associated with each **Marker** on the top menu bar. Refer to the screen example below.



12.10 Event Table

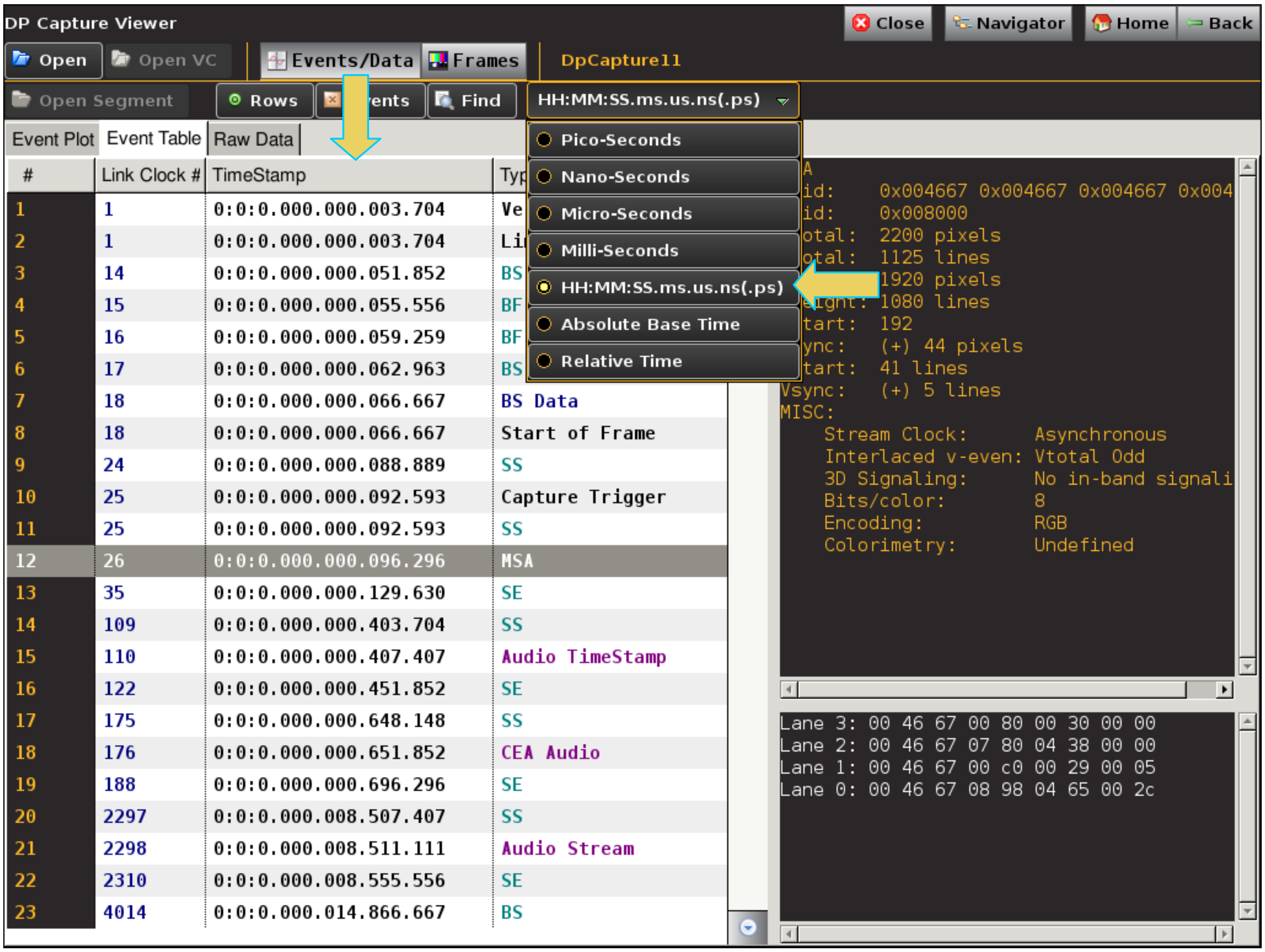
The **Event Table** is shown below. The data elements are presented in sequence from top to bottom. Each element is assigned an event number. The Link Clock number for each item is shown and a timestamp. When you highlight a record the details of that record are shown in human readable text to the right (indicated below).



#	Link Clock #	TimeStamp	Type
1	1	0:0:0.000.000.003.704	Version Information
2	1	0:0:0.000.000.003.704	Link Rate Change
3	14	0:0:0.000.000.051.852	BS
4	15	0:0:0.000.000.055.556	BF
5	16	0:0:0.000.000.059.259	BF
6	17	0:0:0.000.000.062.963	BS
7	18	0:0:0.000.000.066.667	BS Data
8	18	0:0:0.000.000.066.667	Start of Frame
9	24	0:0:0.000.000.088.889	SS
10	25	0:0:0.000.000.092.593	Capture Trigger
11	25	0:0:0.000.000.092.593	SS
12	26	0:0:0.000.000.096.296	MSA
13	35	0:0:0.000.000.129.630	SE
14	109	0:0:0.000.000.403.704	SS
15	110	0:0:0.000.000.407.407	Audio TimeStamp
16	122	0:0:0.000.000.451.852	SE
17	175	0:0:0.000.000.648.148	SS
18	176	0:0:0.000.000.651.852	CEA Audio
19	188	0:0:0.000.000.696.296	SE
20	2297	0:0:0.000.008.507.407	SS
21	2298	0:0:0.000.008.511.111	Audio Stream
22	2310	0:0:0.000.008.555.556	SE
23	4014	0:0:0.000.014.866.667	BS

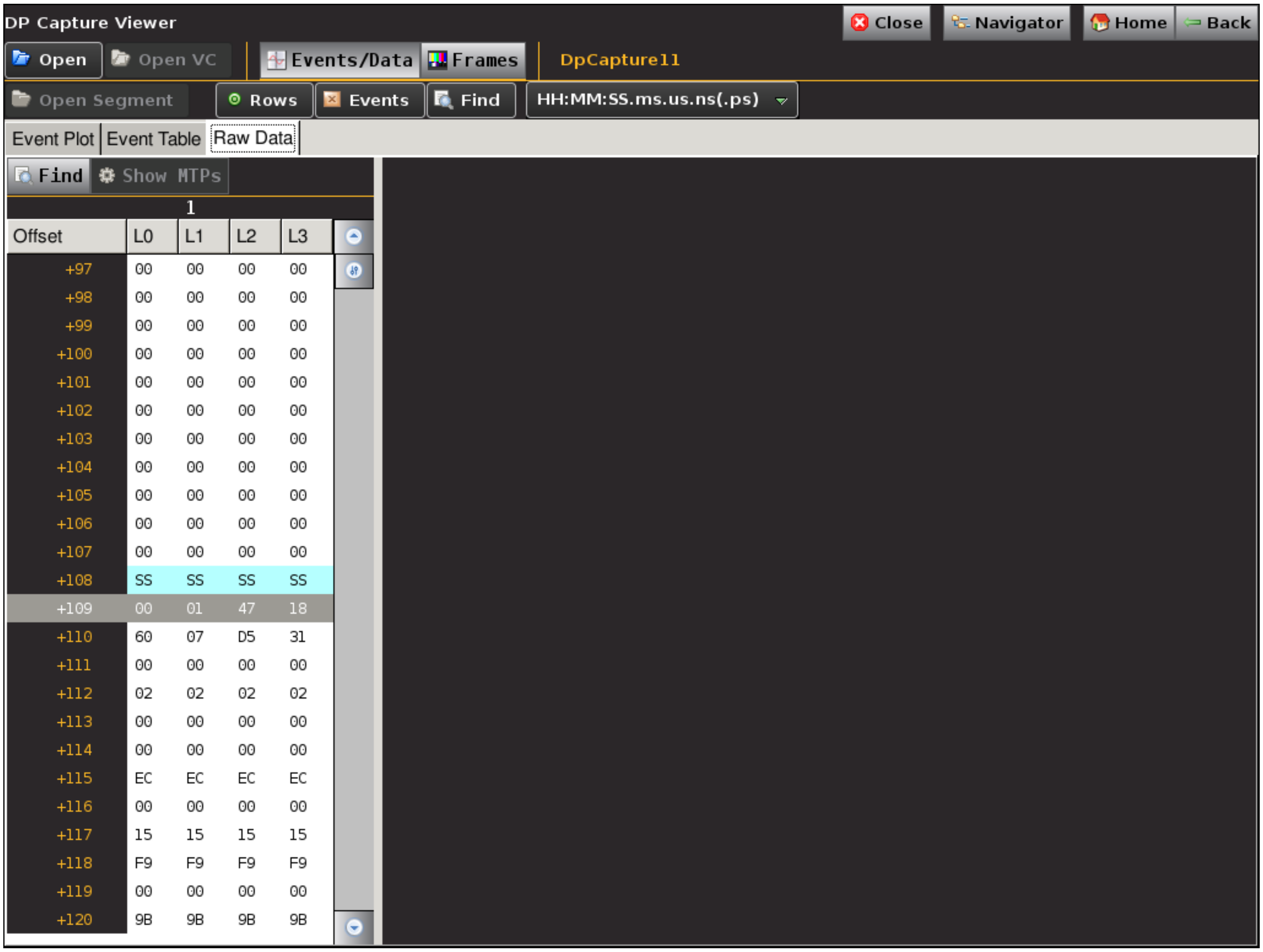
12.10.1 Viewing the Timestamps of the Data

The item number indicated on the bottom of **Event Plot** panel indicates the location of the scroll bar. The **Event Plot** shows all the symbols and timestamps. You can configure the way in which the timestamps are presented using the pull-down menu at the top of the **Capture Viewer**. This pull-down menu is shown below. You can select the base values that you wish to express the timestamps in or you can specify hour, minutes, seconds and so on as in the examples. The Absolute Base Time will display a running time.



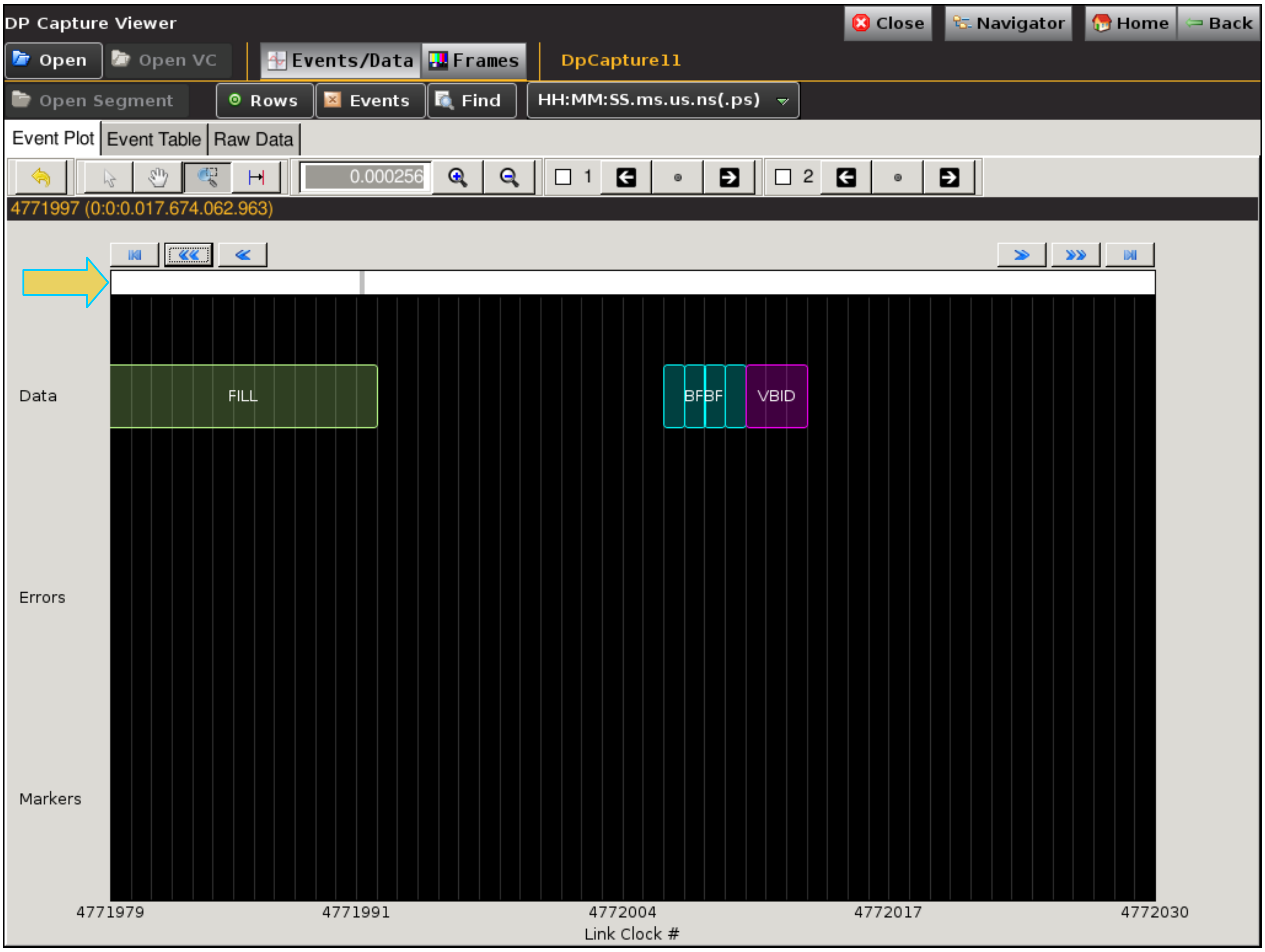
12.11 Raw Data Table

The **Raw Data** table is shown below. This table shows the data in hex per lane (L0 through L3). The Raw Data table is always synchronized with the **Event Table**.



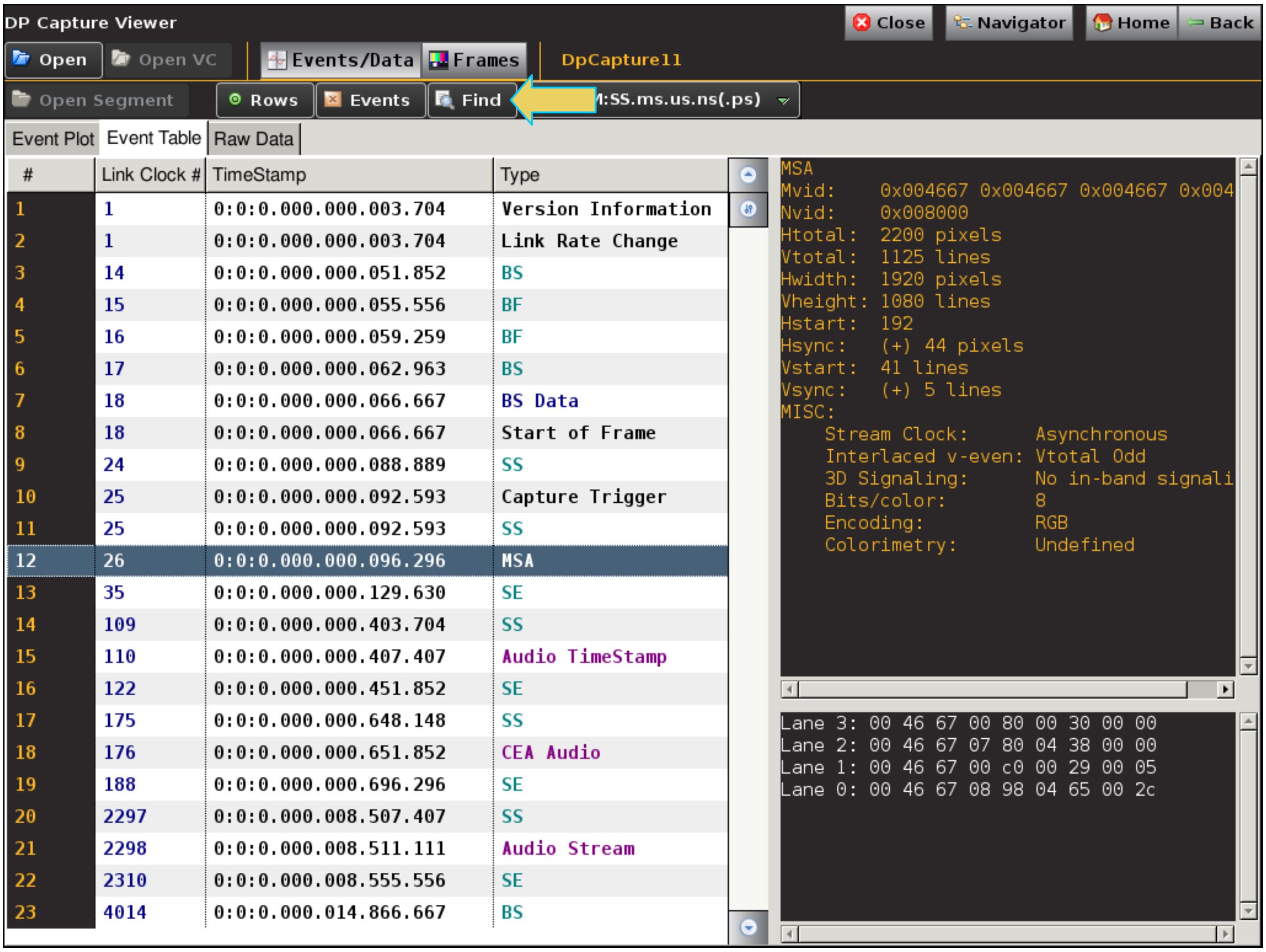
12.12 Searching for Specific Data Elements

You can locate data items by browsing either through the **Event Plot** view of the **Event Data** table. The two windows (**Event Plot** and **Event Table**) are in sync as you browse, search or select an item. The following screen shot shows a zoomed in view of the **Event Plot**. There is a scroll bar just above the **Event Plot** that enables you to move forward (right) and backward (left) in time.

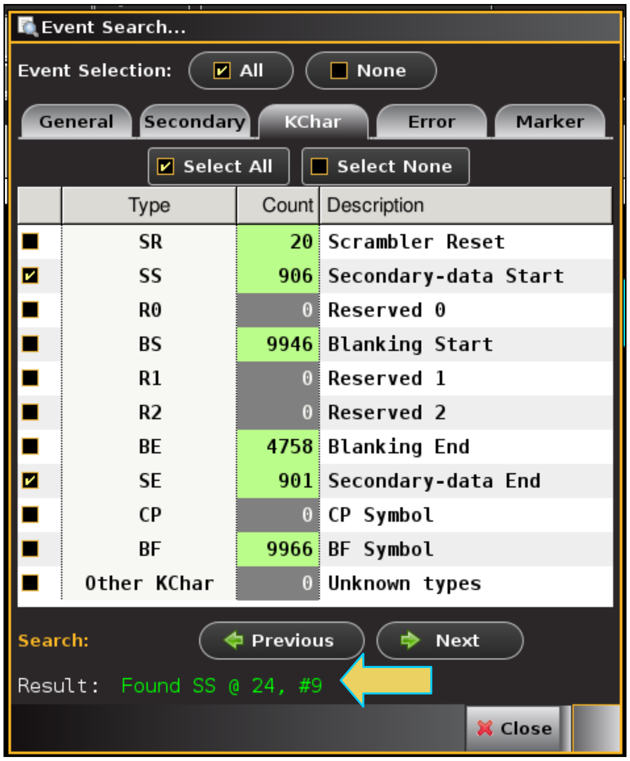


12.12.1 Event Search

You can locate specific data types using the **Event Search** feature in either the **Event Plot** or the **Event Table**. The following screen shot is a typical example of captured data. The **Event Search** dialog box is accessible from the **Find**  activation button on the top of the **DP Capture Viewer** window as shown below.



The **Event Search** dialog box is shown below. You can search for specific data types using the tabs and the check boxes within each tab.



The dialog box enables you to select all or none of the data element types either per tab using the **Event Selection** buttons on the top of the dialog box 

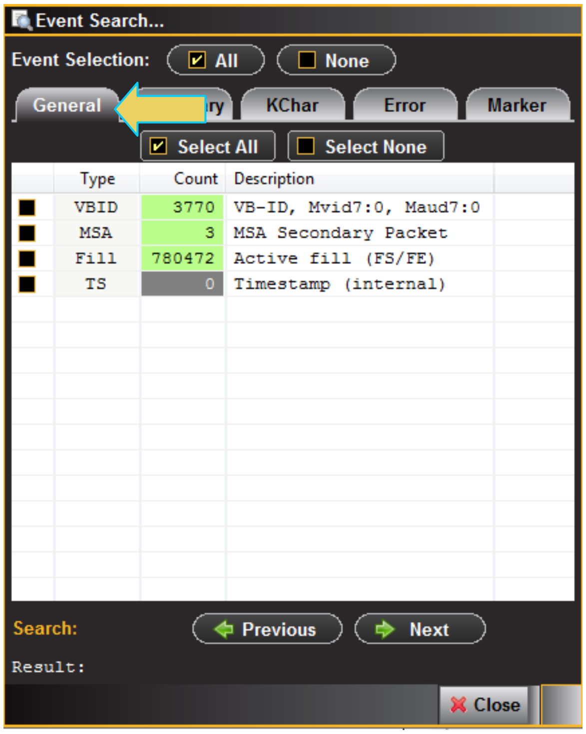
, or all or none of the data elements of a particular tab 

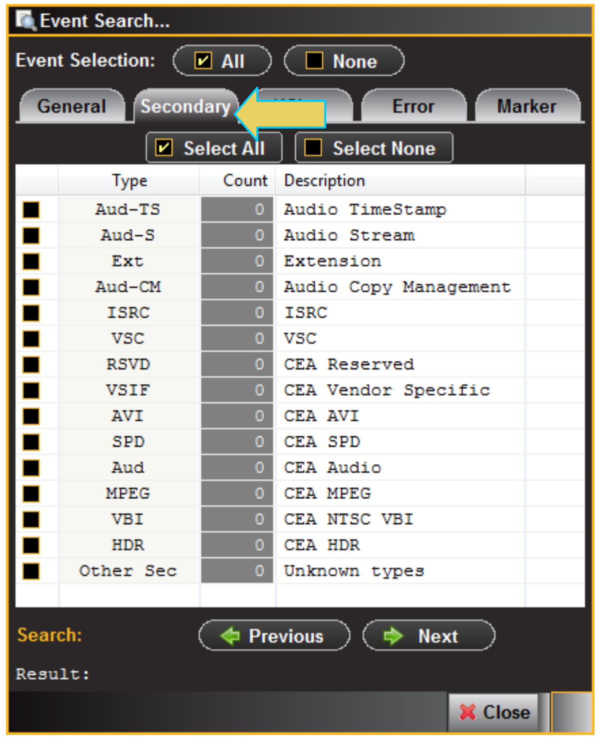
. You can navigate through the data elements that you have indicated in the search using the Previous and Next buttons 

.

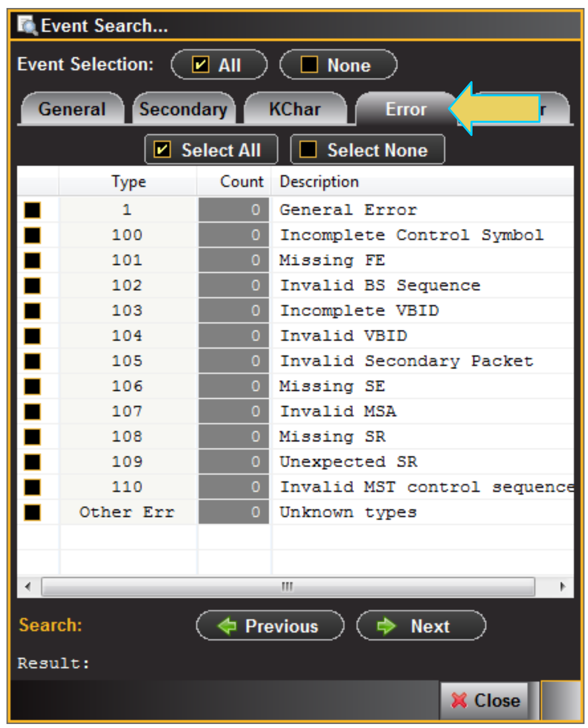
The results of a search are shown below under **Results** indicated above.

Several example screen shots of the **Event Search** dialog box are shown below. There are several tabs at the top. Each tab enables you to select from a category of data types. The examples show all the data elements that can be specified for a search. Note that the **Count** is an indication of the number of that data element that appears in the captured data.

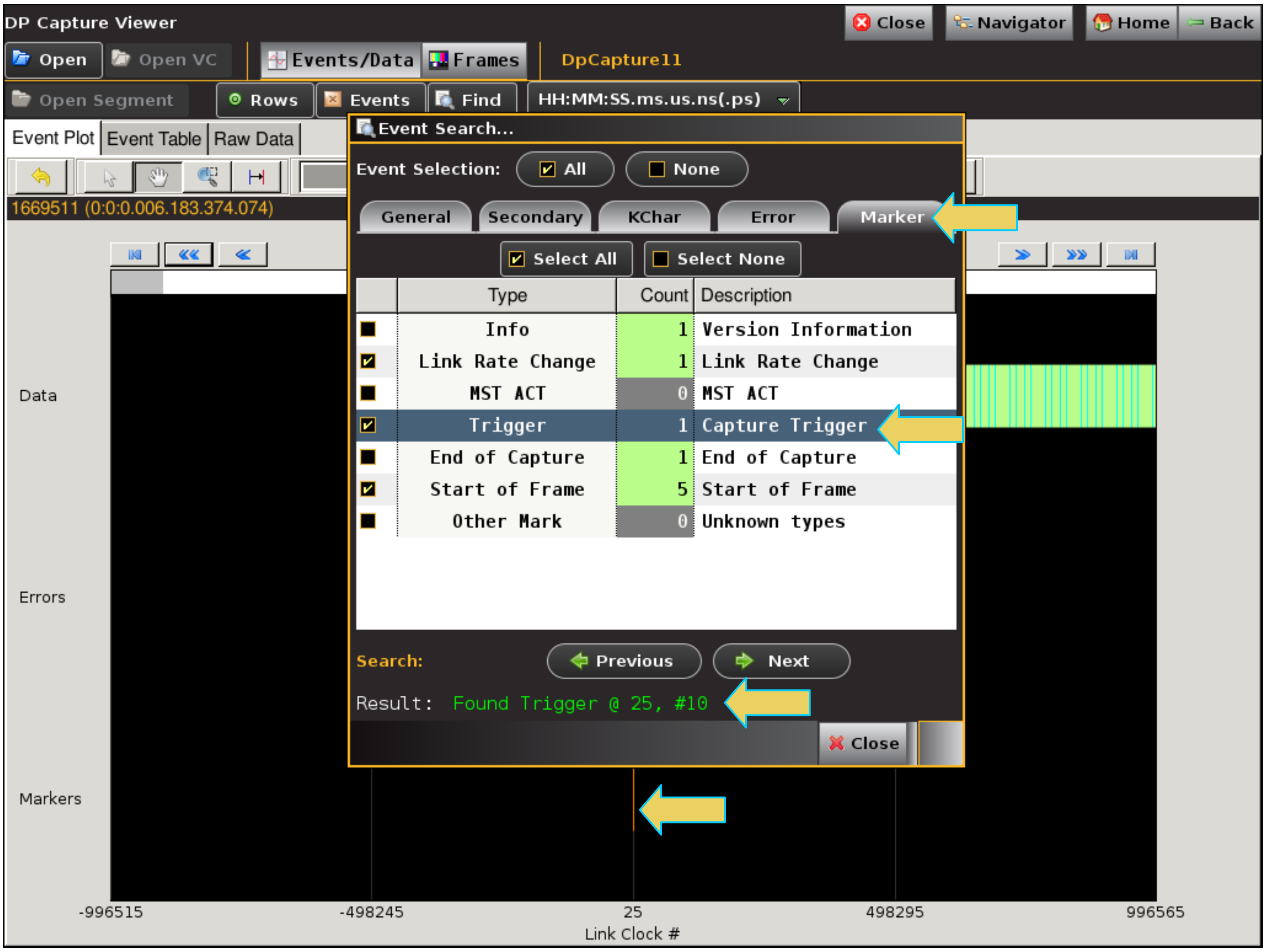

Event Search...
Event Selection: All None
General ry KChar Error Marker
Select All Select None
Type Count Description
VBID 3770 VB-ID, Mvid7:0, Maud7:0
MSA 3 MSA Secondary Packet
Fill 780472 Active fill (FS/FE)
TS 0 Timestamp (internal)
Search: Previous Next
Result:
Close


Event Search...
Event Selection: All None
General Secondary Error Marker
Select All Select None
Type Count Description
Aud-TS 0 Audio TimeStamp
Aud-S 0 Audio Stream
Ext 0 Extension
Aud-CM 0 Audio Copy Management
ISRC 0 ISRC
VSC 0 VSC
RSVD 0 CEA Reserved
VSIF 0 CEA Vendor Specific
AVI 0 CEA AVI
SPD 0 CEA SPD
Aud 0 CEA Audio
MPEG 0 CEA MPEG
VBI 0 CEA NTSC VBI
HDR 0 CEA HDR
Other Sec 0 Unknown types
Search: Previous Next
Result:
Close

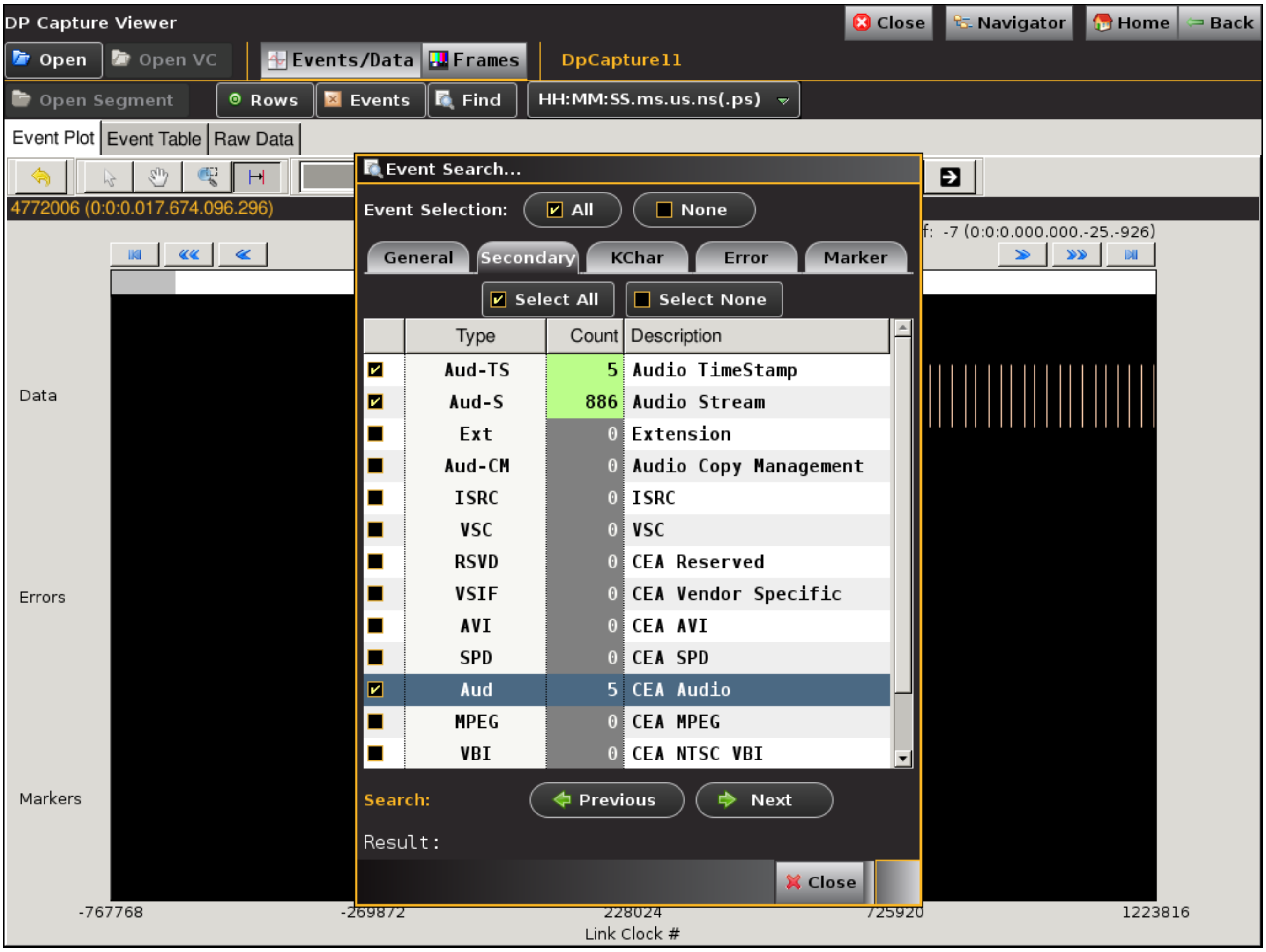

Event Search...
Event Selection: All None
General Secondary KChar r Marker
Select All Select None
Type Count Description
SR 16 Scrambler Reset
SS 6 Secondary-data Start
R0 0 Reserved 0
BS 7524 Blanking Start
R1 0 Reserved 1
R2 0 Reserved 2
BE 3591 Blanking End
SE 4 Secondary-data End
CP 0 CP Symbol
BF 7540 BF Symbol
Other KChar 0 Unknown types
Search: Previous Next
Result:
Close

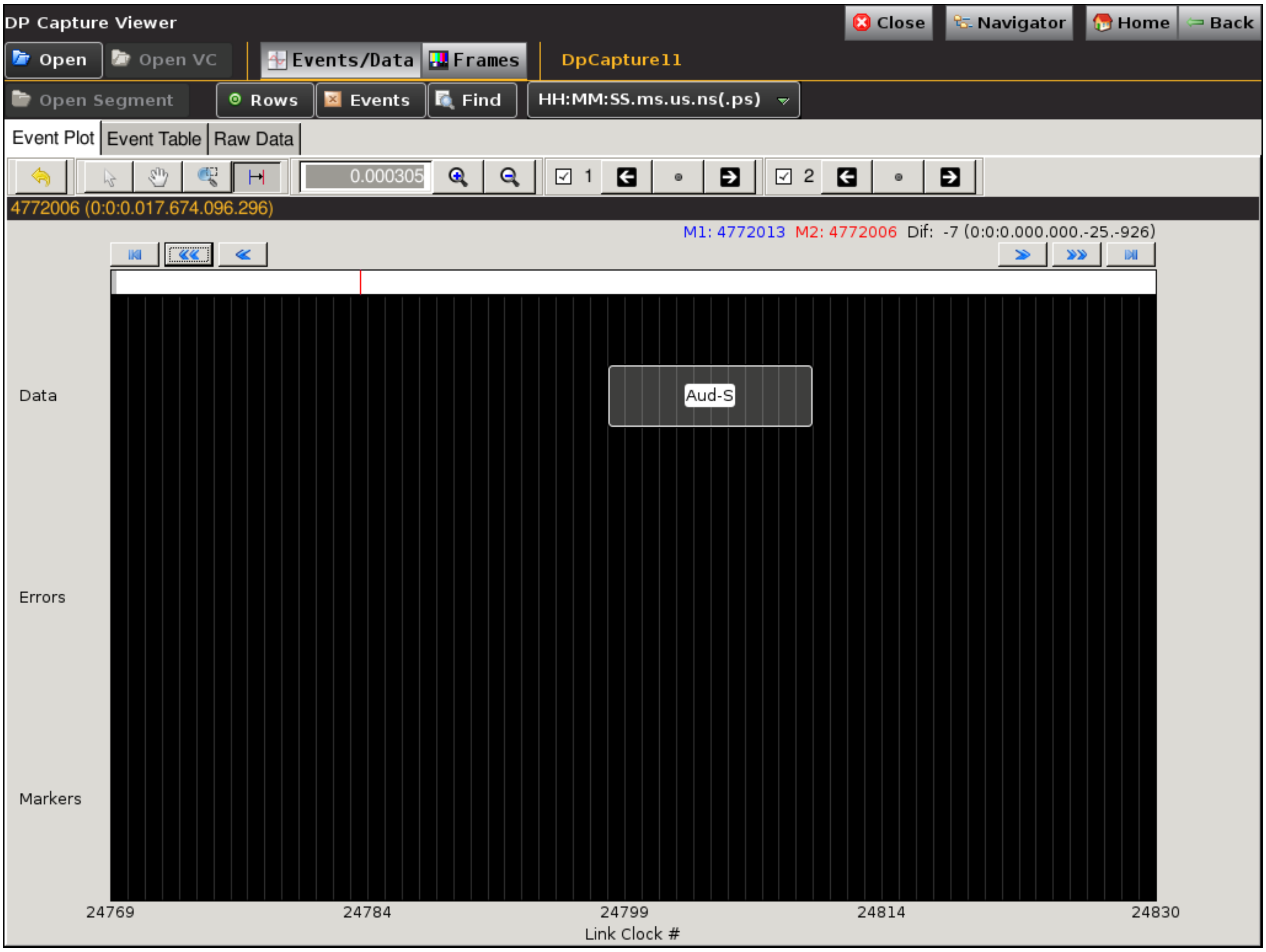

Event Search...
Event Selection: All None
General Secondary KChar Error r
Select All Select None
Type Count Description
1 0 General Error
100 0 Incomplete Control Symbol
101 0 Missing FE
102 0 Invalid BS Sequence
103 0 Incomplete VBID
104 0 Invalid VBID
105 0 Invalid Secondary Packet
106 0 Missing SE
107 0 Invalid MSA
108 0 Missing SR
109 0 Unexpected SR
110 0 Invalid MST control sequence
Other Err 0 Unknown types
Search: Previous Next
Result:
Close

In the following example, the **Trigger** condition **Marker** is searched for. Note that the status of the search is shown on the bottom of the dialog box. The search function centered the trigger condition marker on the Event Plot which you can partially see behind the dialog box.



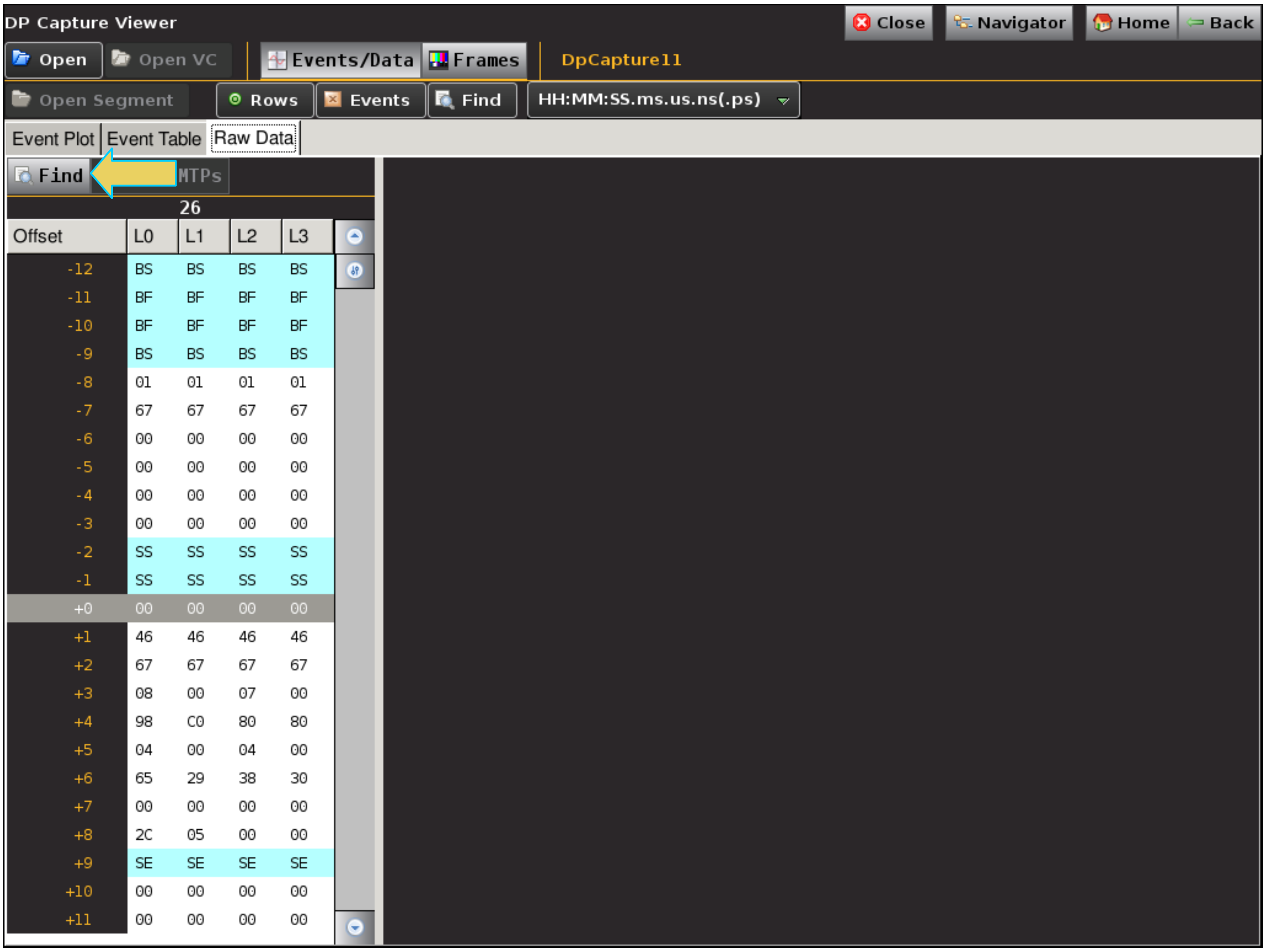
The following example shows a search of audio packets. The second screen shows that the search has located the first audio packet that satisfies the search.


DP Capture Viewer
Close
Navigator
Home
Back
Open
Open VC
Events/Data
Frames
DpCapture11
Open Segment
Rows
Events
Find
HH:MM:SS.ms.us.ns(.ps)
Event Plot
Event Table
Raw Data
4772006 (0:0:0.017.674.096.296)
f: -7 (0:0:0.000.000.-25.-926)
Data
Errors
Markers
Event Search...
Event Selection:
All
None
General
Secondary
KChar
Error
Marker
Select All
Select None
Type
Count
Description
Aud-TS 5 Audio TimeStamp
Aud-S 886 Audio Stream
Ext 0 Extension
Aud-CM 0 Audio Copy Management
ISRC 0 ISRC
VSC 0 VSC
RSVD 0 CEA Reserved
VSIF 0 CEA Vendor Specific
AVI 0 CEA AVI
SPD 0 CEA SPD
Aud 5 CEA Audio
MPEG 0 CEA MPEG
VBI 0 CEA NTSC VBI
Search:
Previous
Next
Result:
Close
-767768
-269872
228024
725920
1223816
Link Clock #

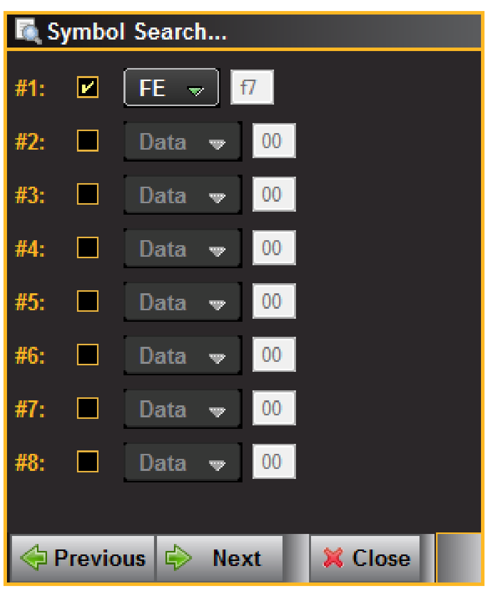


12.12.2 Symbol Search

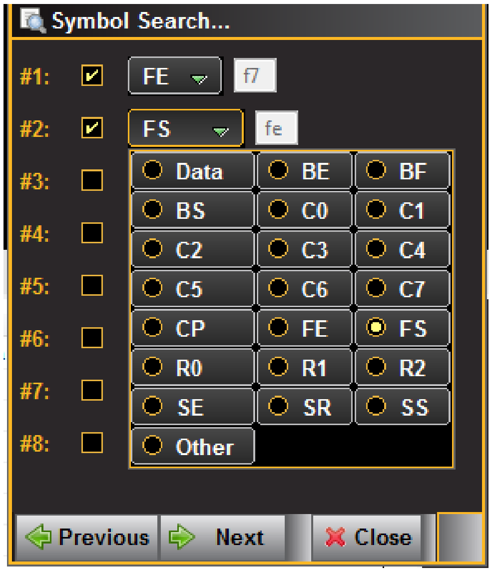
You can also initiate a symbol search on the **Raw Data** panel by clicking on the **Find** button near the top left of the panel. When you initiate a symbol search, the **Symbol Search** dialog box appears as shown below.



The Symbol Search dialog box is shown below.



To search for a symbol, click on a checkbox and select the symbol type from the pop-up menu a shown below.

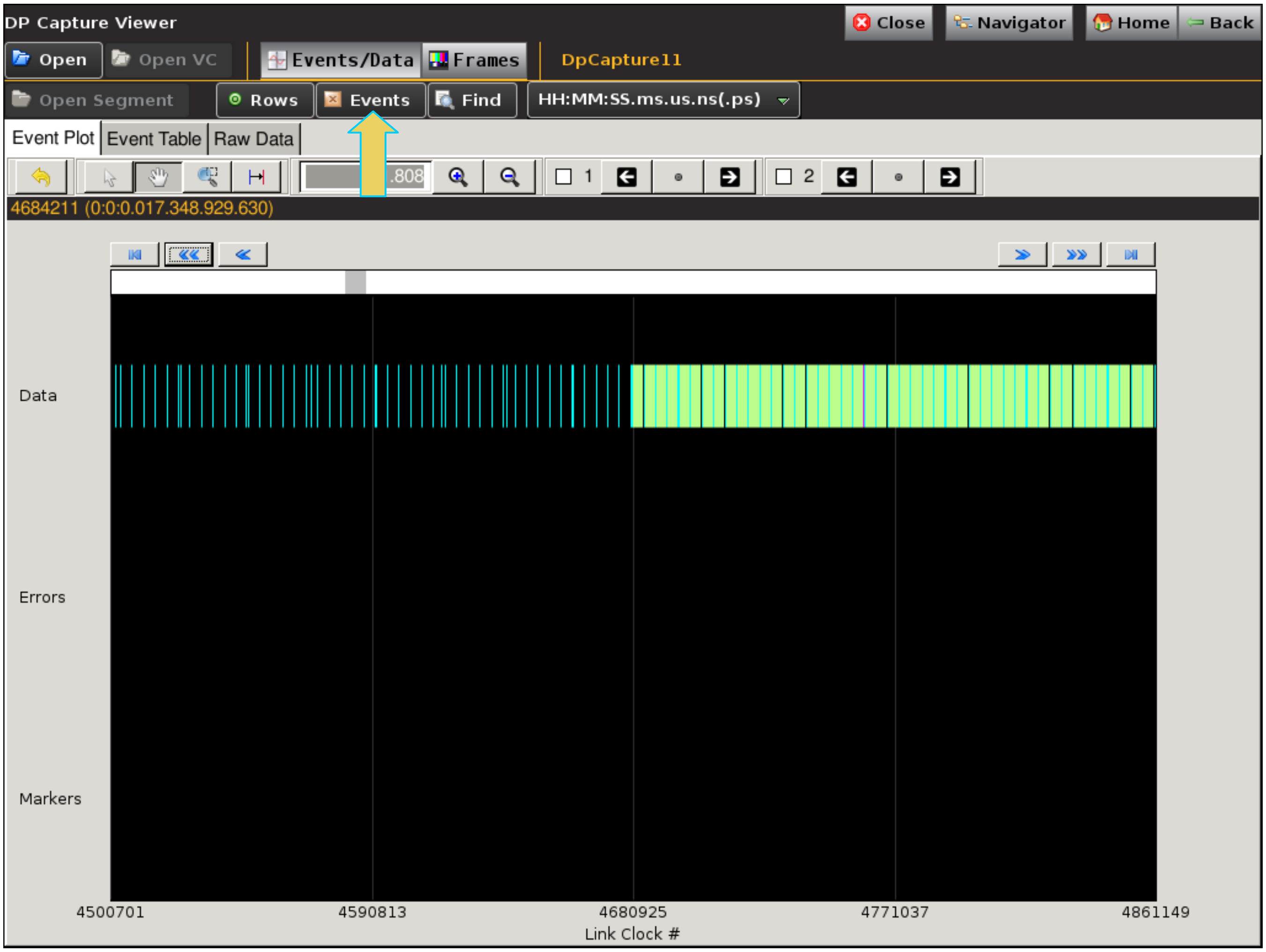


When you click **Next** the application will search for the symbols.

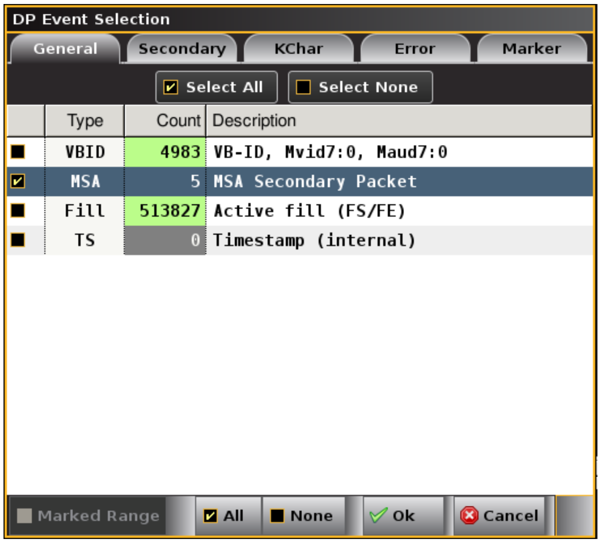
12.13 Filtering Specific Data Elements

You can filter the captured data to show only specific data types using the **Event Selection** feature. The **Event Selection** dialog box is accessible from the **Events** activation button 

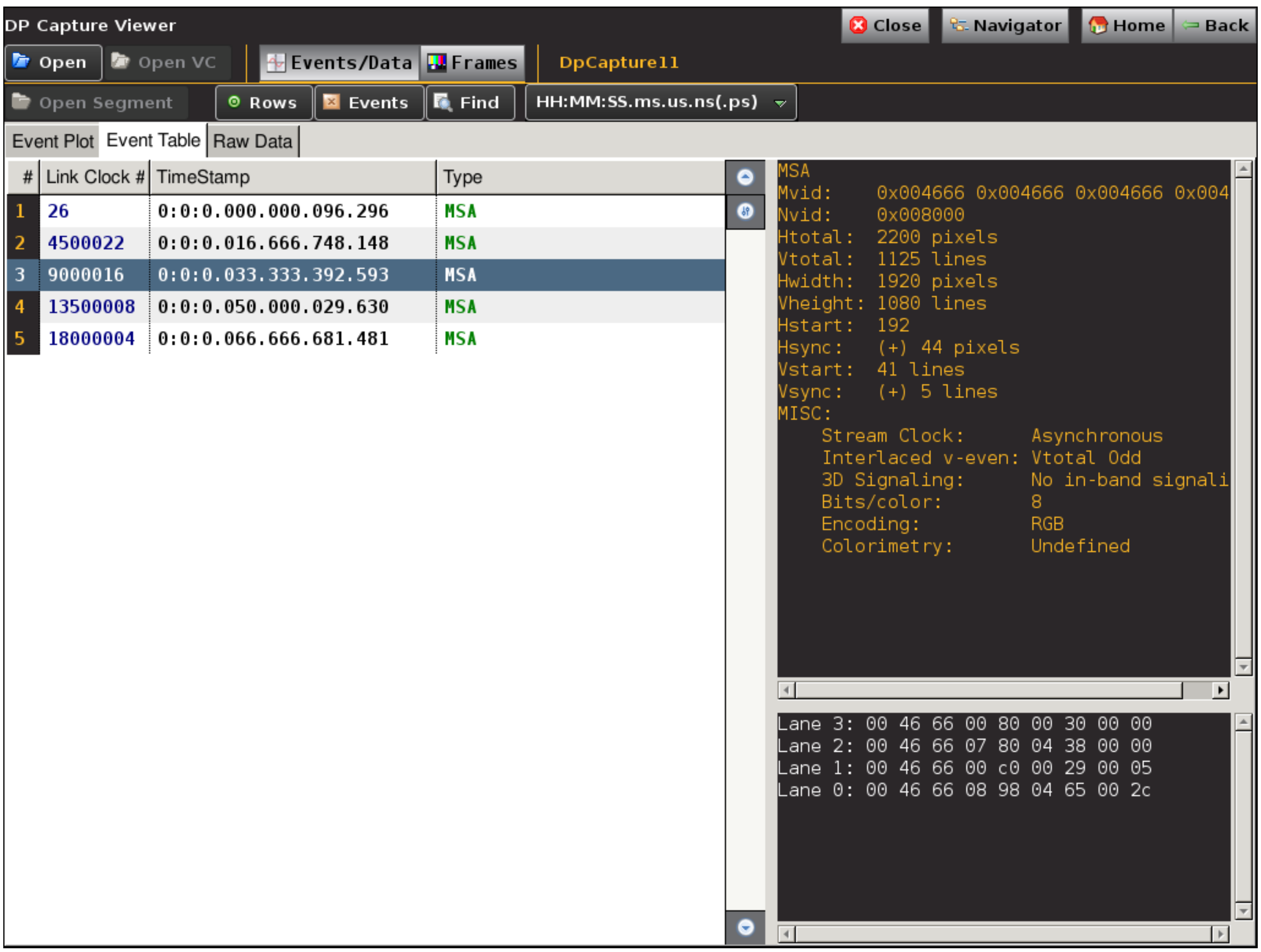
on the top of the **DP Capture Viewer** window as shown below. The results of the filter apply to both the **Event Plot** and the **Event Data** panels.



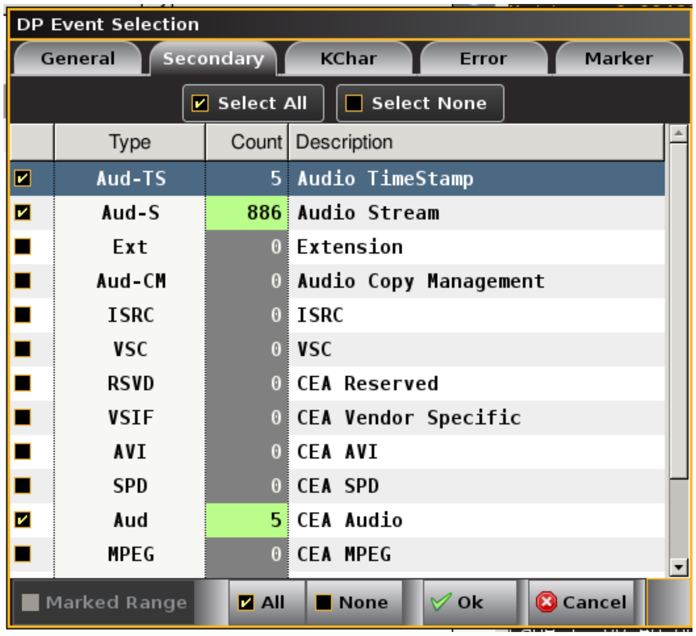
The following screens show some examples of filtering scenarios.



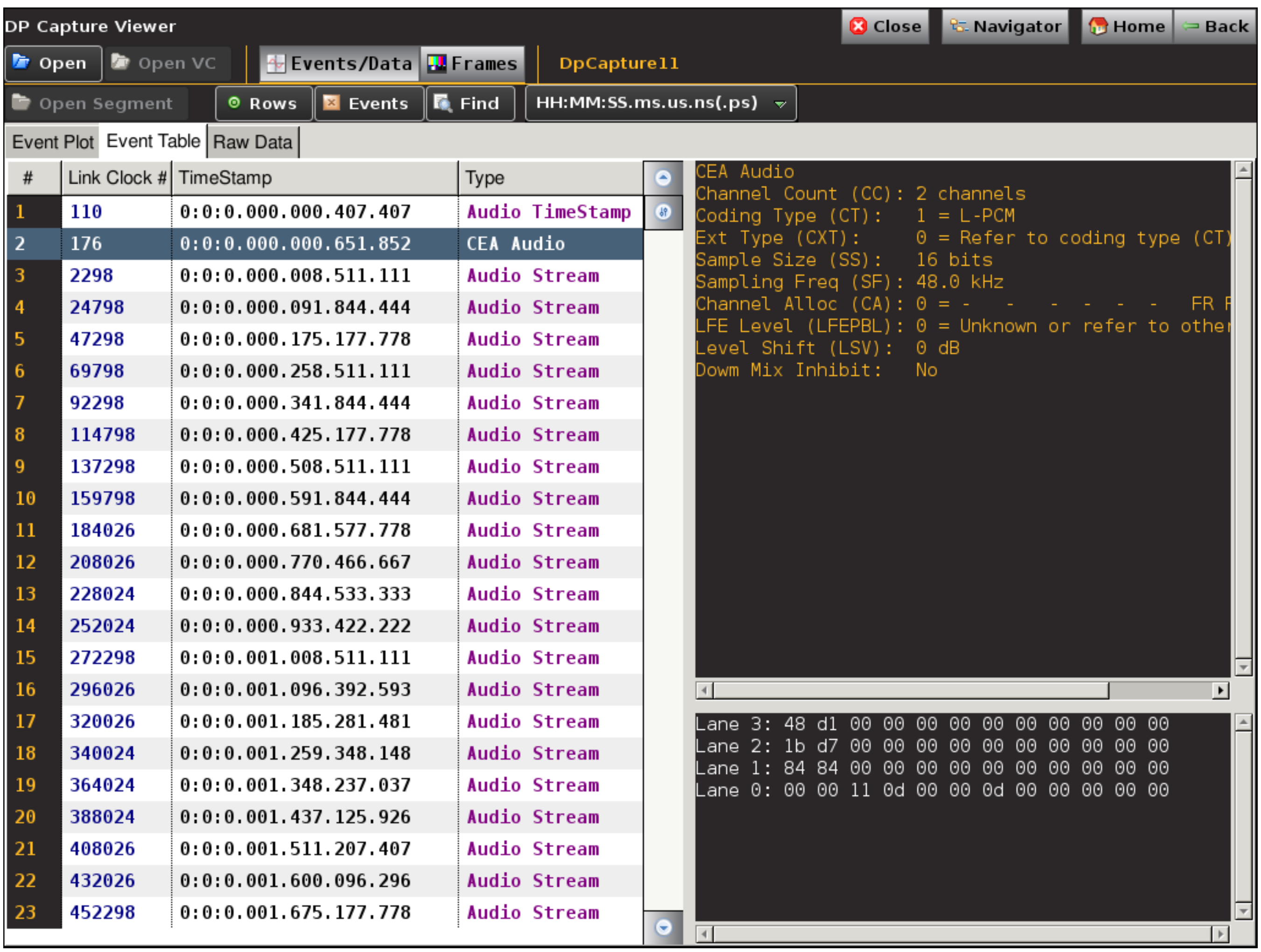
The results of the search of the MSA data elements on the **Event Table** are shown below.



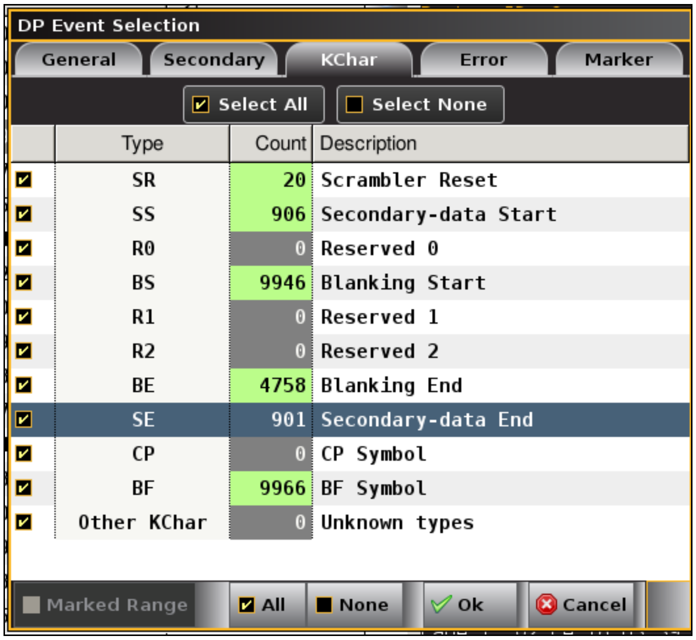
The following screen shows a second example with a successful search for audio data elements.



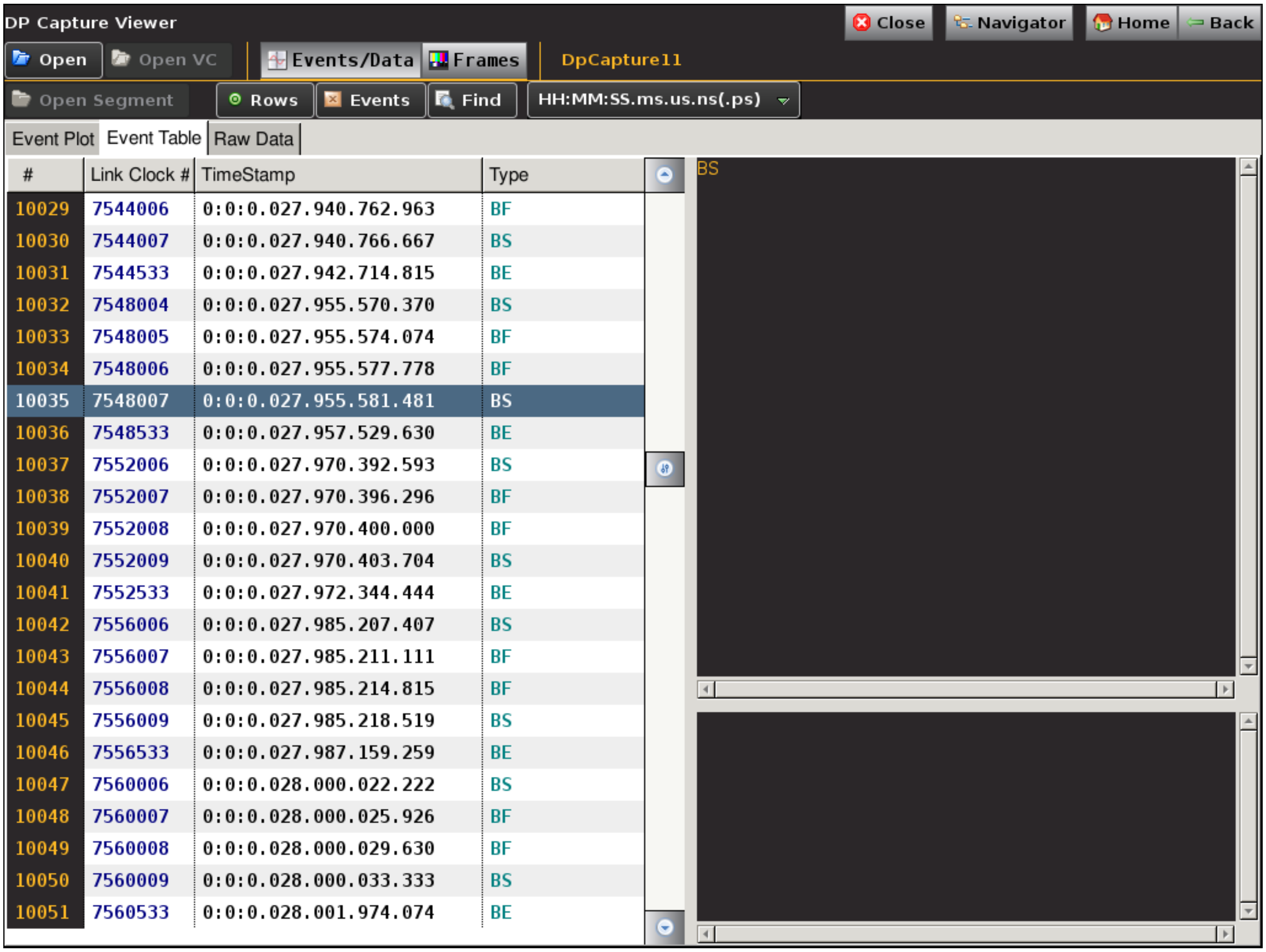
The following screen example shows the results of the above search.



In the next example below, the **K Character** tab is active and all the K Characters are selected in the search.



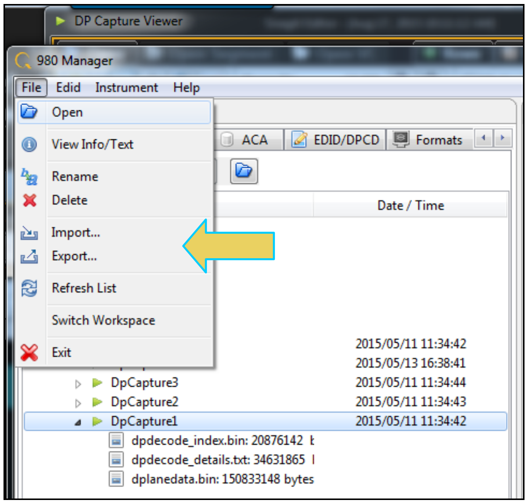
The results of the above search criteria are shown below.



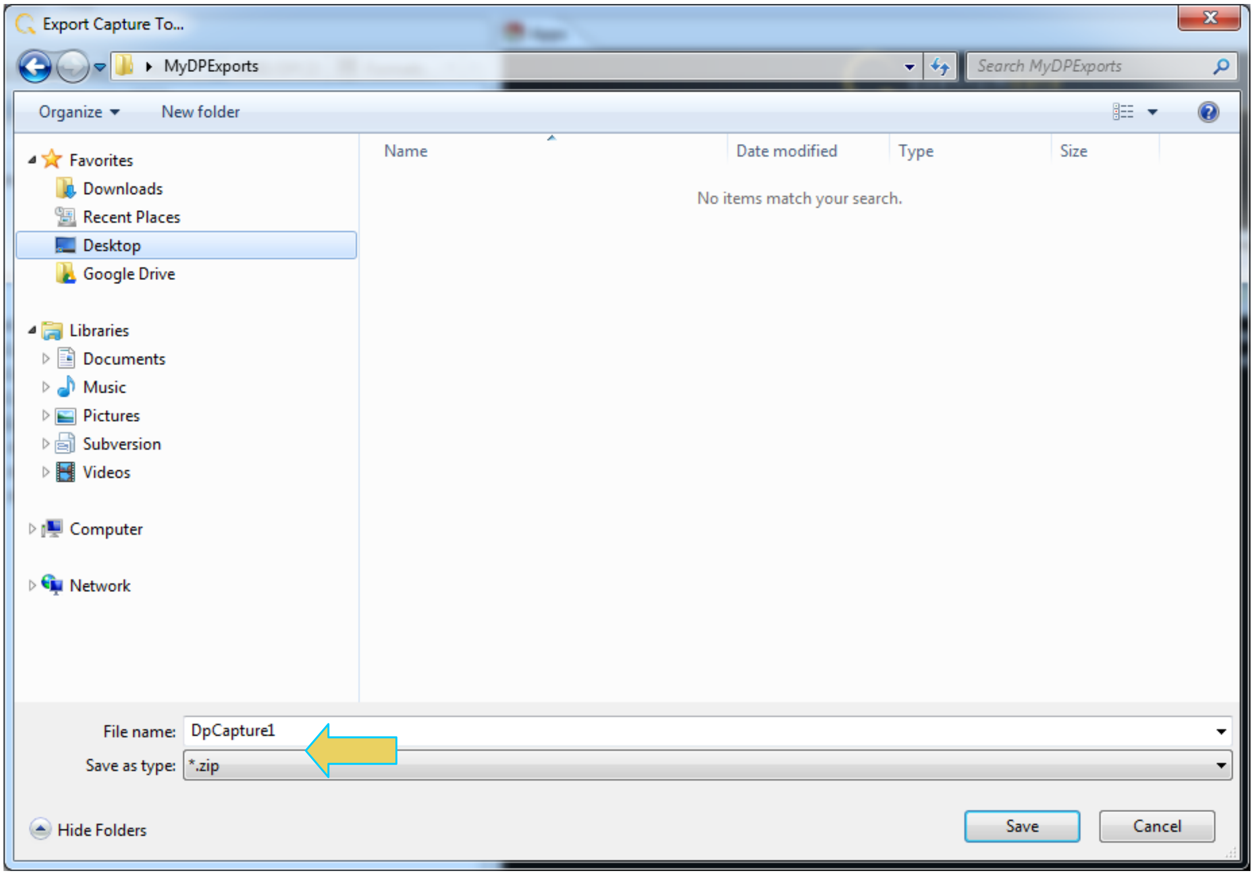
#	Link Clock #	TimeStamp	Type
10029	7544006	0:0:0.027.940.762.963	BF
10030	7544007	0:0:0.027.940.766.667	BS
10031	7544533	0:0:0.027.942.714.815	BE
10032	7548004	0:0:0.027.955.570.370	BS
10033	7548005	0:0:0.027.955.574.074	BF
10034	7548006	0:0:0.027.955.577.778	BF
10035	7548007	0:0:0.027.955.581.481	BS
10036	7548533	0:0:0.027.957.529.630	BE
10037	7552006	0:0:0.027.970.392.593	BS
10038	7552007	0:0:0.027.970.396.296	BF
10039	7552008	0:0:0.027.970.400.000	BF
10040	7552009	0:0:0.027.970.403.704	BS
10041	7552533	0:0:0.027.972.344.444	BE
10042	7556006	0:0:0.027.985.207.407	BS
10043	7556007	0:0:0.027.985.211.111	BF
10044	7556008	0:0:0.027.985.214.815	BF
10045	7556009	0:0:0.027.985.218.519	BS
10046	7556533	0:0:0.027.987.159.259	BE
10047	7560006	0:0:0.028.000.022.222	BS
10048	7560007	0:0:0.028.000.025.926	BF
10049	7560008	0:0:0.028.000.029.630	BF
10050	7560009	0:0:0.028.000.033.333	BS
10051	7560533	0:0:0.028.001.974.074	BE

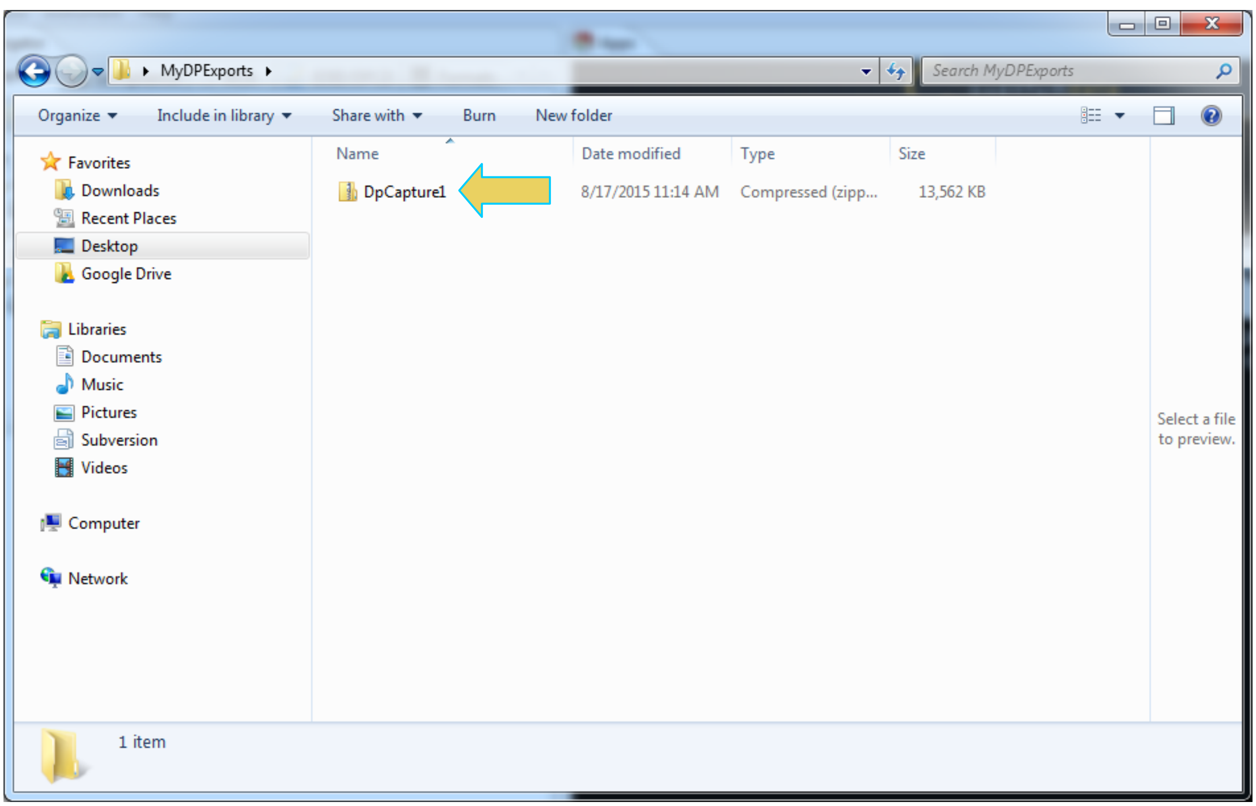
12.14 Importing and Exporting Capture files

The **Import** and **Export** options on the right-click menu and the **File** pull-down menu allow you to exchange capture files between your PC and the 980 GUI Manager application. You Export a capture file to disseminate to colleagues or other subject matter experts. You import a file when you want to examine a capture file taken by a colleague. The **Export** and **Import** function zips or unzips a capture file to enable you to post it on an FTP server of disseminate through email of the file is not too large.

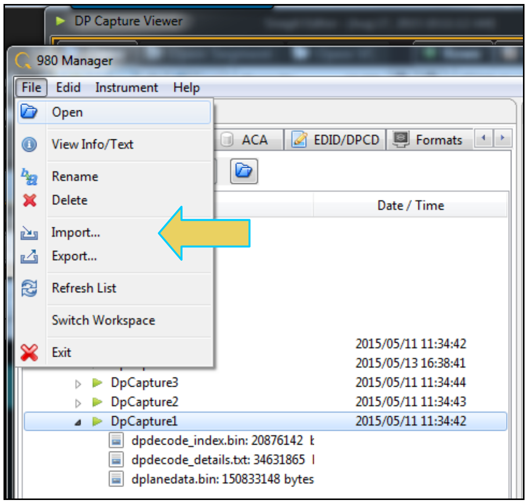


When you select **Export**, a Windows Explorer window will show up enabling you to save the capture as a zip file in a directory and name of your choosing. Refer to the screen examples below.

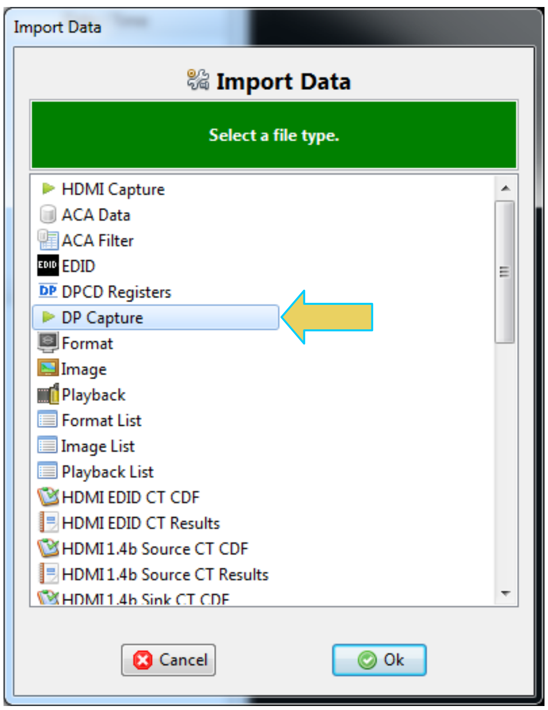

Export Capture To...
MyDPExports
Search MyDPExports
Organize
New folder
Favorites
Downloads
Recent Places
Desktop
Google Drive
Libraries
Documents
Music
Pictures
Subversion
Videos
Computer
Network
Name
Date modified
Type
Size
No items match your search.
File name: DpCapture1
Save as type: *.zip
Hide Folders
Save
Cancel


MyDPExports
Search MyDPExports
Organize
Include in library
Share with
Burn
New folder
Favorites
Downloads
Recent Places
Desktop
Google Drive
Libraries
Documents
Music
Pictures
Subversion
Videos
Computer
Network
Name
Date modified
Type
Size
DpCapture1
8/17/2015 11:14 AM
Compressed (zipp...
13,562 KB
Select a file to preview.
1 item

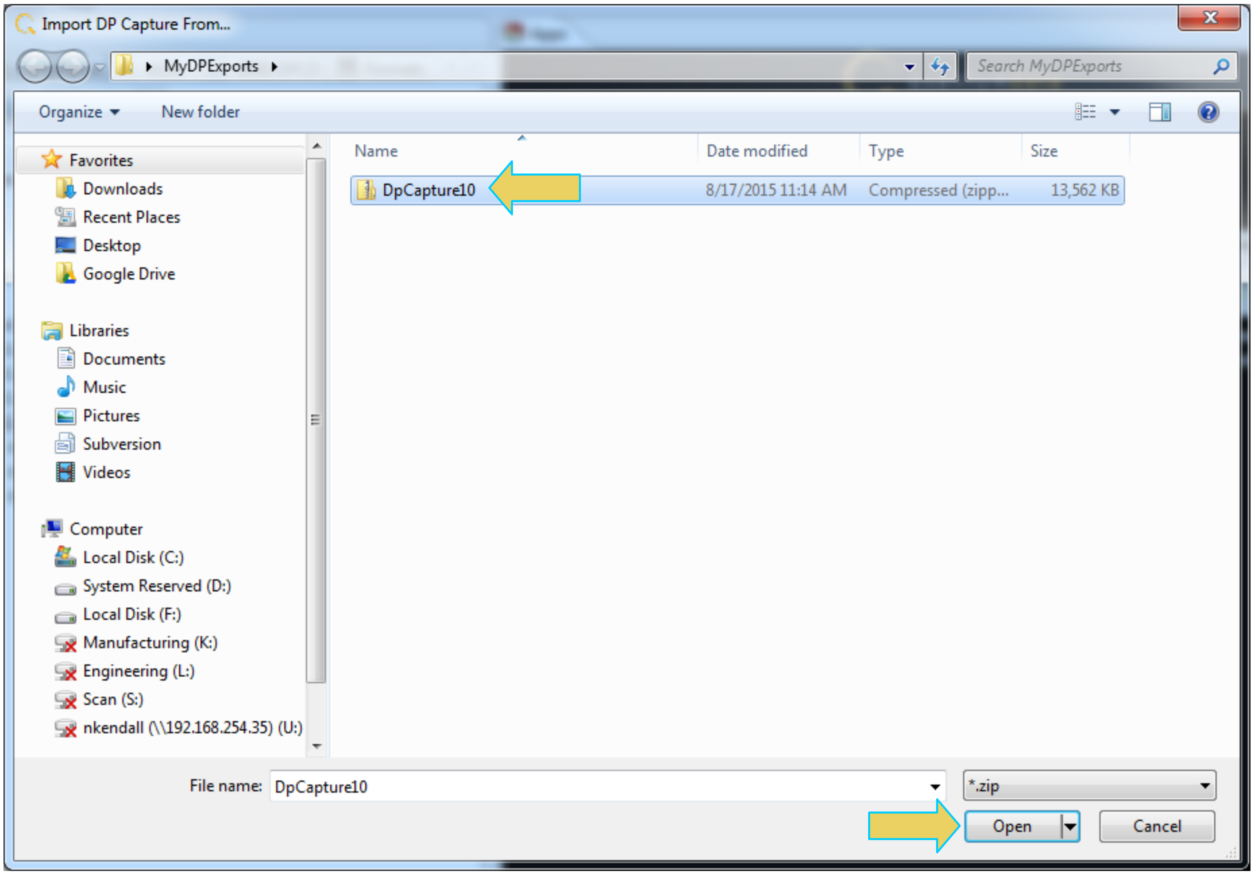
When you want to import a file, use the **File** pull-down menu and select **Import** as shown below.



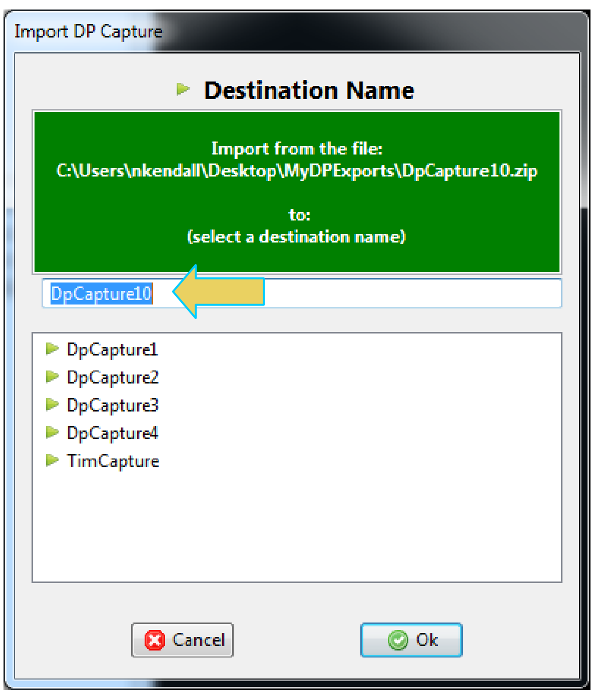
The **Import Data** dialog box will appear as shown below. Select **DPCapture** and click **OK**.



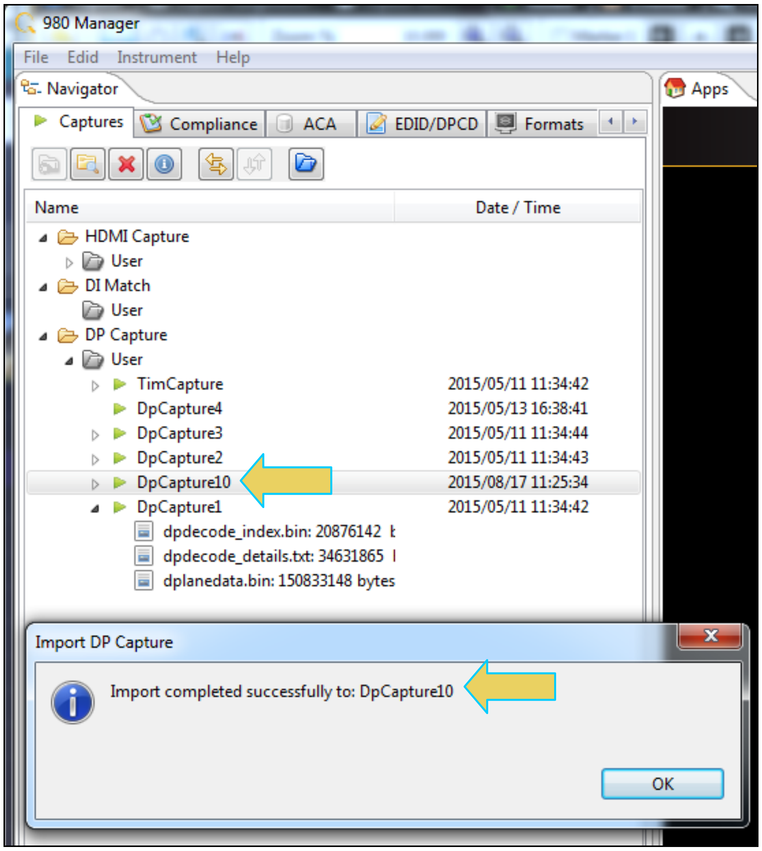
A Windows Explorer window will appear enabling you to navigate to the directory where you have stored your zipped capture file. Select the file and click **Open** as shown below.



You will then be given an opportunity to rename the file with the **Import DP Capture** dialog box as shown below.



Click **Ok** and the import will begin. You will see a confirmation dialog box and you will see the new capture in the list of captures in the **Navigator** panel as shown below.


980 Manager
File Edid Instrument Help
Navigator
Apps
Captures
Compliance
ACA
EDID/DPCD
Formats
Name
Date / Time
HDMI Capture
User
DI Match
User
DP Capture
User
TimCapture 2015/05/11 11:34:42
DpCapture4 2015/05/13 16:38:41
DpCapture3 2015/05/11 11:34:44
DpCapture2 2015/05/11 11:34:43
DpCapture10 2015/08/17 11:25:34
DpCapture1 2015/05/11 11:34:42
dpdecode_index.bin: 20876142
dpdecode_details.txt: 34631865
dplanedata.bin: 150833148 bytes
Import DP Capture
Import completed successfully to: DpCapture10
OK

14 Command Reference

This section provides a list of commands available for use with the 980 DP Video Generator.

Since the 980 can be equipped with multiple modules, there is a convention for addressing commands to specific modules. By default any command you enter will be addressed to the 980 DP Video Generator module in slot 3.

The addressing convention is as follows:

<IN/OUT><Slot><Port>: command_string

Here are some examples of addressing commands. The configuration used in these examples is a 980 DP Protocol Analyzer module in the first slot (Slot 1) and the 980 DP Video Generator module in the third slot (Slot 3).

Example #1: Load a format (resolution) for the transmitter port (Tx1) on the 980 DP Video Generator module:

OUT30:FMTL SMPTEBar

Example #2: Query the image transmitted:

OUT30:IMGU?

Notes:

1. Text case is not important.

2. Since both Tx ports on the DP Video Generator module always transmit the same signal, you do not have to include the port number.

14.1 Video-Related commands

Refer to the following tables for the supported commands.

ALLU	
Command supported?: Y	Query supported?: N

Same as the FMTU command.
Example:
`FMTL 720p60`
`ALLU`	

DVQM	
Command supported?: Y	Query supported?: Y

Sets the quantization mode (color range) for the video. Valid values are: 0 = 0-255; 2 = 16-235.
Requires FMTU or ALLU to activate.
Query returns the current setting of the digital quantization mode.
Examples:
`DVQM 2      // sets the mode or range to 16-235).`
or
`DVQM 0      // sets the mode or range to 0-255).`
`DVQM?       // returns the current value.`	

DVSM	
Command supported?: Y	Query supported?: Y
Sets the sampling mode between 4:4:4 and 4:2:2 in YCbCr mode. Valid values are: 2 = 4:2:2; 4 = 4:4:4.	

Requires FMTU or ALLU to activate.
Query returns the current setting of the digital sampling mode.
Examples:

```
DVSM 2      // sets the sampling to 4:2:2.
```
or
```
DVSM 4      // sets the sampling to 4:4:4.
DVSM?       // returns the current value.
```

DVST

Command supported?: Y	Query supported?: Y

Sets the digital video signal type. Valid values are: RGB = 10; YCbCr = 14.
Requires FMTU or ALLU to activate.
Query returns the current setting of the digital video signal type.
Example:

```
DVST 10     // activates the HDMI/DVI output for RGB video).
DVST?       // returns the current value.
```

FMTL

Command supported?: Y	Query supported?: Y

Loads a format. Takes a format name as a parameter. Requires FMTU or ALLU to activate.
Requires FMTU or ALLU to activate.
Query returns the currently loaded format.
Examples:

```
FMTL 720p60   // loads the 720p60 format.
FMTL?         // returns the current value.
```

FMTU

Command supported?: Y	Query supported?: Y

Uses the currently loaded format. Takes no parameters.
Query returns the currently used format.
Example:

```
FMTL 720p60
FMTU
```

IMGL

Command supported?: Y	Query supported?: Y

Loads an image. Takes an image name as a parameter.
Requires IMGU, FMTU or ALLU to activate.
Query returns the currently loaded image.
Example:

```
IMGL SMPTEBar    // loads smptebar image
```

IMGU

Command supported?: Y	Query supported?: Y

Uses (activates) the currently loaded image. Takes no parameters.
Query returns the currently used image.

```
IMGL SMPTEBar
IMGU
```

ISUB

Command supported?: Y	Query supported?: Y

Enables or disables activation of alternate versions of test images if they have alternate versions. Takes no parameters.

Query returns the current setting.

```
IMGL graysall    // loads the SlideBox image
ISUB 1          // enables alternate versions of the image
IVER 1          // activates the first version of an image
IMGU             // invokes the image and image version.
ISUB 0          // disables alternate versions of the image
```

IVER

Command supported?: Y	Query supported?: Y

Enables or disables activation of alternate versions of test images if they have alternate versions. Takes no parameters.

Query returns the current setting.

```
IMGL graysall     // loads the SlideBox image
ISUB 1           // enables alternate versions of the image
IVER 100          // activates the 100th version of the image
IMGU              // invokes the image and image version.
```

NBPC

Command supported?: Y	Query supported?: Y

Sets the number of bits per component on HDMI. Valid values are: 8 = 8 bits per component; 10 = 10 bits per component; 12 = 12 bits per component. Only affects output when color space is RGB or YCbCr 4:4:4.

Requires FMTU or ALLU to activate.

Query returns the current setting of the number of bits per component.

Example:

```
NBPC 12      // sets the component bit depth to 12 bits
NBPC?       // returns the current value.
```

OUTG

Command supported?: Y	Query supported?: Y

Sets the enable gate of video output. (This is defaulted to 1 – only set to 0 to disable video when absolutely necessary.)

Requires FMTU or ALLU to activate.

Query returns the current setting for the enable gate for the video.

Example:

```
OUTG 1       // enables the outputs.
OUTG?       // returns the current setting.
```

REDG/GRNG/BLUG

Command supported?: Y	Query supported?: Y

Enables red/green/blue, respectively. (Also see XVSG.)

Requires FMTU or ALLU to activate.

Query returns the current setting for enabling red, green, blue video.

Examples:

```
REDG 1      // enables the red output channel.
GRNG 0      // disables the green output channel.
BLUG 1      // enables the blue output channel.
BLUG?      // returns the current setting.
```

SCAN

Command supported?: Y	Query supported?: Y

Sets the current format to either progressive (SCAN 1) or interlaced (SCAN 2).
Requires FMTU or ALLU to activate.
Query returns the current setting for the scan type.
Example:
`SCAN 1      // sets the output to progressive.`
`SCAN?       // returns the current setting.`	

XVSI	
Command supported?: Y	Query supported?: Y

Sets the video interface of the unit.
Requires FMTU or ALLU to activate.
Query returns the current interface activation setting.
Examples:
`XVSI 2      // Sets DVI Computer formats`
`XVSI 3      // Sets DVI TV formats`
`XVSI 4      // Sets active interface to HDMI`	

14.2 Analyzer-Related commands

Refer to the following tables for the supported commands related to the analyzer function for testing DP source devices.

LINK VSTAT	
Command supported?: Y	

Queries for the incoming DisplayPort stream attributes.
Example:
`LINK VSTAT`
Sample response:
`Lane count: 4          // lanes used`
`Bandwidth: 5.40        // link rate`
`Hactive: 1920          // horizontal active video (pixels)`
`Htotal: 2200           // horizontal total video including "blanking" (pixels)`
`Vactive: 1079          // vertical active video (lines)`
`Vtotal: 1125           // vertical total video including "blanking" (lines)`
`Scan: Progressive`
`BPC: 8                 // bits per component`
`YCC Color: N/A`
`Components: Adobe RGB`
`HDCP encryption: off  // status of HDCP encryption`	

DPRX MSA	
Command supported?: Y	
Queries for the incoming DisplayPort main stream attributes and presents the results in hex format. The main stream attributes are Attributes describing the main video stream format in terms of geometry and color format. They are inserted once per video frame during the video blanking period. Example: `DPRX MSA`	

Sample response:

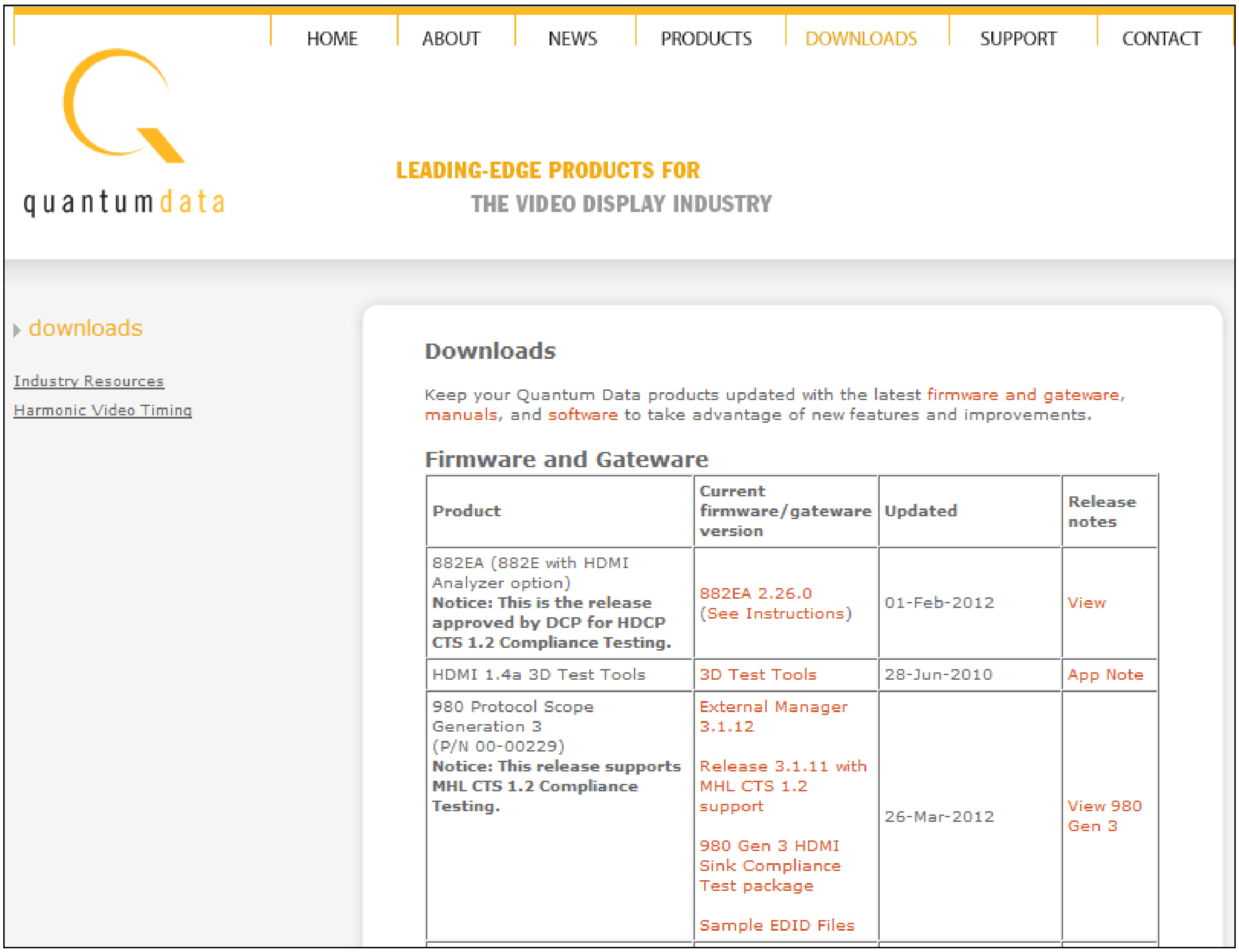
```
Clocks, H Total: 0x00000898    // horizontal total clock cycles
Hsync Polarity: 0x00000001     // horizontal sync pulse polarity 0 = active high pulse
                                  or 1 = active low pulse
Clocks, V Total: 0x00000465    // vertical total clock cycles
Vsync Polarity: 0x00000001     // vertical sync pulse polarity 0 = active high pulse
                                  or 1 = active low pulse
HSync Width: 0x0000002c        // horizontal sync pulse width
VSync Width: 0x00000005        // vertical sync pulse width
Horz Resolution: 0x00000780    // horizontal active resolution clock cycles
Vert Resolution: 0x00000438    // vertical active resolution clock cycles
Horz Start: 0x000000c0         // starting pixel for active resolution
Vert Start: 0x00000029         // starting line for active resolution
Misc0: 0x00000038
Misc1: 0x00000000
M Vid: 0x00002333              // M value for video
N Vid: 0x00008000              // N value for video
VB-ID: 0x00000010
```

15 Upgrading the 980 Manager and 980

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

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

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



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

Two software packages are available for upgrading the 980:

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

Notes:

1. If the Windows-based 980 Manager GUI and the embedded firmware are both being upgraded, we recommend upgrading the 980 Manager first, and then upgrading 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.

16 Image Reference

16.1 Standard image descriptions

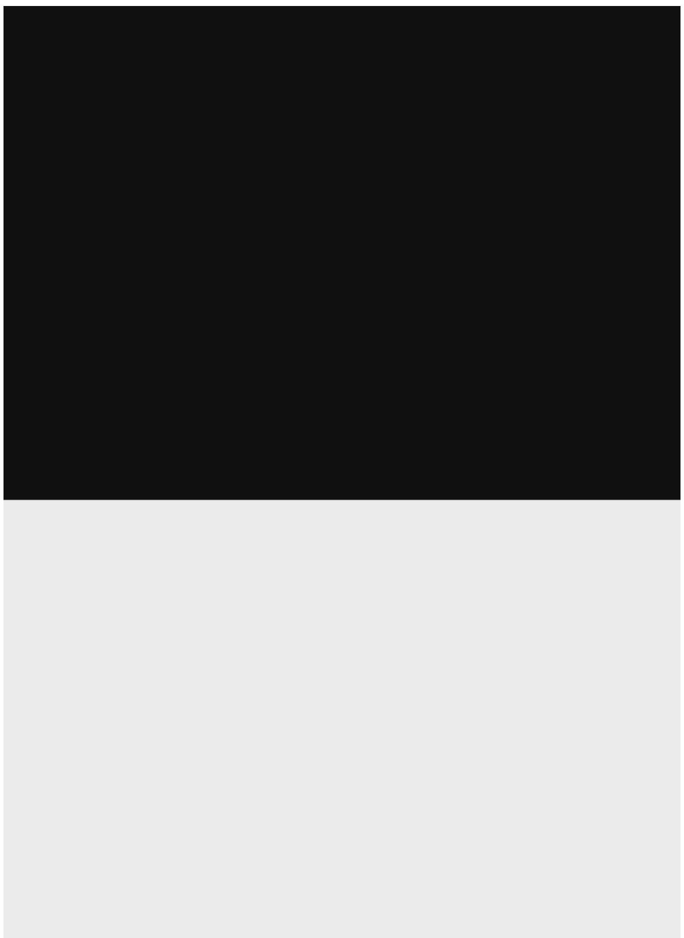
This section provides a reference for the test patterns available with the 980 Video Generator Module.

16.2 3DXTalk

The 3DXTalk is an image for testing 3D crosstalk.

16.2.1 Description

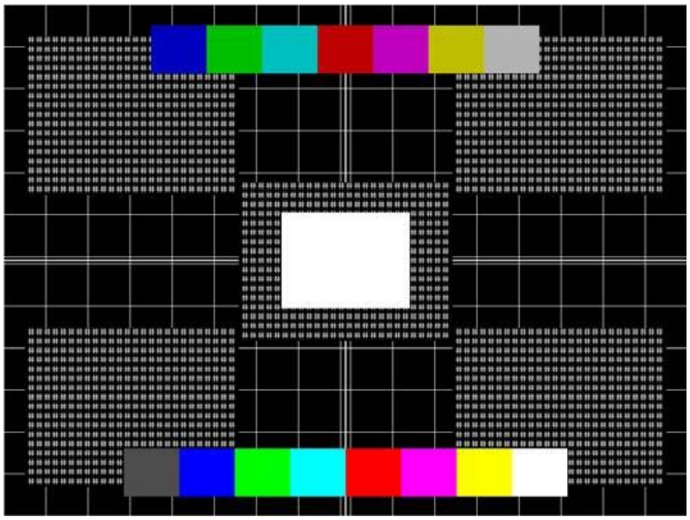
Test image for testing 3D crosstalk.



16.3 Acer1

16.3.1 Description

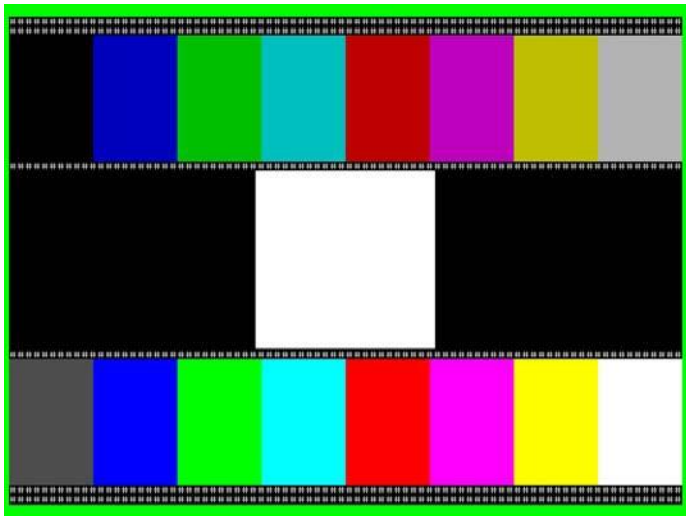
Special test image developed per customer specifications. Consists of two sets of color bars and five blocks of “#” characters on a white crosshatch with a black background.



16.4 Acer2

16.4.1 Description

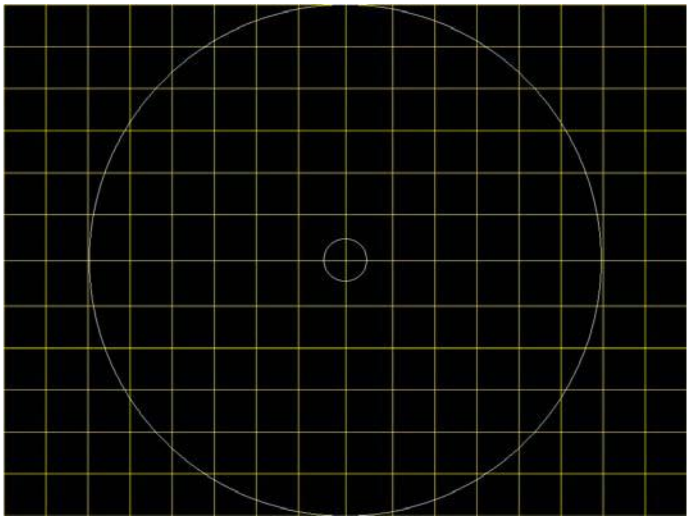
Special test image developed per customer specifications. Consists of colorbars, lines of “#” characters, and a green border.



16.5 Acer3, Acer4, Acer5, Acer6

16.5.1 Description

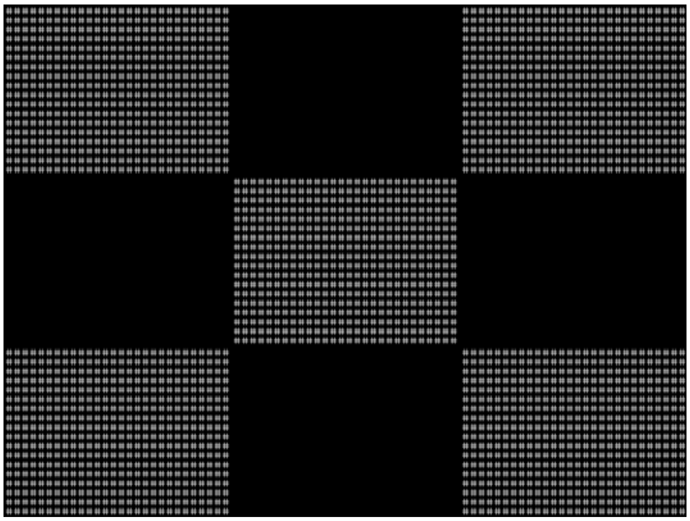
Special test images developed per customer specifications. Consists of large and small white circles centered on either a yellow (Acer3), magenta (Acer4), cyan (Acer5), or white (Acer6) crosshatch on a black background. The Acer3 image is shown below.



16.6 Acer7 and Acer8

16.6.1 Description

Special test image developed per customer specifications. In the primary version, five blocks of either white “#” (Acer7) or “H” (Acer8) characters on a black background are displayed. A secondary version displays black characters on a white background. The Acer7 image is shown below.



16.7 Acer9

16.7.1 Description

Special test image developed per customer specifications. In the primary version, a mostly white field is displayed with two rows of color bars at the bottom. A secondary version displays a black field with the two rows of color bars at the bottom.

16.8 AFDtest

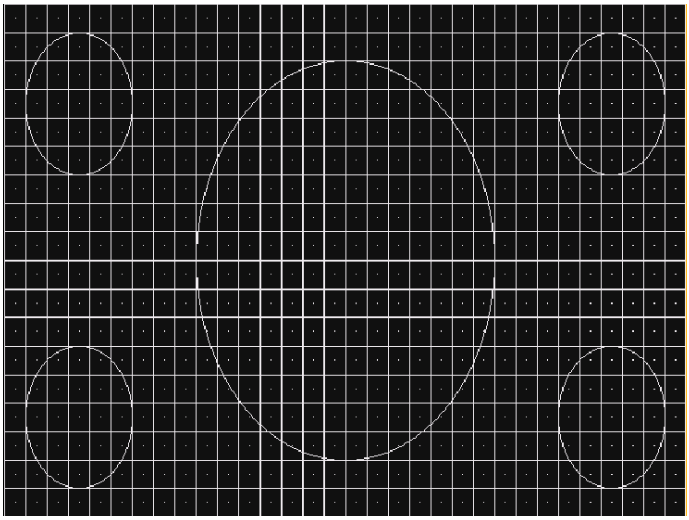
16.8.1 Description

Used to test HDMI content mapping using different EIA/CEA-861-B formats. There are 10 different versions of this image.

16.9 Anamorph

16.9.1 Description

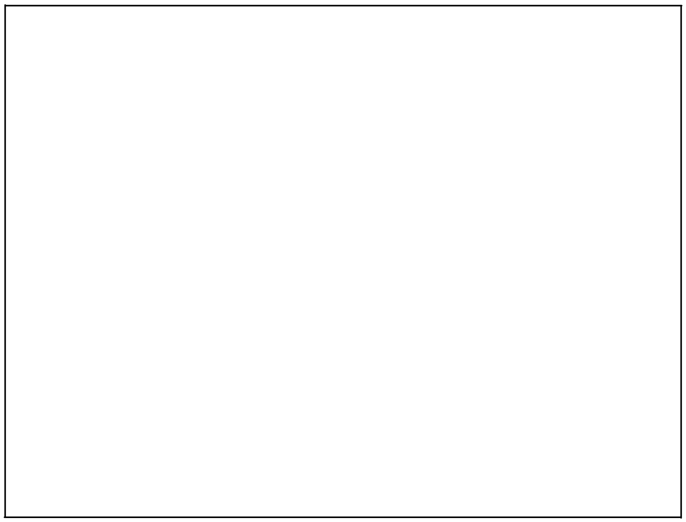
The primary version displays a white background with a small black pixel in the center fills the active video area. A secondary version displays a black background with a small white pixel in the center.



16.10 AnsiGray

16.10.1 Description

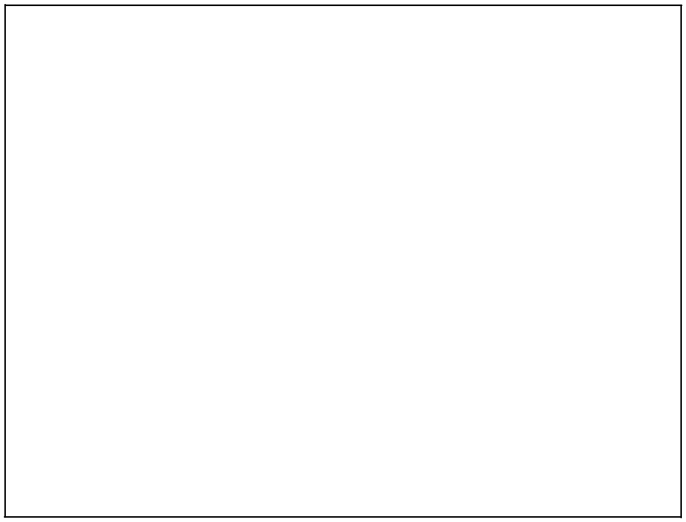
The primary version displays a white background with a small black pixel in the center fills the active video area. A secondary version displays a black background with a small white pixel in the center.



16.11 AnsiLght

16.11.1 Description

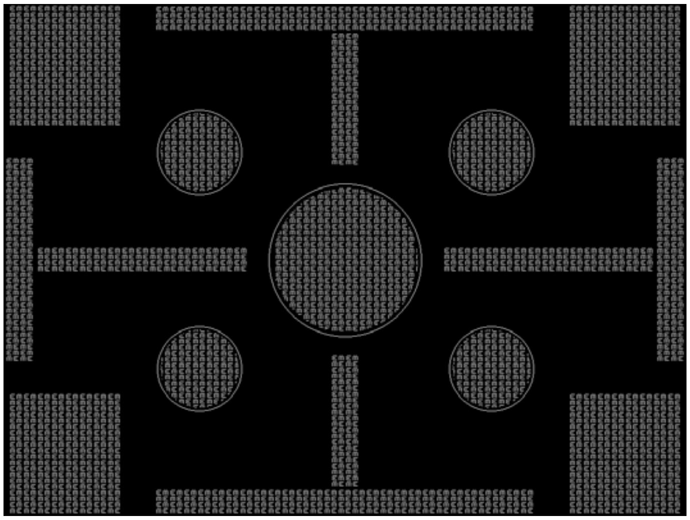
The primary version displays a white background with a small black pixel in the center fills the active video area. A secondary version displays a black background with a small white pixel in the center.



16.12 Apple 1

16.12.1Description

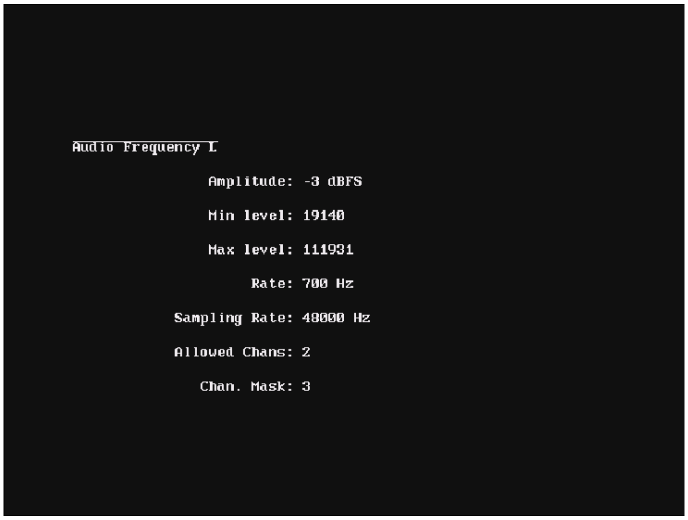
Special test image developed per customer specifications. A secondary version shows reverse (black characters on white background).



16.13 Audio_L, Audio_Lf, Audio_R, Audio_Rf, Audio_X, Audio_Xf

16.13.1Description

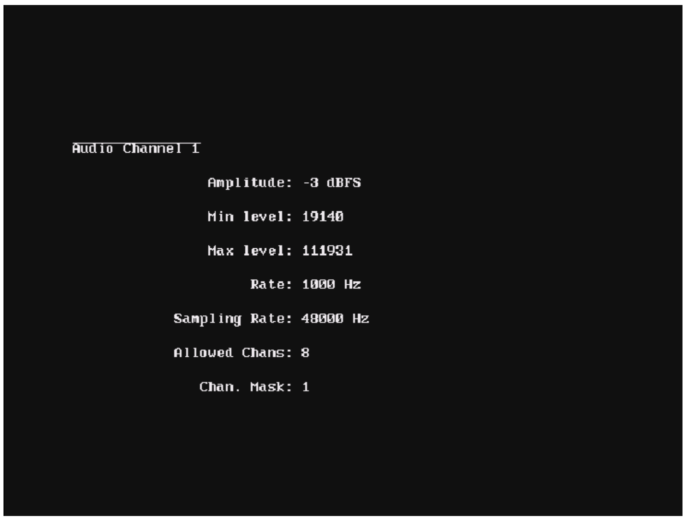
Used to configure HDMI audio output signal. The Audio_L is shown below. For more information, see “Testing HDMI audio” on page 305.



16.14 Audio_1, Audio_1f, Audio_2, Audio_2f, Audio_3, Audio_3f, Audio_4, Audio_4f, Audio_5, Audio_5f , Audio_6, Audio_6f, Audio_7, Audio_7f, Audio_8, Audio_8f

16.14.1 Description

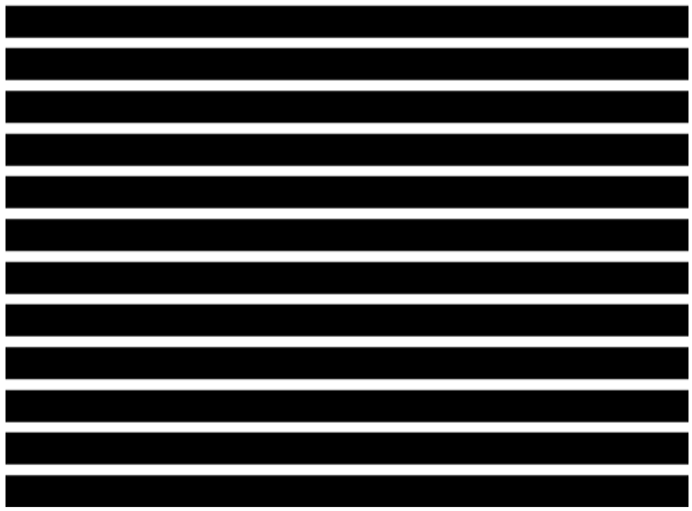
To support testing of HDMI audio, the 882 provides 8-channel LPCM audio (using an internally-generated sinewave) at the highest audio sampling rate (192 kHz).



16.15 BarBlack

16.15.1 Description

Special test image developed per customer specifications. A secondary version shows reverse (black lines on white background).

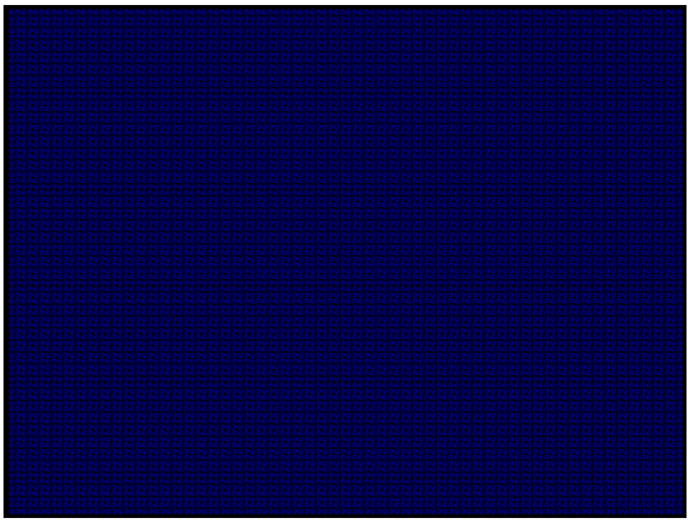


16.16 BLU_EM, GRN_EM, RED_EM, WHT_EM, MEME1111, MEMESony, MESony_B, MESony_G, and MESony_R

16.16.1 Description

In the primary version, the screen is filled with blue (BLU and B), green (GRN and G), red (R), or white (WHT, MEME1111, MEMEPlus, and MEMESony) EM character blocks on a black background. Only the white character has a secondary version. It is drawn with black characters on a white background.

A bitmap of a single character block is shown here. The BLU_EM image is shown below.



16.16.2 Purpose

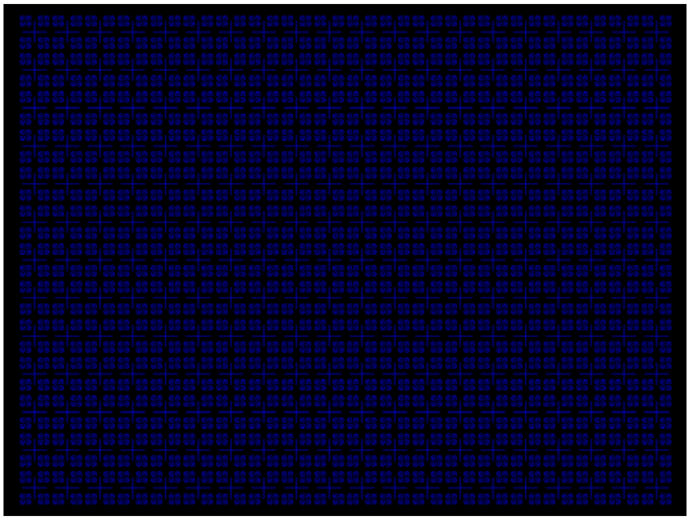
This pattern is specified by some display manufacturers for checking and adjusting focus one color at a time.

16.17 BLU_EM+, GRN_EM+, RED_EM+, WHT_EM+, MEMEPlus, MEPlus_B, MEPlus_G, and MEPlus_R

16.17.1 Description

In the primary version, the screen is filled with blue (BLU and B), green (GRN and G), red (R), or white (WHT and Sony) EM character blocks on a black background. Only the white character has a secondary version. It is drawn with black characters on a white background.

A bitmap of a single character block is shown here. The BLU_EM+ image is shown below.



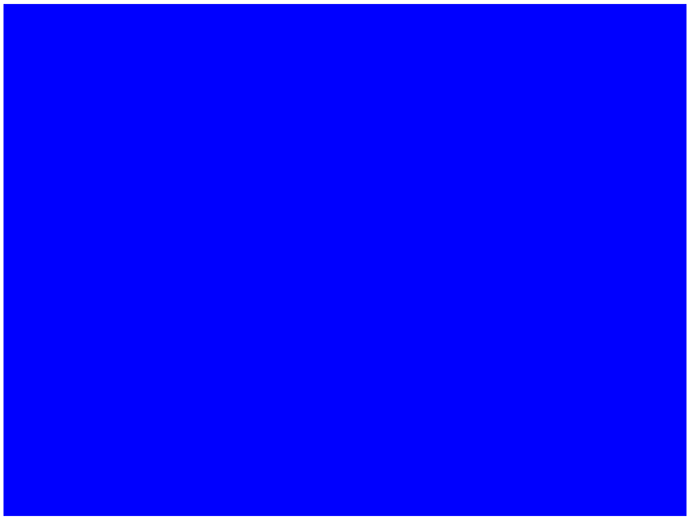
16.17.2 Purpose

This pattern is specified by one or more display manufacturers for checking and adjusting focus one color at a time.

16.18 BLU_PIC, GRAY_PIC, GRN_PIC, RED_PIC, WHT_PIC

16.18.1Description

A solid blue (BLU), gray, green (GRN), red, or white (WHT) box fills the active video area. Only the white fill has a secondary version. It can be changed to a black fill by pressing the **Step** key. The BLU_PIC image is shown below.



16.18.2Test

Purity adjustment.

16.18.3Purpose

To produce correct colors in a displayed image, the electron beams from each of the three (3) guns in the CRT should strike only their matching phosphors. A white image shows patches of various colors on a monitor with bad purity. The purity adjustment(s) should be performed before doing any brightness or color tests. In some cases, purity adjustments involve loosening and repositioning the yoke, in which case purity should be adjusted prior to doing any geometry tests.

Method The methods used for adjusting purity on a color monitor depend on the type of monitor and CRT (for example; Delta, In-Line or Single Gun). In most cases, the first step is to degauss the CRT.

Note: *For a Delta Gun CRT, turn on only the red output. A solid uniform field of red should appear. If the color is not uniform, adjust the yoke and the Purity Tabs assembly.*

If purity cannot be corrected to acceptable limits, the monitor may not have been properly degaussed or there may be a defect in the CRT or purity assembly.

16.18.4Test

Shadow mask warping.

16.18.5Purpose

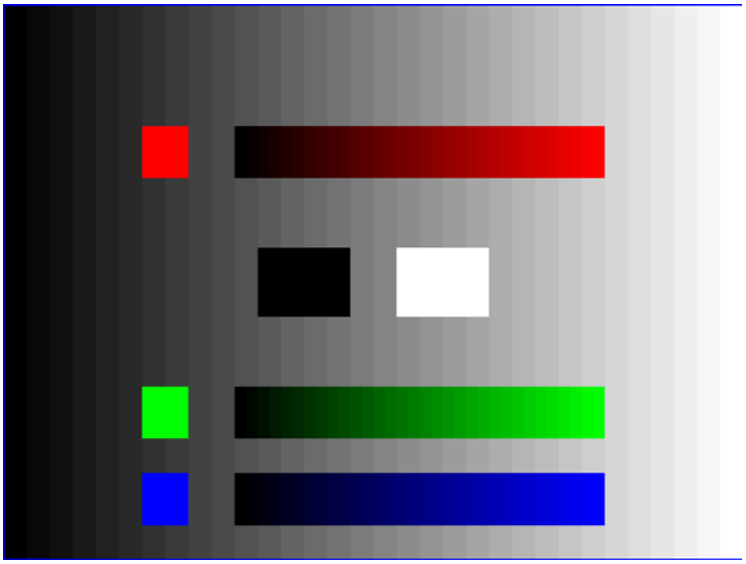
The purity characteristics of your CRT can change over time if you leave it on with a lot of video being displayed. This may be due to the CRT's electron beams striking its shadow mask with enough energy to cause the mask to heat. This internal heating may be enough to cause the shadow mask to warp and give bad purity.

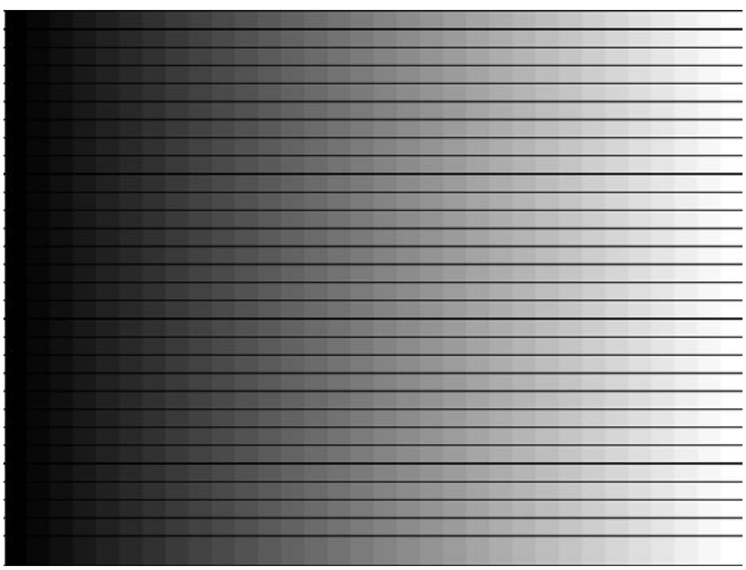
Method Set the purity image to white and allow the monitor to run for a few minutes. Any mask warping shows up as a change in purity. You can use a color meter to measure the change. The BriteBox pattern may also be useful for measuring shadow mask warping.

16.19 Bosch

16.19.1 Description

Special test image developed per customer specifications. This image has 6 versions.





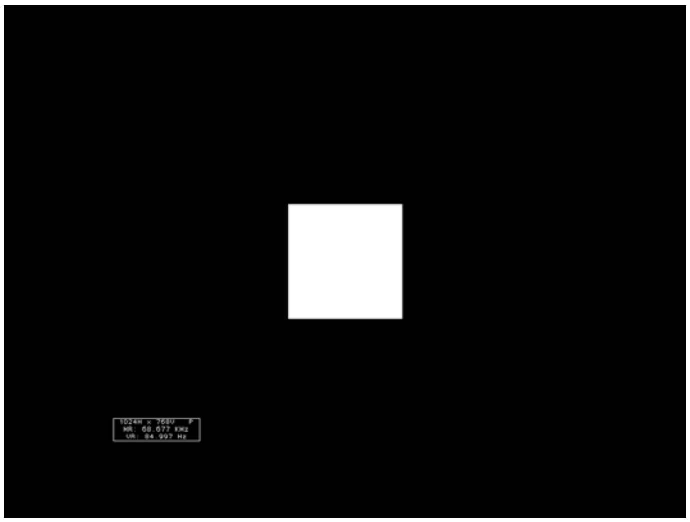
16.20 Box_50mm, Box_64mm, Box100mm, Box150mm, Box200mm, Box250mm

16.20.1Description

The primary version has a solid white box in the center of the active video. Depending on the image selected, the box is sized by square millimeters. If there is room, information on the current format appears below and to the left of the box. This shows the number of active pixels and lines as well as the horizontal and vertical scan rates. A forward slash (*I*) after the number of active lines indicates the format is interlaced.

Note: *The box will be the correct size only if the correct physical active video size is set in the format.*

The Box_50mm image is shown below. The secondary version draws a black box and black text on a white background.



16.20.2Test

Brightness control adjustment.

16.20.3Purpose

The wrong brightness setting may cause other tests such as Contrast, Focus, and Beam Size to be invalid. An accurate brightness setting helps give repeatable measurements throughout other tests.

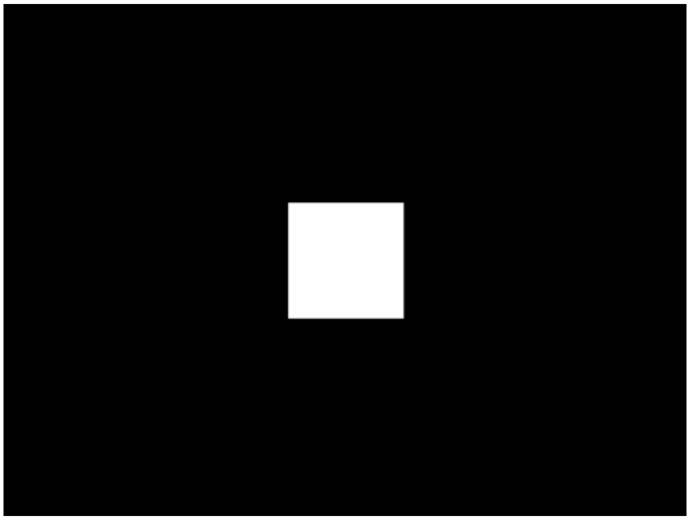
16.20.4Method

Center your light meter probe within the center square and adjust the monitor’s brightness control to obtain the required light meter reading.

16.21 BriteBox

16.21.1Description

The primary version has a single white box in the center of active video. The box size is controlled by the MSIZ system parameter. The secondary version adds four boxes in the corners of active video.



16.21.2Test

Brightness control adjustment.

16.21.3Purpose

The wrong brightness setting may cause other tests such as Contrast, Focus, and Beam Size to be invalid. An accurate brightness setting helps give repeatable measurements throughout other tests.

16.21.4Method

Center your light meter probe within the center square and adjust the monitor’s brightness control to obtain the required light meter reading.

16.21.5Test

Brightness uniformity.

16.21.6Purpose

The light output of most picture tubes varies slightly when measured across the CRT face.

This test can be used to verify that the light output variation is within your specification limits.

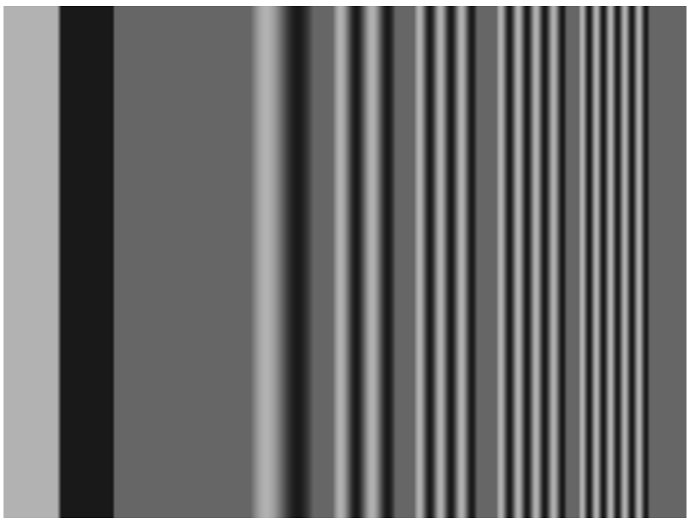
16.21.7Method

Select the inverted version and perform the Brightness Control Adjustment test on the center box. Then, center the light meter probe in each of the corner squares and note the reading you get for each square. The deviation between each of the corner readings and the center reading should be within your specification limits.

16.22 Burst (TV formats only)

Description

The left side starts with reference white (+100 IRE) and black (+7.5 IRE) levels. This is followed by six bursts of sine waves. Each burst is at a different frequency, forming vertical lines of various widths. The frequencies, going from left to right, are 0.5, 1, 2, 3, 3.58, and 4.43 MHz.



16.22.1Test

Frequency response.

16.22.2 Method

When viewed on a TV screen, the peak intensities of all of the bursts should match the white reference level. The darkest portions between the peaks should match the black reference level.

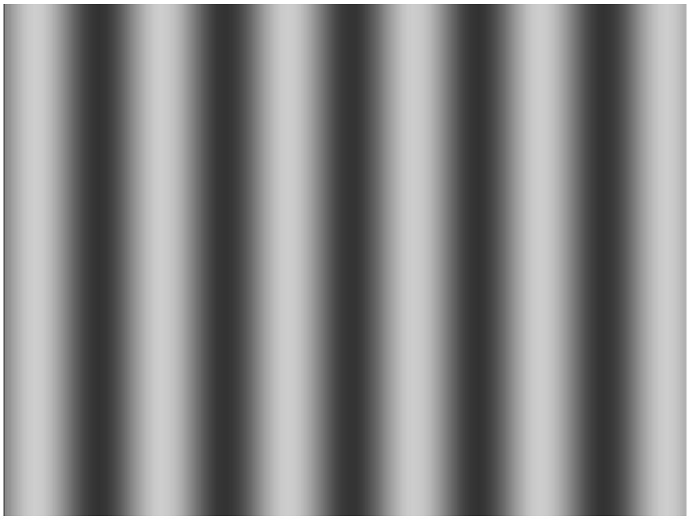
The image can also be used with a TV waveform analyzer to check the frequency response of a video system. One scan line of the image, as it would appear on a waveform analyzer, is shown at the top of the next page. High frequency roll-off (loss) would show up as a decrease in the peak-to-peak swings on the right side of the waveform. Low frequency roll-off would show up as a decrease in the peak-to-peak swings on the left side of the waveform.

Some waveform analyzers can be set to detect and display the amplitude of the peaks. A typical amplitude waveform for a good system is shown at the bottom of the next page.

16.23 BurstTCE

16.23.1 Description

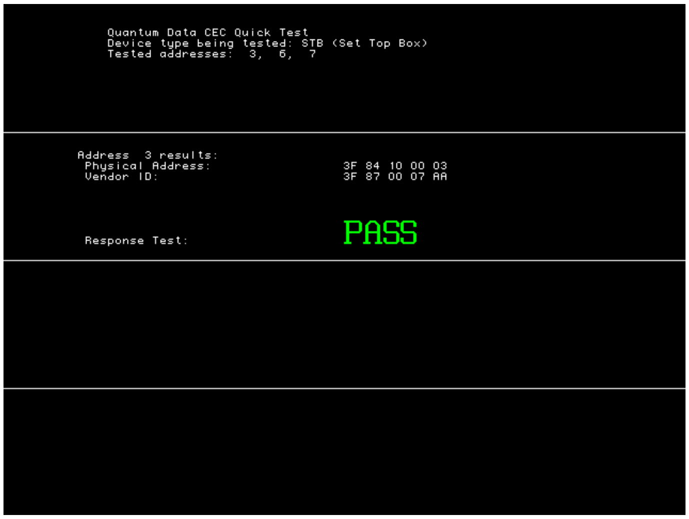
Fills screen with a 0.5 MHz frequency. This can be increased in 0.5 MHz increments through the **Settings/Rendition** dialog box.



16.24 CECTest1, CECTest2

16.24.1Description

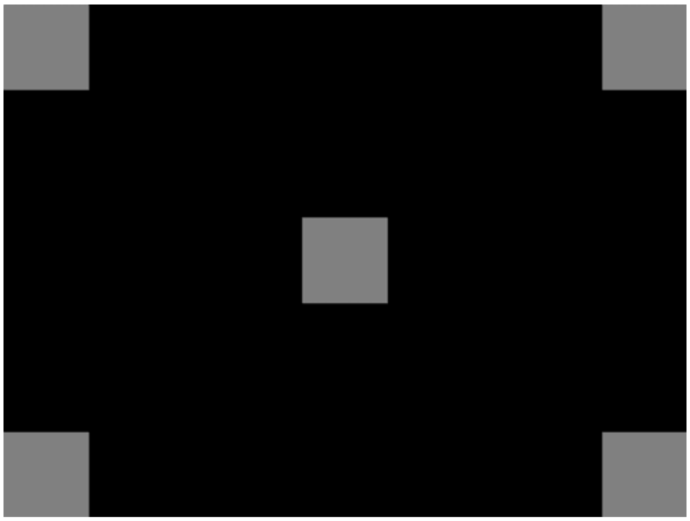
Fills screen with a 0.5 MHz frequency. This can be increased in 0.5 MHz increments through the **Settings/Rendition** dialog box.



16.25 Check511

16.25.1Description

Consists of five small boxes in the corners and at the center of the active video. The boxes are on a black background. Each box consists of alternating black and white pixels that form a very fine checkerboard. The secondary version inverts the image, creating a white background. The colors of the individual pixels in the boxes also are inverted.



16.25.2Test

Verify monitor resolution.

16.25.3Purpose

The resolution of your monitor should meet or exceed the design specifications.

16.25.4 Method

First adjust the brightness, contrast, and focus to their correct settings. You should be able to see individual and distinct pixels in each of the boxes. Failure to see distinct pixels may indicate you have a defective video amplifier, focus correction circuit, or picture tube.

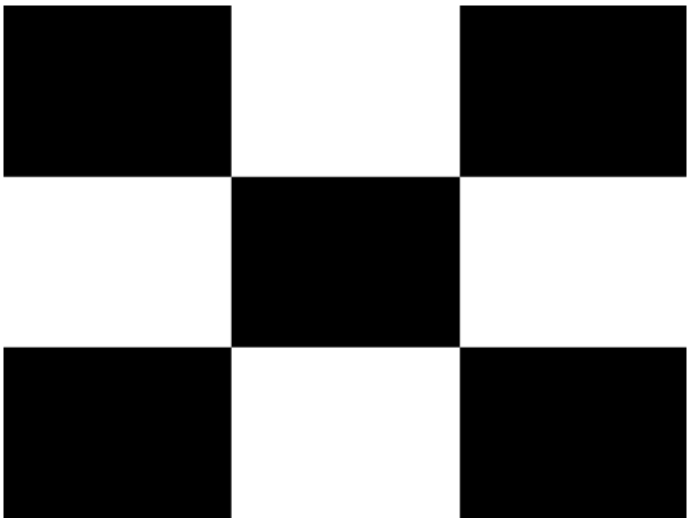
Note: *If multi-colored areas appear on a mask-type color picture tube, you may have a problem with convergence or you may be exceeding the resolution of the picture tube.*

16.26 CheckBy3

16.26.1Description

The active video area is equally divided into a 3x3 checkerboard of black and white boxes.

The primary version has four white boxes as shown in the image below. The secondary version has five white boxes (reverse).



16.26.2Test

Contrast ratio.

16.26.3Purpose

The pattern is based on a proposed ANSI method of measuring the contrast ratio of video projection systems.

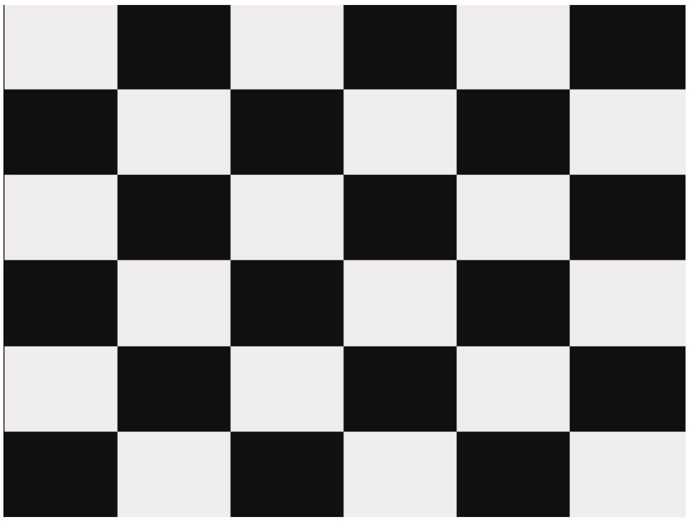
Method Using a light meter probe, measure and record the light-level reading (in foot lamberts) in the center of each of the black and white boxes. The contrast ratio is expressed as the average of all of the white readings divided by the average of all of the black readings.

16.27 CheckBy6

16.27.1Description

The active video area is equally divided into a 6x6 checkerboard of black and white boxes.

The primary version has four white boxes as shown in the image below. The secondary version has five white boxes (reverse).



16.27.2Test

Contrast ratio.

16.27.3Purpose

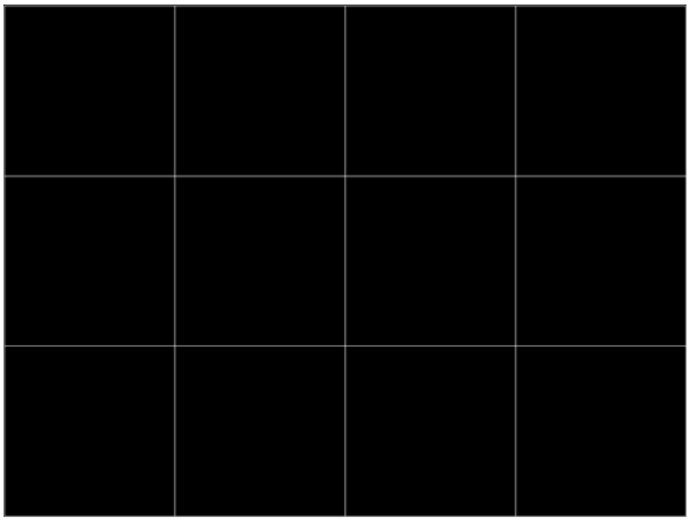
The pattern is based on a proposed ANSI method of measuring the contrast ratio of video projection systems.

Method Using a light meter probe, measure and record the light-level reading (in foot lamberts) in the center of each of the black and white boxes. The contrast ratio is expressed as the average of all of the white readings divided by the average of all of the black readings.

16.28 Check_02

16.28.1Description

Primary version is shown below. The secondary version has reverse (black lines on white background).



16.29 Check_11

16.29.1Description

In the primary version, the active video area is filled with alternating black and white pixels that form a very fine checkerboard, as shown below. The secondary version inverts the colors in the image. The inverted image looks almost the same as the non-inverted version.

16.29.2Test

Verify monitor resolution.

16.29.3Purpose

The resolution of your monitor should meet or exceed the design specifications.

16.29.4 Method

Adjust the brightness, contrast, and focus to their correct settings first. You should be able to see individual and distinct pixels in each of the boxes. Failure to see distinct pixels may indicate you have a defective video amplifier, focus correction circuit, or picture tube.

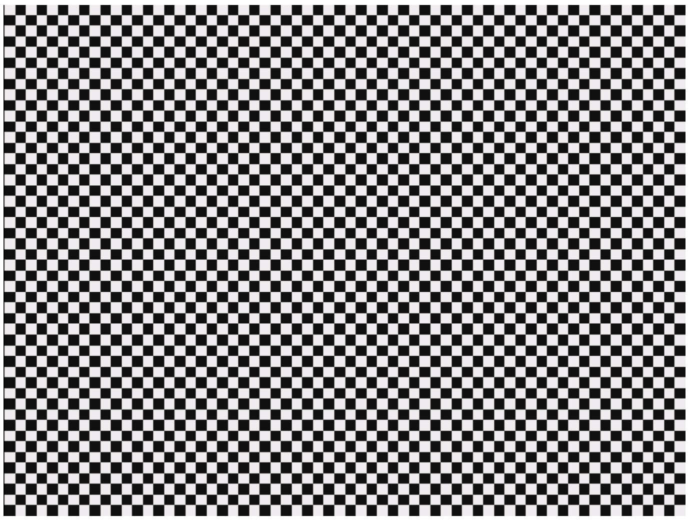
Note: *If multi-colored areas appear on a mask-type color picture tube, you may have a problem with convergence, or you may be exceeding the resolution of the picture tube.*

16.30 Checkers

16.30.1Description

This image has two color checker type arranged in a checker board pattern. It enables you to show a contrast of color depth for each type of checker type. For example you can specify one tile to use 12 bit deep color and the other checker tile to use 10 bit color. You can then view the image and see whether distinquish between the two checker types. You need to set the pixel depth in the generator to 24 bit (PELD = 32) in order to access 512 grayscale or color levels for each tile for a single image rendered on a display.

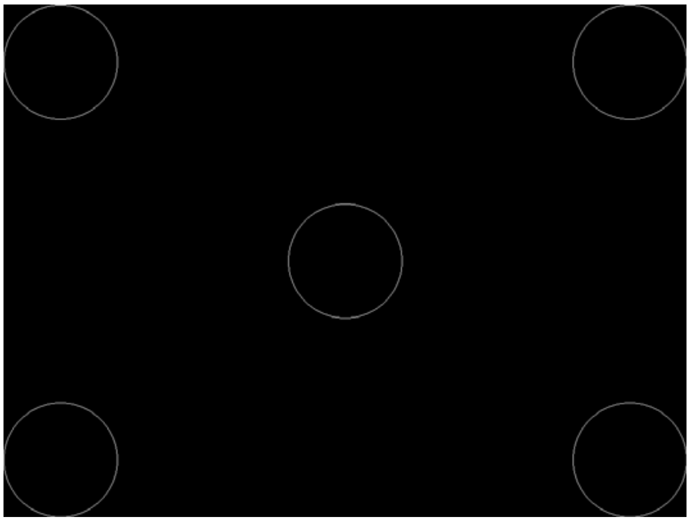
The following is a sample of the Checkers image is rendered on a display.



16.31 CirclesL

16.31.1 Description

Special test image developed per customer specifications. In the primary version (shown below), the image consists of five large white circles on a black background. The circles are positioned in the center and in the corners of the active video area. The secondary version inverts the image to black circles on a white background.



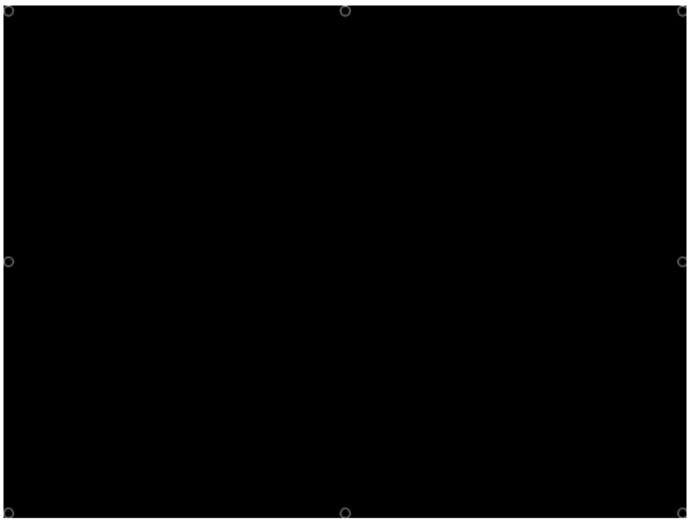
16.31.2 Purpose

This pattern is specified by some monitor manufacturers for checking and adjusting video scan size, linearity, and over scanning.

16.32 CirclesS

16.32.1 Description

Special test image developed per customer specifications. In the primary version (shown below), the image consists of eight small white circles on a black background. The circles are positioned in the corners of the active video area and centered on each edge of the active video area. The secondary version inverts the image to black circles on a white background.



16.32.2 Purpose

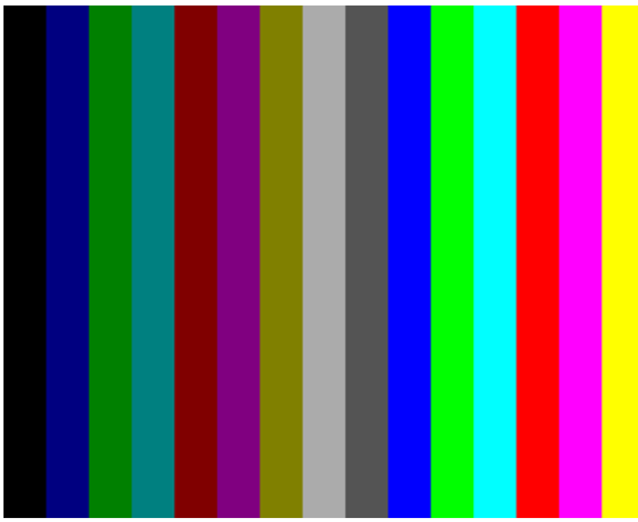
This pattern is specified by some monitor manufacturers for checking and adjusting video scan size, linearity, and over scanning.

16.33 ColorBar

16.33.1 Description

The primary version (shown below) has 16 full-height vertical color bars. The secondary version splits the field into a top and bottom half. The bars in the bottom half of the screen are in reverse order.

Note: *When outputting digital video, 33% Gray changes to 50% Gray, and 67% Gray becomes either Black or some gray level depending on how the display interprets the video information.*



16.33.2 Test

Verify that all video channels are functional.

16.33.3 Purpose

To verify that none of the video channels are bad or connected incorrectly.

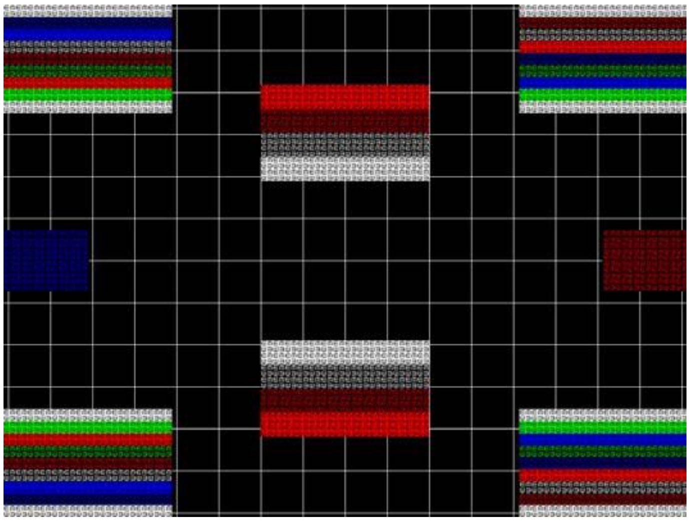
16.33.4 Method

Compare the sequence of color bars with the table. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Each bar should also be uniform in color and intensity across its entire width. Non-uniformity may indicate problems with the response of the video amplifiers. If all the bars are present but in the wrong order, one or more inputs may be swapped.

16.34 ComFocus

16.34.1 Description

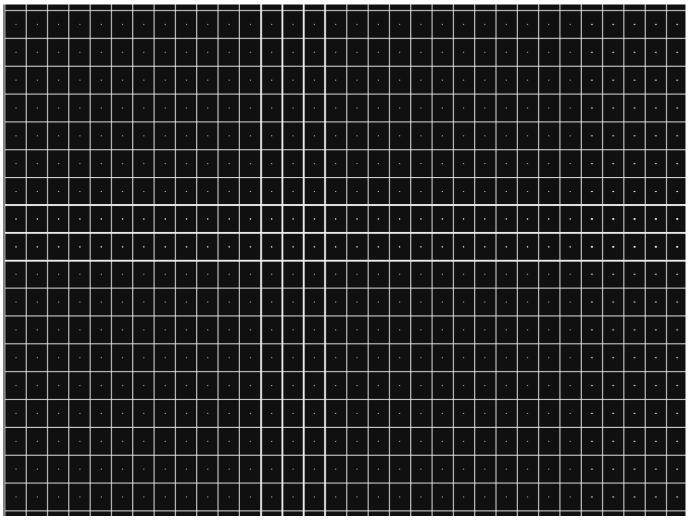
Special test image developed per customer specifications.



16.35 Crosshtch

16.35.1Description

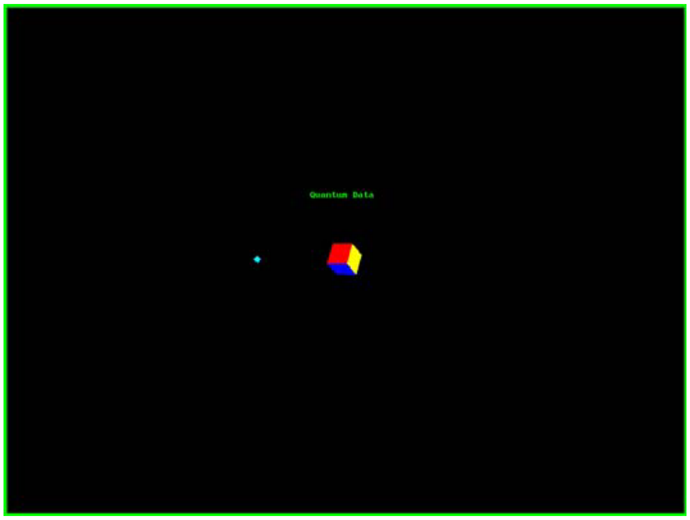
Use the following pattern to check and adjust geometric distortion, focus, beam shape, and convergence or color registration.



16.36 Cubes

16.36.1Description

This is an animated image consisting of one small multicolored cube orbiting around a larger multicolored cube. Each cube also is spinning on its own axis. The default text string is *Quantum Data*, which can be changed using commands. The primary version (shown below) has a black background and a thick green border. The secondary version uses a white background.



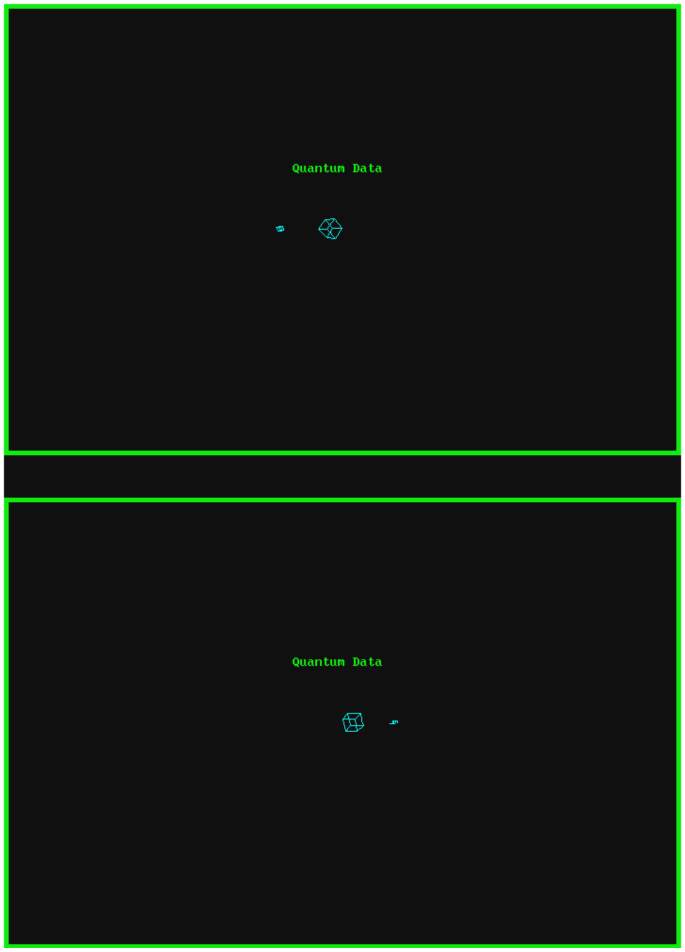
16.36.2Purpose

Can be used for show demonstrations with your own text.

16.37 CUBES3D

16.37.1Description

Test image for testing 3D motion.



16.38 DecodAdj

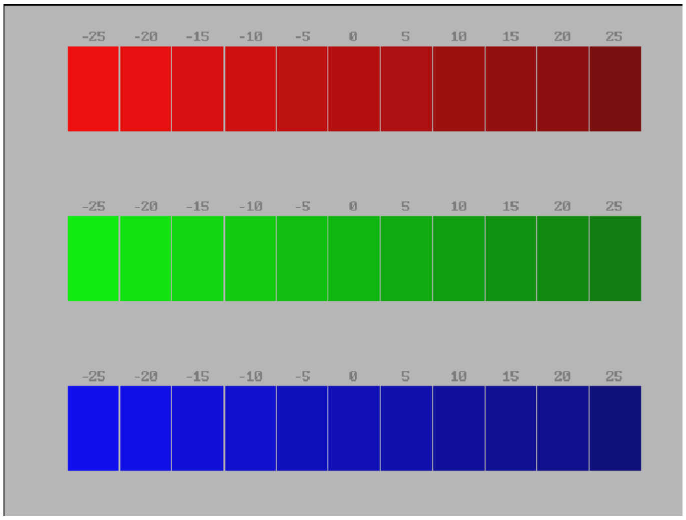
16.38.1Description

To check the color decoder performance to determine if the decoder over-emphasizes red or green colors.

16.39 DecodChk

16.39.1Description

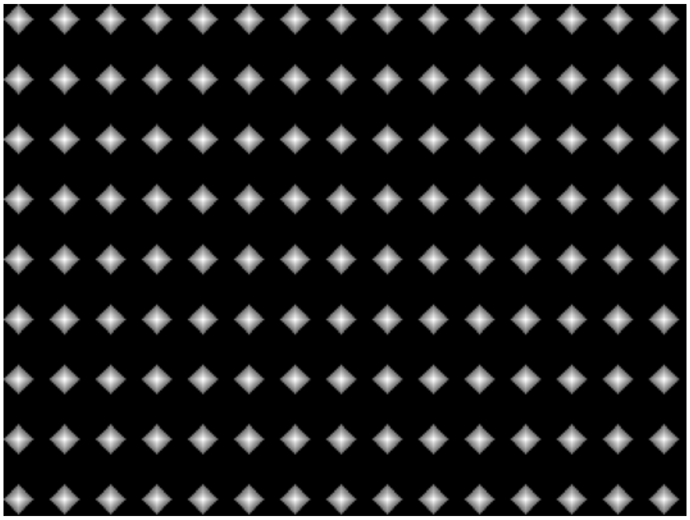
To check the color decoder performance to determine if the decoder over-emphasizes red or green colors.



16.40 Diamond1

16.40.1Description

Special test image developed per customer specifications.

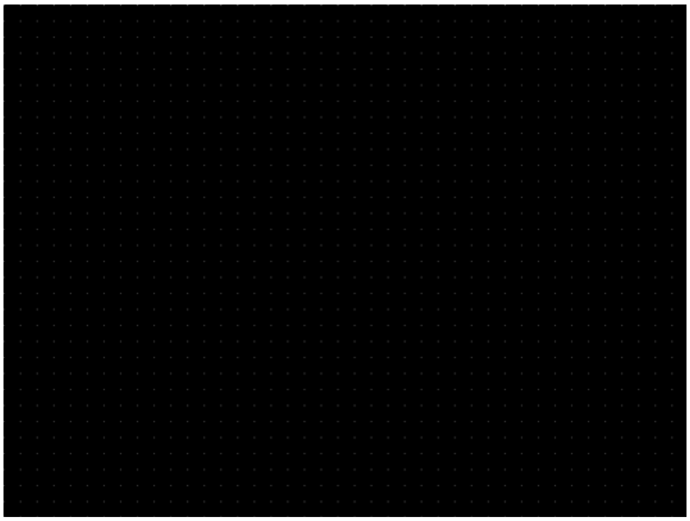


16.41 Dot1606, Dot1610, Dot1612, Dot1615, Dot1812, Dot1815, Dot2016

16.41.1 Description

The primary version has white pixel dots on a black background. The secondary version has black pixel dots on a white background.

The primary version of the Dot2016 image is shown below.



16.42 DOT_10,DOT_12,DOT24

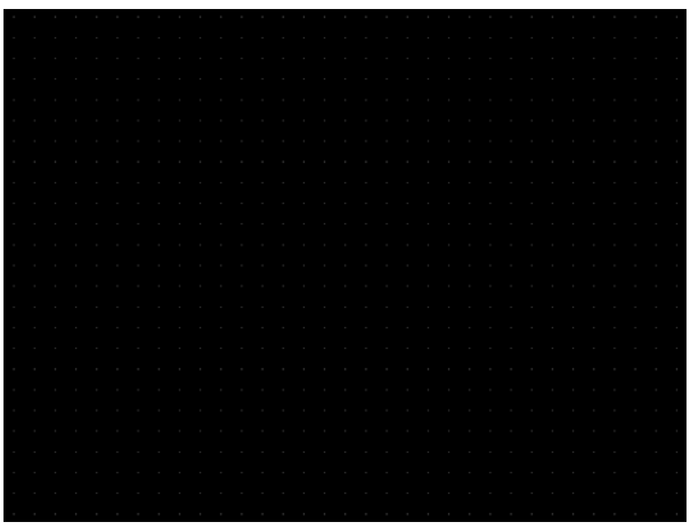
16.42.1Description

The active video area is filled with multiple rows of white, single pixel dots. The dots define the corners of what would appear to be square boxes if all connecting pixels were lit. The number of rows of boxes and the number of boxes per row depends on which version of the image is selected and the screen aspect ratio of the currently-loaded format. The number in the image’s name refers to the number of boxes that will be formed along the minor axis for most aspect ratios. The generator calculates the ratio and then finds the closest match from the following table.

Aspect Ratio		**Dot_10**		**Dot_12**		**Dot_24**	
W : H	Decimal	Number of Rows	Boxes per Row	Number of Rows	Boxes per Row	Number of Rows	Boxes per Row
16 : 9	1.777 É	10	16	10	16	18	32
5 : 3	1.666 É	10	16	10	16	18	30
4 : 3	1.333 É	10	14	12	16	24	32
1 : 1	1.000	10	10	12	12	24	24
	0.750	14	10	16	12	[illegible]	[illegible]

The primary version has white pixel dots on a black background. A secondary version has black pixel dots on a white background.

The primary version of the Dot_24 image is shown below.



16.42.2Purpose

To accurately produce an image on a color monitor, the three electron beams in the CRT must meet (converge) at the same location at the same time. Small dots displayed on a misconverged monitor appear as a group of multi-colored dots.

16.42.3Method

The convergence adjustments of most color monitors fall into two main categories. The first set of adjustments, usually called Static Convergence, aligns the three beams in the center of the display. This method involves turning on all three guns and adjusting the various magnets on the convergence assembly to produce all white dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may each require their own magnet-adjustment sequence.

After the center of the display is properly converged, the outer areas are adjusted by using the monitor's Dynamic Convergence controls. The number of controls, the area of the screen they affect, and their adjustment procedure depends on the monitor under test.

16.42.4Test

Focus adjustments.

16.42.5Purpose

An out-of-focus monitor displays fuzzy pixels which, in turn, result in poorly formed and hard-to-read characters.

16.42.6Method

On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations should be within specified limits.

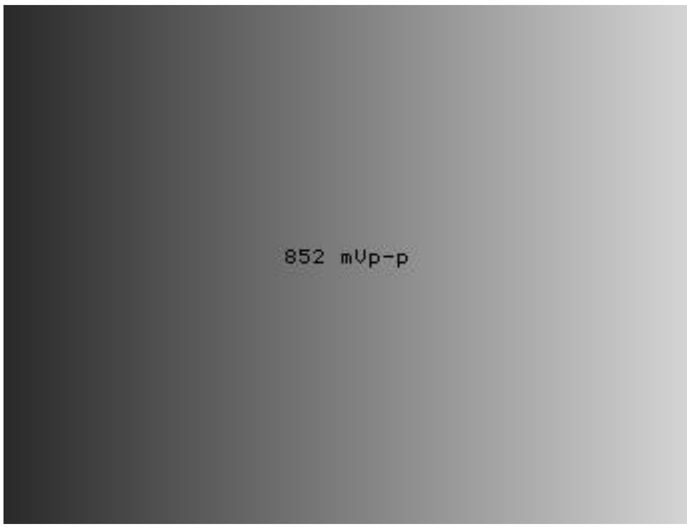
Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen they affect depend on the monitor under test.

16.43 DV_Swing, DVSwing2

16.43.1Description

This image is only available with DVI and HDMI. The DV_Swing image is used to temporally change the digital video swing (DVSS format parameter) between 90 and 1620 mVp-p of the HDMI and DVI digital output for the active format. This image displays the current video swing value over a graduated (ramp) background. This image is supported by HDMI boards (revision F or later), and DVI boards with FPGA F1 or later.

Note: *The DVSC command can be used to set the swing value between 150 and 1500 mVp-p.*



16.43.2Method

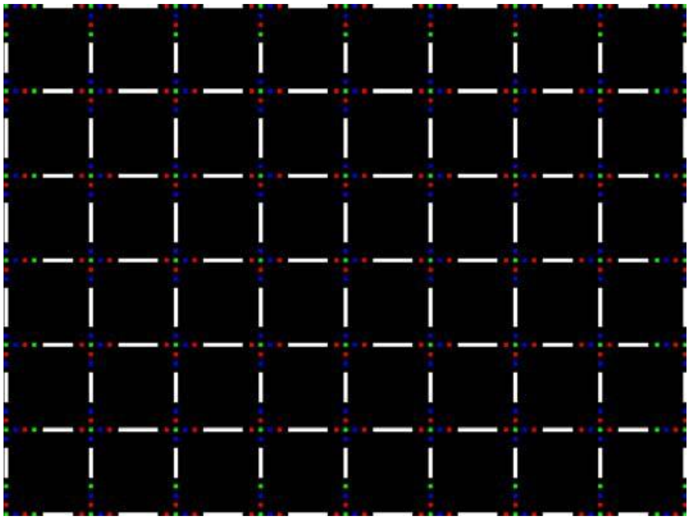
To adjust the swing in 6 mV increments, press the Contents key and then the Options key.

You then enable More and use the +/- increment keys to proceed through the subimages.

16.44 Dyna

16.44.1Description

This image has multiple versions that display different sizes of the same pattern. Version 0 is shown below.



16.44.2Description

Displays EDID from the display connected with the generator.

16.45 EdidData, Edid2

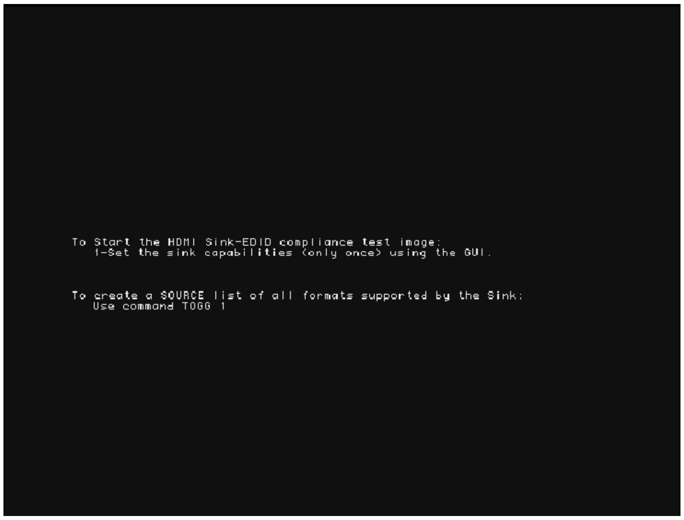
16.45.1 Description

Displays EDID from the display connected with the generator.

16.46 EdidHdmi1, EdidHdmi2

16.46.1Description

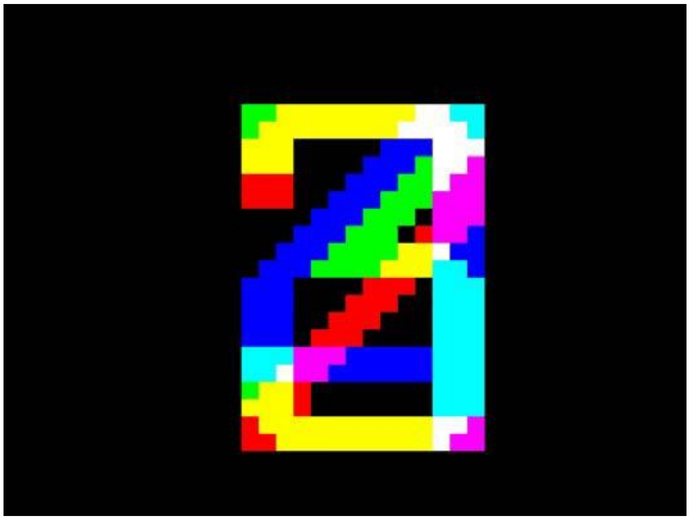
Displays EDID from the HDMI display connected with the generator.



16.47 Elbit

16.47.1Description

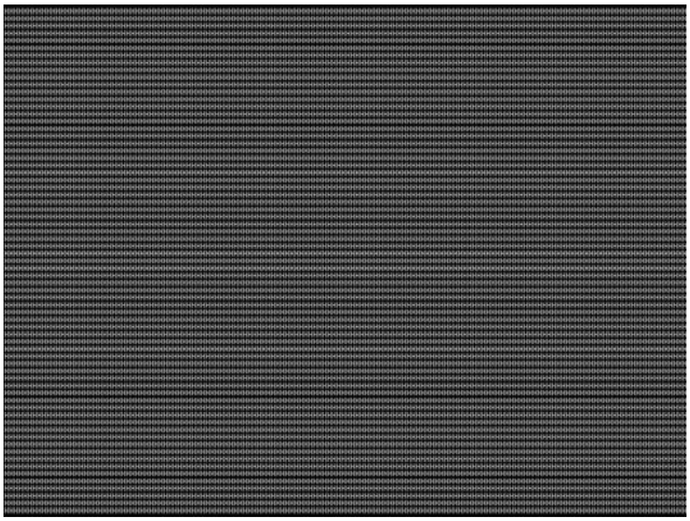
Special test image developed per customer specifications. This image has 19 versions.



16.48 EMITest1 , EMITest3 , EMITest3 , EMITest4 , EMITest5

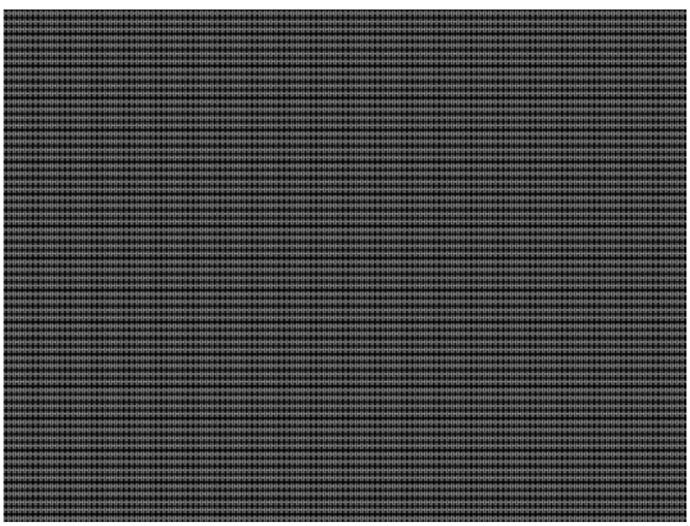
16.48.1Description

Special test images used for electro-magnetic interference (EMI) testing of displays. The entire active video area is filled with an “H” character. The primary versions of these images draw white characters on a black background. The secondary versions draw black characters on a white background. The EMITest1 image is shown below.



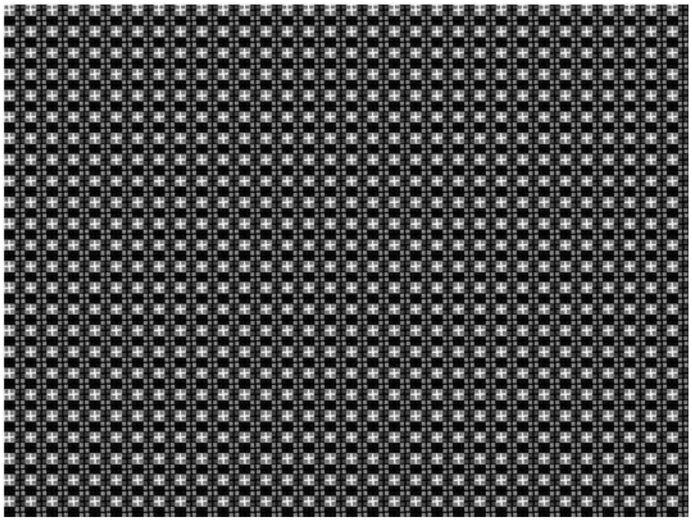
The EMITest2 image is the same as EMITest1, but with the bottom row of characters constantly drawn left-to-right and then cleared.

The EMITest3 image is the same as EMITest1, but with a larger version of the “H” character.



The EMITest4 image is the same as EMITest3, but with the bottom row of characters constantly drawn left-to-right and then cleared.

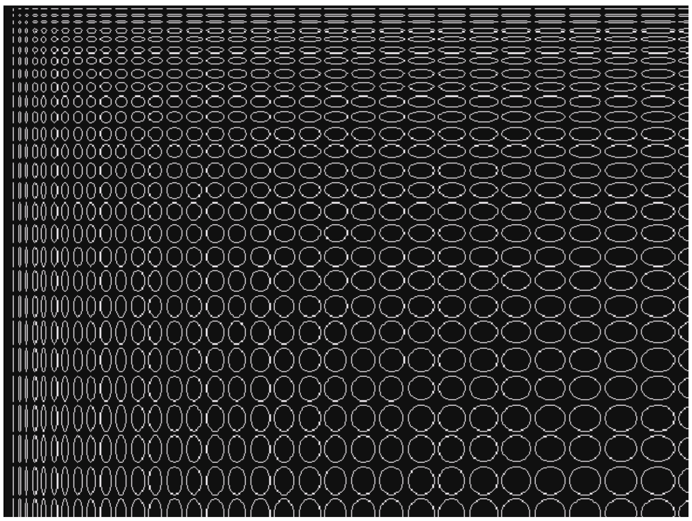
The EMITestS image is shown below.



16.49 Examples

16.49.1Description

Special test images used for electro-magnetic interference (EMI) testing of displays. The entire active video area is filled with an “H” character. The primary versions of these images draw white characters on a black background. The secondary versions draw black characters on a white background. The EMITest1 image is shown below.



16.50 Flat, Flat07, Flat13, Flat20, Flat27, Flat33, Flat40, Flat47, Flat53, Flat60, Flat67, Flat73, Flat80, Flat87, Flat93, FlatGray, Flat_01, Flat_02, Flat_03, Flat_04, Flat_05, Flat_06, Flat_07, Flat_08, Flat_09, Flat_10, Flat_11, Flat_12, Flat_13, Flat_14, Flat_15, Flat_16

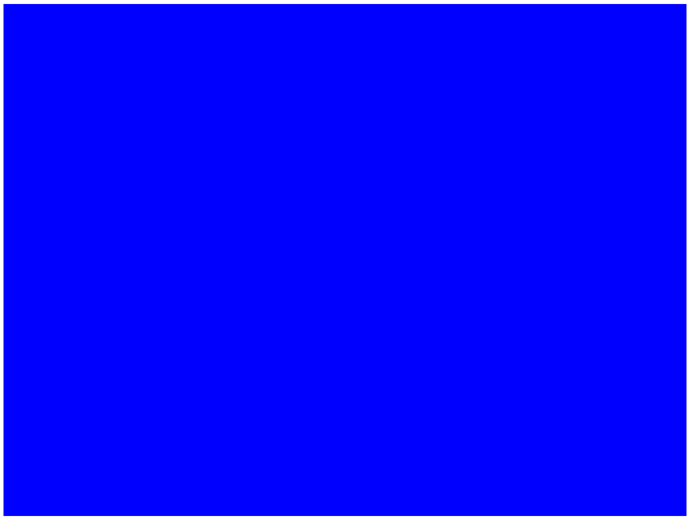
16.50.1 Description

The entire active video area is filled with a shade of gray. Each image displays a different shade of gray. The FlatGray image is shown below.

16.51 Flat_B, Flat_G, Flat_R

16.51.1 Description

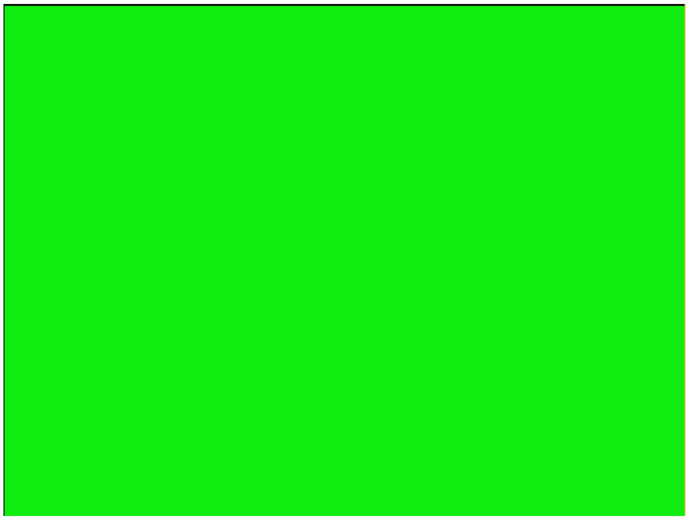
The screen is filled with blue (B), green (G) or red (R). The Flat_B image is shown below.



16.52 FlashRGB

16.52.1 Description

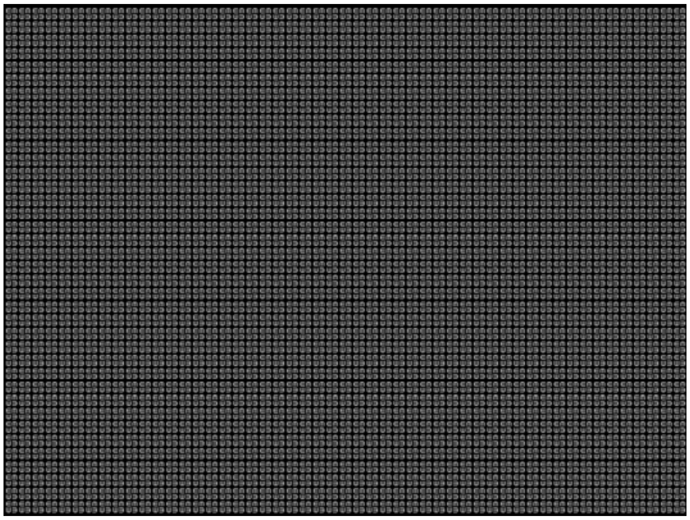
The screen is filled with blue (B), green (G) or red (R).



16.53 Focus20

16.53.1 Description

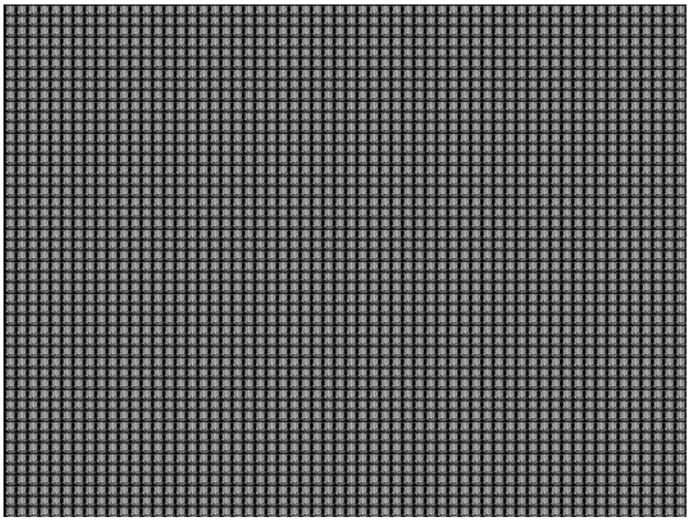
Primary version shown below. The secondary version has black characters on a white background.



16.54 FocusC14

16.54.1 Description

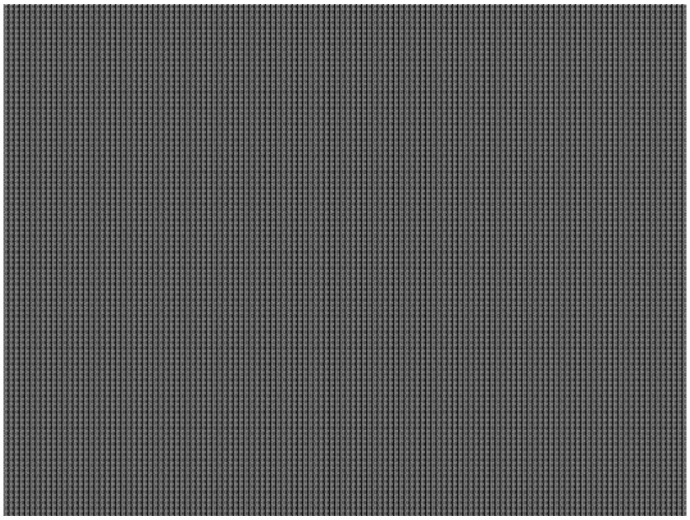
Primary version shown below. The secondary version has black characters on a white background.



16.55 FocusCCx

16.55.1 Description

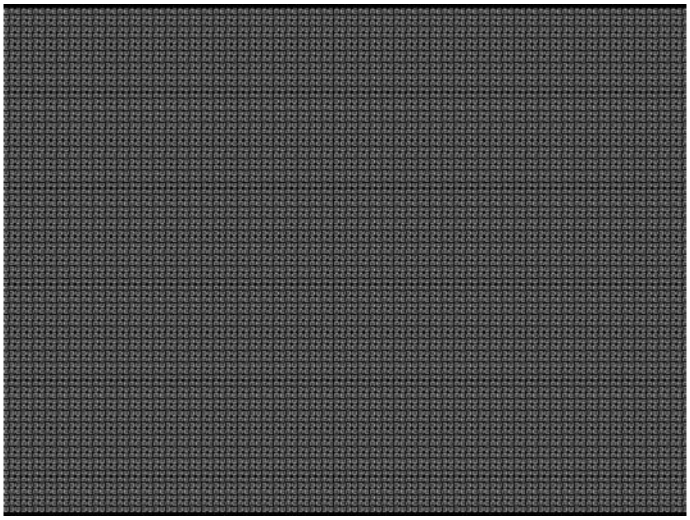
Primary version shown below. The secondary version has black characters on a white background.



16.56 FocusEM

16.56.1Description

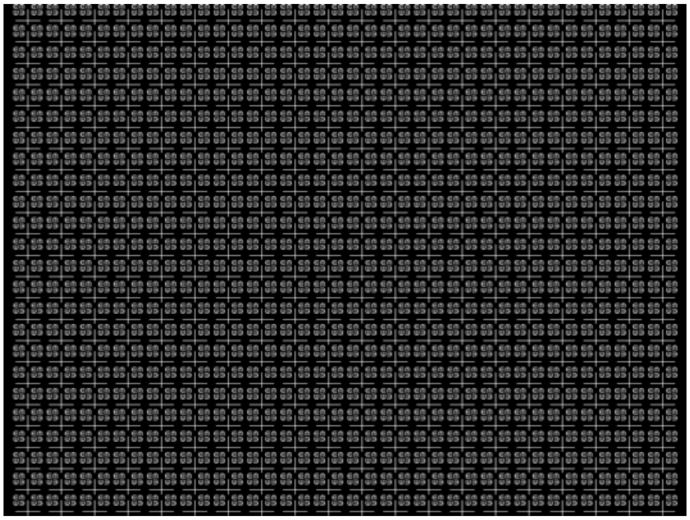
Primary version shown below. The secondary version has black characters on a white background.



16.57 FocusEMP

16.57.1 Description

Primary version shown below. The secondary version has black characters on a white background.



16.58 FocusM00 - FocusM15

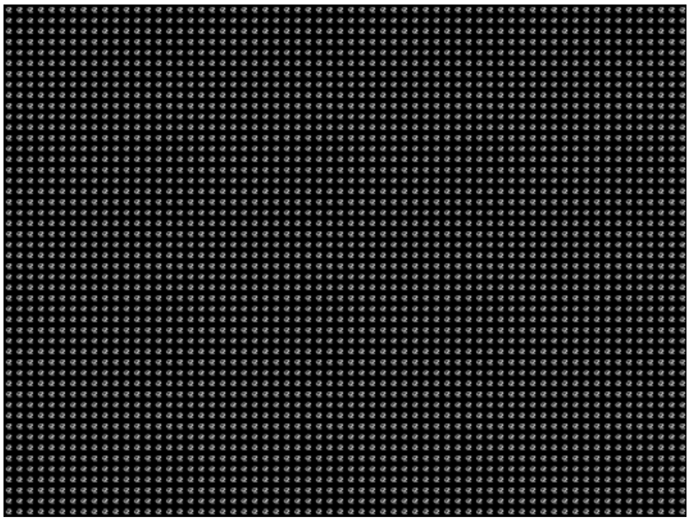
16.58.1 Description

The FocusM00 image is shown below.

16.59 Focus_@6, Focus_@7, Focus_@8, Focus_@

16.59.1Description

In the primary versions, the screen is filled with white “@” characters on a black background. The secondary versions are drawn with black characters on a white background. The primary version of the Focus_@6 image is shown below.



16.59.2Test

Focus adjustments.

16.59.3Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read text characters.

16.59.4Method

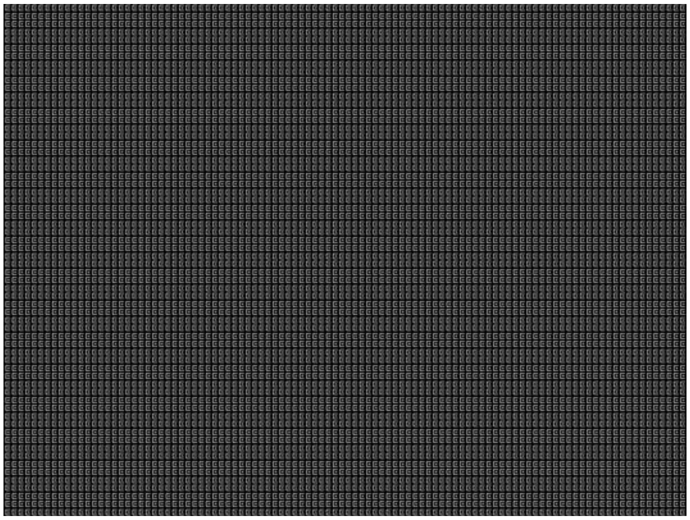
On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect depend on the monitor under test.

16.60 Focus_Cx

16.60.1Description

In the primary version (shown below), the screen is filled with white Cx characters on a black background. The secondary version is drawn with black characters on a white background.



16.60.2Test

Focus adjustments.

16.60.3Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read text characters.

16.60.4 Method

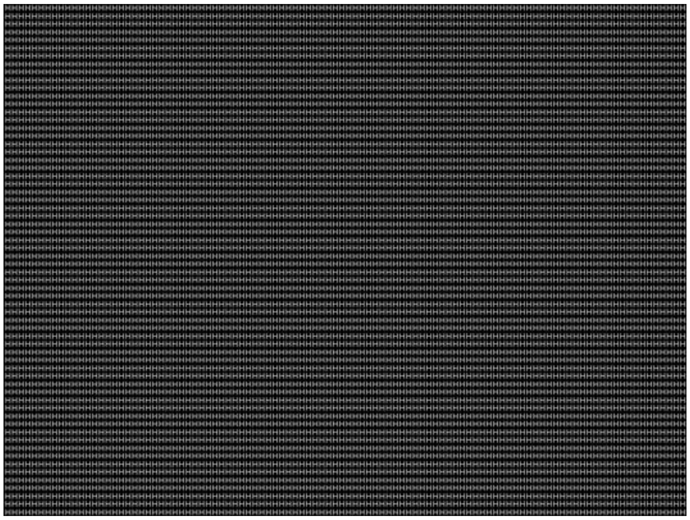
On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect depend on the monitor under test.

16.61 Focus_H

16.61.1Description

In the primary version (shown below), the screen is filled with white H characters on a black background. The secondary version is drawn with black characters on a white background.



16.61.2Test

Focus adjustments.

16.61.3Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read text characters.

16.61.4 Method

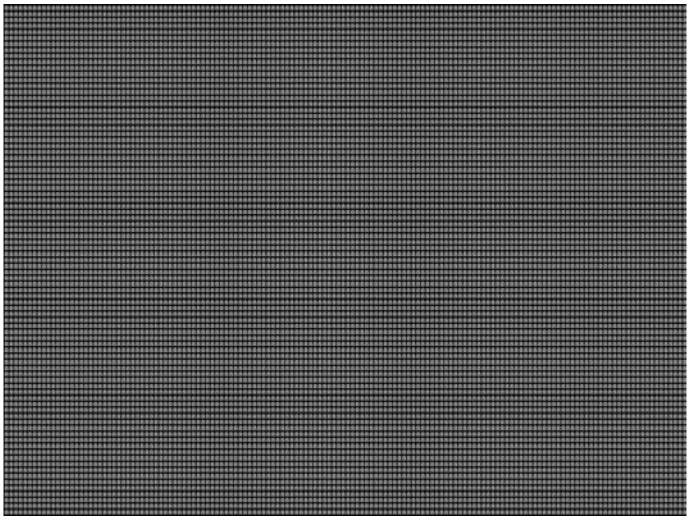
On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect depend on the monitor under test.

16.62 Focus_MM

16.62.1Description

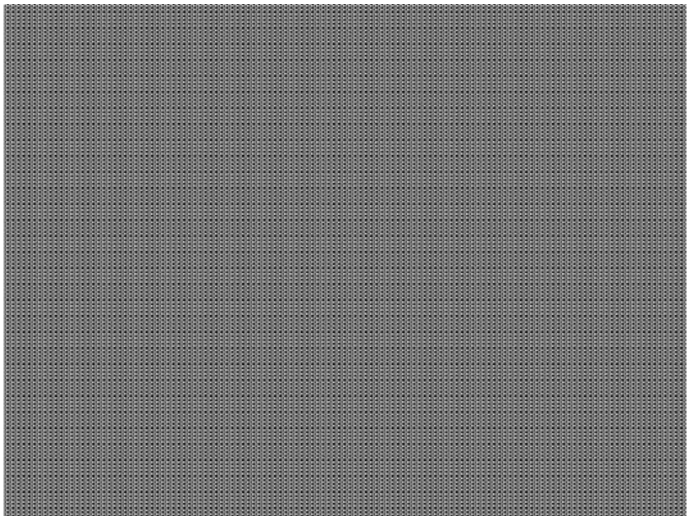
In the primary version (shown below), the screen is filled with white M characters on a black background. The secondary version is drawn with black characters on a white background.



16.63 Focus_Oo

16.63.1 Description

In the primary version (shown below), the screen is filled with white Oo characters on a black background. The secondary version is drawn with black characters on a white background.



16.63.2 Test

Focus adjustments.

16.63.3 Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read text characters.

16.63.4 Method

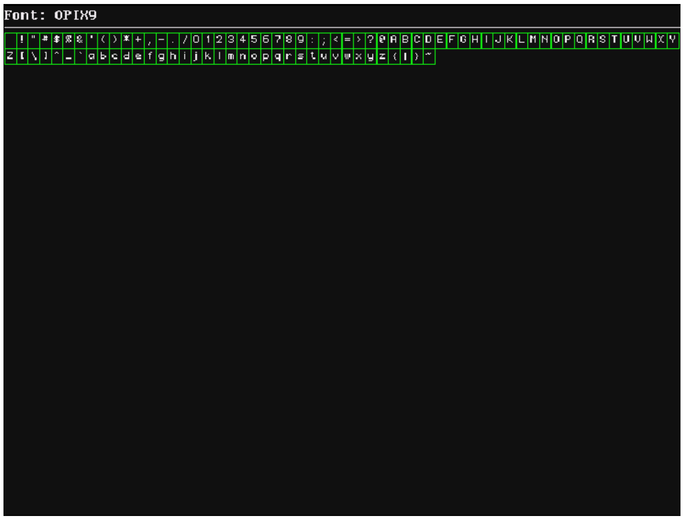
On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect depend on the monitor under test.

16.64 FontViewer

16.64.1 Description

A listing of the data contained in any format. The primary image lists the settings of the format driving the display. The secondary image can be used to list the contents of any stored format (via the Location field).

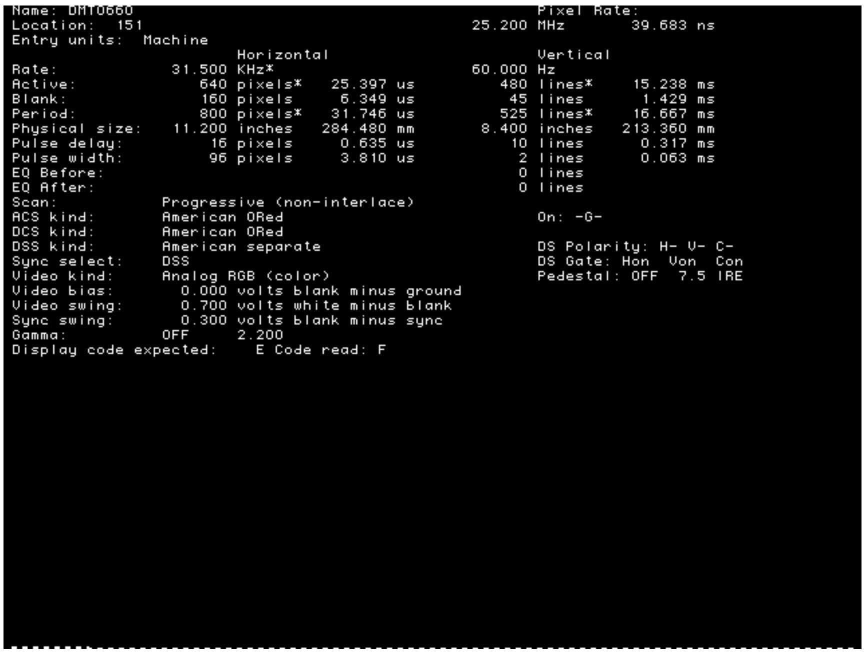


16.65 Format

16.65.1 Description

A listing of the data contained in any format. The primary image lists the settings of the format driving the display. The secondary image can be used to list the contents of any stored format (via the Location field).

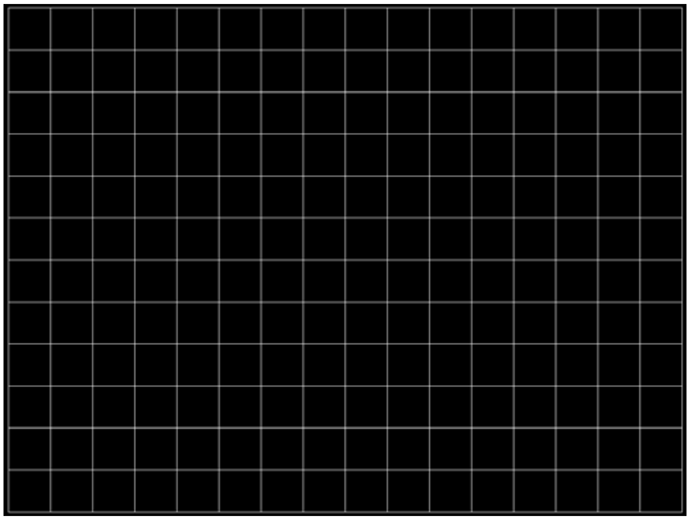
This pattern works best at display resolutions of at least 640 pixel by 480 lines.



16.66 Geom_1 – Geom_5

16.66.1Description

The primary version of the Geom_1 image is shown below. Secondary version is drawn with black lines on a white background.



16.67 Gray25, Gray40

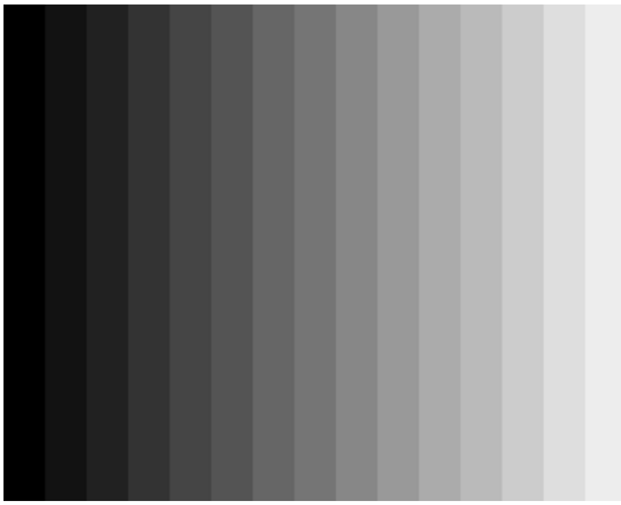
16.67.1 Description

The Gray25 image is shown below.

16.68 GrayBar

16.68.1Description

The primary version (shown below) has 16 full-height vertical graybars. The intensity of the bars is shown below. The secondary version splits the field into a top and bottom half. The bars in the bottom half of the screen are in reverse order.



16.68.2Test

Video color tracking (color monitors)

16.68.3Purpose

To verify that a color monitor accurately reproduces colors at all intensities.

16.68.4Method

Perform the Brightness Control Adjustment and Brightness Uniformity tests first.

Changes in brightness from bar to bar should be uniform. All of the bars should appear as an untinted gray at all levels.

16.68.5Test

Video gain linearity (monochrome monitors)

16.68.6 Purpose

To check the video linearity (grayscale) modulation)

16.68.7Method

Perform the Brightness Control Adjustment and Brightness Uniformity tests first.

Changes in brightness from bar to bar should be visible and uniform.

16.69 GrayL1, GrayL3

16.69.1Description

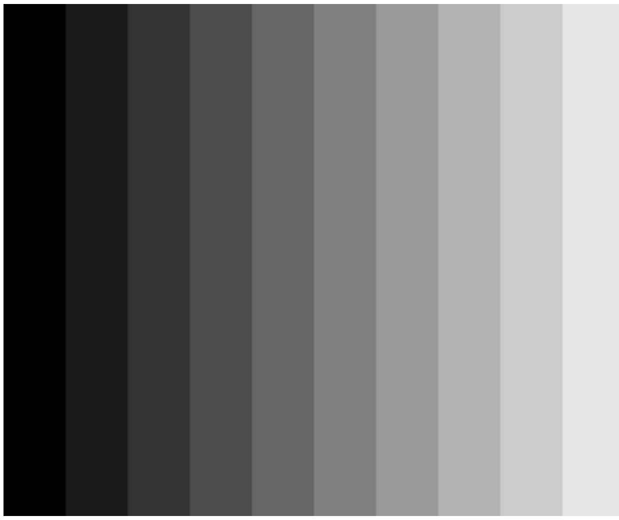
The GrayL1 image is shown below.

16.70 Grays5, Grays9, Grays11, Grays16, Grays32, Grays64

16.70.1 Description

These images have the designated number of full-height vertical graybars.

The Grays11 image is shown below.



16.71 GraysAll

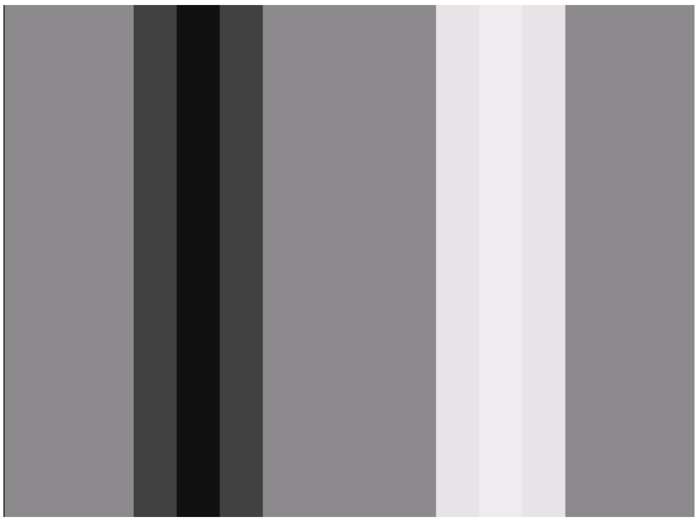
16.71.1 Description

Contains 256 grayscale versions, from 0 (full black) to 255 (full white).

16.72 GraysMHL

16.72.1Description

Contains 256 grayscale versions, from 0 (full black) to 255 (full white).



16.73 Gray_PIC

16.73.1 Description

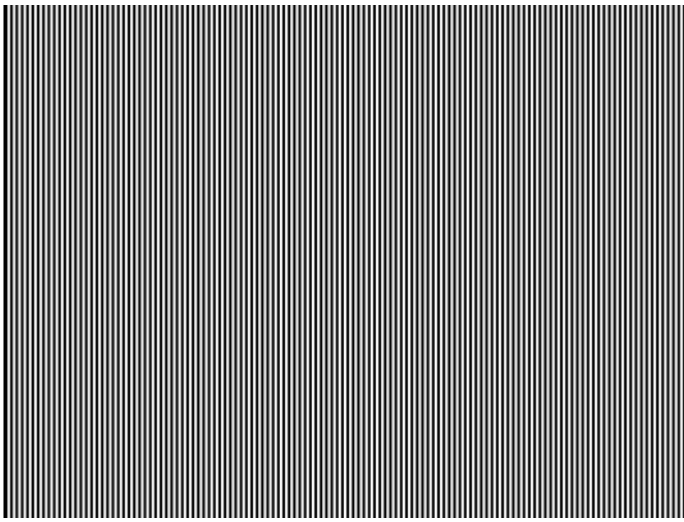
A solid gray box fills the active video area.

16.74 Grill_11, Grill_15, Grill_22, Grill_33, Grill_44

16.74.1Description

The entire active video area is filled with alternating black and white stripes. The stripes are drawn at different resolutions. Each of the stripes is four (4) pixels wide in the Grill_44 image and three (3) pixels wide in the Grill_33 image. Each of the stripes is two (2) pixels wide in the Grill_22 image and one (1) pixel wide in the Grill_11 image.

The primary versions draw vertical stripes. The secondary versions draw horizontal stripes. The primary version of the Grill_44 image is shown below.



16.74.2Test

Verify monitor resolution.

16.74.3Purpose

The resolution of your monitor should meet or exceed the design specifications.

16.74.4Method

First adjust the brightness, contrast, and focus to their correct settings. You should be able to see individual and distinct stripes in all areas of the display at all four resolutions. Failure to see distinct lines at the highest resolution (Grill_11) may indicate you have a defective video amplifier or picture tube.

Note: *If multi-colored lines appear on a mask-type color picture tube, you may have a problem with convergence or you may be exceeding the resolution of the picture tube.*

16.75 GRN_EM, GRM_EM+, GRN_HTCH, GRN_PIC

16.75.1Description

In the primary version, the screen is filled with green (GRN) character blocks on a black background. Only the white character has a secondary version. It is drawn with black characters on a white background.

16.76 H_Stair

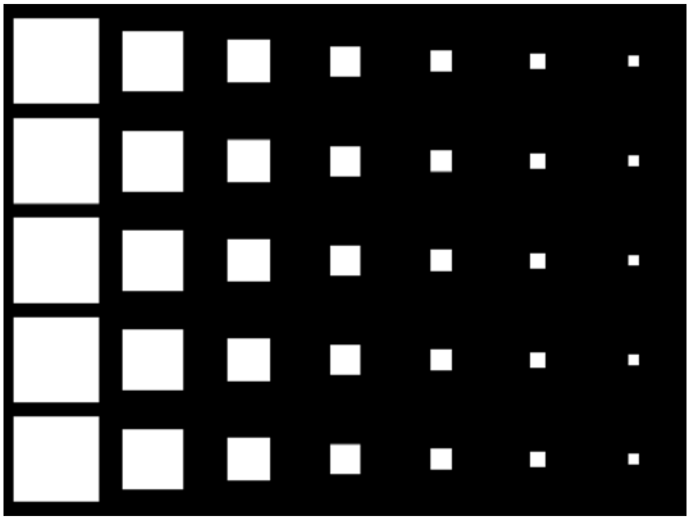
16.76.1 Description

The active video area goes from full black at the bottom edge of the screen to full white at the top edge.

16.77 HalfArea

16.77.1 Description

Primary version shown below. Secondary version is drawn with black boxes and white background.



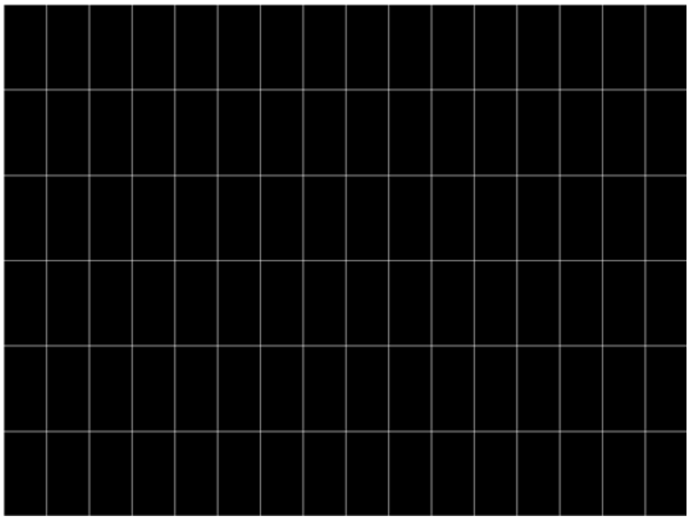
16.78 HalfClk

16.78.1 Description

16.79 Hat1606, Hat1610, Hat1612, Hat1615

16.79.1 Description

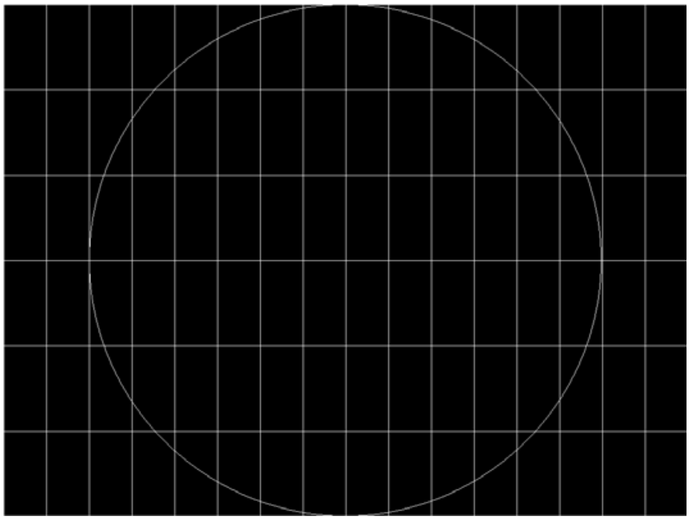
Primary version of Hat1606 is shown below. Secondary version is inversed.



16.80 Hat1606A, Hat1610A, Hat1612A, Hat1615A

16.80.1 Description

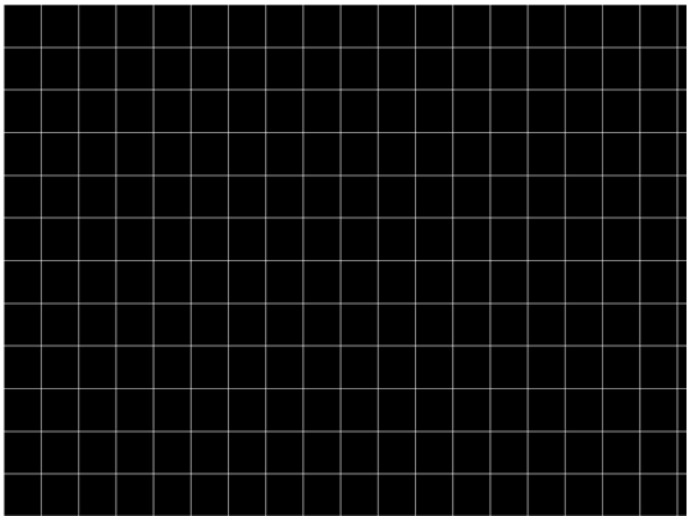
Primary version of Hat1606A is shown below. Secondary version is inversed.



16.81 Hat1812, Hat1815

16.81.1Description

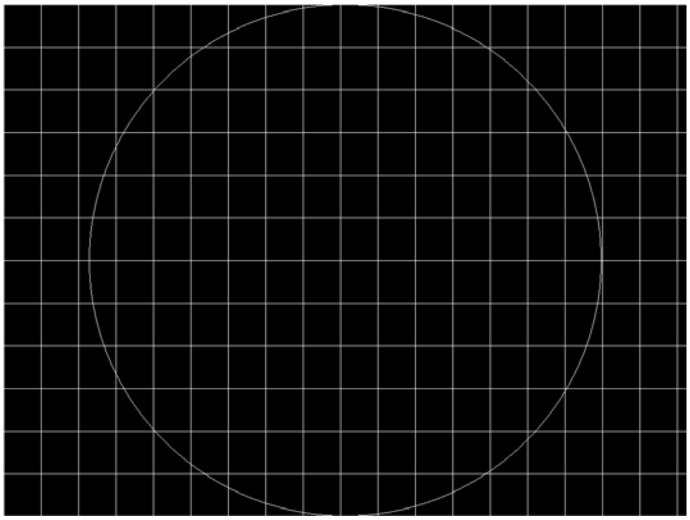
Primary version of Hat1812 is shown below. Secondary version is inversed.



16.82 Hat1812A, Hat1815A

16.82.1 Description

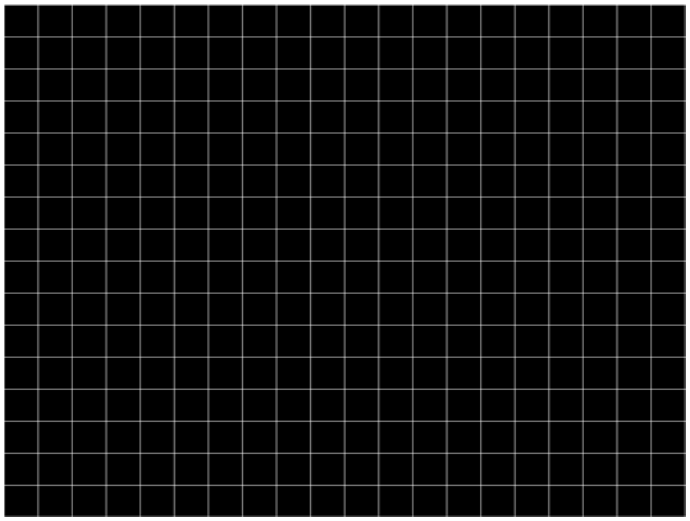
Primary version of Hat1812A is shown below. Secondary version is inversed.



16.83 Hat2016

16.83.1Description

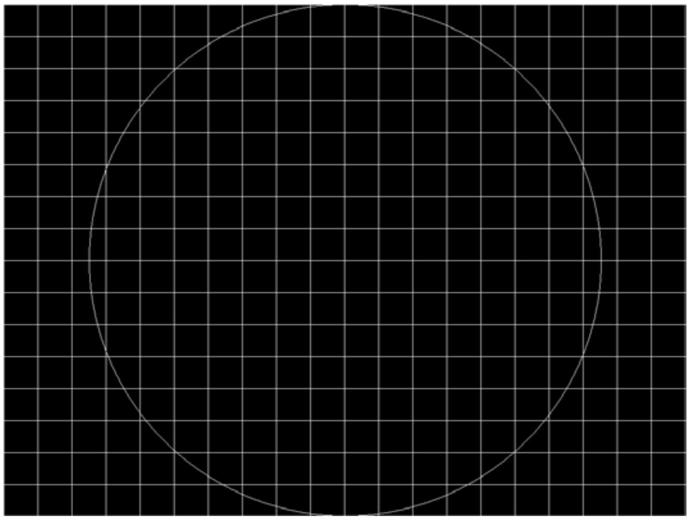
Primary version is shown below. Secondary version is inversed.



16.84 Hat2016A

16.84.1 Description

Primary version is shown below. Secondary version is inversed.



16.85 Hatch_6, Hatch_10i, Hatch_10o, Hatch_12i, Hatch_12o, Hatch_24i, Hatch_24o, Hatch_24s, Hatch_G, Hatch_M, GRN_HTCH, and MAGENTA

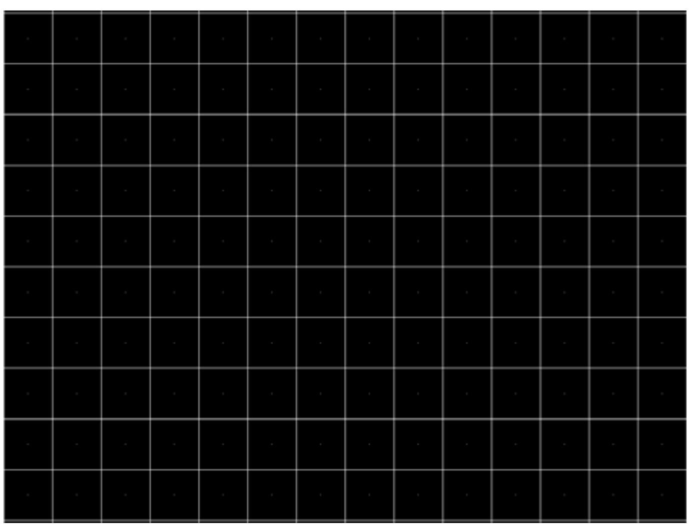
16.85.1 Description

The primary versions consist of a white, green (G and GRN), or magenta (M) crosshatch drawn on a black background. The lines form square boxes. A single pixel dot is located in the center of each crosshatch box. The number of boxes formed depends on the version of the image selected and the screen aspect ratio of the currently loaded format. The number in the image's name refers to the number of boxes that are formed along the minor axis for most aspect ratios. The generator calculates the ratio and then finds the closest match from the table on the next page. Version names indicate the drawing method, as follows:

- Versions ending in "i" draw from the inside (center) out. Any partial boxes are placed around the perimeter of the image.
- Versions ending in "o" draw from the outside in. Any partial boxes are placed along the centerlines of the image.
- Versions ending in "s" are the "i" version plus a 1-pixel thick border.

The secondary versions invert the images to black lines and dots on a white background. Hatch_G, Hatch_M, GRN_HTCH and Magenta do not have secondary versions.

The primary version of the Hatch_10i image is shown below.



Aspect Ratio		Dot_10		Dot_12		Dot_24	
W : H	Decimal	Boxes Vertically	Boxes Horizon-tally	Boxes Vertically	Boxes Horizon-tally	Boxes Vertically	Boxes Horizon-tally
16 : 9	1.777 É	10	16	10	16	18	32
5 : 3	1.666 É	10	16	10	16	18	30
4 : 3	1.333 É	10	14	12	16	24	32
1 : 1	1.000	10	10	12	12	24	24

3 : 4	0.750	14	10	16	12	32	24

16.85.2Test

Convergence adjustment (color monitors only).

16.85.3Purpose

To accurately produce an image on a color monitor, the three electron beams in the CRT must meet (converge) at the same location at the same time. Lines displayed on a misconverged monitor appear as several multi-colored lines, and the transitions between different colored areas contain fringes of other colors.

16.85.4Method

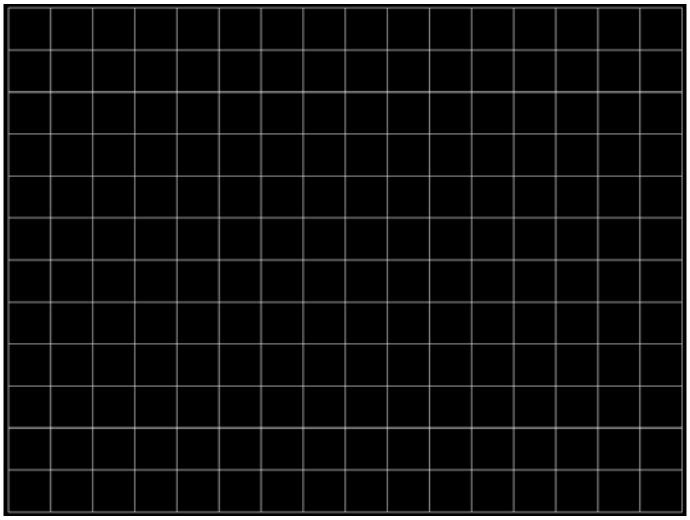
The convergence adjustments of most color monitors fall into two main categories. The first set of adjustments, usually called Static Convergence, aligns the three beams in the center of the display. This method involves turning on all three guns and adjusting the various magnets on the convergence assembly to produce all white dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may each require their own magnet adjustment sequence.

After the center of the display is properly converged, the outer areas are adjusted by using the monitor’s Dynamic Convergence controls. The number of controls, the area of the screen they affect, and their adjustment procedure depends on the monitor under test.

16.86 Hatch_16, Hatch_20

16.86.1 Description

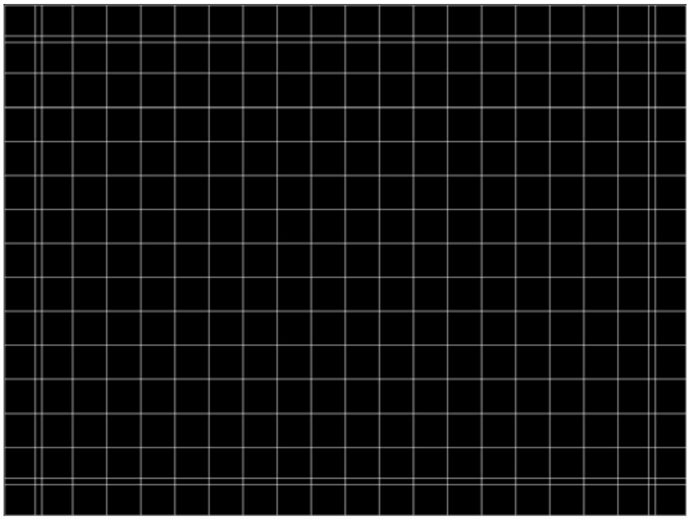
The primary version of the Hatch_16 image is shown below. The secondary versions draw black lines on a white background.



16.87 Hatch20

16.87.1 Description

Primary version shown. The secondary version draws black lines on a white background.

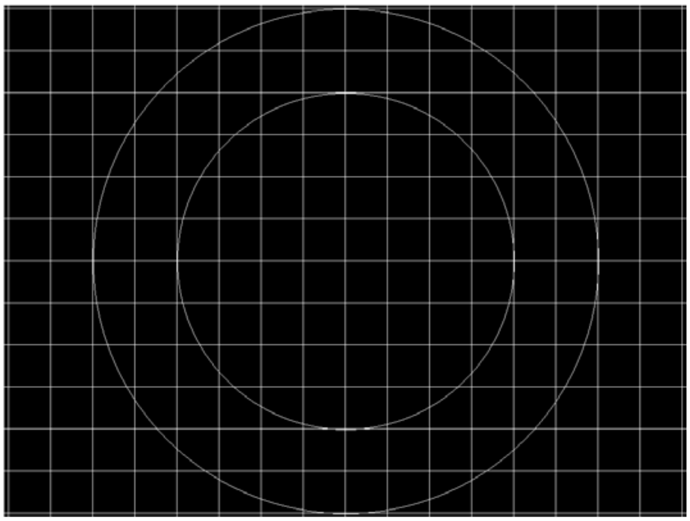


16.88 Hatch4x3, Hatch5x4 and Hatch8x8

16.88.1Description

These are different versions of a crosshatch pattern that may be called for by some display manufacturers' test procedures. The primary version consists of white crosshatch and circles on a black background. The secondary version inverts the image to black lines on a white background.

The primary version of the Hatch4x3 image is shown below.



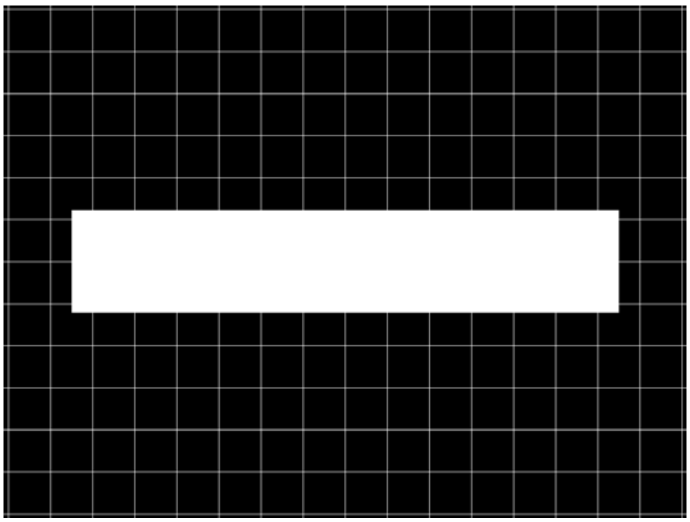
16.88.2Purpose

This is a general purpose test image that can be used to check and adjust video scan linearity and geometry and color convergence.

16.89 Hatch64W

16.89.1Description

This is a crosshatch pattern that may be called for by some manufacturers' test procedures. The primary version (shown below) consists of an 8x8 white crosshatch on a black background. A white rectangular patch is added in the center. The secondary version inverts the image to black lines and box on a white background.



16.89.2Purpose

Method This is a general purpose test image that can be used to check and adjust video scan linearity and geometry, and color convergence. The large white rectangle also allows for checking a display's high voltage regulation. This is done by observing the vertical lines at the left and right edges of the image. They should be fairly straight and not pull in the area of the white rectangle.

16.90 HdcpProd, Hdcp2

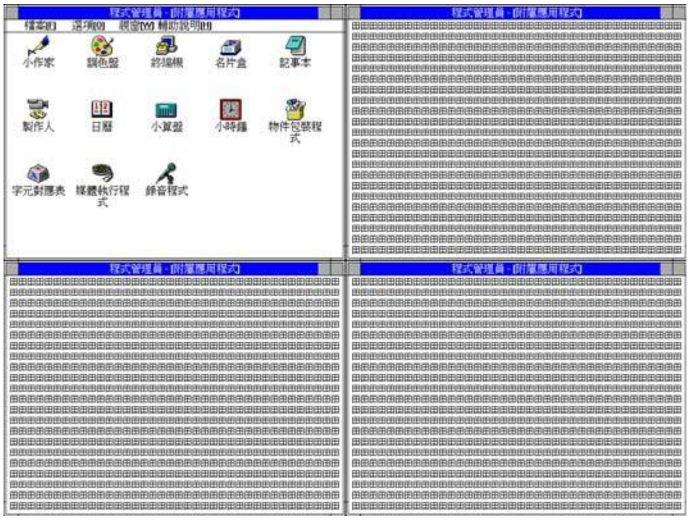
16.90.1 Description

Used with HDCP feature.

16.91 Hitatchi

16.91.1 Description

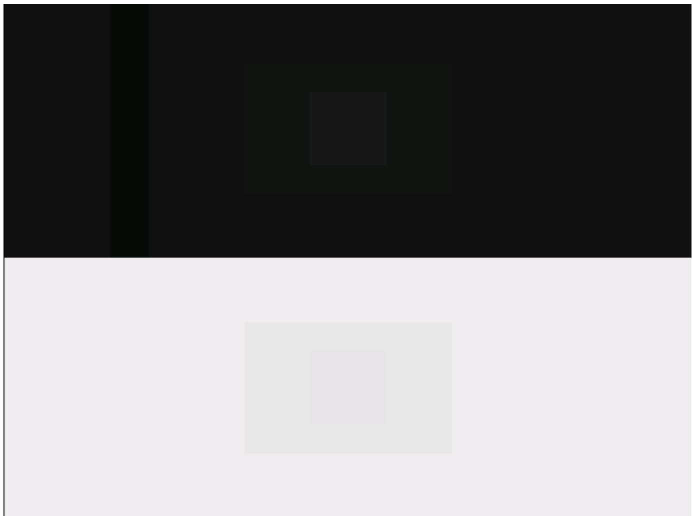
Special test image developed per customer specifications. The image consists of a 2x2 cluster of Microsoft Windows® screen simulations using Japanese characters.



16.92 HiLoTrk

16.92.1Description

The image consists of the middle of the 100-percent-white bottom portion is a 97.5-percent-white box within a larger 95-percent-white box.

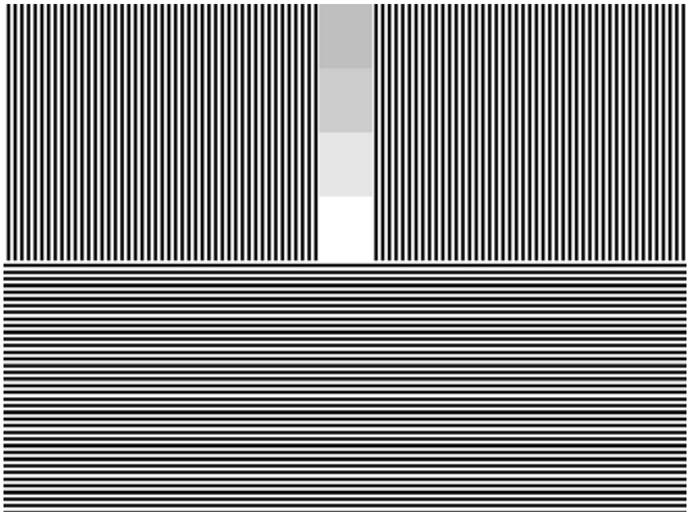


16.93 HSVnRGB

16.93.1Description

16.94 Imex1

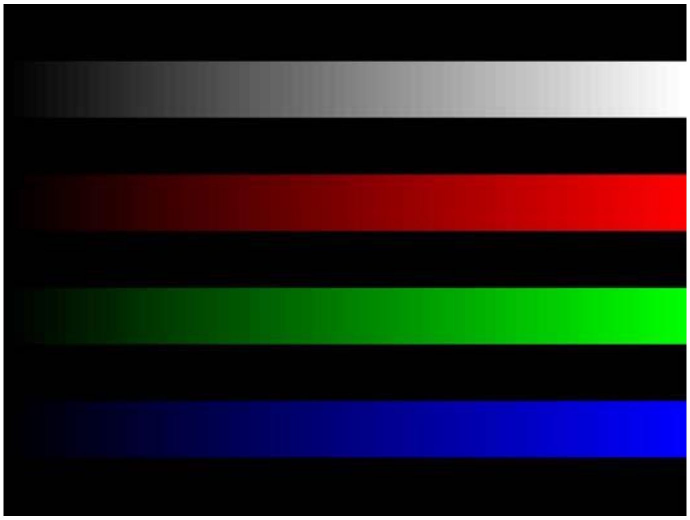
16.94.1 Description



16.95 InFocus1

16.95.1Description

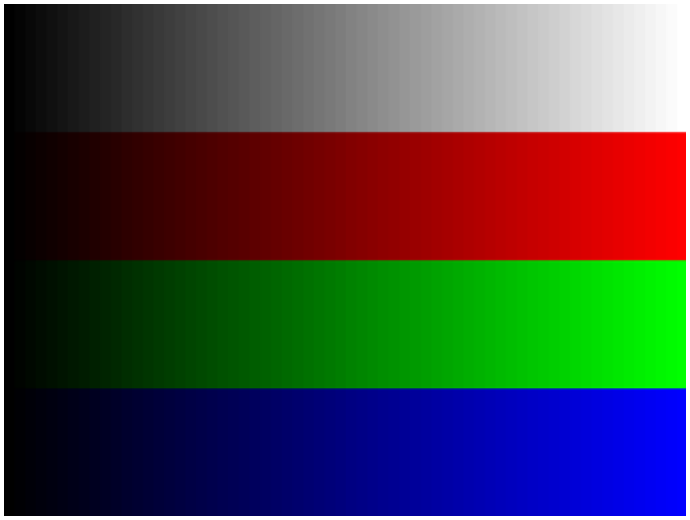
Special test image developed per customer specifications.



16.96 InFocus2

16.96.1 Description

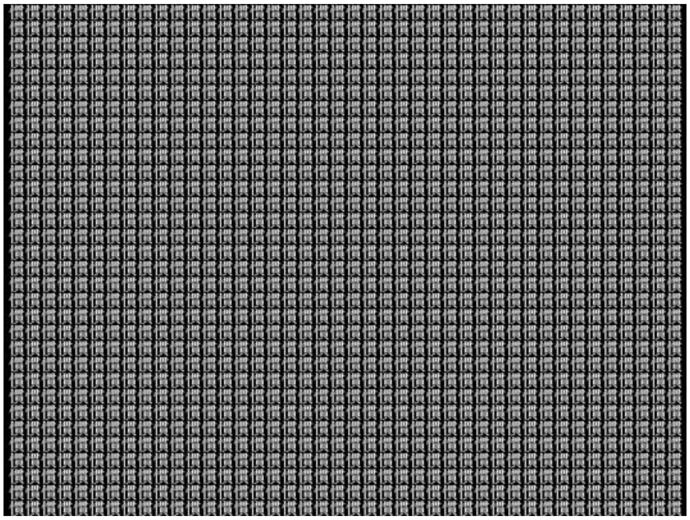
Special test image developed per customer specifications.



16.97 KanjiKAN

16.97.1 Description

In the primary version (shown below), the screen is filled with white Japanese Kan characters on a black background. The secondary version is drawn with black characters on a white background.



16.97.2 Test

Focus adjustments.

16.98 L80

16.98.1Description

Special test image developed per customer specifications. Each image has three versions. The primary version of the LGLCDTVB image is shown below.

16.99 LGLCDTVB, LGLCDTVG, LGLCDTVR, LGLCDTVW

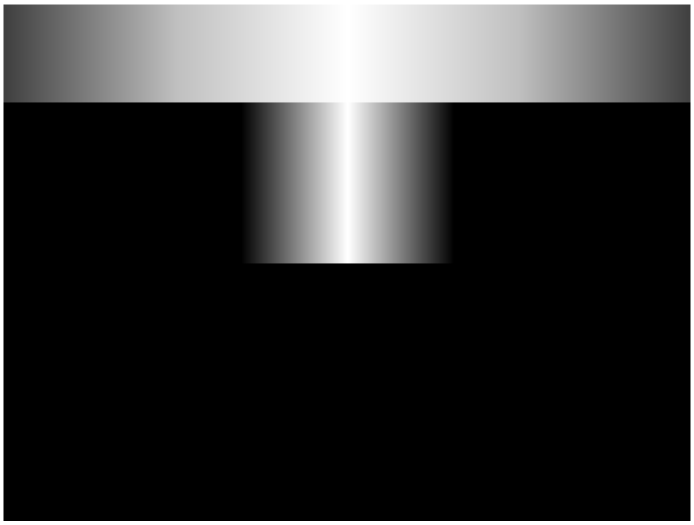
16.99.1 Description

Special test image developed per customer specifications. Each image has three versions. The primary version of the LGLCDTVB image is shown below.

16.100 LGRamp

16.100.1 Description

Special test image developed per customer specifications. The image provides a grayscale of two objects. The secondary version of the LGRamp image is shown below.



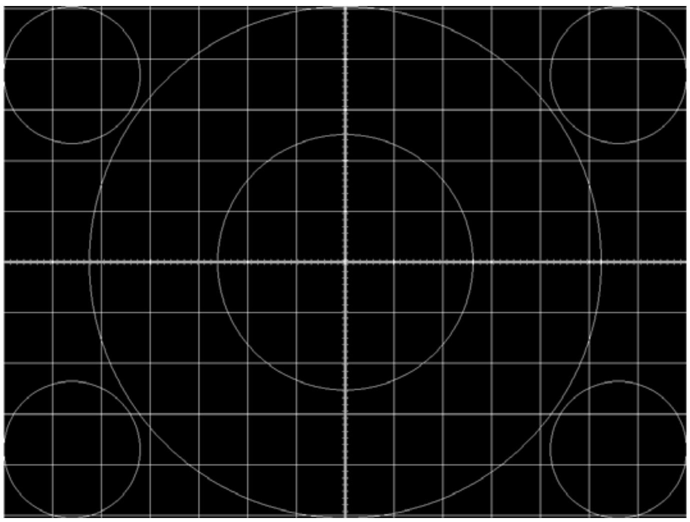
16.101 Linearty (Linearity)

16.101.1 Description

This image has three parts. The first part consists of six (6) white circles. A large circle is drawn in the center of the screen. Its diameter equals the lesser of the video height or width of the display. A smaller circle is drawn at half the diameter and concentric with the larger circle. A circle also is drawn in each of the corners of the screen. The diameter of the corner circles equals one-fifth of the display width.

The second part of the image consists of a white crosshatch. The number of boxes in the crosshatch depends on the physical size of the display.

The last part of the image consists of white tic marks on the horizontal and vertical center lines of the image. The marks are one pixel thick at every other pixel location. Every fifth mark is slightly longer. The color of the pattern can be changed with the individual video output controls.



16.101.2 Test

Linearity adjustment.

16.101.3 Purpose

To present an undistorted display, the horizontal and vertical sweeps of the electron beam across the face of the CRT should be at uniform speeds. Any non-uniformity in the sweep causes portions of an image to stretch while other portions are compressed. Non-linearity in a monitor shows up in several ways. It may be present across the entire screen, in a large portion of the screen, or localized in a very small area.

16.101.4 Method

The circles in the image can be used to do a general adjustment of a monitor’s linearity controls. Adjust the controls to form perfectly round circles. The crosshatch image can be used to measure linearity and to make finer control adjustments. All the full boxes in the crosshatch should be identical in size. Measure them with a ruler or a gauge made for the monitor under test. Any deviation should be within your specification limits. Use the tic marks and a ruler or gauge to measure linearity over a small portion of the display. Compare the number of tic marks per unit of measure with an adjacent or overlapping area.

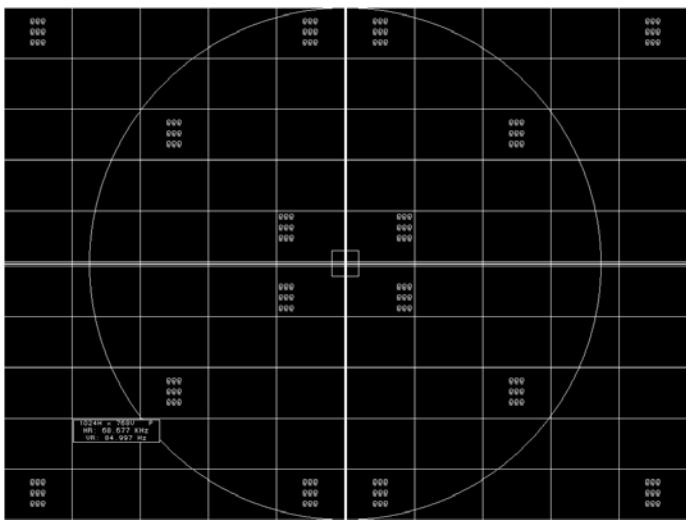
16.102 LinFocus

16.102.1 Description

This image has several parts. The first part consists of a large circle in the center of the screen. Its diameter equals the lesser of the video height or width of the display.

The second part is a 10x10 box crosshatch. The crosshatch is drawn in from the outside edges, with any extra pixels in the boxes placed along the vertical and horizontal axis. The vertical centerline is two pixels thick if the format has an even number of active pixels per line. The horizontal centerline is two pixels thick if the format has an even number of active lines per frame. A smaller box is added at the center of the image. The box is one-half the height and two-fifths the width of one of the crosshatch boxes. Current format data is shown in the lower left quadrant of the image. It shows the number of active pixels (H) and lines (V) as well as the vertical and horizontal scan rates.

The primary version (shown below) consists of a white pattern on a black background. The secondary version has a black pattern on a white background.



The image also includes blocks of focus-checking characters at various locations. The blocks are positioned inside the crosshatch boxes and are up to 3x3 characters in size. The size of the blocks is limited by the number of characters that can fit in one box.

16.102.2 Test

Linearity adjustment

16.102.3 Test

Focus adjustment.

16.102.4 Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read characters when text is displayed on the screen.

16.102.5 Method

On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen they affect depend on the monitor under test.

16.103 LipSync, LipSyncB

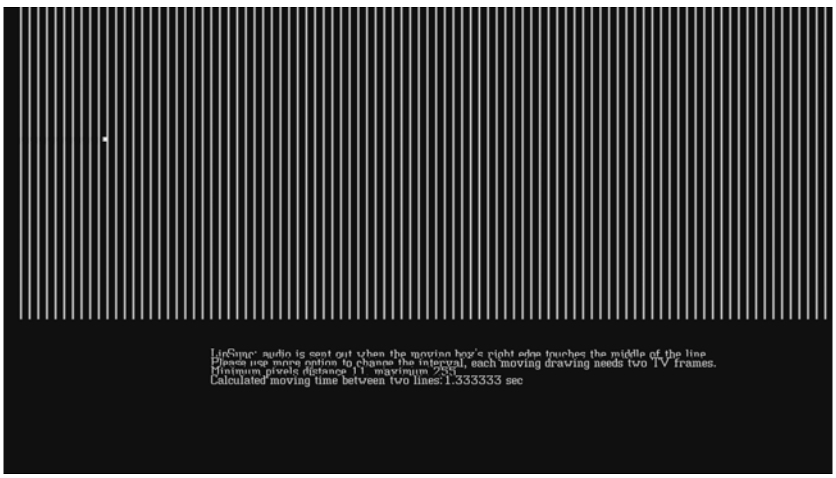
16.103.1 Description

The lipsync image enables you to test for synchronization between HDMI video and audio.

The image enables you to select between a range of intervals. You can access the subimages to control the interval of each video/audio synchronization event through the Content->Options menu and incrementing with the +/- keys. There are 255 distinct settings (different intervals) available.

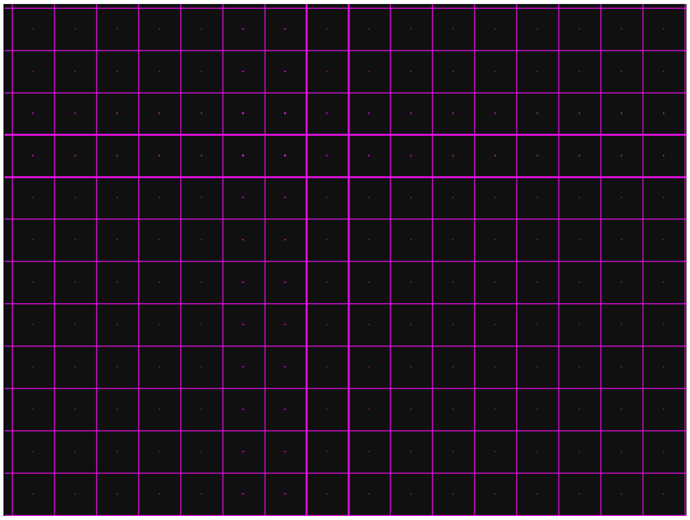
When you first select the Lipsync image, the interval is set at 0.66733 sec per audio event (shown below) for progressive formats and 1.333333 sec for interlaced formats. When you enable subimages with Content->Option, the default inital screen at image rendition 0 is one sync event per 1.101100 sec for progressive formats and 2.2 sec for interlaced formats. You can increase this up to 8.475133 sec at image rendition 254 which is one video/audio synchronization event per 8.46666 seconds for progressive formats and

16.933332 for interlaced formats.



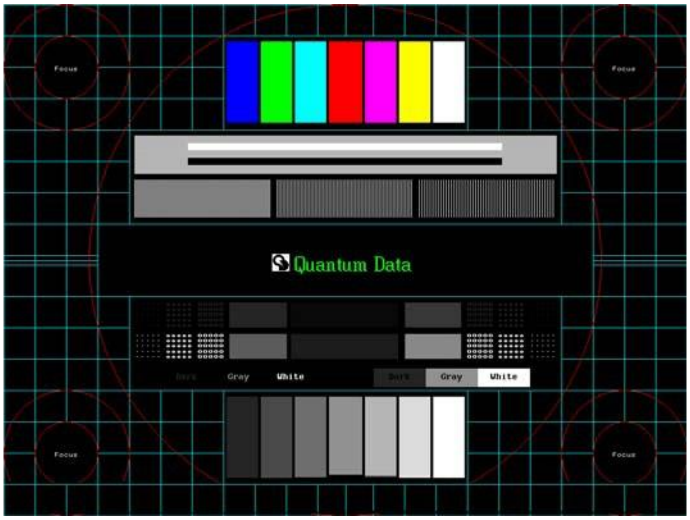
16.104 MAGENTA

16.104.1 Description



16.105 Master

16.105.1 Description

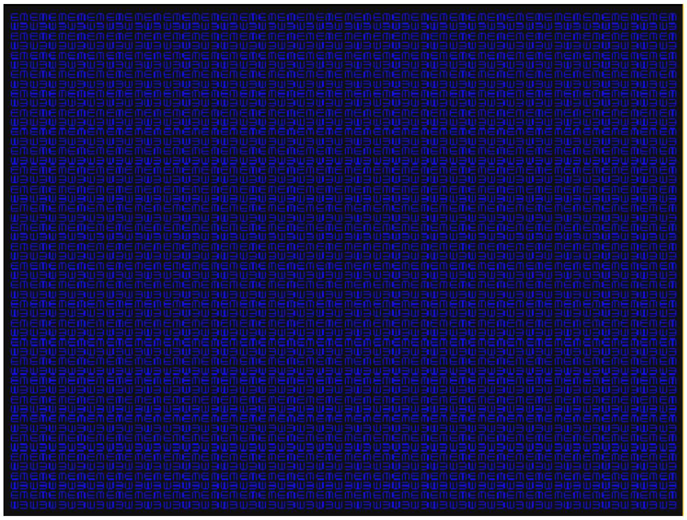


16.106 MESony_R, MESony_G, MESony_B,

16.106.1 Description

In the primary version, the screen is filled with blue (B), green (G), red (R) EM character blocks on a black background. Only the white character has a secondary version. It is drawn with black characters on a white background.

A bitmap of a single character block is shown here. The MESony_B image is shown below.

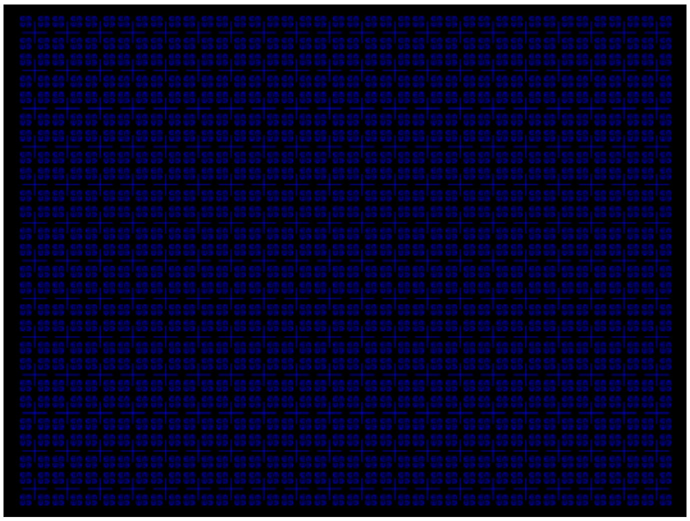


16.107 MEMEPlus, MEPlus_B, MEPlus_G, and MEPlus_R

16.107.1 Description

In the primary version, the screen is filled with blue (BLU and B), green (GRN and G), red (R), or white (WHT and Sony) EM character blocks on a black background. Only the white character has a secondary version. It is drawn with black characters on a white background.

A bitmap of a single character block is shown here. The BLU_EM+ image is shown below.



16.107.2 Test

Focus.

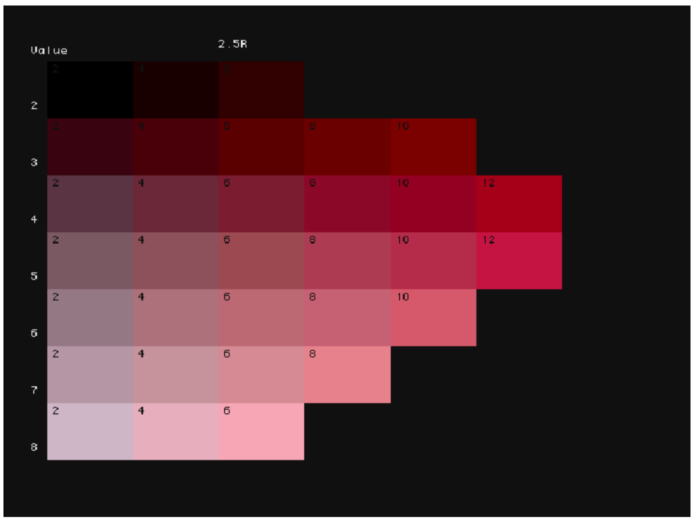
16.107.3 Purpose

This pattern is specified by one or more display manufacturers for checking and adjusting focus one color at a time.

16.108 MnslCLR

16.108.1 Description

There are a series of these images (40 in total) that are accessible as sub images through the 882E front panel. Each hue in the MnslCLR image set has 4 sub hues, labeled 2.5, 5, 7.5 and 10, that represent a hue as it traverses around the perimeter of the diagram above and transitions into the adjacent hues. Each such sub image depicts the chroma and value variances of one of these sub hues. Each sub image provides a color block for each chroma and value level for that sub hue. The value varies along the vertical axis and the chroma varies along the horizontal axis.



16.109 MnslGM

16.109.1 Description

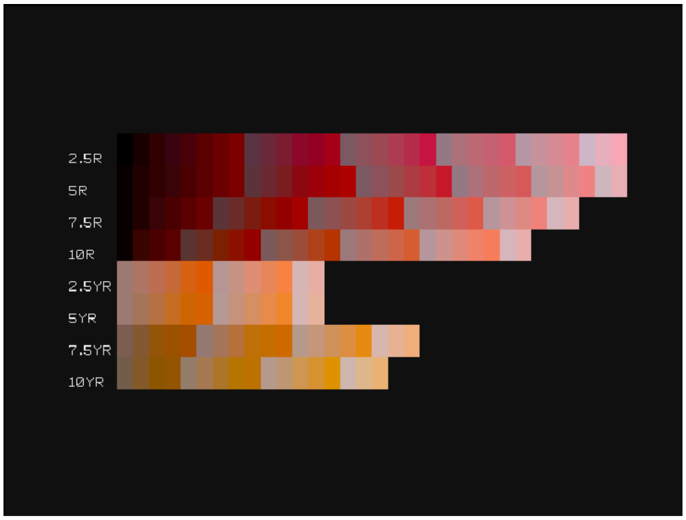
This is a color checker image with 24 colors arranged in a checker board.

16.110 MnslPG

16.110.1 Description

There are a series of these images (5 in total) that are accessible as sub images through the 882E front panel. Each sub image depicts two hue families (each hue family contains 4 sub hues (2.5, 5, 7.5, 10). Each set of color blocks arranged along a horizontal axis depicts the chroma and value variations for one of the sub hues which is labeled on the left. Each such horizontal set of color blocks is a cancatenation of the value and chroma variations for that particular hue. These cancatenations can be derived from the MnslCLR images. In other words, the MnslPG image is a concatenation of 8 of the MnslCLR images.

The MnslPG Image is shown below.

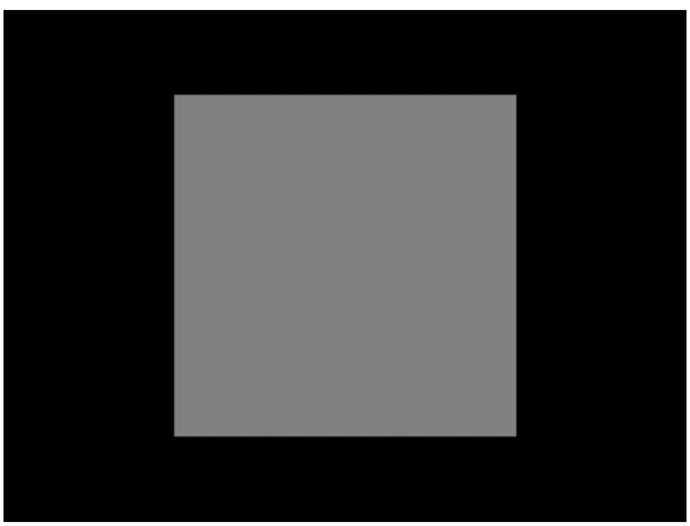


16.111 MoireX, MoireX33, MoireY, MoireY33

16.111.1 Description

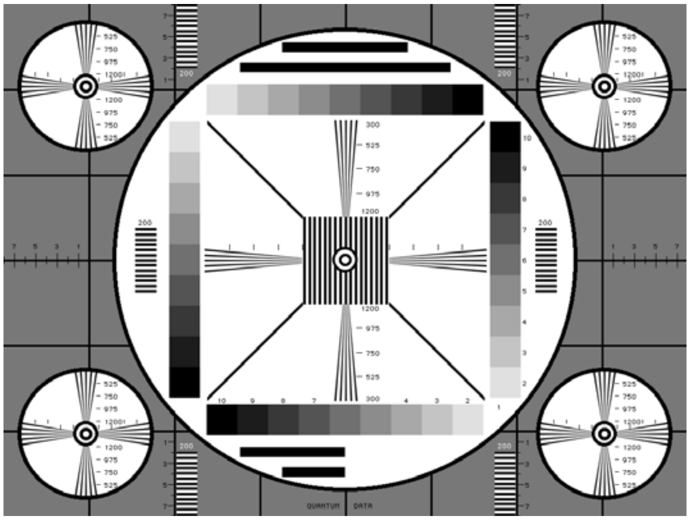
The MoireX and MoireY images consist of black lines on a white background across the active video area. MoireX provides vertical lines; MoireY provides horizontal lines. The MoireX image is shown below.

The primary version of the MoireX33 and MoireY33 images provide a black frame around the black lines. The secondary version draws a white frame around black lines. The primary version of the MoireX33 image is shown below.



16.112 Monoscope

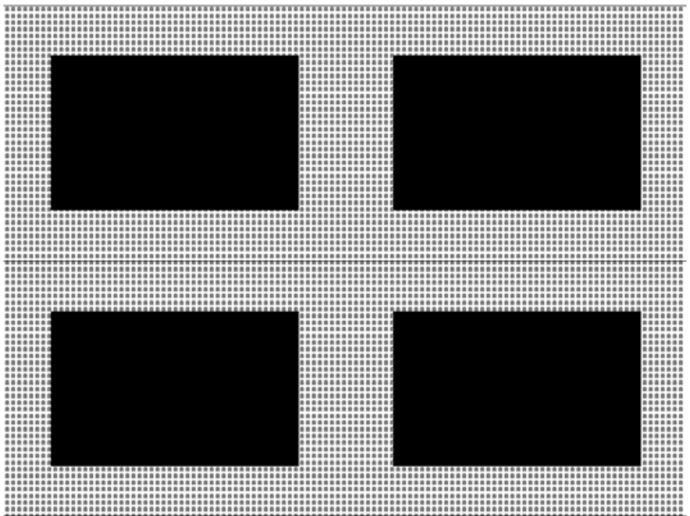
16.112.1 Description



16.113 MSony7, MSony8

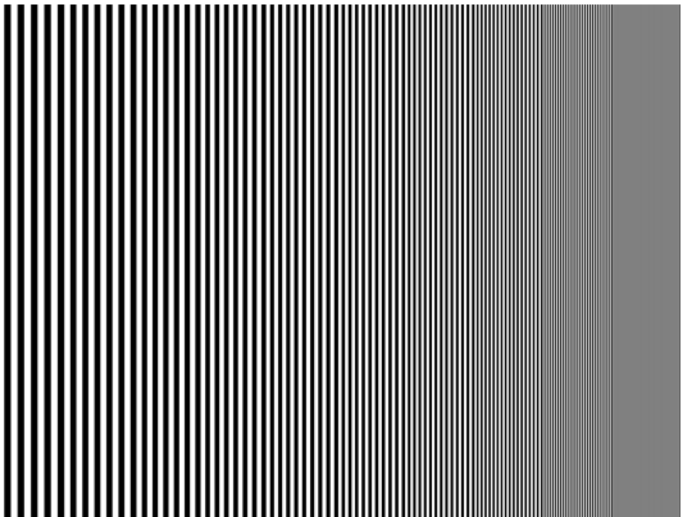
16.113.1 Description

Special test image developed per customer specifications. Primary version of the MSony7 image is shown below. The secondary version draws white boxes and characters with a black background.



16.114 MulBurst

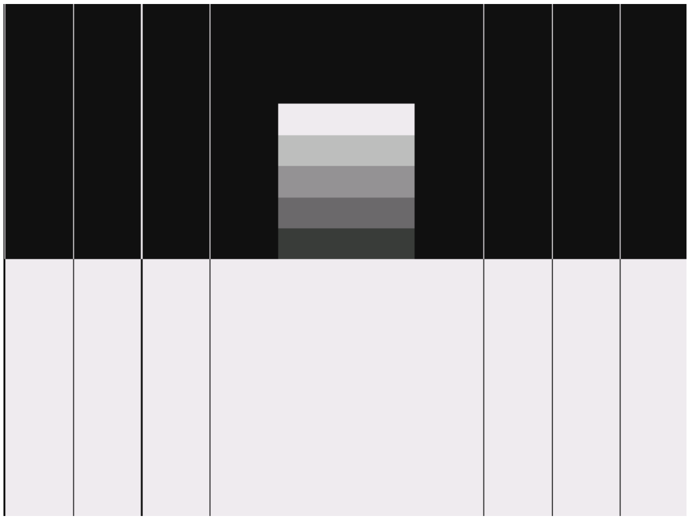
16.114.1 Description



16.115 Needle

16.115.1 Description

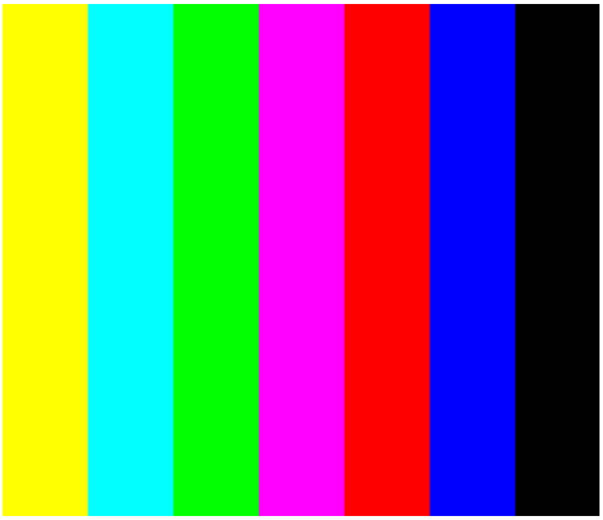
To check and adjust for the proper geometry of display including picture centering, size, pincushion and linearity



16.116 Orion

16.116.1 Description

This image provides a color bar that rotates (shifts) the bars to the right on an incremental basis.



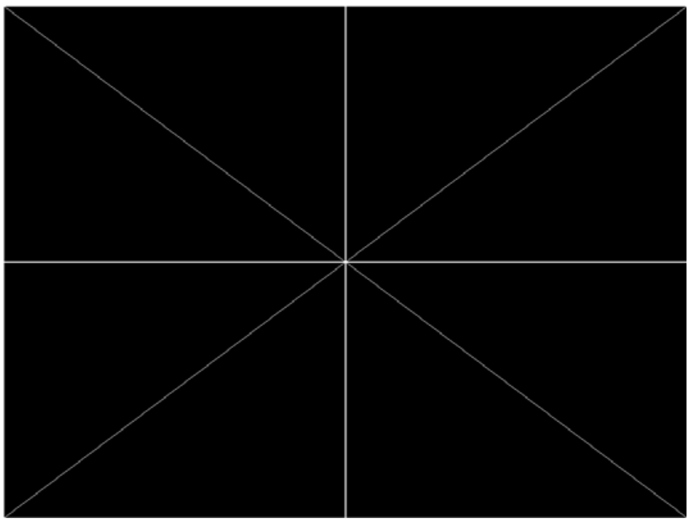
The color bars are shifted to the right at 3 second intervals. You can access additional renditions to adjust the interval between 3, 10, 30 and 60 seconds through the **Settings/Rendition** dialog box.

16.117 Outline0, Outline1, Outline2, Outline3

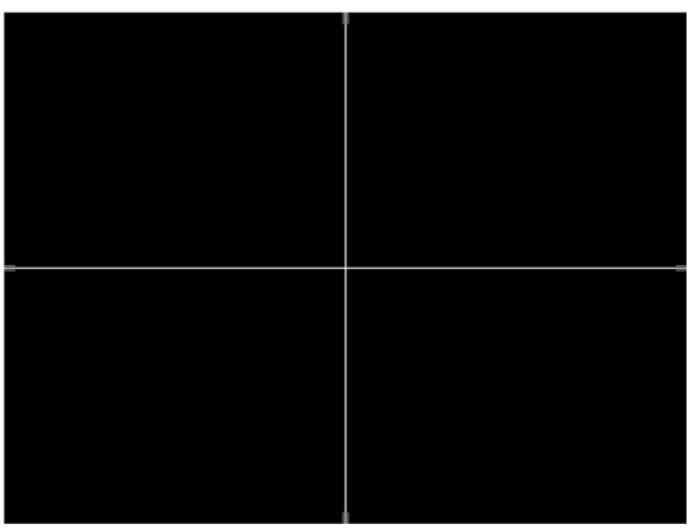
16.117.1 Description

The primary version of the Outline0 image consists of a rectangular white border on a black background. The border is one (1) pixel wide and defines the active video area. Two (2) diagonal lines join the opposite corners. A-full size cross is centered in the image. The horizontal line of the cross is one (1) pixel thick for formats with an odd number of active lines and two (2) pixels thick for formats with an even number of active lines. The vertical line of the cross is one (1) pixel thick for formats with an odd number of active pixels per line and two (2) pixels thick for formats with an even number of active pixels.

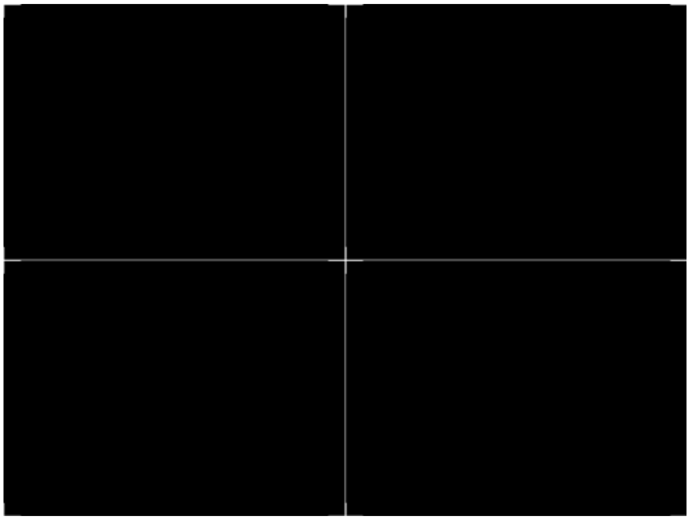
The secondary version of these images draw black lines on a white background.



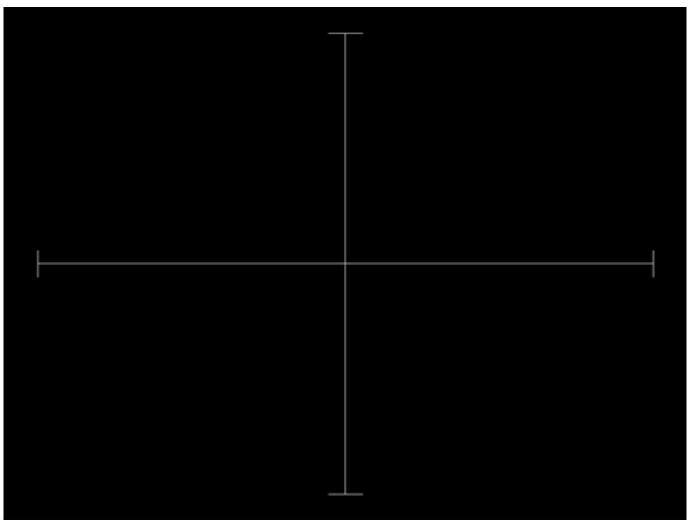
In the Outline1 version, the two diagonal lines are removed and short marker lines are added to the border lines near to where the cross lines meet the border lines. The markers appear at both sides of the cross lines. The distance between the marker lines and the cross lines is the greater of either two (2) pixels or one (1) millimeter.



In the Outline2 version, the two diagonal lines are removed and short marker lines are added to the corners, and where cross lines meet and end.



In the Outline3 version, the two diagonal lines are removed, cross lines are shortened, and short marker lines are added.



16.117.2 Test

Yoke tilt correction.

16.117.3 Purpose

The horizontal axis of a displayed image should line up with the horizontal axis of your monitor. Any tilt is likely due to the yoke being rotated on the neck of the CRT. A rotated yoke makes any displayed image appear rotated.

16.117.4 Method

Place your monitor on a flat surface so the face of the CRT is perpendicular to the surface.

Use a ruler or gauge to measure the height of each end of the image's horizontal center line from the surface. The difference between the two readings should be within specification for the monitor. If it is out of specification, the yoke must be adjusted. Loosen the hardware that clamps the yoke to the neck of the CRT and rotate the yoke until the line is horizontal. Tighten the yoke-clamp hardware.

16.117.5 Test

Yoke winding orthogonality check.

16.117.6 Purpose

The horizontal and vertical deflection coils on the yoke should have their axes cross at exactly 90 degrees. Improper orientation of the windings causes displayed rectangles to look more like nonorthogonal parallelograms. This type of defect is almost impossible to correct with adjustments. It is usually easier to replace the defective yoke.

16.117.7 Method

First, perform the yoke tilt correction described above. The vertical center line of the image should be perpendicular to the work surface. If the deviation is beyond specification, the monitor should be rejected and sent back for repair, rather than trying to magnet a defective yoke.

16.117.8 Test

Display size correction.

16.117.9 Purpose

A too-large active video size adjustment on a monitor may cause information to be lost around the edges of the screen. A too-small active video size adjustment may make some displayed information hard to read. The correct size is needed to obtain the correct aspect ratio. You need the correct aspect ratio to get round circles and square squares.

16.117.10 Method

First, determine the correct physical size of the active video area for the display. This information usually is given in a display’s specification sheet or service manual. The size should match the sizes in the format you are using. The size setting of the current format can be checked using the Format test image.

Place a ruler or gauge along the horizontal line of the image and adjust the monitor's horizontal size control until the distance between the end points matches the specified value.

Move the ruler or gauge to the vertical line and adjust your monitor's vertical size control until the distance between the end points matches the specified value.

16.117.11 Test

Parallelogram distortion check.

16.117.12 Purpose

Parallelogram distortion is very difficult to correct with magnets because the correction often causes barrel distortion. Therefore, you should decide early whether your monitor meets this specification. The problem usually can be traced to the improper winding of the yoke coils. If the problem is not too severe, it may be corrected by adding or adjusting magnets on the yoke. However, if the distortion is excessive, it may be an indication of a defective yoke which cannot be corrected with magnets.

16.117.13 Method

Measure the lengths of the two (2) diagonal lines. Any difference is an indication of parallelogram distortion. The difference in readings should be within the specifications of the monitor.

If the difference in the readings is too far beyond specification, the monitor should be rejected and sent back for repair, rather than trying to magnet a defective yoke.

16.117.14 Test

Trapezoid distortion correction.

16.117.15 Purpose

This image gives you a way to measure trapezoid distortion in your monitor. If the distortion is not too severe, you may be able to correct it by adding or adjusting magnets on the yoke.

16.117.16 Method

Perform the yoke winding orthogonality check and parallelogram distortion check first to avoid wasting time on a monitor with a defective yoke.

Measure the width of the image at the top and bottom of the display. Any difference in readings should be within the specification limits. Measure the height of the image at both sides of the display. Again, any difference in readings should be within specification limits. If either of the differences is out of specification, the trapezoid distortion of the monitor is out of specification.

Add or adjust magnets on the yoke to correct the problem. The pin and barrel distortion correction should be repeated to make sure that it is still in specification.

16.117.17 Test

Pin and barrel distortion correction.

16.117.18 Purpose

If perfectly linear sweep signals are sent to a perfectly wound deflection yoke mounted on a perfect CRT, you would not necessarily get a perfectly formed raster. Instead you would likely get a raster that had its corners stretched away from the center, resembling a pin cushion. This distortion occurs because the geometry of the deflected electron beam does not match the geometry of the tube face plate. Also, imperfections in the yoke or CRT may affect this problem. In some cases one or more corners may be pulled towards the center of the raster causing it to look like a barrel. Uncorrected raster distortion carries over as distortion of the displayed image.

16.117.19 Method

A slot gauge may be used to determine if the amount of pincushion or barrel distortion is within limits. A basic slot gauge may consist of a piece of opaque film with at least two (2) transparent slots in it. One slot is used for top and bottom distortion and the other is used for the sides. By positioning the correct slot over each portion of the border line, the entire line should be visible. If this cannot be done at all four sides, the monitor requires correcting.

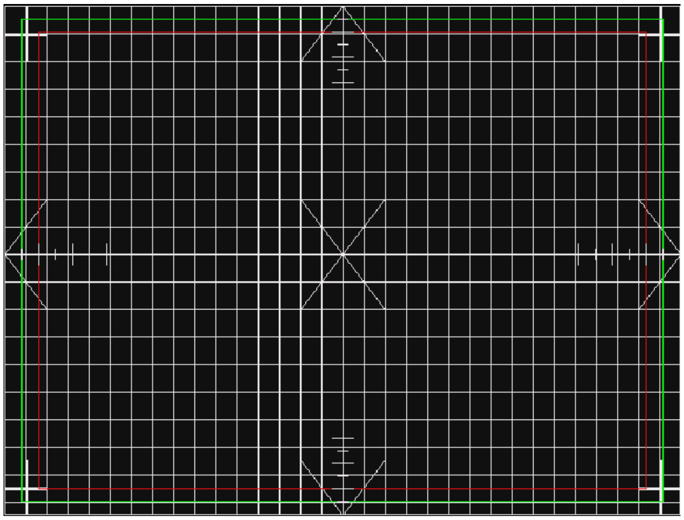
There are two main ways of correcting pincushion distortion. The first involves placing or adjusting magnets on the yoke. This is a trial-and-error method. However, skilled operators develop a feel for how strong a magnet to use and how to place it in order to get the desired correction. If any correction is performed, the trapezoid distortion correction should be repeated.

The other correction method involves adding correction signals to the deflection signal driving the yoke. This method is usually found in color monitors, where adding magnets to the yoke would cause problems with convergence and purity. The type and number ofadjustments depends on the monitor being tested.

16.118 OverScan

16.118.1 Description

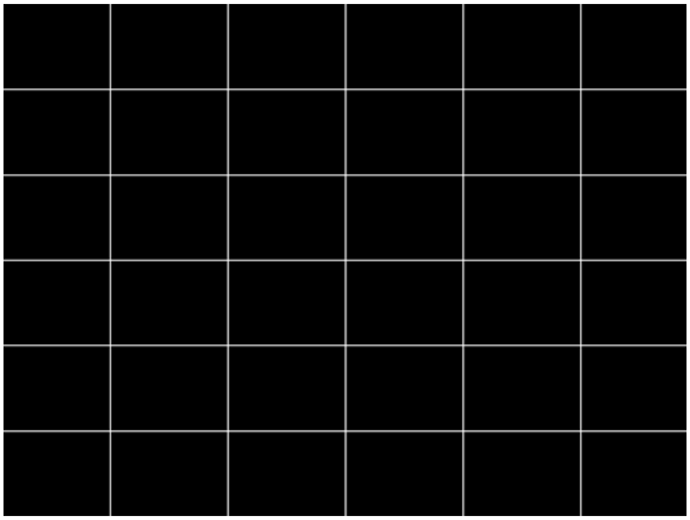
To check and adjust for the proper geometry of display including picture centering, size, pincushion and linearity.



16.119 P1

16.119.1 Description

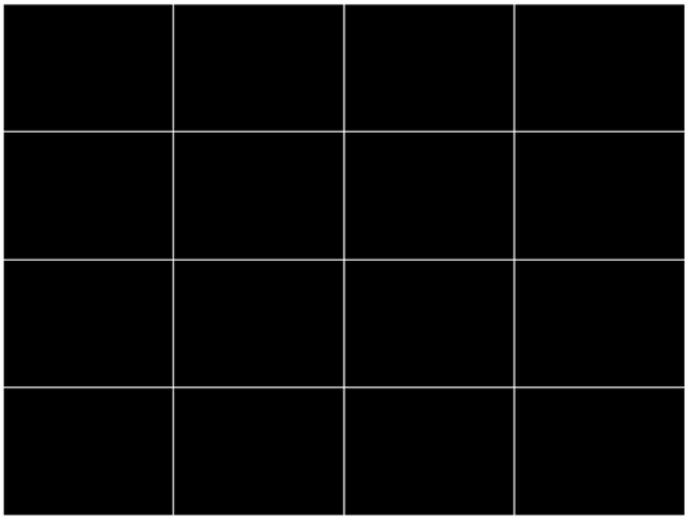
This image is a 6x6 white crosshatch without a border on a black background.



16.120 P2

16.120.1 Description

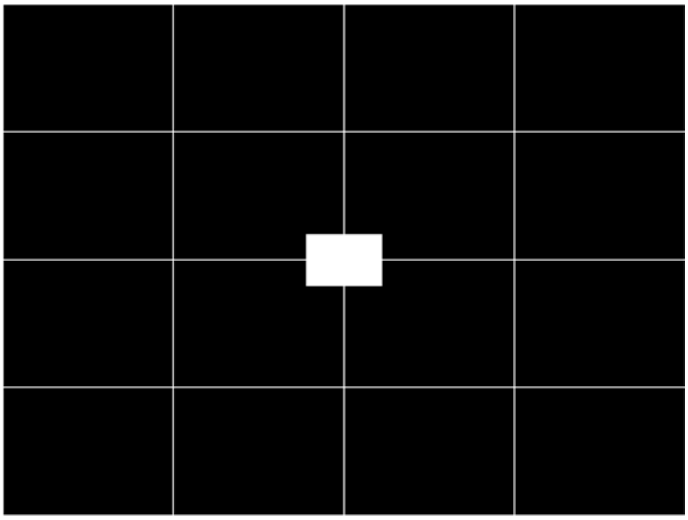
This image is a 4x4 white crosshatch with a border on a black background.



16.121 P3

16.121.1 Description

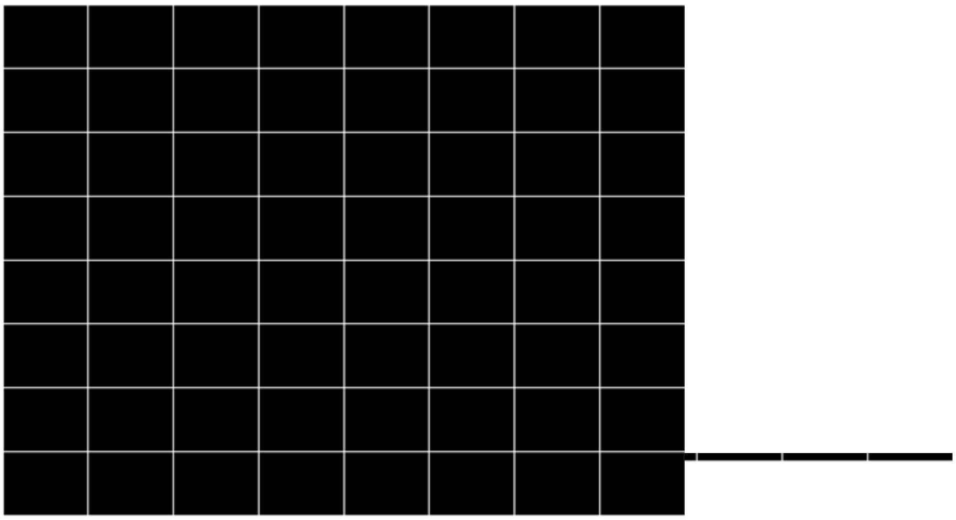
This image is a 4x4 white crosshatch with a border and a small, centered white patch on a black background.



16.122 P4

16.122.1 Description

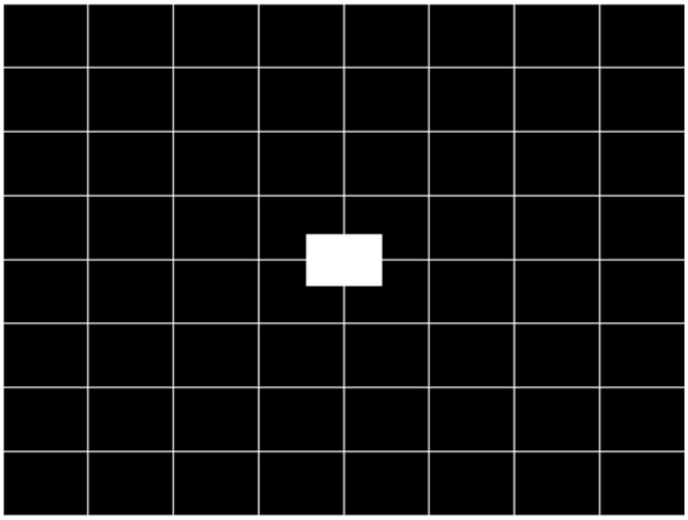
This image is an 8x8 white crosshatch with a border on a black background.



16.123 P5

16.123.1 Description

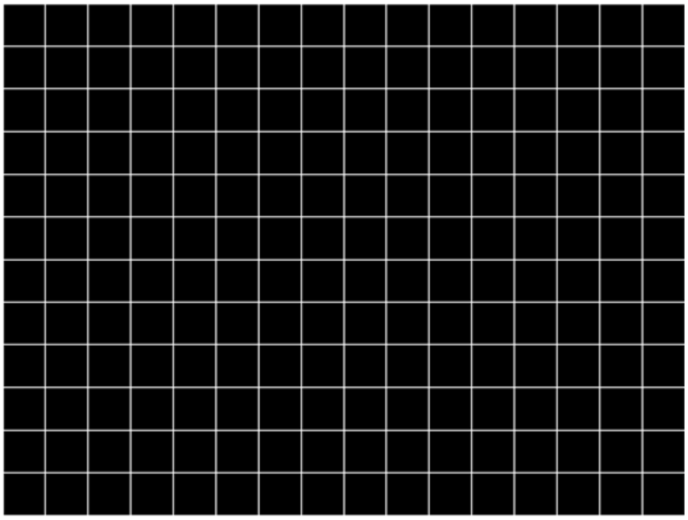
This image is an 8x8 white crosshatch with a border and a small, centered white patch on a black background.



16.124 P6

16.124.1 Description

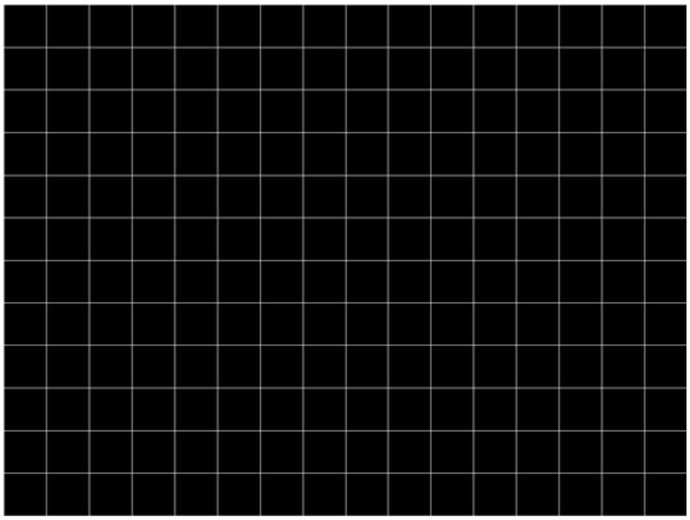
16x12 pixel white crosshatch with a border on a black background.



16.125 P6_Sony

16.125.1 Description

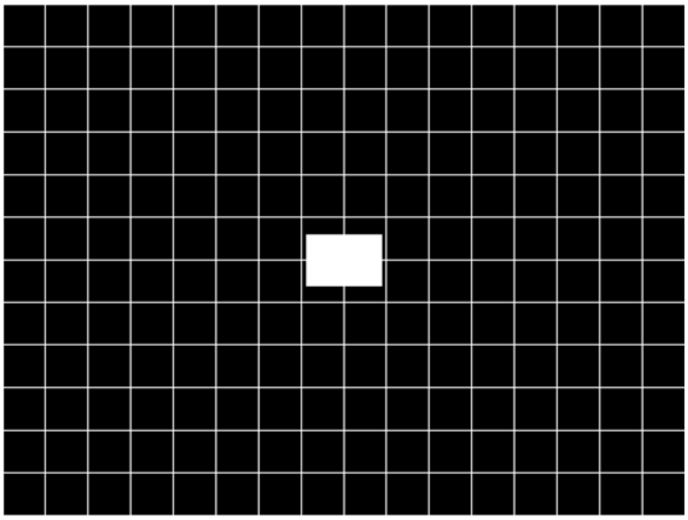
6x12 pixel white crosshatch with a border on a black background.



16.126 P7

16.126.1 Description

16x12 white crosshatch with a border and a small, centered white patch on a black background.



16.127 P8

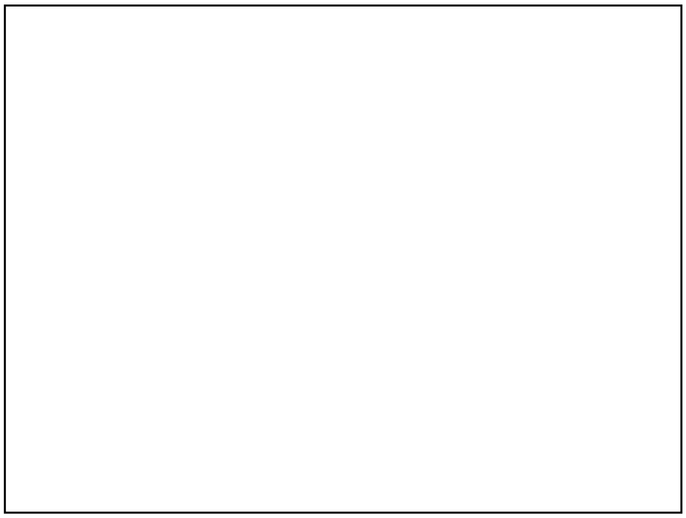
16.127.1 Description

This image is an all black active video area. The secondary version draws an all white video area.

16.128 P9

16.128.1 Description

This image is an all white active video area. The secondary version draws an all black video area.



16.129 PacketTx

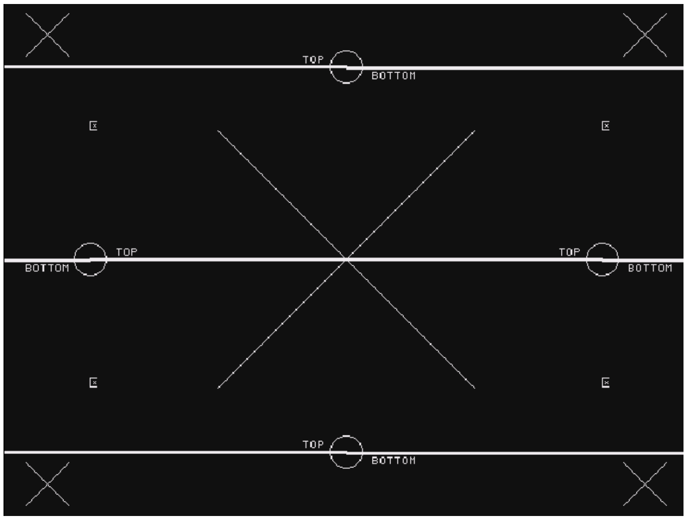
16.129.1 Description

Displays the InfoFrame data transmitted from the HDMI transmitter.

16.130 Pairing

16.130.1 Description

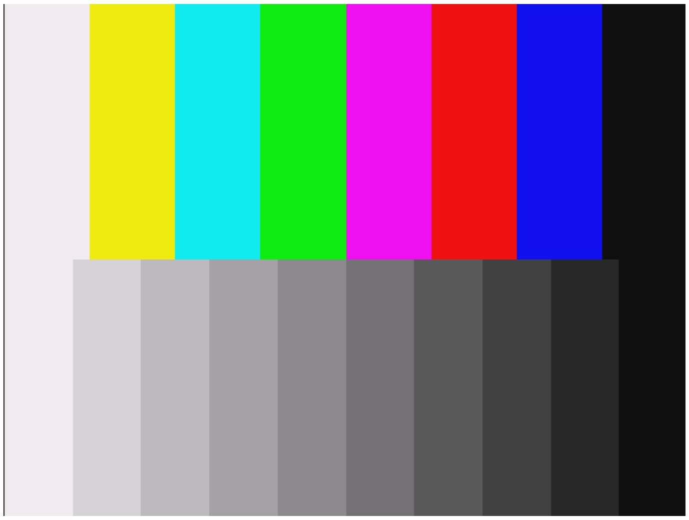
Displays the InfoFrame data transmitted from the HDMI transmitter.



16.131 PanBars

16.131.1 Description

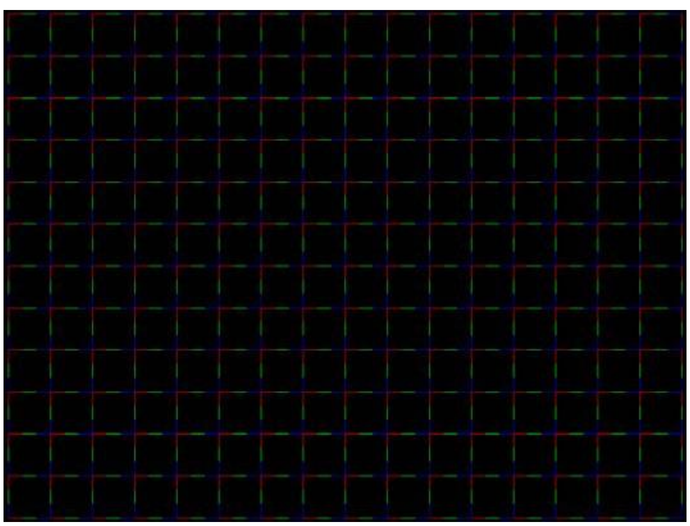
Special test images developed per customer specifications.



16.132 PdsCrt1

16.132.1 Description

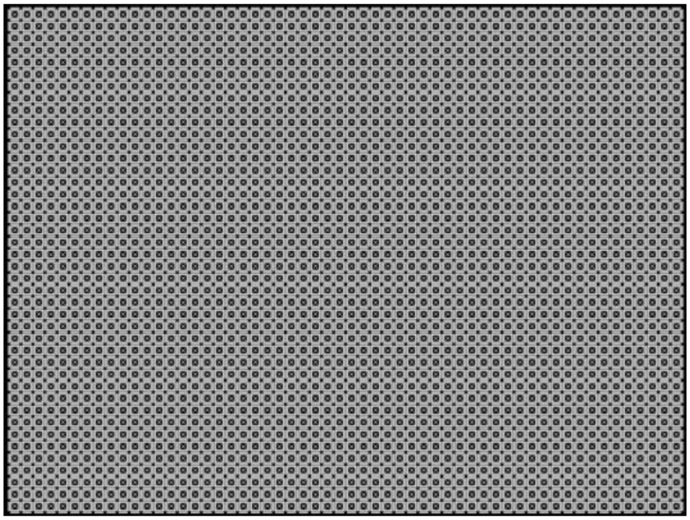
Special test image developed per customer specifications.



16.133 PdsCrt2

16.133.1 Description

Special test image developed per customer specifications.



16.134 Persist

16.134.1 Description

In the primary version, 15 small white boxes move back and forth between diagonal guide lines. The lines form 15 side-by-side tracks. The size of each box is scaled to the light meter box size set by the MSIZ system parameter. The image does the following:

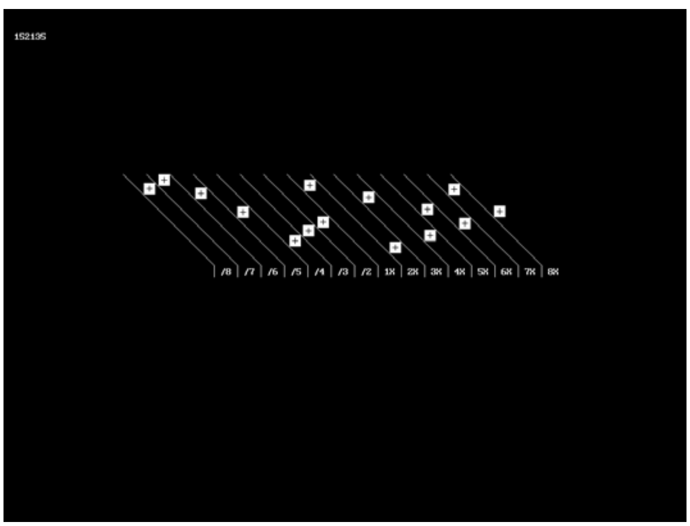
- The box in the center track (marked “1X”) moves one scan line vertically and one pixel horizontally for each vertical frame of refresh.
- The seven boxes to the right of the center track (marked “2X” through “8X”) move 2, 3,4, 5, 6, 7, and 8 pixels and lines per frame, respectively.
- The seven boxes to the left of the center track (marked “/2” through “/8”) move one scan line vertically and one pixel horizontally for every 2, 3, 4, 5, 6, 7, and 8 vertical frames of refresh, respectively. These boxes are at the bottom of the tracks.

In cases where the next move would cause the box to move beyond the end of its track, it immediately reverses and moves the correct distance in the opposite direction for the next frame.

A continuously-running counter appears in the upper left corner of the image. The number shown is the number of vertical frame refreshes that have occurred since the generator was first powered up.

The secondary version draws a black image on a white background.

An example of the primary version of the Persist image is shown below:



16.134.2 Test

Phosphor persistence

16.134.3 Purpose

The phosphors on the face of most CRTs continue to glow for a short period of time after the electron beam has stopped energizing them. This phenomenon is called persistence. A certain amount of persistence is desirable in most applications. It prevents a flickering of a displayed image that most users would find objectionable. On the other hand, a CRT with an overly long persistence time causes moving objects to leave a blurred trail.

16.134.4 Method

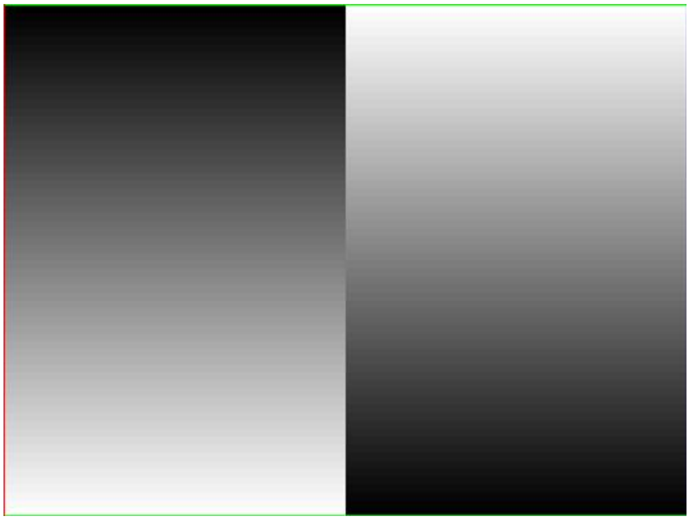
A flickering in the slower moving boxes indicates that the combination of refresh rate and phosphor persistence is not suitable for long-term viewing.

A fading tail left behind by the faster moving boxes indicates that the display may not be suitable for viewing animated images.

16.135 PgBar64H, PgBar64V

16.135.1 Description

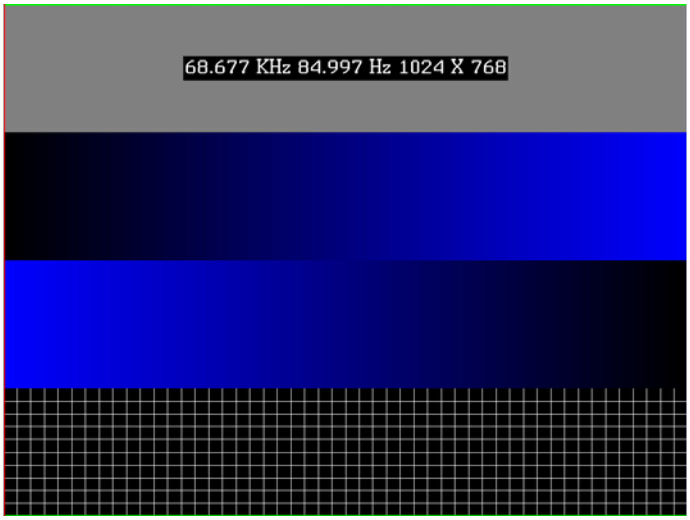
Special test image developed per customer specifications. The PgBar64H image is shown below.



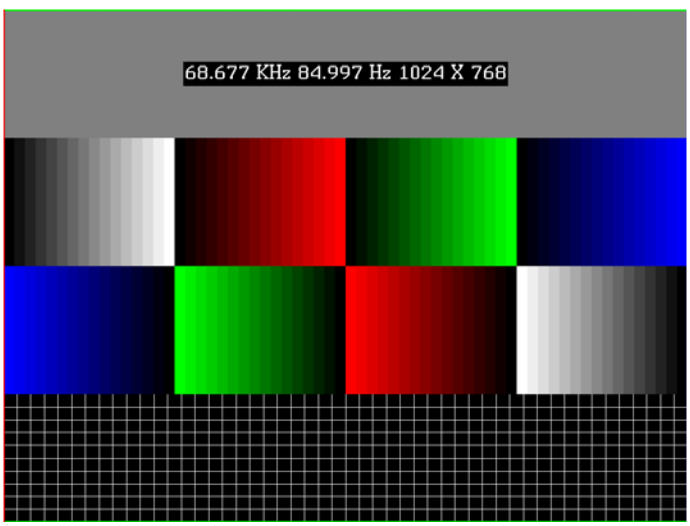
16.136 PgCB, PgCG, PgCR, PgCW, PgCWrgb

16.136.1 Description

Special test image developed per customer specifications. Primary version of PgCB is shown below. The secondary versions draw all white over the last bar.



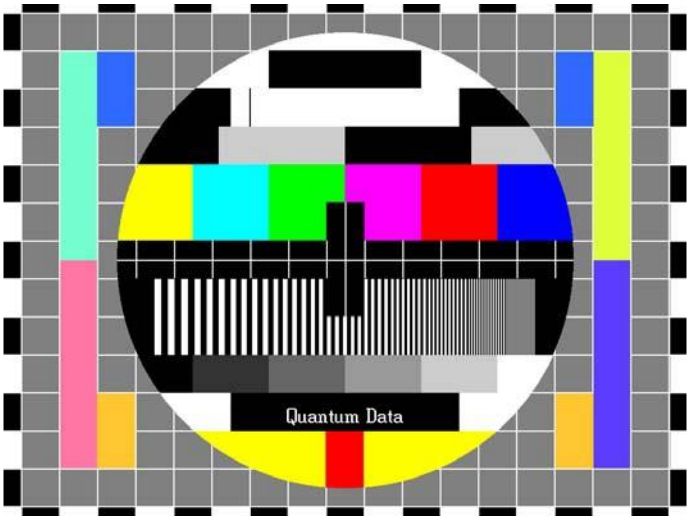
The PGCWrgb is shown below.



16.137 Philips1

16.137.1 Description

Special test image developed per customer specifications.



16.138 Pluge

16.138.1 Description

The two feint vertical stripes on the left are just above and just below black level. The monitor's brightness control should be adjusted so that the super-black stripe is lost, but the other can just be seen.

16.139 PRN24bit

16.139.1 Description

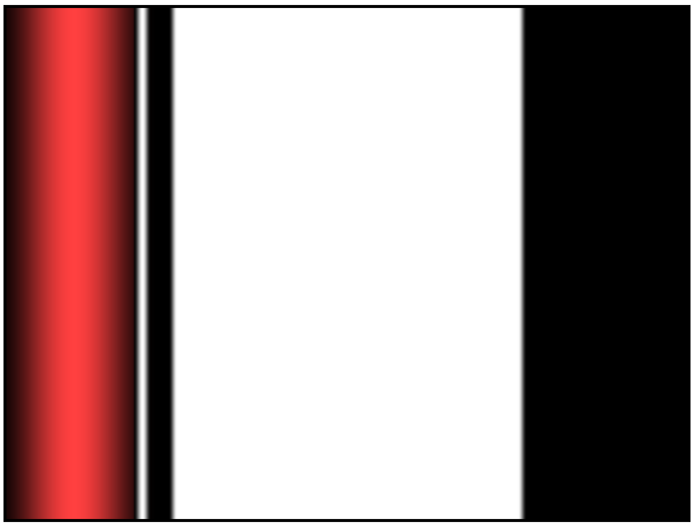
This image displays pseudo-random noise using 24-bits-per-pixel color depth.

16.140 PulseBar

16.140.1 Description

This image is intended for TV formats, but can be displayed with any format up to 100

MHz. The image looks like two vertical lines followed by a wide vertical bar on a display's screen. The first line is a sine-squared modulated pulse that fades from black to red and back to black. The pulse is 20 T for PAL and 12.5 T for NTSC formats. The second narrower line is a 2 T white sine-squared pulse. T = 100 nSec for PAL and 125 nSec for NTSC formats. The wide bar is white with sine-squared edges.



16.140.2 Test

Video system testing.

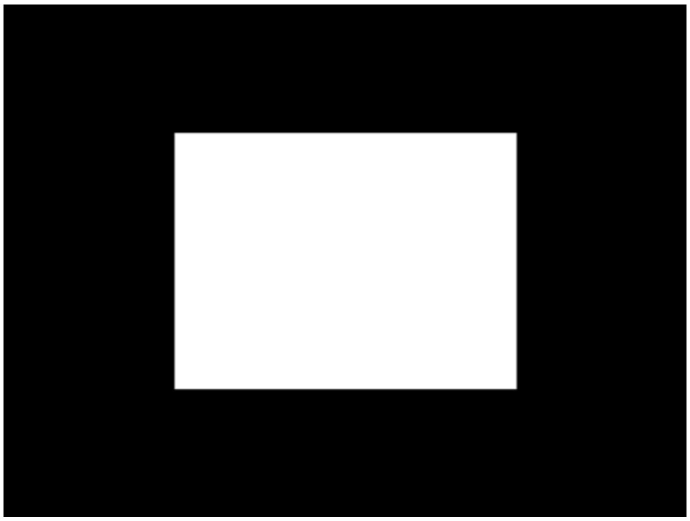
This multi-purpose pattern can be used with other instruments to check television K factors. The modulated pulse can be used to check chrominance-to-luminance delay and gain. The narrow white line can be used to measure short term linear distortion (K2T).

16.141 QuartBox

16.141.1 Description

The primary version (shown below) has a single white box in the center of active video.

The size of the box is one-half the width and height of the active video area (a quarter of the entire active video area). The secondary version draws a black box on a white background.



16.141.2 Test

Brightness control adjustment.

16.141.3 Purpose

The wrong brightness setting on your monitor may cause other tests such as Contrast, Focus, and Beam Size to be invalid. An accurate brightness setting helps give repeatable measurements throughout other tests. This version of the brightness box should be used if the display's specifications call for the brightness to be set with one-fourth of the screen lit.

16.141.4 Method

Place your light meter probe within the center box and adjust the monitor's brightness control to obtain the required light meter reading.

16.141.5 Notes

The color of the center box is a special color, named foreground. The FRGB command can be used to change the default color of foreground to any RGB value.

```
IMGL quartbox: ALLU// loads QuartBox image
FRGB 122 122 122// sets RGB color of box
```

After loading a different format, send the FRGB command again to set the box fill color.

If you want to draw your own box, use foreground as the fill color, and then use the FRGB command to define the color of “foreground.” For example:

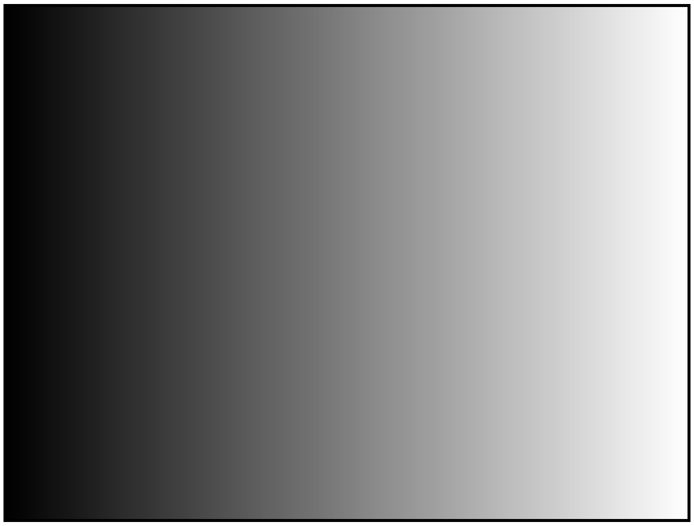
```
IMGL raster; ALLU// clears display
RECT foreground 100 100 100 100 dither100
FRGB 128 128 0
FRGB 192 192 64
FMTL DMT0660; ALLU FRGB 192 192 64
```

16.142 Ramp

16.142.1 Description

This image provides an active video area starting from full black (+7.5 IRE) at one edge of the screen to full white (+100 IRE) at opposite end of the screen.

There are 4 versions of this image—one for each edge of the display. When selected, this image is displayed.



You can access additional versions of this image through the **Settings/Rendition** dialog box.

16.143 Ramp12

16.143.1 Description

This image is used to view a specific range of grayscale levels (ranges up to 1024) throughout the entire range allowed by deep color support in the generator (i.e. 36 bit/pixel or 12-bit/component = 4096). If you set the ramp to display the maximum color depth supported by the display under test you will see a nearly uniform ramp depending on the horizontal resolution of the active format.

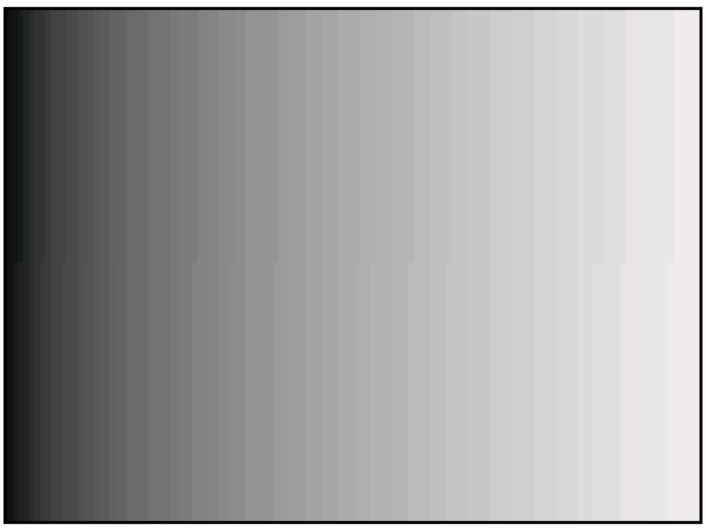
The following is a sample of the Ramp12 image is rendered on a display.

16.144 RampDif

16.144.1 Description

This image has two ramps. One on the top and one on the bottom. It enables you to show a contrast of color depths. For example you can specify that the top ramp use 12-bit/component deep color and the bottom ramp 10-bit color. You can then view the image and see whether banding occurs and how pronounced, in the either of the ramps. If the display under test supports 12-bit/component color, the top ramp will show a near uniform ramp on the top (depending on the horizontal resolution of the active format). The bottom ramp will show more pronounced banding because the range of the ramp is greater than the color depth.

This image is used to view two specific range of grayscale or color levels (ranges up to 512) throughout the entire range allowed by deep color support in the generator (i.e. 36 bit or 4096). You need to set the pixel depth in the generator to 24 bit (PELD = 32) in order to access 512 grayscale or color levels on a single image rendered on a display. The following is a sample of the RampDif image is rendered on a display.

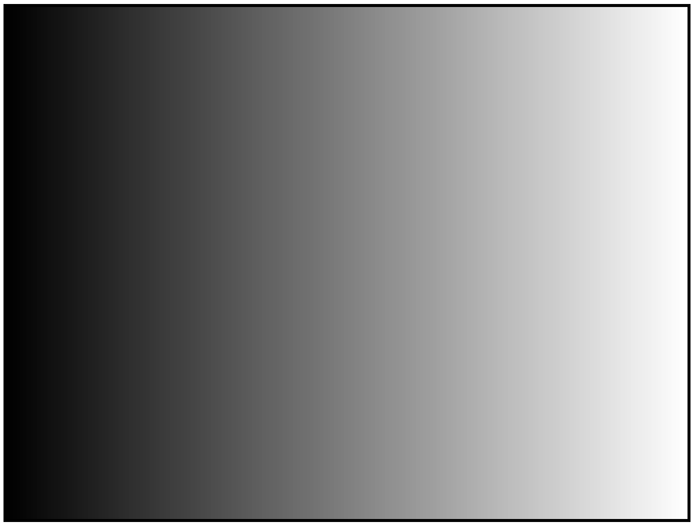


16.145 RampX

16.145.1 Description

This image provides a ramp image that continuously sweeps (moves) to the right on an adjustable time basis.

When selected, this image is displayed.



You can access additional versions of this image through the **Settings/Rendition** dialog box.

16.146 Ramp_B, Ramp_G, and Ramp_R

16.146.1 Description

The active video area goes from full black (+7.5 IRE) at the left edge of the screen to full blue (_B), green (_G), or red (_R) at the right edge. The Ramp_B image is shown below.

16.146.2 Test

Video gain linearity.

16.146.3 Method

When viewed on a TV screen, the full range of grays should be visible. There should be no color shifts visible.

16.147 Raster

16.147.1 Description

The primary version shows a totally black display (nothing being displayed). The secondary version shows a totally white display.

16.147.2 Test

Raster centering.

16.147.3 Purpose

Many monitor applications require that the displayed image or text fit completely within a bezel that surrounds the CRT. This usually requires that you first center the blank raster on the face of the CRT, and then center the image within the raster. Use this image for centering the raster on the CRT.

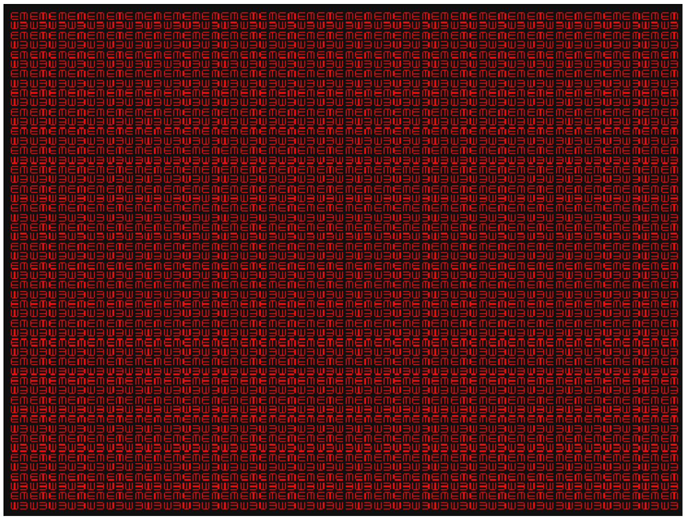
16.147.4 Method

Turn up your monitor’s brightness control until the raster is just visible. Adjust the raster’s position and size using the size and raster centering controls. The raster centering adjustment for many monochrome monitors consists of moving magnetic rings on the deflection yoke.

16.148 RED_EM, RED_EM+

16.148.1 Description

In the primary version, the screen is filled with red (RED) EM character blocks on a black background.



16.149 Regulate

16.149.1 Description

The image cycles between two (2) patterns. In the primary version, the first pattern is a white outline that defines the edges of displayed video. The other pattern has the same outline plus a solid white rectangle in the center. The size of the solid rectangle equal 95% of the height and width of displayed video. The speed of the cycle cannot be changed. The secondary version has a thick white frame with a black center for the first pattern and a solid white active video area for the other pattern.

The first pattern of the primary version is shown below.

16.149.2 Test

High voltage regulation.

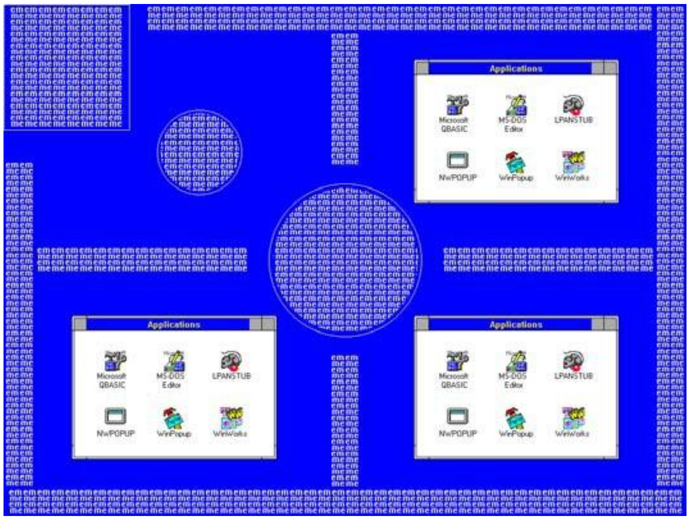
16.149.3 Method

The size of the border should not change for each half of the image. The change in border size between the two images should be within the specification limits of the monitor.

16.150 Samsung1, Samsung2

16.150.1 Description

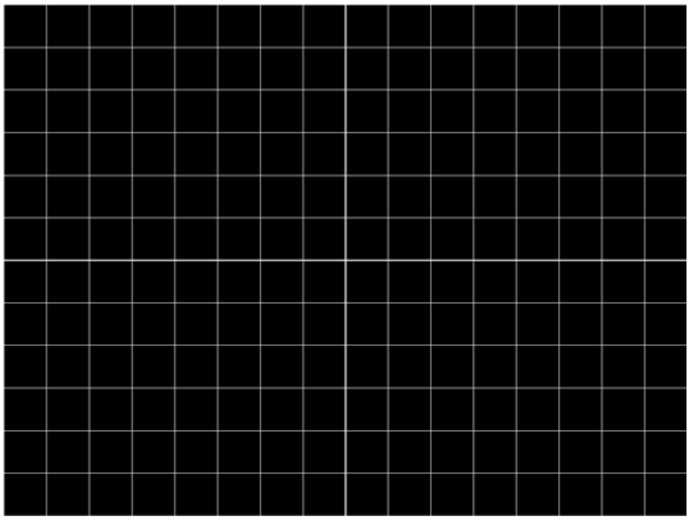
Special test images developed per customer specifications. The image consists of three small simulations of Microsoft Windows® screens on a blue background (Samsung1) or black background (Samsung2). A border and centered cross are formed with repeating groups of the characters “e” and “m”. The repeating characters are also used to form a rectangular patch in the upper left hand corner and a circular area in the center of the image. The secondary version of Samsung2 draws a white background.



16.151 Samsung3

16.151.1 Description

Special test image developed per customer specifications.



16.152 Samsung 4

16.152.1 Description

Special test image developed per customer specifications.

16.153 Samsung5

16.153.1 Description

Special test image developed per customer specifications.

16.154 Samsung6

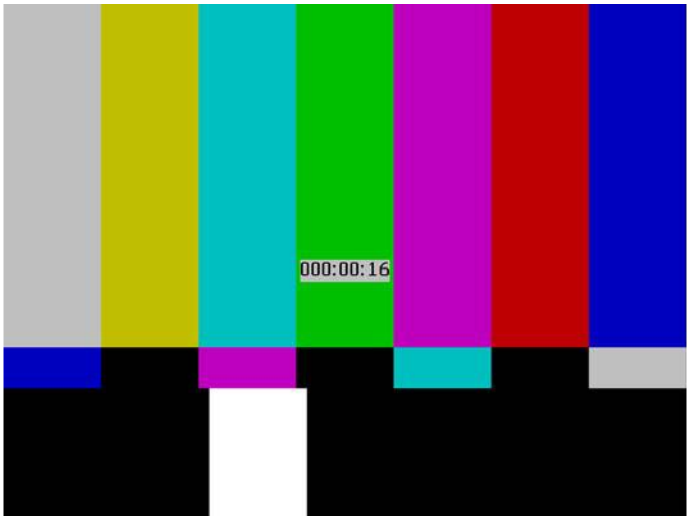
16.154.1 Description

Special test image developed per customer specifications.

16.155 SansungB

16.155.1 Description

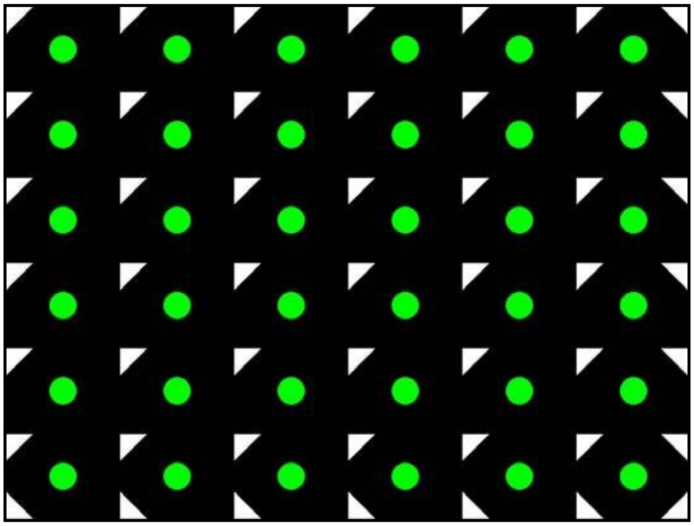
Special test image developed per customer specifications.



16.156 SamsungT

16.156.1 Description

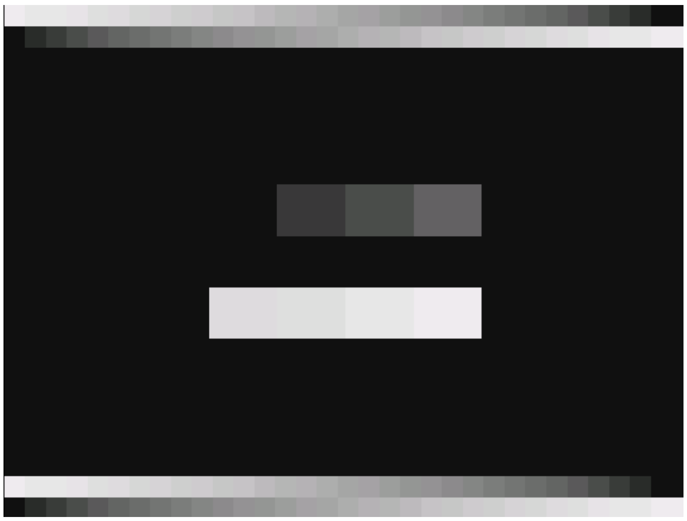
Special test image developed per customer specifications. There are four versions of this image. When selected, the following image is displayed.



16.157 Set01k

16.157.1 Description

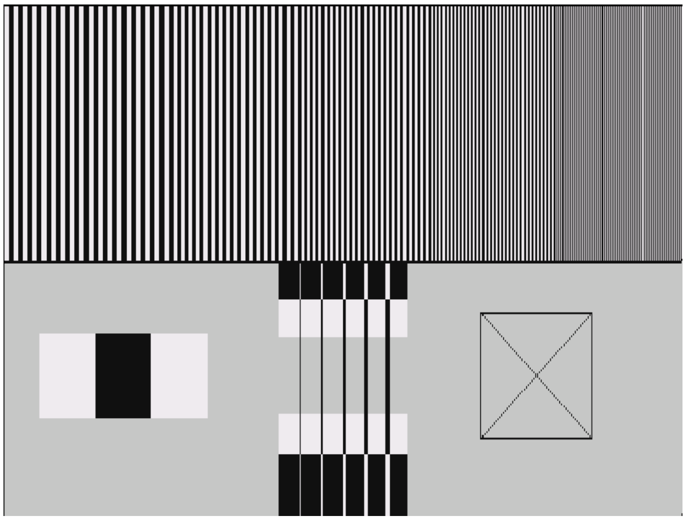
Special test image developed per customer specifications. There are 8 shades of gray from full black (0 volts) to full white.



16.158 Sharpnes

16.158.1 Description

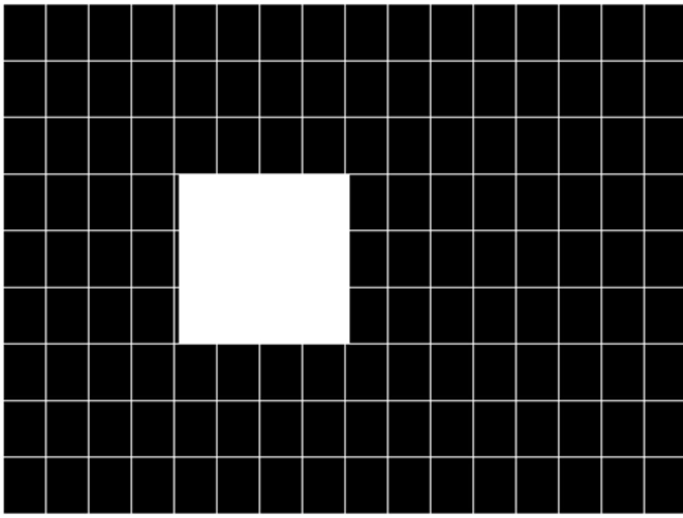
The top of this pattern is the same as the Multiburst. The bottom, with all its single-pixel black lines, allows you to fine-tune the sharpness control.



16.159 SlideBox

16.159.1 Description

This image displays a 16x9 white crosshatch with a large white patch moving across the screen.


¥

To change the animation speed:

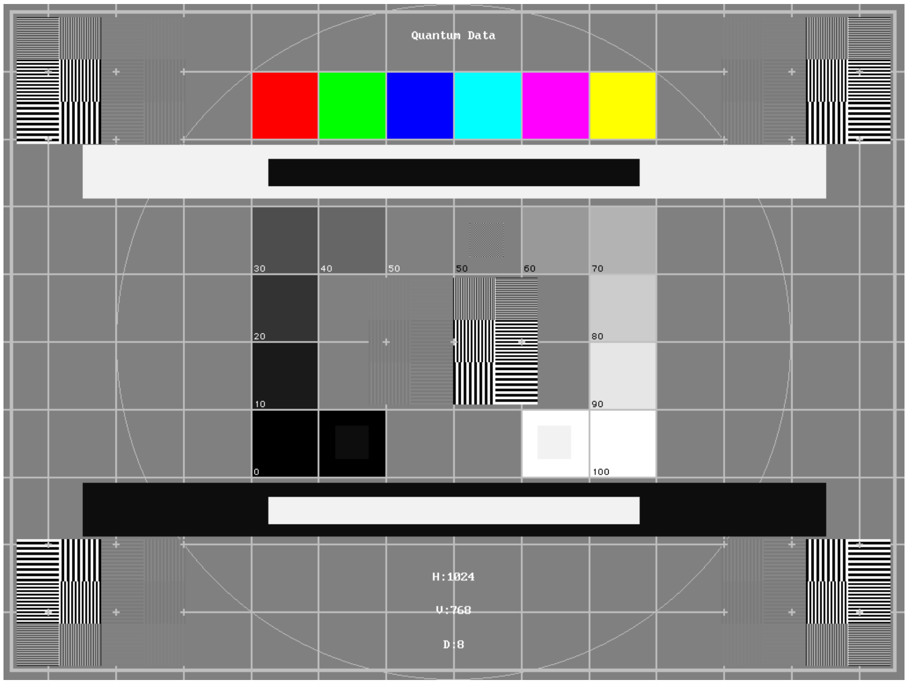
1. Load the SlideBox image.
2. Establish a terminal session with the generator (see page 30).
3. Enter the following commands:

```
ISUB 1
IVER 1
IMGU
DELX 10; IMGU
DELX 20; IMGU
```

16.160 SMPTE133

16.160.1 Description

This image is based on a recommended practice (RP-133) test pattern designed by the Society of Motion Picture and Television Engineers (SMPTE). The original application was used in testing and evaluating medical imaging monochrome displays. The image now is used in many different display applications. The image is self-scaling as to the number of active pixels and active lines used. Some of the image's elements have minor differences from the original SMPTE specification.



These differences are noted in descriptions of the individual elements.

The image is drawn on a reference background having a 50% intensity level. The background covers the entire active video area.

Crosshatch – There are 10 boxes vertically. The number of horizontal boxes is based on the physical aspect ratio determined by the HSIZ and VSIZparameters in the currently loaded format. The boxes are perfectly square with any fractional spaces placed around the outside edges of the image. The vertical lines are two (2) pixels thick while the horizontal lines are two (2) scan lines thick. Small crosses indicate the intersection of the horizontal and vertical lines when they are covered by other parts of the image. All parts of the crosshatch are normally drawn using a 70% intensity level. A 75% level is used in the secondary version.

Resolution patch – The patch is made up of six (6) smaller boxes that are each about 6.25% of the height of the display. The boxes are made of alternating intensity (0 and 100%) stripes. The stripes run vertically and horizontally. The stripes may be one (1), two (2) or three (3) pixels wide each. Details of the patch are shown in the lower half of the following illustration. The patches are located in each corner of the main image and in the center. They are oriented with the highest resolution and contrast boxes closest to the outside corners. The 48%-53%, 48%-51% and 50%-51% level patches are omitted in the secondary version.

Grayscale boxes – Twelve (12) boxes at eleven (11) intensity levels are clustered around the center of the main image. They start at 0% and increase in 10% steps to100% with two (2) boxes at a 50% level. All of the grayscale boxes are omitted in the secondary version.

Gamma check dither box – A small box is drawn inside the right-hand 50% grayscale box. The box is half the width and height of the larger box. The box consists of a checkerboard of alternate one-on and one-off pixels. The alternate pixels have levels of 0 and 100%. This smaller box is not part of the original SMPTE specification and is omitted in the secondary version.

Contrast boxes – Two (2) boxes are drawn adjacent to the grayscale boxes. They are at 0 and 100% levels. There are smaller boxes drawn inside each box at 5 and 95% levels. The contrast boxes are omitted in the secondary version.

Black and white windows – Two (2) horizontal bars are located above and below the grayscale boxes. Their height equals 8% of the display height. There are half-size bars centered in the larger bars. In the primary version, the dark portion of the windows is at a 5% level and the bright portion is at a 95% level. Zero and 100% levels are used in the secondary version.

Border – A border line is drawn around the image. It is set in from the edges of displayed video a distance equal to 1% of the displayed height and has a thickness equal to 0.5% of the displayed height. The intensity level is the same as that of the crosshatch lines.

Circle – A large circle is centered in the image. It touches the top and bottom of the active video area when the aspect ratio is wider than it is high (landscape-type display). The circle touches the left and right sides of active video when the aspect ratio is taller than it is wide (portrait-type display). The intensity level is the same as that of the crosshatch lines. The circle is not part of the original SMPTE specification.

Resolution data - The number of active pixels per line and the number of active lines is shown as text below the lower black and white window. The pixel depth also is shown. The intensity level of the text is the same as that of the crosshatch lines. The displaying of the data is not part of the original SMPTE specification.

The secondary version adds a row of six (6) color bars above and below the black-and-white windows. The order of the colors, from left to right, is red, green, blue, cyan (g+b), magenta (r+b) and yellow (r+g). The top row is drawn at 100% intensity levels and the bottom row is drawn at 50% intensity levels. Color bars are not part of the original SMPTE specification.

16.160.2 Test

Deflection linearity.

16.160.3 Method

If the overall height and width of the display's active video area match the sizes in the format, the large circle should be perfectly round. Each box in the crosshatch pattern should be the same size and shape.

16.160.4 Test

High contrast resolution.

16.160.5 Method

All the 0 and 100% level stripes in all the resolution patches should be separate and distinct.

16.160.6 Test

Low contrast resolution and noise.

16.160.7 Method

All the mid-level 2 on - 2 off stripes in all the resolution patches should be visible and distinct. This is a sensitive test for noise in the display's video amplifiers.

16.160.8 Test

Quick gamma check.

16.160.9 Method

The average brightness level of the small gamma dither box should match the brightness of the larger surrounding box. This is a visual check to see if the display's gamma correction is producing the correct mid-level response.

16.160.10 Test

Video gain linearity and gamma.

16.160.11 Method

The individual grayscale boxes all should be at their indicated levels. A small aperture photometer is usually required to get accurate and repeatable readings.

16.160.12 Test

Contrast and brightness check.

16.160.13 Method

On a display with properly adjusted brightness and contrast controls, both the 5% and

95% contrast boxes should be clearly visible inside their larger surrounding 0% and 100% boxes.

16.160.14 Test

Video amplifier stability.

16.160.15 Method

The two black-and-white windows should show sharp transitions between the smaller box and the surrounding window. Streaking may be an indication of undershoot or overshoot while ghost images may indicate a ringing problem.

16.160.16 Test

Excessive overscan and off-center alignment

16.160.17 Method

The entire border should be clearly visible on the face of the tube and not be hidden by the edge of the glass or by any bezel.

16.160.18 Test

Interlace flicker.

16.160.19 Method

The horizontal 1 on - 1 off stripes in the resolution boxes should not have objectionable flicker when shown with an interlaced format. Excessive flicker indicates that the combination of the display's CRT persistence and frame scan rate is below the persistence time of the human eye.

16.161 SMPTEbar, SMPTEbr2

16.161.1 Description

This image is based on an engineering guideline (EG1-1990) test signal specified by the Society of Motion Picture and Television Engineers (SMPTE). The SMPTE pattern, in turn, is derived from an EIA standard test pattern (RS-189-A). The image, is set up to be generated by an 801GX generator as an encoded TV output. It is designed for adjusting the color settings of a television monitor by eye. It can also be used with a TV waveform analyzer and vectorscope for testing video signal processors and color decoders. The image is available on all models as a component RGB signal. Some of the image's elements have some differences from the original SMPTE specification.

These differences are given in descriptions of the individual elements.

- The upper 67% of the image consists of a series of color bars. These bars match the order of the bars in the SMPTE and EIA patterns. They are similar to the 801GX's TVBar_75 image without the last black bar.
- The left side of the lower 25% of the image contains isolated -I and Q color difference signals that match the original EIA and SMPTE patterns. The -I signal appears as a bluish-gray bar and the Q signal appears as a purple bar on a TV monitor. The bars are separated by a white (+100 IRE) bar.
- The right side of the lower 25% of the image contains a narrow 12.5 IRE gray bar. Due to a hardware limitation on the 801GX, this portion of the pattern does not match the original EIA and SMPTE patterns. The original patterns had +3.5 (blacker than black) and +11.5 IRE bars separated by a +7.5 IRE (black) bar.
- The remaining central 8% of the image contains a row of chroma set bars. These bars are part of the SMPTE pattern but are not in the EIA pattern. The order of the alternating color and black bars matches those in the SMPTE pattern.

16.161.2 Test

Color video performance.

16.161.3 Purpose

This general purpose pattern can be used to check the video handling capabilities of most parts of a television system.

16.161.4 Method

When viewed on a TV screen, all of the upper color bars should be correct and in the order shown. The hue and intensity of each bar should be uniform over the entire bar.

The image can be used with a TV waveform analyzer to check the performance of a video system. The upper color bars, as they would appear on a waveform analyzer, are shown on a previous page.

16.161.5 Test

Color decoder performance.

16.161.6 Purpose

The image can used with a TV vectorscope to check for proper operation of a video color decoder. Vectorscope signatures of the upper and lower portions of the image using NTSC encoding can be found on the previous page.

16.161.7 Method

The vectorscope signature for the color bars should hit the target test point for each color on the vectorscope's graticule. If you are using PAL encoded video, the signature will be similar to the one shown for the TVBar_75 test image.

The three "legs" of the vectorscope signature for the -I and Q color difference signals should match the Burst, -I and Q reference lines on the vectorscope's graticule.

The following tests are based on the original SMPTE guideline:

16.161.8 Test

Visual chroma gain adjustment.

16.161.9 Method

To perform this test, you must have a way of turning off the red and green guns in the monitor under test. Turning off the red and green video components of the 801GX generator's video output will not work for this test.

This test uses the upper and central color bars. Switch off the red and green guns on the monitor. This will produce four blue bars, separated by black bars. Adjust the chroma gain so that the brightness of each outer blue bar is uniform over the entire bar. The gain is correct when the bottom 10% of each bar is the same brightness as the rest of the bar.

16.161.10 Test

Visual chroma phase adjustment.

16.161.11 Method

In order to perform this test, you must have a way of turning off the red and green guns in the monitor under test. Turning off the red and green video components of the 801GX generator's video output will not work for this test.

This test uses the upper and central color bars. Switch off the red and green guns on the monitor. This will produce four blue bars, separated by black bars. Adjust the chroma phase so that the brightness of each of the two central blue bars is uniform over the entire bar. The phase is correct when the bottom 10% of each bar is the same brightness as the rest of the bar.

16.161.12 Test

Visual black level adjustment.

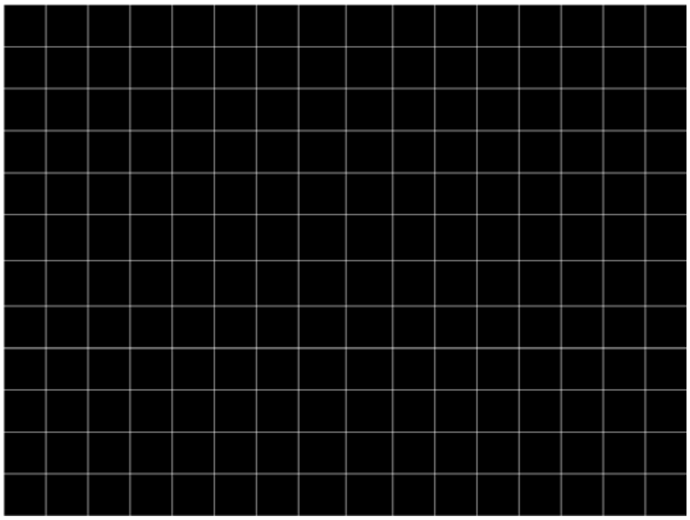
16.161.13 Method

This test uses the lower right hand portion of the image. Reduce the black level until the gray bar disappears. Slowly increase the black level until the bar just becomes clearly visible.

16.162 Sony6

16.162.1 Description

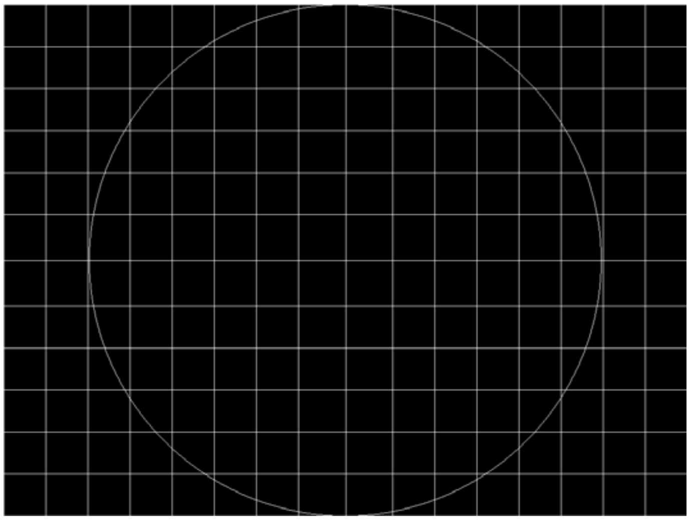
Special test image developed per customer specifications.



16.163 Sony6WLC

16.163.1 Description

Special test image developed per customer specifications.



16.164 sRGBflat

16.164.1 Description

For testing color response per Microsoft's WinColorKit standard. This standard was developed by Microsoft to standardize methods relating to the matching of colors appearing on various displays. There are 38 different versions of this image to support this feature.

When selected, a flat image appears with a color that is remembered from the last time the image was set up. The example below shows version 8 (Red1) of the sRGBflat image:

A small label in the upper left corner of the image indicates the Microsoft name for the color that is currently being displayed (for example, "sRGB-Gray5"). Note that some of the names that appear conflict with generator color names (for example, "sRGB-Gray5" is not the same as the generator color "Gray5").

After pressing the Contents key and then the Options key. You then enable More and use the +/- increment keys to select up to 38 different versions of this image. Each image displays another WinColorKit color.

16.165 Staircase

16.165.1 Description

The active video area goes from full black at the left edge of the screen to full white at the right edge. There are sixteen (16) steps.

16.165.2 Test

Video gain linearity

16.165.3 Method

When viewed on a monitor's screen, a black bar plus five (5) gray bars should be visible.

There should be no color shifts, and each of the bars should be uniform in color.

The image also can be used with an oscilloscope or TV waveform analyzer to check the gain linearity and gamma correction of a video system.

16.166 Strokes0, Strokes1

16.166.1 Description

This image may cited by some display manufacturers' test procedures. The Strokes0 version consists of multiple groups of separated red, green and blue horizontal lines drawn on a black background. The Strokes1 version consists of multiple groups of separated red, green and blue diagonal lines drawn on a black background.

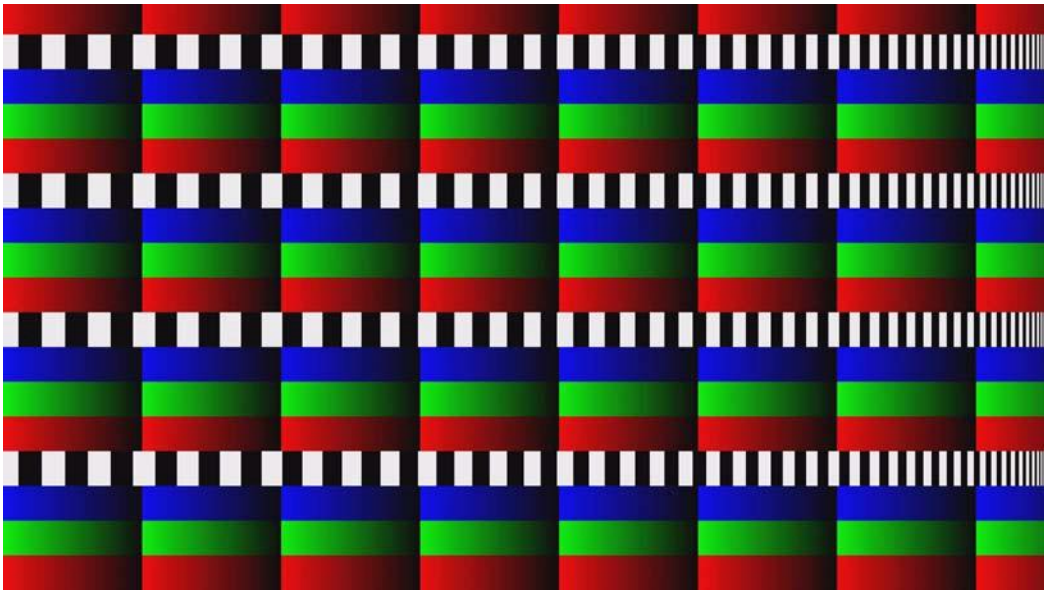
16.166.2 Purpose

These images are special-purpose test patterns used in test and alignment procedures specified by some display manufacturers.

16.167 TAARamp

16.167.1 Description

The TAARamp pattern is shown below.



16.168 Taffeta

16.168.1 Description

16.169 Text_9, Text_9T, Text_11, Text_12T, Text_16

16.169.1 Description

In the primary versions, the screen is filled with random paragraphs of white text on a black background. The amount of text is determined by the size of the font used and the horizontal and vertical resolution of the format. The Text_16 image uses a larger font than the Text_9 image. The secondary versions use black text on a white background.

The primary version of the Text_9 image is shown below.

16.169.2 Test

Word processor simulation

16.169.3 Purpose

If your monitor is used in word processor workstations or other applications that call for large amounts of text to be displayed, you can use this image to simulate actual user conditions.

16.169.4 Method

Select a suitable font size and text color. Adjust your monitor's brightness and contrast controls to obtain the best image. The characters in all areas of the display should be well formed and in focus.

16.170 TextFlat

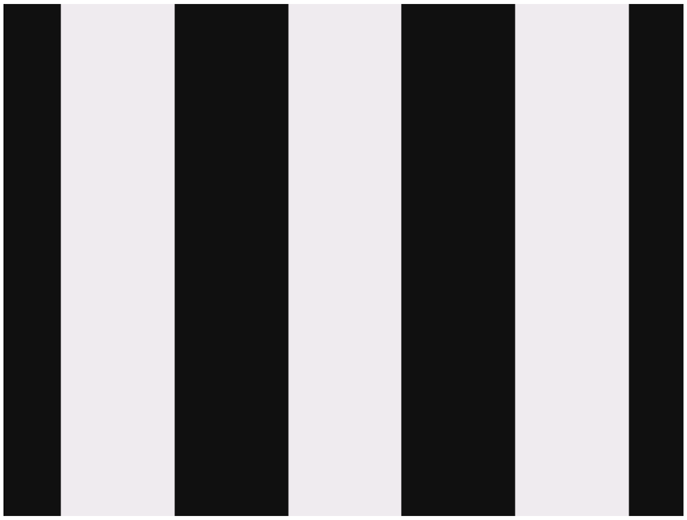
16.170.1 Description

In the primary versions, the screen is filled with random paragraphs of white text on a black background. The amount of text is determined by the size of the font used and the horizontal and vertical resolution of the format. The Text_16 image uses a larger font than the Text_9 image. The secondary versions use black text on a white background.

16.171 ThreeBar

16.171.1 Description

The screen is filled three vertical white bars on black background.



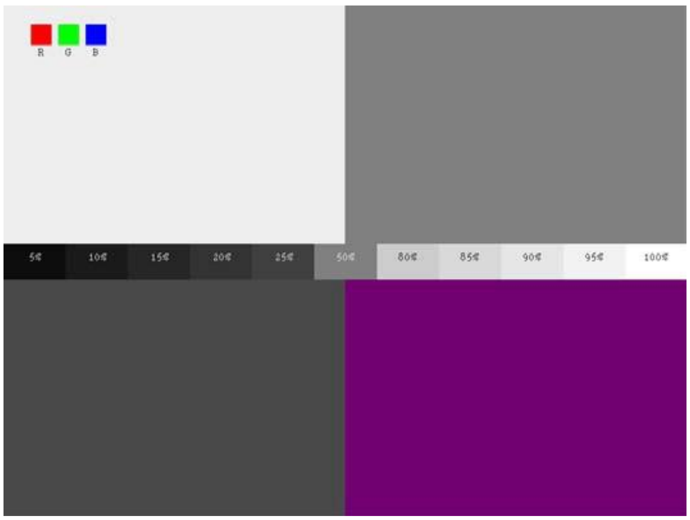
16.172 TintAlign

16.172.1 Description

16.173 Toshiba

16.173.1 Description

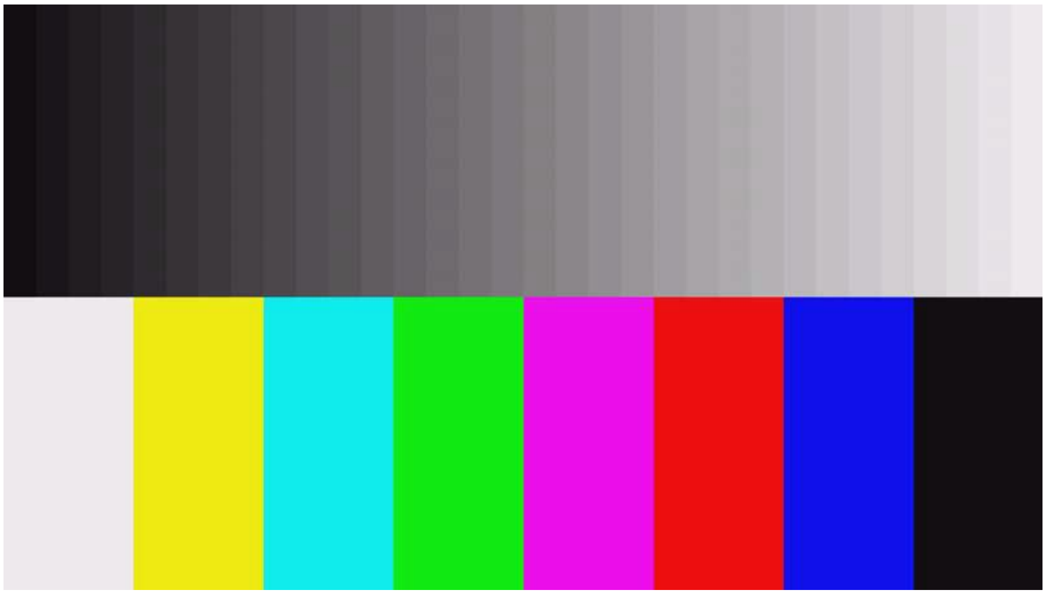
Special test image developed per customer specifications. There are two sub images, the secondary image is depicted below. The top half of the image has three small boxes (red, green, blue) with the upper left half at 92.7% luminence and the upper right half at 50% luminence. There is a series of 11 small boxes of increasing luminence left to right with the luminence identified in text. The lower left quarter of the image is 28.5% luminence and the lower right is magenta at 44.3 IRE.



16.174 TPVAOC1 and TPVAOC2

16.174.1 Description

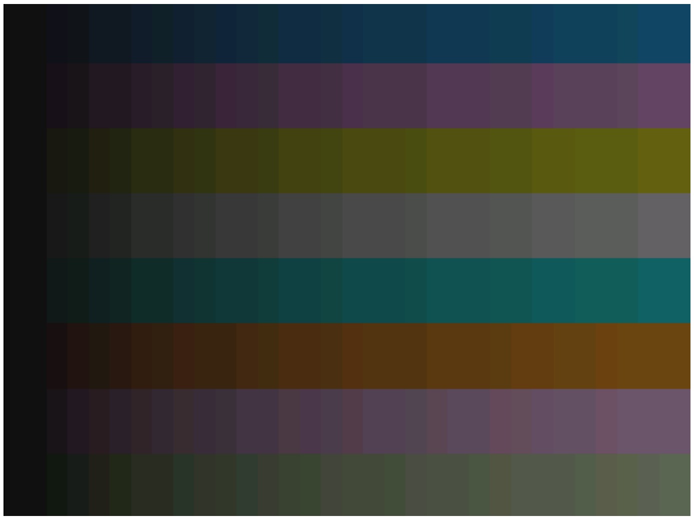
The TPVAOC1 pattern is shown below.



16.175 TTECorp1

16.175.1 Description

Special test image developed per customer specifications.

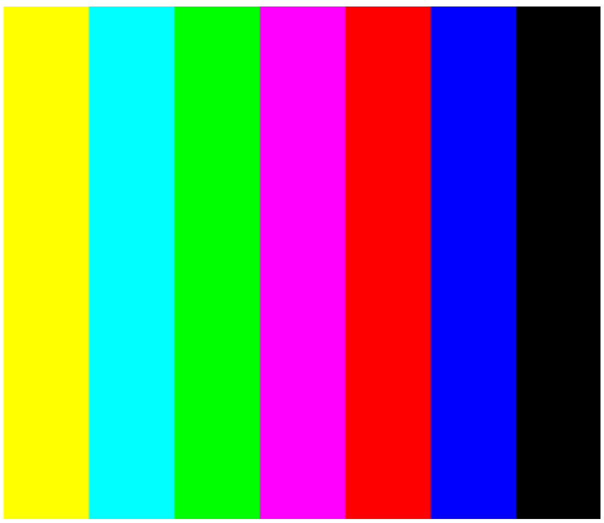


16.176 TVBar100 & TVBar_75 (TV formats only)

16.176.1 Description

The image consists of seven vertical bars that fill the entire active video area. The color and order of the bars is shown in the figure below. The TVBar100 image has a peak video level of 100 IRE and the TVBar_75 image has a peak video level of 75 IRE.

The TVBar100 image is shown below.



16.176.2 Test

Color video performance.

16.176.3 Purpose

This general purpose pattern can be used to check the video handling capabilities of most parts of a television system.

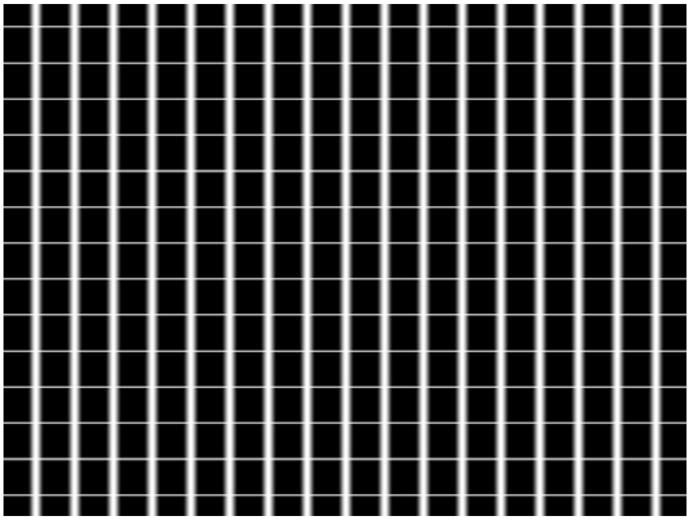
16.176.4 Method

When viewed on a TV screen, all of the colors should be correct and in the order shown.

The hue and intensity of each bar should be uniform over the entire bar.

The image can be used with a TV waveform analyzer to check the performance of a video system. Individual scan lines of each image, as they would appear on a waveform analyzer, are shown on the following page.

The image is quite effective when used with a TV vectorscope to see how a video system handles an encoded color signal.The image consists of a white crosshatch on a black background. The lines form square boxes when the display's active video area has a 4:3 aspect ratio. The vertical lines are made using sine-squared (2 T) pulses (T = 125 nSec for NTSC and T = 100 nSec for PAL).



16.176.5 Test

Convergence adjustment.

16.176.6 Purpose

To accurately produce an image on a color monitor, the three electron beams in the CRT must meet (converge) at the same location at the same time. Lines displayed on a mis-converged monitor will appear as several multi-colored lines, and the transitions between different colored areas will contain “fringes” of other colors.

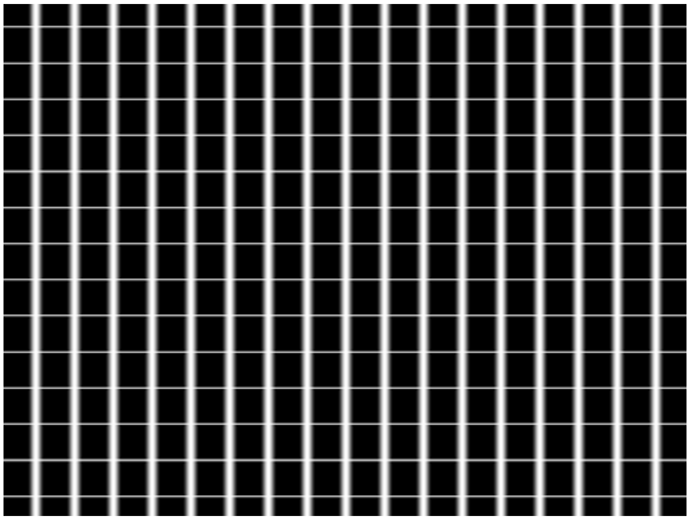
16.176.7 Method

The convergence adjustments of most color monitors can be divided into two main categories. The first set of adjustments, usually called “Static Convergence,” calls for aligning the three beams in the center of the display. This method involves turning on all three guns and adjusting the various magnets on the convergence assembly to produce all white lines and dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may each require their own magnet adjustment sequence.

After the center of the display is properly converged, the outer areas can be adjusted by using the monitor’s “Dynamic Convergence” controls. The number of controls, the area of the screen that they affect and their adjustment procedure is dependent upon the monitor under test.

16.176.8 Test

Sweep linearity adjustment.



16.176.9 Purpose

To present an undistorted display, the horizontal and vertical sweeps of the electron beam across the face of the CRT should be at uniform speeds. Any non-uniformity in the sweep will cause portions of an image to be stretched while other portions will be compressed. Non-linearity in a monitor can show up in several ways. It may be present across the entire screen, a large portion of the screen, or it may be localized in a very small area.

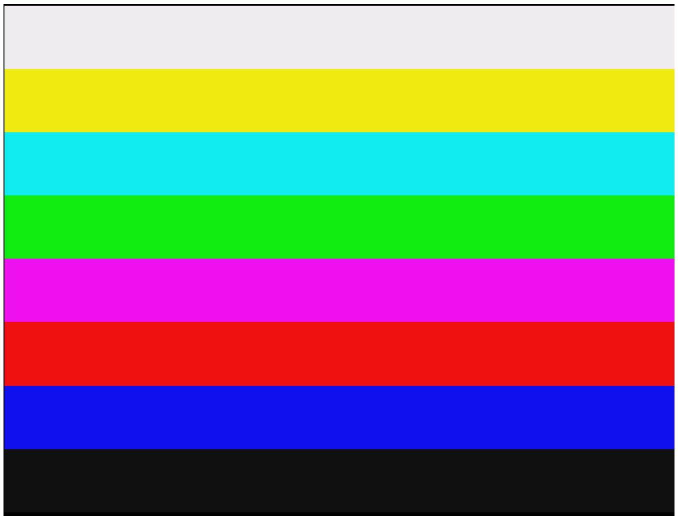
16.176.10 Method

Adjust the display's linearity controls so that all of the boxes in the crosshatch are identical in size. You can measure the boxes with a ruler or with a gauge made for the monitor under test. Any deviation should be within your specification limits.

16.177 TVBarH

16.177.1 Description

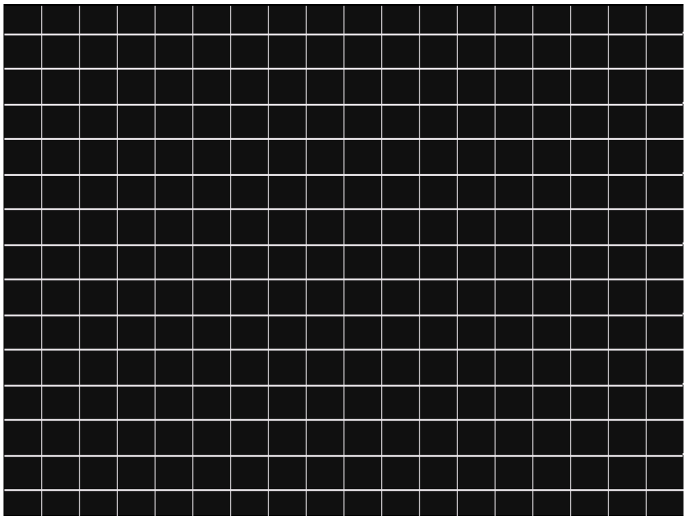
The image consists of seven horizontal bars that fill the entire active video area. The color and order of the bars is shown in the figure below.



16.178 TVHatch

16.178.1 Description

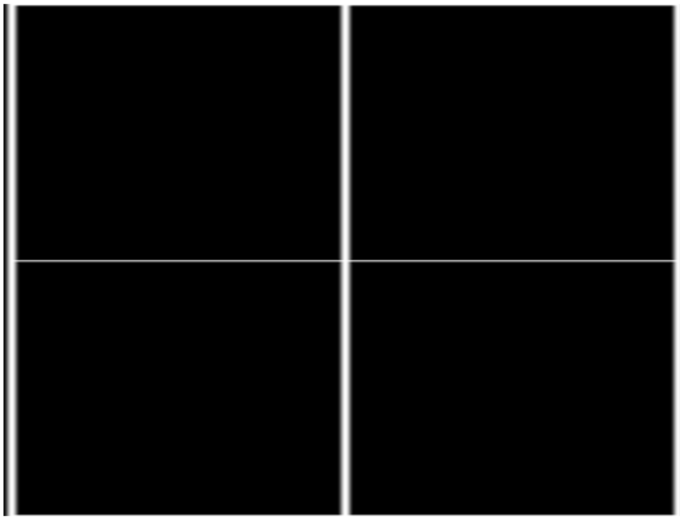
Primary version of TVHatch is shown below.



16.179 TVoutLin

16.179.1 Description

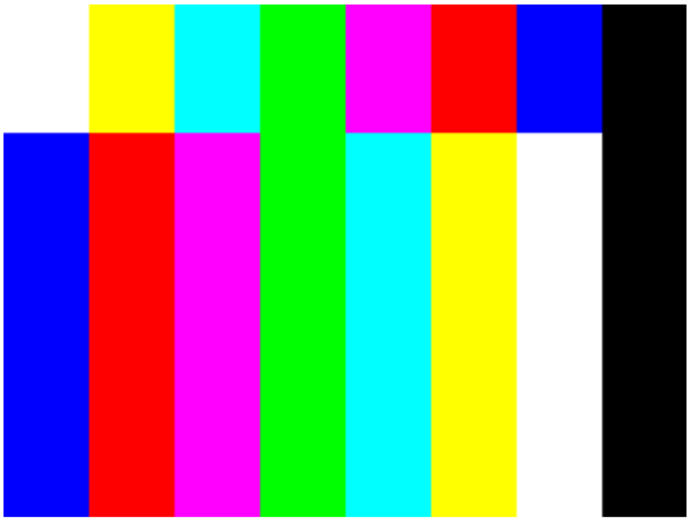
Equivalent to Outline1 image but it uses anti-aliasing for vertical bars and double horizontal lines, which reduces flickering.



16.180 TVSplBar

16.180.1 Description

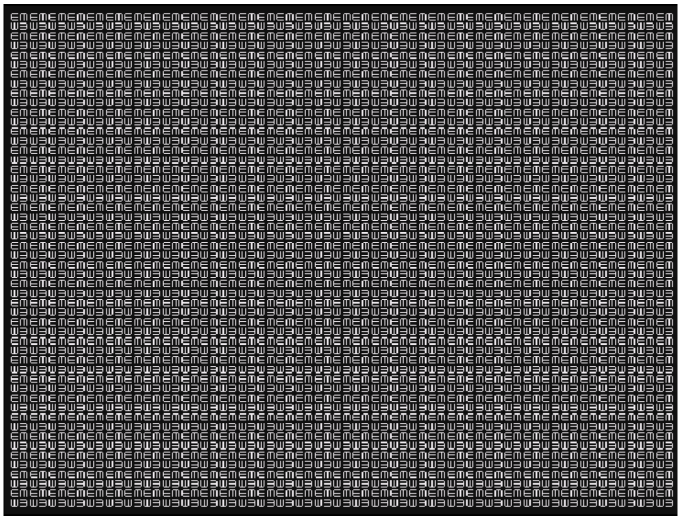
Special test image developed per customer specifications.



16.181 WHT_EM, WHT_EM+

16.181.1 Description

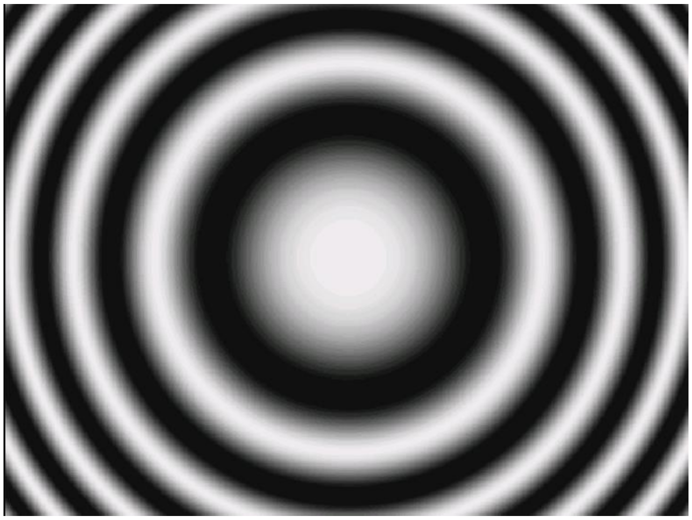
In the primary version, the screen is filled with white (WHT) EM character blocks on a black background.



16.182 ZonePlt

16.182.1 Description

A zone plate is a radially symmetric pattern with low frequencies in the middle and high frequencies near the edge. It is useful for experimenting with frequency- and direction-sensitive filtering and also for testing the anti-aliasing capability of image resizing methods.



END OF USER GUIDE