980 HDMI Video Generator Module

User Guide

Rev: A10

Table of Contents

1. About the 980 HDMI Video Generator Module

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

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

1) The 980 Advanced Test Platform – 2-slot chassis with a 10.4 inch touch display

2) The 980B Advanced Test Platform – 5-slot chassis with a 15 inch touch display

3) The 980R Advanced Test Platform - 5-slot rack mountable chassis with a 7 inch touch display

The 980 HDMI Video Generator module supports video pattern testing and audio testing of 4Kx2K HDMI sink devices with pixel rates up to 300MHz. It is equipped with two (2) Tx ports and an Rx port. The two HDMI Tx ports are both active simultaneously which enables you to test multiple sinks and displays at the same time. The Rx port feature is optional and enables you to conduct basic functional testing of an HDMI or DVI source device.

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

1.1   Scope of this User Guide

This User Guide provides descriptive and procedural information on the 980 HDMI Video Generator module for testing HDMI sink devices.

Although you can operate the 980 HDMI Video Generator 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 980/980B 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 980/980B modules. The following is a list of the User Guides available with the 980/980B 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 – This User Guide 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 – This User Guide 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 – This 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 – This User Guide 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 – This User Guide 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 – This User Guide 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 - This User Guide covers MHL CBUS compliance testing for both MHL sources as well as sinks and dongles. This compliance test applications are provided by the 980 CBUS Compliance Test module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.

- 980 HDMI 2.0 Video Generator module – This User Guide covers the features and functions offered by the 980 HDMI 2.0 Video Generator module. Used in conjunction with the 980 Advanced Test Platform Quick Start Guide.

- 980 HDMI Video Generator module (This User Guide.) – This User Guide 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.

1.2   Changes to this User Guide

The following changes were made to this document:

- Updated screen examples to reflect the new GUI.

- Added Analyzer functionality for basic functional testing of HDMI 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 HDMI Video Generator 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. In the near future and the Rx port will be activated and there will be some options related to analysis of HDMI source devices. Refer to the following screens. When using the external 980 GUI Manager you must be connected to the 980/980B in order to read the Instrument Information.

```
    ⊚   Link Mode...
    ⊚   RX HDCP Settings...
   [5v]  RX 5 Volts...

    ✚   Add
    ✖   Delete

    🖉   Connect
    🖉   Disconnect

    ⓘ   Information
    🖉   Edit
    ⊚   Configure

    🖳   Real-Time Screen Capture
    🖳   Real-Time Data Capture

    ⚙   Upgrade GUI Application
    ⚙   Upgrade UI/Firmware/Gateware
    ⚙   Upgrade CT Scripts
    ⚙   Upgrade System Components

    🖉   Generate UID File
    📜   Apply Old License
    📜   Apply ATP License
    📜   Apply Demo License
```

ⓘ Instrument Information   ✕

ⓘ Instrument: 980_5_Cards

```
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]
3            : [ eth0    inet 192.168.254.143/24 brd 192.168.254.255 scope global eth0]
PCIE3        : [ 2.5x8]
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]
```

                                                                OK

1.4   980 User Interface

The 980 provides a graphical user interface for operation. This GUI can run both on the 980 itself 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 980 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 980 GUI Manager provides convenient operation of the 980 HDMI 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 980/980B fully through the built-in color touch screen display. There are two key features that are available only with the embedded 980 GUI Manager: 1) viewing the video in real time, 2) viewing the HDMI/MHL video/audio metadata and DDC (MHL C-Bus) transactions in real time using the **Real Time** mode. The only feature related to the 980 HDMI Video Generator module that is only available on the embedded GUI Manager is the Auxiliary Channel Analyzer (ACA) optional feature. You cannot view the auxiliary channel traces—DDC traces and CEC messages—in real time on external 980 GUI Manager. However, once saved you can view them off line on a PC.

2. Getting Started

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

2.1   What is shipped with the 980 HDMI Video Generator module?

The 980 HDMI Video Generator module can optionally be equipped in either of the 980 Advanced Test Platforms (980 and 980B). The following items are included with the 980 HDMI Video Generator module:

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

2.2   Operational workflow for HDMI Video Pattern Testing

The following are the high level steps you will need to follow to get your 980 HDMI Video Generator 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 980/980B from the shipping box.
2. Assemble the sink device under test into your lab area and power it up.
3. Connect the 980/980B 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:
    o Put the 980/980B on your corporate network and enable DHCP using an available Ethernet patch cable, or…
    o Connect directly with a host PC or laptop using the Ethernet crossover cable provided.
6. (Optional – not required if using the built-in display) Assign an IP address to the 980/980B either directly or by enabling DHCP.
7. (Optional – not required if using the built-in display) Download the latest 980 GUI Manager application from the Quantum Data website:
    www.quantumdata.com/downloads/index.asp.
8. (Optional – not required if using the built-in display) Install the 980 Manager application on your host PC.
9. (Optional – not required if using the built-in display) Establish a connection to the 980/980B from the 980 Manager resident on your host PC.
10. (Optional – not required if using the built-in display) Through the 980 Manager "Add" the 980/980B as an Instrument.

2.2.2   Procedures covered in this User Guide:

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

2. Selecting video formats (resolutions).

3. Setting the colorimetry and video mode.

4. Selecting the test patterns.

5. Running other tests on HDMI sink devices.

6. Optionally running tests on HDMI source devices.

3. Testing HDMI Displays with the 980 HDMI Video Generator module

This chapter describes how to operate the 980 HDMI Video Generator module to test HDMI or DVI sink devices (HDTVs, PC monitors).

3.1   Workflow for running the video pattern testing of HDMI displays

The workflow below is a high level set of tasks for operating the 980 HDMI Video Generator 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.
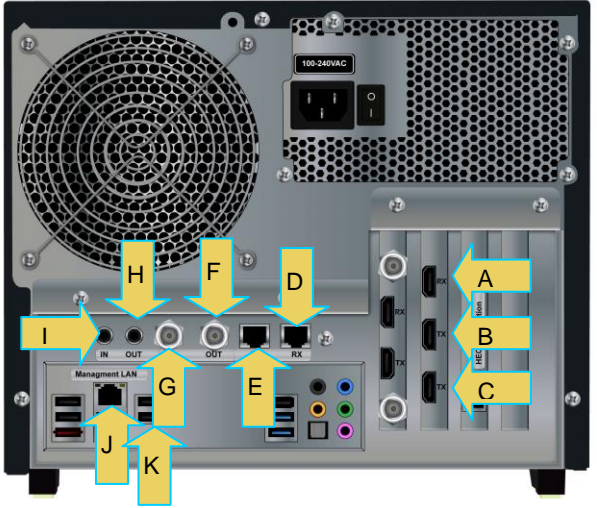
1. Power up the 980. Refer to the procedures in <u>Powering up the 980</u>.

    Note: The power switch in the front is used when you are turning off the 980 HDMI Protocol Analyzer 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 980/980B Advanced Test Platform using the procedures in the 980 Advanced Test Platform Quick Start Guide.

3. Connect the HDMI or DVI 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 HDMI or DVI.

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 HDMI Video Generator module.

| 980 Configurations	Information / Function
HDMI Video Generator module - 980 	The following is a description of each connector: **980 HDMI Video Generator module:** ▪ A – HDMI Rx port for analyzing HDMI sources (future functionality). ▪ B – HDMI Tx1 port for HDMI video/audio generation. ▪ C – HDMI Tx2 port for HDMI video/audio generation (same output as Tx1). 　　**Note**: Video Generator module will always be equipped in the second slot on the 980 ATP. **980/980B QD Bus Board:** ▪ D – Internal Ethernet Tx connector; not used. ▪ E – Internal Ethernet Rx connector; not used. ▪ F – BNC Trig OUT connector. Not used for this module. ▪ G – BNC Trig IN connector. Not used for this module. ▪ H – RCA OUT connector for SPDIF function. Not used for this module. ▪ I – RCA IN connector for SPDIF function. Not used for this module. **980/980B Lower Panel:** ▪ J – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line control and FTP for transferring files. ▪ K – Various USB ports for transferring files and restoring system.
HDMI Video Generator module – 980B	The following is a description of each connector: **980 HDMI Video Generator module:** ▪ A – HDMI Rx port for analyzing HDMI sources (future functionality). ▪ B – HDMI Tx1 port for HDMI video/audio generation. ▪ C – HDMI Tx2 port for HDMI video/audio

980 Configurations	Information / Function
	generation (same output as Tx1). **Note**: Video Generator module may be equipped in any of the 5 slots in the 980B ATP. **980/980B 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.
HDMI Video Generator module – 980R 	The following is a description of each connector: **980 HDMI Video Generator module:** - A – HDMI Rx port for analyzing HDMI sources (future functionality). - B – HDMI Tx1 port for HDMI video/audio generation. - C – HDMI Tx2 port for HDMI video/audio generation (same output as Tx1). **Note**: Video Generator module may be equipped in slots 1,. **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.
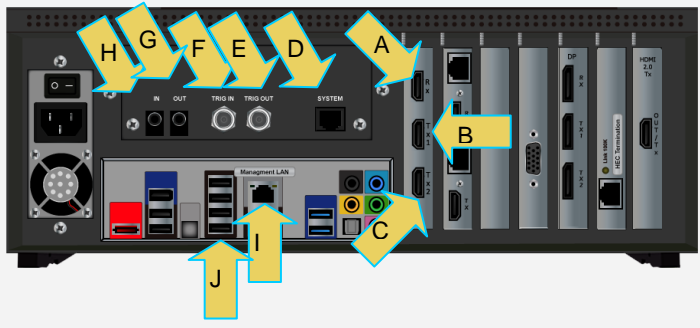
980 Configurations	Information / Function
	Not used for this module.
	980R Lower Panel:
	▪ I – Ethernet port for connection to PC host for 980 GUI Manager application, telnet for command line control and FTP for transferring files.
	▪ J – Various USB ports for transferring files and restoring system.

3.3   Making the physical HDMI connections

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

Connection for video testing (e.g. Tx2) – 980 example
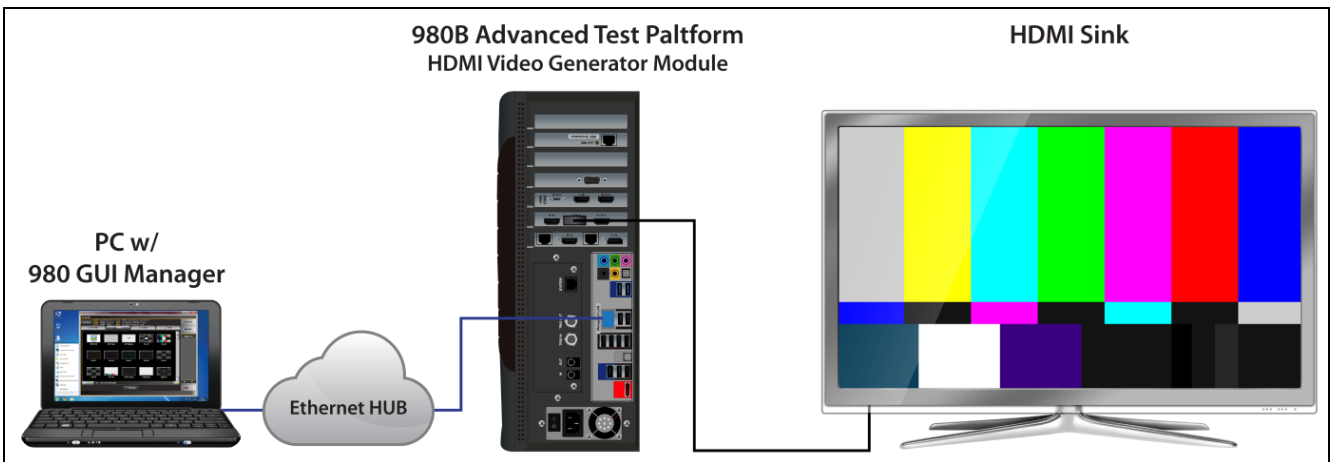
Connection for video testing (e.g. Tx1) – 980B example
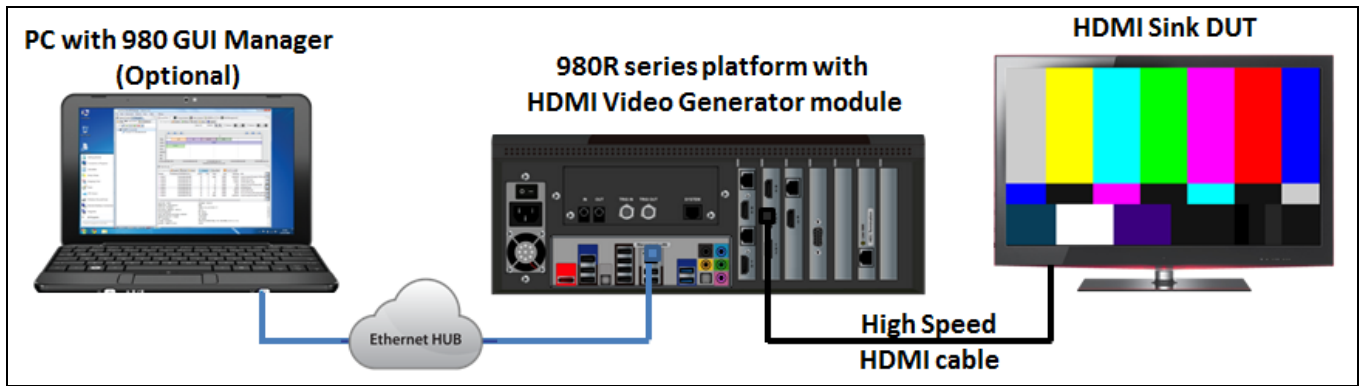
Connection for video testing (e.g. Tx1) – 980B example

To make the physical HDMI connections for testing HDTVs:

This procedure assumes that you have assembled the 980 platform (980, 980B or 980R) with the 980 HDMI Video Generator module and the HDMI sink device under test and applied power to all these devices. Refer to the procedures below and the diagram above.

980 Advanced Test Platform
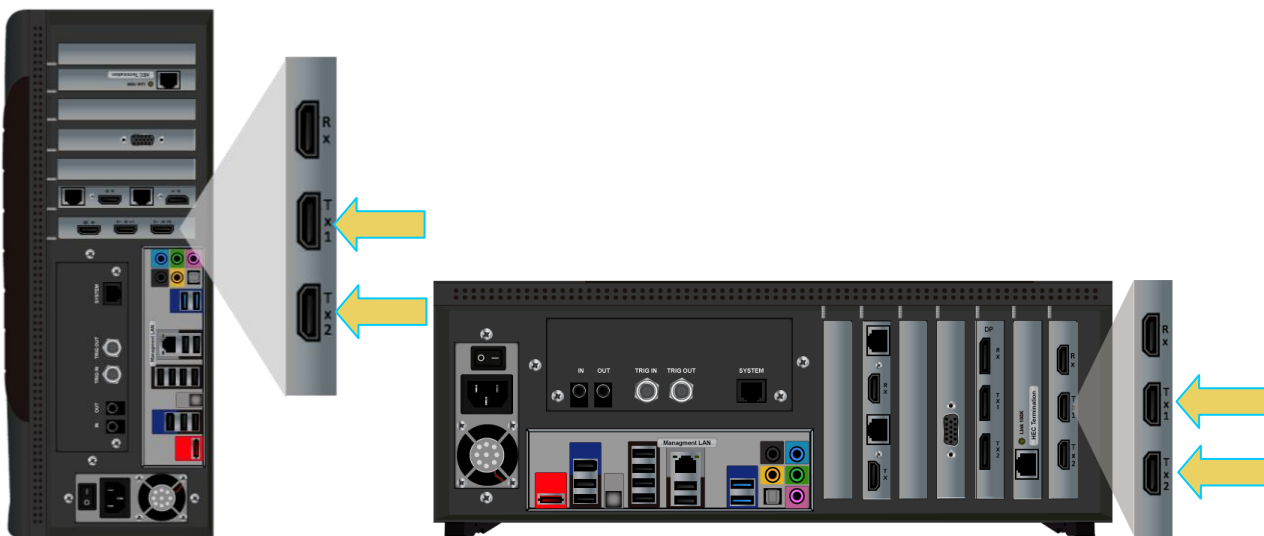
980B Advanced Test Platform   *980R Advanced Test Platform*

1. Connect your HDMI sink device under test to one of the HDMI Tx connectors on the 980 HDMI Video Generator module. Use an HDMI-compliant cable.

3.4   Navigating through the 980 GUI Manager interface

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

To navigate to the video test functions:

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

A blank **Generator** panel appears as shown below.
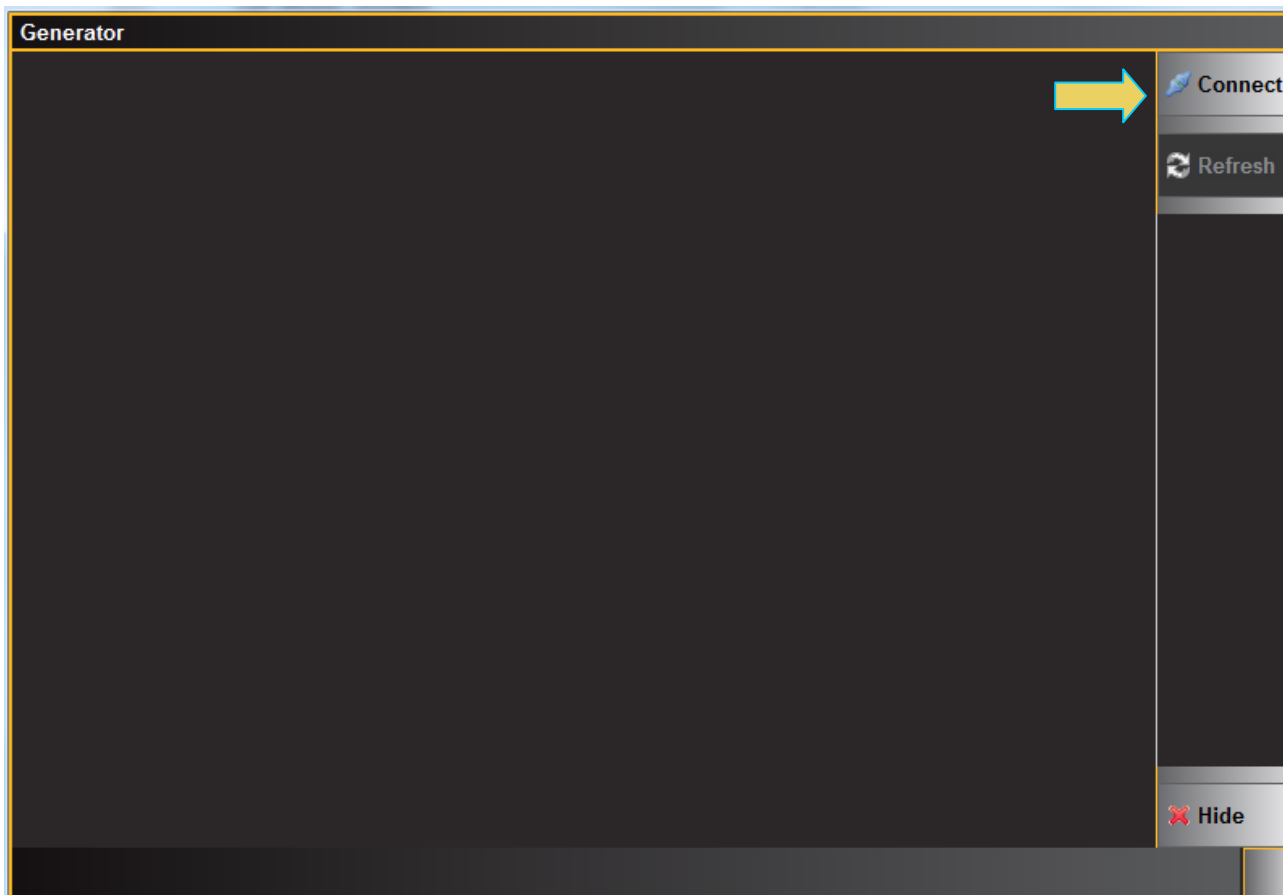
2. Click on the **Connect** button to initiate a connection between the 980 GUI Manager and the 980 Generator application.

   A dialog box will appear asking you to connect to the 980/980B.

   Once you establish the connection, the **Generator** panel will be populated as shown below:
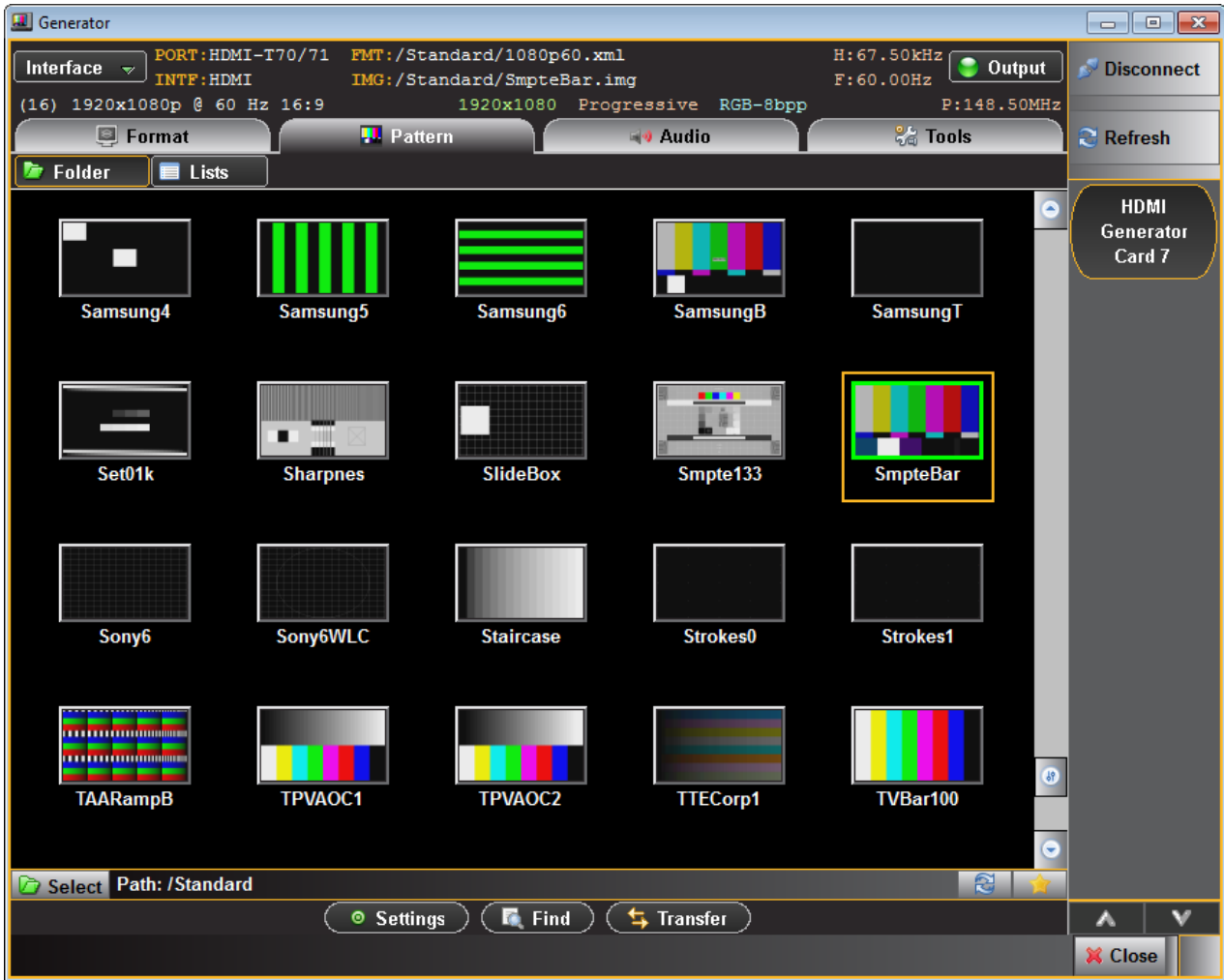
There is a port indicator on the right side of the panel (indicated below). The module will be in slots 1 through 7 on the 980B or in slot 2 on the 980.
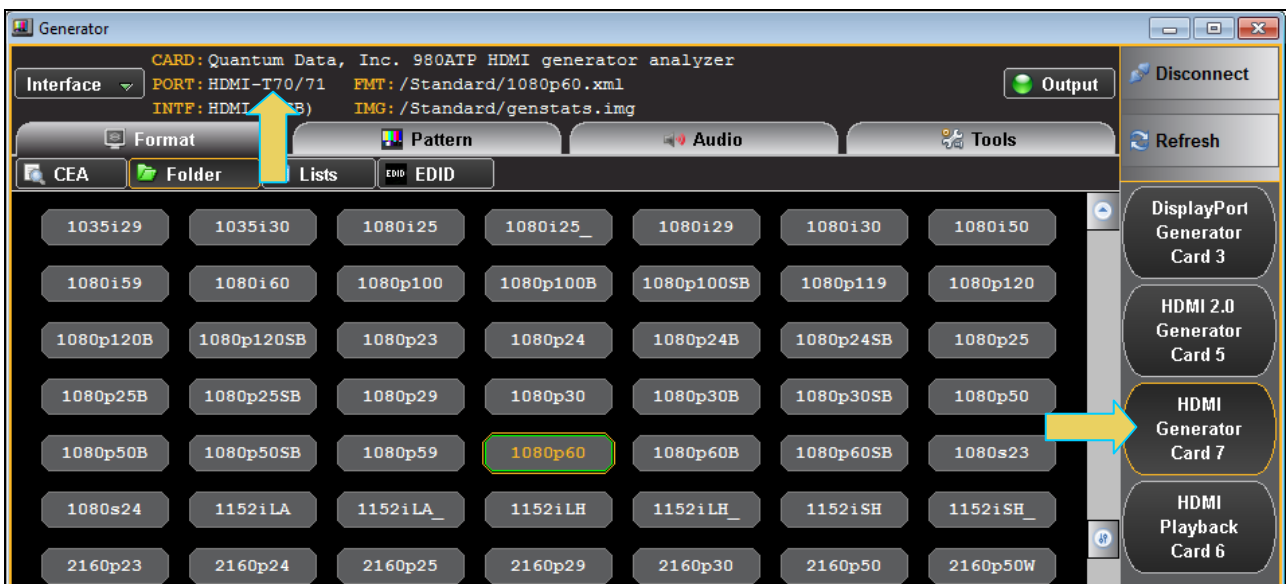
The Generator screen has a status area on the top of its panel. The status area provides the following information:

Generator Status Area (Top)	
Item	**Description**
Card	The name of the module. In all cases this will be the HDMI generator analyzer module.
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 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** [Refresh] activation button to re-sync the status area.

3.5   Selecting HDMI or DVI formats

Use the following procedures to select the mode, HDMI or DVI on the HDMI Video Generator module. There are two ways of selecting the HDMI formats. You can either access the formats through a CEA button that enables you to select (filter) format parameters one at a time to narrow in on a set of formats or you can select format from a list in a library.

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

To select interface (HDMI or DVI):

1. From the **Main** menu of the 980 HDMI Video Generator module, click the **Interface** button to select HDMI or DVI mode.
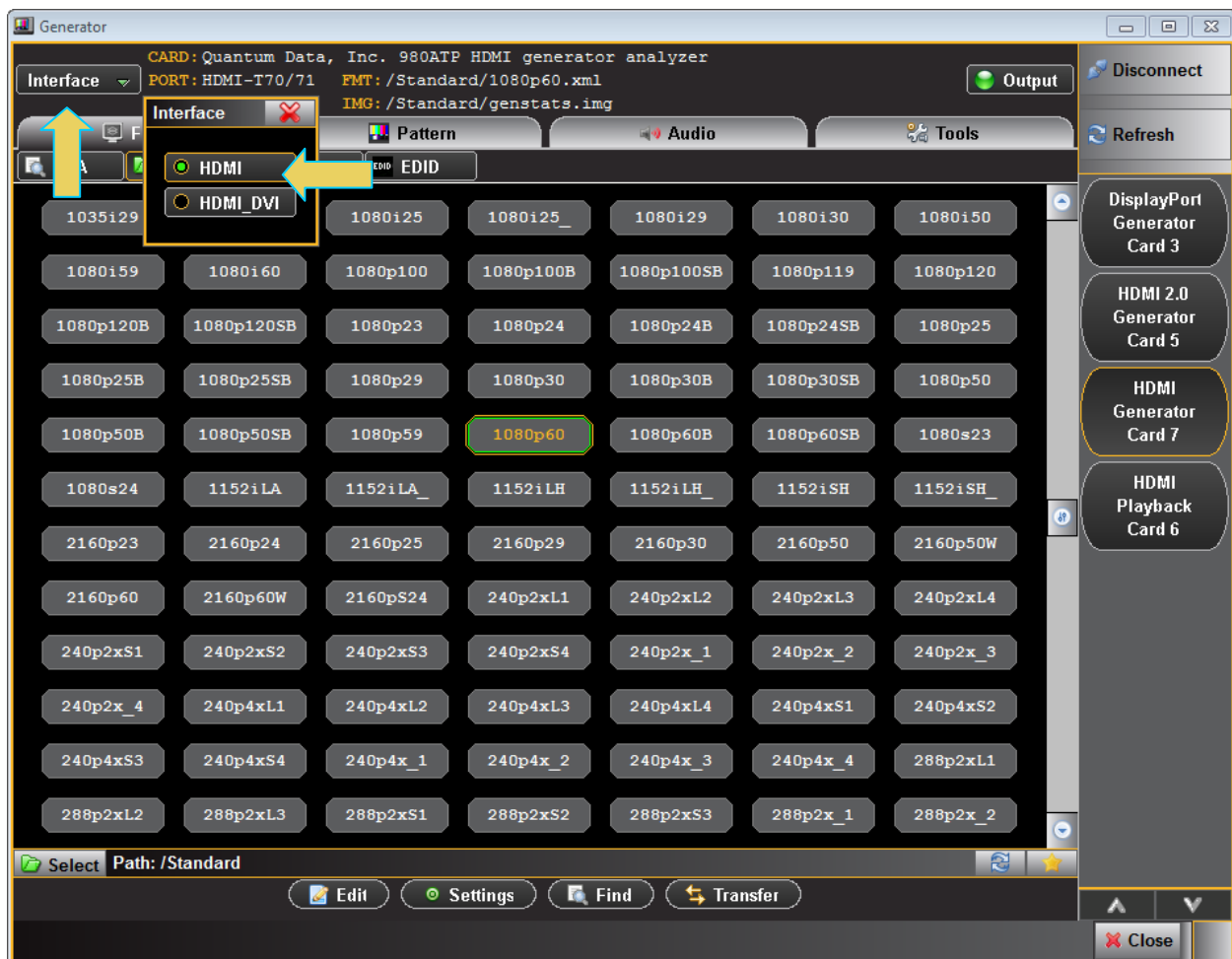
When you select the interface type you will get a listing of HDMI or DVI formats and the **INTF** field in the status area will show HDMI (or DVI). The screen example below depicts a set of HDMI formats.
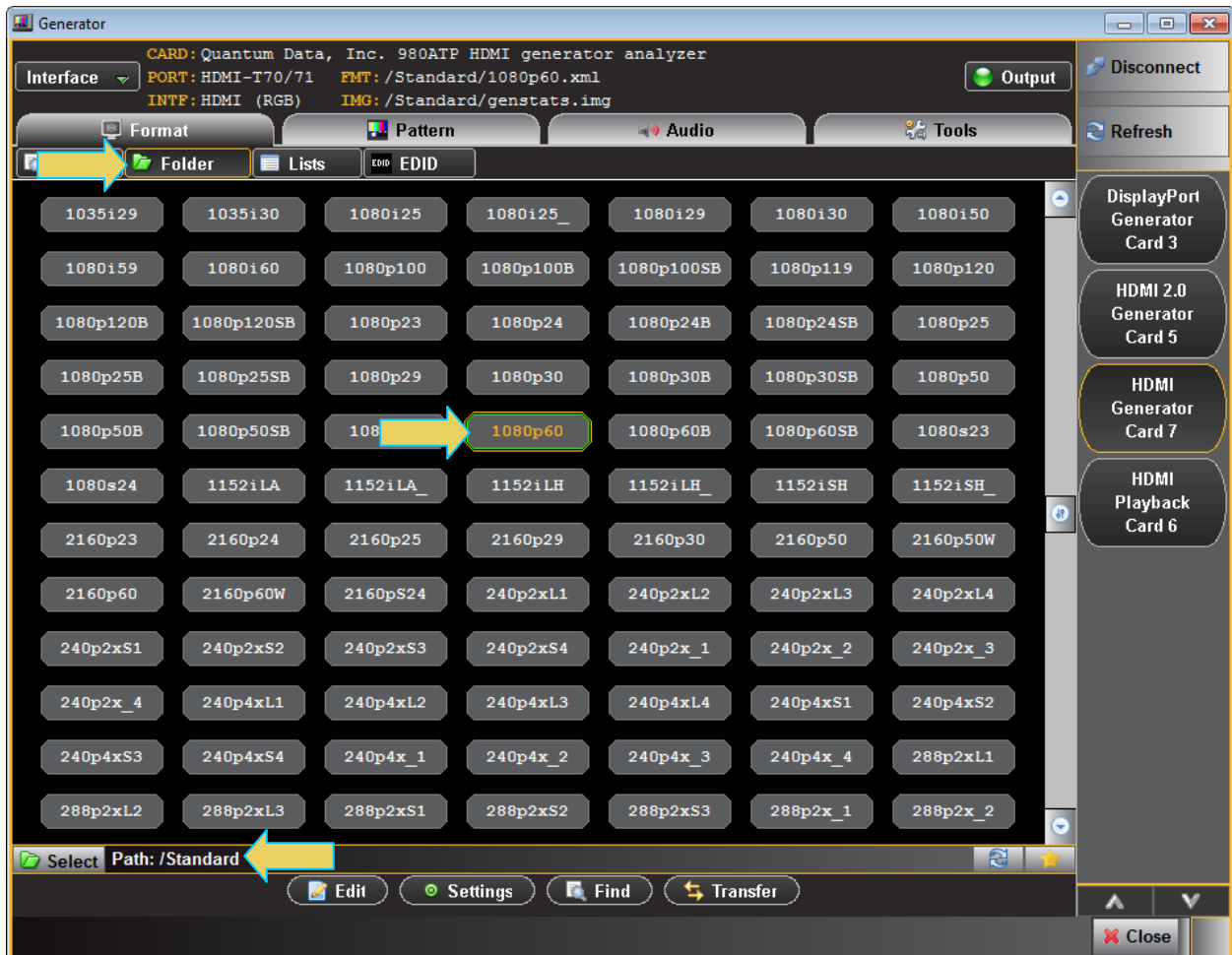
3.6 Selecting formats (resolutions)

You can select formats (timings) from the 980 HDMI Video Generator'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.

3.6.1 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 an interface (HDMI or DVI).

To select a format from the Library List:

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

   A list of 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 [star] button to show the selected format. When you click on the Star button the list of formats will be repositioned such that the selected format is shown on the top line.

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

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

3. Click on the Find activation button on the lower portion of the Format panel.
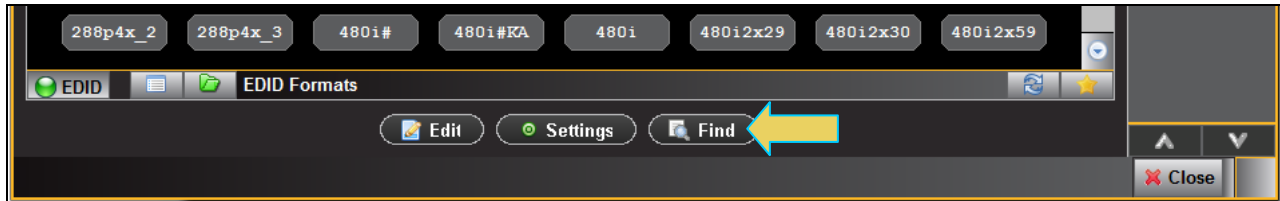
The **Find Format** dialog box appears as shown below. Enter a string in the Search Text field to find a format. You can specify either Starts with or Contains using the radio buttons and you select the Case Sensitive check box to indicate case sensitivity in your text. Click on the **OK** button when you have located the format.
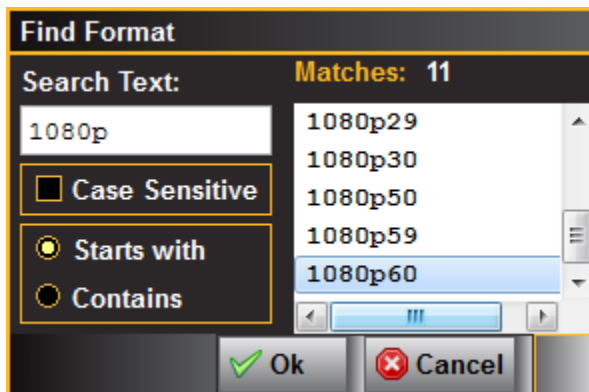
4. Click on the EDID smart activation button on the top center to configure the list of formats in accordance with the EDID for the connected display. There will be an indication that the EDID list is displayed on the bottom of the panel (identified in the screen shot below).
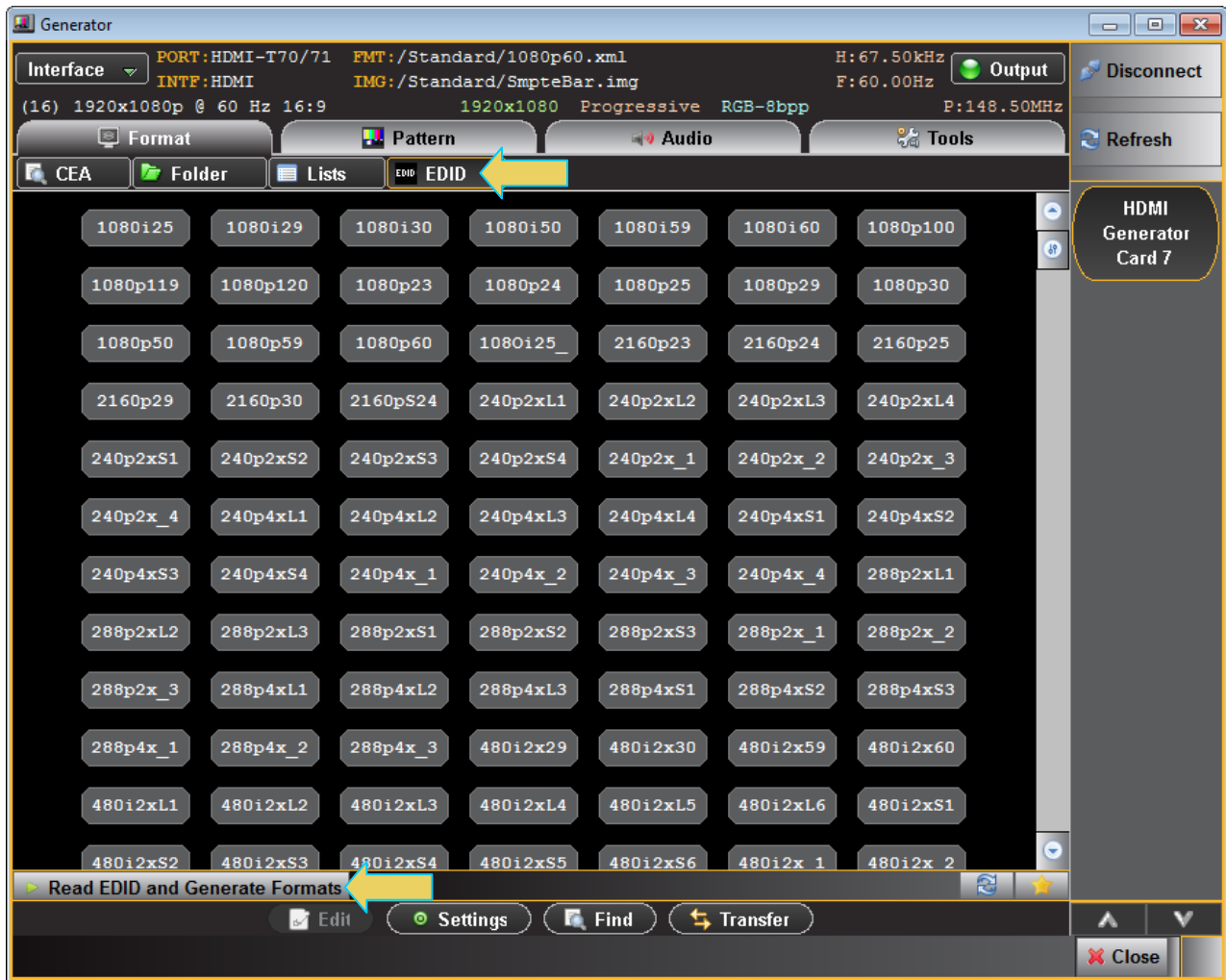
You can determine if the list of formats displayed is derived from the EDID of the connected display by looking at the indicator on the lower portion of the panel (identified above).

When EDID formats are not active, the directory whose formats are being displayed is listed in the lower panel as indicated below. Typically this would be the Standard directory where the 980 module's default format library is stored. The default path is the Standard path. The following screen example shows the Standard list indicated.
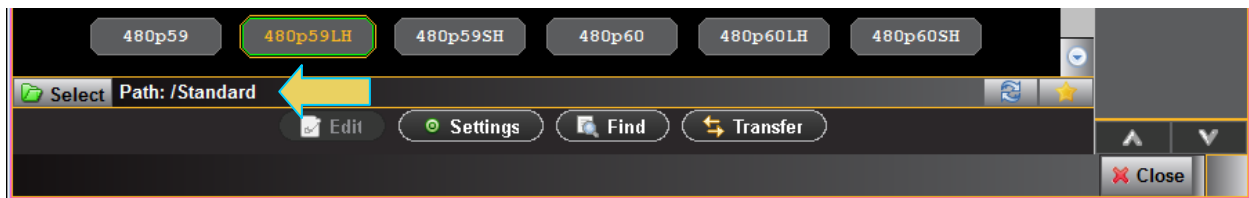
You can change the directory of formats using the directory activation button [Select Path: /Standard]. You might wish to change the directory path if you have created your own custom formats using the Format Editor to create custom formats. Note also that you can configure a smaller list of formats to choose from using the **Format List Edit**; refer to Format List Editor.

By default when you create a custom format, the new format will be saved in the User directory. When you select the directory activation button Select Path: /Standard   a dialog box will appear allowing you to select the alternative path such as the User path shown highlighted and selected in the dialog box below.
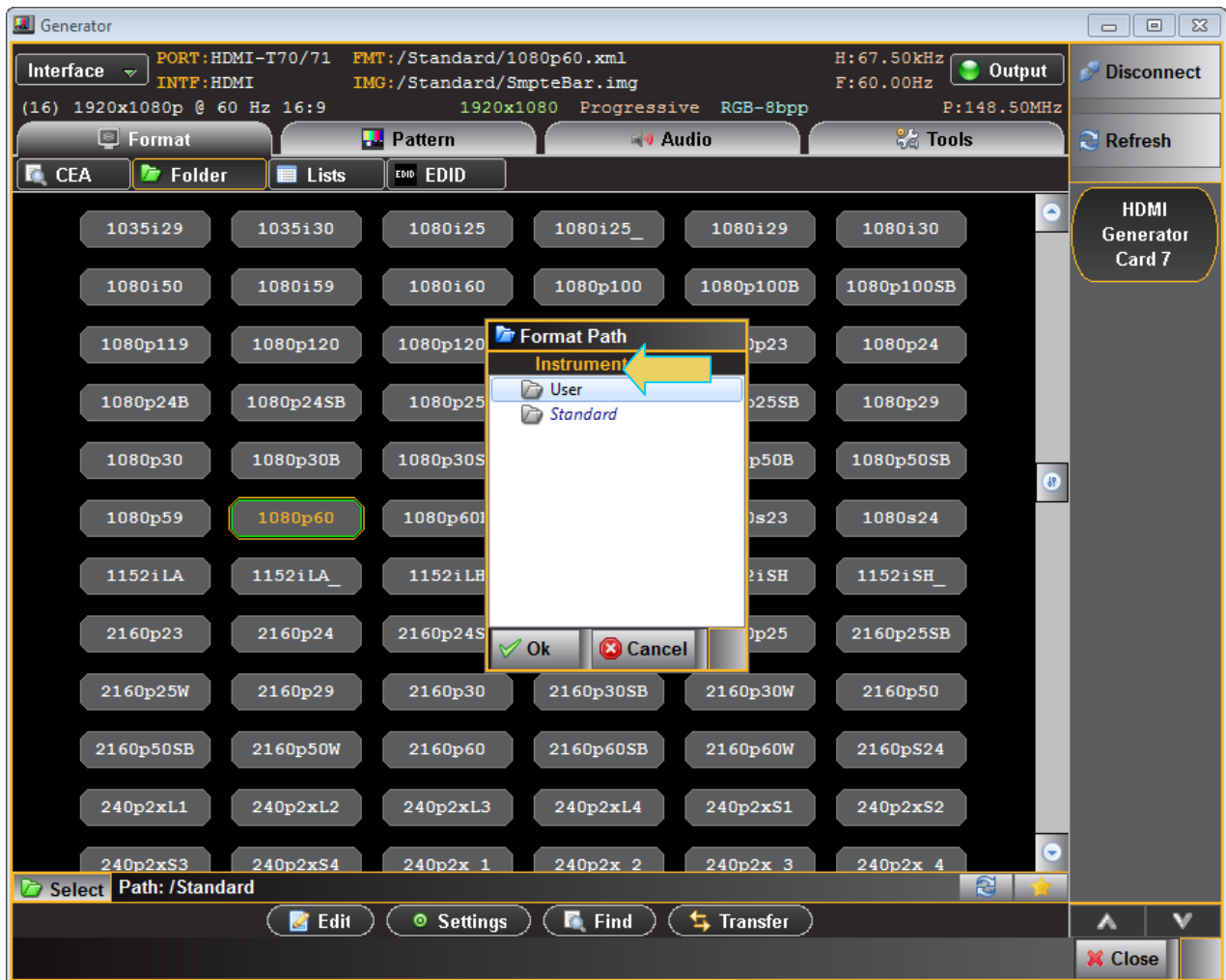
You can open up and activate any custom Format Lists you have previously defined with the associated icon Select Path: /Standard . A dialog box will appear enabling you to select a custom format list or lists (below).
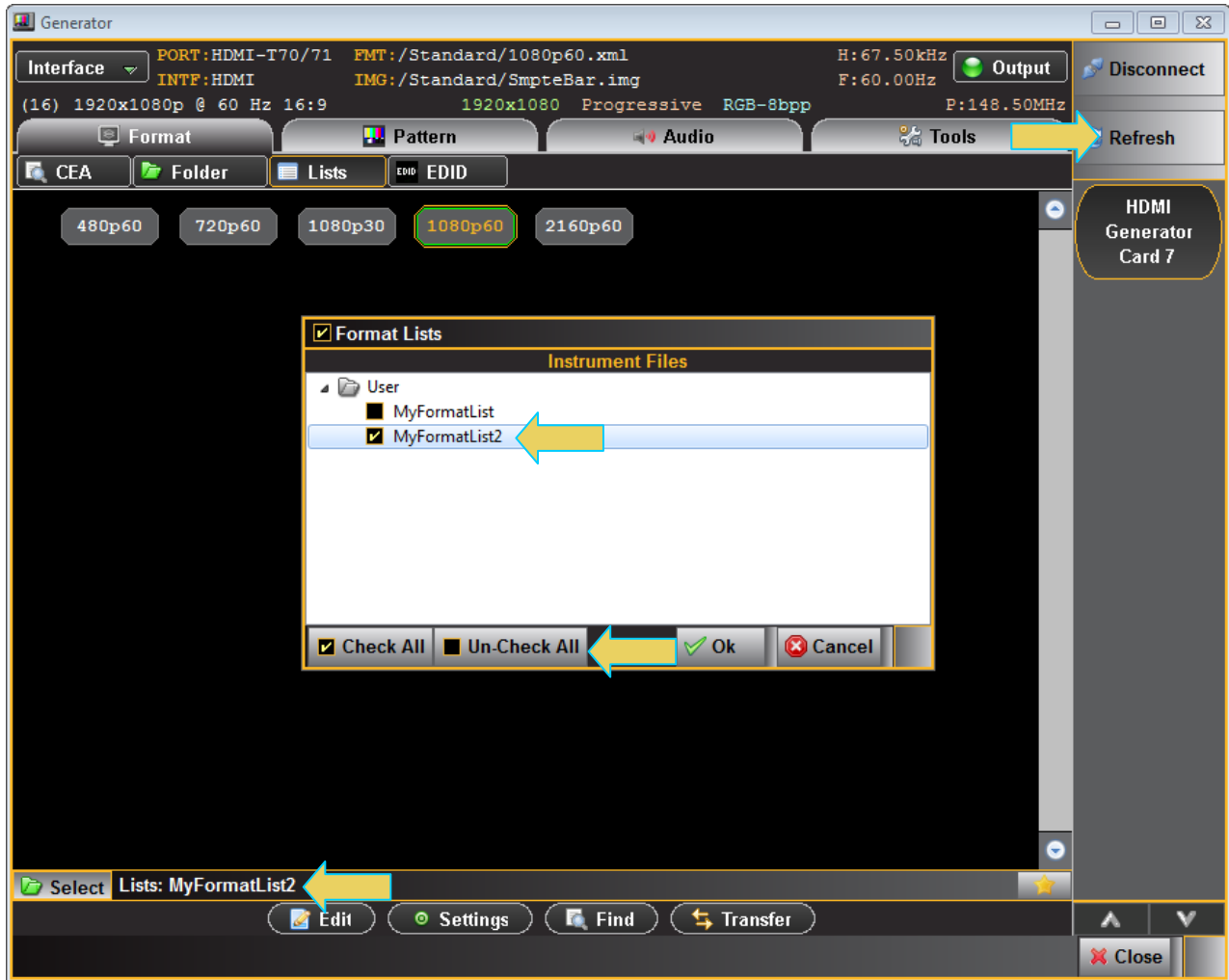
Note: You may have to click on the Refresh button shown above to view the lists if you have just transferred them from your host PC.

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

3.6.2   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 an interface (HDMI or DVI).

To select a format from the CEA smart filtering button:

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

   The default for HDMI is to present the CEA smart filtering list as shown below. If the CEA button is not active, simply click on the CEA button on the upper left of the top panel (indicted in the screen shot below). The CEA smart filtering screen enables you to select formats through filtering of various 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.
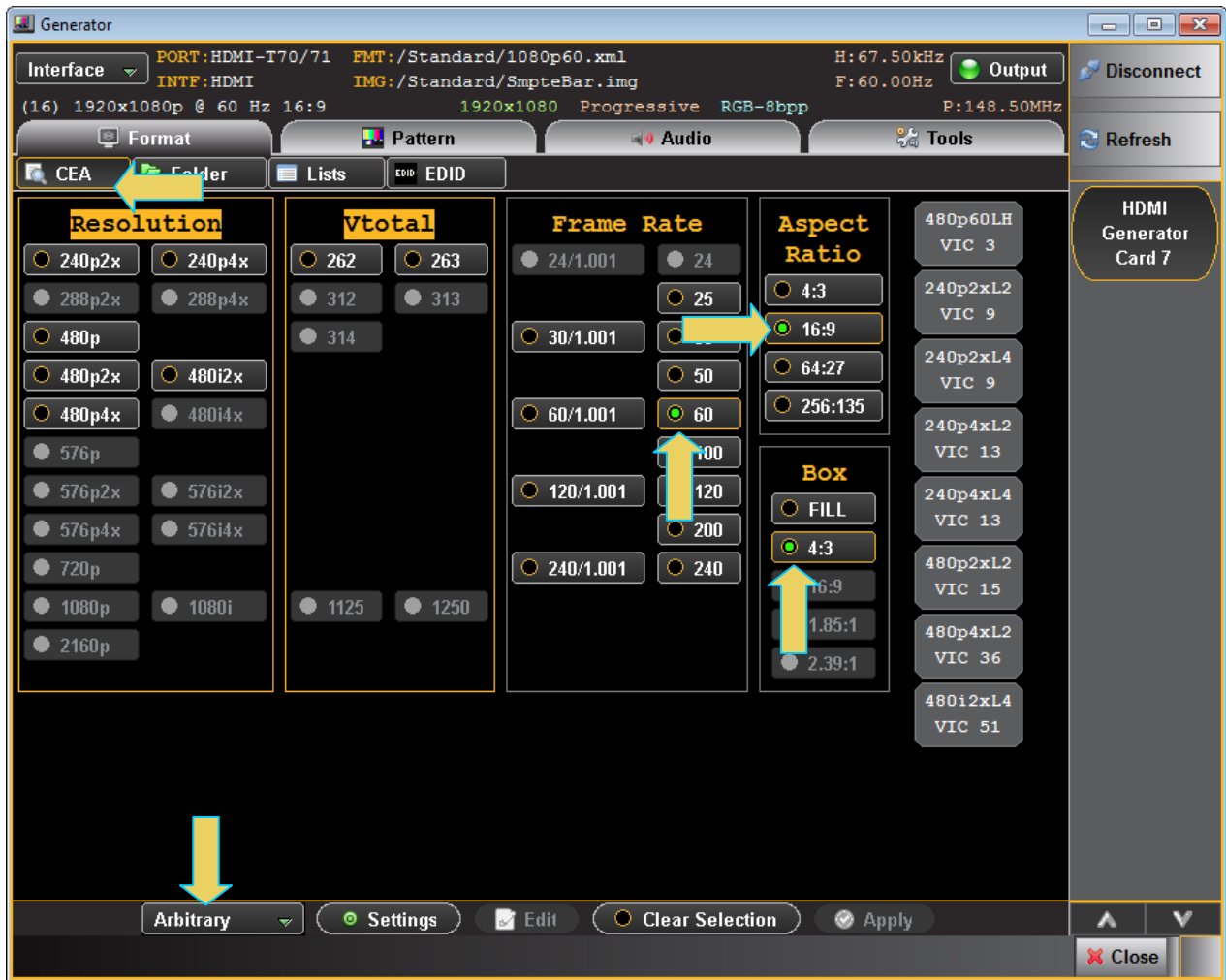
3.7 Configuring the format Settings

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).
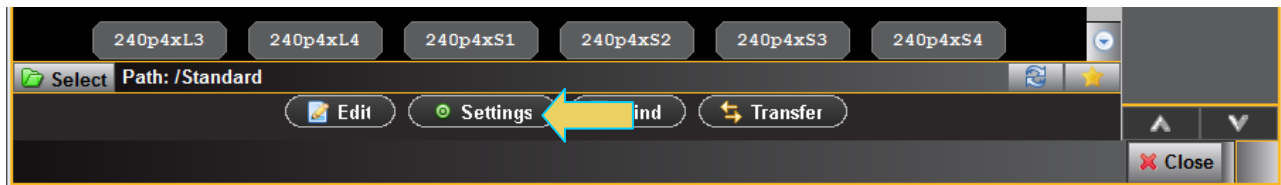
The **Settings** dialog box appears as shown below. Two examples are shown below; the first with RGB selected and the second with YCbCr selected.
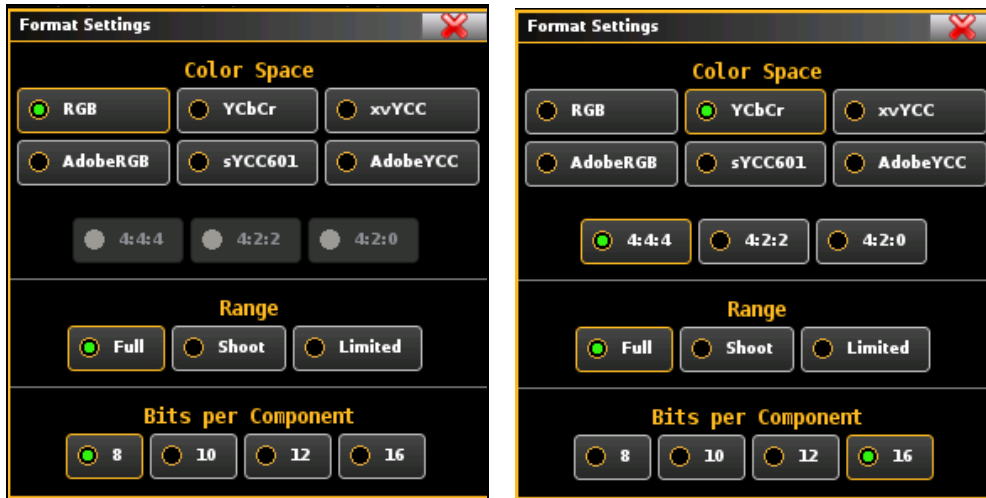
2. Select the Color Space, Range and Bits per Component from the **Format Settings** dialog box in accordance with your requirements.

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 or 4:2:0 sampling. • xvYCC – High definition colorimetry based on IEC 61966 2-4. • AdobeRGB – The AdobeRGB color space is defined in IEC 61966-2-5. If the connected display does not support Adobe color modes, then the sink shall not transmit Adobe encoded video. • sYCC601 – Colorimetry based on IEC 61966-2-1/Amendment 1. • AdobeYCC - The AdobeRGB color space is defined in Annex A of IEC 61966-2-5. If the connected display does not support Adobe color modes, then the sink shall not transmit Adobe encoded video.
Range	These values are described in CEA-861E. They pertain to the number of levels for RGB and YCbCr mode.	• Limited – Use for CEA formats. Please refer to the HDMI specification section on Video Quantization Ranges for more details. • Shoot – for testing the undershoot/overshoot signal code margins. • Full - Use for PC formats. Please refer to the HDMI specification section on Video Quantization Ranges for more details.
Bits per Component	Color depth per component.	• 8 – Eight (8) bit per component (24 bit per pixel) color depth.

Format Settings		
Parameter	**Description**	**Options**
		• 10 – Ten (10) bit per component (30 bit per pixel) color depth; deep color. Deep color only supported at pixel rates up to pixel clock of 165MHz; TMDS clock rate of up to 225MHz. • 12 – Twelve (12) bit per component (36 bit per pixel) color depth; deep color. Deep color only supported at pixel rates up to pixel clock of 165MHz; TMDS clock rate of up to 225MHz. • 16 – Sixteen (16) bit per component (48 bit per pixel) color depth; deep color. Deep color only supported at pixel rates up to pixel clock of 165MHz; TMDS clock rate of up to 297MHz.

3.8   Viewing detailed parameters of formats

Use the following procedures to view the detailed format parameters. You can view the basic format parameters using the information in the dashboard. To view all the parameters you can use the Format Editor home screen.

To view detailed format parameters:

1. From the Format tab, click on the Edit activation button on the lower control part of the panel (below).
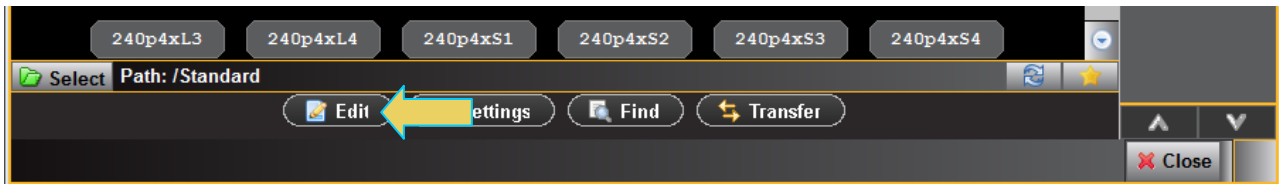
The Format Editor main screen appears showing the details of the selected format.

## 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 HDMI Video Generator module, click the **Pattern** tab to access the list of test patterns.
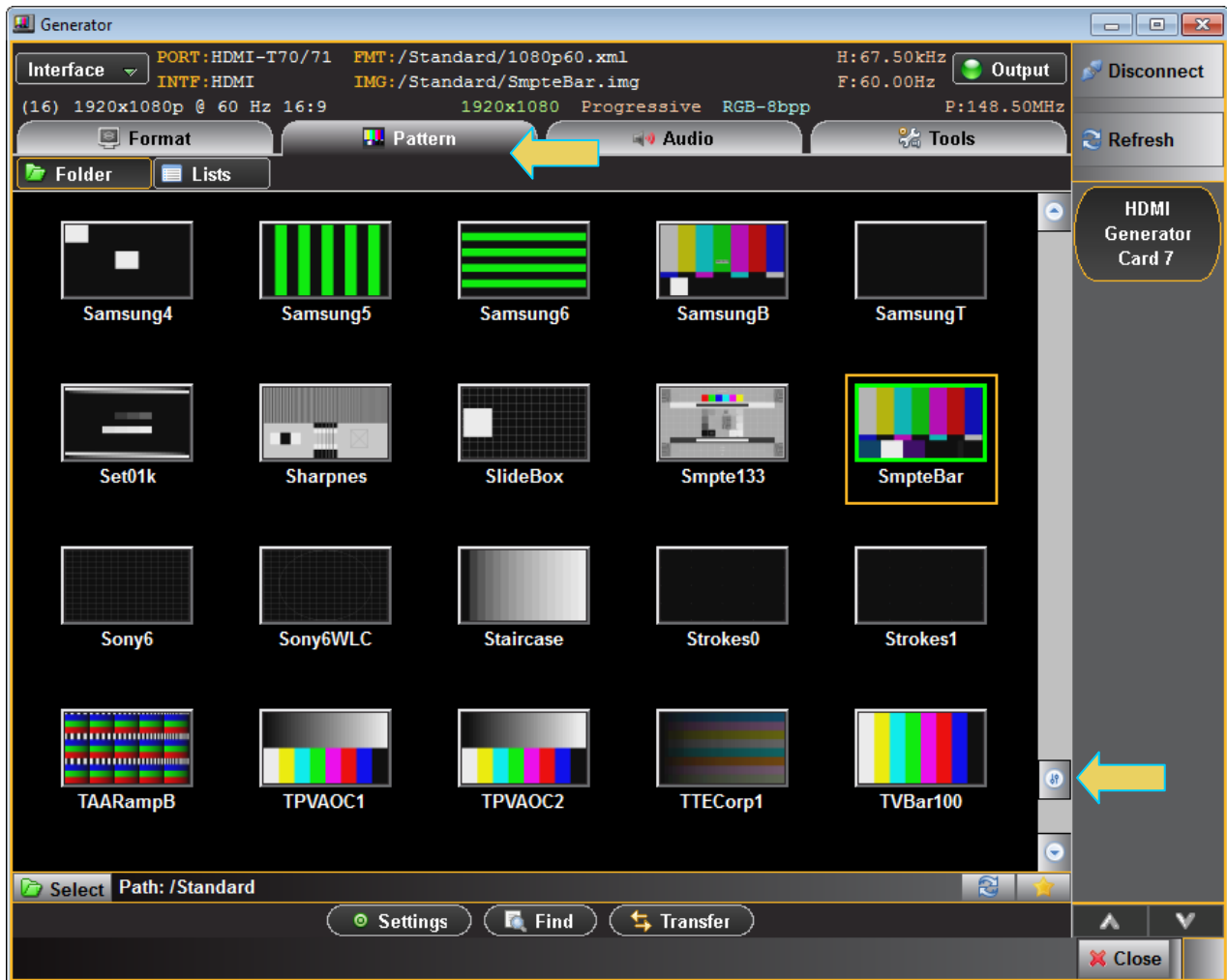
2. Select a test pattern from the list by clicking or selecting it. There is a scroll bar on the right to allow access to the entire list by browsing.

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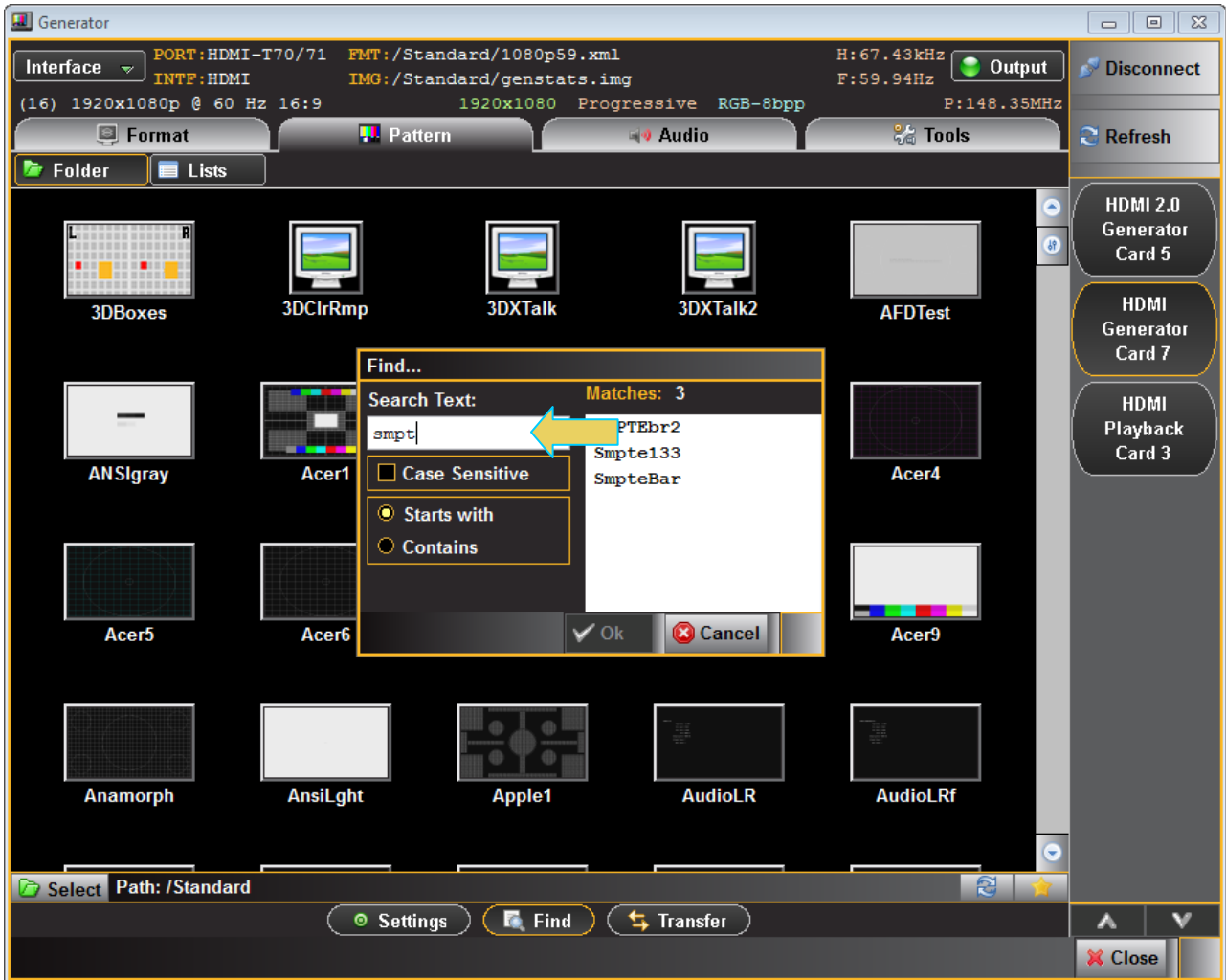
The directory whose images (patterns) are being displayed is listed in the lower panel as indicated below. In the example below, the path is set to Standard which will display the entire test pattern library and is the default path.

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.
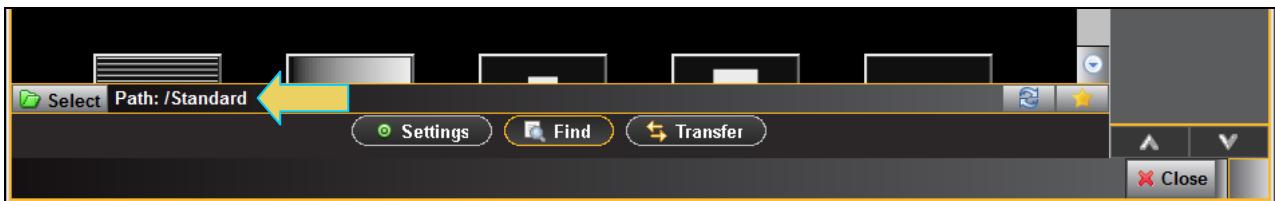
You can change the directory path with the directory activation button . When you select the directory icon a dialog box will appear allowing you to select the alternative path such as the User path shown in the dialog box below.
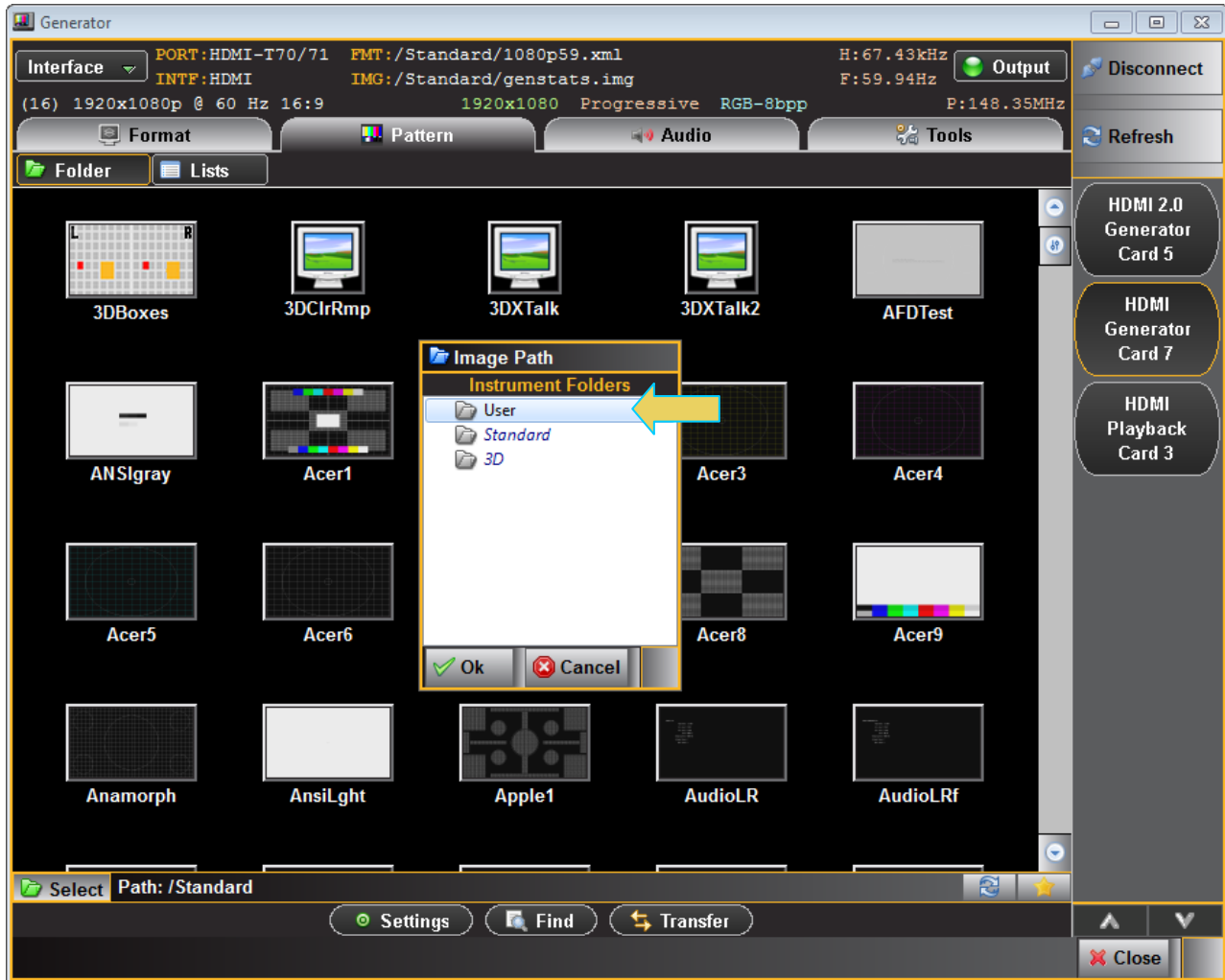
When you have changed the directory the User directory will be indicated on the lower panel beside the associated icon as shown below.
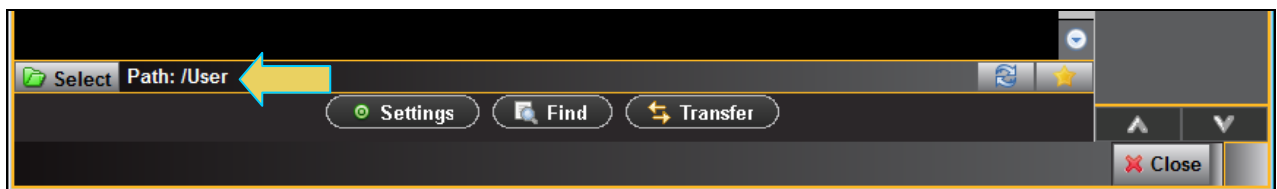
Now you can configure the list of patterns in accordance with a custom Pattern List by clicking on the associated icon . A dialog box will appear enabling you to select a custom image list (below).
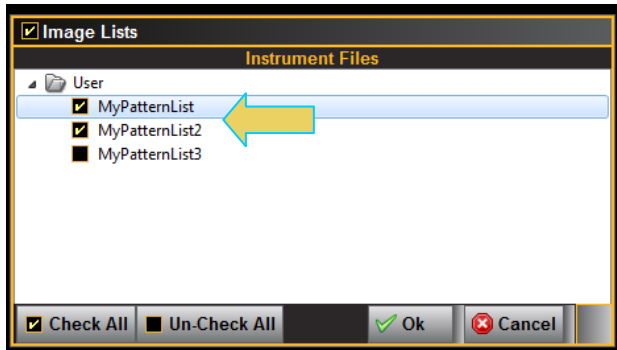
You can select one or more custom Pattern Lists in any combination if you have several defined. The example above shows selecting one Pattern List. The **Check All** and **Un-Check All** activation buttons allow convenient selection where you have many Pattern Lists to choose from. The result of selecting one custom Pattern List is shown in the screen example below. A limited set of patterns are displayed. The source of the patterns is indicated on the bottom status panel (below).
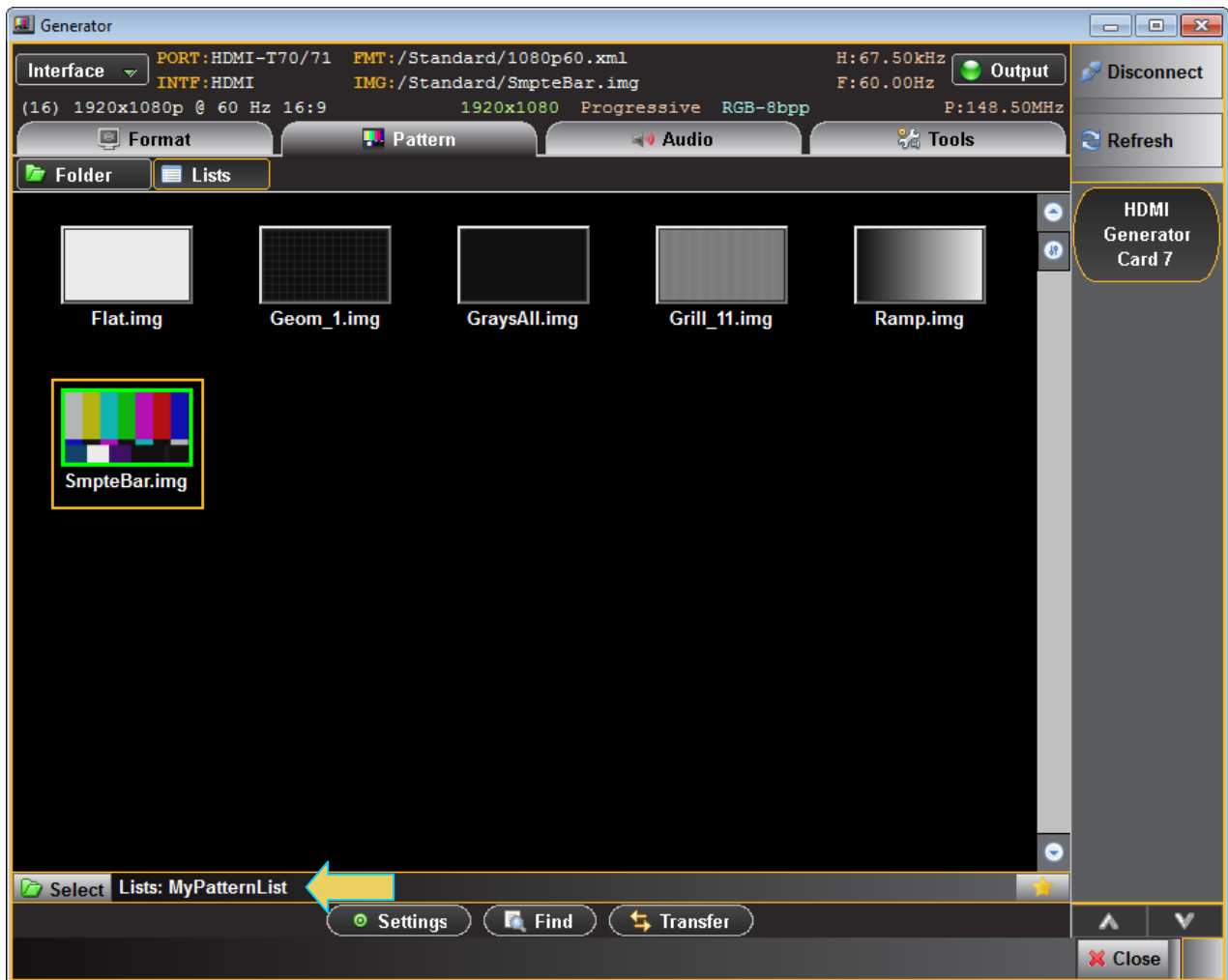
3.10   Selecting Test Patterns Settings

Use the following procedures to select a test pattern.

To specify test pattern settings:

1. From the main window of the 980 HDMI Video Generator 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.
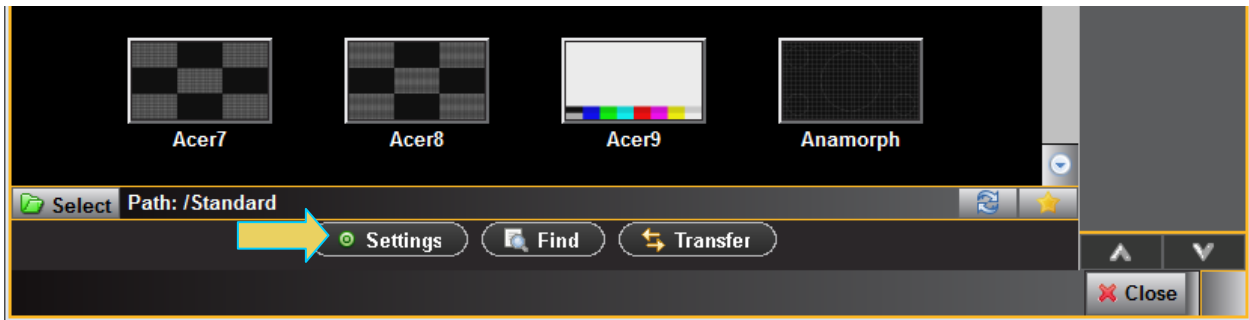
The **Settings** dialog box appears as shown below:

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 3D Displays

Use the following procedures to test 3D displays.

To test 3D capable HDMI displays:

1. From the main window of the 980 HDMI Video Generator module, select a 3D test pattern for example 3DXTalk indicated in the screen examples below.
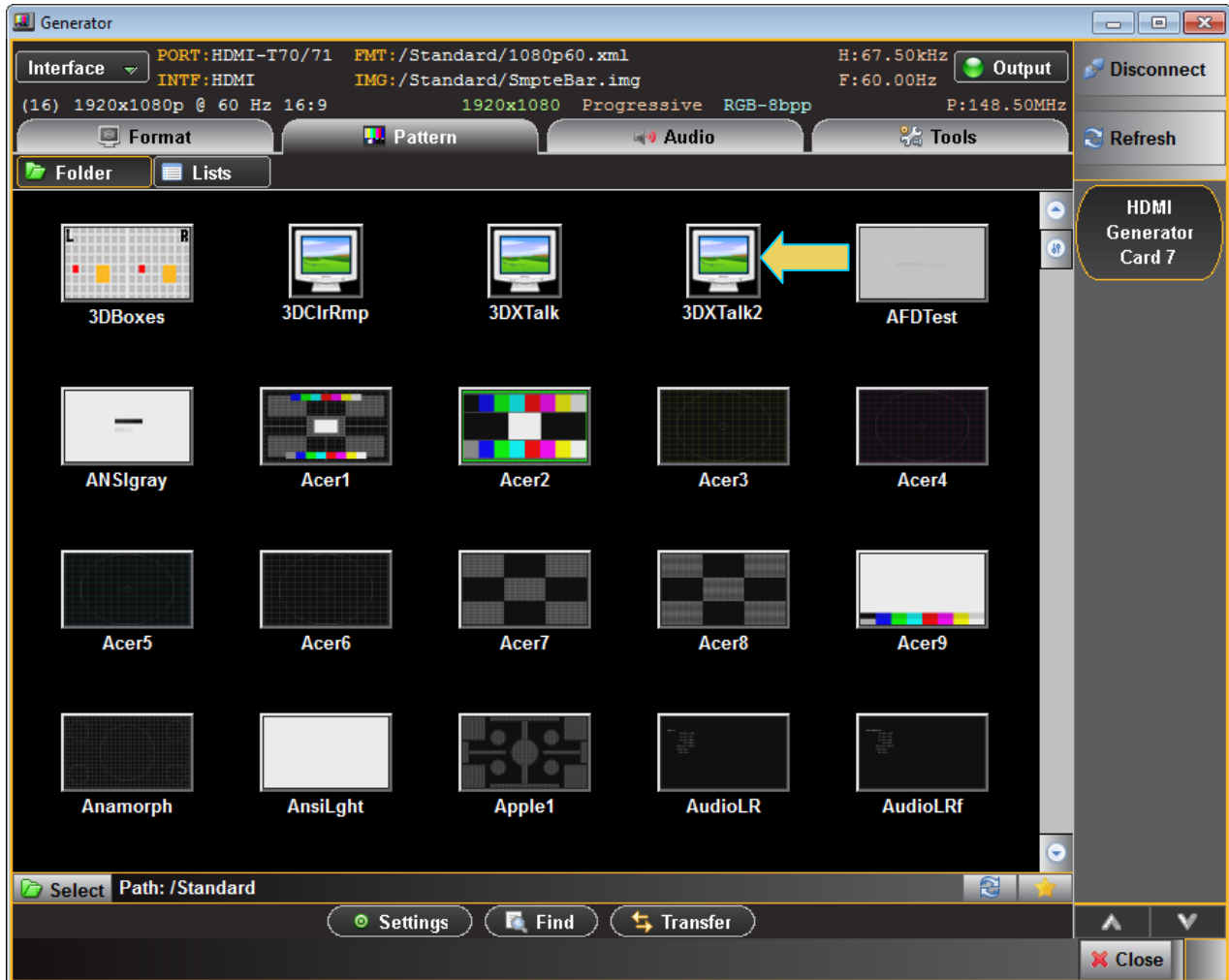
2. (optionally) Select a stored 3D Pattern Library by clicking on the **Select** button and then choosing your 3D library as shown below.
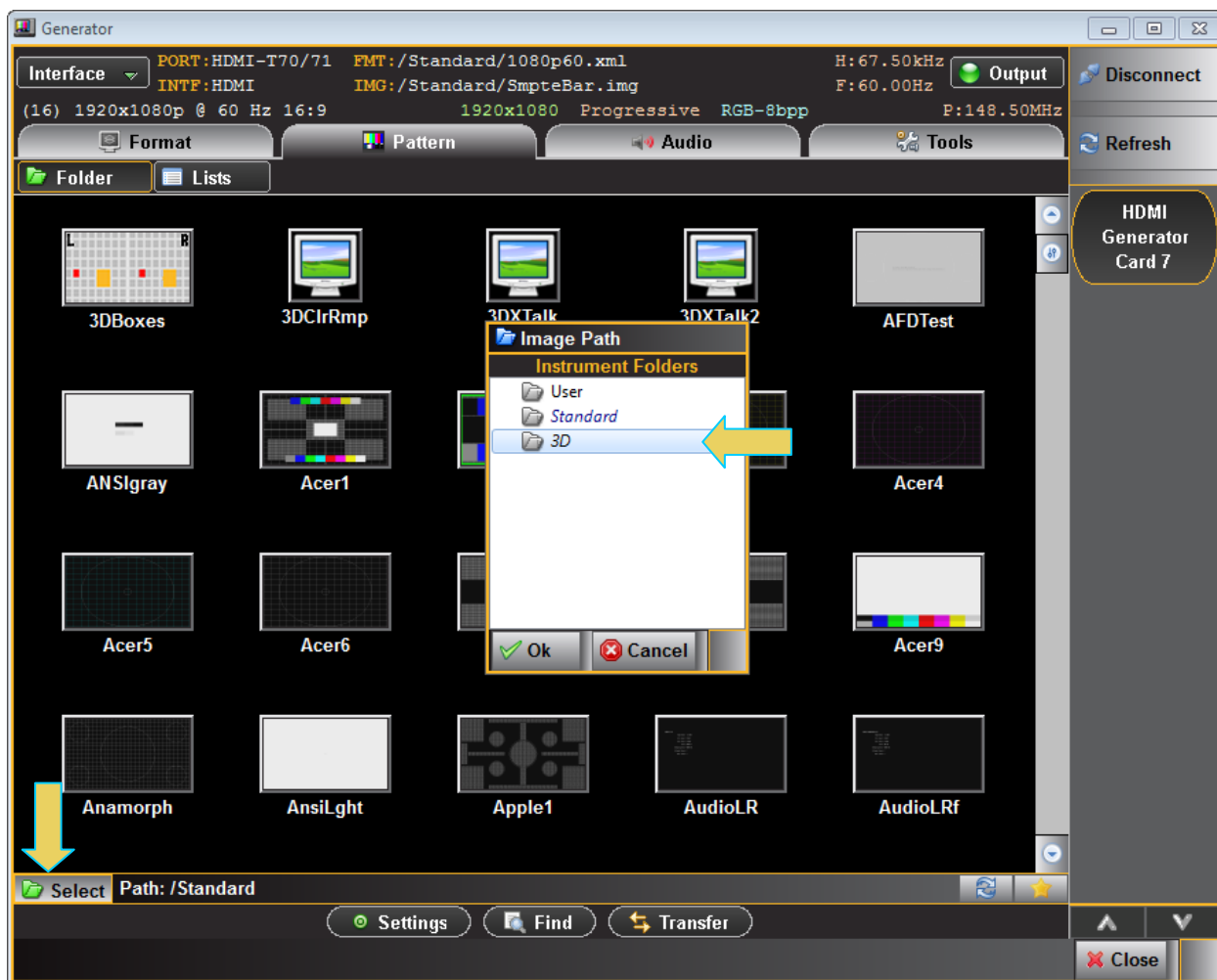
The following is an example of a 3D Test Pattern Library.
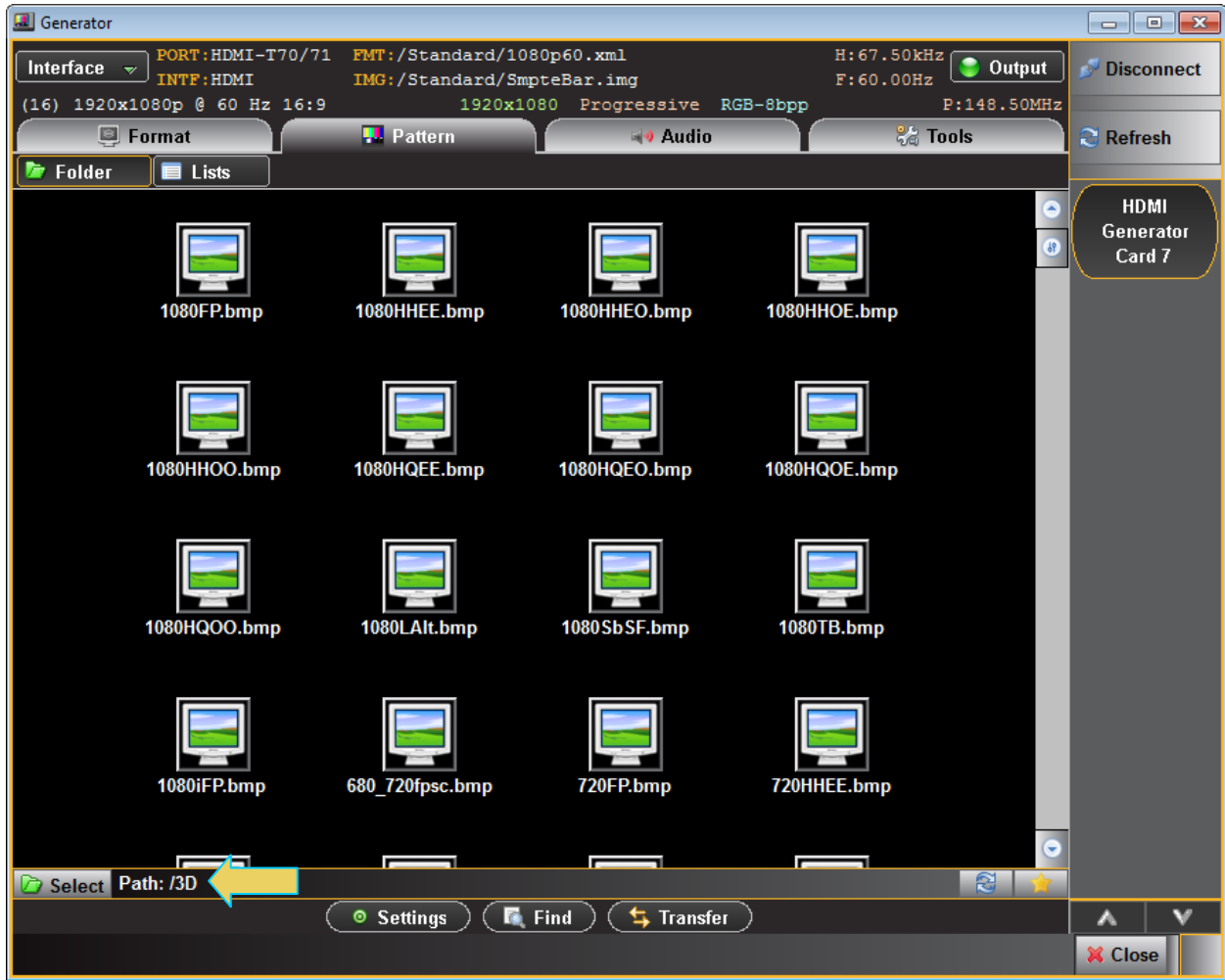
3. Select the **Format** tab to select a format (resolution).
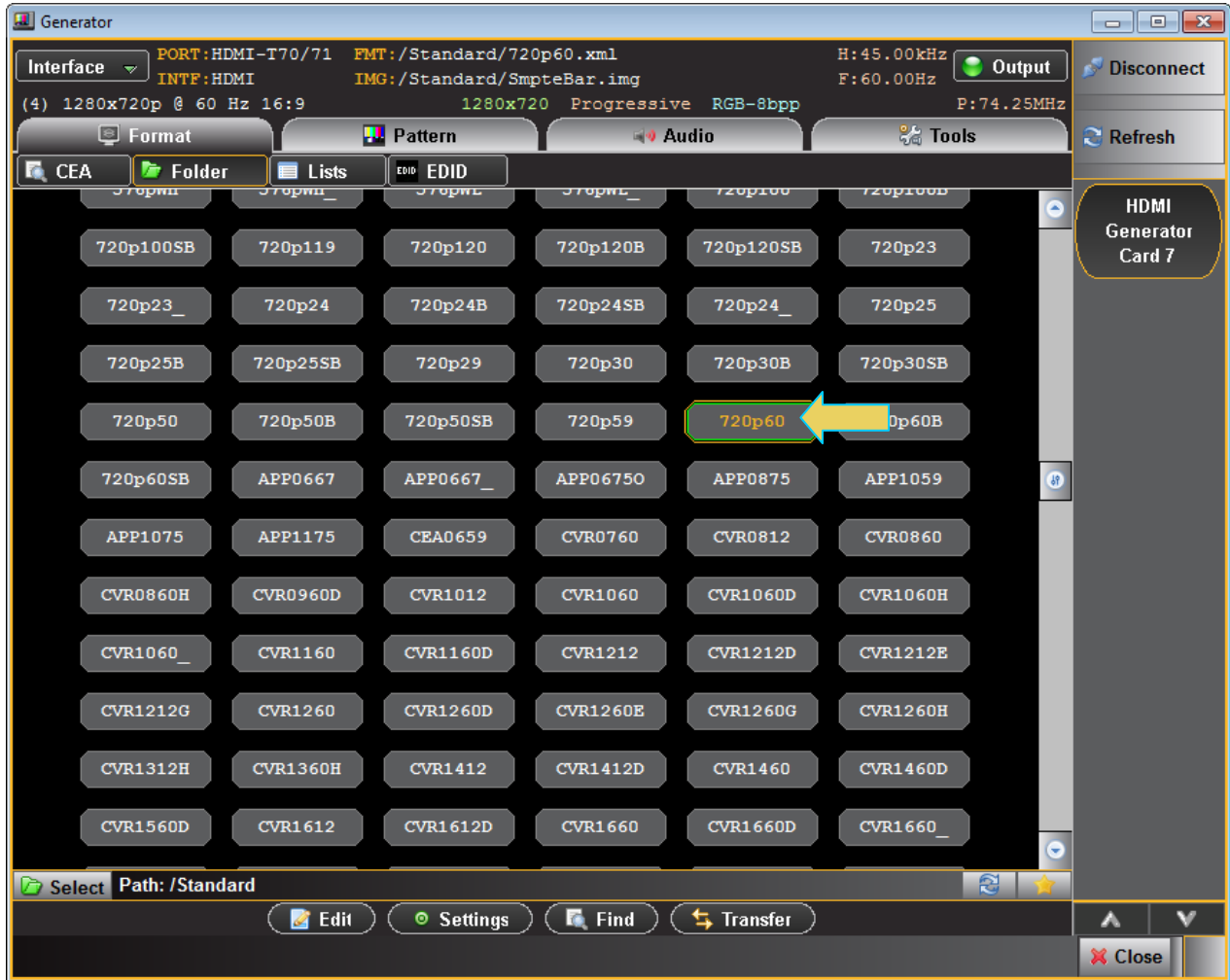
4.   Select the **Tools** tab to access the 3D configuration utilities.
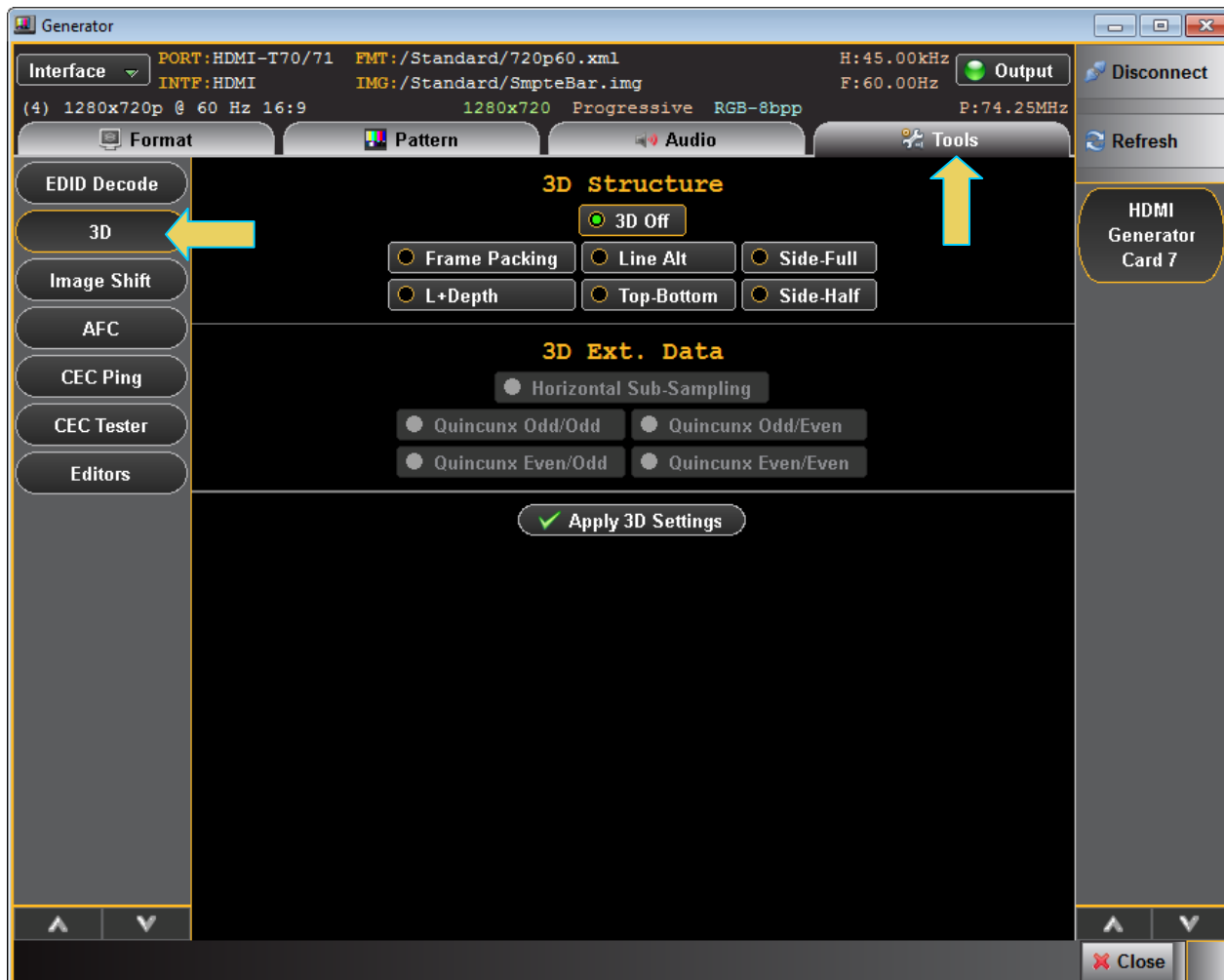
The following table describes the information on the **3D** dialog box.

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

5. Apply 3D settings with the activation button provided.
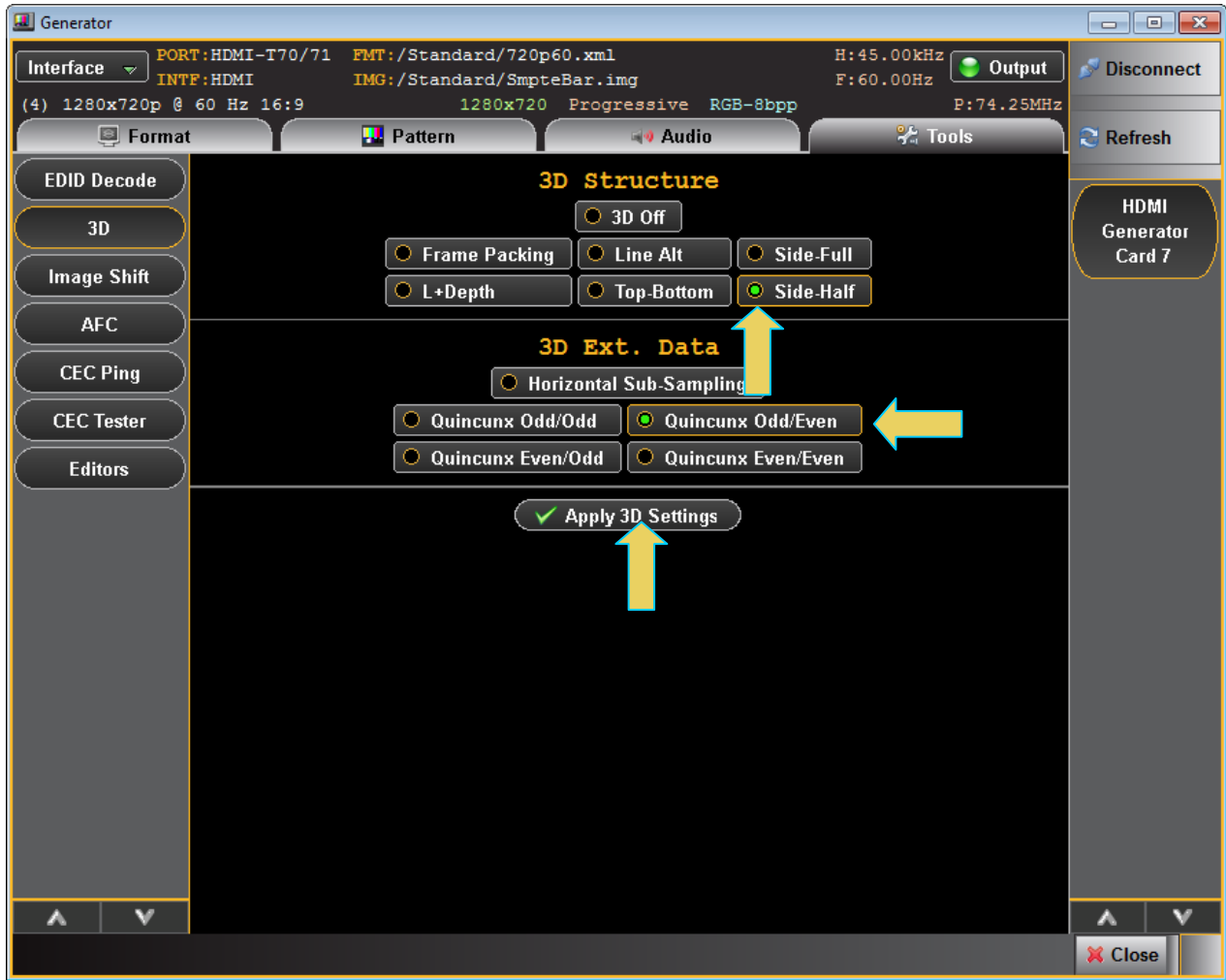
3.12   Testing 4K Ultra-HD Capable Displays

You can test 4K ultra high definition displays either at frame rates of 30Hz and below or at 50Hz or 60Hz. When you are testing 4K resolutions at 50 or 60Hz the HDMI Video Generator module will use 4:2:0 pixel encoding in accordance with HDMI 2.0. When you are testing 4K resolutions at 30Hz or below, use RGB or YCbCr 4:4:4 or 4:2:2 pixel encoding. Refer to the following procedures for each test case.

3.12.1 Testing 4K Ultra High Definition TVs at 30Hz and below

Use the following procedures to test 4K-capable HDMI HDTVs.

To test 4K displays at 30Hz or below:

1.   Select a 4K resolution such as 2160p30.

     Note the pixel rate on the status panel top right.
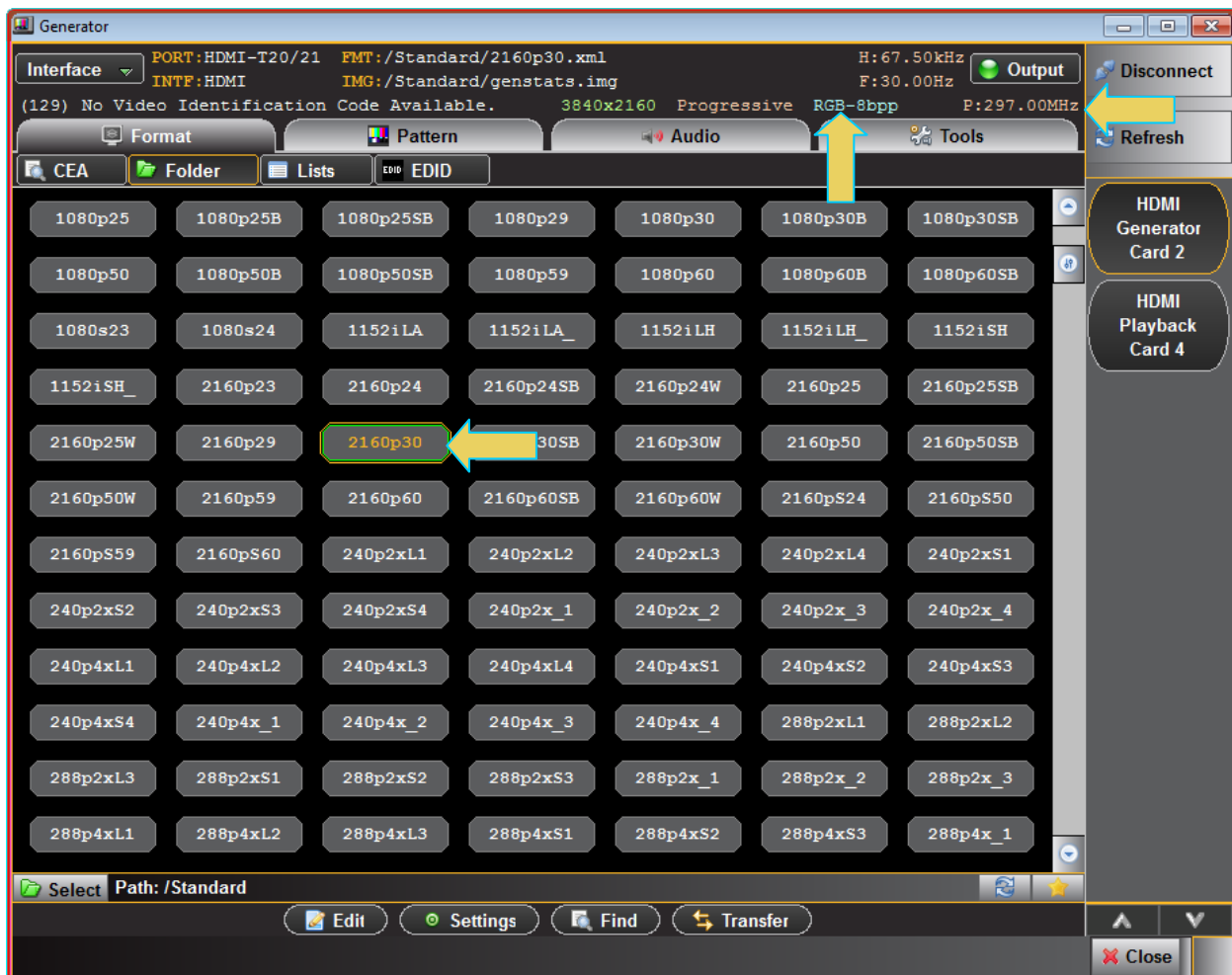
3.12.2 Testing 4:2:0 Capable Displays

Use the following procedures to send HDMI 2.0-compliant 4:2:0 pixel encoding to a 4K-capable HDMI HDTV.

To select test 4K displays at 50 or 60Hz:

1. Select the **Settings** (refer to screen example above).

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

2. Select 4:2:0 pixel encoding from the Format Settings dialog box.

3. From the main window of the 980 HDMI Video Generator module, access the **Format** tab and select a 4K format such as 2160p 50Hz or 60Hz format as shown below.

   Note the pixel encoding and pixel rate shown on the upper status bar.
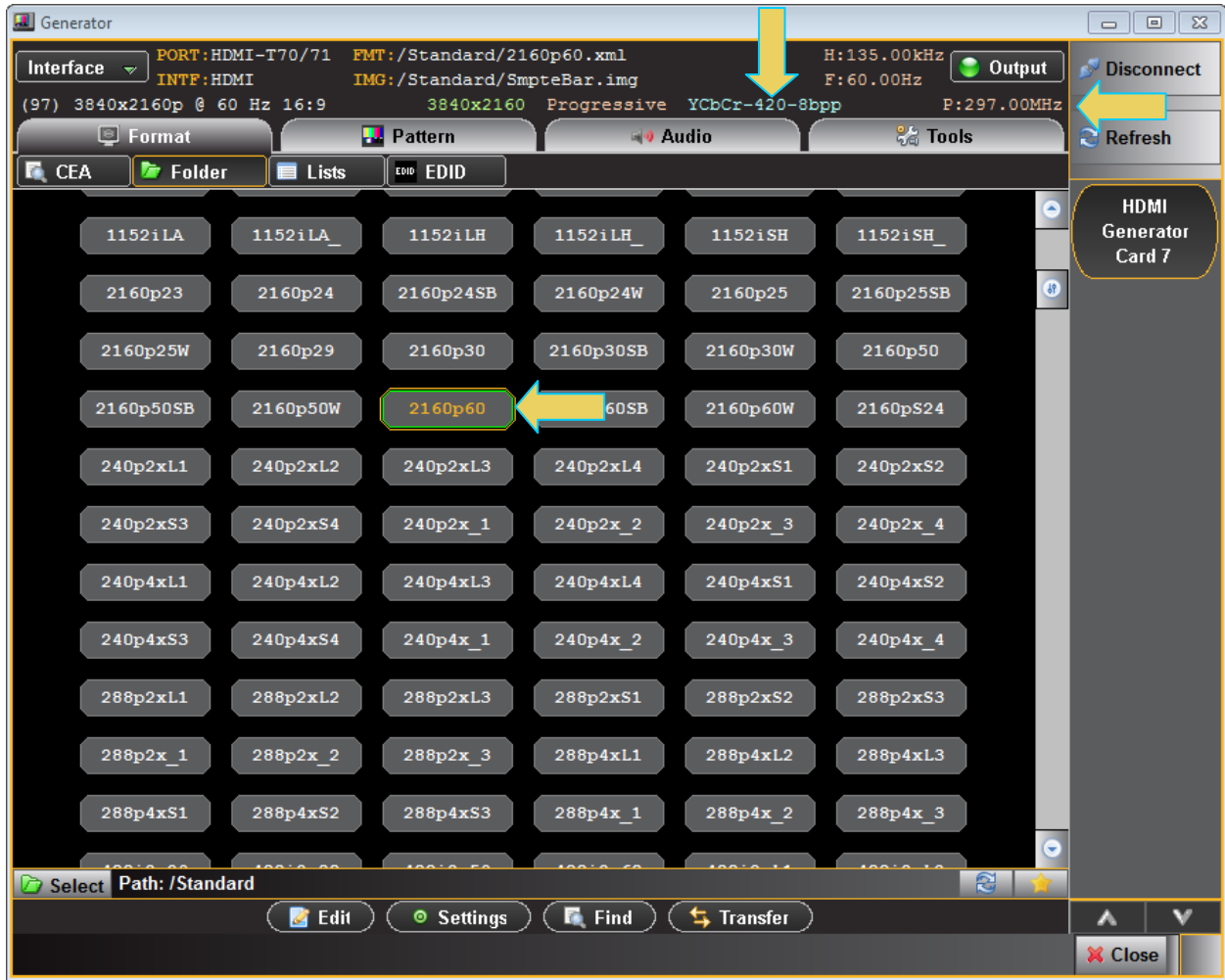
3.13   Viewing the EDID of a connected display

Use the following procedures to select HDMI formats.

To view the EDID of a connected display:

1. From the main window of the 980 HDMI Video Generator module, select the **Tools** tab.
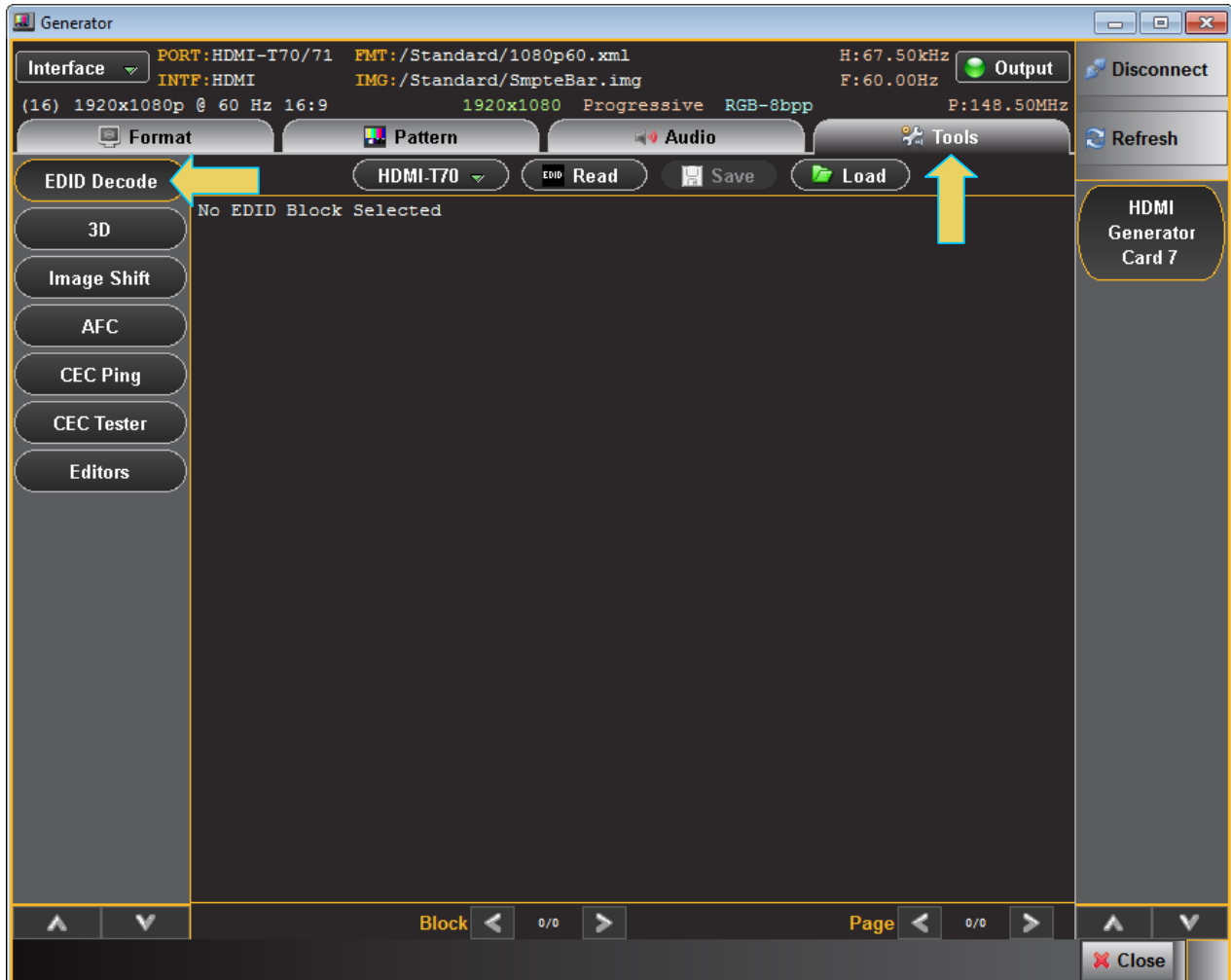
Make sure the HDMI Generator module is selected (as opposed to the HDMI Playback Card which is the transmitter interface in the HDMI Protocol Analyzer module).

2. Select the HDMI Tx port that is connected to the sink DUT from the pull-down menu provided (below). The modules and interfaces are assigned a descriptive name and the card slot number. In the example below the 980 Video Generator is in slot 2.
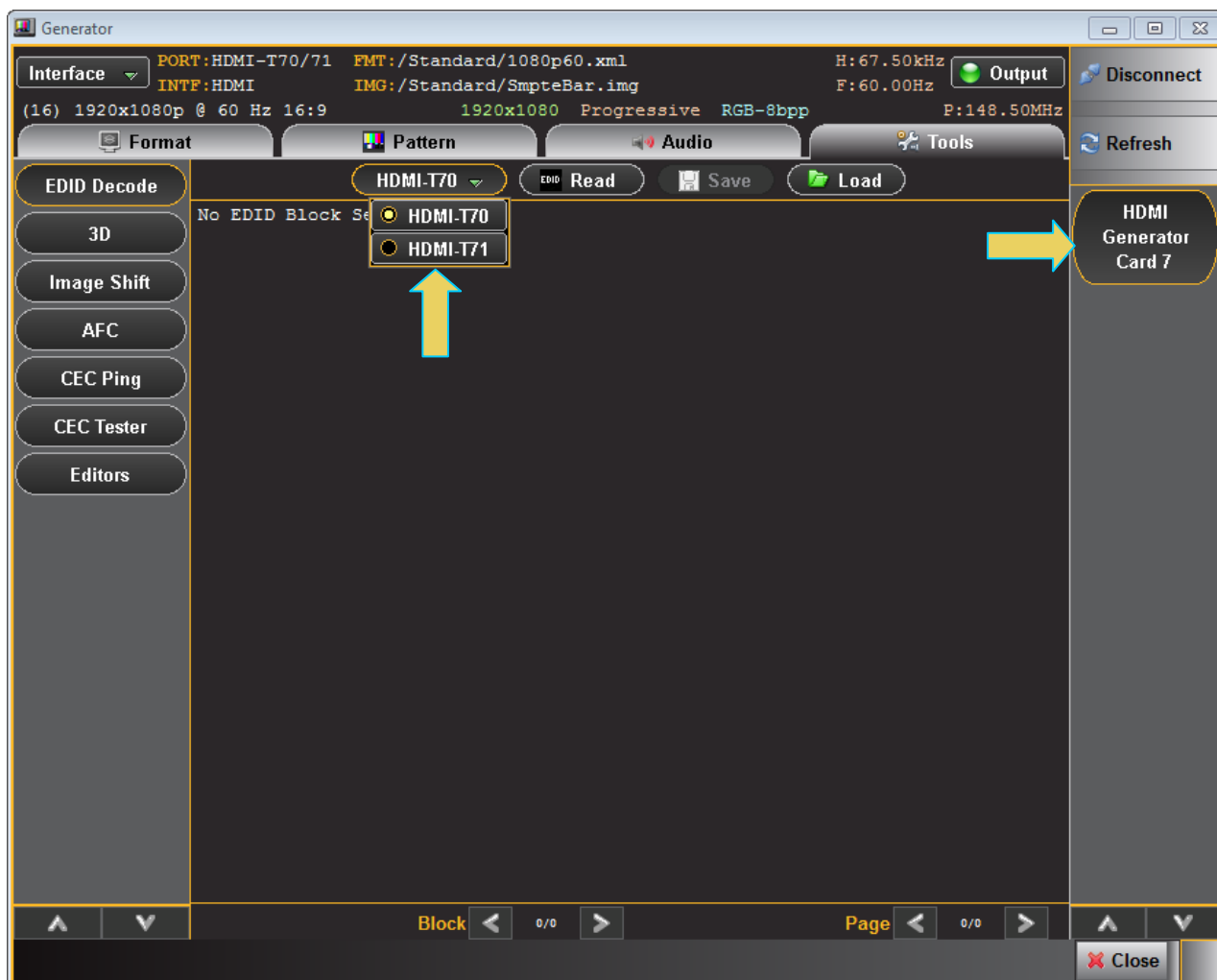
3. Activate the **EDID Decode** button on the upper left (indicated below).

Contents of the initial data in the first block of the EDID will be displayed (below).
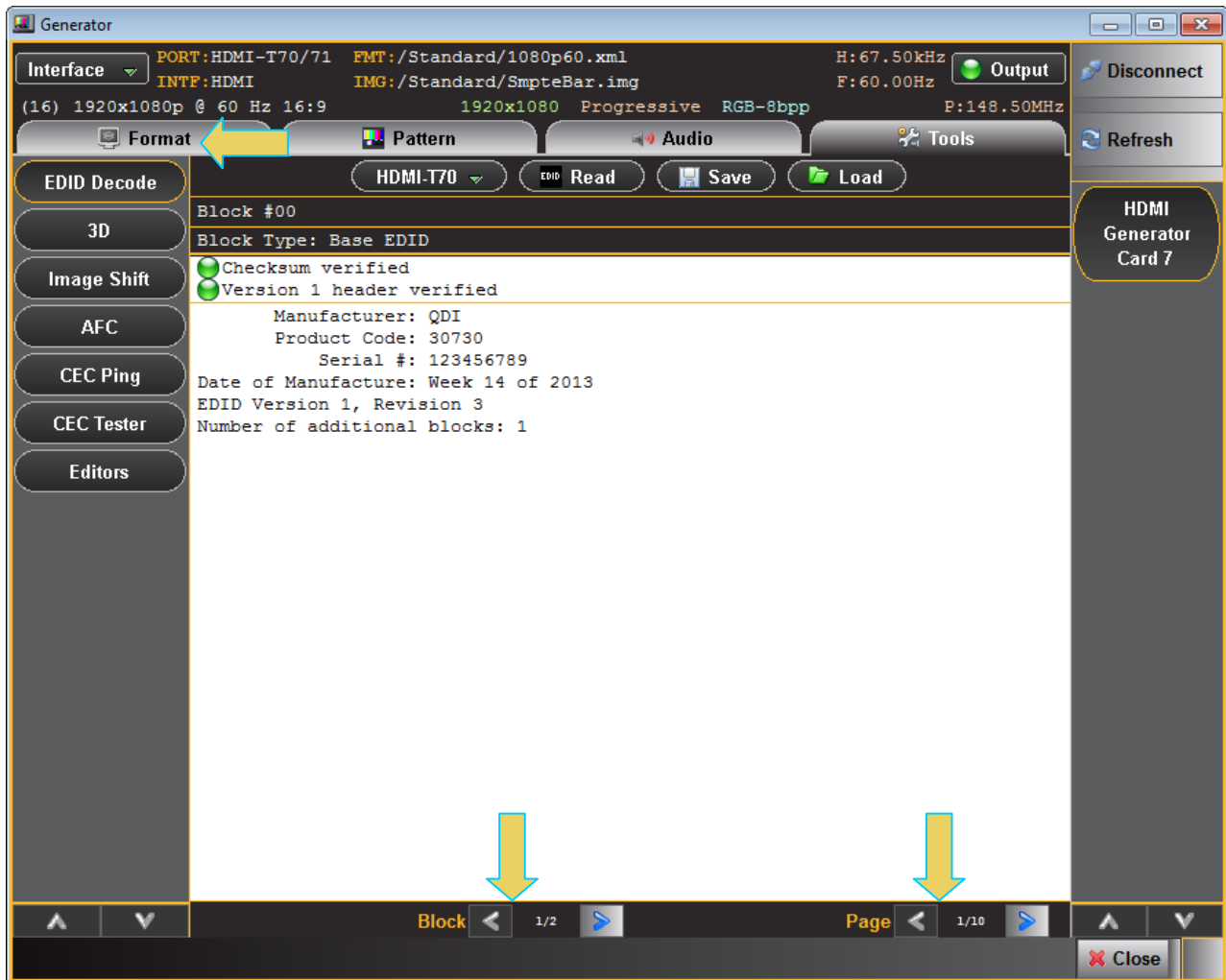
Navigate through the blocks and pages of the EDID using the arrow buttons on the lower panel (indicated above). Examples of the **EDID Decode** content are shown in the following screens.

Example: Detailed Timing Descriptor:
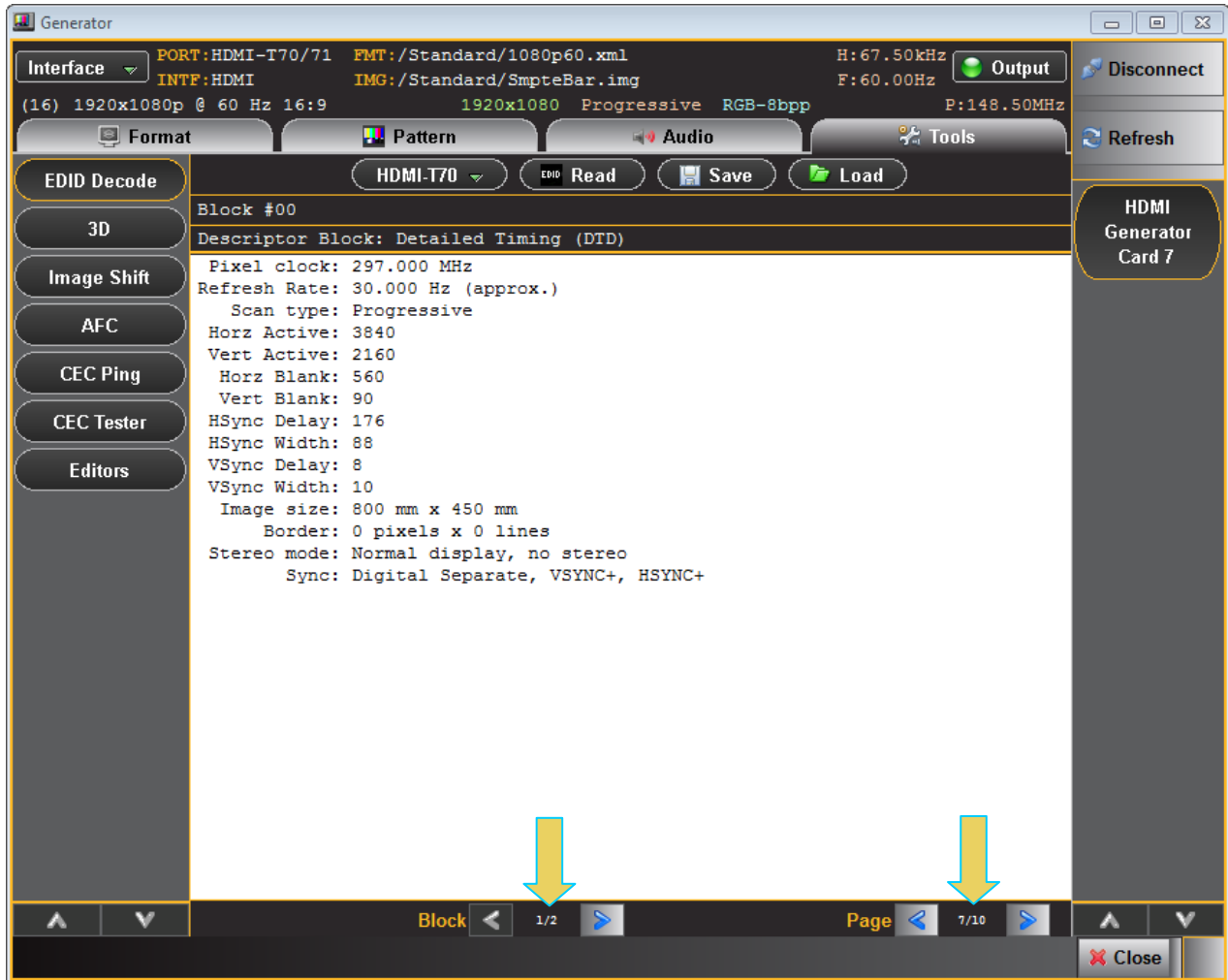
Example: CEA Extension block - Page 1:
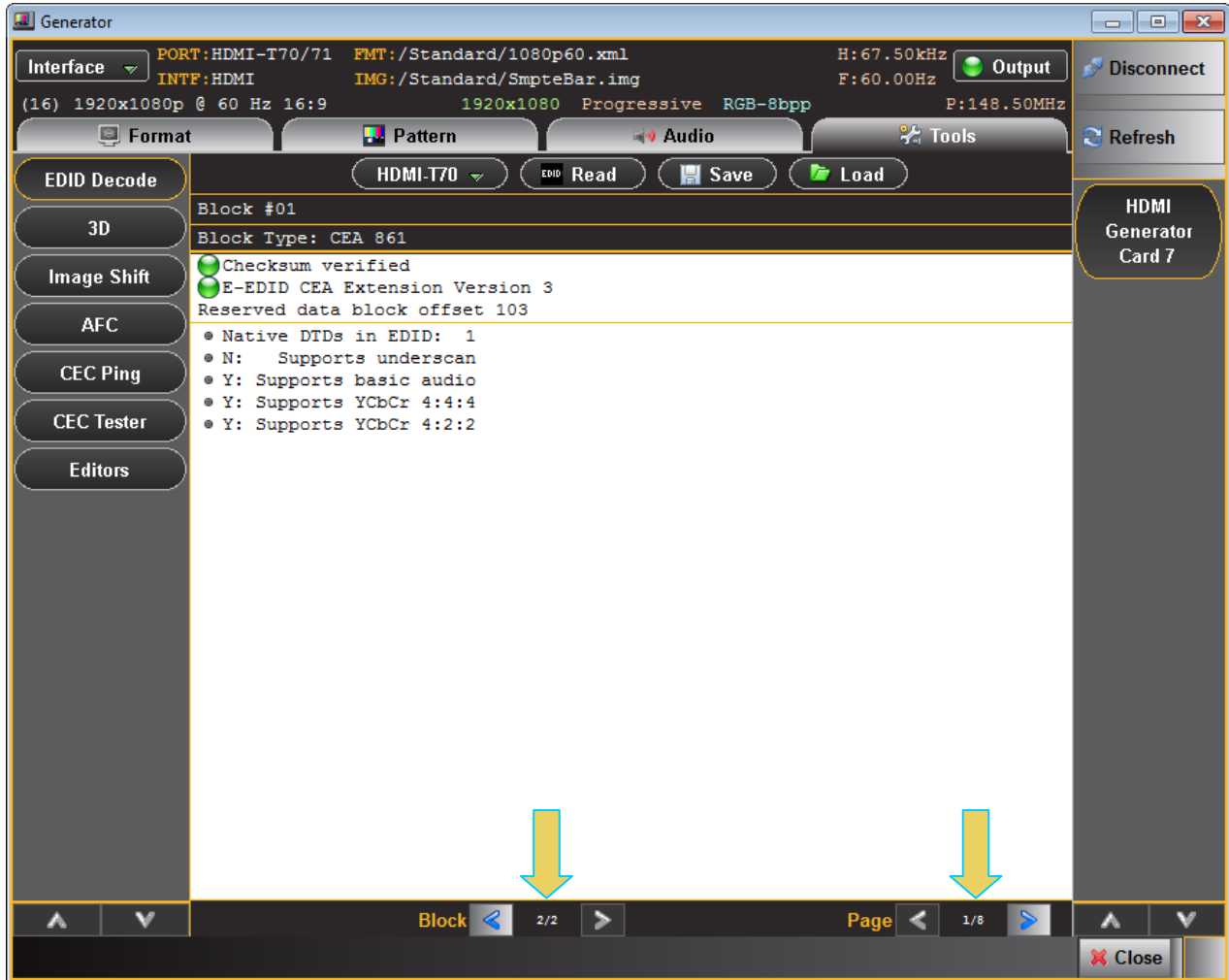
Example: CEA Extension block - Short Video Descriptors:

Example: CEA Extension block - Audio Block:
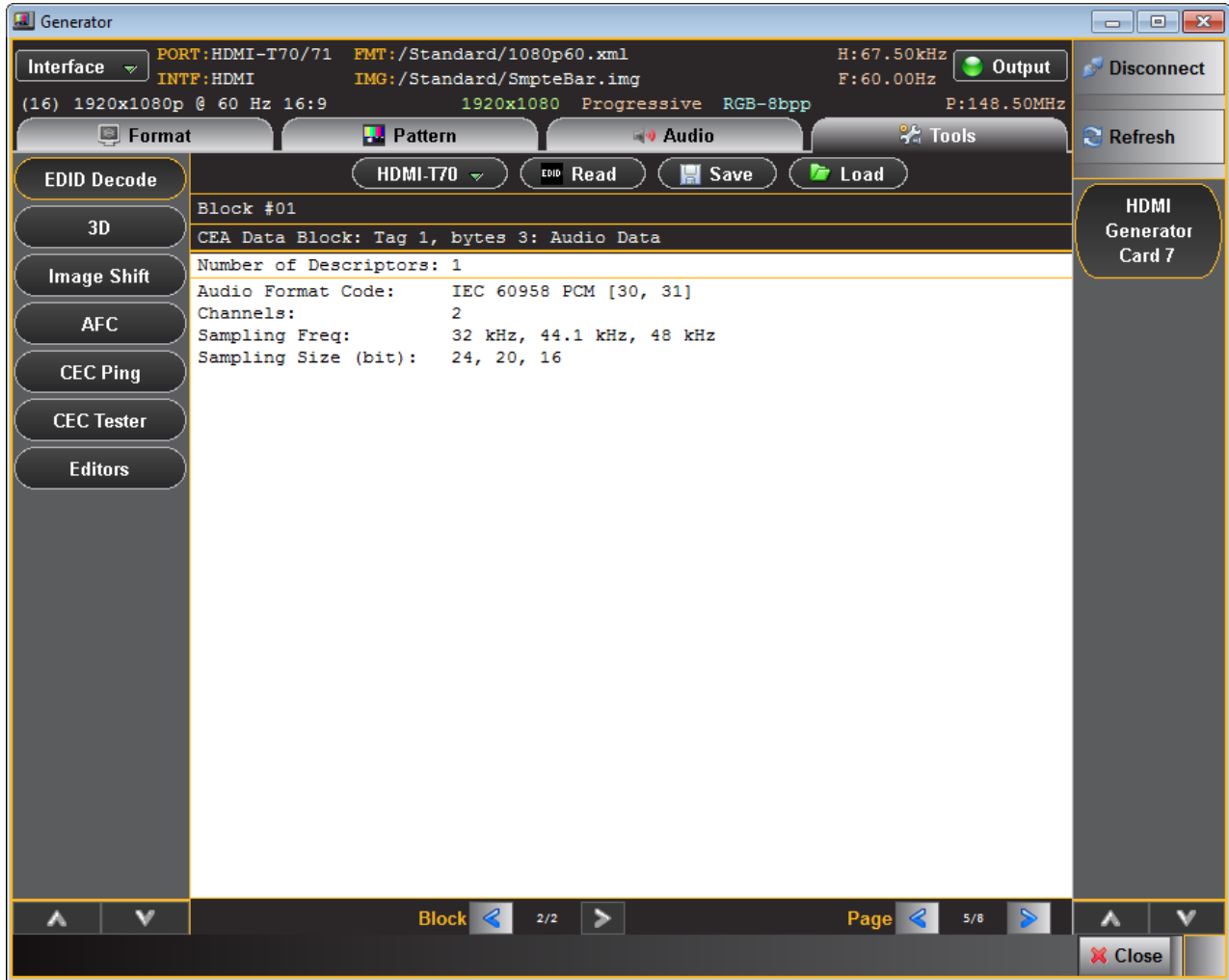
Example: CEA Extension block – Vendor Specific Data Block:

```
Generator                                                                    ─ ▫ ✕

Interface ▾   PORT:HDMI-T70/71   FMT:/Standard/1080p60.xml        H:67.50kHz   ● Output    Disconnect
              INTF:HDMI          IMG:/Standard/SmpteBar.img       F:60.00Hz
(16) 1920x1080p @ 60 Hz 16:9              1920x1080  Progressive  RGB-8bpp     P:148.50MHz

     💻 Format          🖼 Pattern          🔊 Audio          🔧 Tools         🔄 Refresh

                   HDMI-T70 ▾    EDID Read    💾 Save    📁 Load                HDMI
 EDID Decode                                                                   Generator
               Block #01                                                       Card 7
    3D         CEA Data Block: Tag 3, bytes 16: Vendor Specific

 Image Shift   🟢HDMI 1.4b Vendor Specific Data Block
               ● CEC Physical Address: 1.0.0.0
    AFC        ● ISRC/ACP:             Not supported
               ● Deep Color
  CEC Ping        36 bits per color
                  30 bits per color
 CEC Tester        YCbCr 4:4:4 supported
               ● DVI dual-link:        Not supported
   Editors     ● Max TMDS clock:       300 MHz
               ● Content types:        None
               ● Latency:              Not Present
               ● Interlaced Latency:   Not Present

               ● Basic 3D:             Supported
               ● Image Size:           No addditional information.

               ● 4K x 2K Support:
                  3840x2160 30Hz
                  3840x2160 25Hz
                  3840x2160 24Hz
                  4096x2160 24Hz
               ● General 3D Support:   On the first 16 SVDs.
                  Frame packing
                  Side-by-Side (Full)
                  Top-and-Bottom
                  Side-by-Side (Half)


   ⋀   ⋁              Block ◁  2/2  ▷           Page ◁  7/8  ▷      ⋀   ⋁
                                                                   ✖ Close
```

3.14   Capturing EDIDs of a connected display

Use the following procedures to capture and save EDIDs from a connected display or HDTV.
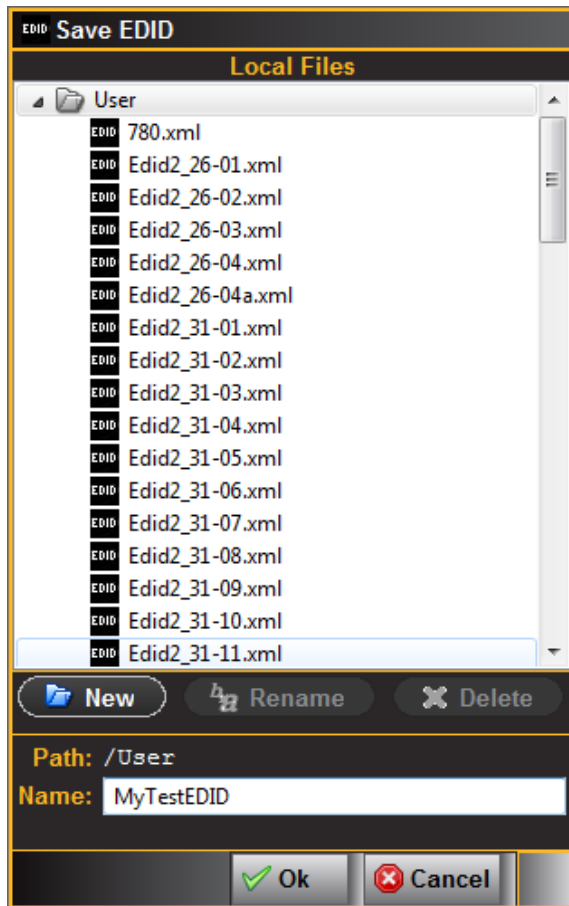
To capture the EDID of a connected display:

1. From the main window of the 980 HDMI Video Generator module, select the **Tools** tab, select EDID Decode and then Read the EDID using the procedures in the previous section.

    Example of the **EDID Decode** content are shown in the following screens.
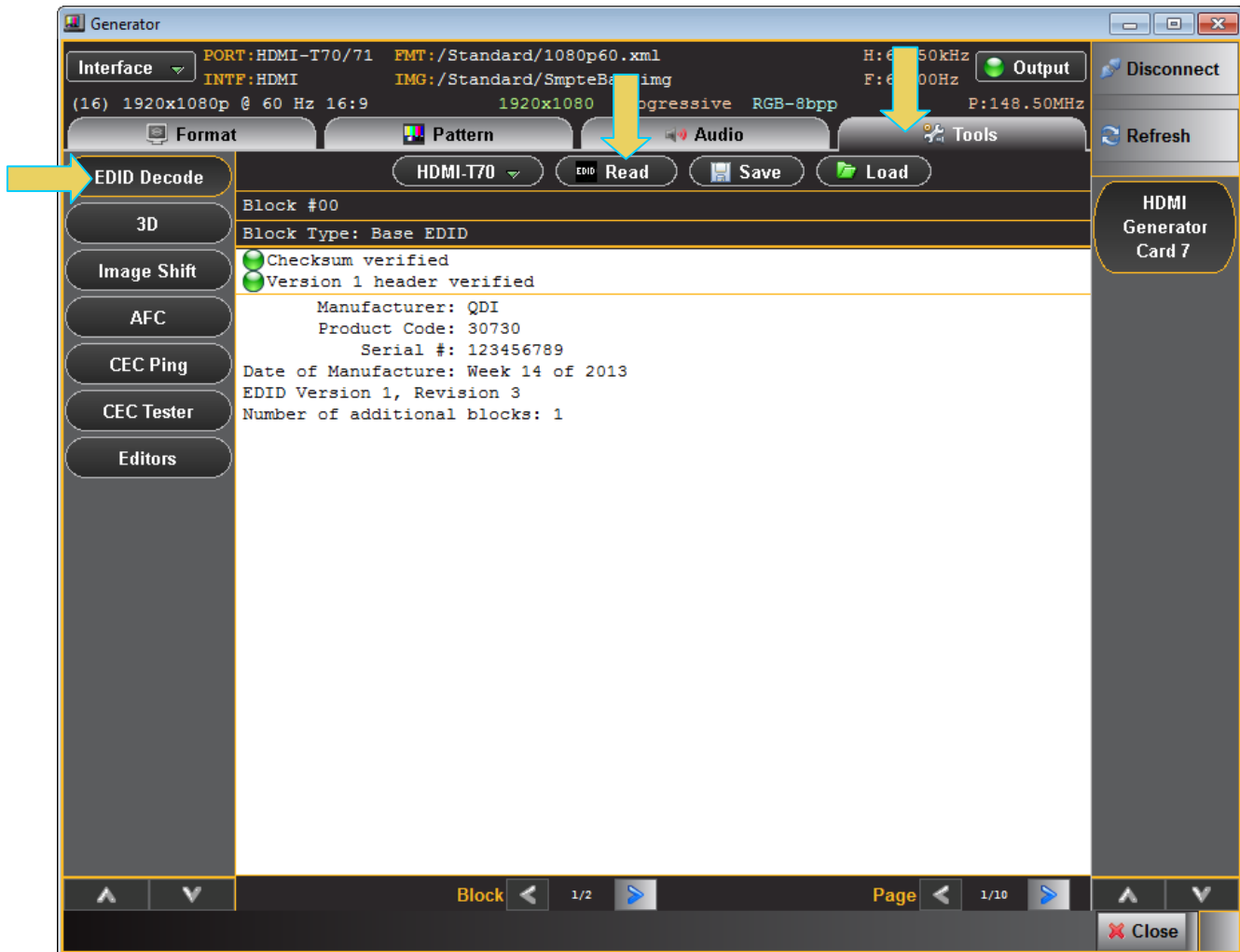
2. Click on **Save** to store the EDID on the 980 instrument for later use. A dialog box will appear enabling you to select a name.

3.15 Loading EDIDs from stored files

Use the following procedures to load EDIDs that you have captured or created.

To load an EDID for viewing:

1. From the main window of the 980 HDMI Video Generator module, select the **Tools** tab, select **EDID Decode** and then **Read the EDID** using the procedures in the previous sections.

2. Example of an **EDID Decode** contents are shown in the following screens.
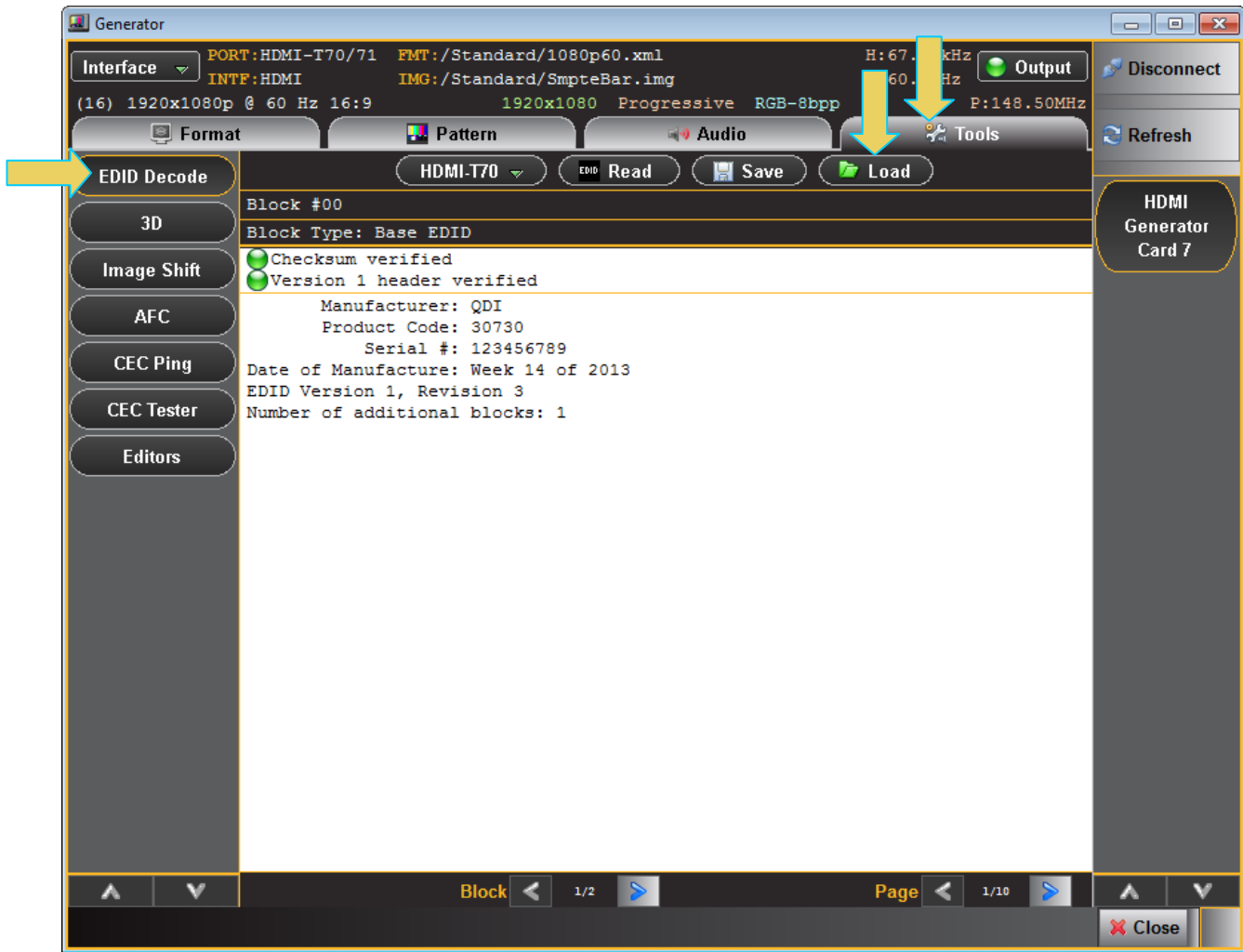
3. Click on **Load** to view a stored EDID. A dialog box will appear enabling you to select the EDID for viewing.

EDID Load EDID

Local Files

- ▲ 📂 User
  - EDID 780.xml
  - EDID Edid2_26-01.xml
  - EDID Edid2_26-02.xml
  - EDID Edid2_26-03.xml
  - EDID Edid2_26-04.xml
  - EDID Edid2_26-04a.xml
  - EDID Edid2_31-01.xml
  - EDID Edid2_31-02.xml
  - EDID Edid2_31-03.xml
  - EDID Edid2_31-04.xml
  - EDID Edid2_31-05.xml
  - EDID Edid2_31-06.xml
  - EDID Edid2_31-07.xml
  - EDID Edid2_31-08.xml
  - EDID Edid2_31-09.xml
  - EDID Edid2_31-10.xml
  - EDID Edid2_31-11.xml
  - EDID Edid2_31-12.xml
  - EDID Edid2_31-13.xml
  - EDID Edid2_31-14.xml
  - EDID Edid2_31-15.xml
  - EDID Edid2_31-16.xml
  - EDID Edid2_31-17.xml

✓ Ok   ❌ Cancel

3.16   Selecting audio formats

Use the following procedures to select HDMI formats.

To select an audio format:

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

The table below summarizes the 980 HDMI Video Generator uncompressed LPCM programmable audio test tones.

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

The table below summarizes the 980 HDMI Video Generator compressed audio test tones.

Summary of Selectable Compressed Audio Signal Test Tones	
Audio Signal Type	**Description**
Dolby 5.1 (AC-3)	Provides a set of Dolby Digital 5.1 noise test tones per channel: ▪ 500-2kHz Pink ▪ 20-20kHz Pink ▪ Sine Wave (63Hz, 125Hz, 1kHz, 4kHz all channels or cycle through channels) ▪ Impulse (per channel) ▪ Polarity (per channel)
DTS-ES 6.1	Provides a set of DTS ES 6.1 noise pattern clips: ▪ 500-2kHz Pink ▪ 20-20kHz Pink ▪ Sine Wave (63Hz, 125Hz, 1kHz, 4kHz all channels or cycle through channels) ▪ Impulse (per channel) ▪ Polarity (per channel)

3.17   Testing HDCP on a connected display

Use the following procedures to test HDCP authentication on a connected display. HDPC is tested using a special test image called HDCPProd and HDCP2. These test images are selectable through the **Pattern** tab.

3.17.1 Running the HDCP test

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

To test HDCP on a connected display:

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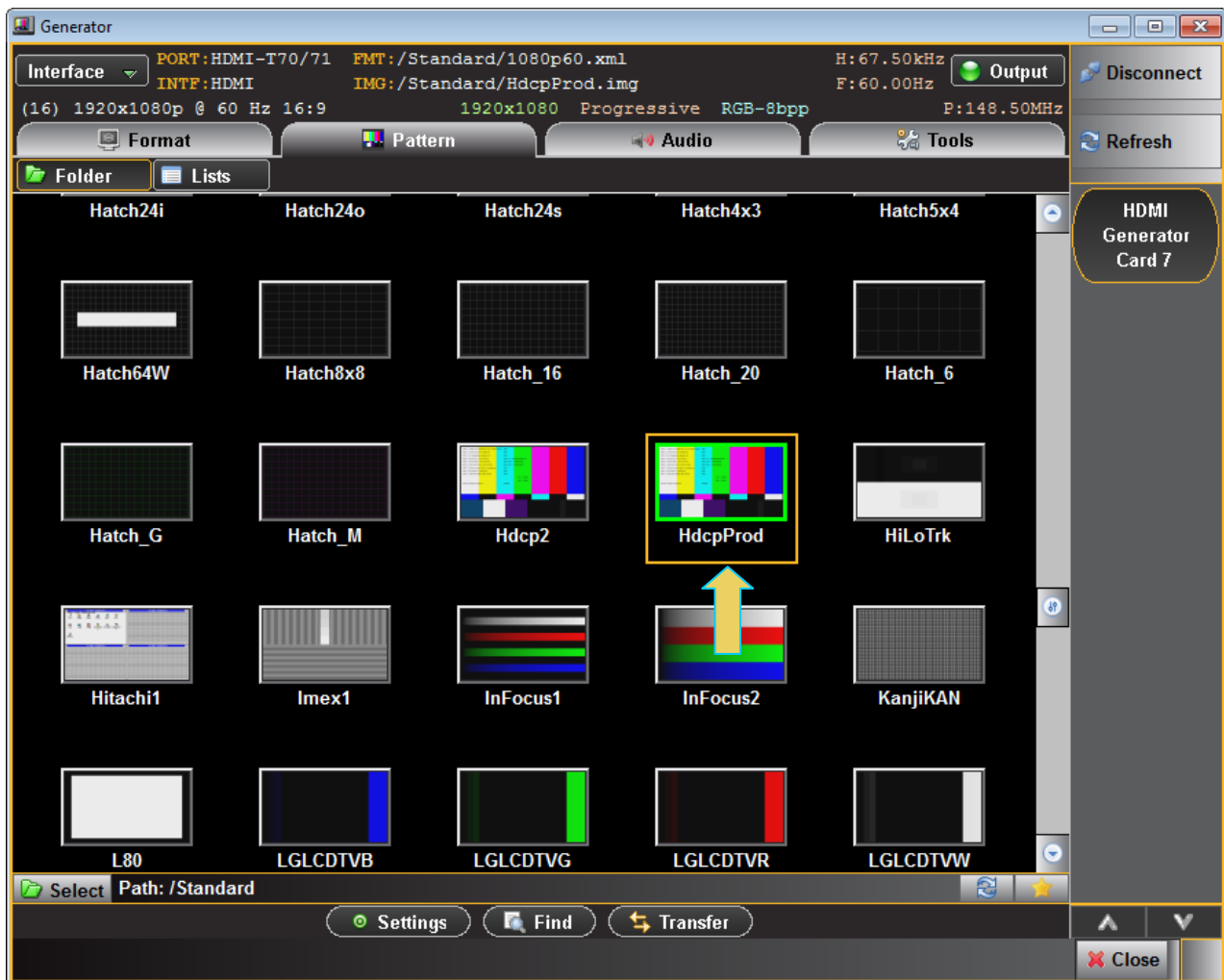
2.   Select the HdcpProd test image if your sink device under test is connected to Port 0 (Tx1); select Hdcp2 if your sink device under test is connected to Port 1 (Tx2).

A typical result is shown below.

```
STEP  1: Reset the transmitter                      - PASS
STEP  2: Initialize the transmitter                 - PASS
STEP  3: At transmitter generate An                 - PASS
STEP  4: Write An to the receiver                   - PASS
STEP  5: Write the transmitter KSV to the receiver  - PASS, Aksv = 0x91584A036F
STEP  6: Read and verify the receiver KSV           - PASS, Bksv = 0x9C115E35EA
STEP  7: Write receiver KSV to transmitter          - PASS
STEP  8: Ri ready at transmitter                    - PASS
STEP  9: Read and compare transmitter Ri with receiver Ri  - PASS
                              RiTX = 0xA543
                              RiRX = 0xA543

STEP 10: Generate authentication                    - PASS
STEP 11: Transmitting encrypted data                - TESTING


            HDCP test passed as long as you can read this.
                         RiTX = 0x73C7
                         RiRX = 0x73C7
    PASS                        4
```

3.17.2 Understanding the HDCP test

The HDMI HDCP test sequence performed by the 980 HDMI 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.

3.18 Viewing Metadata Packets Transmitted to a Connected Display

Use the following procedures to view the HDMI metadata packets transmitted to your display under test. The test image used to view the metadata is selectable through the **Pattern** tab.

3.18.1 Viewing Metadata Packets

Use the procedures below to view metadata packets transmitted to a connected display.

To view the metadata packets transmitted to a connected display:

1. Access the **Pattern** tab to view the test patterns.
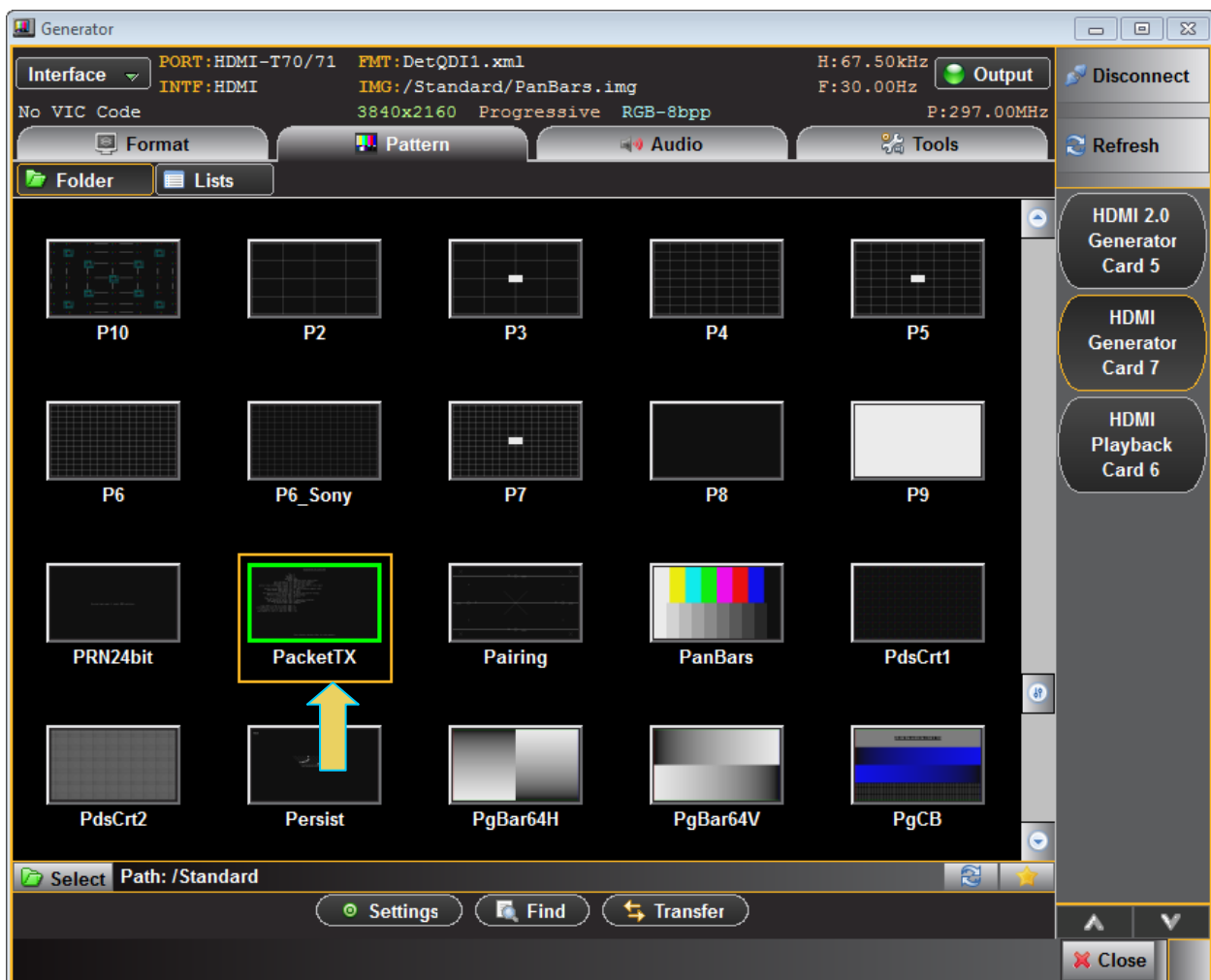
2. Select the PacketTx test.

    View the results on the connected display. A typical example of the first packet type (AVI Infoframe) is shown below. The following is a list of packet types viewable through the PacketTx test image:

- AVI Infoframe.

- Audio infoframe

- Source product descriptor Infoframe.

- Other packets:

    o   Audio Clock Regeneration packets

    o   Channel Status bits

- Vendor Specific Infoframe

The image below is the first page of the multi-page test image. This screen shows the AVI Infoframe.
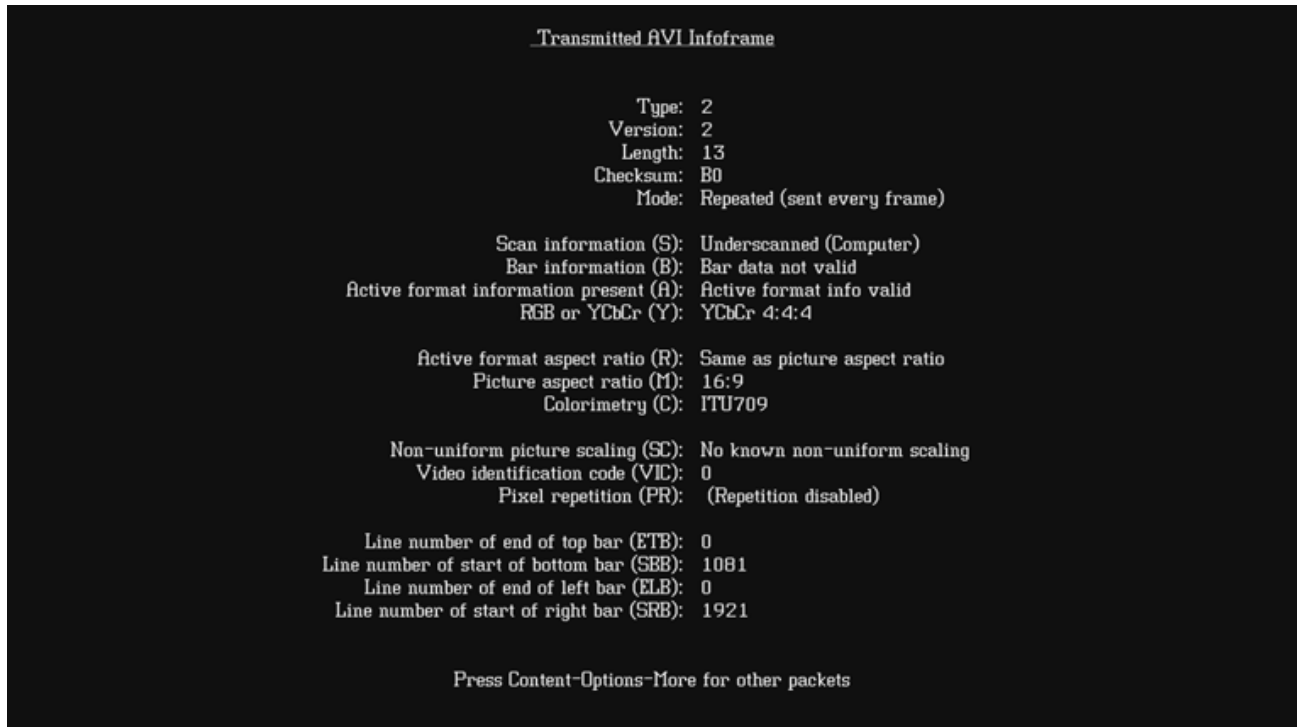
To advance to the next metadata packet type, access the **Renditions** dialog box through the **Settings** activation button as shown below.

4. Auxiliary Channel Analyzer (ACA)

The **ACA** (Auxiliary Channel Analyzer) enables you to view the DDC traffic for HDMI streams. The Real Time viewing of DDC traces is only available through the embedded GUI. However, you can save these ACA traces and then view them with the ACA application off-line from a PC. Furthermore you can send these saved ACA traces to your colleagues or Quantum Data for further analysis. Your colleagues can view the traces without a 980/980B simply by downloading the 980 GUI manager application and loading the trace file.

4.1   Accessing the ACA Panel

The ACA Real Time viewer can be accessed through the **Home** window on the embedded GUI.

The ACA window appears as shown below:

Aux. Channel Analyzer

[-] Events: 0

Data

Clear

Open

Hide
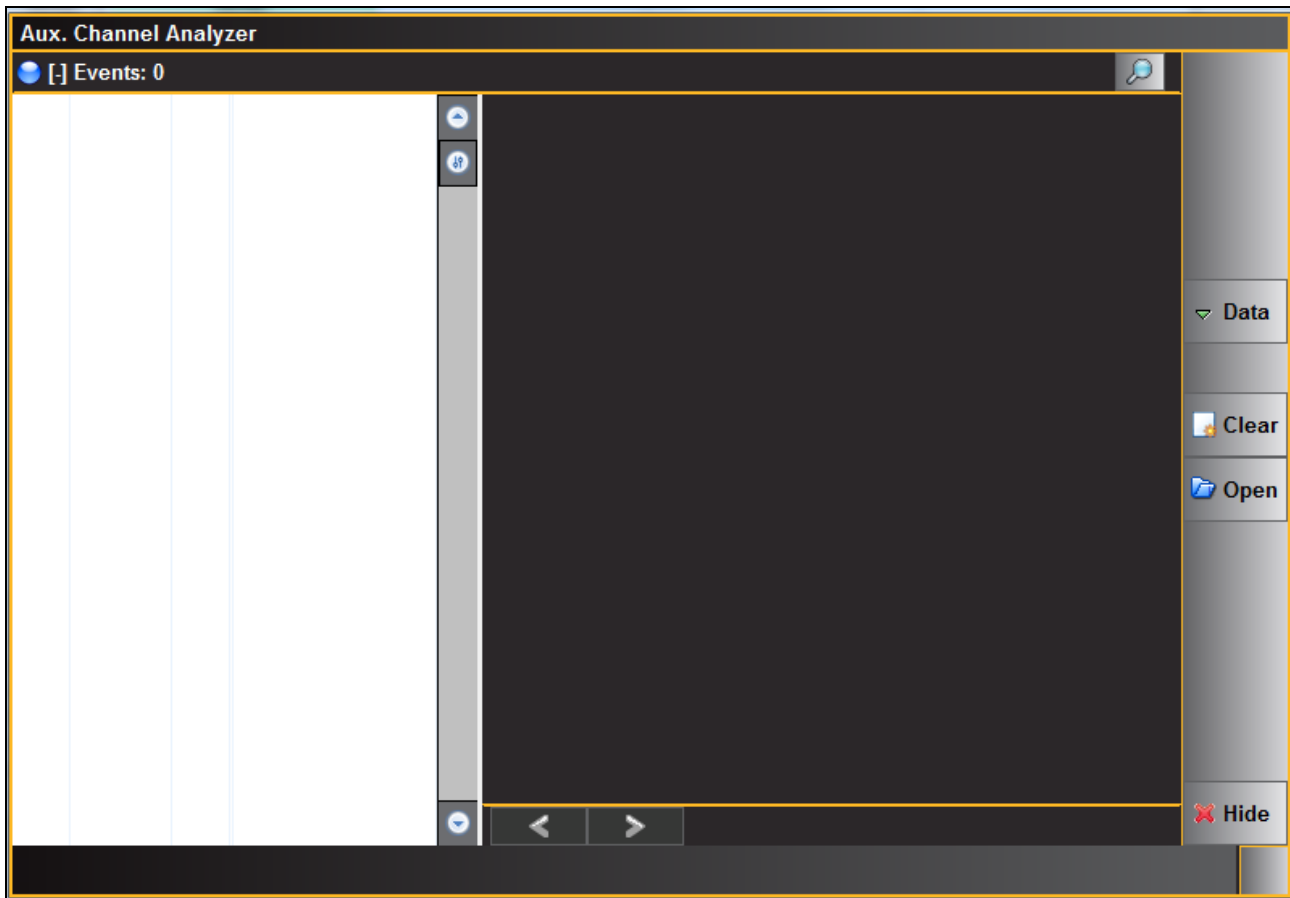
4.2 ACA Panel Description

The **ACA Events** panel enables you to view the transaction data in real time. There is a details panel associated with the ACA panel that provides additional information about a selected transaction in the ACA Events panel. A populated ACA panel with the details panel shown is provided 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 DDC transaction; either EDID or HDCP. ▪ 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. 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. ▪ Events – Shows or hides events enabling you to configure what events you see in the real

Real Time – ACA	Information / Function
	time panel. ▪ Data – Opens up the Details panel 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, EDID or CBUS. ▪ 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 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.

4.3   Monitoring the HDMI auxiliary channels with the ACA

This subsection provides procedures for monitoring the HDMI DDC transactions from an HDMI sink device in real time. The procedures assume that the HDMI sink device under test is powered up and connected to one of the 980 HDMI Video Generator Tx ports.

The following diagram depicts the test setup for monitoring the DDC transactions with the 980 HDMI Video Generator emulating an HDMI source device.

Connection for video testing Tx2 – 980 example
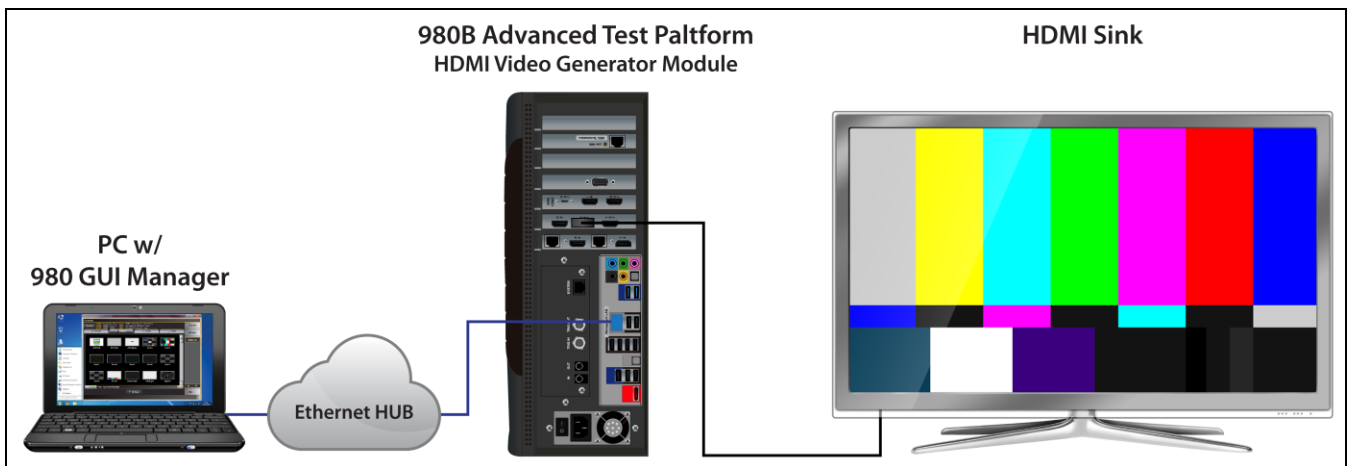
Connection for video testing Tx1 – 980B example

To monitor the HDMI DDC transactions:

1. Touch select the Aux Channel Analyzer item from the Card Control page on the embedded GUI.

The ACA panel appears as shown below:
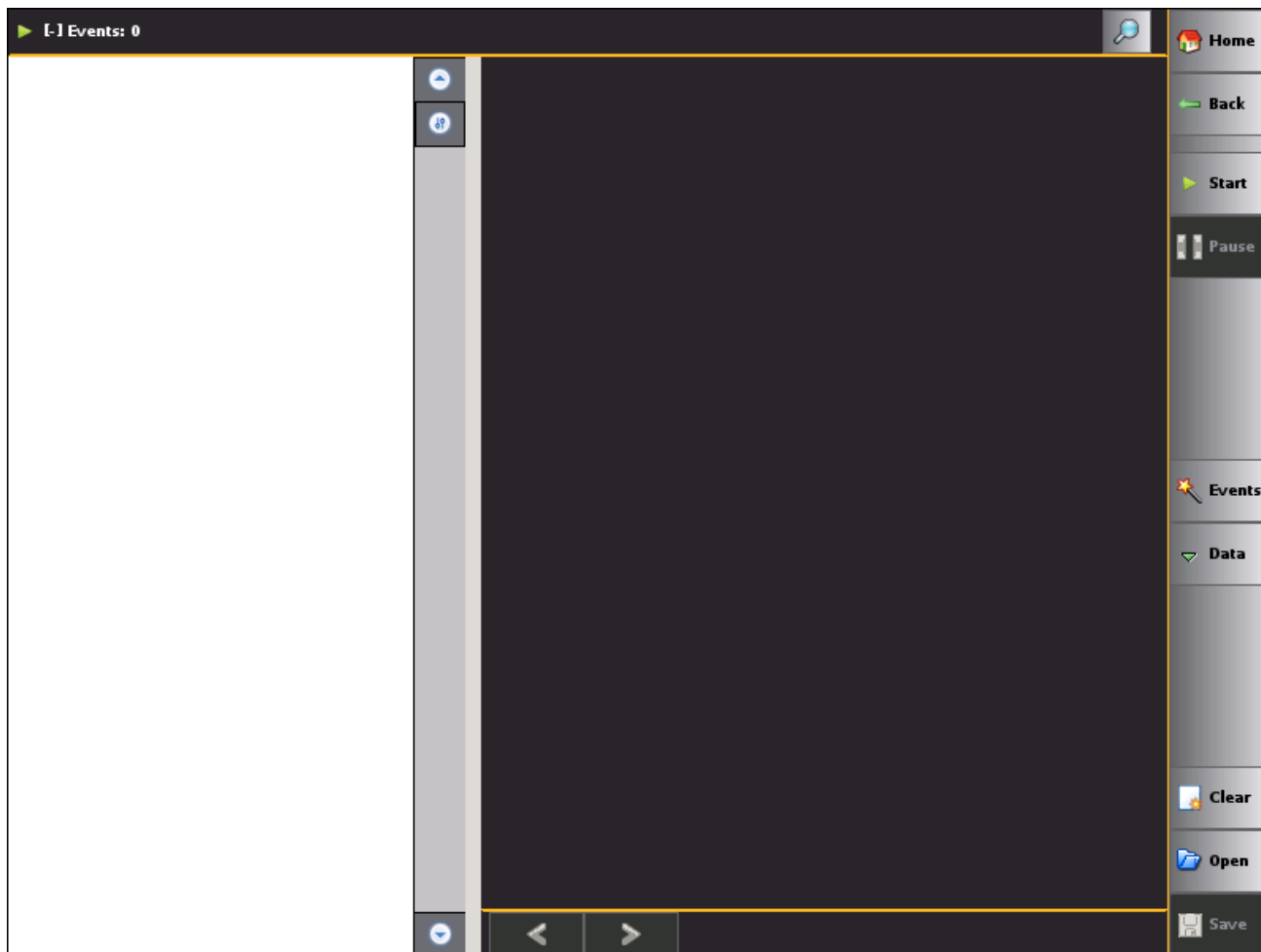
▶ [-] Events: 0

🏠 Home

← Back

▶ Start

❚❚ Pause

✨ Events

▽ Data

🖼 Clear

📂 Open

💾 Save

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

The **ACA Event Selection** dialog box is shown below with all HDMI events selected for monitoring. If you wish to view only a subset of the events deselect the **All Events** option and then select the specific event.
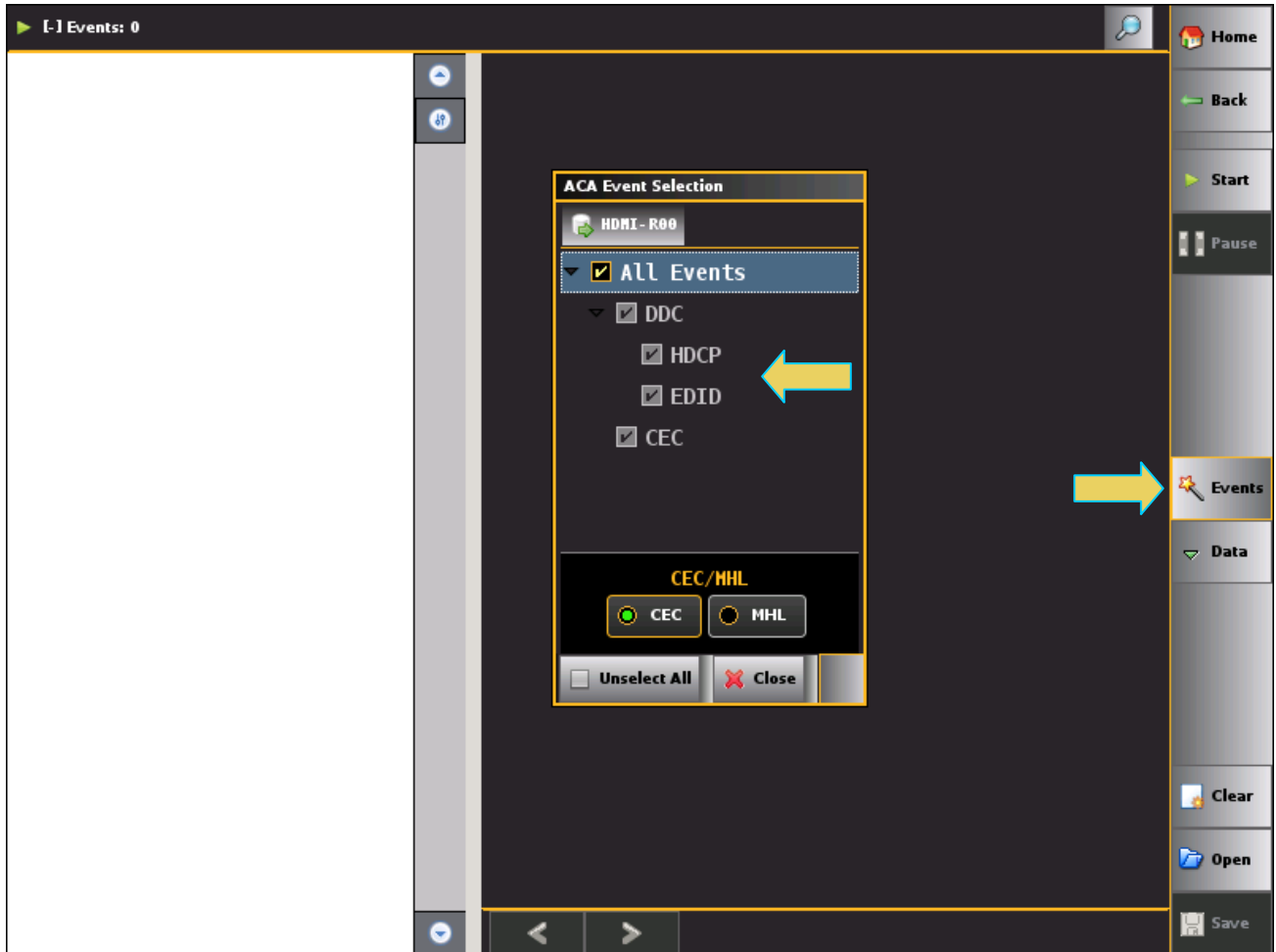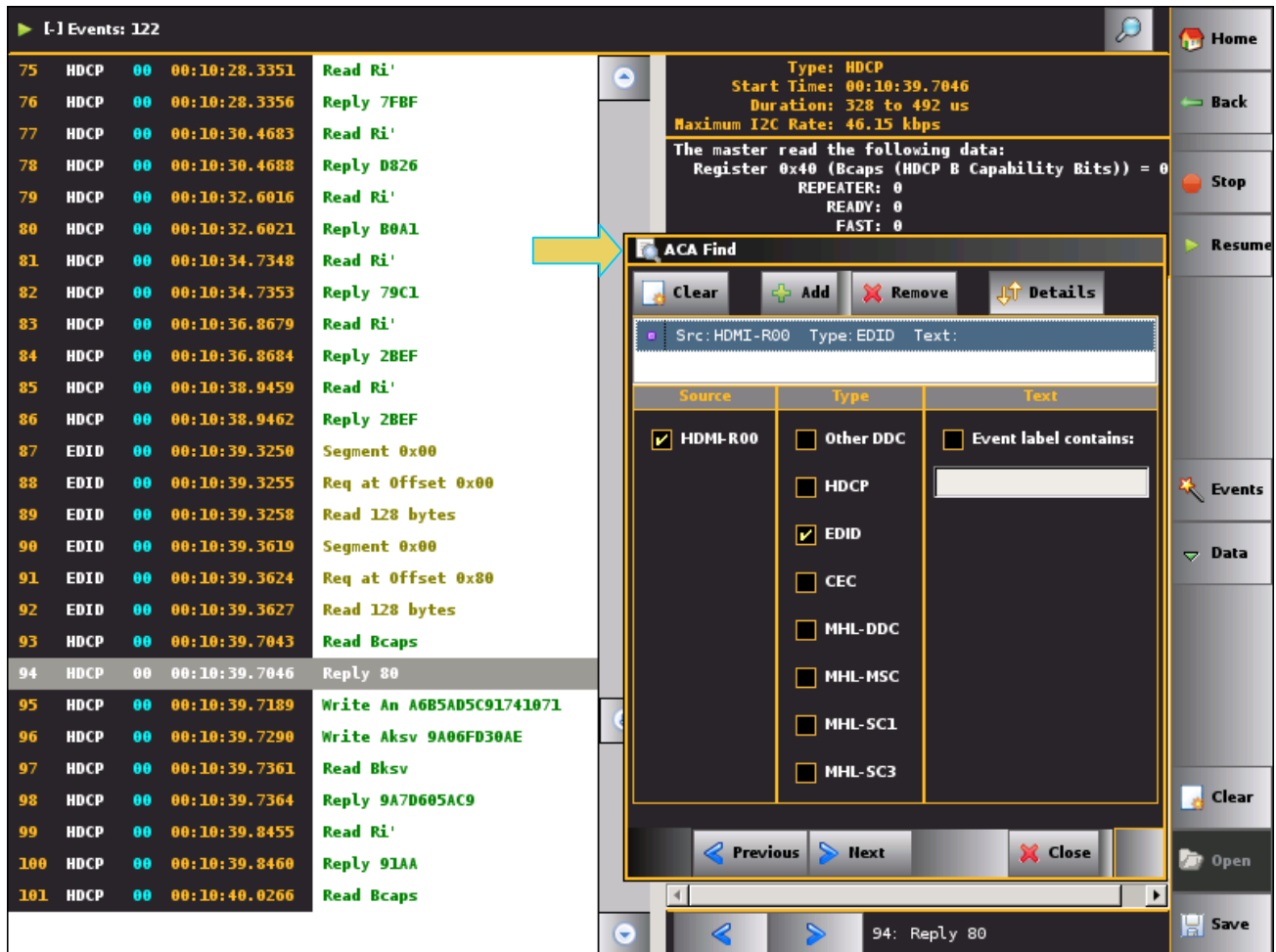
3. Take the necessary action—such as a hot plug—to initiate EDID or HDCP transactions from the HDMI source device. You will see the DDC transactions in the ACA panel as shown below.

4. Touch select the **Start** [▶ Start] button on the ACA Menu panel on the right to initiate the viewing of the HDMI HDCP and EDID transactions. An example showing monitored data is shown below. You can stop or pause the collection at any time using the buttons on the ACA menu panel on the right. These are indicated in the screen example below.
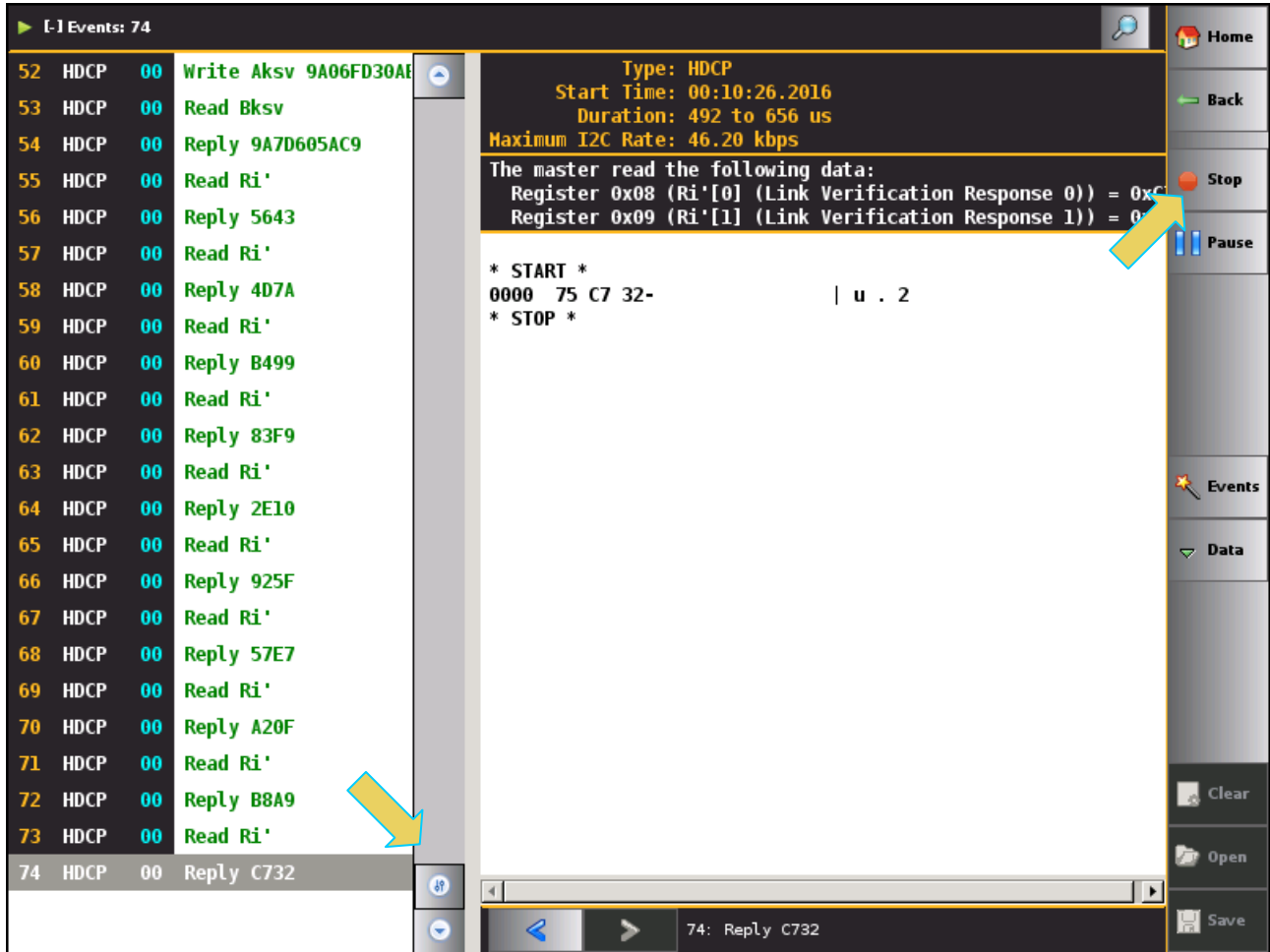
5. Scroll through the data to find specific events. The scroll bars are indicated in the screen example above.

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

   a) Click the **Add** [+ 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** [< Previous] [> Next] to locate the item in the transactions.

4.4   Viewing HDMI auxiliary channel traces on a PC with the ACA

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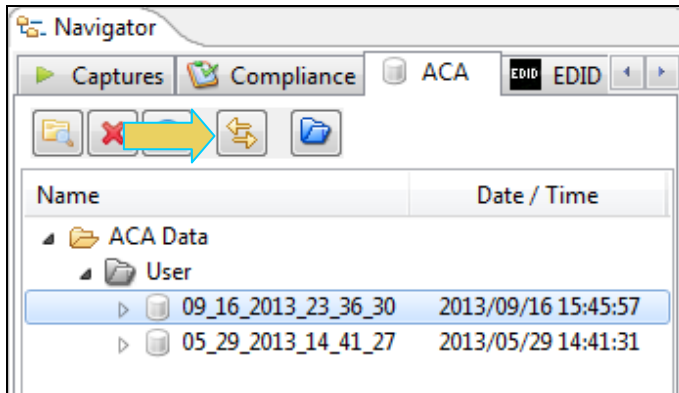
3. Access the **Data Transfer** utility by double clicking on the Transfer Data icon .

   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.
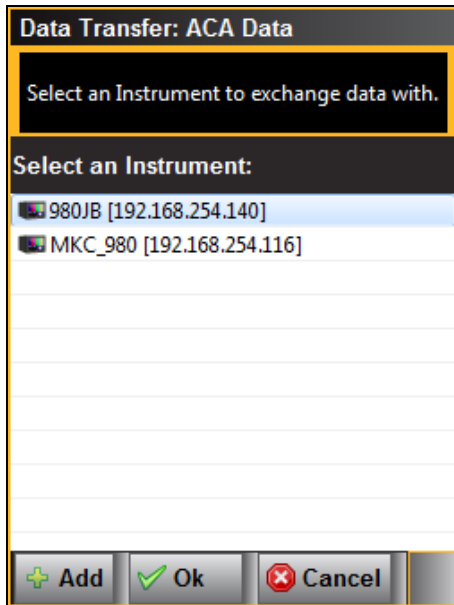
   The **Data Transfer** panel appears in context with the ACA files on the 980 (Instrument) under the **Instrument Files** available as shown below.
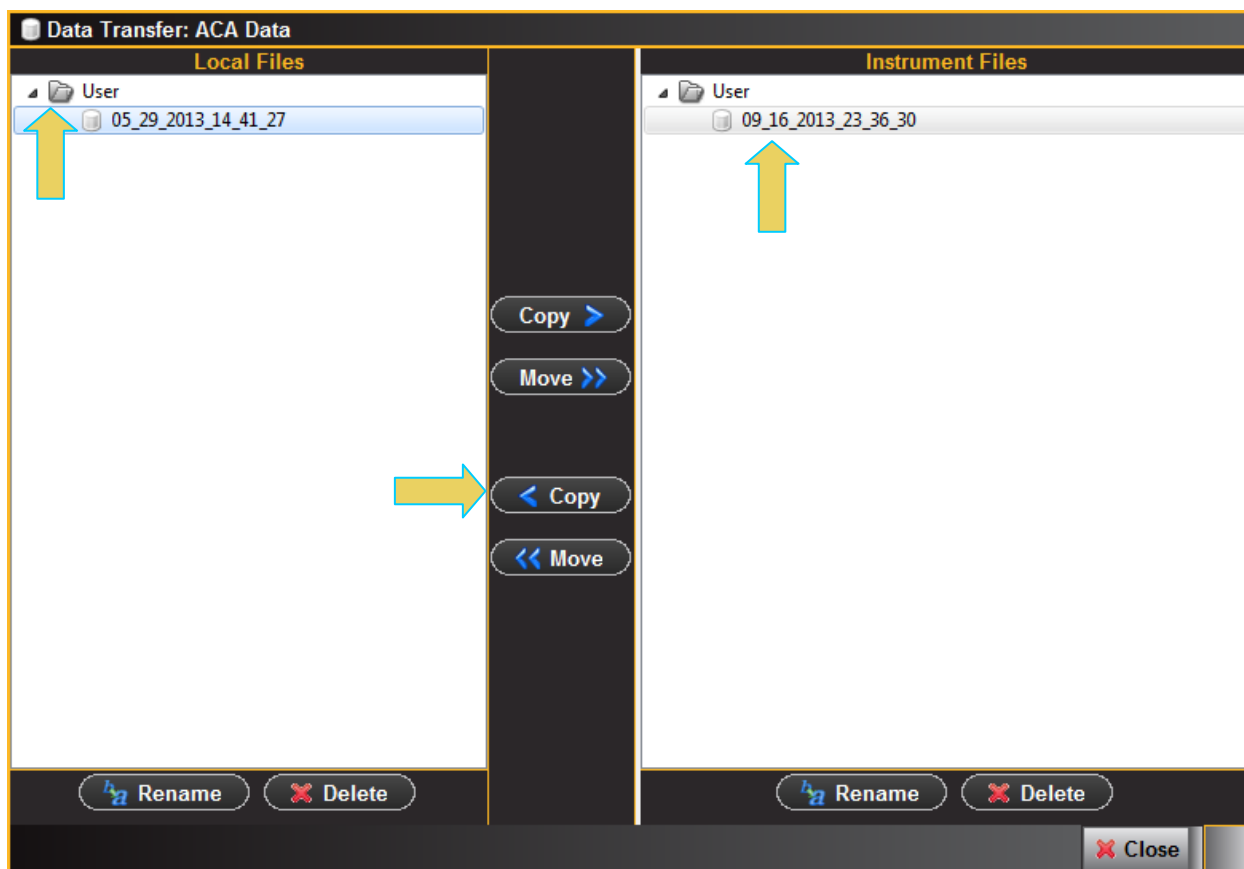
4. Highlight a directory on the **Local Files** side (host PC) and then initiate a **Copy** or **Move**.

    The file appears on the PC host **Local** Files (below).
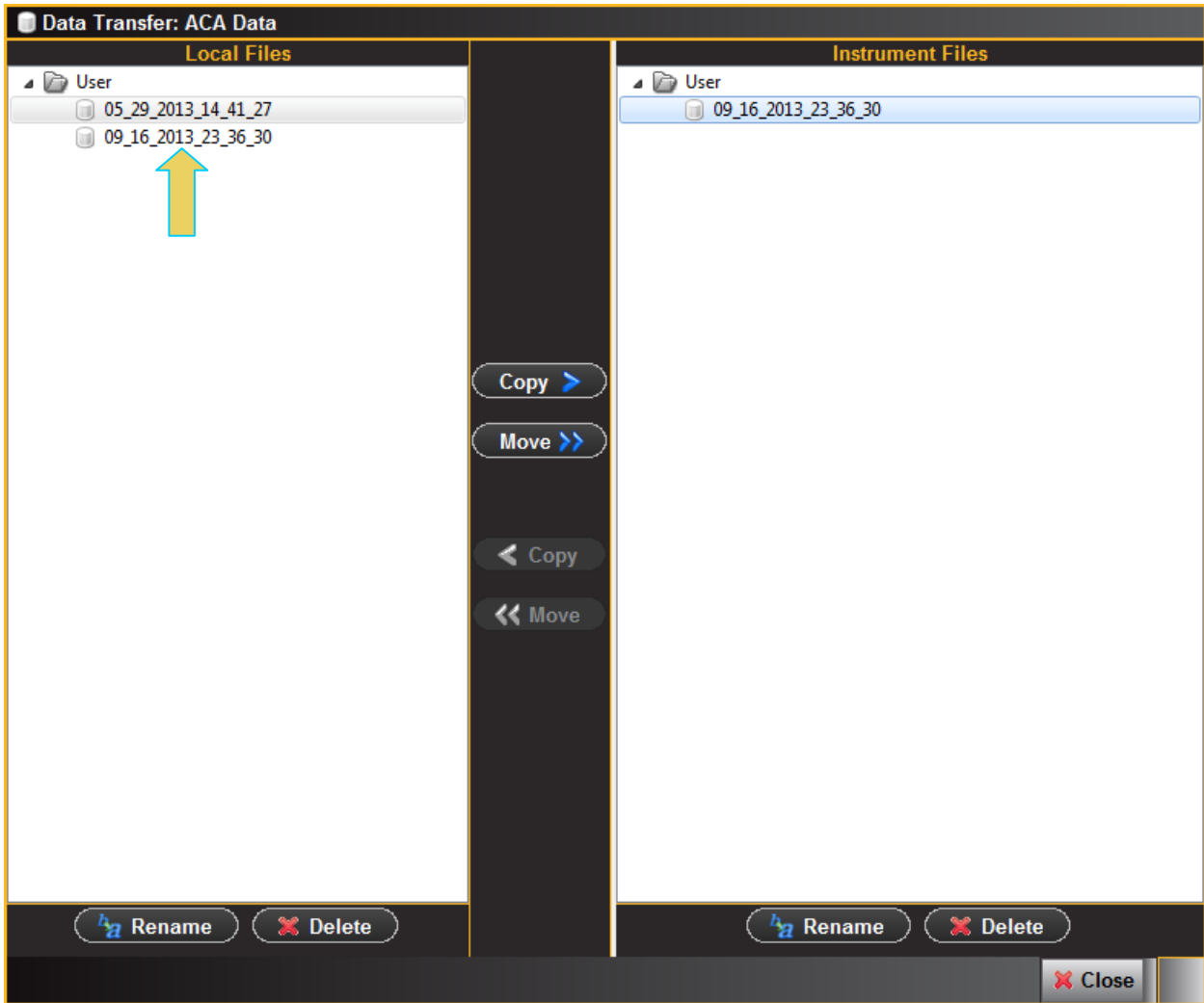
The transferred data file appears in the **Navigator** panel under the ACA data as shown below.
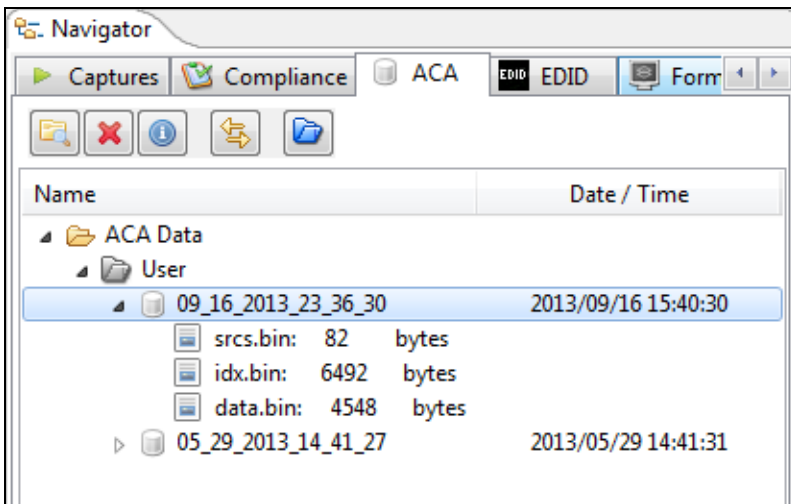
5. Select the **Open** button or double click on the items to open the ACA file as shown below:
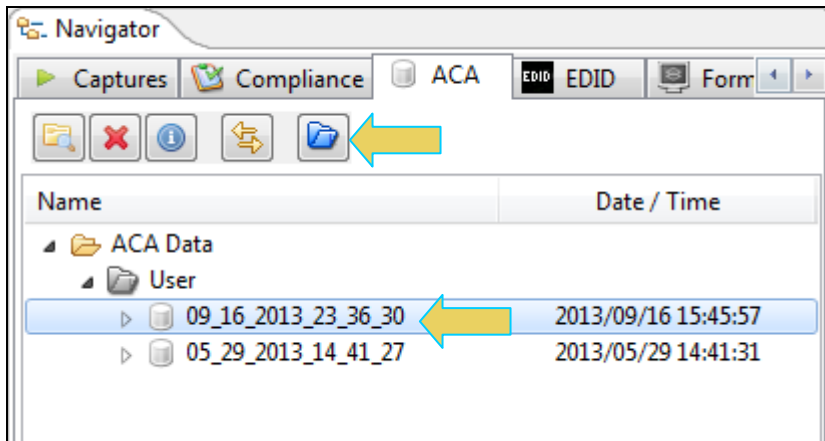
The ACA file appears in the ACA Data Viewer as shown below.
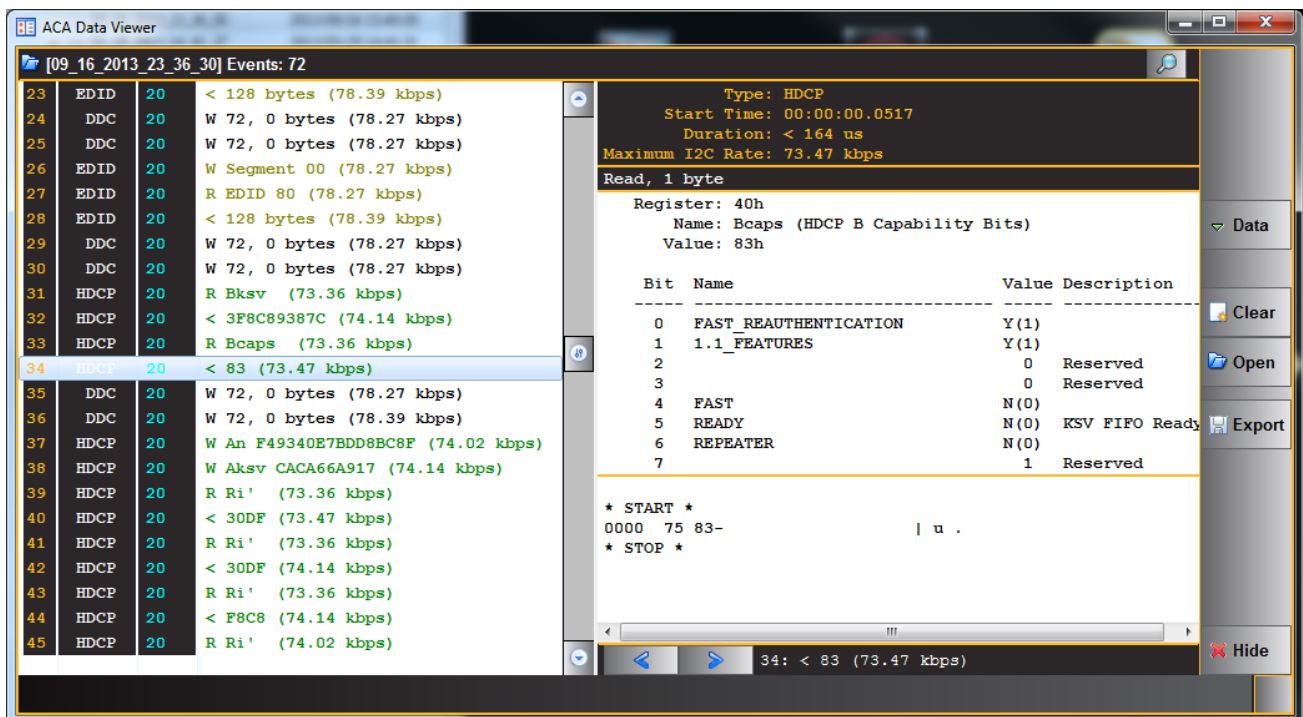
5. CEC Tester

The 980 Video Generator module provides an optional CEC Tester application which enables you to test the CEC message handling capability of your sink or repeater device. You can send any messages to any device and monitor the response of the device under test.

Note: The CEC Tester is an optional feature of the 980 Video Generator module. You must have a license for the CEC Tester application. Please contact Quantum Data Customer Support.

But the CEC Tester also enables you to run robustness tests or "irregular" tests on your CEC device. For example, you can configure the CEC Tester's message output such that a message will contain one or more intentional bit corruptions to see how a CEC device under test will respond. You can also modify the timing of any bit in any message to verify that your CEC device can handle various legal bit timings scenarios. You can also simulate non-acknowledgement scenarios where a message sent from your CEC device to the CEC Tester receives a non-acknowledge from the 980 CEC Tester. Finally you can also simulate arbitration scenarios where the CEC device that the CEC Tester is emulating attempts to seize the bus in various invalid ways.

These CEC Tester features enable you to run a complete set of regular and irregular tests. The Auxiliary Channel Analyzer (ACA) can be used to monitor the CEC messages and their responses in real time enabling you to run thorough tests of your CEC device and verify the results.

5.1   Accessing the CEC Tester application

You can access the CEC Tester application through the **Tools** tab on the 980 Video Generator module interface as shown below. The **Command** tab is show in the example below.

Generator

CARD: Quantum Data, Inc. HDMI generator analyzer
PORT: HDMI-T20/21   FMT: /Standard/1080p60.xml
INTF: HDMI (RGB)   IMG: /Standard/Acer2.img

Interface ▾

🟢 Output   📡 Disconnect   🔄 Refresh

| Format | Pattern | Audio | 🔧 Tools |

Command | **Control**

EDID Decode
3D
Image Shift
AFC
CEC Ping
CEC Tester
Editors

HDMI-T20
HDMI-T01

Port
HDMI-T20 ▾

Configuration
0x04: PLAY1 ▾

Physical Address
0 . 0 . 0 . 1   Apply

Initiator
0x04: PLAY1 ▾

Follower
<None> ▾

Opcode
<None> ▾

Parameters:

No parameters.

🗑 Clear   ⌃ Reset To   📨 Send   🔵 Get Response   ⓘ Details

⋀ ⋁   ✖ Hide

5.2   Configuring the CEC Tester to Emulate a CEC Device

The subsection provides procedures on configuring the CEC Tester to emulate a CEC device. The **Command** tab is used to configure the emulation of devices.

1.   Select the HDMI Port that you wish to use for CEC testing and emulation. For emulating a device you will use the CEC Tester's **Command** tab. In the example below T20 is selected (Transmitter, second slot, first (0) port).

2. Select the **Initiator** device. This is the CEC device that the 980 CEC Tester will be emulating and will be sending messages. In the example below the Initiator device is the Play1 with Logical Address 04.

3. Select the **Follower** device. This is the CEC device that the 980 CEC device will be sending messages to. In the example below the Initiator device is a TV with Logical Address 00.

5.3   Sending CEC Messages

This subsection provides procedures on sending CEC messages through the CEC Tester application. These procedures assume that you have configured the HDMI Port to emulate the desired CEC device (in these examples a player at logical address 4).

1. Select the message you wish to send from the **Opcode** pull-down menu in the **Command** Tab. In the example below the Give Vendor ID message will be sent.

2.   Send the message by clicking on the **Send** activation button (example Give Physical Address).

3. View the details of the message response by clicking on the **Details** activation button. There are two examples provided; one showing the details of the Report Physical Address response and a second example showing the Device Vendor ID response.

Generator

CARD: Quantum Data, Inc. HDMI generator analyzer
PORT: HDMI-T20/21   FMT: /Standard/1080p60.xml
INTF: HDMI (RGB)   IMG: /Standard/Acer2.img

Interface ▾   ● Output   ⚡ Disconnect

🖥 Format   📊 Pattern   🔊 Audio   🛠 Tools   🔄 Refresh

EDID Decode   HDMI-T20

3D   HDMI-T01

Image Shift

Response Details

TV->*ALL*, Device Vendor ID (0x87)

Bytes: 0F 87 00 07 AA

Size of message: 5 bytes
Message source: TV (0x0)
Message destination: *ALL* (0xF)
Message opcode: Device Vendor ID (0x87)
   Device Vendor ID: 0x0007AA

AFC   0x0

CEC Ping

CEC Tester

Editors

❌ Close

● 17:02:30.278   HDMI-T20   PLAY1 -> TV: Give Physical Address
● 17:02:57.689   HDMI-T20   TV->*ALL*, Report Physical Ad...
● 17:05:12.765   HDMI-T20   PLAY1 -> TV: Give Vendor ID
● 17:05:15.816   HDMI-T20   TV->*ALL*, Device Vendor ID (...

∧ ∨

🗒 Clear   ⚹ Reset To   ● Send   ● Get Response   ⓘ Details

∧ ∨

❌ Hide
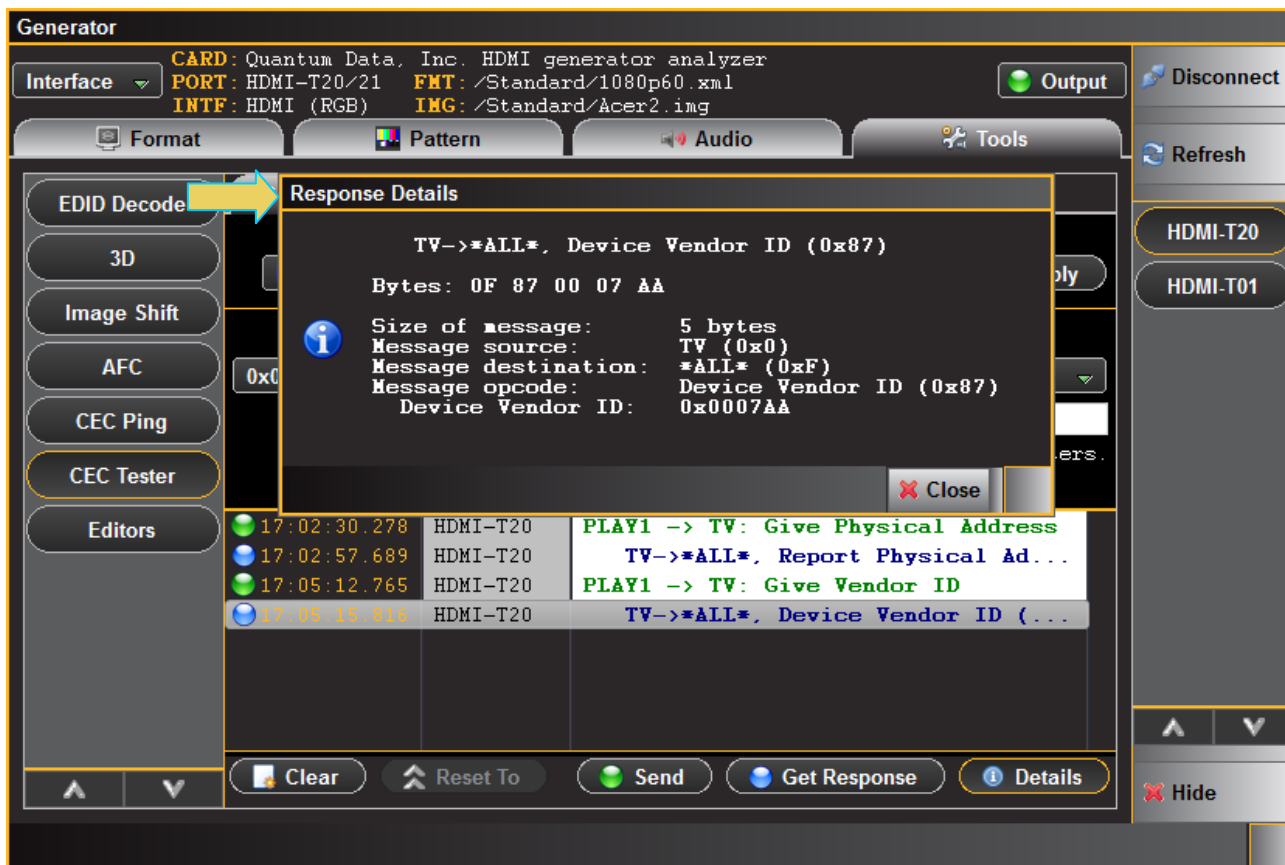
You can also send messages that require additional parameters such as the Report Physical Address command. The additional operands are entered into the **Parameters** field. Refer to the HDMI spec for details on the parameters for each message.

5.4 Monitoring CEC Messages with the ACA

This subsection provides procedures on monitoring the CEC transactions through the Auxiliary Channel Analyzer (ACA) application.

1. Launch the ACA application either from the View pull-down window of the **Home** Menu (shown in example below).

The ACA panel appears as shown below:
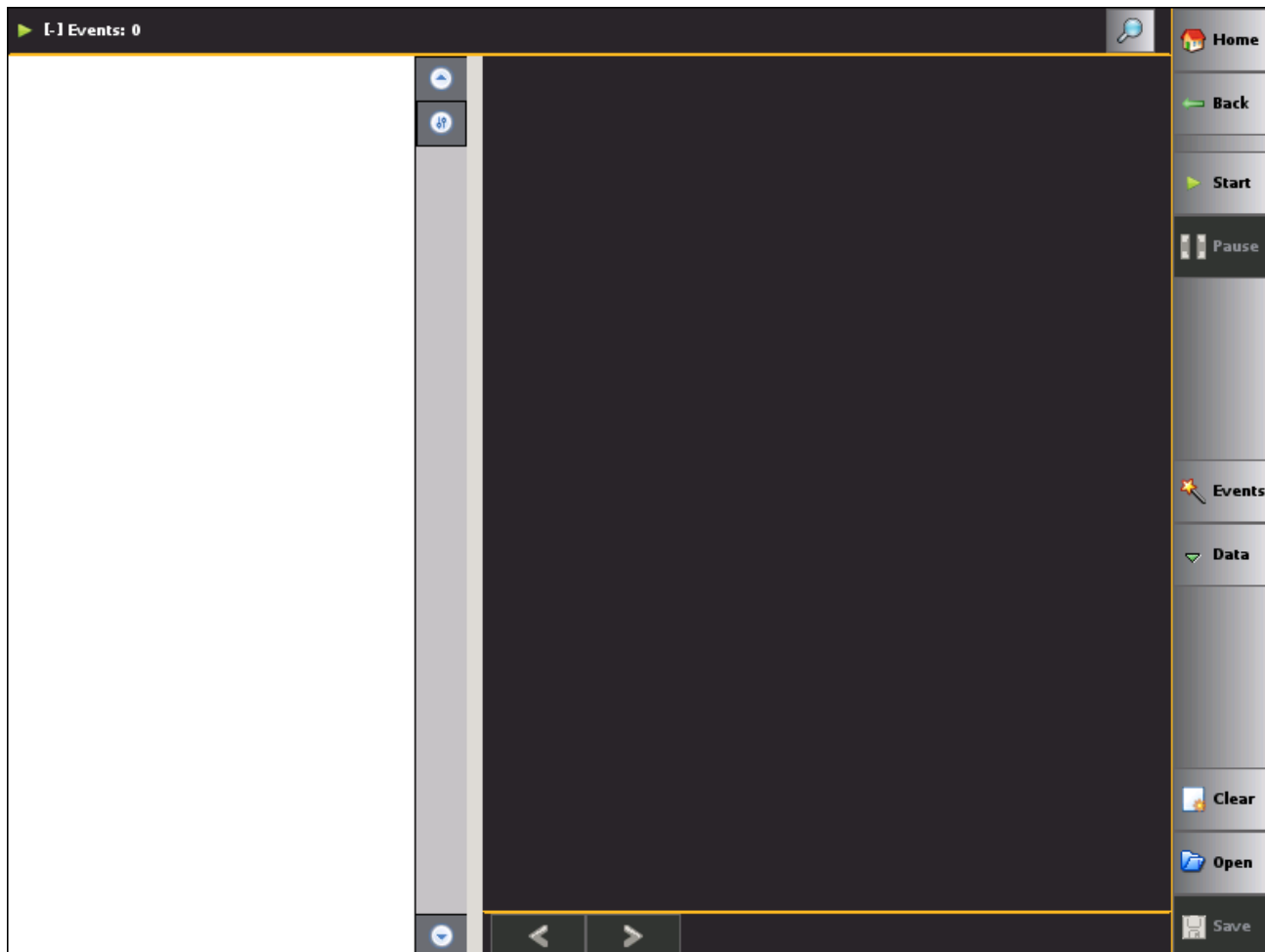
2. Select the event types that you wish to capture by touch selecting the **Events** [icon: Events] button on the **ACA** panel menu at the right. Refer to the screen example below.

The **ACA Event Selection** dialog box is shown below with all HDMI events selected for monitoring. If you wish to view only a subset of the events deselect the **All Events** option and then select the specific event. Be sure to select CEC.
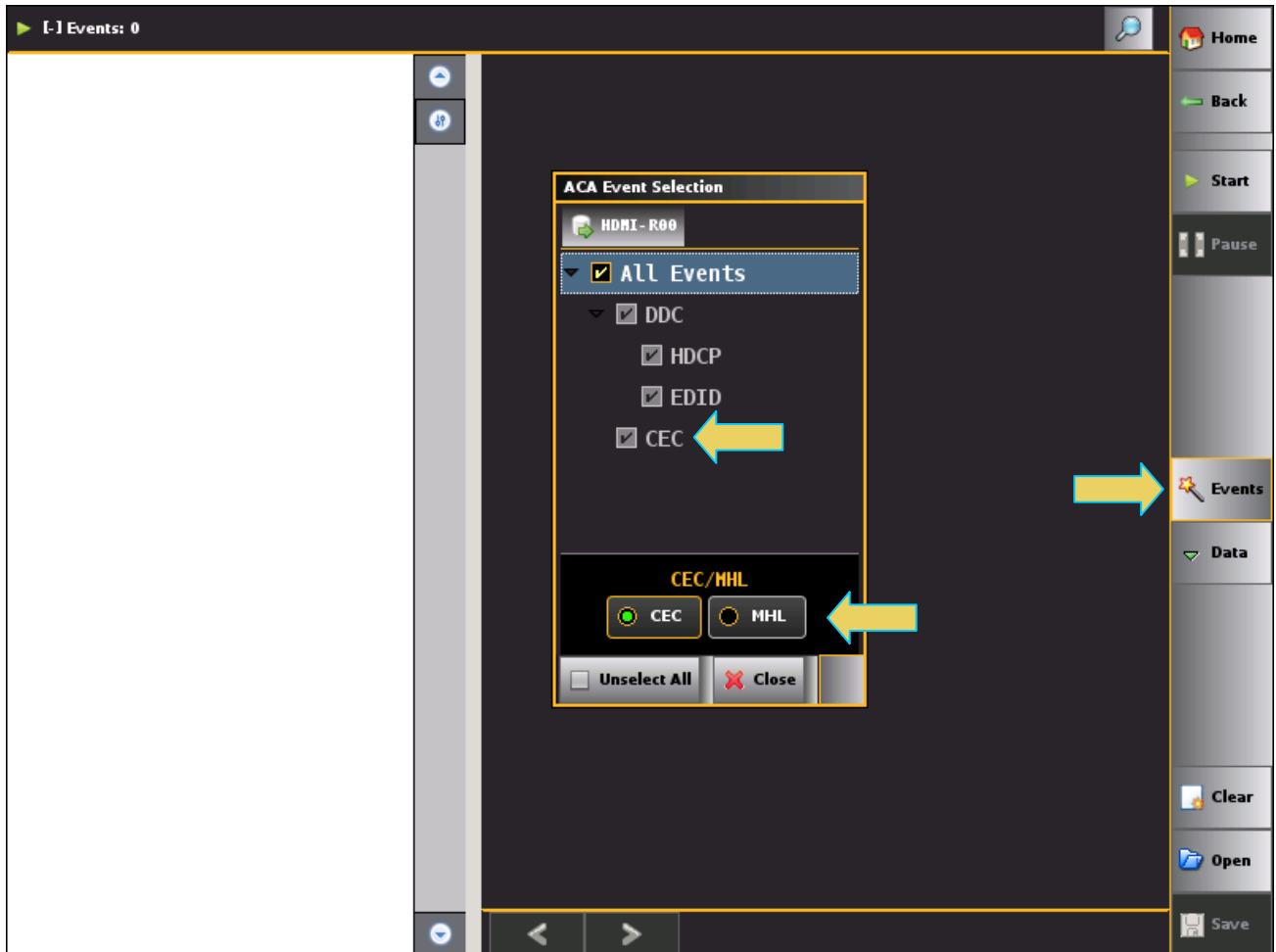
3. Start monitoring by clicking on the Start ▶ Start activation button as indicated below.
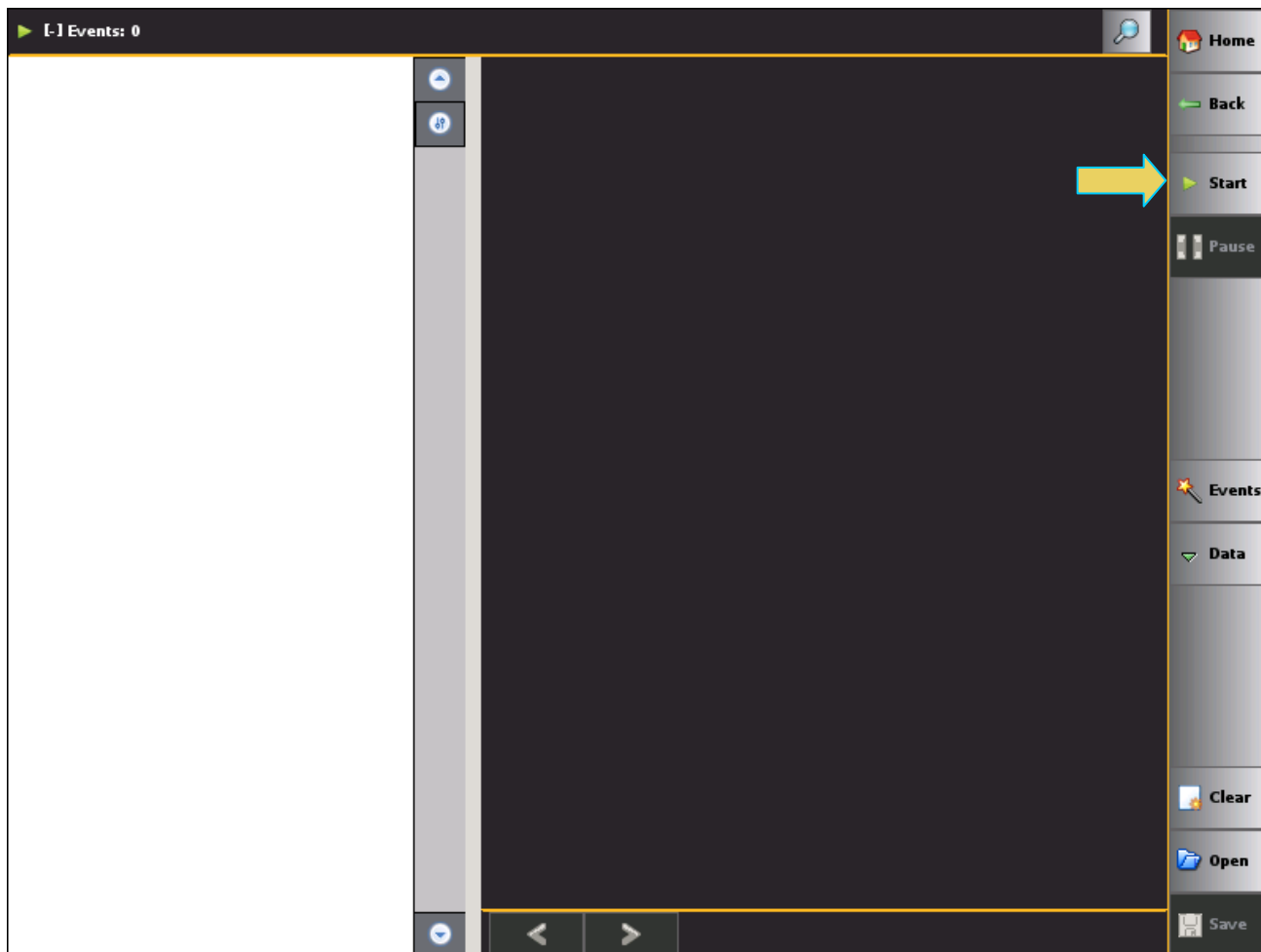
4. Take the necessary action to send the desired CEC message and monitor the response. The example below shows the player sending a Give Physical Address message to the TV and the TV responds by sending a broadcast message Report Physical Address to all other CEC devices.

The Details panel on the right shows all the details about the message and bit timings.

5.5   Sending CEC Messages with Corrupt Bits

This subsection provides procedures on sending CEC messages with corrupt bits. The **Control** tab is used to send corrupt bits in a CEC message. These procedures assume that you have configured the CEC Tester to emulate the desired device and have indicated the follower device(s) which will receive the messages. In these examples the CEC Tester is emulating a player device.

1. From the **Control** tab select the bit and byte you wish to corrupt using the pull-down menus under **Corrupt Bit** on the lower left. Example below shows bit 2 on byte 1 will be corrupted.

2. Return to the Command tab and send the message using the procedures described above in this chapter.

3. Click on **Get Response** to see the response from the device that is the target of the message. In this example the 10310 error indicates that the message is invalid which is the result of the corrupt bit.

5.6   Modifying the timing parameters of CEC Messages

This subsection provides procedures on sending CEC messages with variations in the timing of various bits. The **Control** tab is used to modify the timing parameters in a CEC message. These procedures assume that you have configured the CEC Tester to emulate the desired device and have indicated the follower device(s) which will receive the messages. In these examples the CEC Tester is emulating a player device.

1. From the **Control** tab select the type of bit(s) you wish to change the timing for under the **Timing Control** area of the **Control** Tab. In the example below the timing parameters are set to an extreme high or low allowed by the specification.

2. Return to the **Command** tab and send the desired message.

3. View the timing parameter details using the ACA. Note the timing for each type of bit and specifically (for example) the low period of the start bit detected as 3.88 milliseconds.

```
[-] Events: 12, Pending: 0                                               🔍        🏠 Home

1   CEC   20  PLAY1->   TV, Give Physical Address (0x83)   ⊙              Type: CEC
2   CEC   20       TV->*ALL*, Report Physical Address (0x84)   Time since last reset: 00:00:00.7818      ⬅ Back
3   CEC   20       TV->   TV, Ping or UnACKed Header        ⊙
4   CEC   20       TV->   TV, Ping or UnACKed Header           Size of message:      2 bytes (21 bits total)
5   CEC   20       TV->   TV, Ping or UnACKed Header           Message source:       PLAY1 (0x4)          ⏹ Stop
6   CEC   20       TV->   TV, Ping or UnACKed Header           Message destination:  TV (0x0)
7   CEC   20       TV->   TV, Ping or UnACKed Header           Message opcode:       Give Physical Address (0x83)
8   CEC   20       TV->   TV, Ping or UnACKed Header            (No details for this opcode.)             ⏸ Pause
9   CEC   20       TV->   TV, Ping or UnACKed Header           Byte Count: 2
10  CEC   20       TV->   TV, Ping or UnACKed Header           [0000][40-  83-.          ][@ . ----]
11  CEC   20  PLAY1->   TV, Give Physical Address (0x83)       Bit Timings
12  CEC   20       TV->*ALL*, Report Physical Address (0x84)   -------+--------+--------+-----+-----+-----
                                                               Number | Lo(ms) | Hi(ms) | Inv | Dat | Val
                                                               -------+--------+--------+-----+-----+-----
                                                                    0 |  3.88  |  0.80  | --- |  N  |  S  ⬅
                                                                    1 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    2 |  0.78  |  1.28  | --- |  Y  |  1
                                                                    3 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    4 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    5 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    6 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    7 |  1.32  |  0.74  | --- |  Y  |  0      🔍 Events
                                                                    8 |  1.32  |  0.74  | --- |  Y  |  0
                                                                    9 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   10 |  1.52  |  0.54  | --- |  Y  |  0      ▽ Data
                                                                   11 |  0.78  |  1.28  | --- |  Y  |  1
                                                                   12 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   13 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   14 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   15 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   16 |  1.32  |  0.74  | --- |  Y  |  0
                                                                   17 |  0.78  |  1.28  | --- |  Y  |  1
                                                                   18 |  0.78  |  1.28  | --- |  Y  |  1
                                                                   19 |  0.78  |  1.28  | --- |  Y  |  1
                                                                   20 |  1.52  | 17.85  | --- |  Y  |  0
                                                               -------+--------+--------+-----+-----+-----
                                                                                                            🗑 Clear

                                                                                                            📂 Open

                                                ⊙    ◁    ▷    11: PLAY1->   TV, Give Physical A           💾 Save
```

5.7   Simulating Non-Acknowledgements of CEC Messages

This subsection provides procedures on how to simulate a CEC device that does not properly acknowledge a message. The **Control** tab is used to simulate the acknowledgement secenario in a CEC message. These procedures assume that you have configured the CEC Tester to emulate the desired device and have indicated the follower device(s) which will receive the messages. In these examples the CEC Tester is emulating a player device.

1.   From the **Control** tab select the type message you wish to simulate a nack for under the **Enable ACKs** area of the **Control** Tab. In the example below the Broadcast Data message packet will not be acknowledged by the CEC device emulated by the 980 HDMI Video Generator transmitter.

2. Return to the **Command** tab and send a message that will cause a broadcast message to be returned. In this example the Give Physical Address message is sent to the TV which will cause the TV to send a broadcast message.

3. Monitor the messages in the ACA. Note in the example below the message from the TV is not acknowledged which causes the TV to resend the message multiple times.

5.8   Simulating Arbitration Errors on CEC Messages

This subsection provides procedures on how to simulate a CEC device that tries to seize the CEC bus in an improper way. The **Control** tab is used to simulate the arbitration scenario. These procedures assume that you have configured the CEC Tester to emulate the desired device and have indicated the follower device(s) which will receive the messages. In these examples the CEC Tester is emulating a player device.

1. From the **Control** tab select the type of arbitration test you wish to run under the **Test Arbitration** area of the **Control** window. In the example below the CEC device emulated by the 980 will try and seize the bus during transmission of the Data Bits.

2. Return to the **Command** tab and send a message that will cause both address and data bits to be transmitted.

3. View the message response by clicking on the **Get Response** button on the bottom of the **Command** tab.
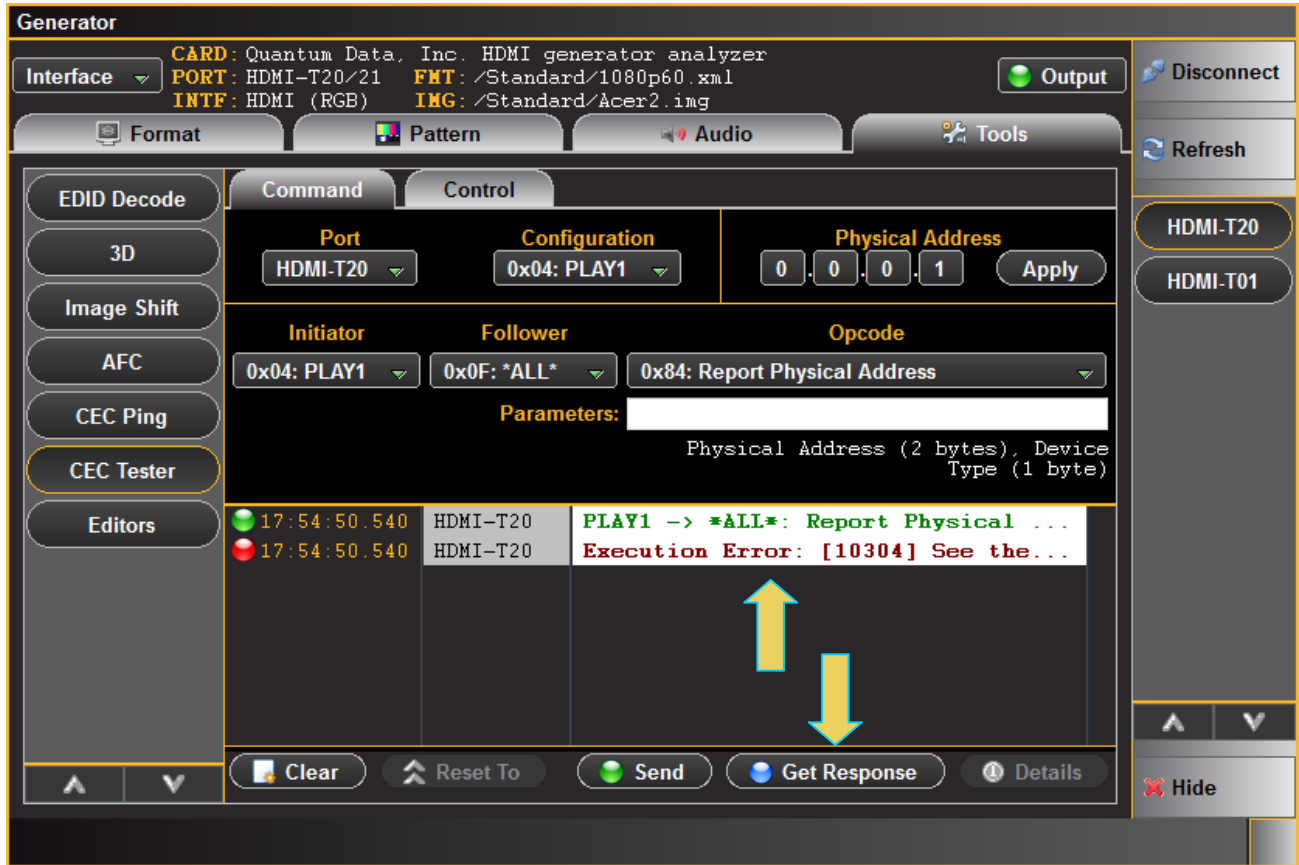
4. Monitor the messages in the ACA. Note in the example below the CEC device that the 980 is emulating (Player) seizes the bus multiple times when the TV attempts to send a message. This causes the TV to continue to try and send the message.

    This test enables you to verify if a CEC device waits the proper length of time (signal free time) before attempting to resend a message.

```
▶ [-] Events: 24, Pending: 0                                          🔍        🏠 Home

1    CEC   20   PLAY1->    TV, Give Physical Address (0x83)     ⬆         Type: CEC
2    CEC   20        TV->*ALL*, Report Physical Address (0x84)     Time since last reset: 00:00:00.7983    ⬅ Back
3    CEC   20        TV->    TV, Ping or UnACKed Header           ⊛  • Missing one or more acknowledgements.
4    CEC   20        TV->    TV, Ping or UnACKed Header              • Shorter than the opcode it contains will allow.
5    CEC   20        TV->    TV, Ping or UnACKed Header                                                    ⏹ Stop
6    CEC   20        TV->    TV, Ping or UnACKed Header           Size of message:      2 bytes (21 bits total)
7    CEC   20        TV->    TV, Ping or UnACKed Header           Message source:       TV (0x0)
8    CEC   20        TV->    TV, Ping or UnACKed Header           Message destination:  *ALL* (0xF)        ⏸ Pause
9    CEC   20        TV->    TV, Ping or UnACKed Header           Message opcode:       Report Physical Address (0x84)
10   CEC   20        TV->    TV, Ping or UnACKed Header             Physical Address:   <Insufficient Data>
11   CEC   20   PLAY1->    TV, Give Physical Address (0x83)         Device Type:        ERROR:None given
12   CEC   20        TV->*ALL*, Report Physical Address (0x84)   Byte Count: 2
13   CEC   20   PLAY1->    TV, Give Physical Address (0x83)       [0000][0F+  84-              ][. . ----]
14   CEC   20        TV->*ALL*, Report Physical Address (0x84)   Bit Timings
15   CEC   20   PLAY1->    TV, Give Physical Address (0x83)       -------+--------+--------+-----+-----+-----
16   CEC   20        TV->*ALL*, Report Physical Address (0x84)   Number | Lo(ms) | Hi(ms) | Inv | Dat | Val
17   CEC   20   PLAY1->    TV, Give Physical Address (0x83)       -------+--------+--------+-----+-----+-----   ⭐ Events
18   CEC   20        TV->*ALL*, Report Physical Address (0x84)        0 |  3.69  |  0.81  | --- |  H  |  S
19   CEC   20   PLAY1->    TV, Give Physical Address (0x83)            1 |  1.50  |  0.89  | --- |  Y  |  0
20   CEC   20        TV->*ALL*, Report Physical Address (0x84)        2 |  1.50  |  0.90  | --- |  Y  |  0   ▽ Data
21   CEC   20        TV->*ALL*, Report Physical Address (0x84)        3 |  1.50  |  0.89  | --- |  Y  |  0
22   CEC   20        TV->*ALL*, Report Physical Address (0x84)        4 |  1.50  |  0.90  | --- |  Y  |  0
23   CEC   20        TV->*ALL*, Report Physical Address (0x84)        5 |  0.59  |  1.80  | --- |  Y  |  1
24   CEC   20   PLAY1->*ALL*, Report Physical Address (0x84)          6 |  0.59  |  1.81  | --- |  Y  |  1
                                                                     7 |  0.59  |  1.80  | --- |  Y  |  1
                                                                     8 |  0.59  |  1.81  | --- |  Y  |  1
                                                                     9 |  1.49  |  0.90  | --- |  Y  |  0
                                                                    10 |  0.60  |  1.80  | --- |  Y  |  1
                                                                    11 |  0.59  |  1.80  | --- |  Y  |  1
                                                                    12 |  1.49  |  0.91  | --- |  Y  |  0
                                                                    13 |  1.49  |  0.90  | --- |  Y  |  0
                                                                    14 |  1.49  |  0.91  | --- |  Y  |  0
                                                                    15 |  1.49  |  0.90  | --- |  Y  |  0
                                                                    16 |  0.59  |  1.80  | --- |  Y  |  1
                                                                    17 |  1.49  |  0.90  | --- |  Y  |  0
                                                                    18 |  1.49  |  0.90  | --- |  Y  |  0    🗑 Clear
                                                                    19 |  1.49  |  0.91  | --- |  Y  |  0
                                                                    20 |  1.50  |  9.16  | --- |  Y  |  0
                                                                -------+--------+--------+-----+-----+-----   📂 Open

                                                                ◄                                    ►
                                                                                                          💾 Save
                                                                ◄    ►      20:      TV->*ALL*, Report Physic
```

6. 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.

6.1 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.
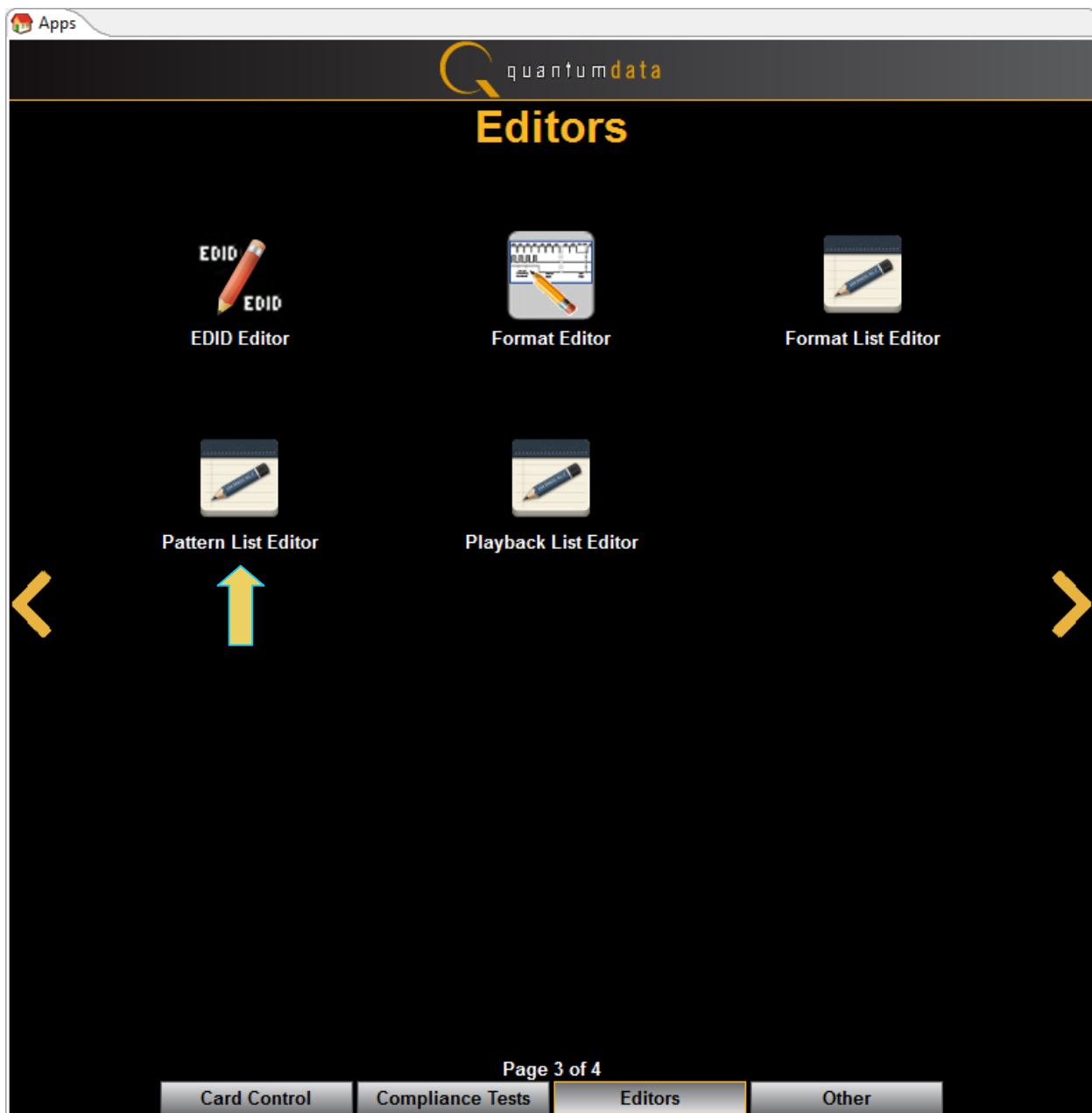
Alternatively, if you are using the embedded 980 GUI Manager you can access the **Pattern List Editor** from the **Generator Tools tab** as shown below. Be sure to select the correct Transmitter on the right side:
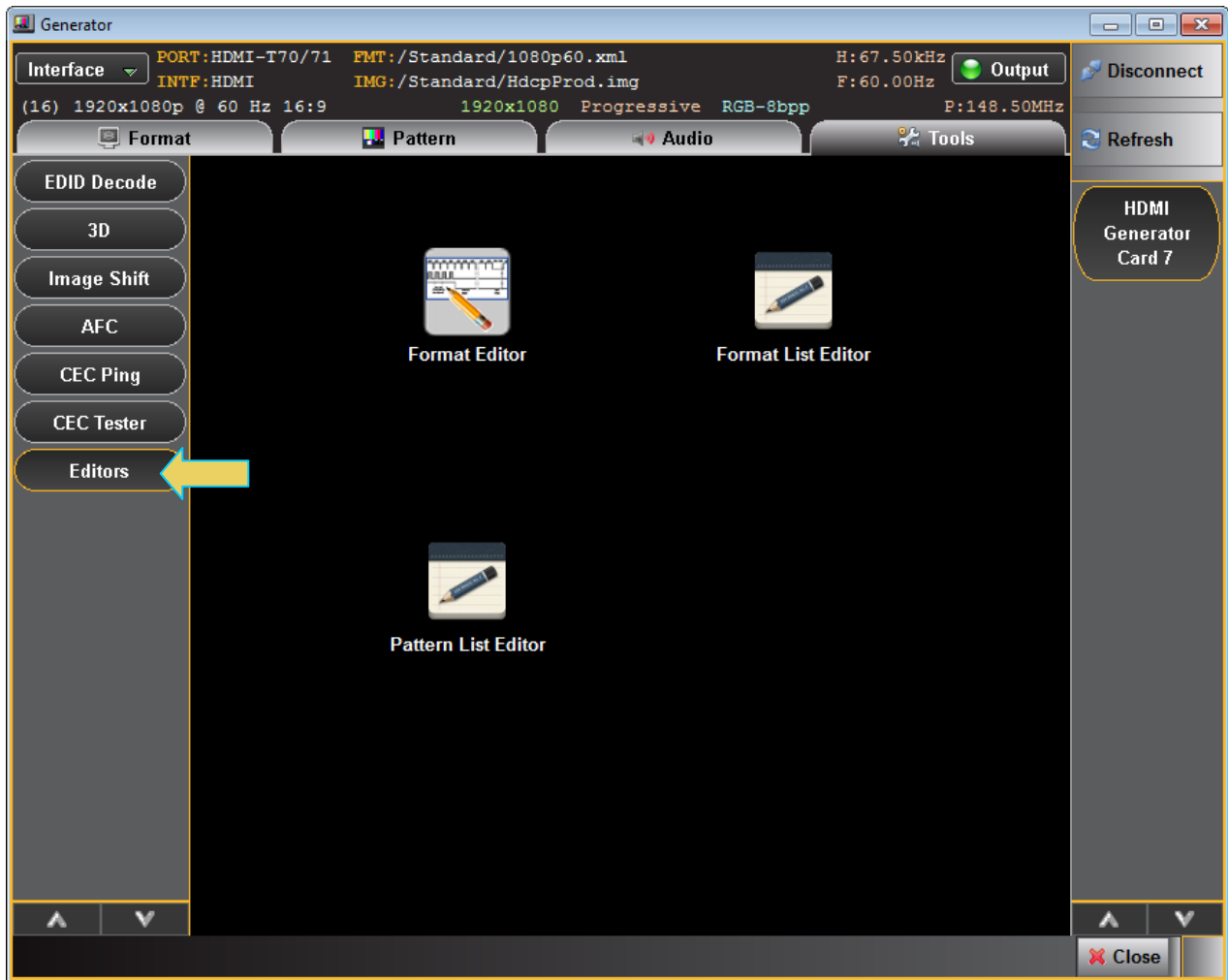
The list of editors appears as shown in the screen below.
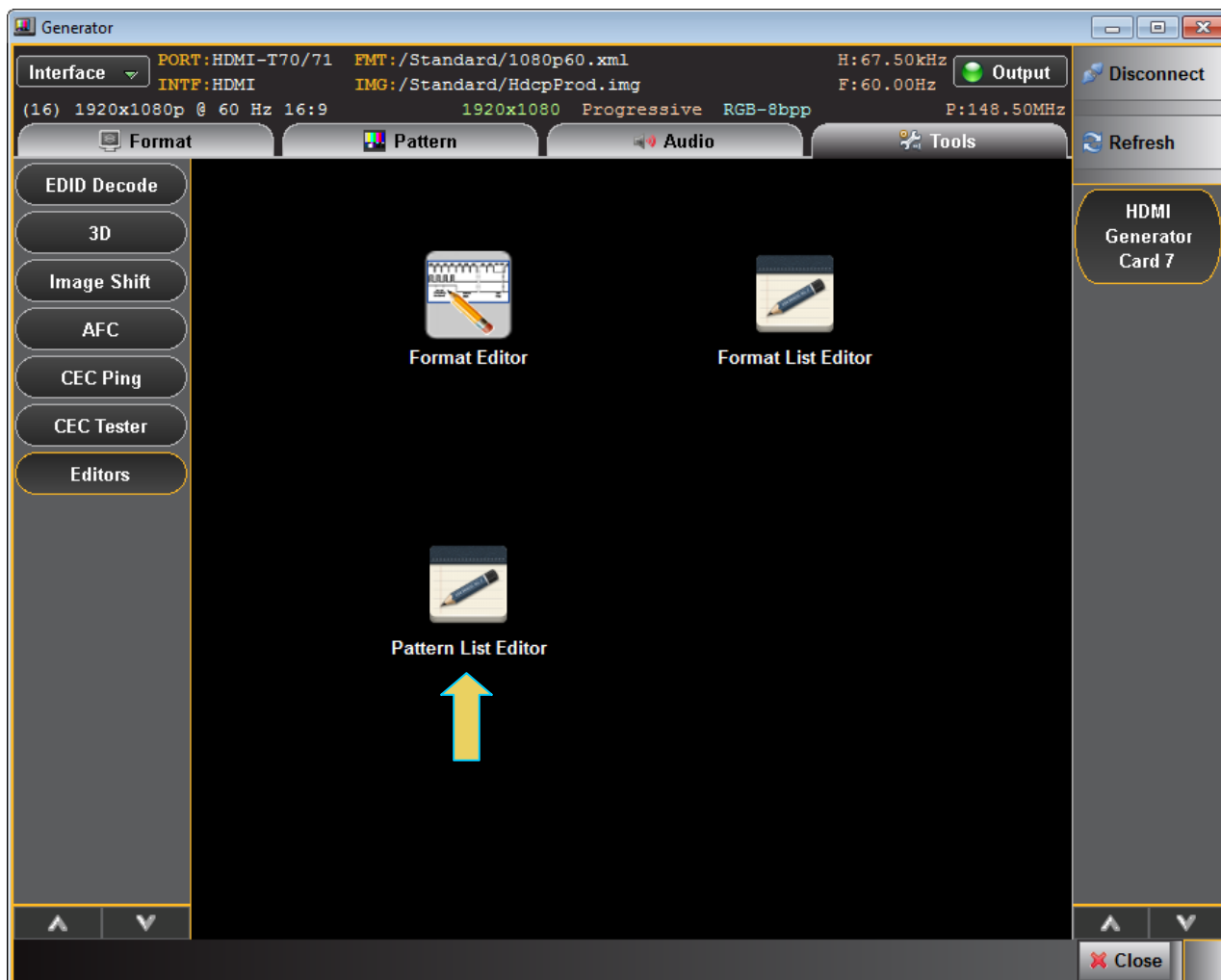
1. Select the Pattern List Editor icon.

    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 HDMI Video Generator module to create your custom list. This dialog box also enables you to select the particular 980 (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 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.
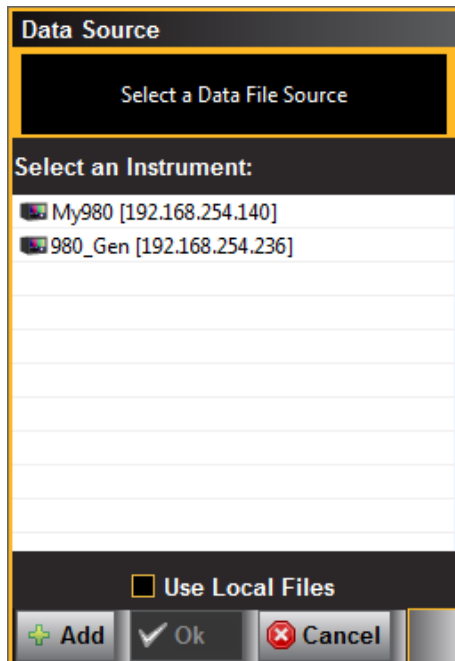
4. Click **OK** to continue.

   The left side window of the **Pattern List Editor** will display the files on the 980 HDMI 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*

Append ✚

Insert ◀

📄 Source

Data List

Name	Data Path	

➕ Add   **✏ Edit**   **✖ Delete**   **▲ Up**   **▼ Down**

💾 Save   **📂 Open**   **🖼 New**

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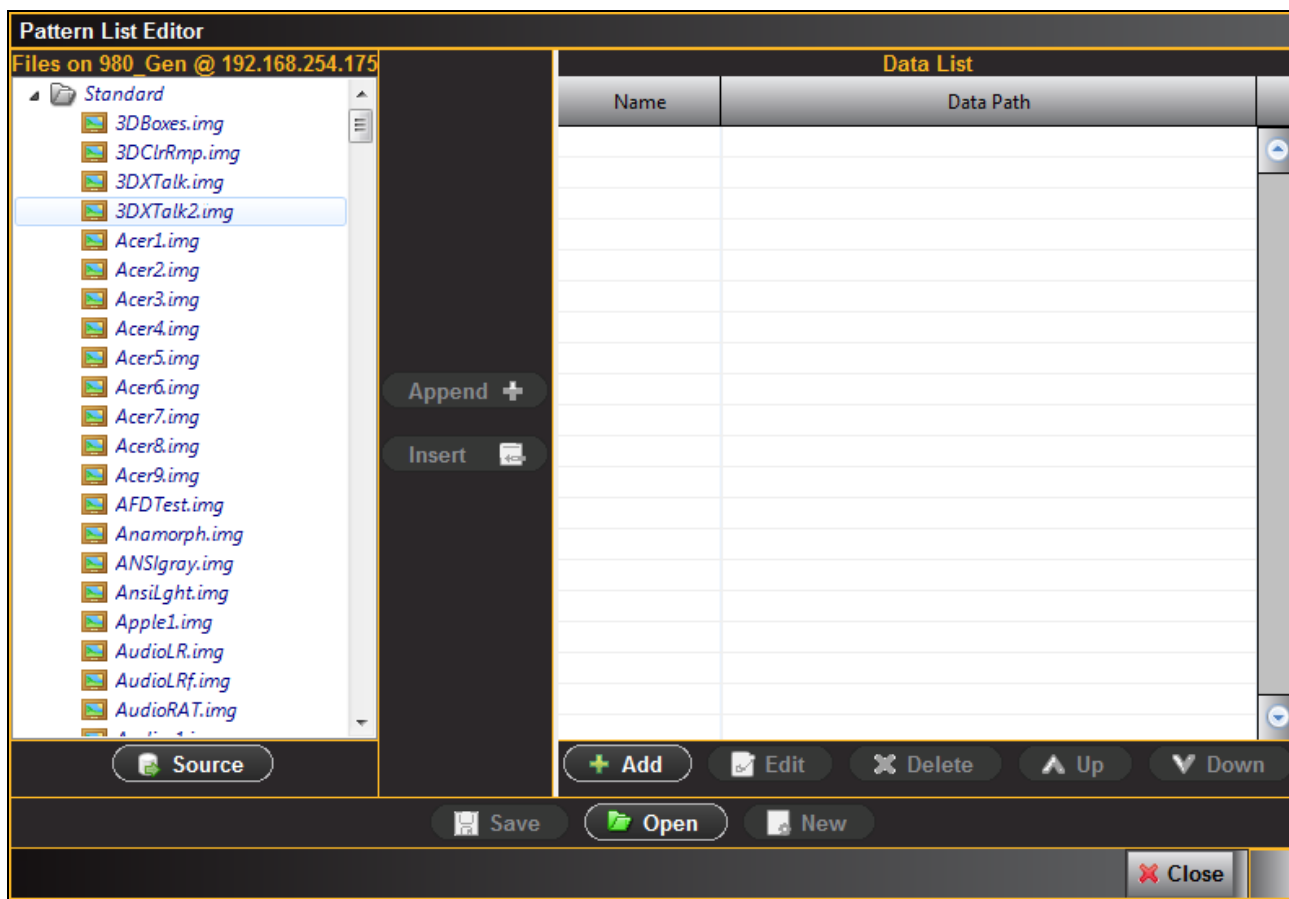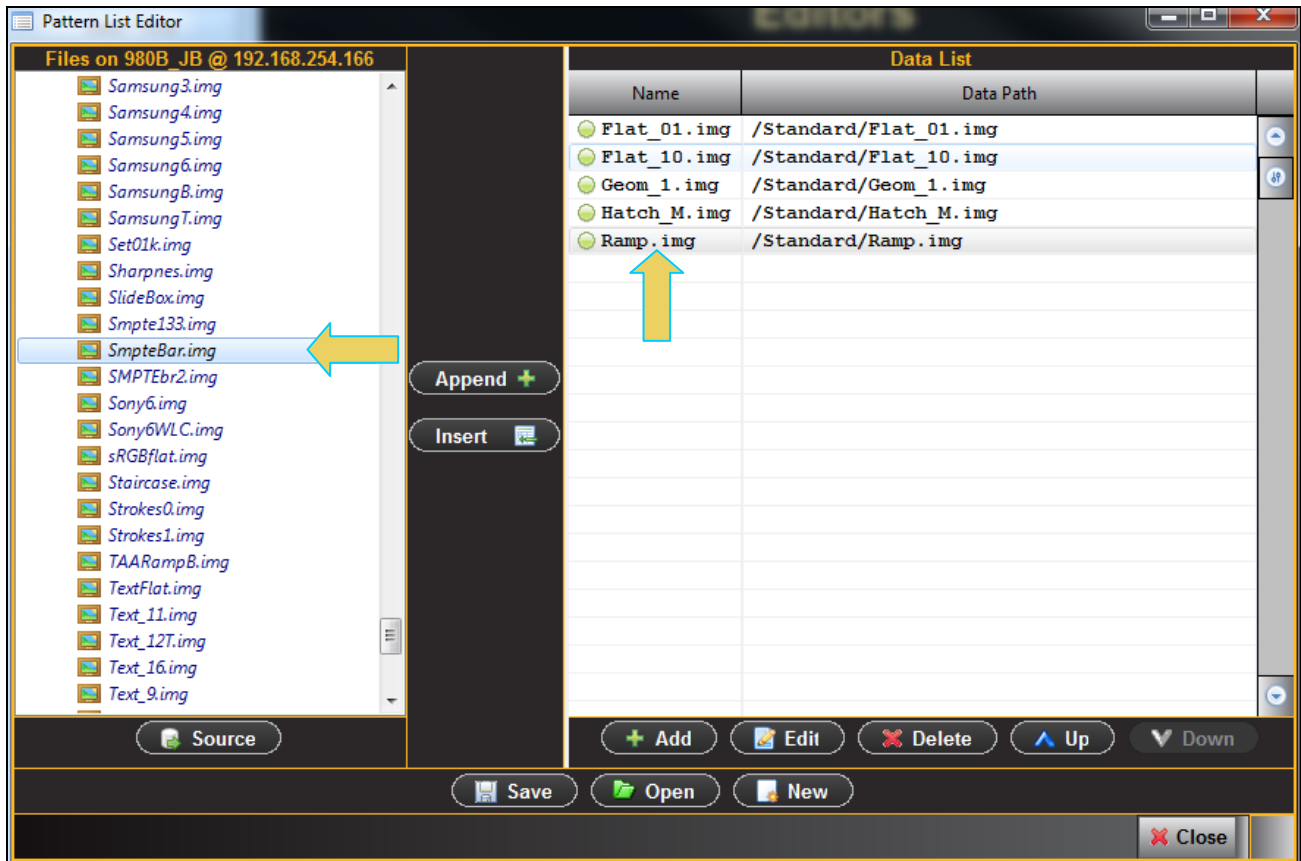
There are three buttons in the middle between the two windows that enable you to configure the test patterns in your Pattern List. These are defined as follows:

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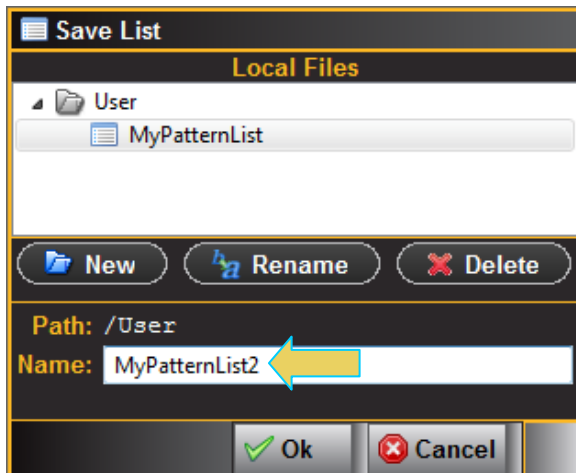
6. Click on the pattern name if you wish to rename it.

Edit Entry

Name:	Ramp_256.img
Path:	/Standard/Ramp.img
	✓ Ok ⊗ Cancel
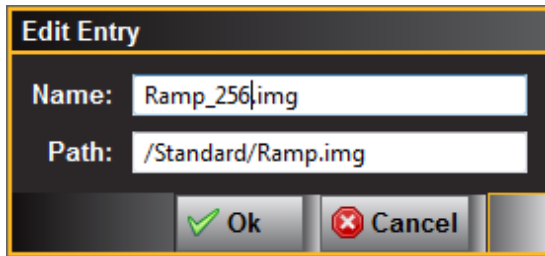
6.2   Applying a custom Pattern List

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.
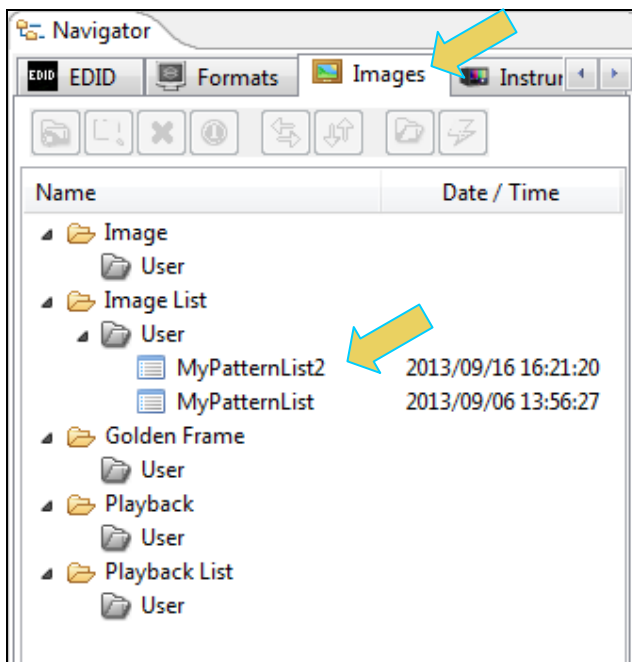
2. Transfer the Pattern List from your Host PC to the 980/980B by invoking the transfer icon indicated below.
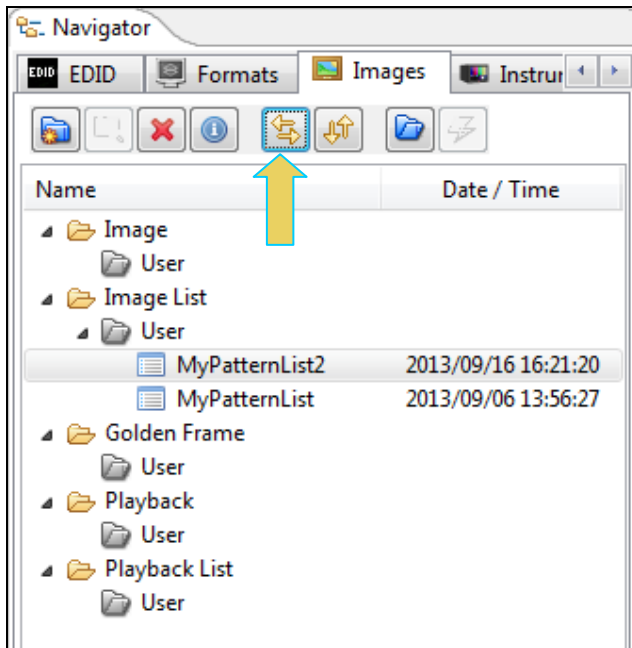
The File Transfer panel appears as shown below:
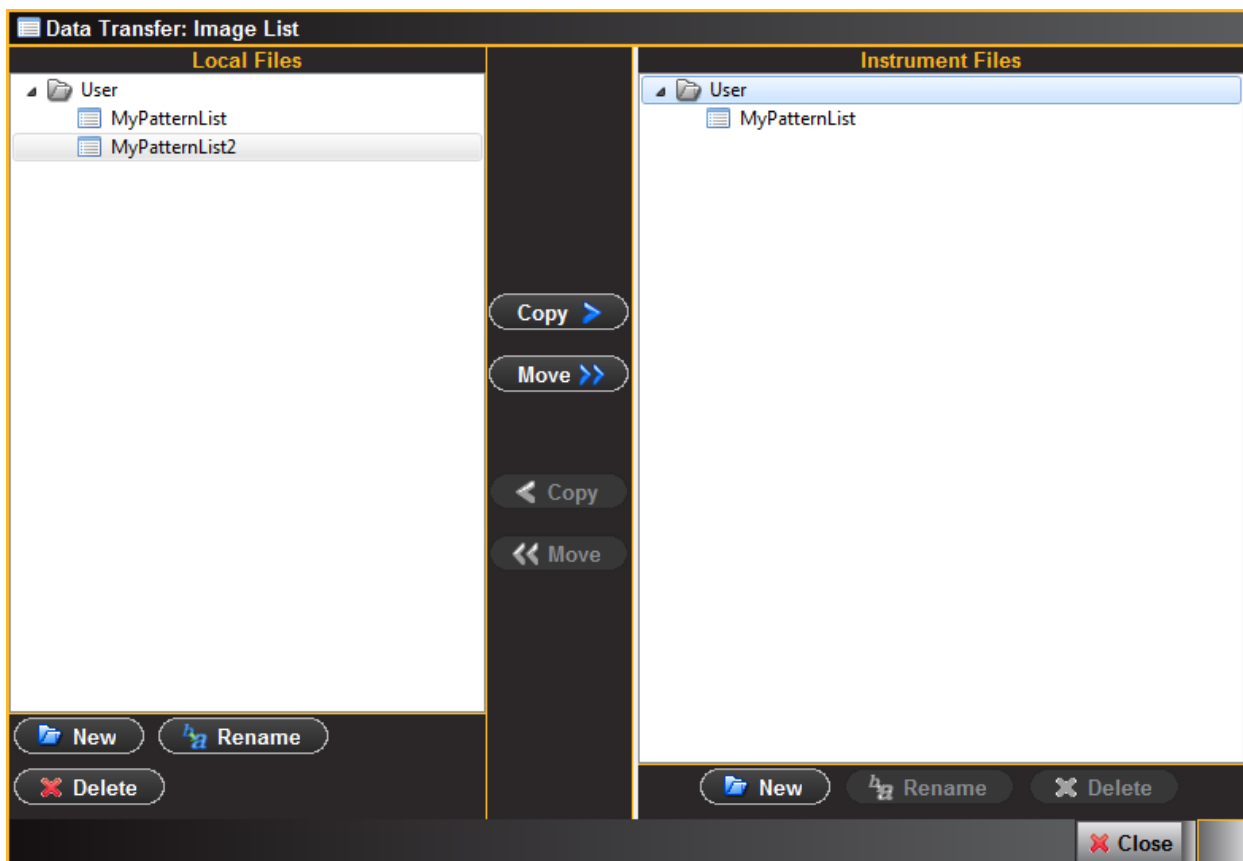
3. Transfer the Pattern list from the Local Files on the left side to the Instrument files using the Copy or Move button. Note that you will have to highlight a directory on the Instrument Files panel in order to enable the Copy

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:
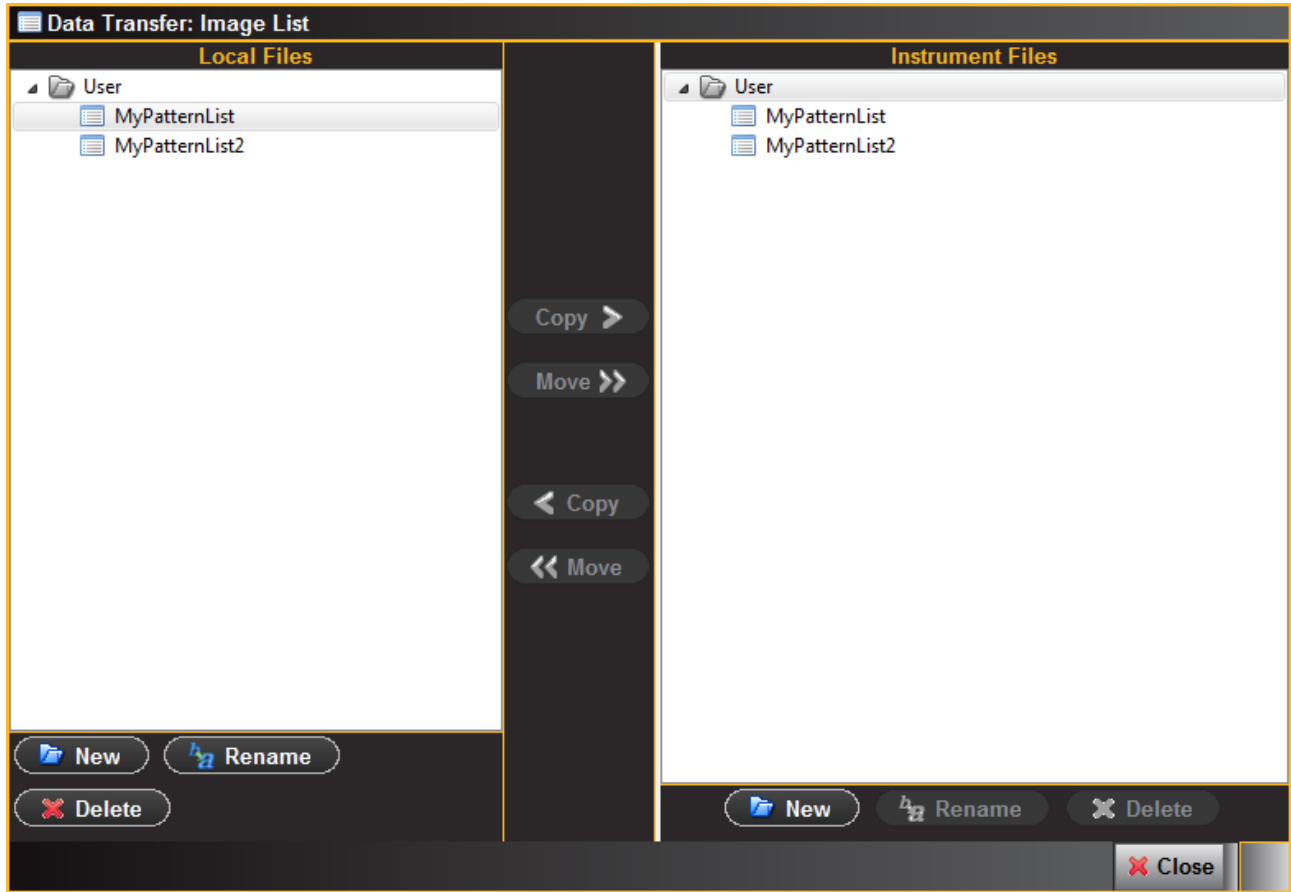
4. Navigate to the **Pattern** Tab on the Generator panel and click on the **Select** activation on the bottom status panel as shown below.
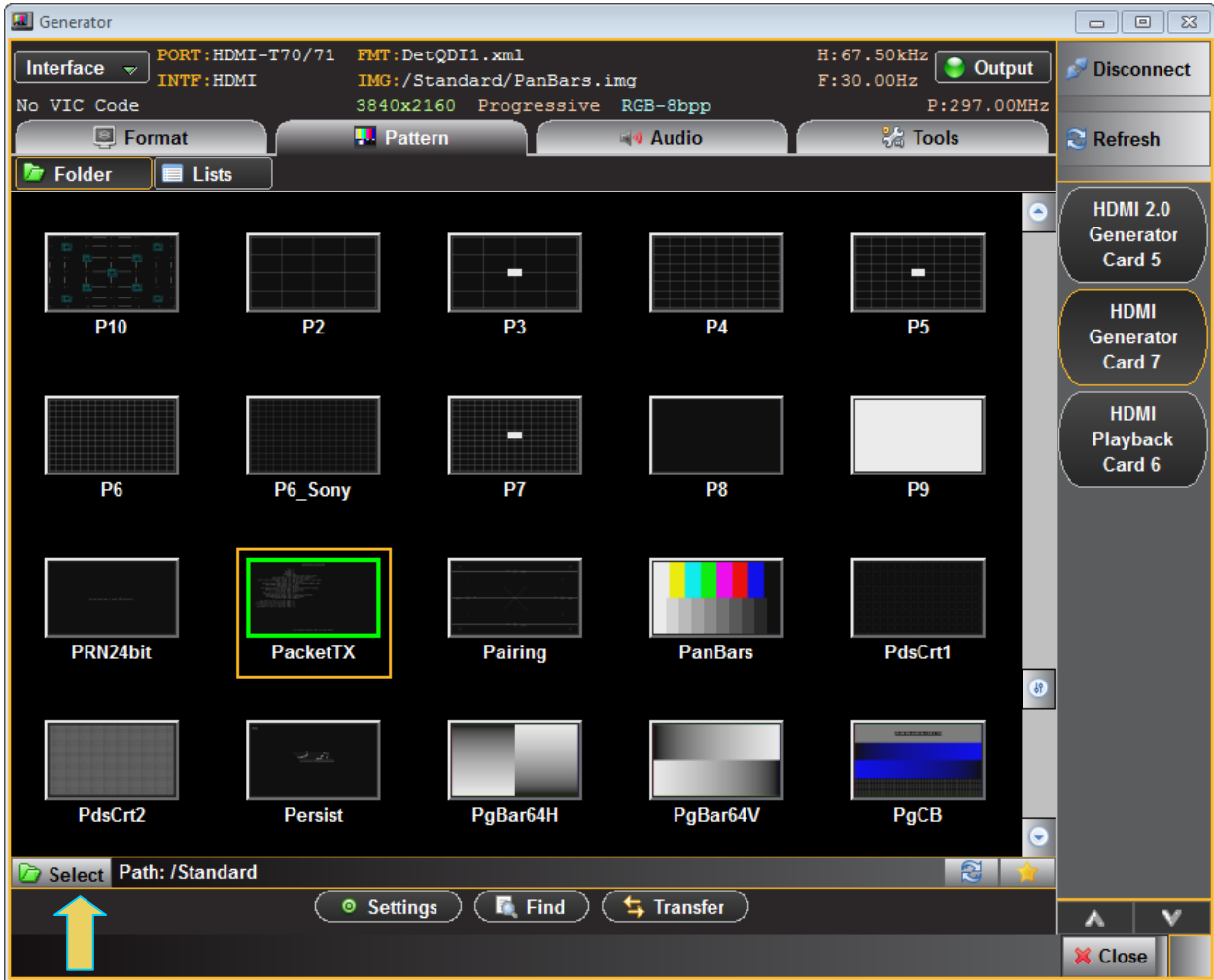
The Image Path dialog box will appear as shown below.
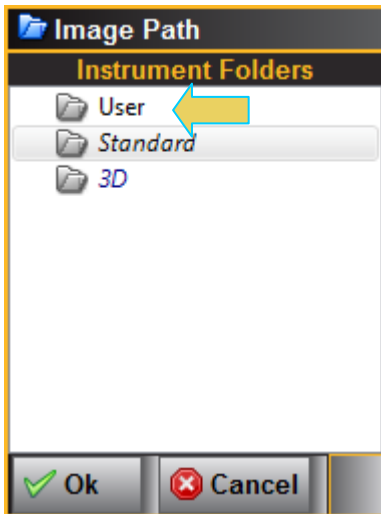
5. Select the User directory and click OK.

6. Click on the **Lists** button on top of the panel. Refer to the screen example below.
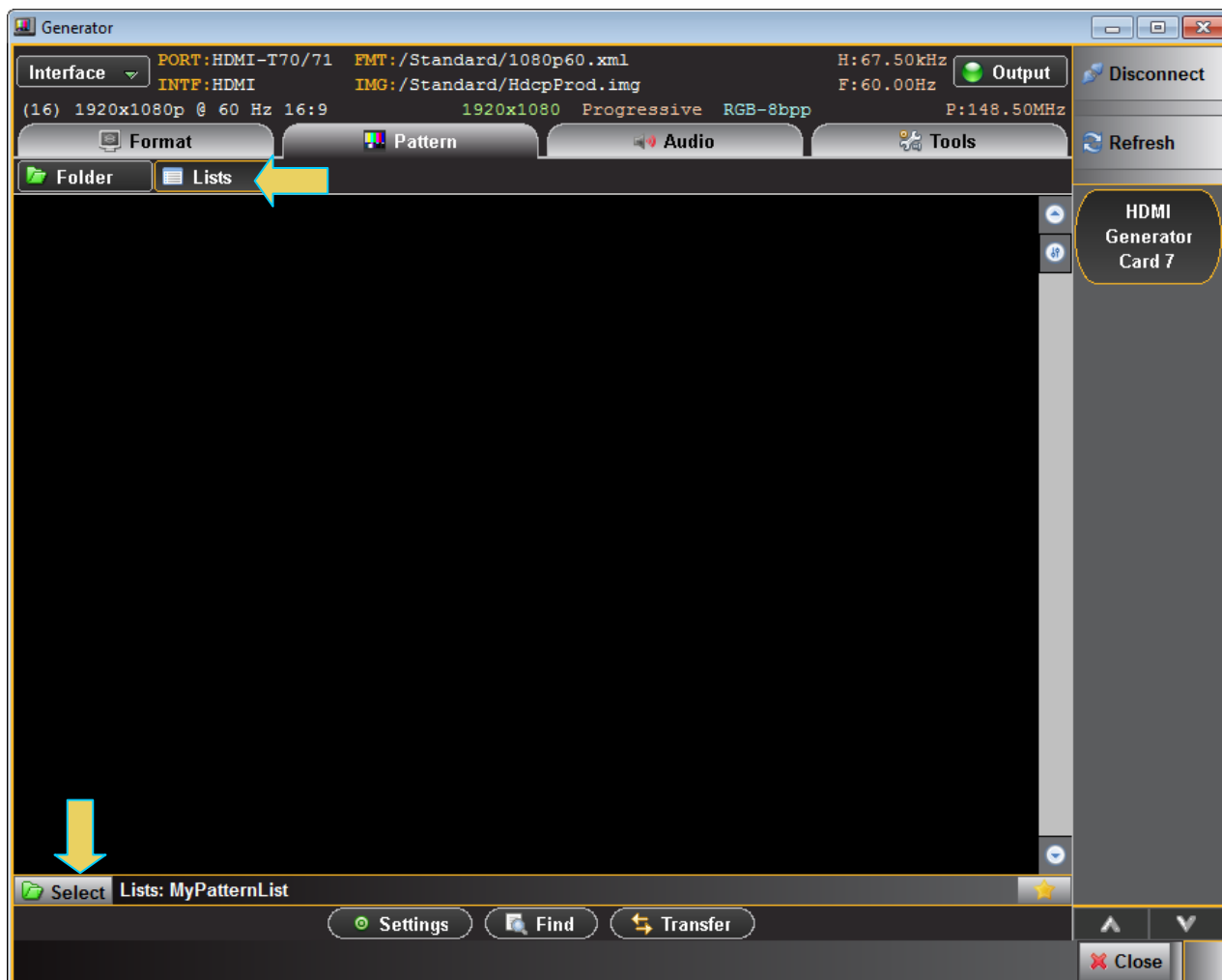
7. Click on the **Select** activation button (reference screen example above).
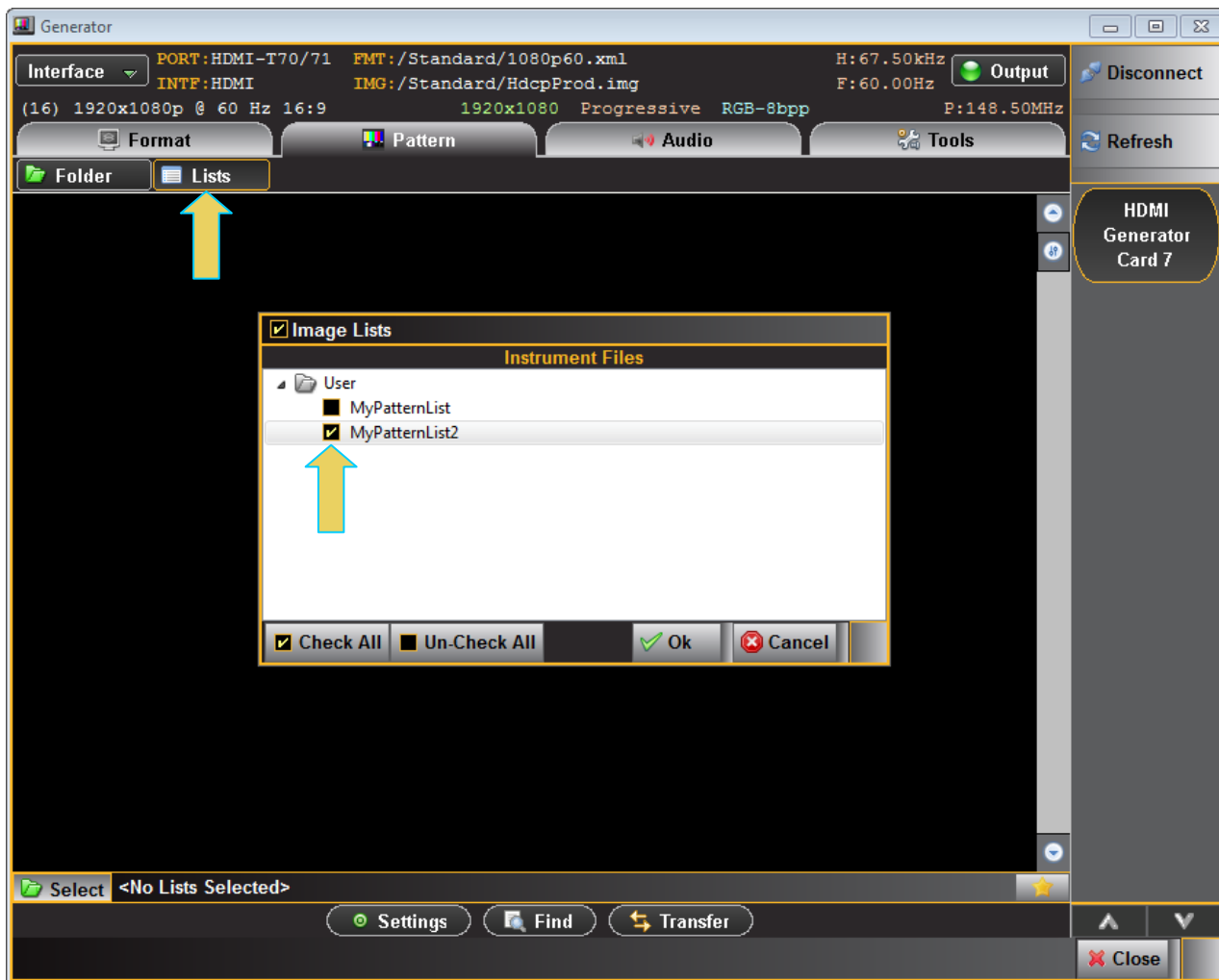
The result is that there will be a restricted list of test patterns available and display in the **Pattern** tab window (below). The Path icon on the bottom status panel will display that new list.
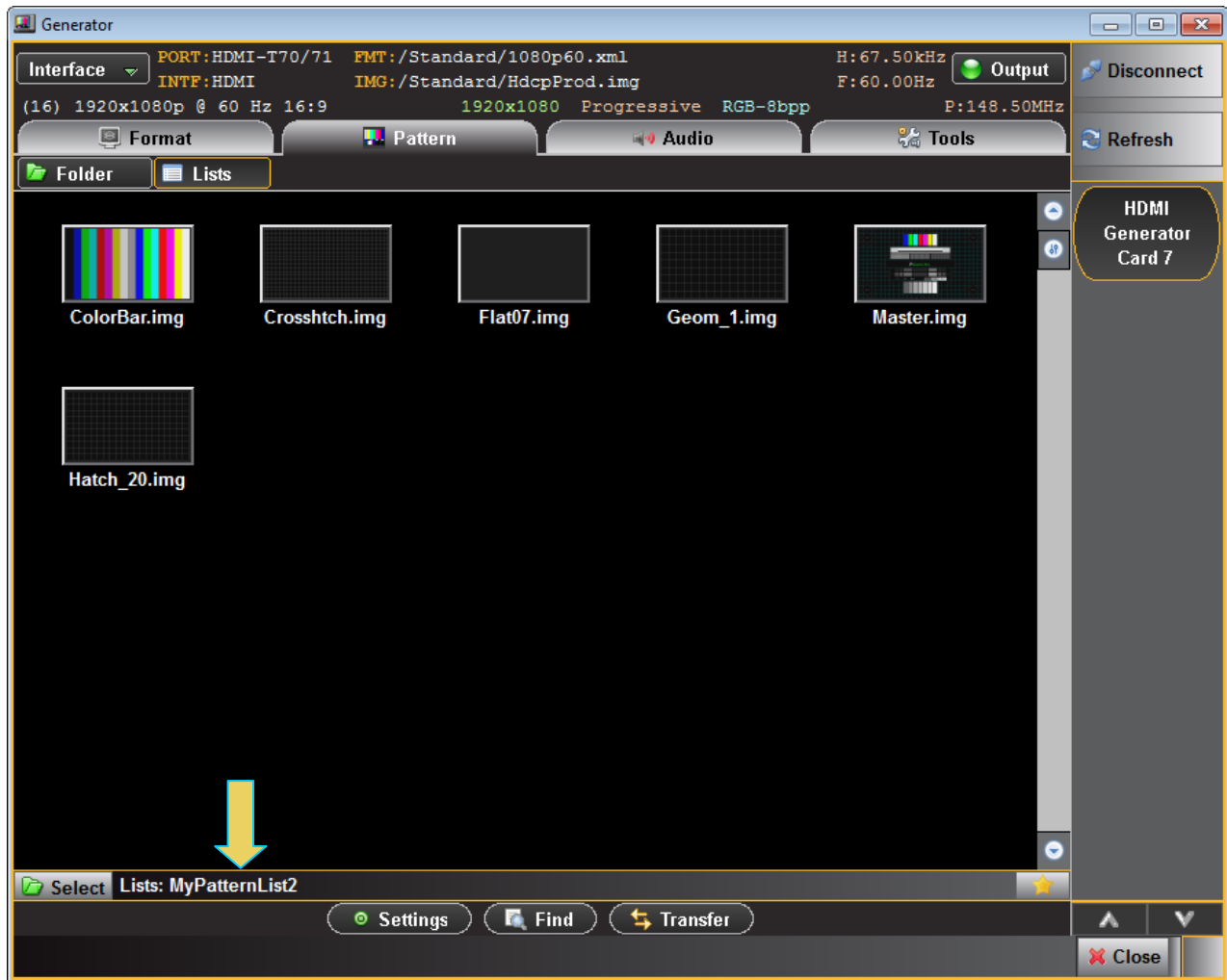
6.3   Viewing a custom Pattern List

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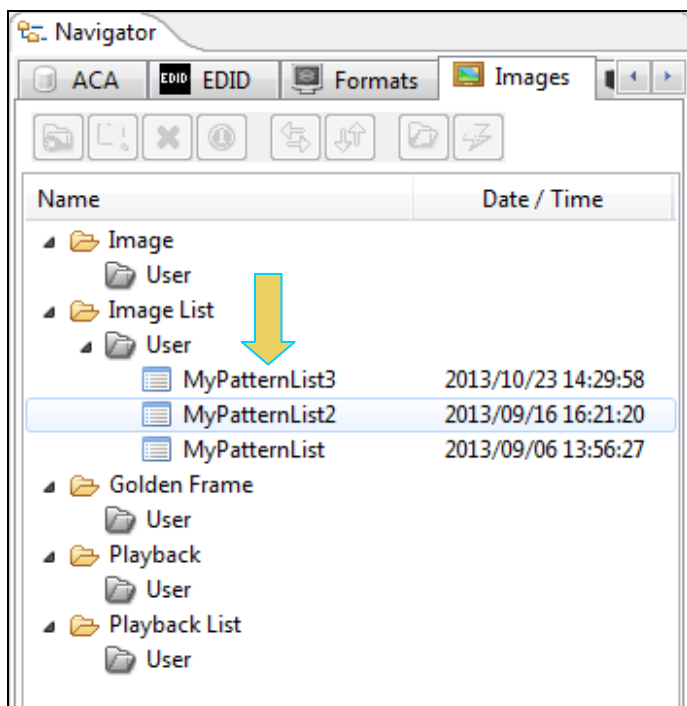
2. The new Pattern List will appear under User in the Local Files panel as shown above.

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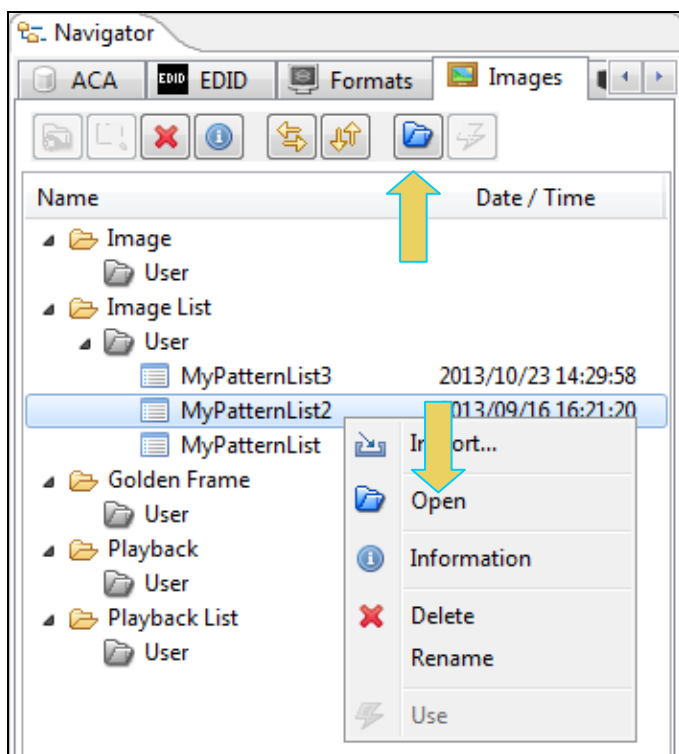
The Pattern List will appear in the panel as shown below:

Pattern List Editor: /User/MyPatternList2

Local Files

📁 User

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

Append ✚

Insert 📥

📄 Source

➕ Add   ✏ Edit   ✖ Delete   ⋀ Up   ⋁ Down

💾 Save   📂 Open   🗋 New

❌ Close
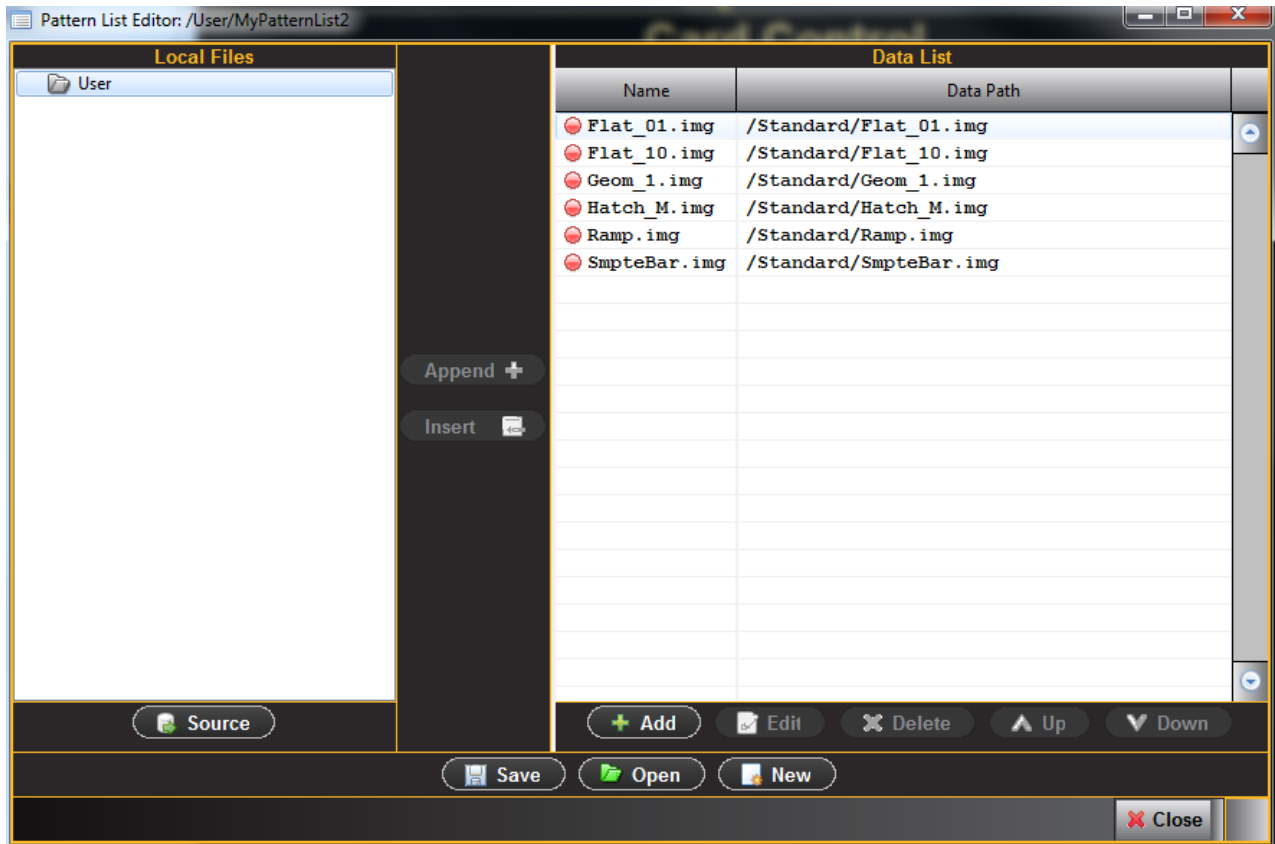
6.4   Opening a custom Patten List from the Pattern List Editor

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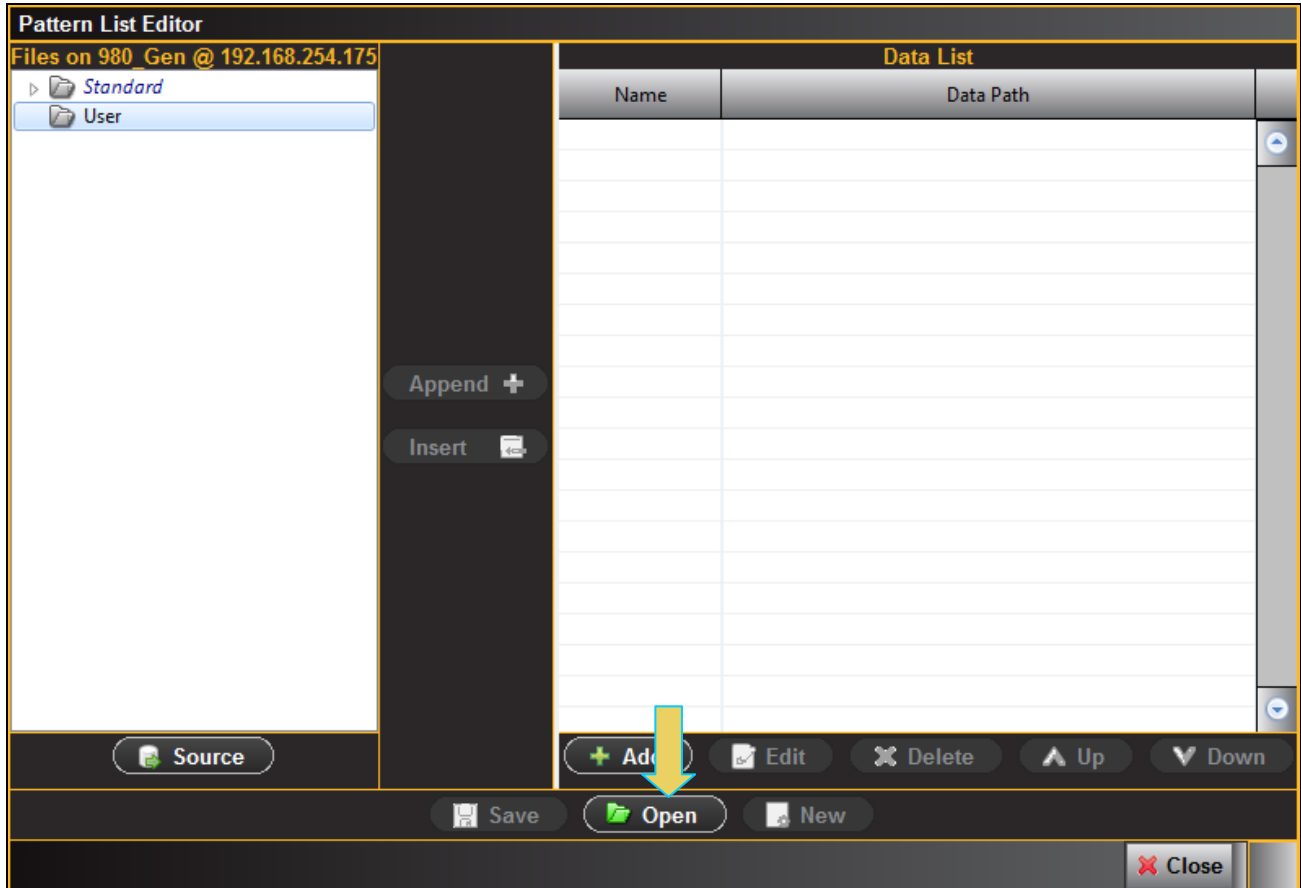
The **Open List** dialog box appears enabling you to select a Pattern List (below).
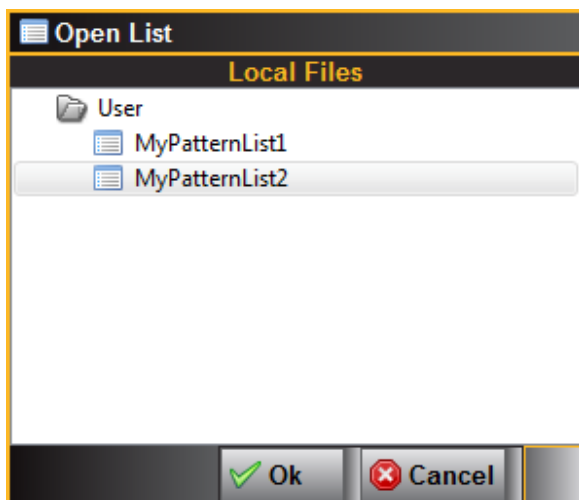
2. Select the list you wish to open (only one list is shown in the **Open List** dialog box example above). The Pattern List will appear in the Pattern List Editor window as shown below.

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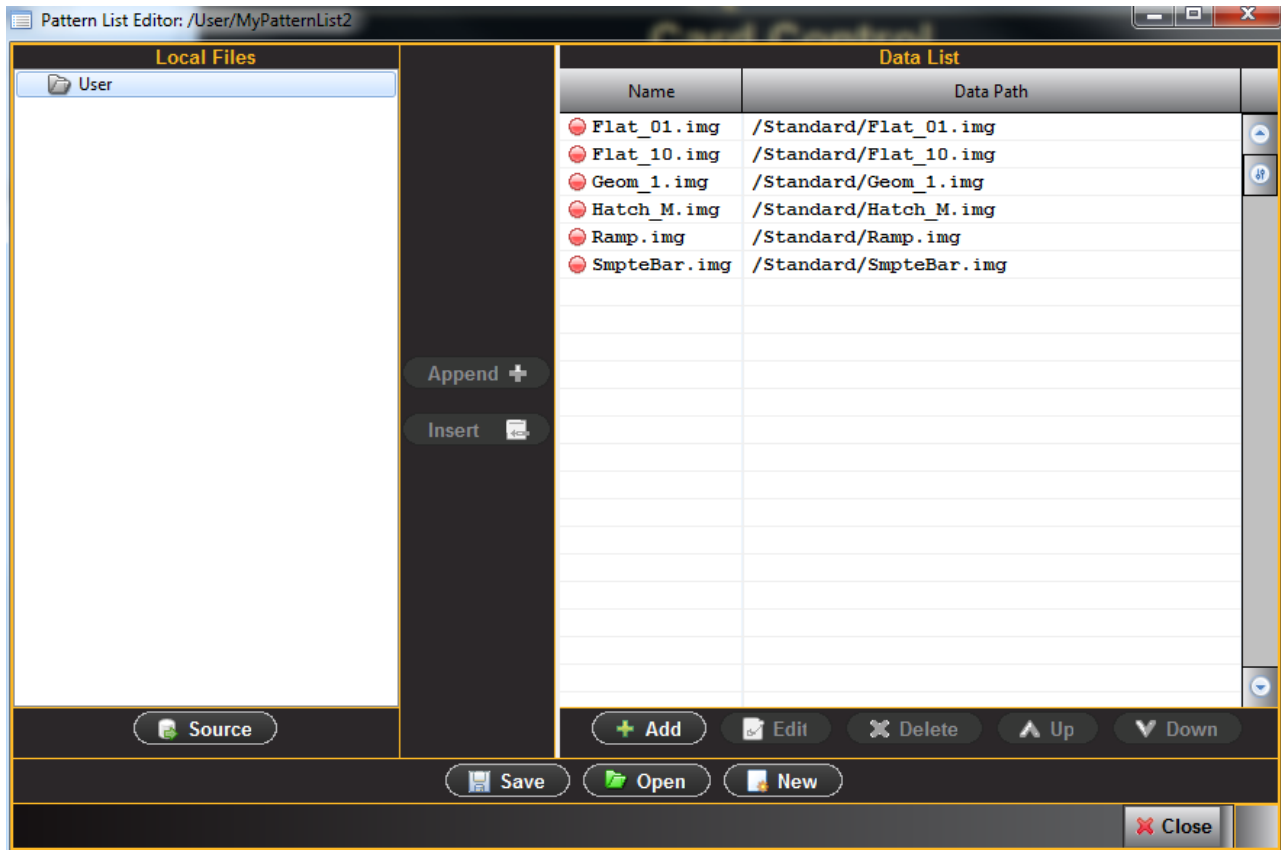
7. Format List Editor

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

7.1   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.
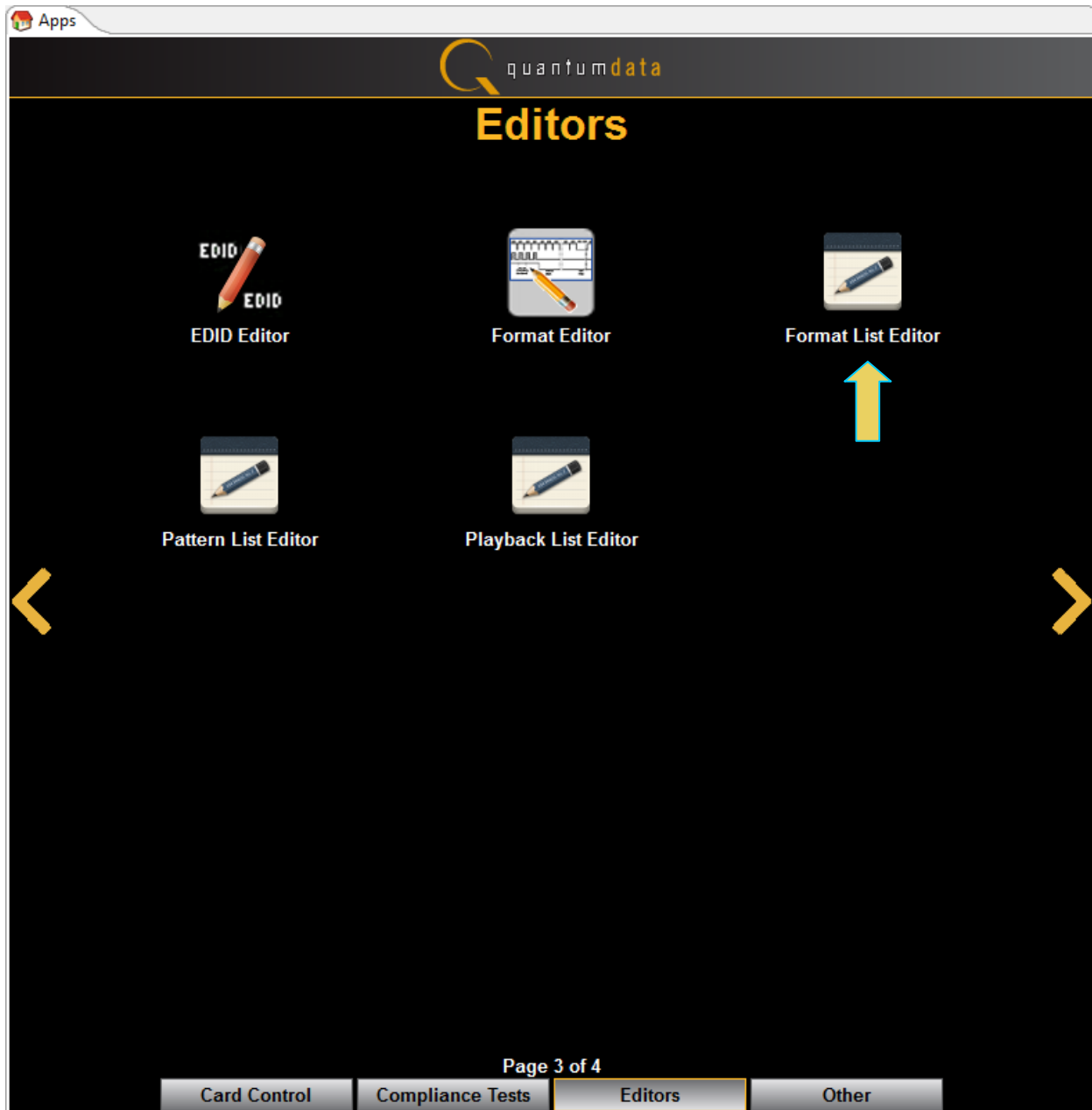
Alternatively, if you are using the embedded 980 GUI Manager you can access the **Format List Editor** from the **Generator Tools tab** as shown below. Be sure to select the correct Transmitter on the right side:
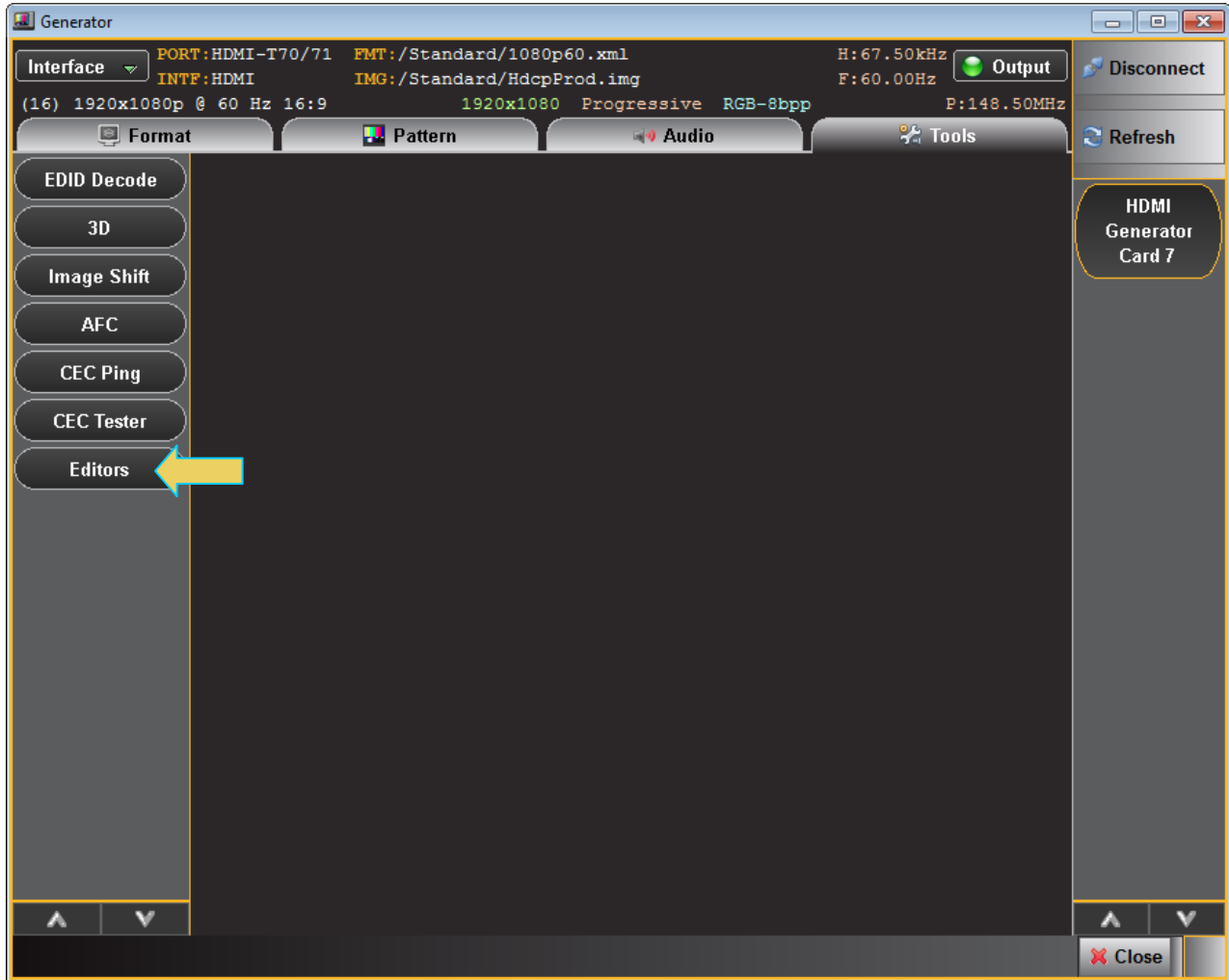
The list of editors appears as shown in the screen below.
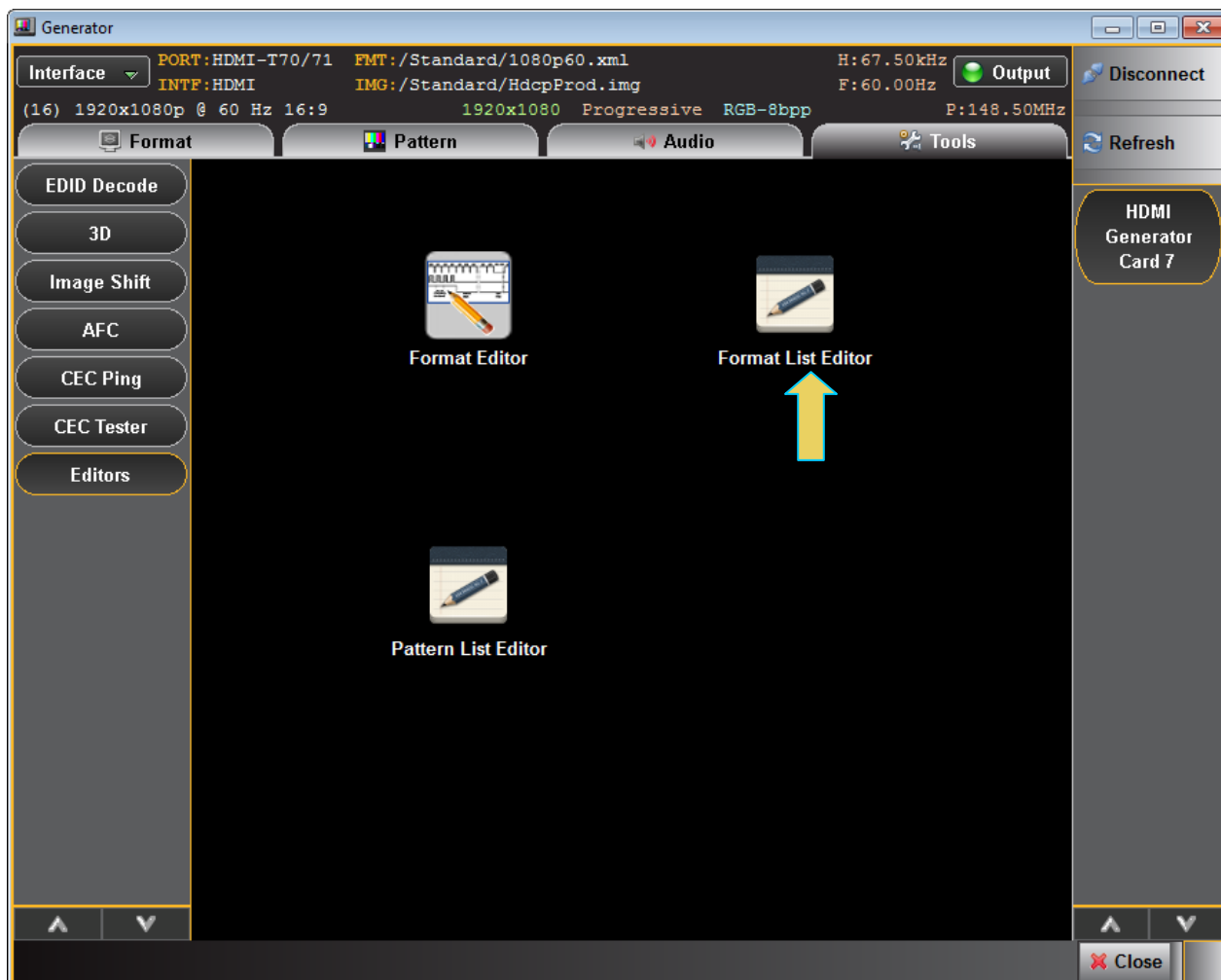
1. Select the Format Editor icon.

   The **Format List Editor** appears as shown below:
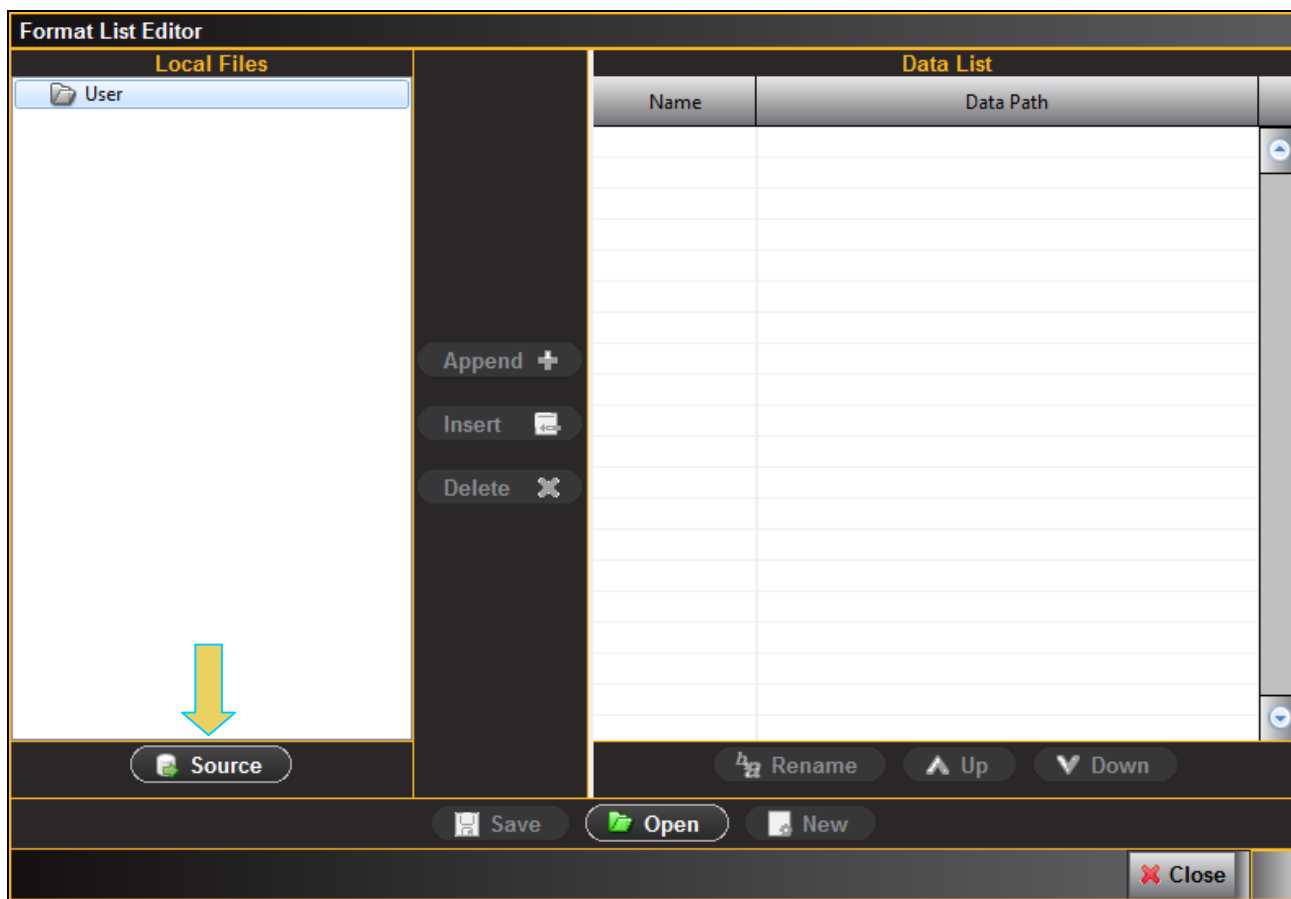
2. Click on the **Source** button on the lower left under Local Files (indicated in the diagram above). The Data **Source** dialog box will appear enabling you to select between using files on your PC or using files on the 980 HDMI Video Generator module to create your custom list. This dialog box also enables you to select the particular 980/980B (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 980/980B file system.

Data Source

Select a Data File Source

Select an Instrument:

My980 [192.168.254.140]
980_Gen [192.168.254.236]

☑ Use Local Files

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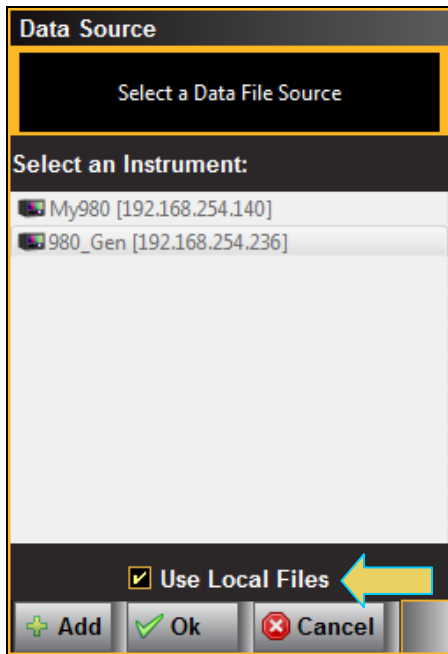
3. Select the instrument that you want to use as the source of your formats. (If there are multiple 980s on the network you will have to choose which one.) Note that if you are using the **Format List Editor** on the external 980 GUI Manager, the custom Format List is stored on the host PC not the 980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

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

Data Source

Select a Data File Source

Select an Instrument:

My980 [192.168.254.140]
980_Gen [192.168.254.236]

☐ Use Local Files

➕ Add   ✓ Ok   ❌ Cancel
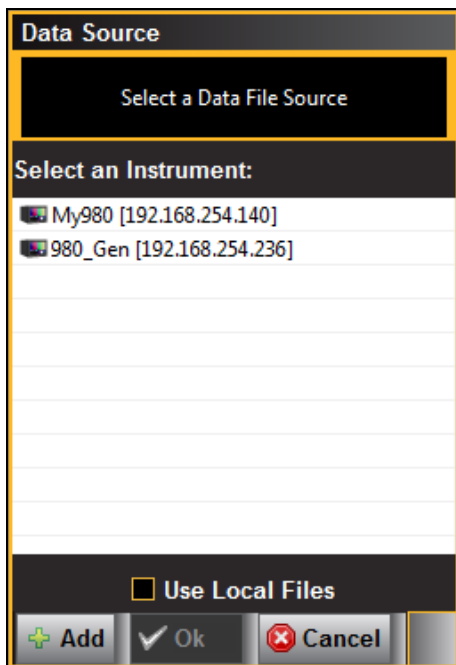
4. Click **OK** to continue.

   The left side window of the **Format List Editor** will display the files on the 980 HDMI Video Generator module in the Standard directory. The panel on the right (**Data List**) is a list of formats in your custom list.
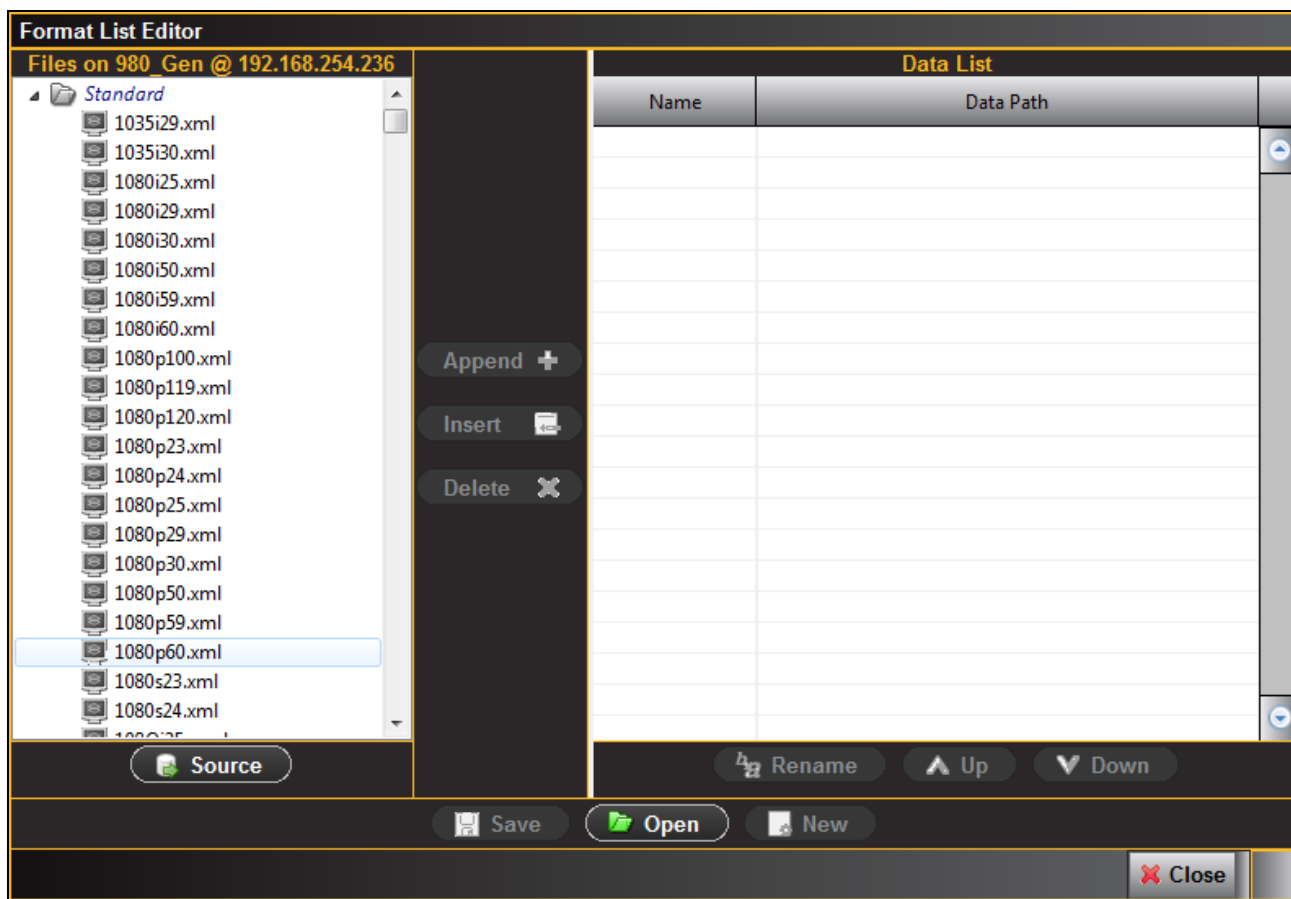
5. Select formats from the left side panel (Files on 980) and Append or Insert them to your Format List. They will accumulate on the Data List panel on the right side of the Format List Editor window.

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.
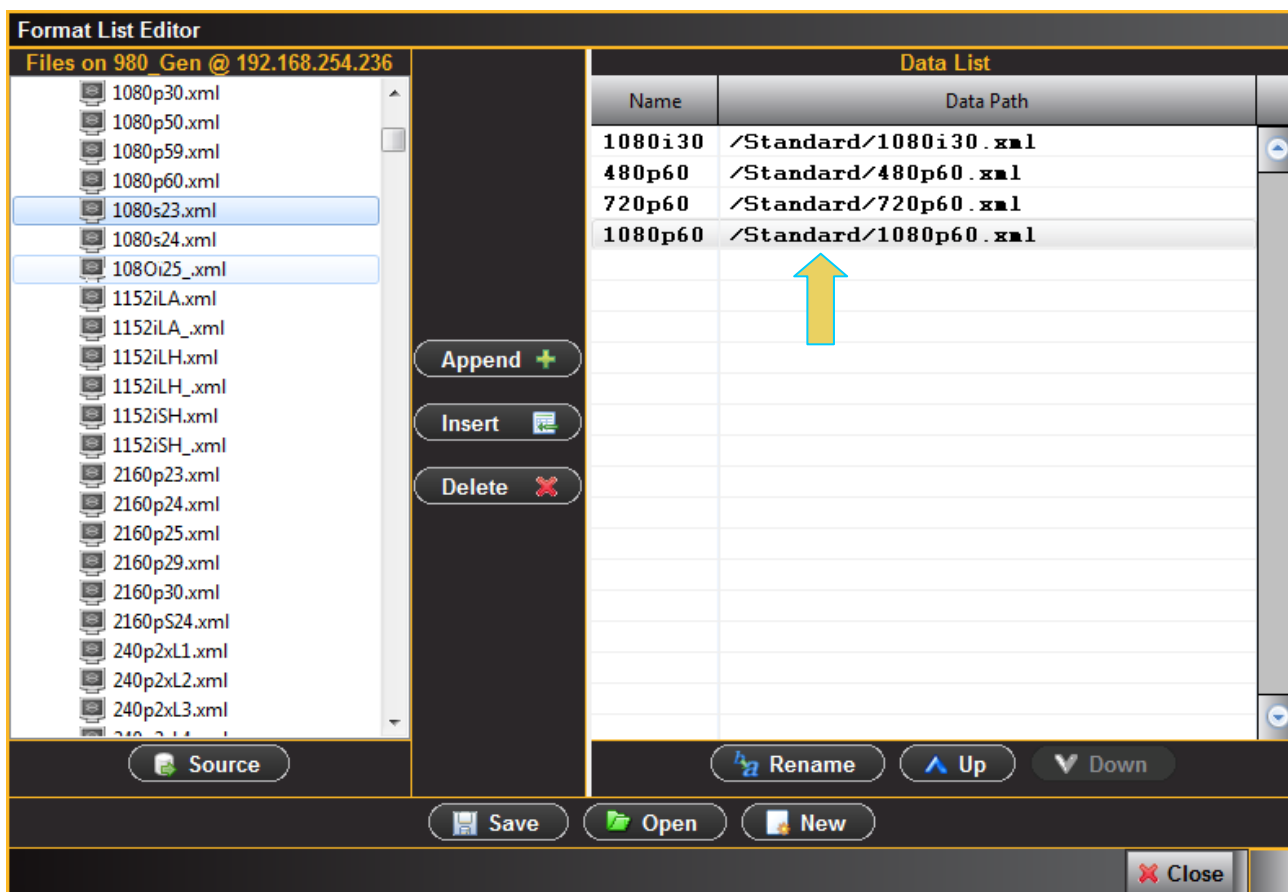
6. Click on the **Save** activation button when you are done configuring your custom list. You will be asked to enter a name for your new Format List. Use the **Name** field provided (below).
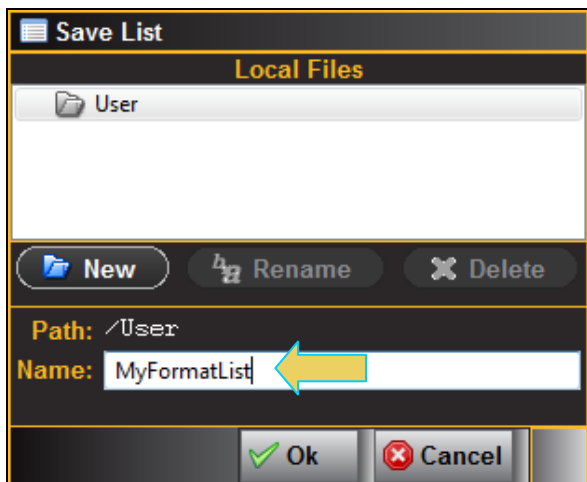
7. Click on any format if you wish to rename it for convenience.
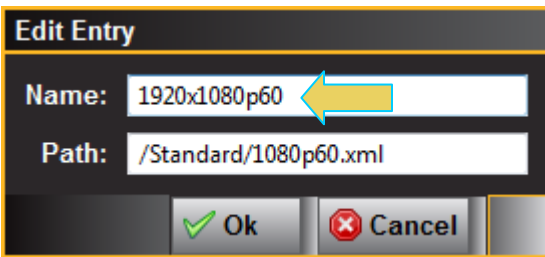
7.2   Applying a custom Format List

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.

2. Select User as the path. User directory is typically where you save custom format lists.
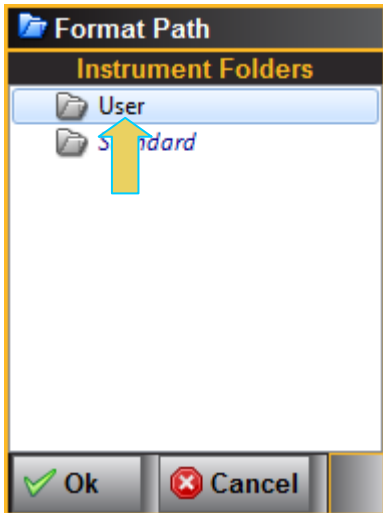
The User directory will be indicated on the bottom status panel.
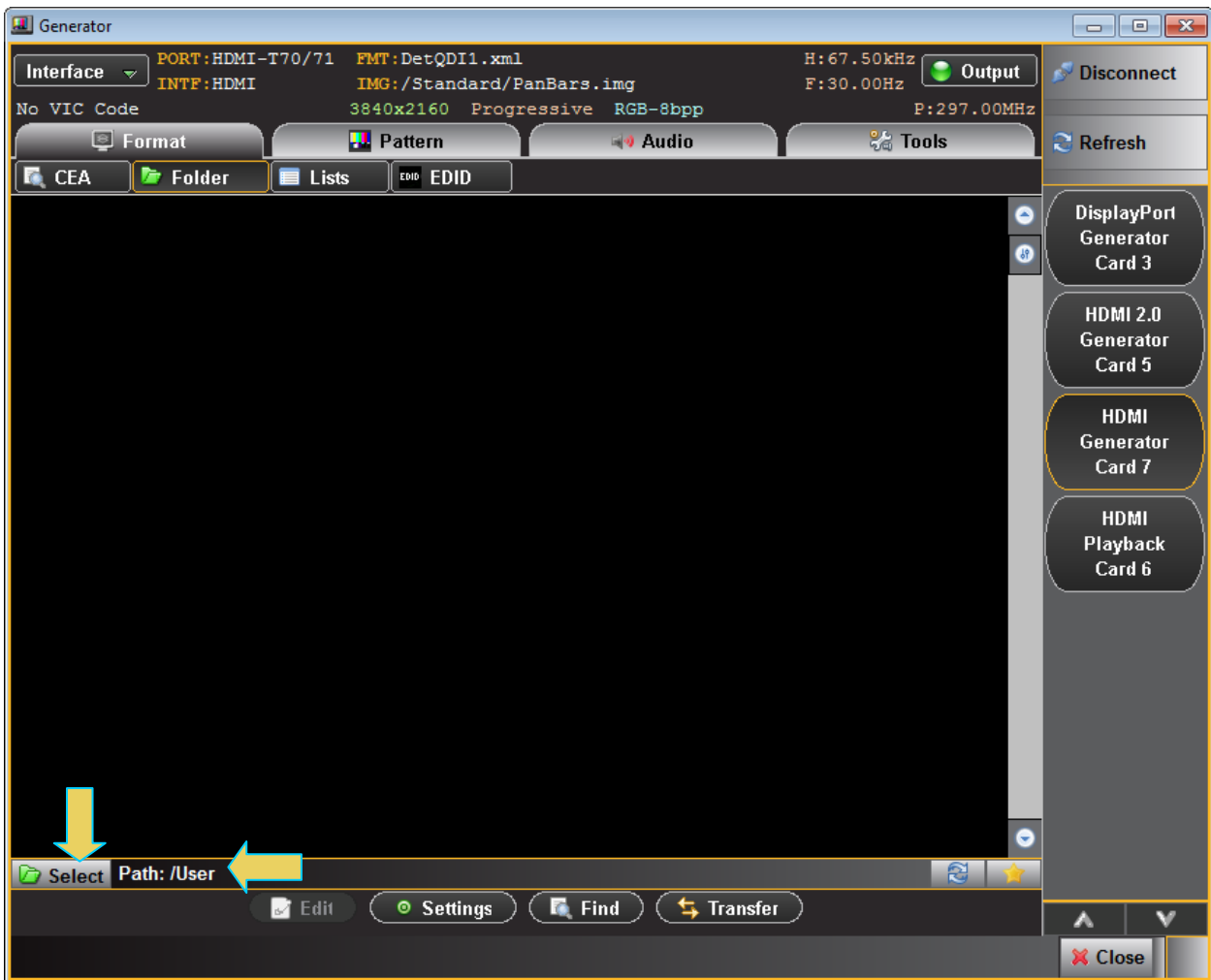
3. Click on Select to access the custom format lists.

    The Format Lists dialog box will appear as shown below.
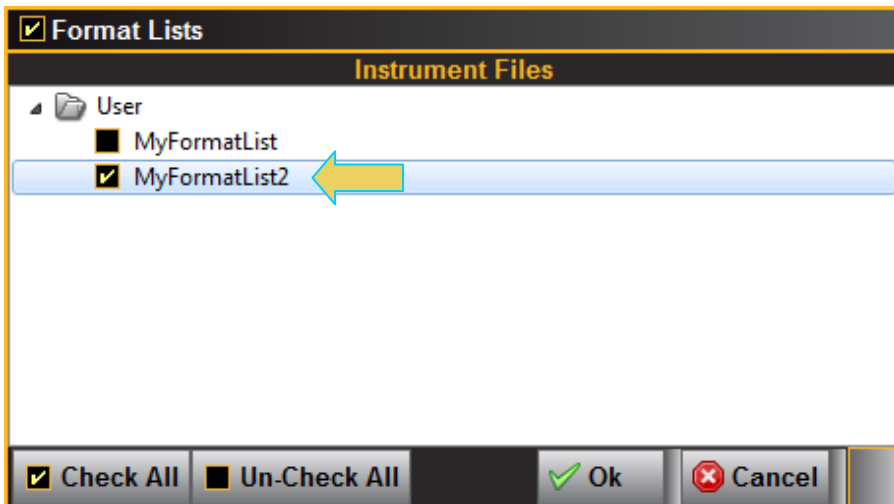
4. Select the desired format list.

    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.
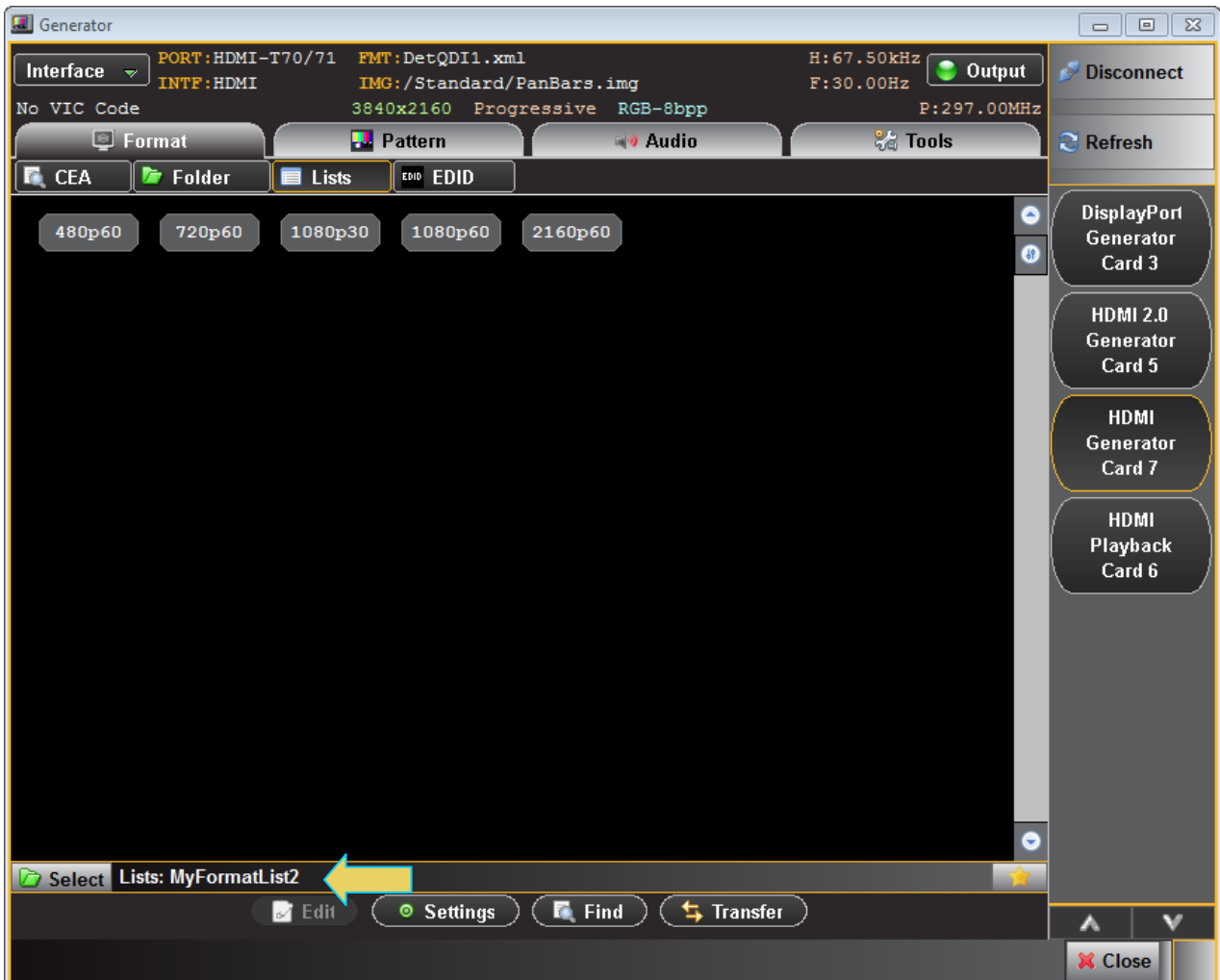
7.3   Viewing a custom Format List

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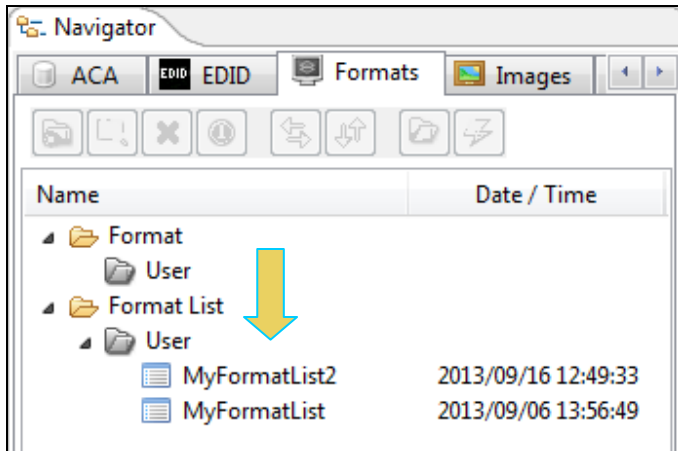
2.   The new Format List will appear under User in the Local Files panel as indicated above.

7.4 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.
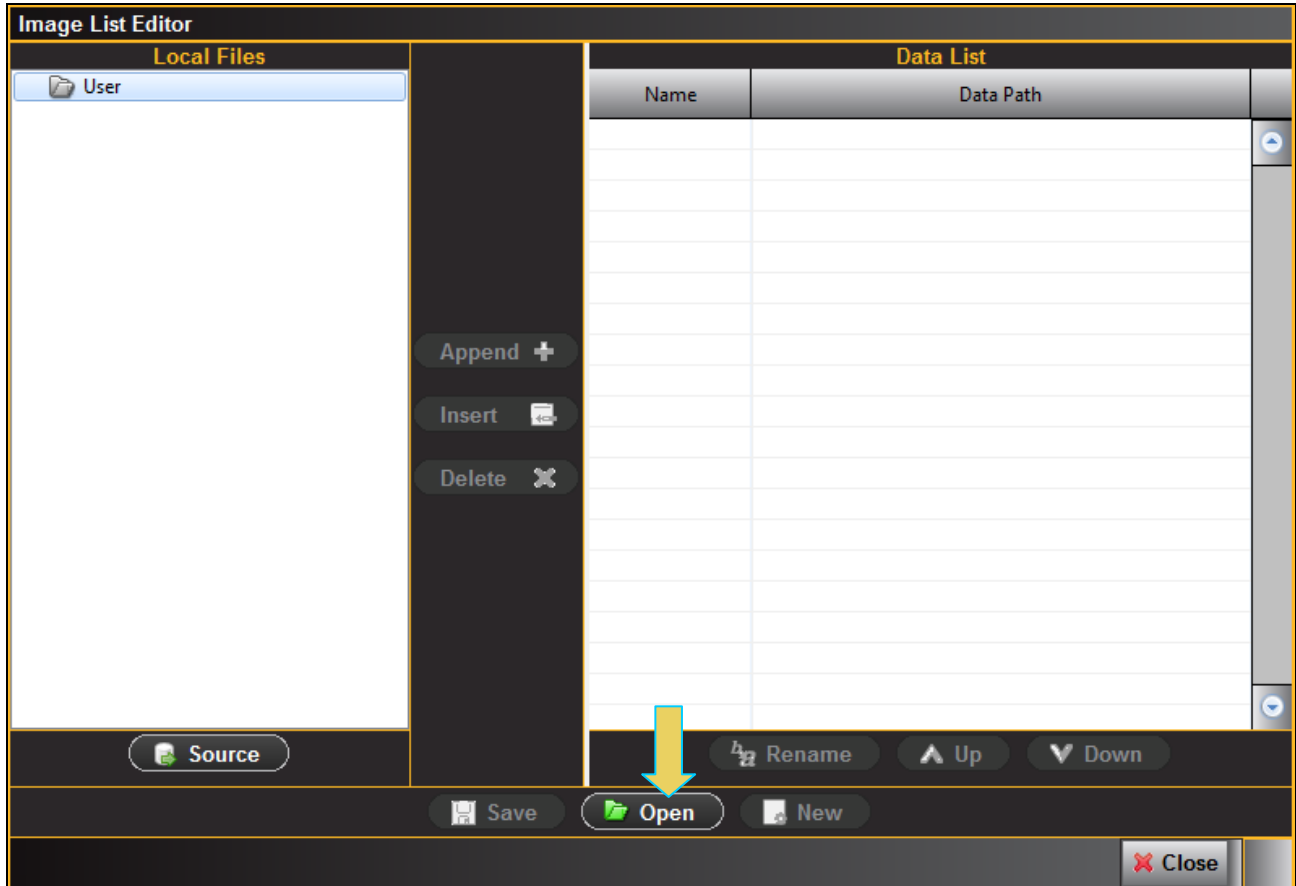
The **Open List** dialog box appears enabling you to select a Format List (below).
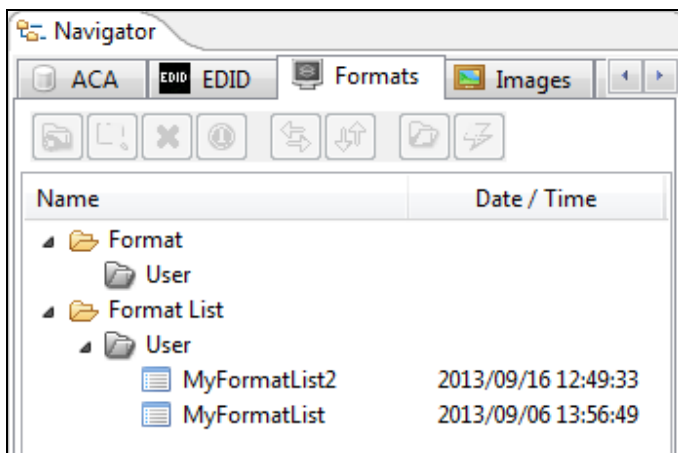
2. Select the list you wish to open (only one list is shown in the **Open List** dialog box example above). The Format List will appear in the **Format List Editor** window as shown below.

    You can now edit the list as desired.
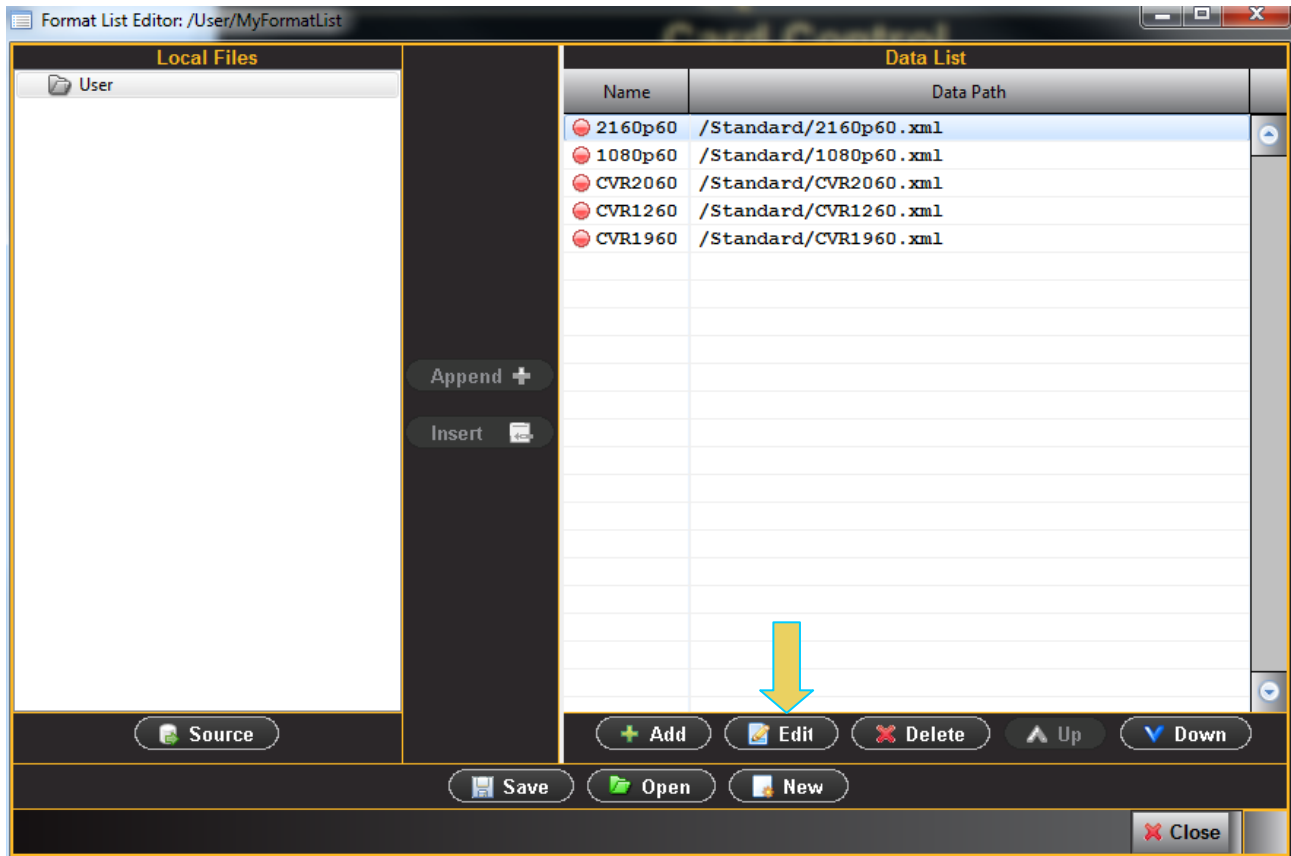
3. To rename a format simply select the format on the right side panel and click on the Edit activation button.

    A dialog box appears enabling you to change the name (below). Click Ok and the new name will appear as shown in the second screen below.
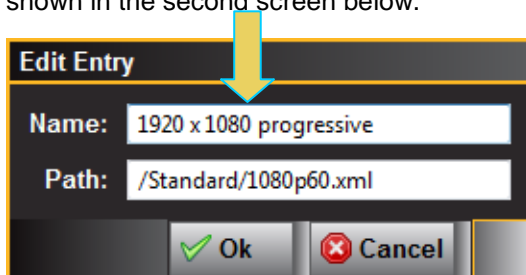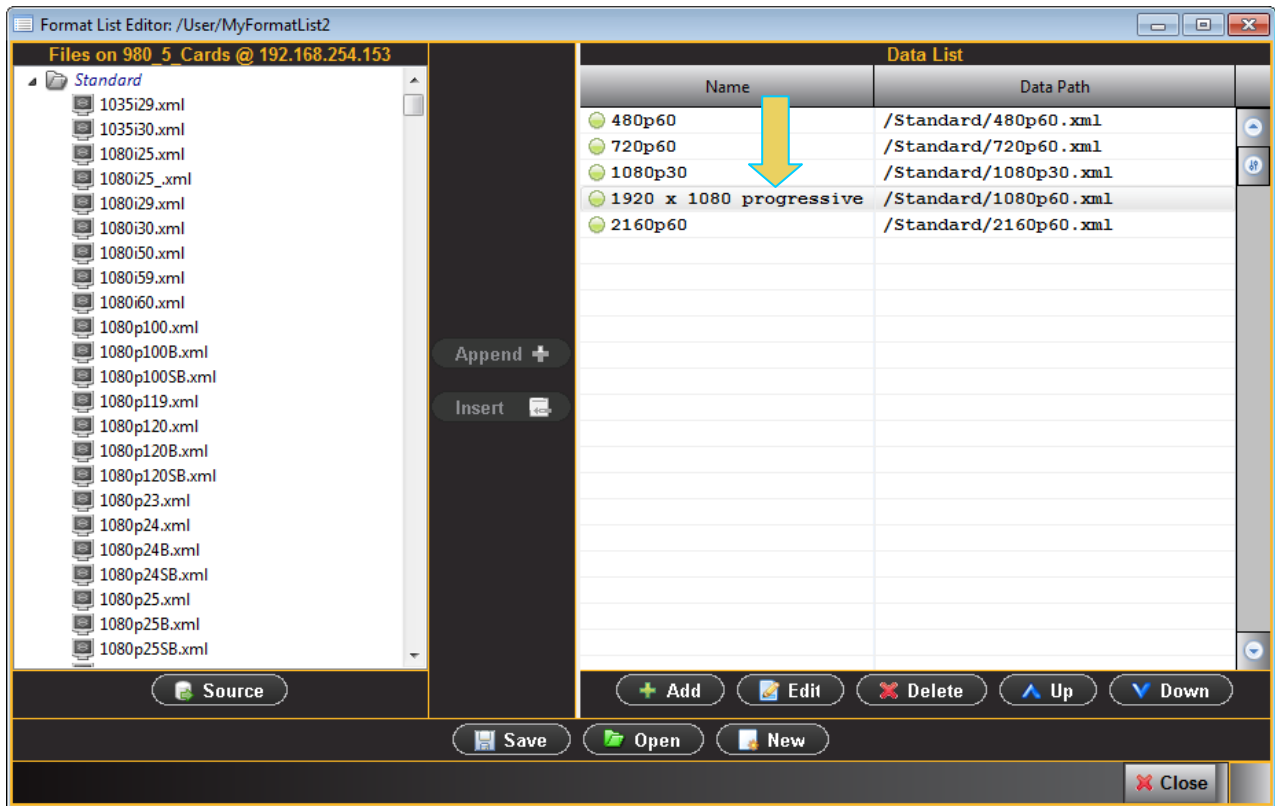
8. Format Editor

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.

8.1   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.
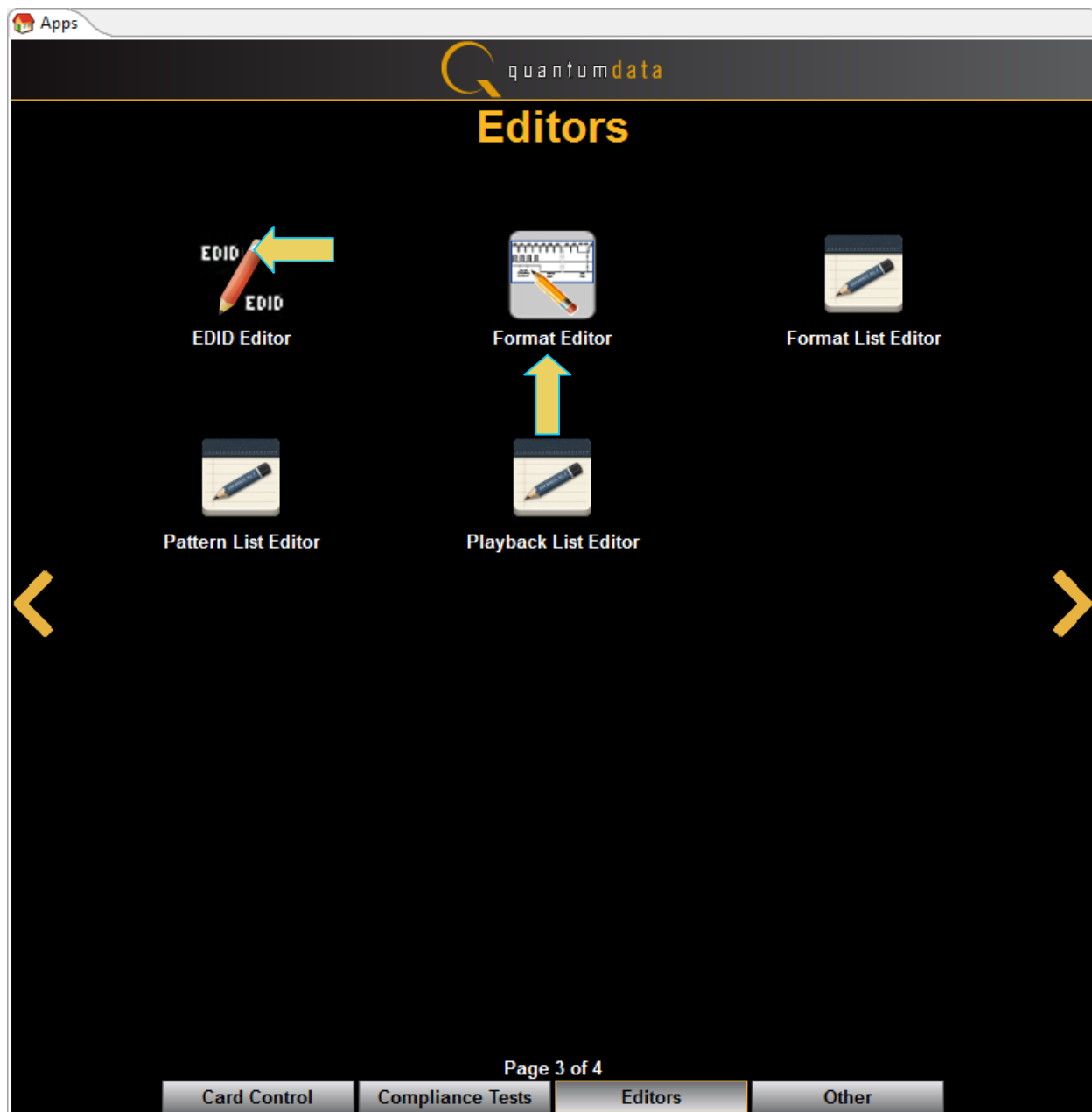
(Optionally) access the **Format Editor** through the **Format** tab using the **Edit** button on the bottom of the window (indicated below).
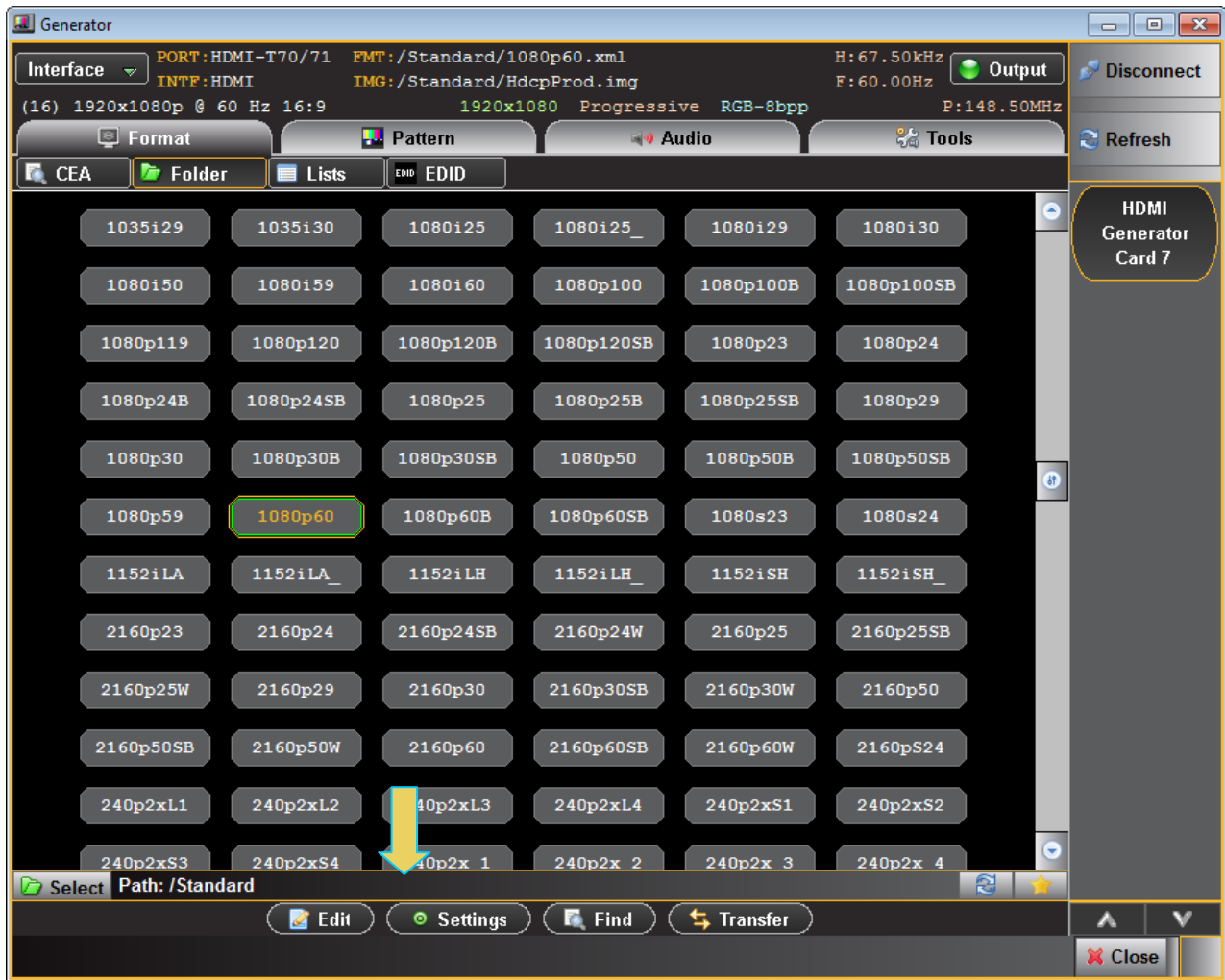
When you first open the **Format Editor**, the window will be blank as shown below. There are a set of activation buttons on the bottom of the screen that enable you to load, save and create formats.
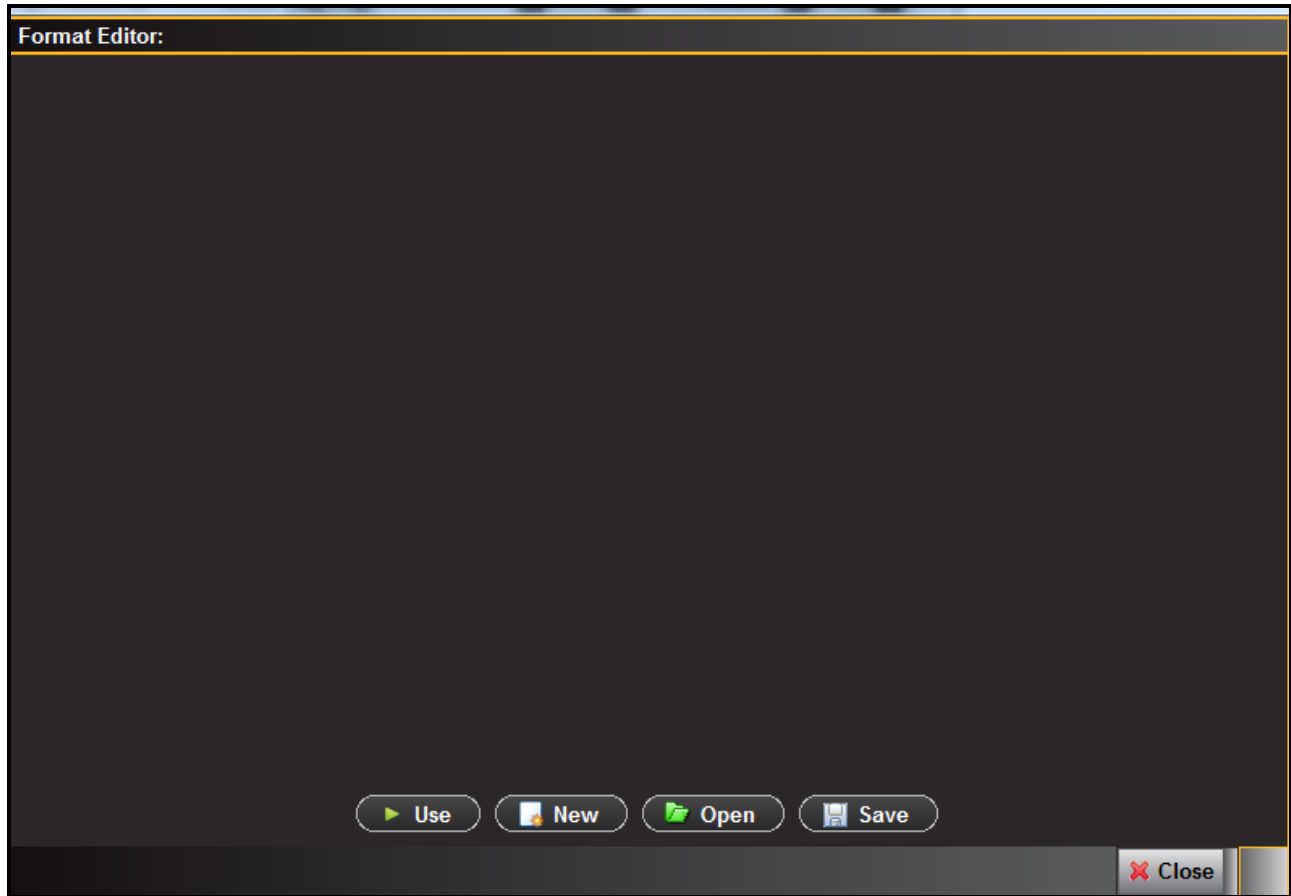
8.2   Format Editor - Basic Window Configuration and Operation

You can resize the window using the square area on the lower right side (indicated below).
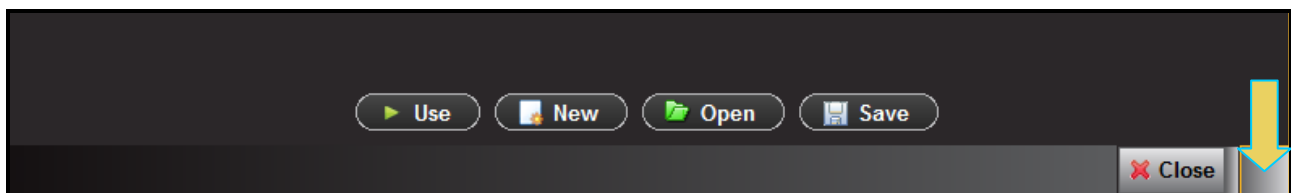
8.2.1   Format Editor – Lower Activation Buttons

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.

Button	Description
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.

8.2.2 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.
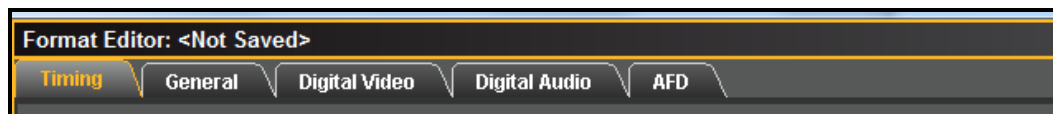
The following table describes the top level tabs in the Format Editor.

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.
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.

8.3   Format Editor – New Format

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

8.3.1   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.

8.3.2   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 HDMI	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 HDMI	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.

8.3.3

8.3.4 New Format - General Tab

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

8.3.5 New Format - General Tab (Top Left Panel)

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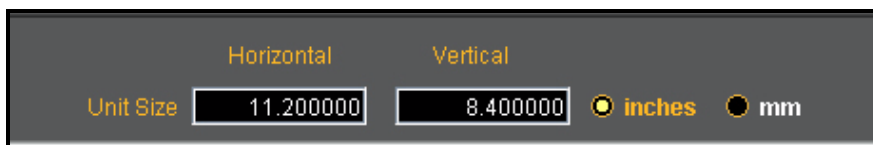
The table that follows describes each of the fields in the top left panel of the General tab.

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:**	
	inches	Selects the unit size of the Horizontal and Vertical Size entities to be

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

8.3.6   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)

8.3.7   New Format – General Tab (Center Panel)

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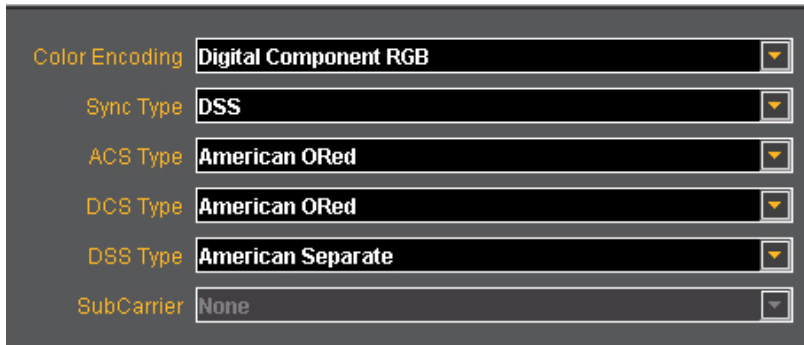
The table below describes the pull-down menus in the center panel of the **General** tab.

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) • Digital BT.601 xvYCC

Field / Entity	Description / Function
	• 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 HDMI •
DCS Type (Not used)	Not used for HDMI •
SubCarrier (Not used)	Not used for HDMI •

8.3.8   New Format - General Tab (Right Panel)

The right panel of the General tab in the Format Editor is shown below.
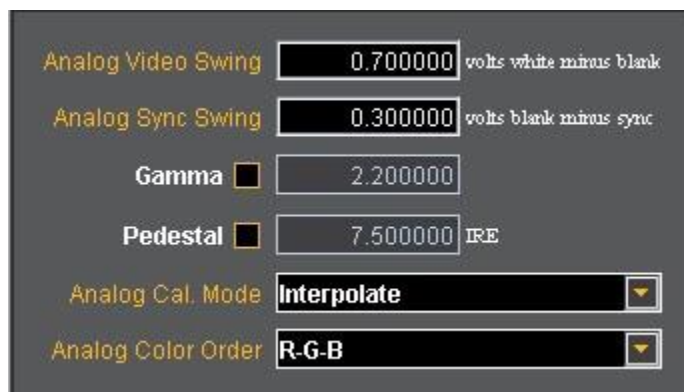
The table below describes the entities and fields of the right-side panel of the **General** tab.

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

Field / Entity	Entity Type	Description / Function
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

8.3.9   New Format - General Tab (Bottom Panel)

The bottom panel of the **General** tab in the **Format Editor** is shown below.
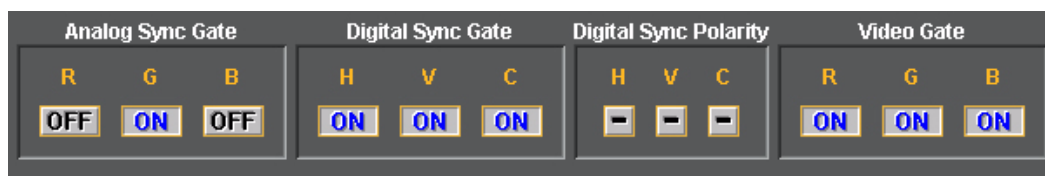
The table below describes the gating functions of the right-side panel of the **General** tab.

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 component.

Field / Entity	Entity Name	Description / Function
	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.

8.4 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 HDMI	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

8.5   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 HDMI**	Pull-down select	Sets the digital audio signal interface. The valid values are: • None - Use HDMI. • 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:

Field	Type	Description / Function
		• None
		• 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.

Field	Type	Description / Function
Mix Down Gate **Not applicable**	Check box	Sets the digital audio down-mix gate. The valid values are: enabled (0) 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.

8.6   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 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.

8.7   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.

8.8   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).

8.9   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.
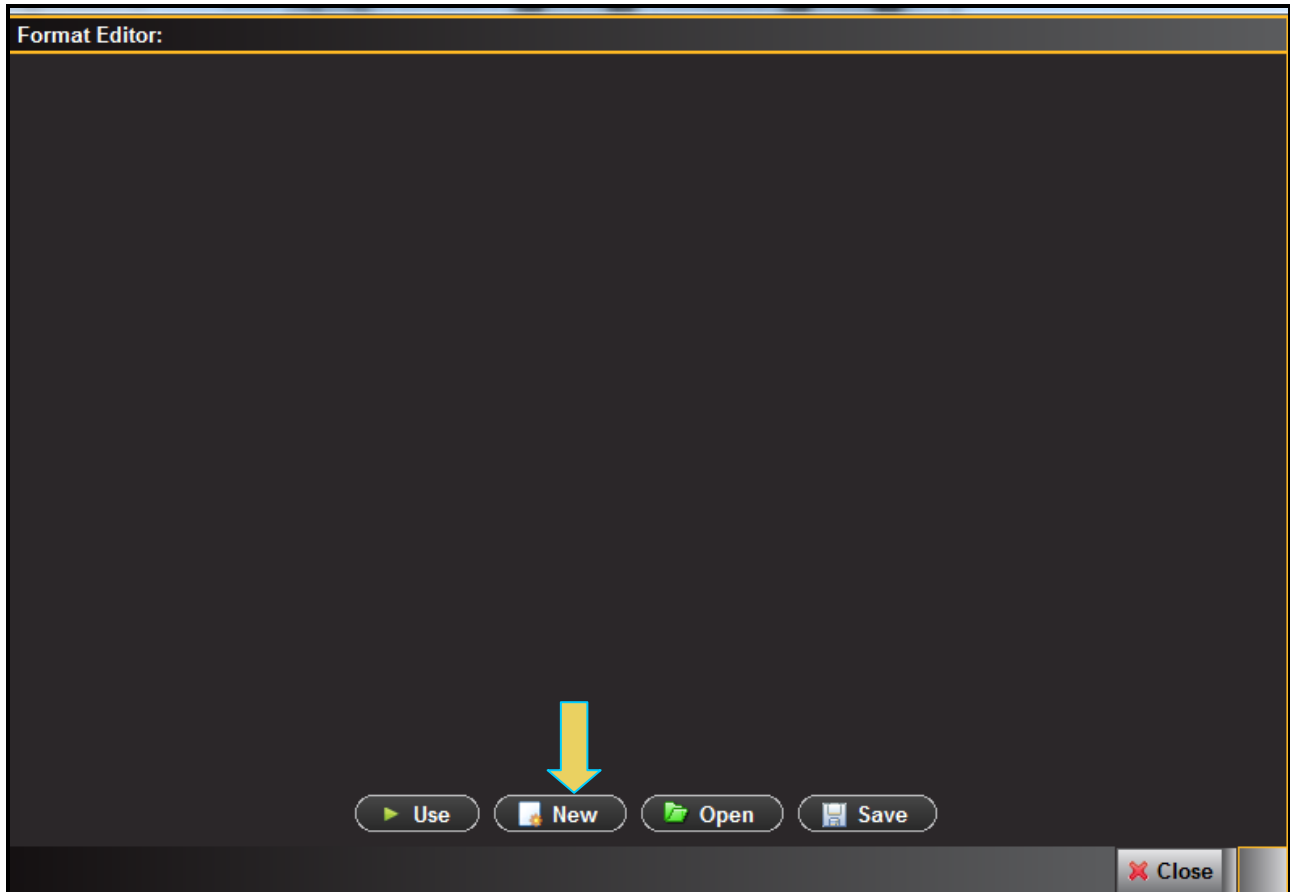
4.   Click the **New** activation button on the bottom of the panel (indicated above).

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.
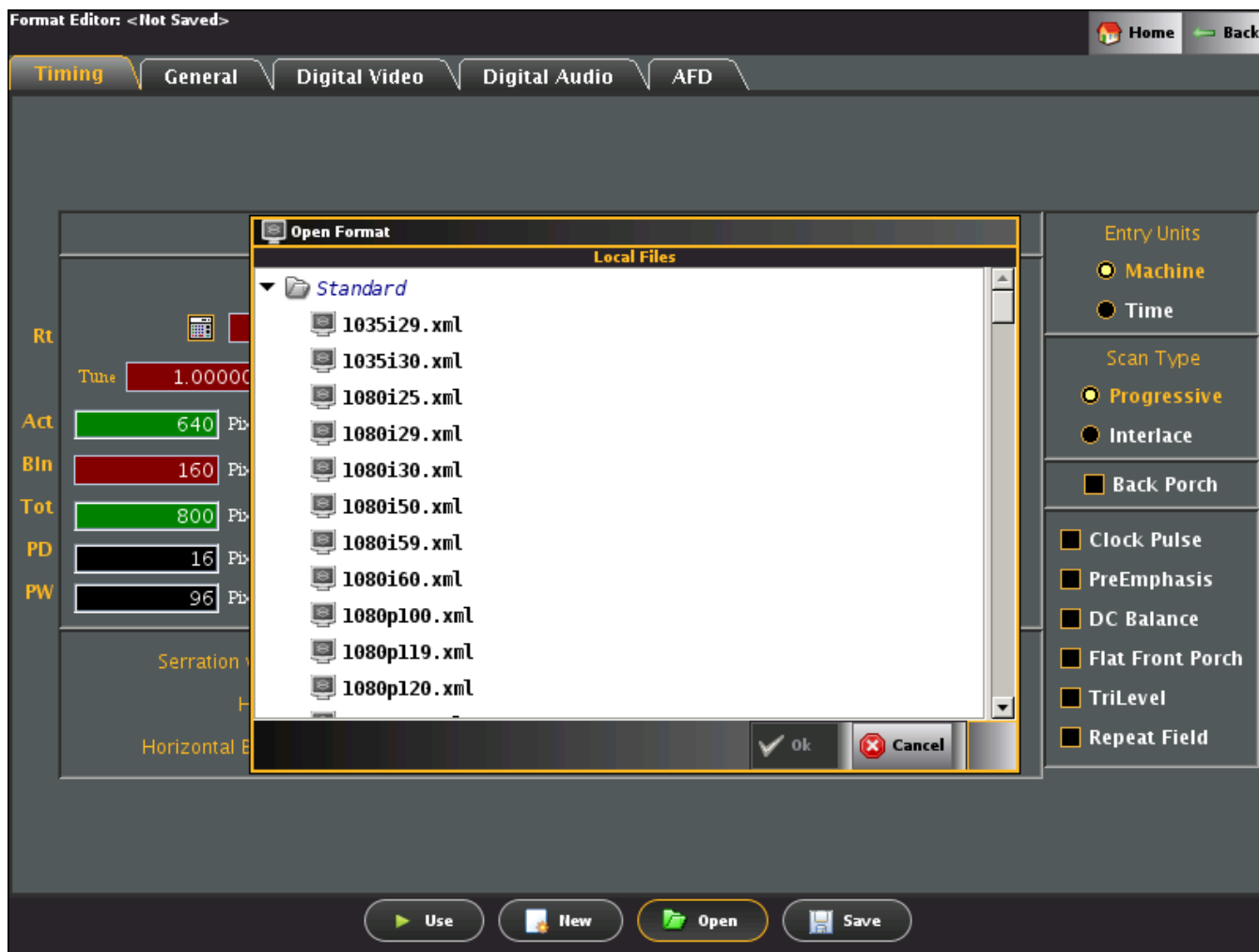
5. Scroll and select a format file to use as a starting point for defining your new format.

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.
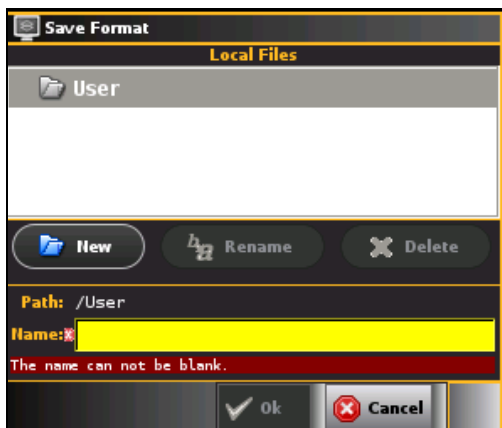
   b. Enter new format name in Name field.

8.10   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.
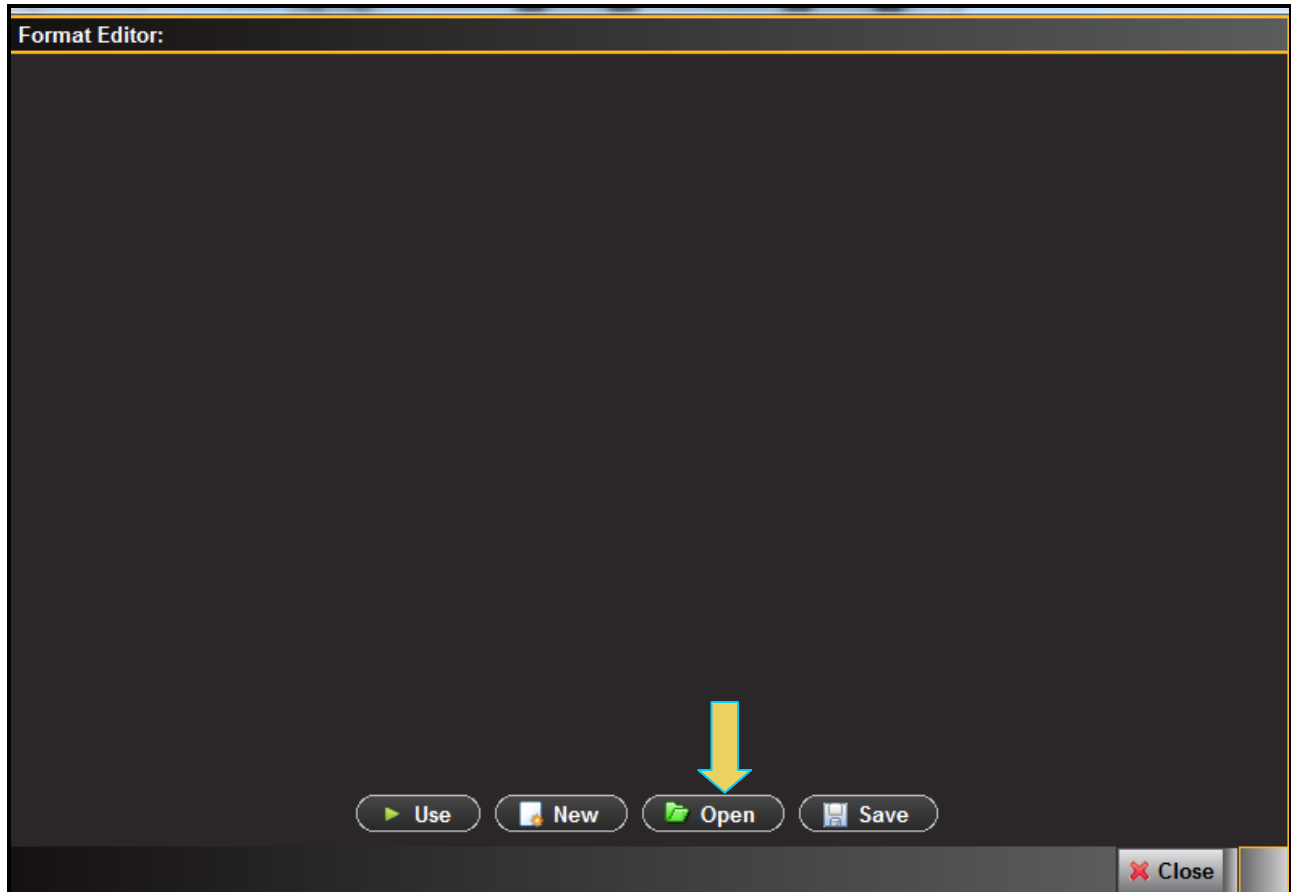
5.   Click the **Open** activation button on the bottom of the panel (indicated above).

A dialog box enabling you to scroll and select a format appears as shown below.
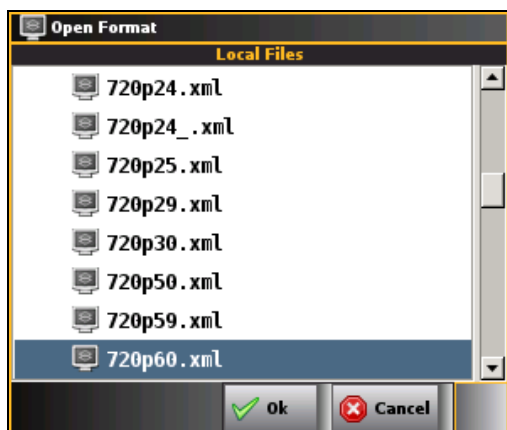
The format parameters of the selected format will appear in the new format **Timing** window as shown below.

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.

9. Source Verification with Rx Analyzer

The 980 HDMI Video Generator also has an Rx port for the optional network analyzer feature which provides basic verification of a source device. The Network Analyzer enables you to view the incoming video image and basic video characteristics. This section provides procedures for using the network analyzer functions. The analyzer features are only available through the embedded 980 GUI Manager through the touch display.

9.1   Accessing the Network Analyzer feature

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.

The Analyzer panel appears showing the incoming video image. There is a dashboard on the top of the panel indicating the essential video characteristics. There is a set of controls on the right.

9.2   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:**   ▪ **Card** –The Card area shows the current module whose port is being displayed on the Network 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   . Currently the only analyzer port is the 980 HDMI Video Generator port.

Network Analyzer – Dashboard Items

Second Row Items:

▪ **Video Identification (format)** –The first item indicates the video identification code (if there is one) **CEA VIC=16:**. If the incoming video is not determined to be a CEA format, there will be an indication of CEA VIC 0 and a note: "No Video Identification Code Available."

▪ **Format**. The format name, frame rate and aspect ratio. In this example **1920x1080p @ 60 Hz 16:9** the format is 1080p60.

▪ **Resolution**. The next item is the active horizontal and vertical resolution. In this example **1920 x 1080** the format is 1080p so the vertical lines are indicated per frame.

▪ **Scan**. The next item is the scan. In this example the field indicates Progressive **Progressive**. The other option is Progressive.

▪ **Bit Depth and Video colorimetry**. The next item is the bit depth and video mode. In this example the field indicates YCbCr with 4:4:4 sampling and 24 bit color depth **24 bpp, RGB**. The other options are: RGB, YCbCr 4:2:2 and deep color at either 30 or 36 bit color depth.

▪ **HDCP Status**. The next item is HDCP status which could either be Encrypted or Not Encrypted **Not Encrypted** or **Encrypted**.

9.3   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 **Home** is a navigation button that when pressed takes you back to the home screen **Apps** Panel. ▪ Back – The Back button **Back** is a navigation button that when pressed takes you back to the previously viewed screen. ▪ Nav – The Nav button **Nav.** when pressed takes you to the navigation panel where you can access various data files. ▪ Port – The Port button **Port** 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 **Stop** / **Start** is used to enable and

Network Analyzer – Control Panel	Control Button Descriptions
	disable the showing of the incoming video image.
	▪ Video – The video button [Video] 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.
	o Color – The Color button [Color / Video / Scale] and associated dialog box enables you to identify the color of any particular pixel.
	o 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 [Mode] enables you to toggle HDCP on or off on the 980 HDMI Video Generator's Rx port.
	▪ Tools - The Tools button [Tools] enables you to set the EDID and generate a hot plug with the associated flyout controls: [Set EDID / Generate Hot-plug / Mode / Tools]

9.4   Controlling the Network Analyzer

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

9.4.1   Determining the pixel values

The 980 HDMI 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.
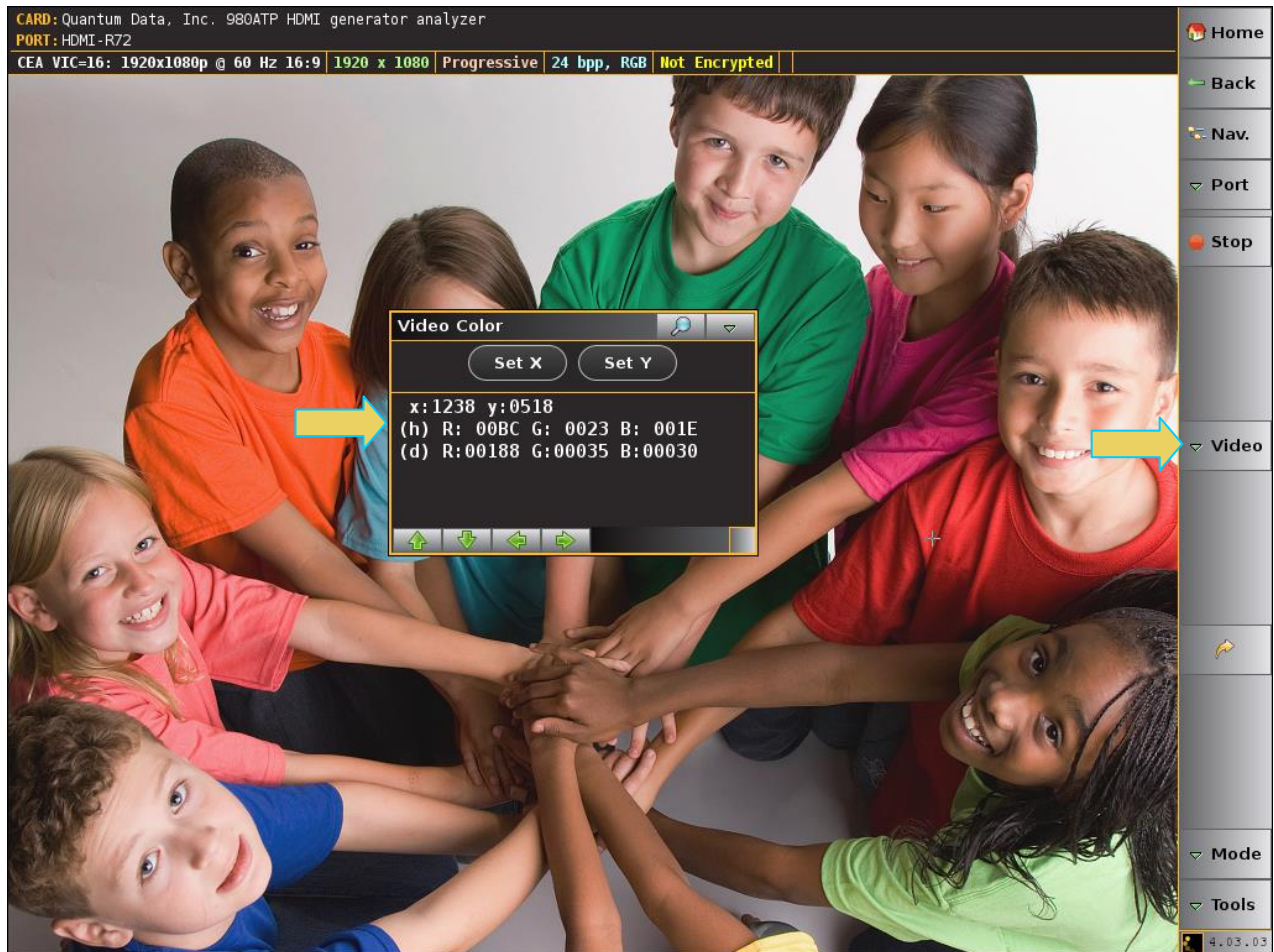
2. Move your finger or stylus to a location on the video. You can also move to the adjacent pixels with the green arrow buttons provided in the dialog box.

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.

9.4.2   Setting the video image size and aspect ratio

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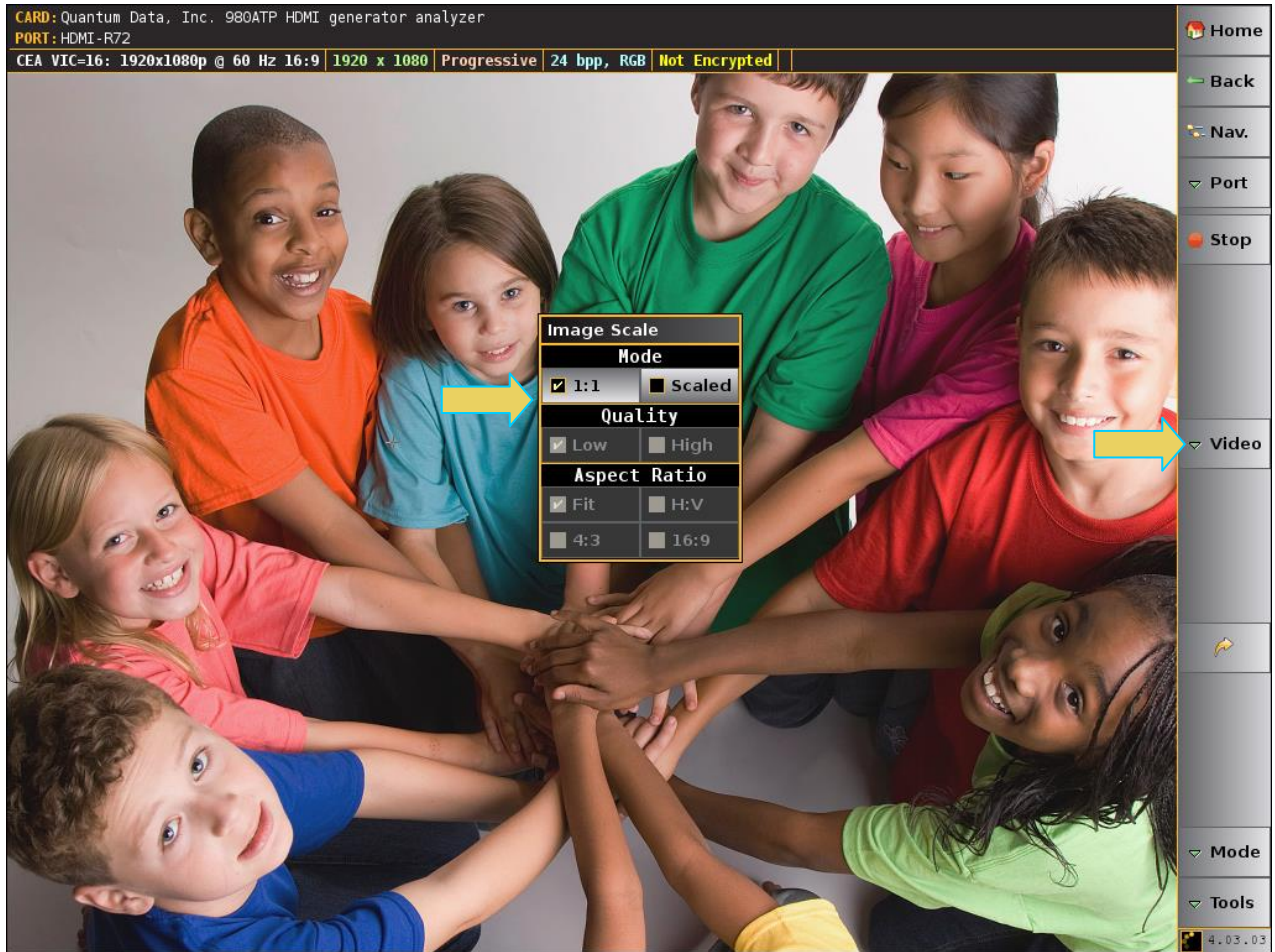
The example below shows Image Scale set to Scaled.
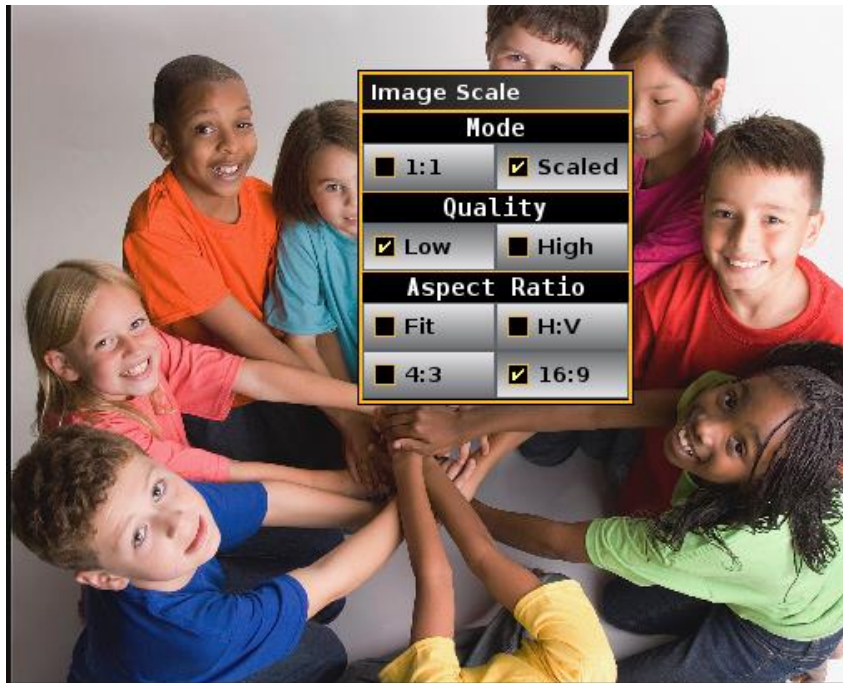
2. Set the size to either 1:1 or Scaled. The 1:1 setting means that the image appears in its true size. In this mode the image can be moved by dragging to view all areas of the image. The Scaled setting means that the image appears scaled to fit within the viewing area of the 980's embedded display.

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

9.4.3   Setting the EDID for the Rx port

The 980 HDMI 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 HDMI 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 HDMI 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.

9.4.4   Generating Hot Plug

The 980 HDMI 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.
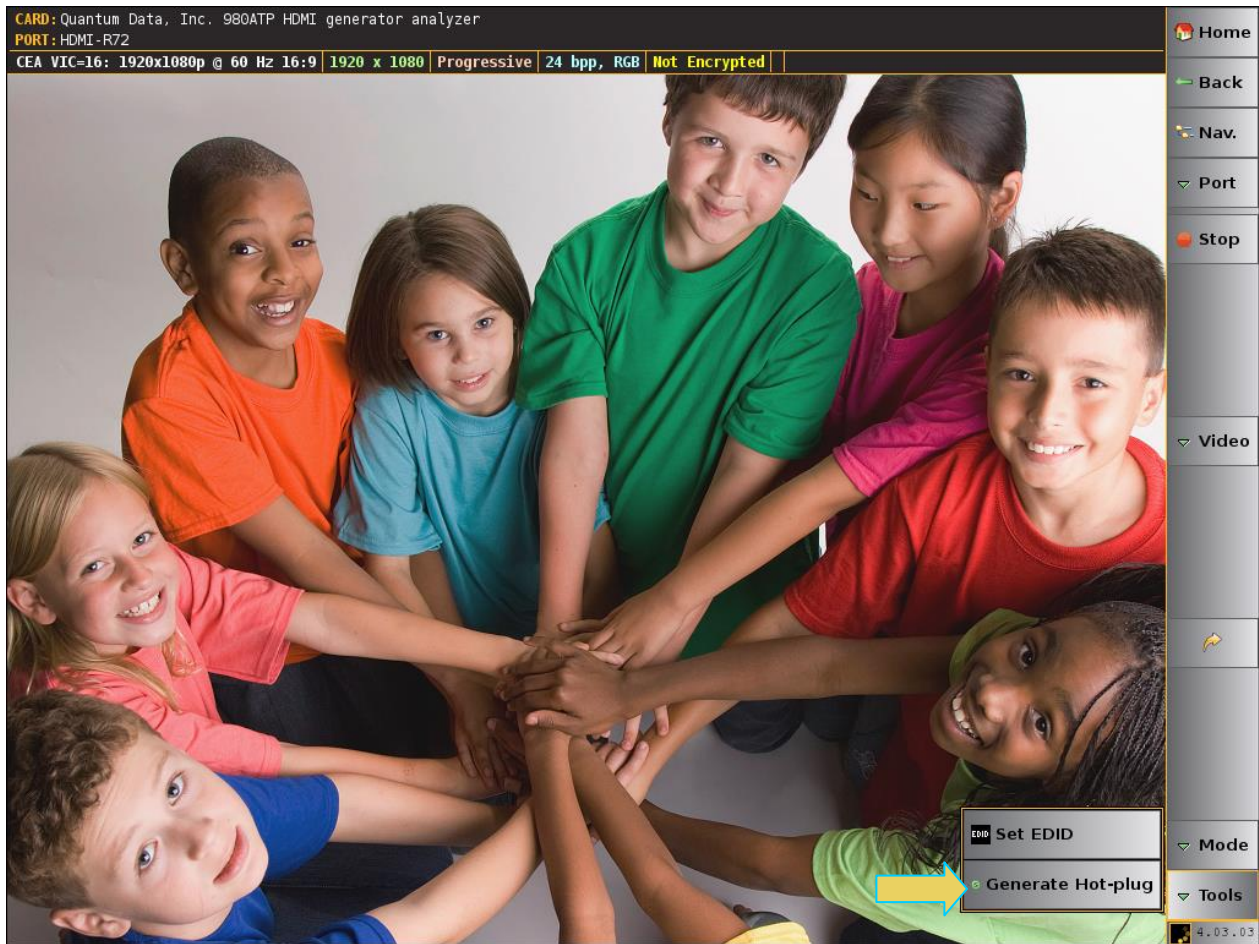
9.4.5   Enable or disable HDCP on the Rx port

The 980 HDMI Video Analyzer enables you to enable or disable HDCP capabilities on its Rx port.

1. Enable or disable HDCP using the Mode fly-out control.

10. Command Reference

This section provides a list of commands available for use with the 980 HDMI Video Generator module. You can control the 980 and its modules through the command line via a telnet session or from the 980 Manager Console panel. Typically users will utilize a terminal program such as PuTTY.

10.1 Accessing the Command Line
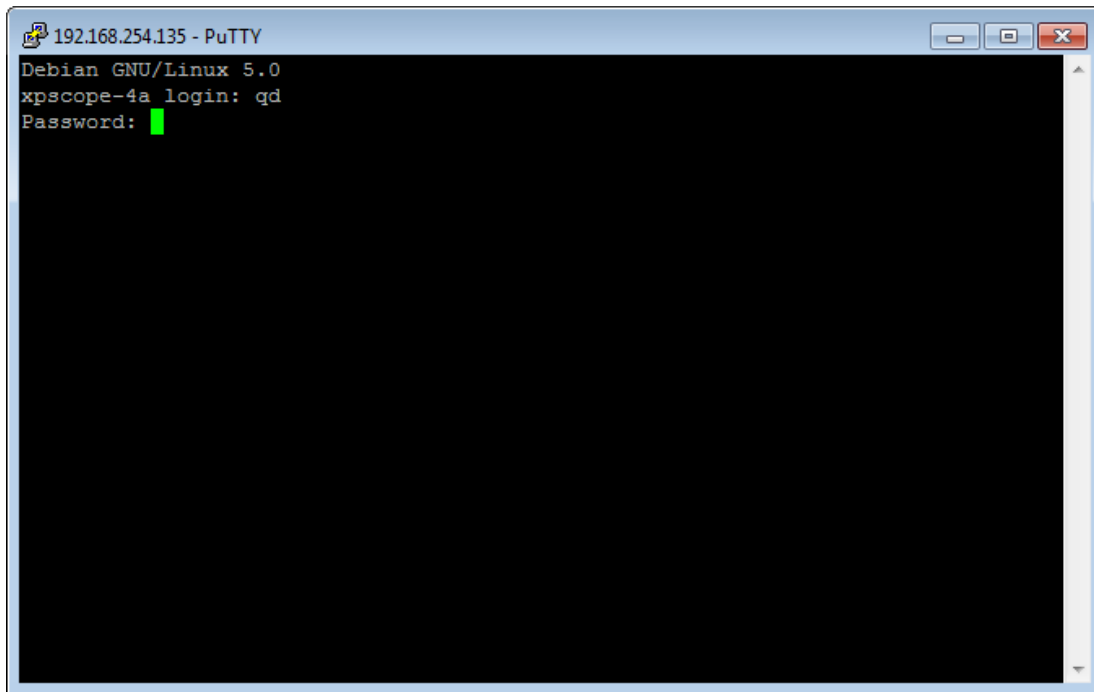
To establish a command line session through a telnet session:

1. Launch the Command Prompt utility from the Windows Accessories such as PuTTY. Enter
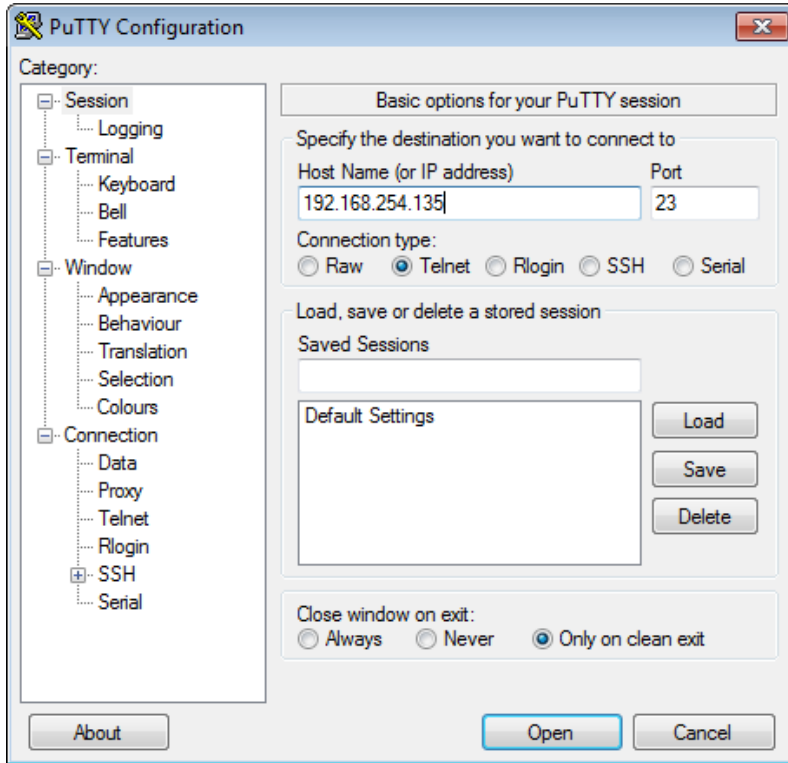
2. Establish a telnet session with the 980 using the following command. Note you will enter in the IP address of the 980 (192.168.254.135 in example)

   The 980 login prompt will then appear as shown below.

3. Login at the prompt.

    Pscope login: qd

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

4. The **p-scope>** prompt will appear allowing you to enter commands. Refer to the screen example below.

5. Access the HDMI Video Generator prompt by entering the 980 slot number that the HDMI Video Generator module is installed in. In this example it is Slot 7. Refer to the following screen. (Note you can determine the slot number using the discover command discussed further below.)

The hdmi prompt is presented as shown above. Note that Slot 7 become the "default" slot and does not need to be entered on the command line; it is optional.

10.2   Command Line Conventions

Since the 980 can be equipped with multiple modules, there is a convention for addressing commands to specific modules.

The addressing convention is as follows:

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

The configuration used in this example is a 980 HDMI Video Generator module in Slot 7.

Example: Load a test pattern for the transmitter port (Tx1 port 0) on the 980 HDMI Video Generator module which is equipped in Slot 7:

`OUT70:IMGL SMPTEBar`

Note 1: Commands are not case sensitive.

Note 2: If the slot number has been established as the default (by entering) the slot number on the command line) then you can leave the slot out of the command:

`OUT0:IMGL SMPTEBar`

To determine what modules are installed in what slots enter the discover command as shown:

```
192.168.254.135 - PuTTY                                    [_] [□] [✕]
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
1 failure since last login.
Last was Fri 11 Apr 2014 01:59:09 PM CDT on pts/1.
#p-scope>discover
slot:          1
rev:           1
class:         Quantum Data, Inc. MHL CBUS protocol analyzer
device:        e009
pci:           00:08:00
qdbus:         SLAVE
port:          0:1:297: MHL TX
port:          1:1:297: MHL RX


slot:          3
rev:           1
class:         Quantum Data, Inc. DP protocol analyzer
device:        e010
pci:           01:00:00
qdbus:         SLAVE
port:          0:1:600: DP TX
port:          1:2:600: DP TX
port:          2:0:600: DP RX PA
```

```
192.168.254.135 - PuTTY                                    [_] [□] [✕]

slot:          6
rev:           3
class:         Quantum Data, Inc. HDMI protocol analyzer
device:        e007
pci:           00:01:00
qdbus:         MASTER
port:          0:1:297: HDMI RX PA
port:          1:0:297: HDMI TX PA


slot:          7
rev:           1
class:         Quantum Data, Inc. 980ATP HDMI generator analyzer
device:        a001
pci:           00:07:00
qdbus:         SLAVE
port:          0:1:297: HDMI TX
port:          1:1:297: HDMI TX
port:          2:0:297: HDMI RX


#p-scope>
```

The discover command in the example above indicates that the HDMI module is installed in Slot 7.

10.3   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:

```
OUT70:FMTL 720p60
OUT70:ALLU
```

DDCR	
Command supported?: Y	Query supported?: Y

Sets the TPA-MHL2 into MHL Packed Pixel mode or the Normal mode for testing MHL 2.0 sink devices .

Query returns the current mode setting.

Examples:

```
OUT70:DDCR 70 FB     // sets the TPA-MHL2-8R into the Packed Pixel mode.
```

or

```
OUT70:DDCR 70 FF     // sets the TPA-MHL2-8R into the Normal mode.
```

DVQM	
Command supported?: Y	Query supported?: Y

Sets the quantization mode (color range) for the video in HDMI. 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:

```
OUT70:DVQM 2      // sets the mode or range to 16-235).
```

or

```
OUT70:DVQM 0      // sets the mode or range to 0-255).
OUT70: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 on HDMI. 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:

```
OUT70:DVSM 2      // sets the sampling to 4:2:2.
```

or

```
OUT70:DVSM 4      // sets the sampling to 4:4:4.
OUT70:DVSM?       // returns the current value.
```

DVST	
Command supported?: Y	Query supported?: Y

Sets the digital video signal type. Valid values are: HDMI/DVI RGB = 10; HDMI YCbCr   = 14.

Requires FMTU or ALLU to activate.

Query returns the current setting of the digital video signal type.

```
OUT70:Example:
OUT70:DVST 10     // activates the HDMI/DVI output for RGB video).
OUT70: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:

```
OUT70:FMTL 720p60   // loads the 720p60 format.
OUT70: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:

```
OUT70:FMTL 720p60
OUT70:FMTU
```

IFGU	
Command supported?: Y	Query supported?: N

Activates an inoframe command.

Examples:

```
OUT70:XAVI:S 1    // sets scan parameter to overscanned.
OUT70:IFGU        // required to invoke the command.
```

IFTG	
Command supported?: Y	Query supported?: Y

Enables inoframe transmission.

Refer to EIA/CEA-861-D standard for mask values for each inoframe.

Example:

```
OUT70:IFTG 138     // ensure particular inoframe is enabled (being transmitted).
OUT70:IFTG?        // verify that it is enabled.
138
```

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:

```
OUT70: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.

```
OUT70:IMGL SMPTEBar
OUT70: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.

```
OUT70:IMGL graysall   // loads the SlideBox image
OUT70:ISUB 1          // enables alternate versions of the image
OUT70:IVER 1          // activates the first version of an image
OUT70:IMGU            // invokes the image and image version.
OUT70: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.

```
OUT70:IMGL graysall   // loads the SlideBox image
OUT70:ISUB 1          // enables alternate versions of the image
OUT70:IVER 100        // activates the 100th version of the image
OUT70: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 on HDMI.

Example:
```
OUT70:NBPC 12     // sets the component bit depth to 12 bits
OUT70: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:
```
OUT70:OUTG 1      // enables the outputs.
OUT70: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:
```
OUT70:REDG 1      // enables the red output channel.
OUT70:GRNG 0      // disables the green output channel.
OUT70:BLUG 1      // enables the blue output channel.
OUT70: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:

```
OUT70:SCAN 1     // sets the output to progressive.
OUT70:SCAN?      // returns the current setting.
```

X3DM

Command supported?: Y	Query supported?: N

Enables you to enable 3D and to set the 3D frame structure to send out the HDMI outputs.

X3DM: *enable method sampling*

Refer to the EIA/CEA-861-E standard for details.

Where *enable* is:

0 = disable 3D

1 = enable 3D

 Where *method* is:

0 = Frame Packing
2 = Line Alternative
3 = Side by Side (Full)
4 = L + Depth
6 = Top and Bottom
8 = Side by Side (Half)

Where *sampling* is the Side-by-Side Horizontal Sub-Sampling method. Can be one of:

0 - Odd/Left picture, Odd/Right picture
1 - Odd/Left picture, Even/Right picture
2 - Even/Left picture, Odd/Right picture
3 - Even/Left picture, Even/Right picture

Quincunx Matrix:

4 - Odd/Left picture, Odd/Right picture
5 - Odd/Left picture, Even/Right picture
6 - Even/Left picture, Odd/Right picture
7 - Even/Left picture, Even/Right picture

Examples:

```
OUT70:X3DM:1 0        // enables the HDMI output for 3D and sets structure to Frame Packing.
OUT70:ALLU            // required to invoke the command.
OUT70:X3DM:1 8 4      // enables the HDMI output for 3D and sets structure to Side by Side
                         half with Odd/Left picture, Odd/Right picture subsampling.
OUT70:ALLU            // required to invoke the command.
```

XAUD

Command supported?: Y	Query supported?: Y

Enables you to send Audio infoframes out the HDMI outputs. This will not change the HDMI audio content.

XAUD:*audparameter value*

Parameters are optional. Refer to the EIA/CEA-861-D standard for details on each parameter and their values.

Where *audparameters* are:

CA – Channel assignment. Sets the channel assignment value or retrieves the value transmitted.

CC – Channel count. Sets the channel count value or retrieves the value transmitted.

CT – Audio coding type. Sets the audio coding type value or retrieves the value transmitted.

SS – Sample size. Sets the sample size value or retrieves the value transmitted.

SF – Sampling frequency. Sets the sampling frequency value or retrieves the value transmitted.

DMI – Down-mix inhibit. Sets the down-mix inhibit value or retrieves the value transmitted.

LSV – Level shift value. Sets the level shift value or retrieves the value transmitted.

PBL – LFE playback level. Sets the LFE playback level or retrieves the level transmitted.

CSUM – Checksum. Sets or gets the checksum value for the corresponding InfoFrame.

Examples:
```
OUT70:XAUD:CC 2        // sets the channel count to 3.
OUT70:IFGU             // required to invoke the command.
OUT70:XAUD:SS 2        // sets the sampling size to 20.
OUT70:IFGU             // required to invoke the command.
OUT70:XAUD:CC?         // returns the channel count.
```

XAVI

Command supported?: Y	Query supported?: Y

Enables you to send AVI infoframes out the HDMI outputs.

XAVI:*aviparameter value*

Parameters are optional. Refer to the EIA/CEA-861-D standard for details on each parameter and their values.

Where *aviparameters* are:

S – Scan information. Sets the scan information value or retrieves the value transmitted.

B – Bar information. Sets the bar information value or retrieves the value transmitted.

A – Active format information. Sets the active format information value or retrieves the value transmitted.

C – Colorimetry. Sets the colorimetry value or retrieves the value transmitted.

Y – Video type. Sets the video type value or retrieves the value transmitted.

Q – *RGB* Quantization range. Sets the *RGB* Quantization range or retrieves the value transmitted.

YQ – YCC quantization range. Sets the YCC quantization range or retrieves the value transmitted.

R – Active Format Aspect Ratio. Sets active format aspect ratio value or retrieves the value transmitted.

M – Picture Aspect Ratio. Sets the picture aspect ratio value or retrieves the value transmitted.

EC – Extended Colorimetry. Sets the extended colorimetry value or retrieves the value transmitted.

SC – Non-uniform Picture Scaling. Sets the non-uniform picture scaling value or retrieves the value transmitted.

ETB – Line number at start of top bar. Sets the pixel number start top value or retrieves the value transmitted.

SBB – Line number at start of bottom bar. Sets the pixel number start bottom value or retrieves the value transmitted.

ELB – Pixel number at start of left bar. Sets the pixel number start left value or retrieves the value transmitted.

SRB – Pixel number at start of right bar. Sets the pixel number start right value or retrieves the value transmitted.

VIC – Video Identification Code. Retrieves the value transmitted.

PR – Pixel repetition. Sets the pixel repetition value or retrieves the value transmitted.

ITC – IT Content. Sets the IT content value or retrieves the value transmitted.

CN – Content Type. Sets the content type value or retrieves the value transmitted.

CSUM – Checksum. Sets the checksum value or retrieves the value transmitted.

Example:
```
OUT70:XAVI:S 1      // sets scan parameter to overscanned.
OUT70:IFGU          // required to invoke the command.
OUT70:XAVI:Y 0; M 1  // sets video type to RGB and aspect ratio to 4:3
```

```
OUT70:IFGU          // required to invoke the command.
OUT70:XAVI:Y?       // returns the value or setting of the video type parameter.
```

XHVI

Command supported?: Y	Query supported?: Y

Enables you to send Vendor Specific inframes out the HDMI outputs. This will not change the HDMI output stream.

XHVI:*hviparameter value*

Parameters are optional. Refer to the EIA/CEA-861-E standard for details on each parameter and their values.

Where *hviparameters* are:

HVF – HDMI Video Format field. Values: 0 = no info, i.e. 2D; 1 = 4Kx2K; 2 = 3D.

HVIC – HDMI Video Identification Code (VIC). Sets VIC for 4Kx2K use.

H3DS– HDMI 3D structure. Sets the 3D structure indication.

3DMG – 3D metadata present gate. Indicates whether 3D metadata is present or not present.

3DED – 3D External data.

LEN – HDMI VSIF length in bytes.

CSUM – Checksum. Sets or gets the checksum value for the corresponding InfoFrame.

Examples:
```
OUT70:XHVI:HVF 2      // 3D is enabled.
OUT70:IFGU            // required to invoke the command.
OUT70:XHVI:3DMG 2     // indicates that 3D metadata is present.
OUT70:IFGU            // required to invoke the command.
OUT70:XHVI:3DMG?      // returns the value for the 3DMG parameter.
```

XSPD

Command supported?: Y	Query supported?: Y

Enables you to send Source Product Descriptor inframes out the HDMI outputs.

Syntax:

XSPD   [VNS [PDS [SDI]]]

Where:

VNS – Vendor string name.

PDS – Product description string.

SDI – Source device information (see EIA/CEA-861-D standard)

Example:
```
XSPD QDI HDMI-Analyzer 1     // populates the vendor string name, product description
                                and source device.
OUT70:IFGU                      // required to invoke the command.
OUT70:XSPD                      // returns the current value.
```

XVSG

Command supported?: Y	Query supported?: Y

Enables red/green/blue gates.
Requires FMTU or ALLU to activate.
Examples:
```
OUT70:XVSG 1 0 1  // enables Red and Blue gates)
```
Or
```
OUT70:XVSG 1     // enables all 3 channels as a shortcut
```

```
XVSG?        // returns the current setting of polarity of VSYNC and HSYNC
```

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:

```
OUT70:XVSI 2     // Sets DVI Computer formats
OUT70:XVSI 3     // Sets DVI TV formats
OUT70:XVSI 4     // Sets active interface to HDMI
```

11.   Upgrading the 980 Manager and 980

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

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

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

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.

12.   Image Reference

12.1   Standard image descriptions

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

12.2   3DXTalk

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

12.2.1   Description

Test image for testing 3D crosstalk.
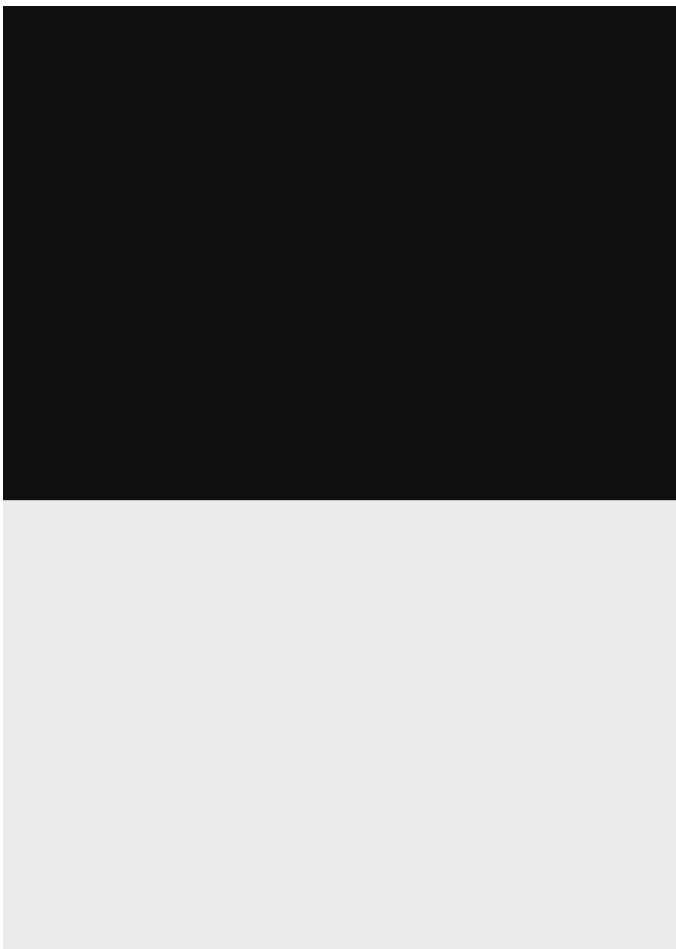
12.3   Acer1

12.3.1 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.
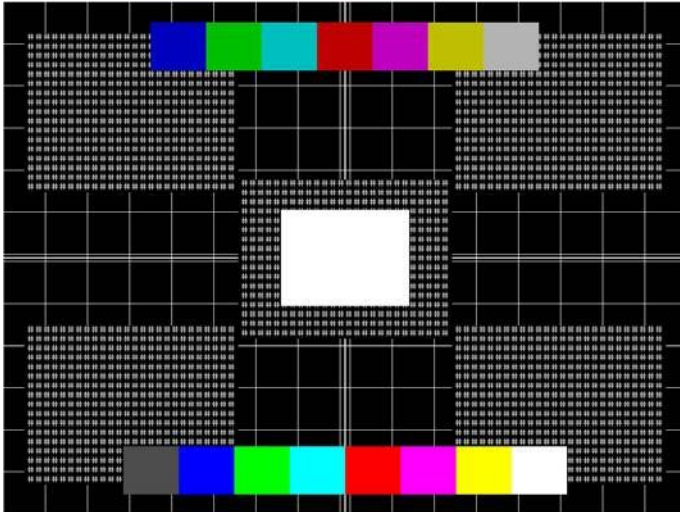
12.4 Acer2

12.4.1 Description

Special test image developed per customer specifications. Consists of colorbars, lines of "#" characters, and a green border.
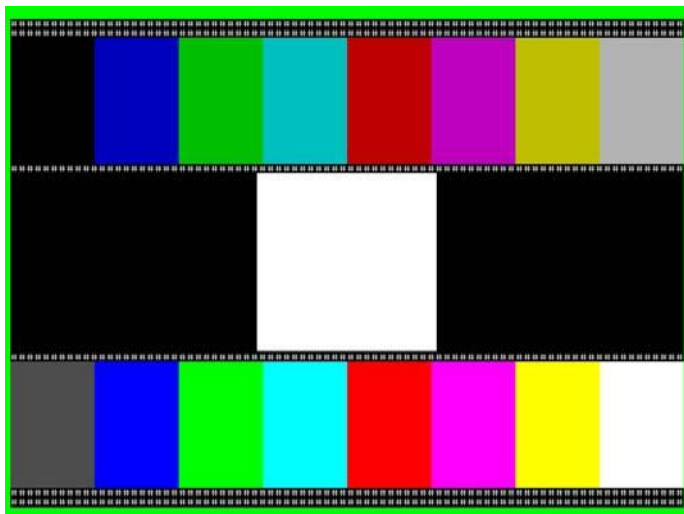
12.5   Acer3, Acer4, Acer5, Acer6

12.5.1 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.
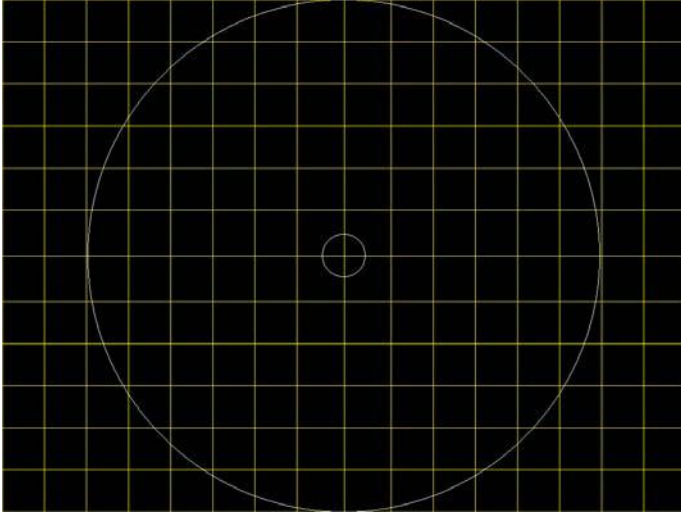
12.6   Acer7 and Acer8

12.6.1 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.
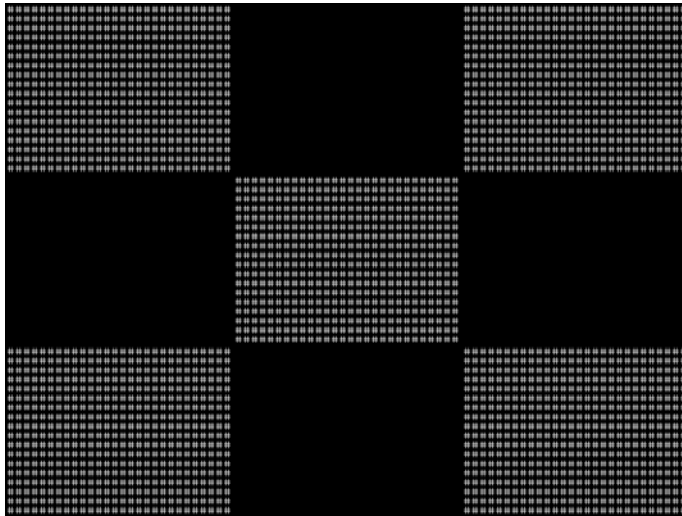
12.7   Acer9

12.7.1 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.

12.8   AFDtest

12.8.1 Description

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

12.9   Anamorph

12.9.1 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.
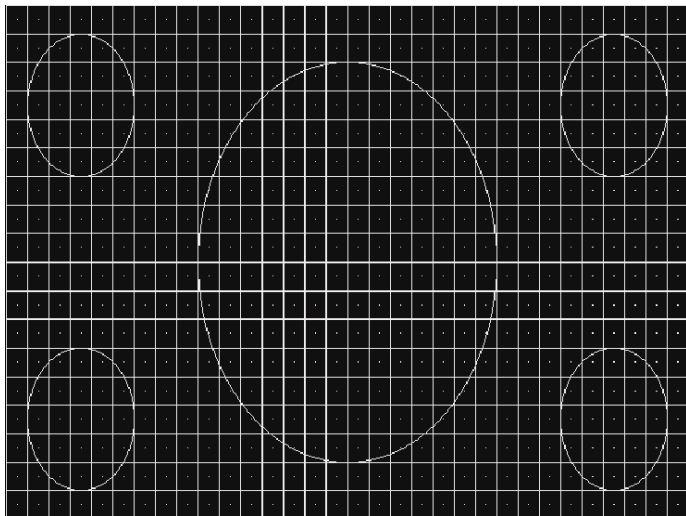
12.10 AnsiGray

12.10.1   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.
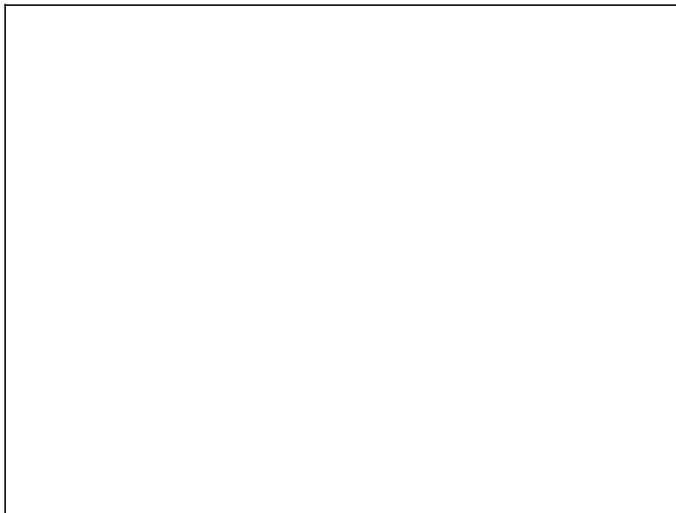
12.11 AnsiLght

12.11.1   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.

12.12 Apple 1

12.12.1 Description

Special test image developed per customer specifications. A secondary version shows reverse (black characters on white background).
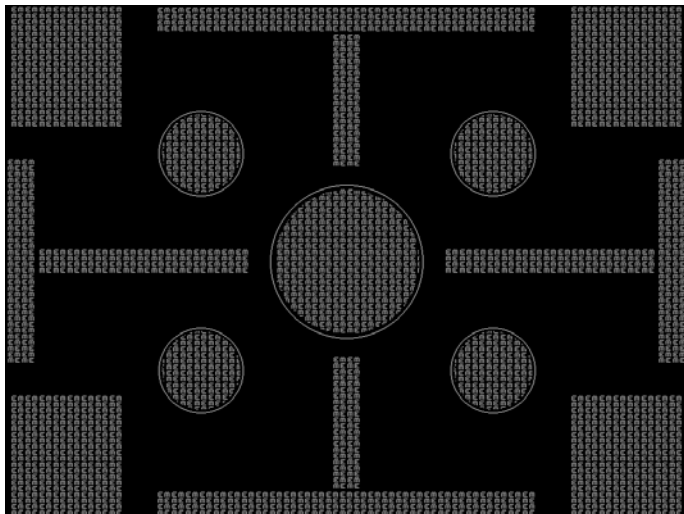
12.13 Audio_L, Audio_Lf, Audio_R, Audio_Rf, Audio_X, Audio_Xf

12.13.1 Description

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

12.14 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

12.14.1 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).

```
Audio Channel 1

          Amplitude: -3 dBFS

          Min level: 19140

          Max level: 111931

              Rate: 1000 Hz

     Sampling Rate: 48000 Hz

     Allowed Chans: 8

       Chan. Mask: 1
```

12.15 BarBlack

12.15.1 Description

Special test image developed per customer specifications. A secondary version shows reverse (black lines on white background).
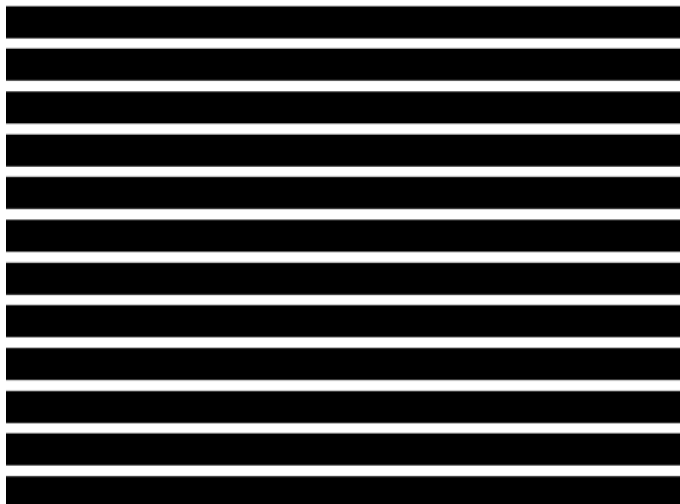
12.16 BLU_EM, GRN_EM, RED_EM, WHT_EM, MEME1111, MEMESony, MESony_B, MESony_G, and MESony_R

12.16.1 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.
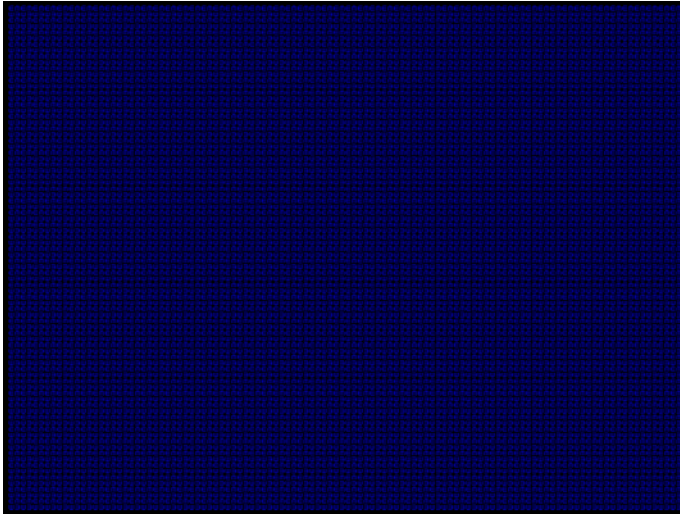
12.16.2 Purpose

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

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

12.17.1 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.

12.17.2 Purpose

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

12.18 BLU_PIC, GRAY_PIC, GRN_PIC, RED_PIC, WHT_PIC

12.18.1 Description

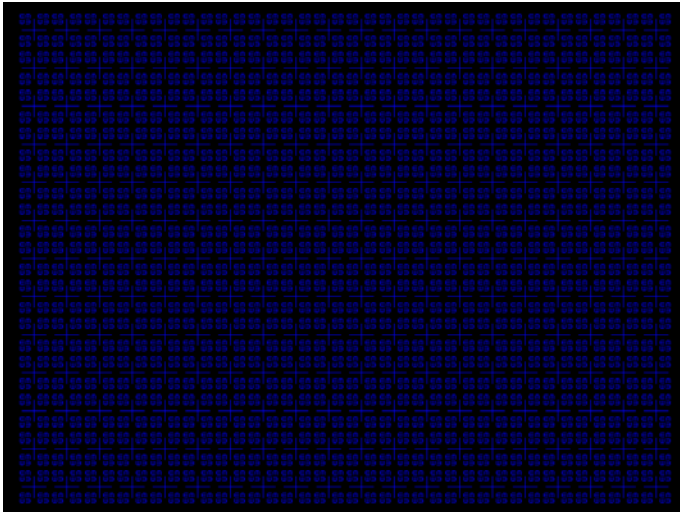A solid blue (BLU), gray, green (GRN), red, or white (WHT) box fills the active video area. Only the white fill has a secondary version. It can be changed to a black fill by pressing the **Step** key. The BLU_PIC image is shown below.

12.18.2 Test

Purity adjustment.

12.18.3 Purpose

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.

12.18.4 Test

Shadow mask warping.

12.18.5 Purpose

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.

12.19 Bosch

12.19.1 Description

Special test image developed per customer specifications. This image has 6 versions.
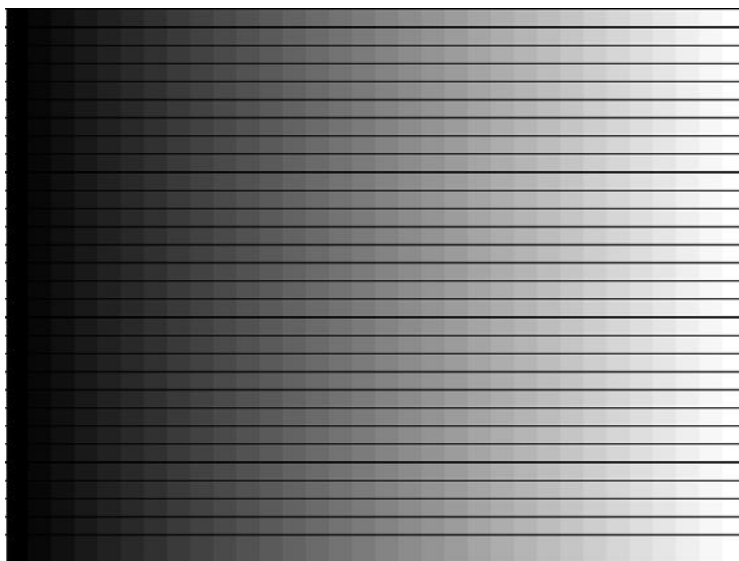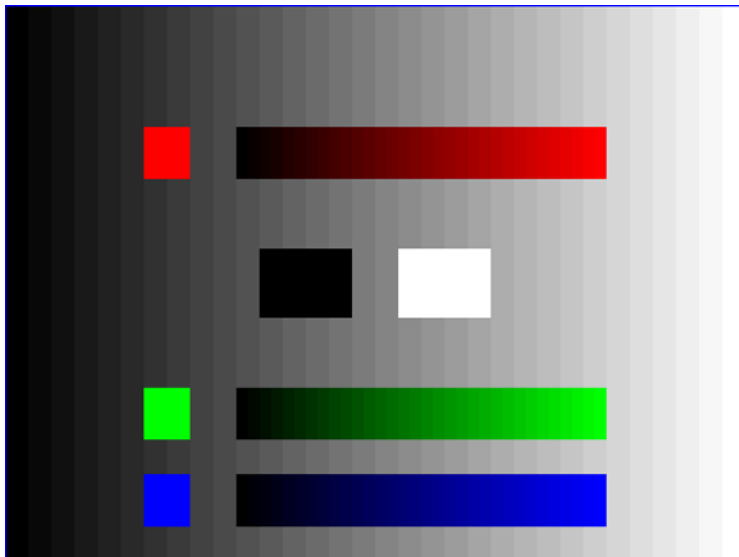
12.20 Box_50mm, Box_64mm, Box100mm, Box150mm, Box200mm, Box250mm

12.20.1 Description

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.
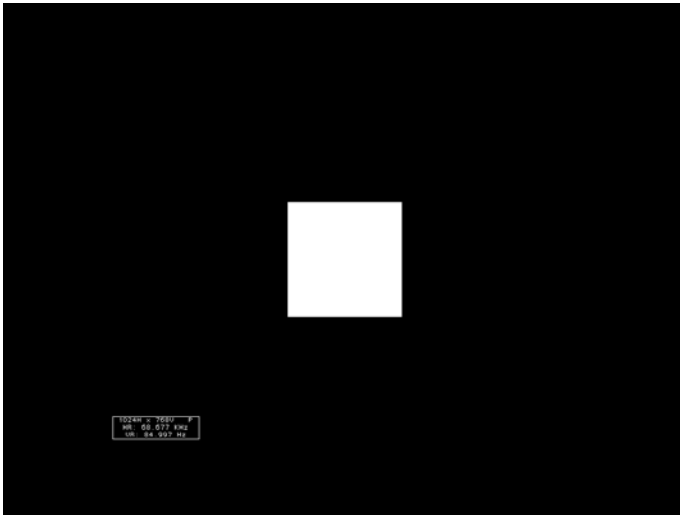
12.20.2 Test

Brightness control adjustment.

12.20.3 Purpose

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.

12.20.4 Method

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

12.21 BriteBox

12.21.1 Description

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.

12.21.2 Test

Brightness control adjustment.

12.21.3 Purpose

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.

12.21.4 Method

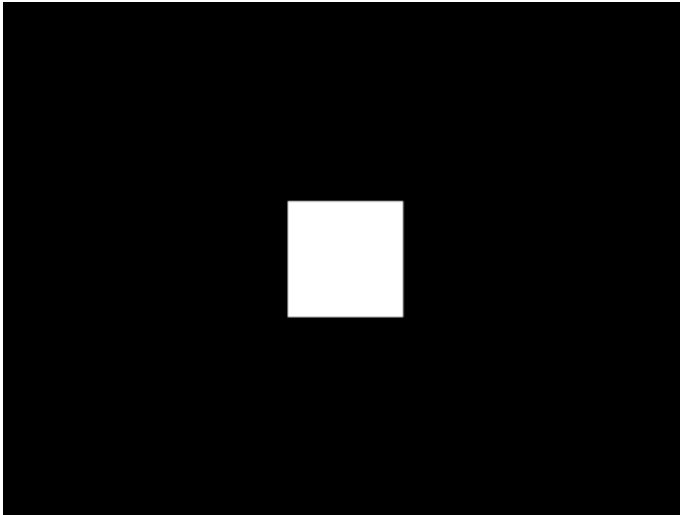Center your light meter probe within the center square and adjust the monitor's brightness control to obtain the required light meter reading.

12.21.5 Test

Brightness uniformity.

12.21.6 Purpose

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.

12.21.7 Method

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.

12.22 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.
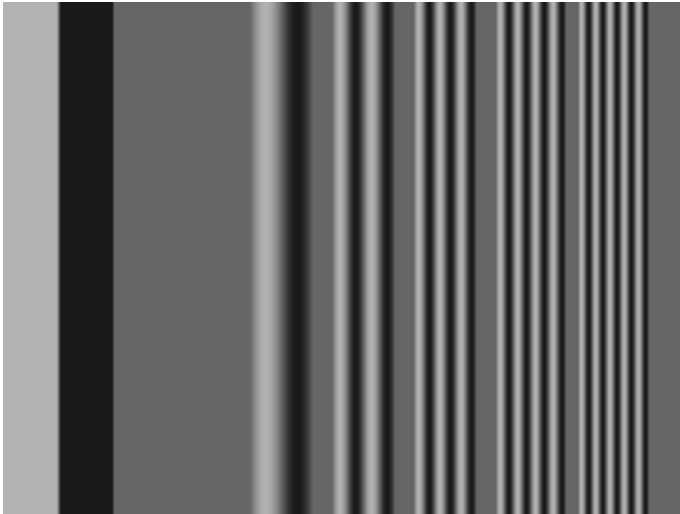
12.22.1 Test

Frequency response.

12.22.2   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.

12.23 BurstTCE

12.23.1Description

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

12.24 CECTest1, CECTest2

12.24.1 Description

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

12.25 Check511

12.25.1Description

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.
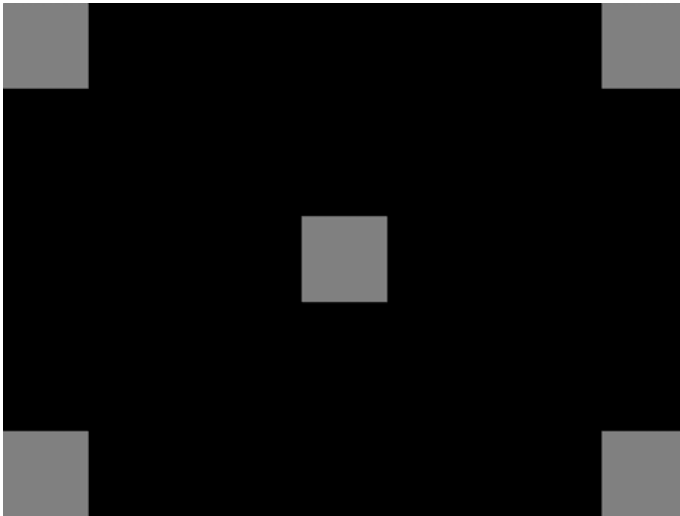
12.25.2Test

Verify monitor resolution.

12.25.3Purpose

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

12.25.4   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.*

12.26 CheckBy3

12.26.1Description

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).
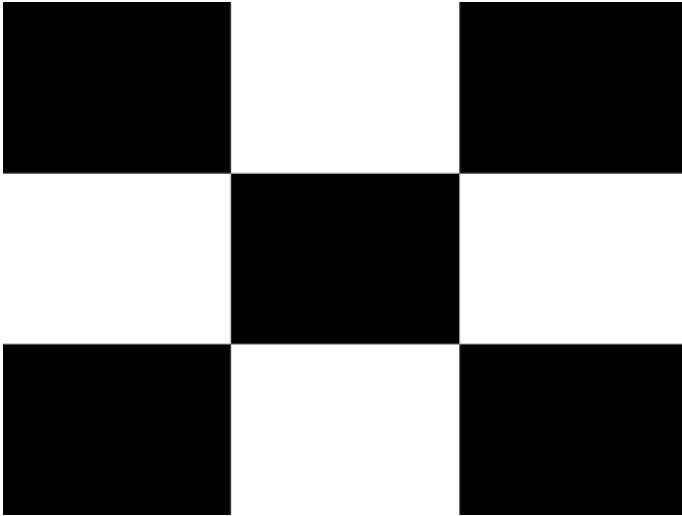
12.26.2Test

Contrast ratio.

12.26.3Purpose

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.

12.27 CheckBy6

12.27.1 Description

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).

12.27.2 Test

Contrast ratio.

12.27.3 Purpose

The pattern is based on a proposed ANSI method of measuring the contrast ratio of video projection systems.
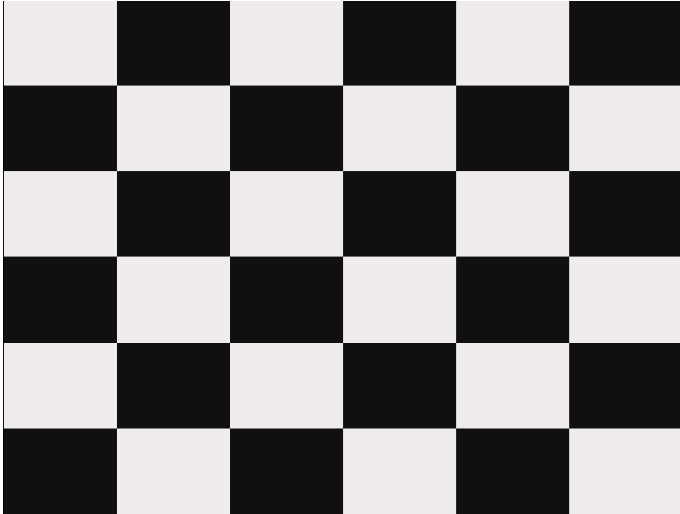
Method Using a light meter probe, measure and record the light-level reading (in foot lamberts) in the center of each of the black and white boxes. The contrast ratio is expressed as the average of all of the white readings divided by the average of all of the black readings.

12.28 Check_02

12.28.1Description

Primary version is shown below. The secondary version has reverse (black lines on white background).
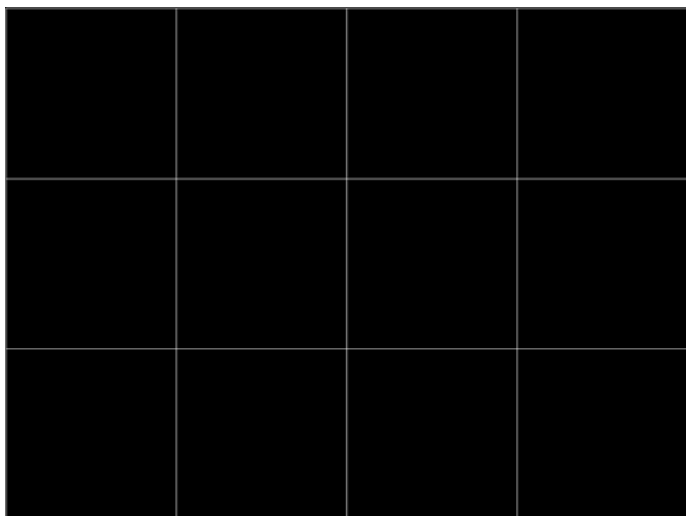
12.29 Check_11

12.29.1 Description

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.

12.29.2 Test

Verify monitor resolution.

12.29.3 Purpose

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

12.29.4   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.

12.30 Checkers

12.30.1Description

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.
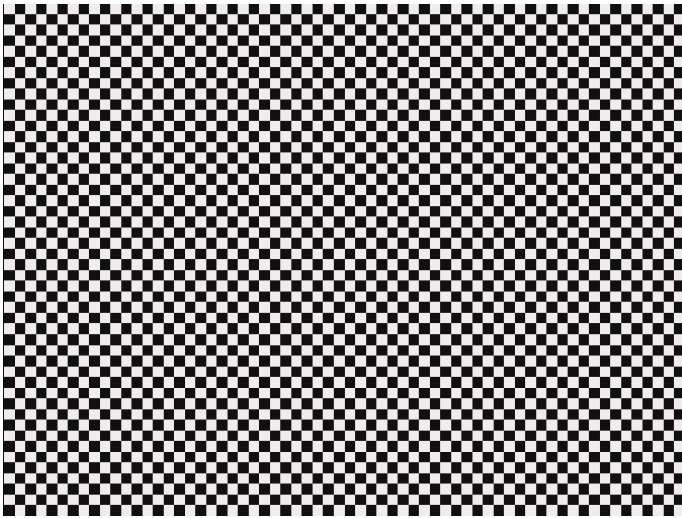
12.31 CirclesL

12.31.1 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.
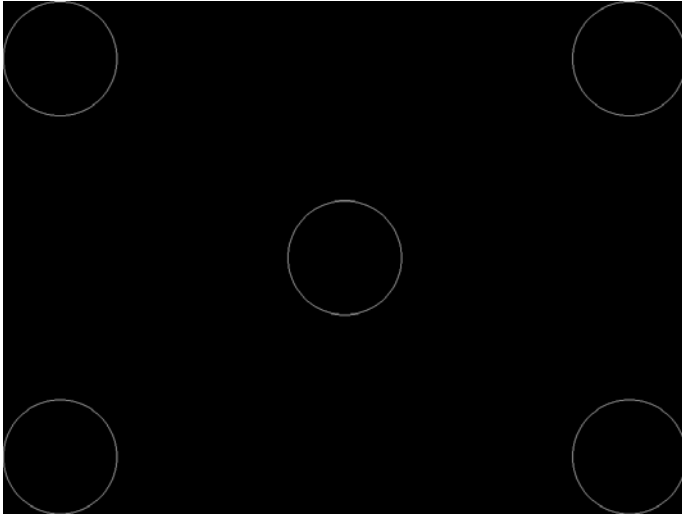
12.31.2 Purpose

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

12.32 CirclesS

12.32.1 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.
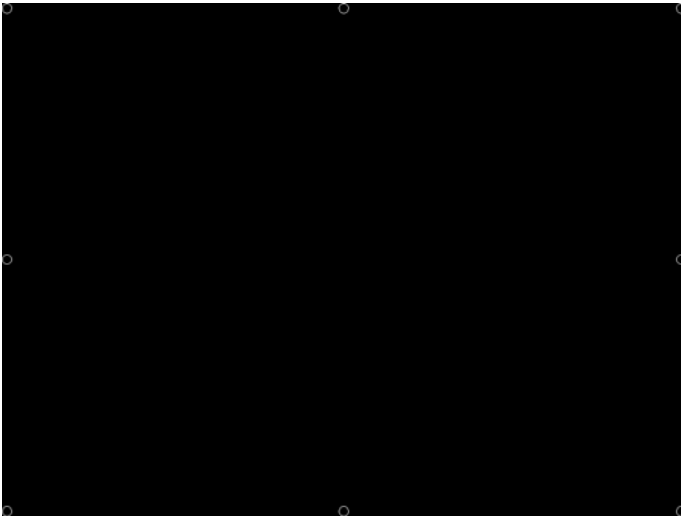

12.32.2 Purpose

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

12.33 ColorBar

12.33.1 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.*
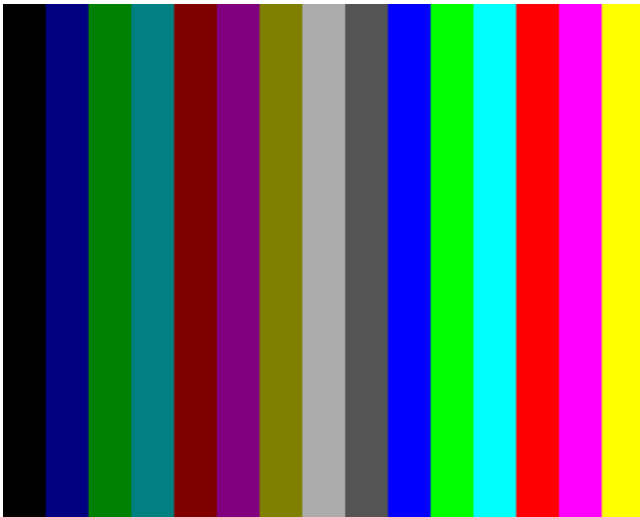
12.33.2 Test

Verify that all video channels are functional.

12.33.3 Purpose

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

12.33.4 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.

12.34 ComFocus

12.34.1Description

Special test image developed per customer specifications.
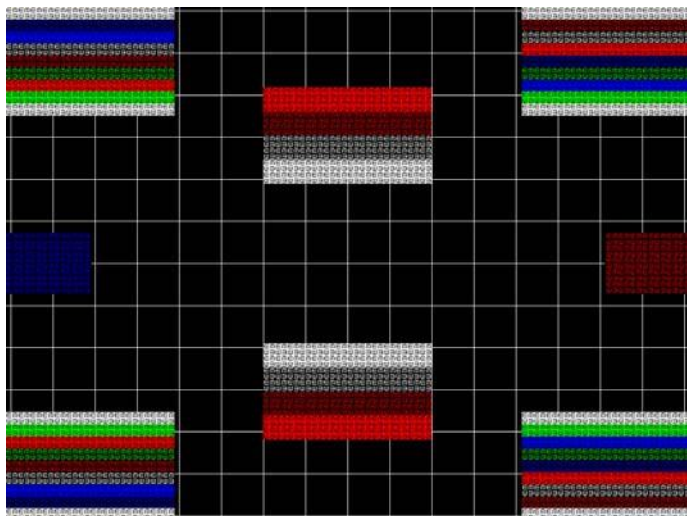
12.35 Crosshtch

12.35.1 Description

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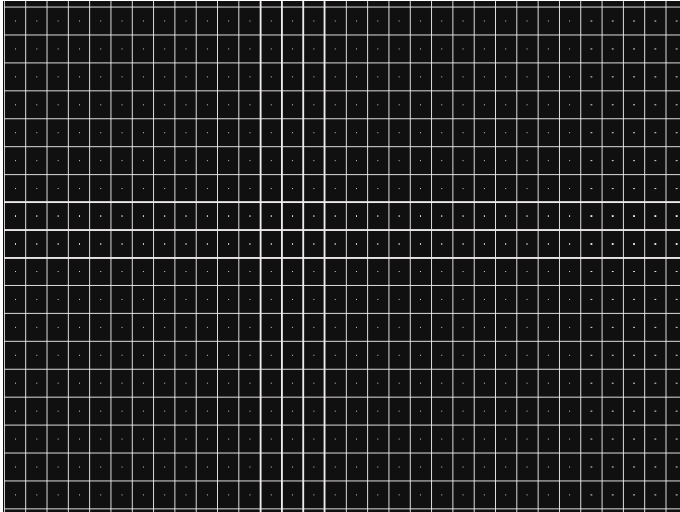
12.36 Cubes

12.36.1 Description

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.

12.36.2 Purpose

Can be used for show demonstrations with your own text.

12.37 CUBES3D

12.37.1 Description

Test image for testing 3D motion.
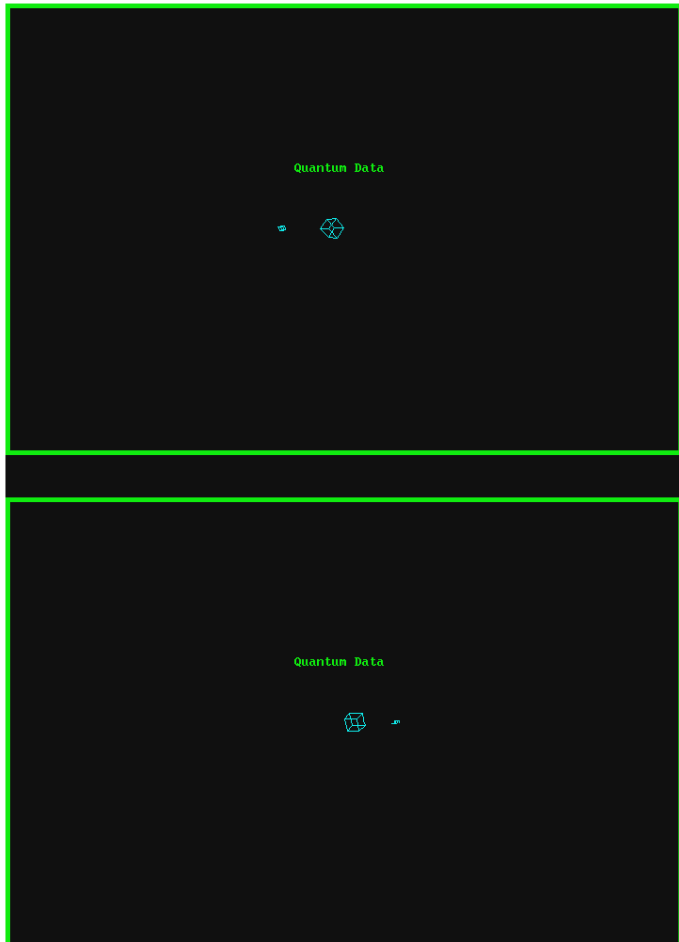
12.38 DecodAdj

12.38.1 Description

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

12.39 DecodChk

12.39.1Description

To check the color decoder performance to determine if the decoder over-emphasizes red or green colors.
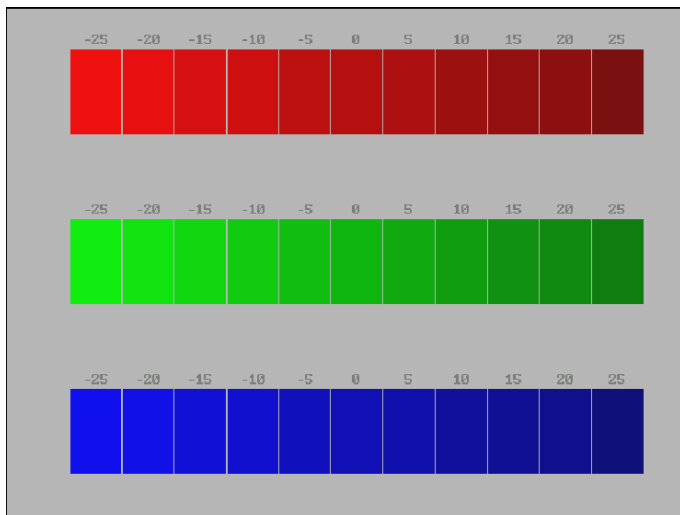
12.40 Diamond1

12.40.1 Description

Special test image developed per customer specifications.
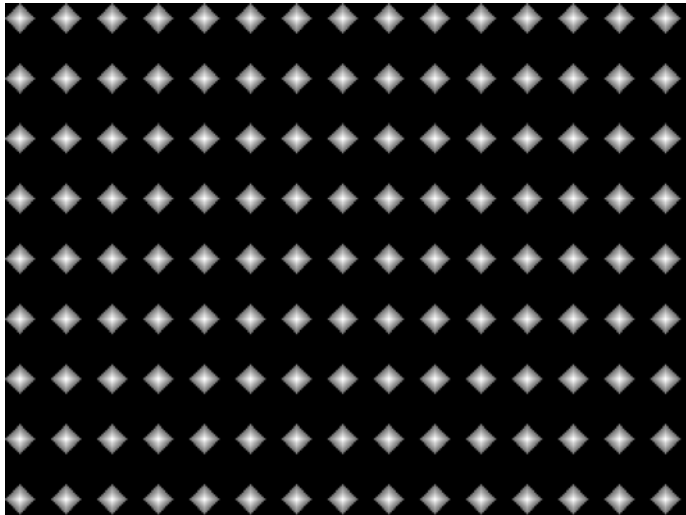
12.41 Dot1606, Dot1610, Dot1612, Dot1615, Dot1812, Dot1815, Dot2016

12.41.1 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.
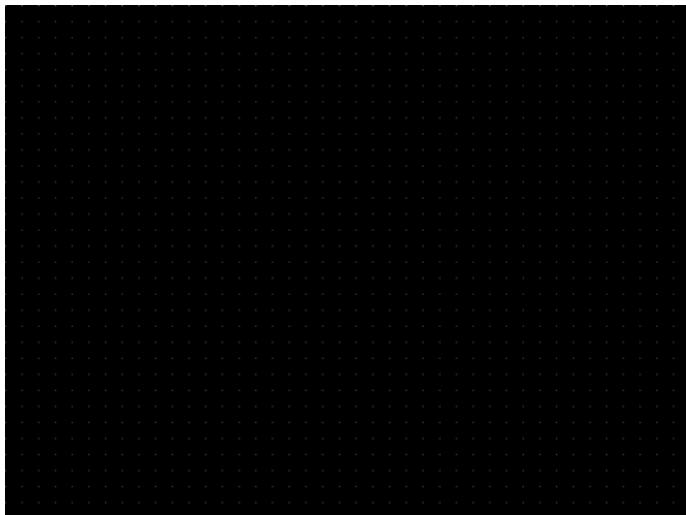
12.42 DOT_10,DOT_12,DOT24

12.42.1 Description

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	32	24

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.
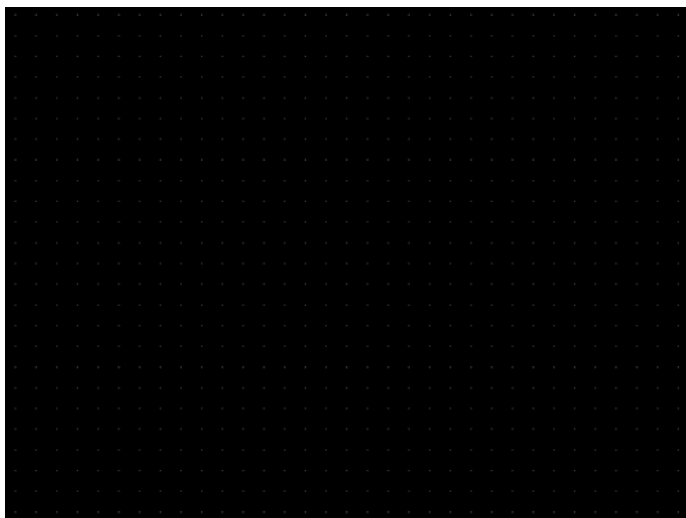
12.42.2 Purpose

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. Small dots displayed on a misconverged monitor appear as a group of multi-colored dots.

12.42.3 Method

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.

12.42.4 Test

Focus adjustments.

12.42.5 Purpose

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

12.42.6 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 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.

12.43 DV_Swing, DVSwing2

12.43.1 Description

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.*

12.43.2 Method

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.

12.44 Dyna

12.44.1 Description

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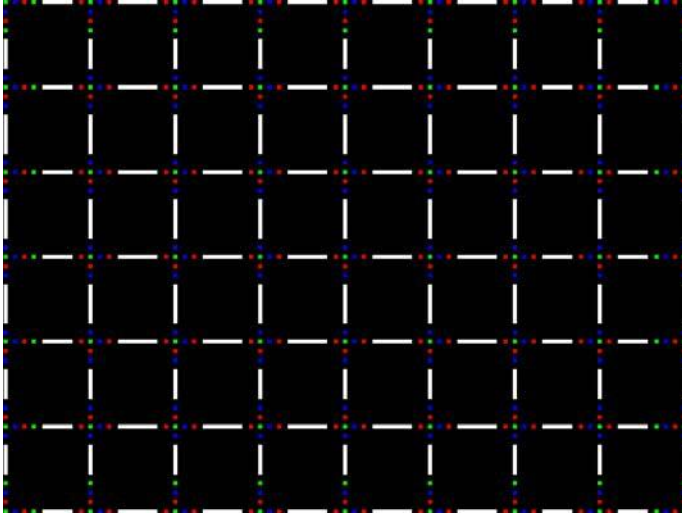
12.44.2 Description

Displays EDID from the display connected with the generator.

12.45 EdidData, Edid2

12.45.1Description

Displays EDID from the display connected with the generator.

12.46 EdidHdmi1, EdidHdmi2

12.46.1 Description

Displays EDID from the HDMI display connected with the generator.
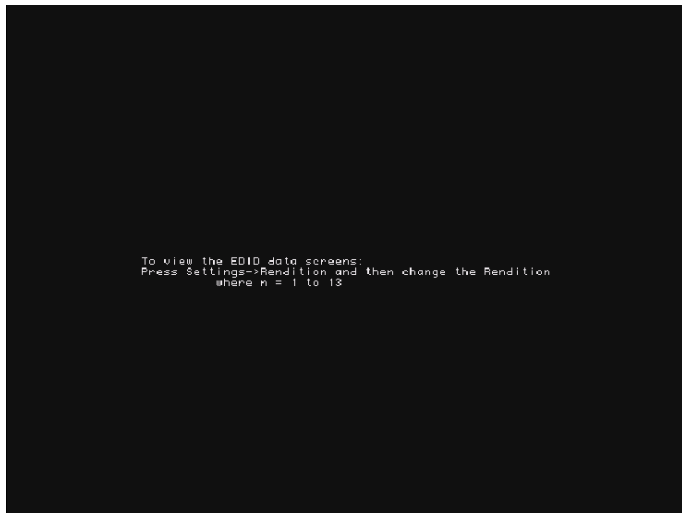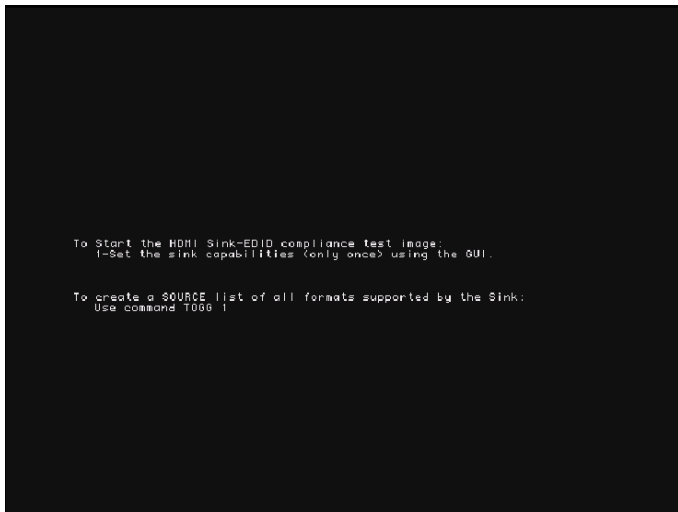
12.47 Elbit

12.47.1 Description

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

12.48 EMITest1 , EMITest3 , EMITest3 , EMITest4 , EMITest5

12.48.1 Description

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.

12.49 Examples

12.49.1Description

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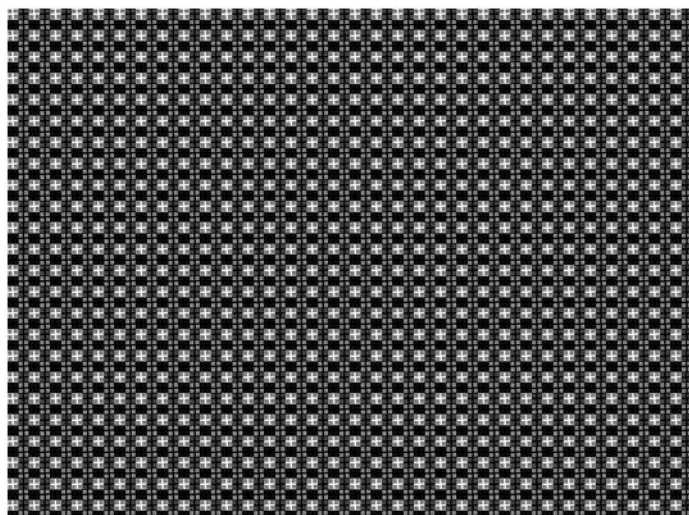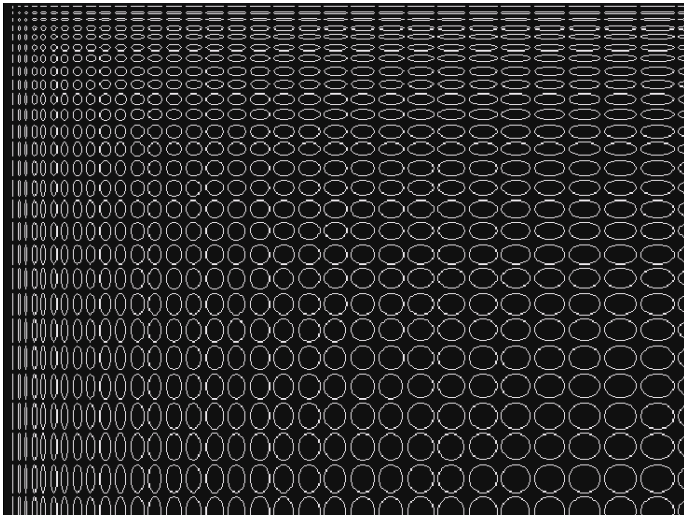
12.50 Flat, Flat07, Flat13, Flat20, Flat27, Flat33, Flat40, Flat47, Flat53, Flat60, Flat67, Flat73, Flat80, Flat87, Flat93, FlatGray, Flat_01, Flat_02, Flat_03, Flat_04, Flat_05, Flat_06, Flat_07, Flat_08, Flat_09, Flat_10, Flat_11, Flat_12, Flat_13, Flat_14, Flat_15, Flat_16

12.50.1 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.

12.51 Flat_B, Flat_G, Flat_R

12.51.1Description

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

12.52 FlashRGB

12.52.1 Description

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

12.53 Focus20

12.53.1 Description

Primary version shown below. The secondary version has black characters on a white background.
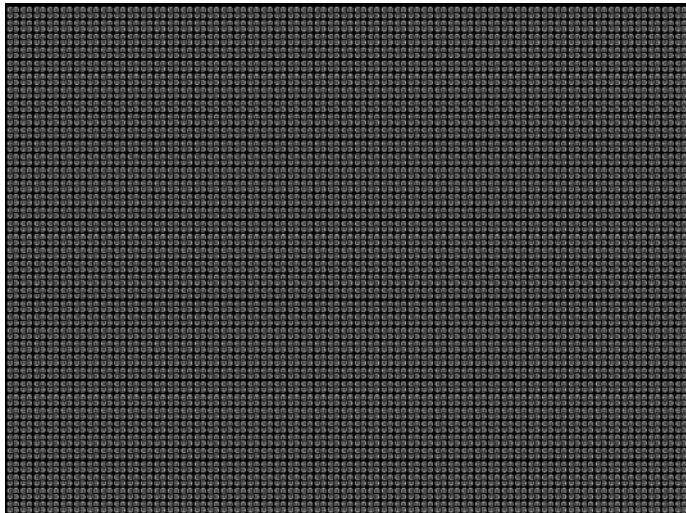
12.54 FocusC14

12.54.1 Description

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

12.55 FocusCCx

12.55.1 Description

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

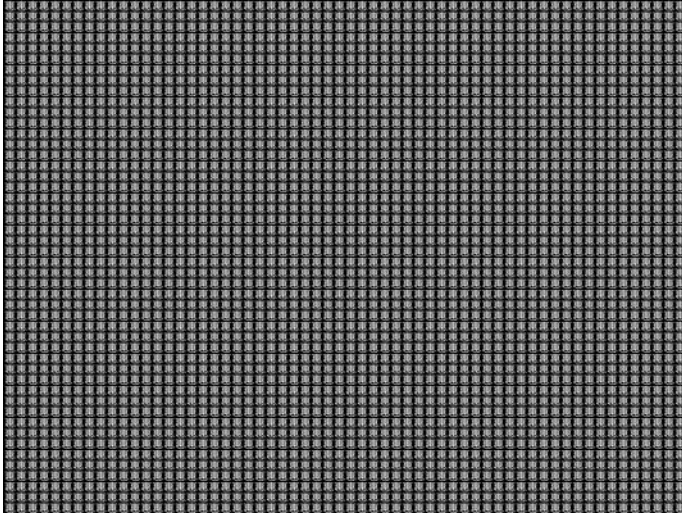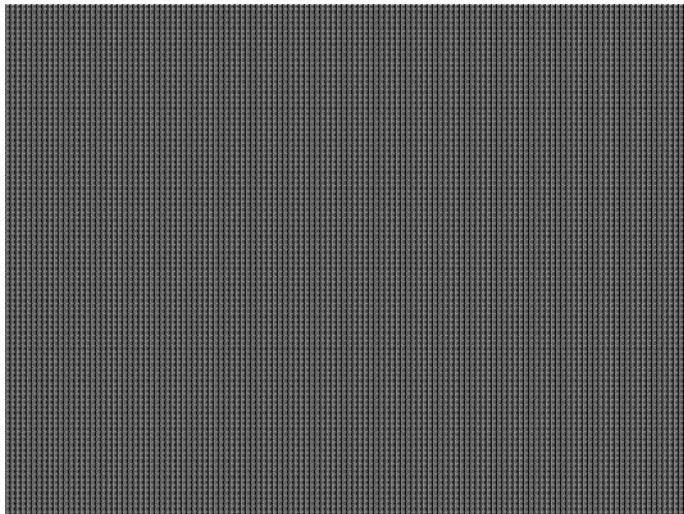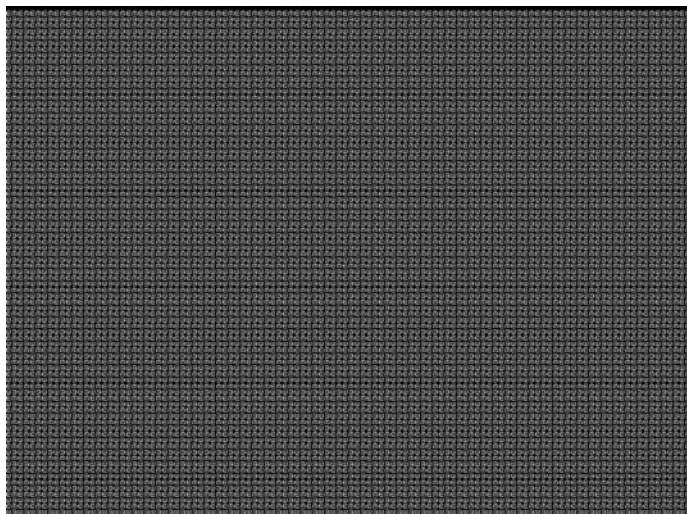## 12.56 FocusEM

12.56.1 Description

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

12.57 FocusEMP

12.57.1 Description

Primary version shown below. The secondary version has black characters on a white background.
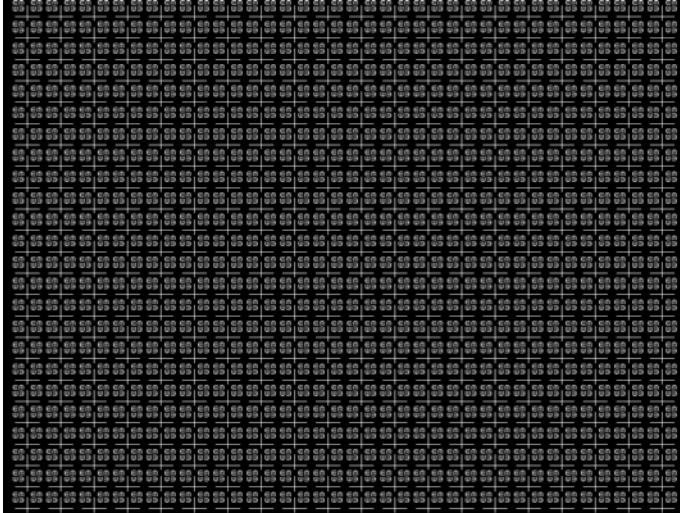
12.58 FocusM00 - FocusM15

12.58.1 Description

The FocusM00 image is shown below.
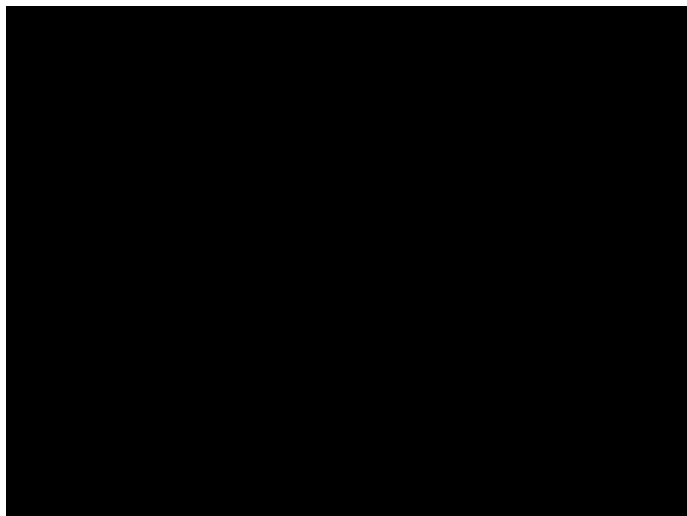
12.59 Focus_@6, Focus_@7, Focus_@8, Focus_@

12.59.1 Description

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.
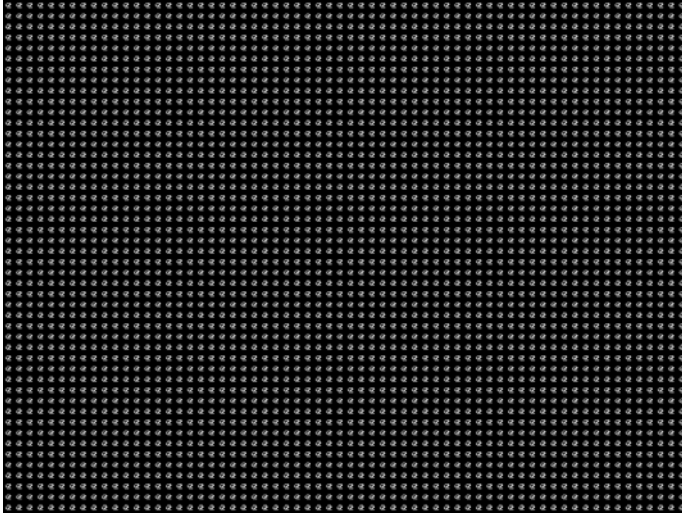
12.59.2 Test

Focus adjustments.

12.59.3 Purpose

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

12.59.4 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.

12.60 Focus_Cx

12.60.1 Description

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.

12.60.2 Test

Focus adjustments.

12.60.3 Purpose

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

12.60.4   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.

12.61 Focus_H

12.61.1 Description

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.

12.61.2 Test

Focus adjustments.

12.61.3 Purpose

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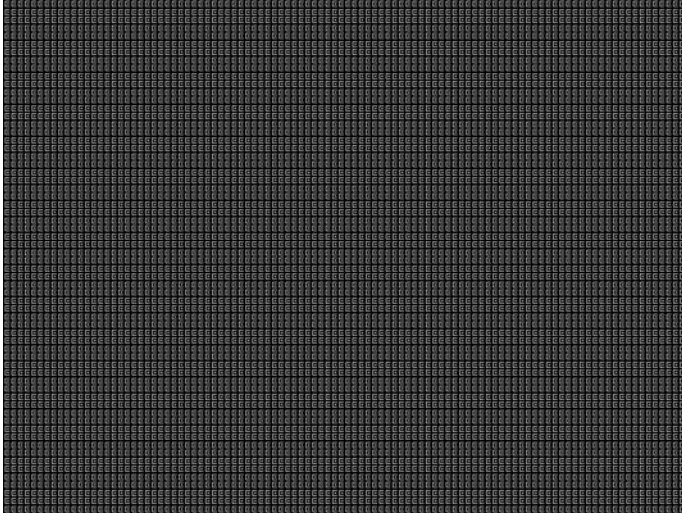
12.61.4   Method

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.

12.62 Focus_MM

12.62.1Description

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.

12.63 Focus_Oo

12.63.1 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.

12.63.2 Test

Focus adjustments.

12.63.3 Purpose

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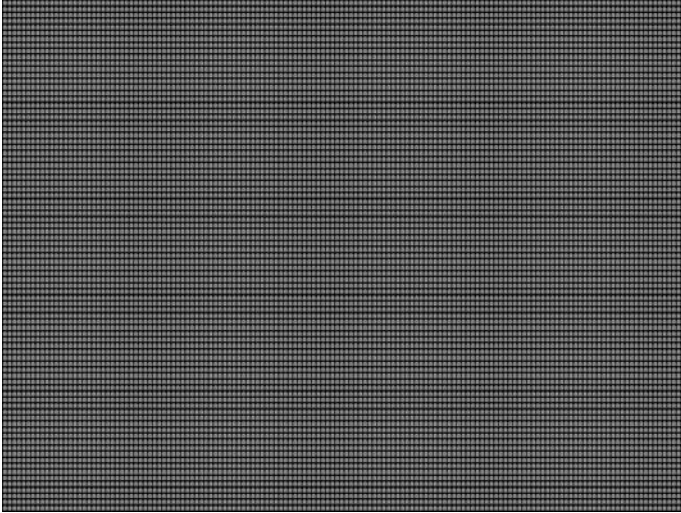
12.63.4 Method

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.

12.64 FontViewer

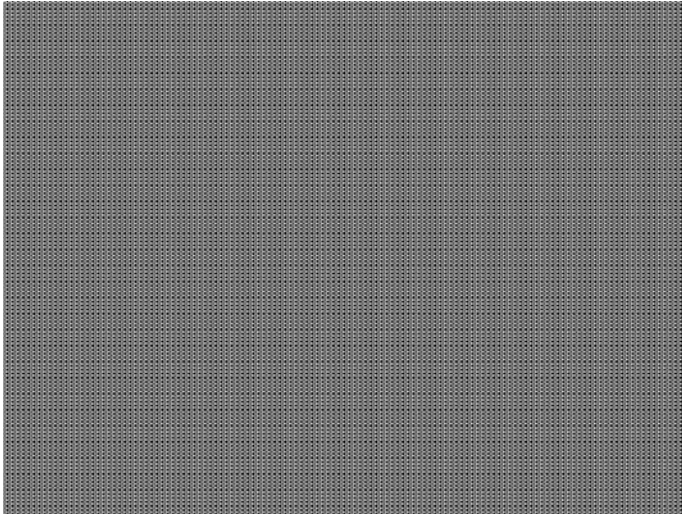### 12.64.1   Description

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).
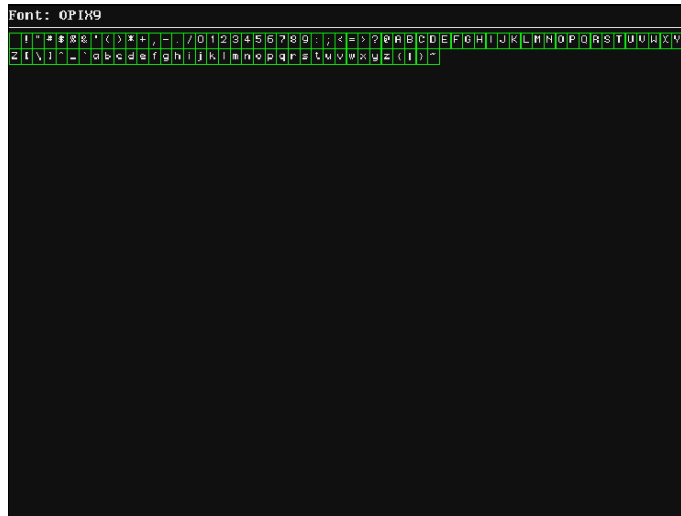
12.65 Format

12.65.1   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.

```
Name: DMT0660                                    Pixel Rate:
Location:  151                       25.200 MHz       39.683 ns
Entry units:  Machine
                        Horizontal              Vertical
Rate:            31.500 KHz*          60.000 Hz
Active:            640 pixels*   25.397 us    480 lines*    15.238 ms
Blank:             160 pixels     6.349 us     45 lines      1.429 ms
Period:            800 pixels*   31.746 us    525 lines*    16.667 ms
Physical size:  11.200 inches   284.480 mm   8.400 inches  213.360 mm
Pulse delay:        16 pixels     0.635 us     10 lines      0.317 ms
Pulse width:        96 pixels     3.810 us      2 lines      0.063 ms
EQ Before:                                      0 lines
EQ After:                                       0 lines
Scan:           Progressive (non-interlace)
ACS kind:       American ORed                 On: -G-
DCS kind:       American ORed
DSS kind:       American separate             DS Polarity: H- V- C-
Sync select:    DSS                           DS Gate: Hon  Von  Con
Video kind:     Analog RGB (color)            Pedestal: OFF  7.5 IRE
Video bias:      0.000 volts blank minus ground
Video swing:     0.700 volts white minus blank
Sync swing:      0.300 volts blank minus sync
Gamma:          OFF     2.200
Display code expected:    E Code read: F
```
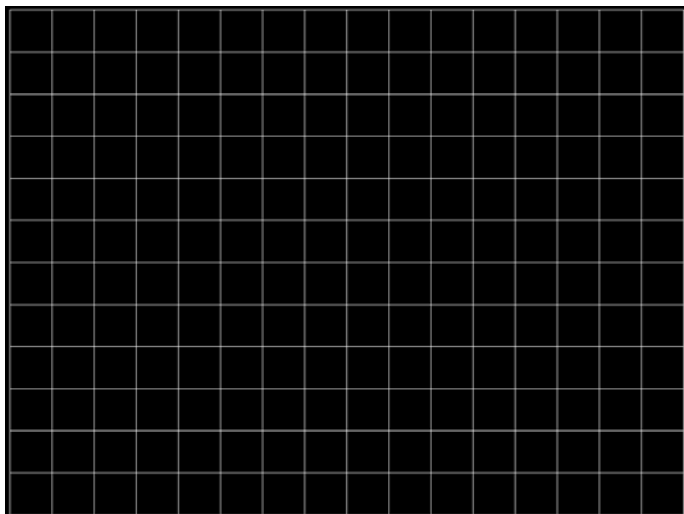
12.66 Geom_1 – Geom_5

12.66.1 Description

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

12.67 Gray25, Gray40
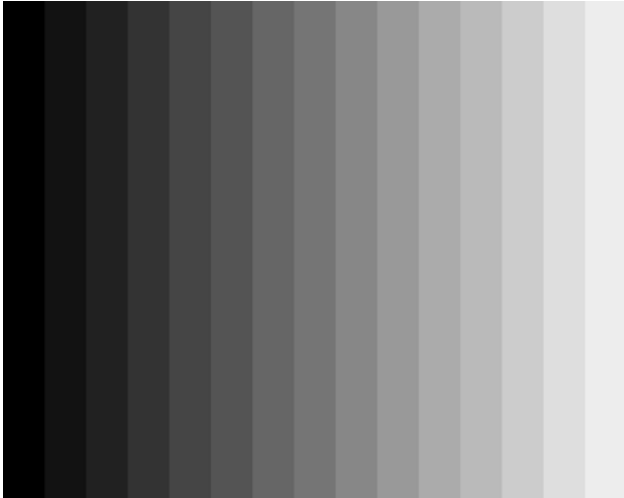
12.67.1 Description

The Gray25 image is shown below.

12.68 GrayBar

12.68.1 Description

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.

12.68.2 Test

Video color tracking (color monitors)

12.68.3 Purpose

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

12.68.4 Method

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.

12.68.5 Test

Video gain linearity (monochrome monitors)

12.68.6 Purpose

To check the video linearity (grayscale) modulation)

12.68.7 Method

Perform the Brightness Control Adjustment and Brightness Uniformity tests first.

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

12.69 GrayL1, GrayL3

12.69.1Description

The GrayL1 image is shown below.

12.70 Grays5, Grays9, Grays11, Grays16, Grays32, Grays64

12.70.1 Description

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

The Grays11 image is shown below.
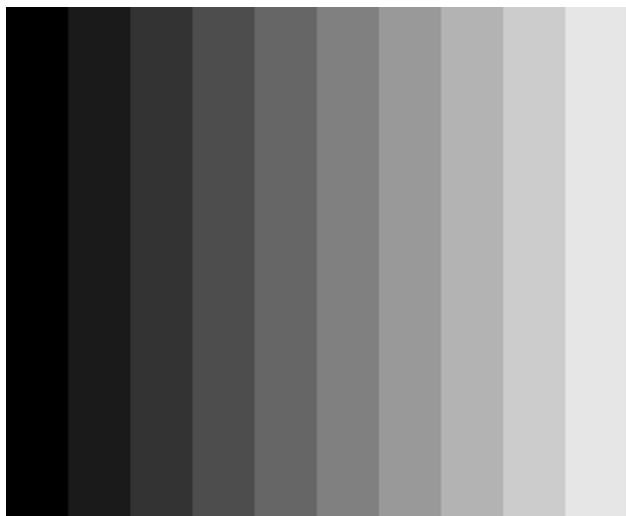
12.71 GraysAll

12.71.1Description

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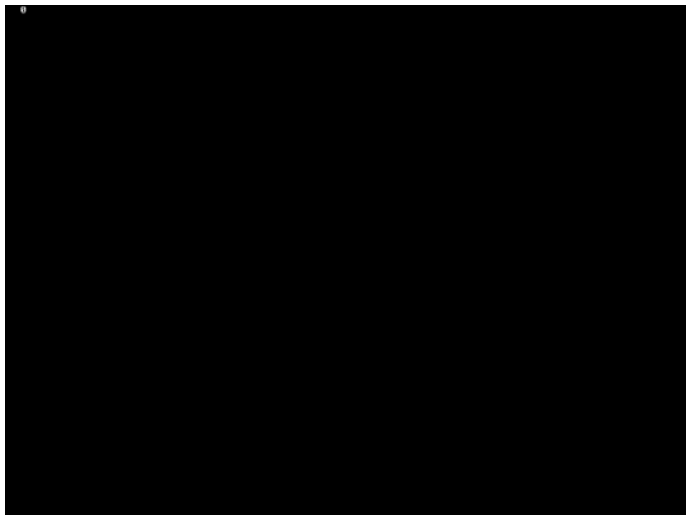
12.72 GraysMHL

12.72.1Description

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

12.73 Gray_PIC

12.73.1 Description

A solid gray box fills the active video area.

12.74 Grill_11, Grill_15, Grill_22, Grill_33, Grill_44

12.74.1 Description

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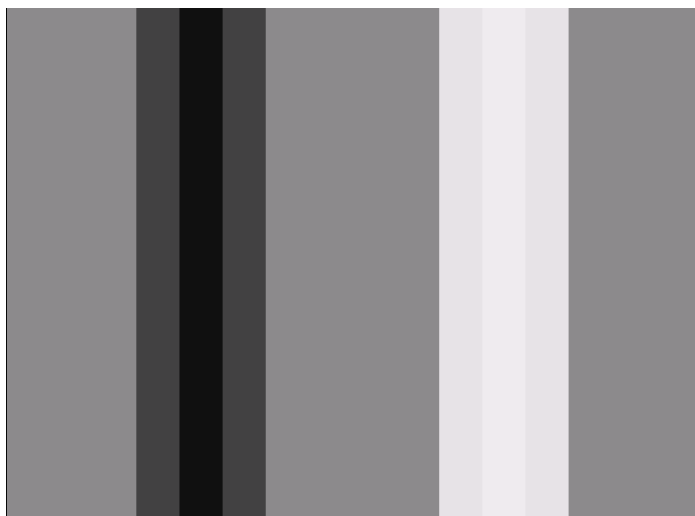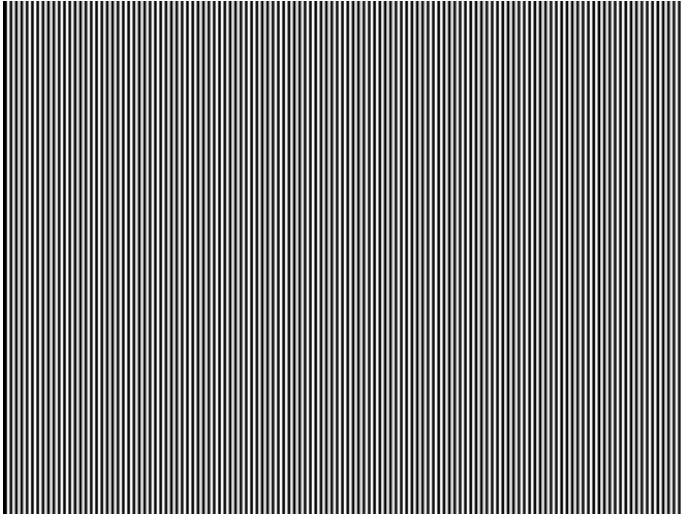
The primary versions draw vertical stripes. The secondary versions draw horizontal stripes. The primary version of the Grill_44 image is shown below.

12.74.2 Test

Verify monitor resolution.

12.74.3 Purpose

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

12.74.4 Method

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.*

12.75 GRN_EM, GRM_EM+, GRN_HTCH, GRN_PIC

12.75.1 Description

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.

12.76 H_Stair

12.76.1 Description

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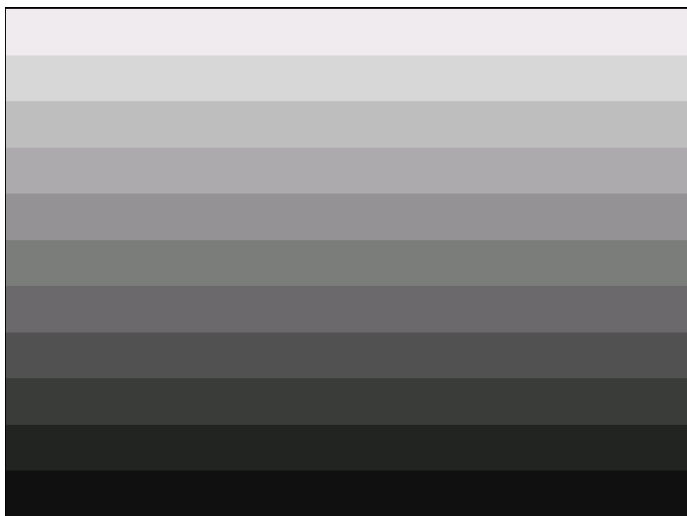
12.77 HalfArea

12.77.1Description

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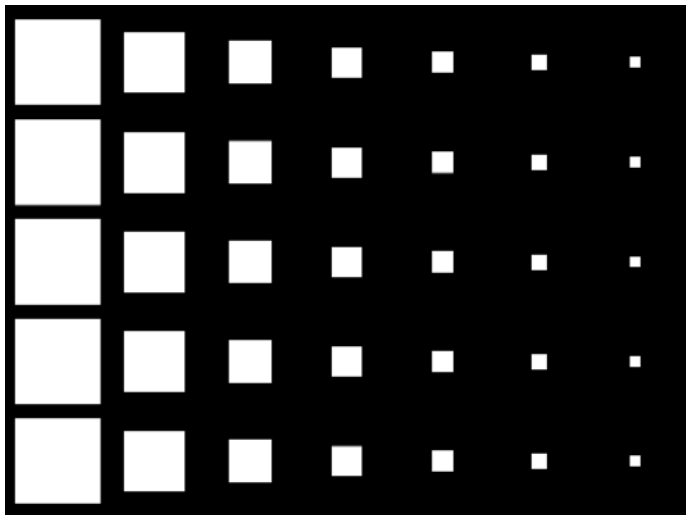
12.78 HalfClk

12.78.1 Description

12.79 Hat1606, Hat1610, Hat1612, Hat1615

12.79.1 Description

Primary version of Hat1606 is shown below. Secondary version is inversed.
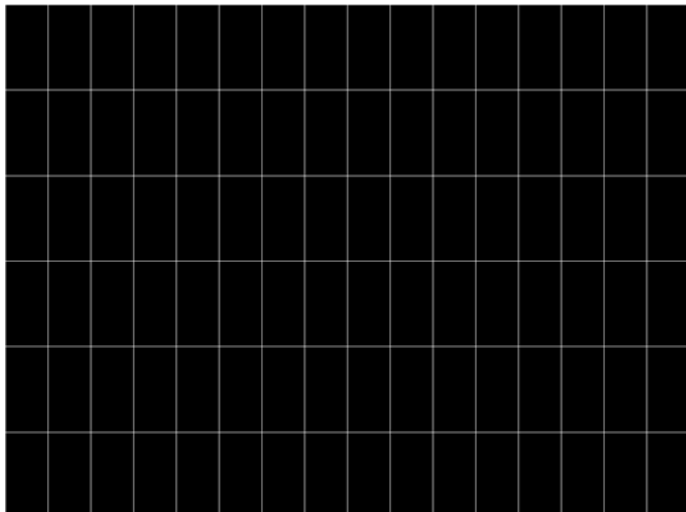
12.80 Hat1606A, Hat1610A, Hat1612A, Hat1615A

12.80.1Description

Primary version of Hat1606A is shown below. Secondary version is inversed.
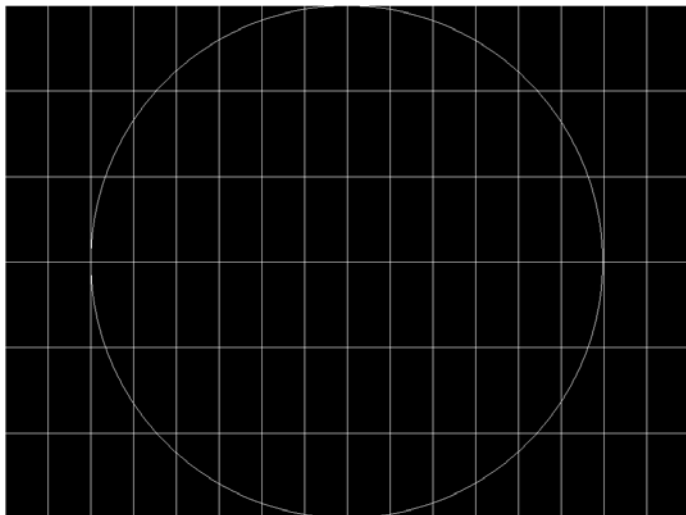
12.81 Hat1812, Hat1815

12.81.1 Description

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

12.82 Hat1812A, Hat1815A

12.82.1 Description

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

12.83 Hat2016

12.83.1 Description

Primary version is shown below. Secondary version is inversed.

12.84 Hat2016A

12.84.1 Description

Primary version is shown below. Secondary version is inversed.

12.85 Hatch_6, Hatch_10i, Hatch_10o, Hatch_12i, Hatch_12o, Hatch_24i, Hatch_24o, Hatch_24s, Hatch_G, Hatch_M, GRN_HTCH, and MAGENTA
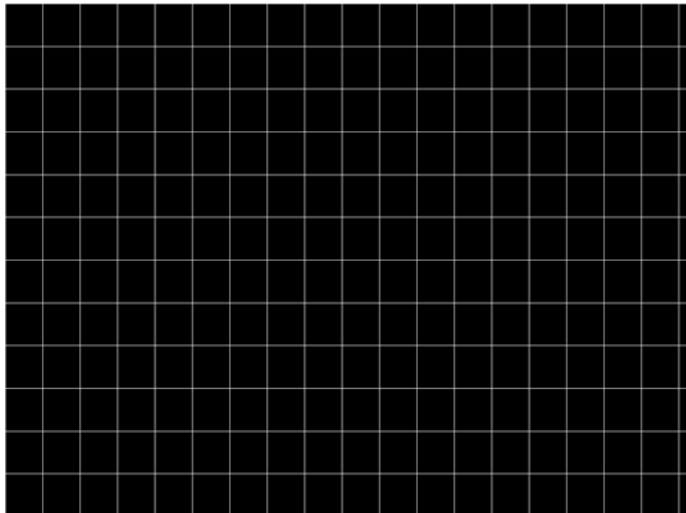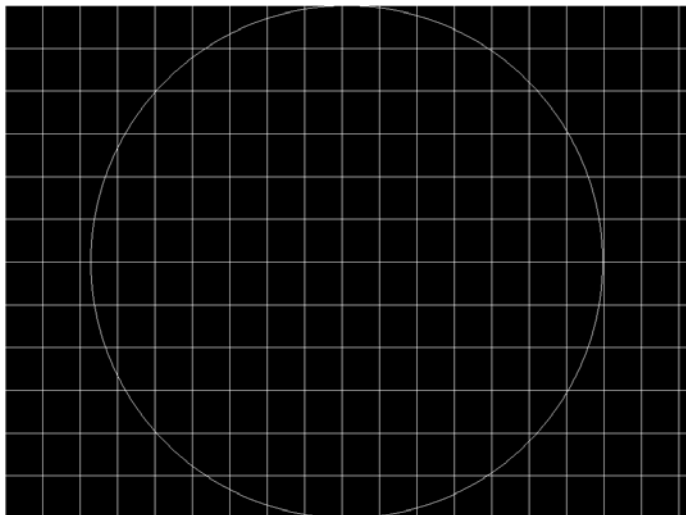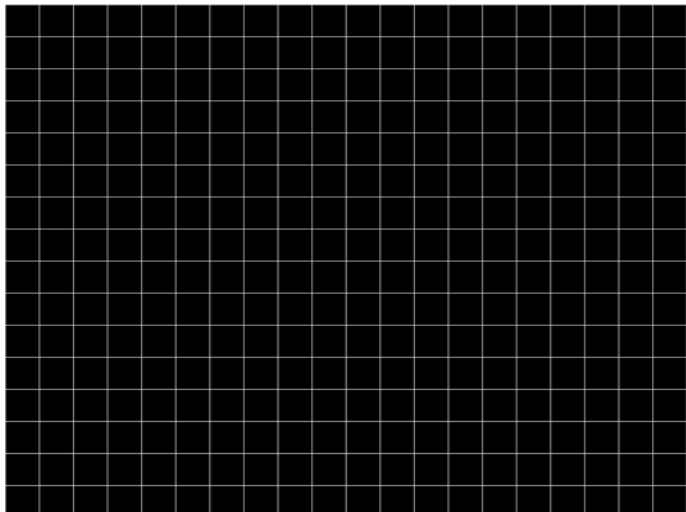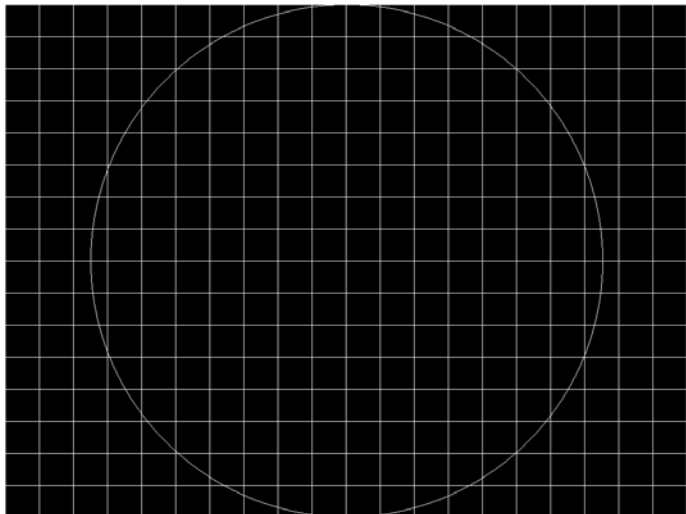
12.85.1 Description

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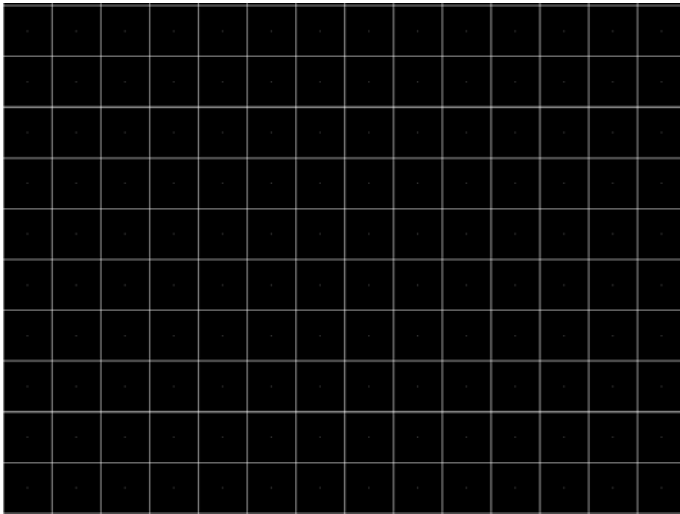
Aspect Ratio		Dot_10		Dot_12		Dot_24	
W : H	Decimal	Boxes Vertically	Boxes Horizon-tally	Boxes Vertically	Boxes Horizon-tally	Boxes Vertically	Boxes Horizon-tally
16 : 9	1.777 É	10	16	10	16	18	32
5 : 3	1.666 É	10	16	10	16	18	30
4 : 3	1.333 É	10	14	12	16	24	32
1 : 1	1.000	10	10	12	12	24	24

| 3 : 4 | 0.750 | 14 | 10 | 16 | 12 | 32 | 24 |

12.85.2 Test

Convergence adjustment (color monitors only).

12.85.3 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 misconverged monitor appear as several multi-colored lines, and the transitions between different colored areas contain fringes of other colors.

12.85.4 Method

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.

12.86 Hatch_16, Hatch_20

12.86.1 Description

The primary version of the Hatch_16 image is shown below. The secondary versions draw black lines on a white background.
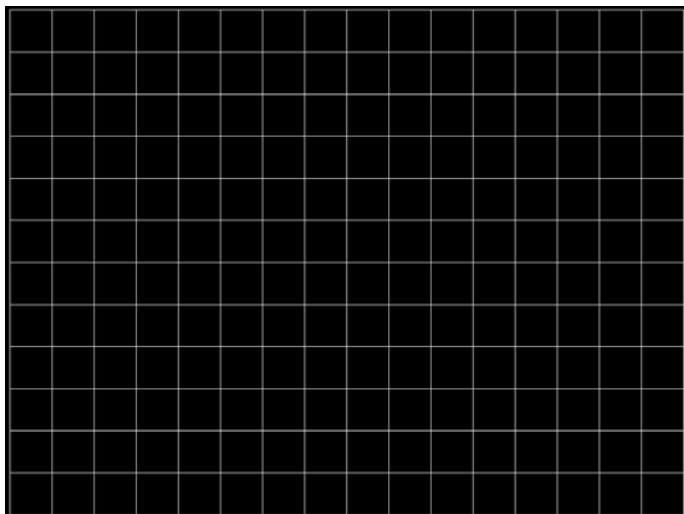
12.87 Hatch20

12.87.1Description

Primary version shown. The secondary version draws black lines on a white background.
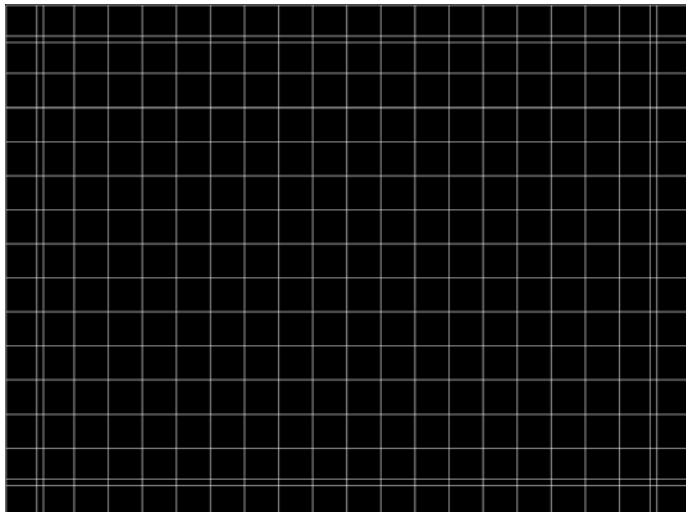
12.88 Hatch4x3, Hatch5x4 and Hatch8x8

12.88.1 Description

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.
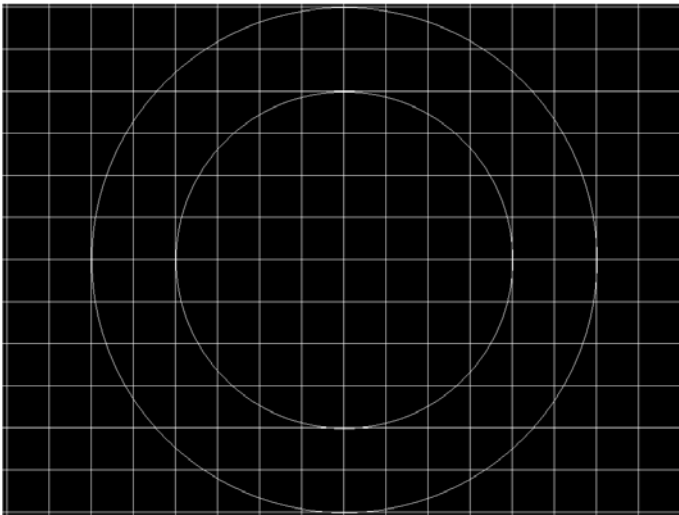
12.88.2 Purpose

This is a general purpose test image that can be used to check and adjust video scan linearity and geometry and color convergence.

12.89 Hatch64W

12.89.1 Description

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.

12.89.2 Purpose

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.

12.90 HdcpProd, Hdcp2

12.90.1 Description

Used with HDCP feature.

12.91 Hitatchi

12.91.1Description

Special test image developed per customer specifications. The image consists of a 2x2 cluster of Microsoft Windows® screen simulations using Japanese characters.
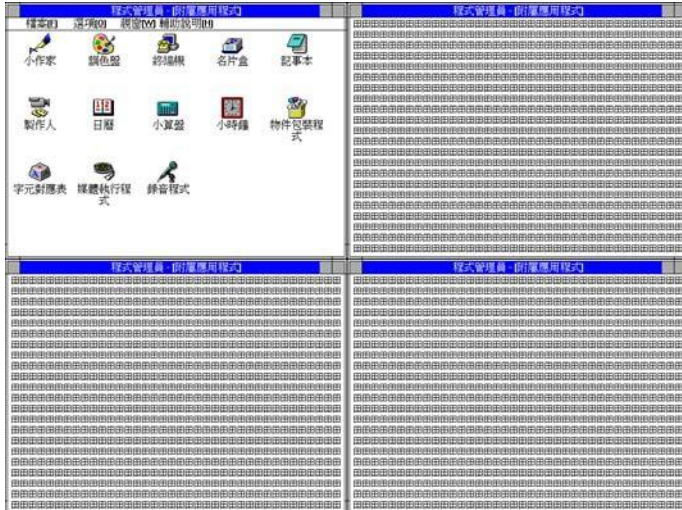
12.92 HiLoTrk

12.92.1 Description

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.
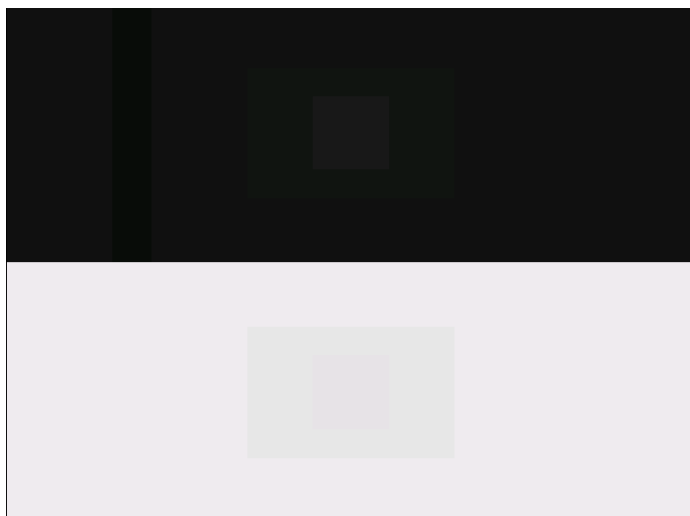
12.93 HSVnRGB

12.93.1Description

12.94 Imex1

12.94.1Description
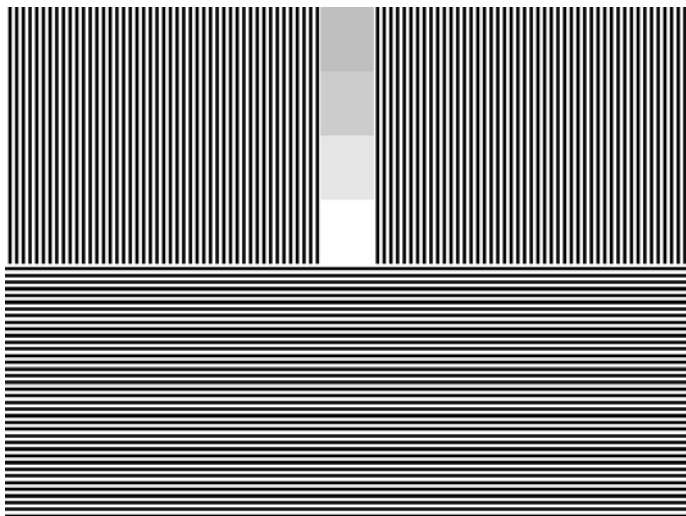
12.95 InFocus1

12.95.1 Description

Special test image developed per customer specifications.
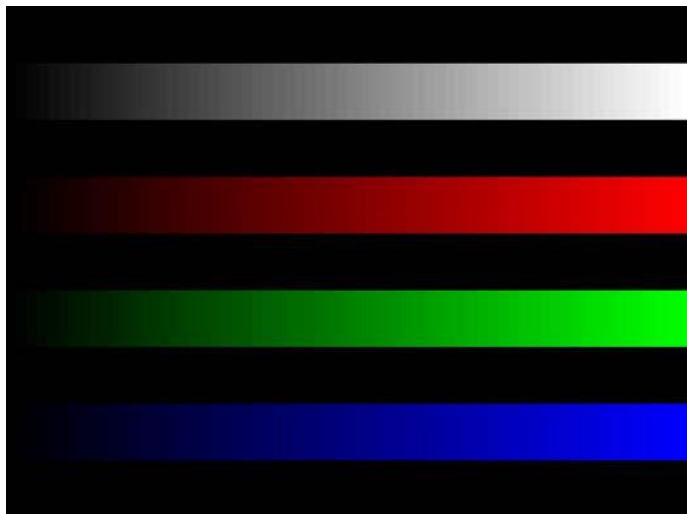
12.96 InFocus2

12.96.1 Description

Special test image developed per customer specifications.

12.97 KanjiKAN

12.97.1 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.
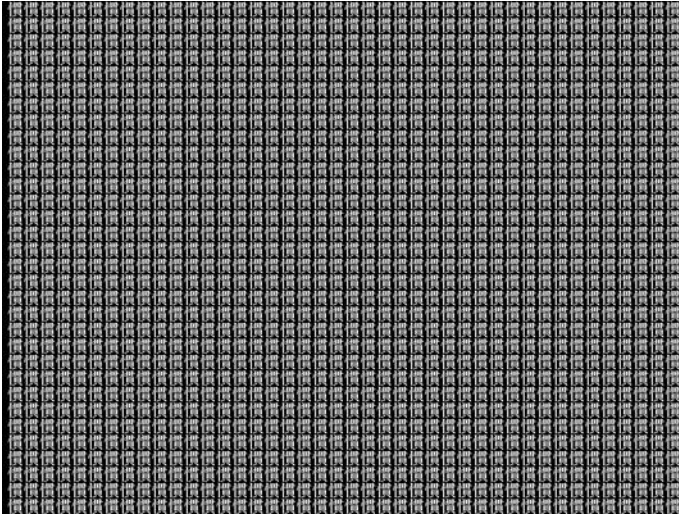
12.97.2 Test

Focus adjustments.

12.98 L80

12.98.1Description

Special test image developed per customer specifications. Each image has three versions. The primary version of the LGLCDTVB image is shown below.

12.99 LGLCDTVB, LGLCDTVG, LGLCDTVR, LGLCDTVW

12.99.1Description

Special test image developed per customer specifications. Each image has three versions. The primary version of the LGLCDTVB image is shown below.

12.100   LGRamp

12.100.1   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.

12.101   Linearty (Linearity)

12.101.1   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.

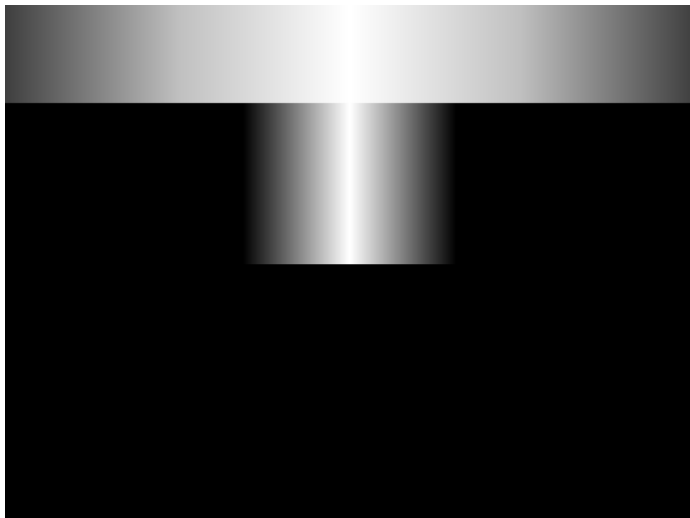The second part of the image consists of a white crosshatch. The number of boxes in the crosshatch depends on the physical size of the display.

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.
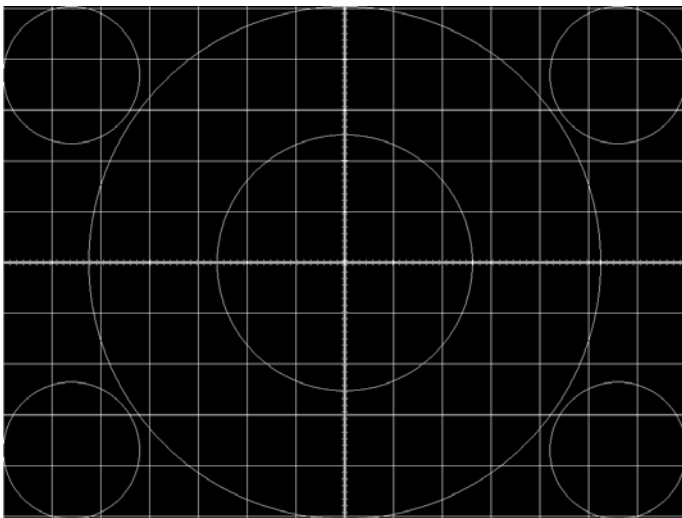
12.101.2   Test

Linearity adjustment.

12.101.3   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.

12.101.4   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.

12.102   LinFocus

12.102.1   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.
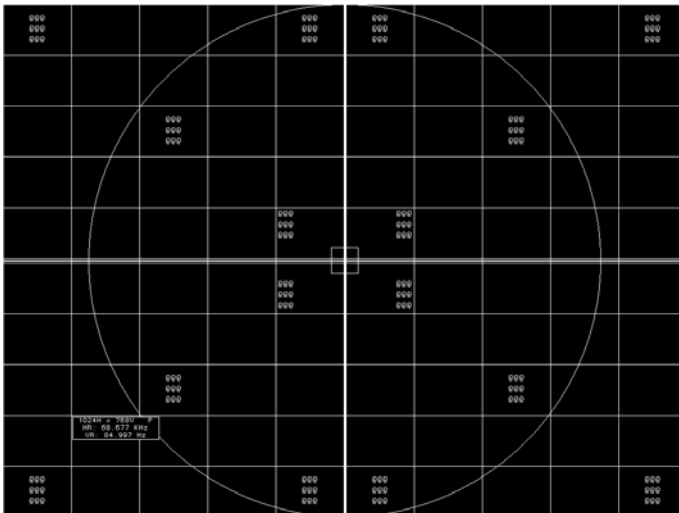
The image also includes blocks of focus-checking characters at various locations. The blocks are positioned inside the crosshatch boxes and are up to 3x3 characters in size. The size of the blocks is limited by the number of characters that can fit in one box.

12.102.2   Test

Linearity adjustment

12.102.3   Test

Focus adjustment.

12.102.4   Purpose

An out-of-focus monitor displays fuzzy graphic images and poorly formed, hard-to-read characters when text is displayed on the screen.

12.102.5 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.

12.103   LipSync, LipSyncB

12.103.1   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.
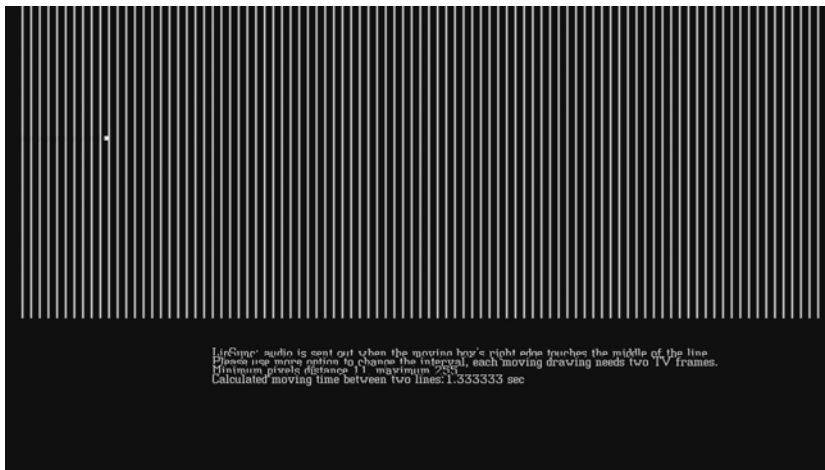
12.104 MAGENTA

12.104.1 Description
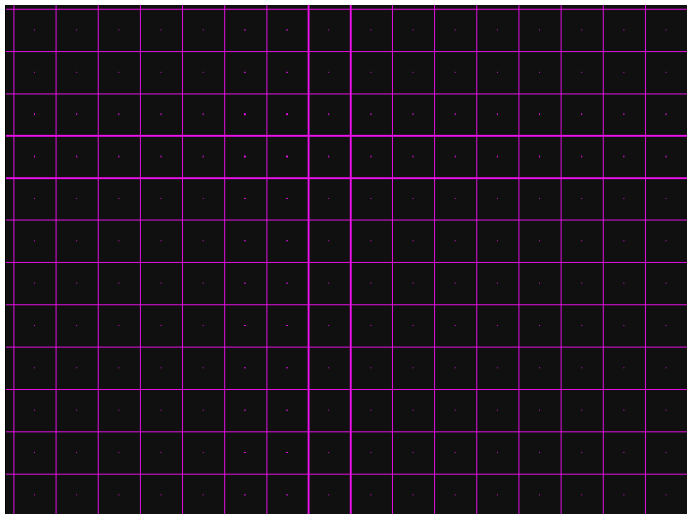
12.105   Master

12.105.1   Description
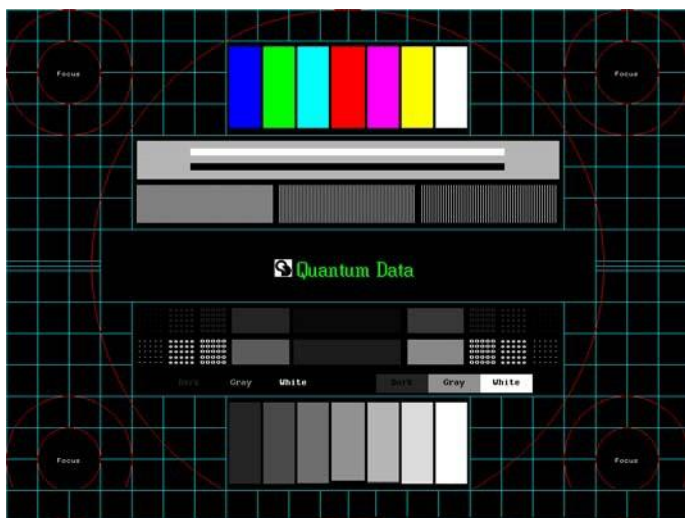
12.106   MESony_R, MESony_G, MESony_B,

12.106.1   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.
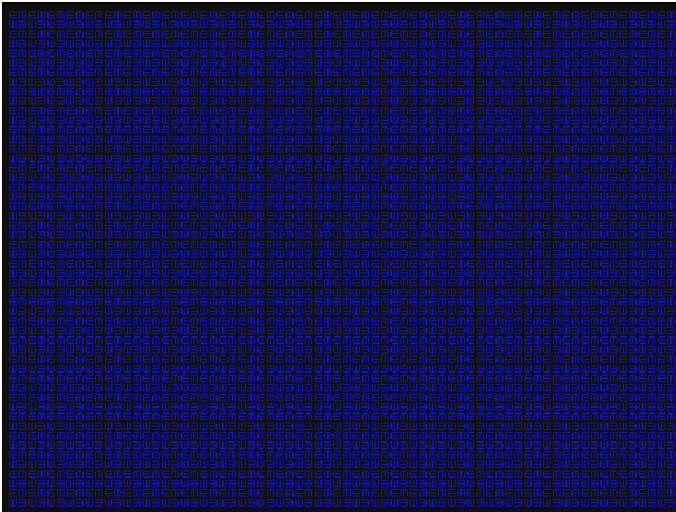
12.107   MEMEPlus, MEPlus_B, MEPlus_G, and MEPlus_R

12.107.1   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.
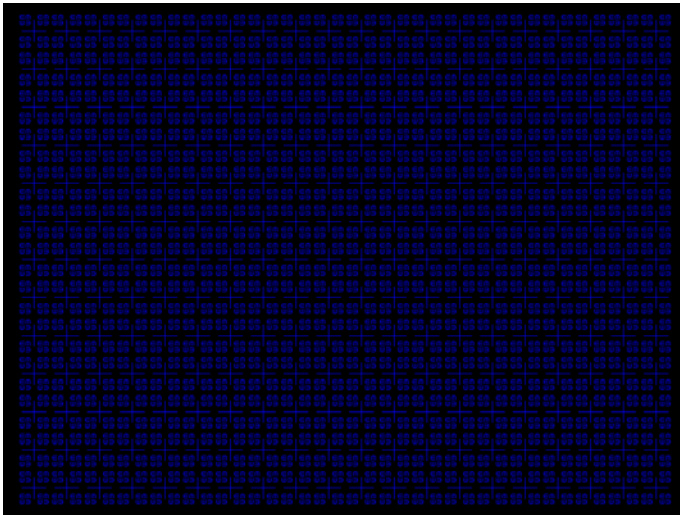
12.107.2   Test

Focus.

12.107.3   Purpose

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

12.108   MnslCLR

12.108.1   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.
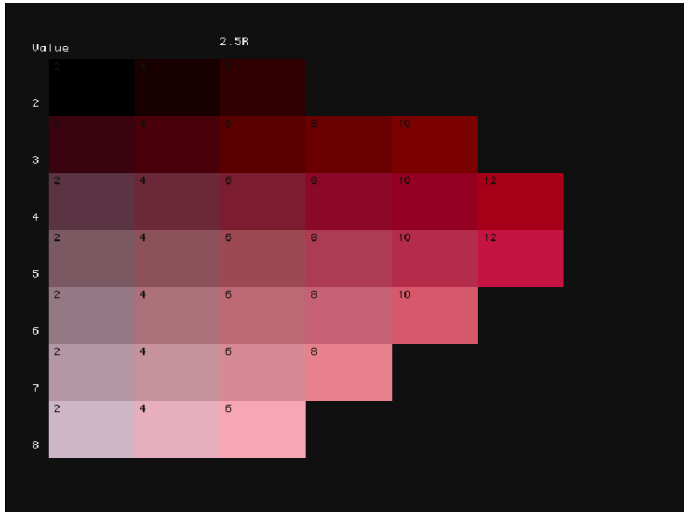
12.109   MnslGM

12.109.1   Description

This is a color checker image with 24 colors arranged in a checker board.

12.110   MnslPG

12.110.1   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.
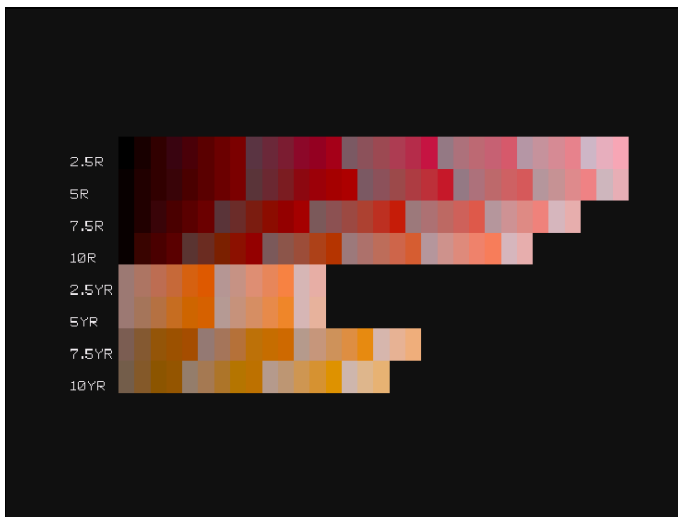
12.111   MoireX, MoireX33, MoireY, MoireY33

12.111.1   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.
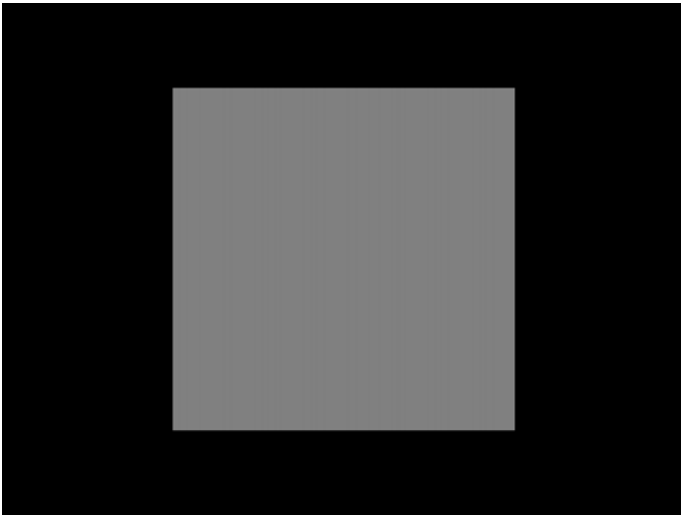
12.112   Monoscope

12.112.1   Description
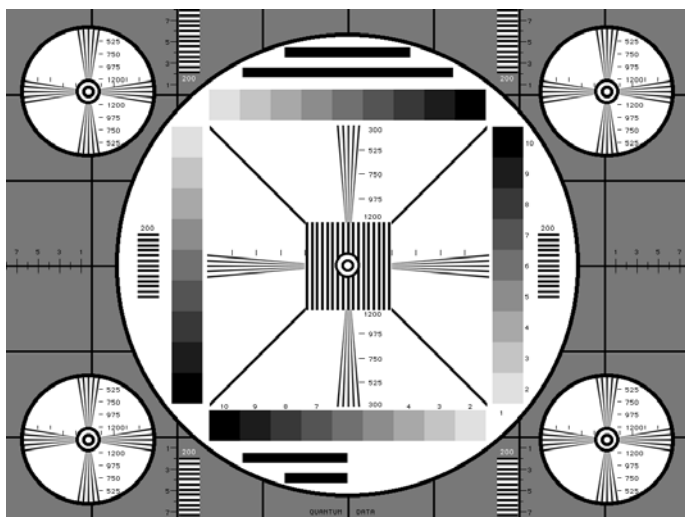
12.113   MSony7, MSony8

12.113.1   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.
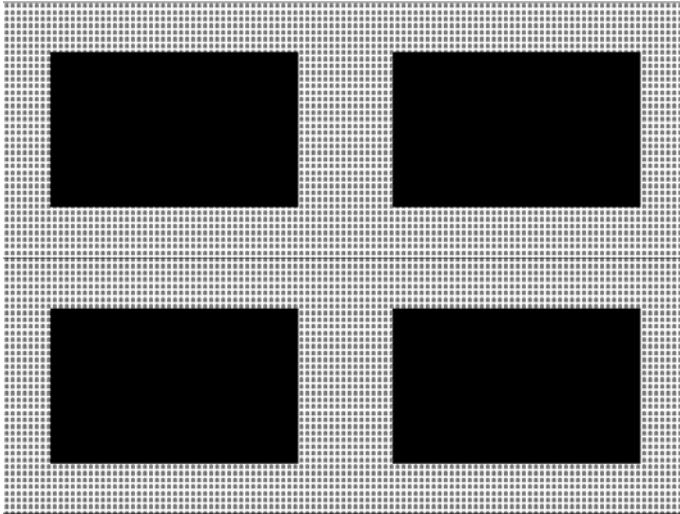
12.114   MulBurst

12.114.1   Description
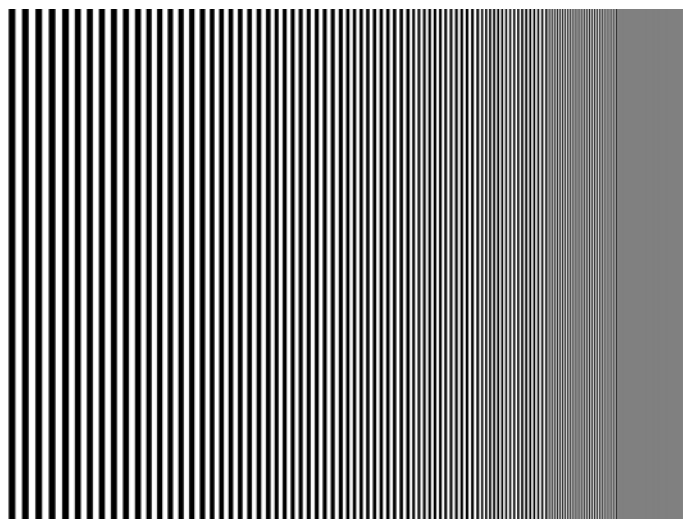
12.115 Needle

12.115.1 Description

To check and adjust for the proper geometry of display including picture centering, size, pincushion and linearity
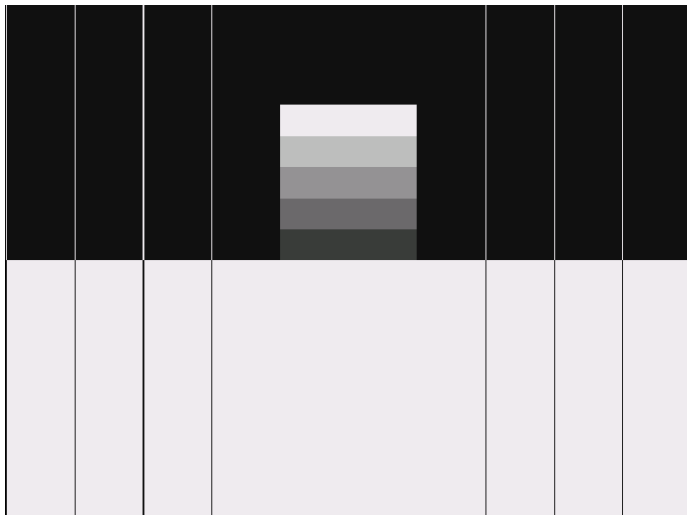
12.116   Orion

12.116.1   Description

This image provides a color bar that rotates (shifts) the bars to the right on an incremental basis.
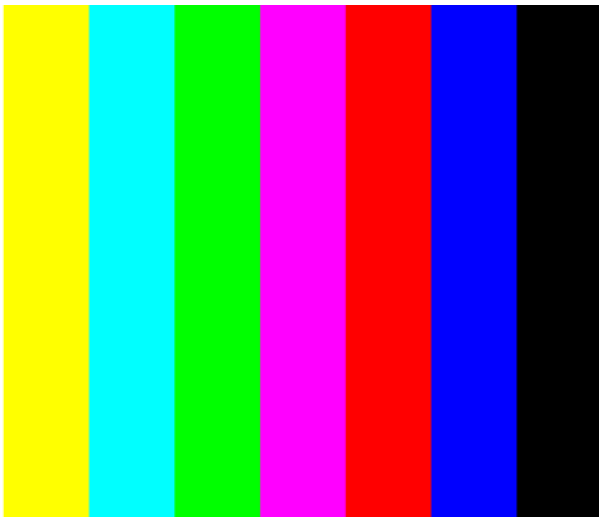
The color bars are shifted to the right at 3 second intervals. You can access additional renditions to adjust the interval between 3, 10, 30 and 60 seconds through the **Settings/Rendition** dialog box.

12.117   Outline0, Outline1, Outline2, Outline3

12.117.1   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.
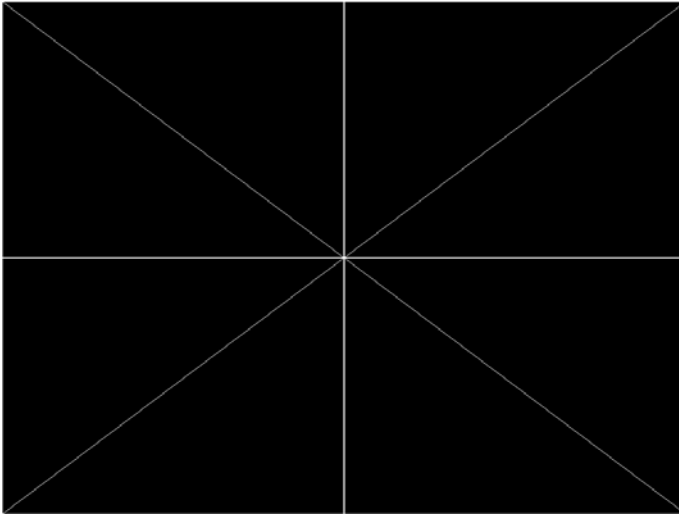
In the Outline1 version, the two diagonal lines are removed and short marker lines are added to the border lines near to where the cross lines meet the border lines. The markers appear at both sides of the cross lines. The distance between the marker lines and the cross lines is the greater of either two (2) pixels or one (1) millimeter.
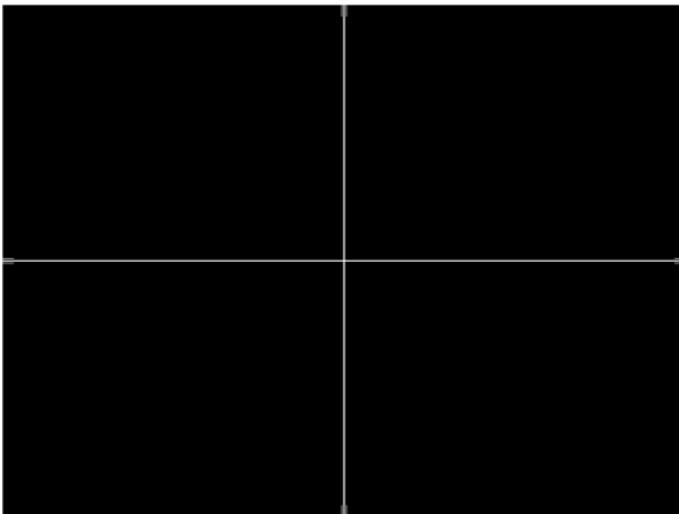
In the Outline2 version, the two diagonal lines are removed and short marker lines are added to the corners, and where cross lines meet and end.
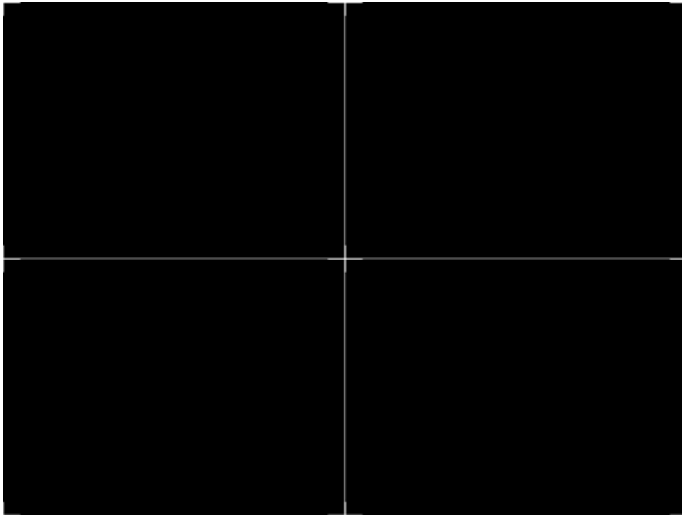
In the Outline3 version, the two diagonal lines are removed, cross lines are shortened, and short marker lines are added.
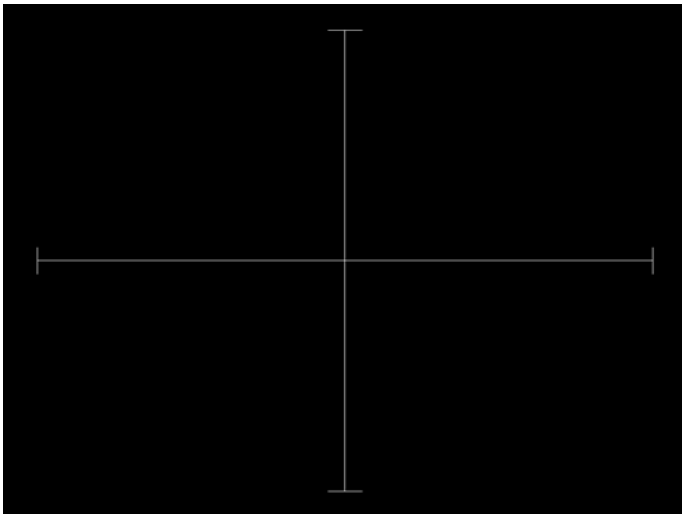
12.117.2   Test

Yoke tilt correction.

12.117.3   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.

12.117.4   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.

12.117.5 Test

Yoke winding orthogonality check.

12.117.6 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.

12.117.7 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.

12.117.8 Test

Display size correction.

12.117.9 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.

12.117.10 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.

12.117.11 Test

Parallelogram distortion check.

12.117.12 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.

12.117.13   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.

12.117.14   Test

Trapezoid distortion correction.

12.117.15   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.

12.117.16   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.

12.117.17   Test

Pin and barrel distortion correction.

12.117.18   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.

12.117.19   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.

12.118   OverScan

12.118.1   Description

To check and adjust for the proper geometry of display including picture centering, size, pincushion and linearity.
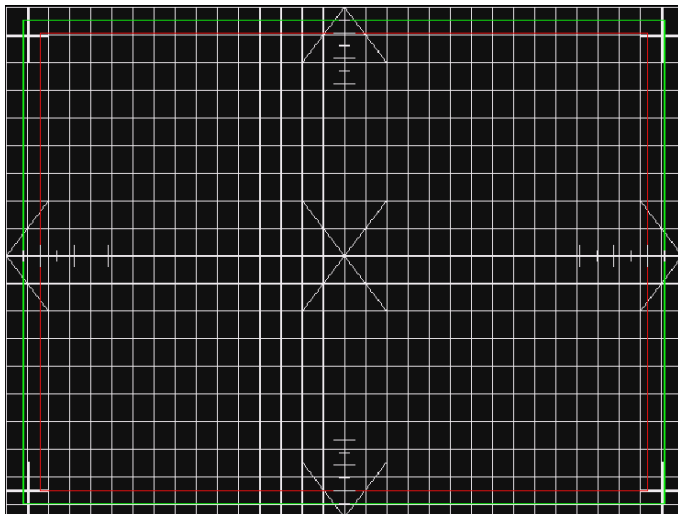
12.119   P1

12.119.1   Description

This image is a 6x6 white crosshatch without a border on a black background.
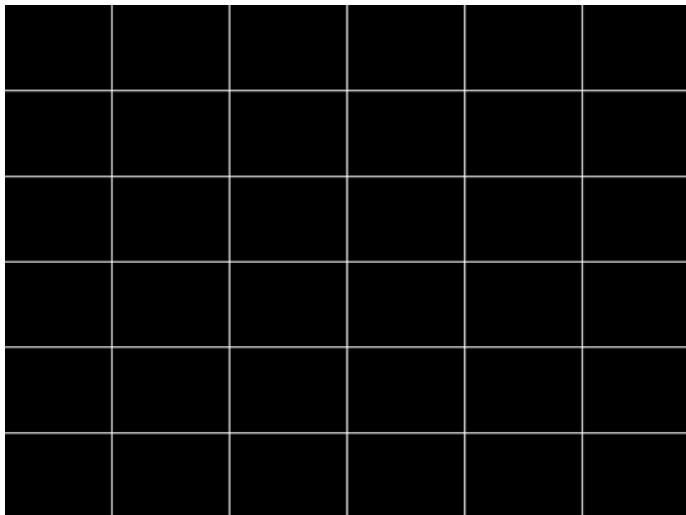
12.120   P2

12.120.1   Description

This image is a 4x4 white crosshatch with a border on a black background.
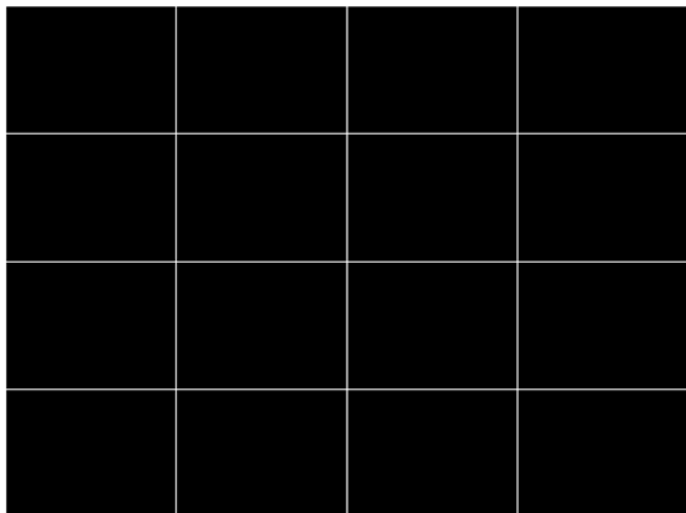
12.121 P3

12.121.1 Description

This image is a 4x4 white crosshatch with a border and a small, centered white patch on a black background.
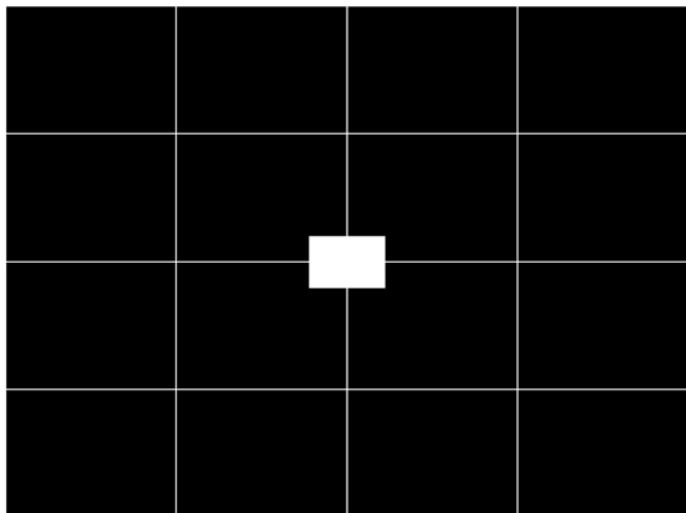
12.122   P4

12.122.1   Description

This image is an 8x8 white crosshatch with a border on a black background.
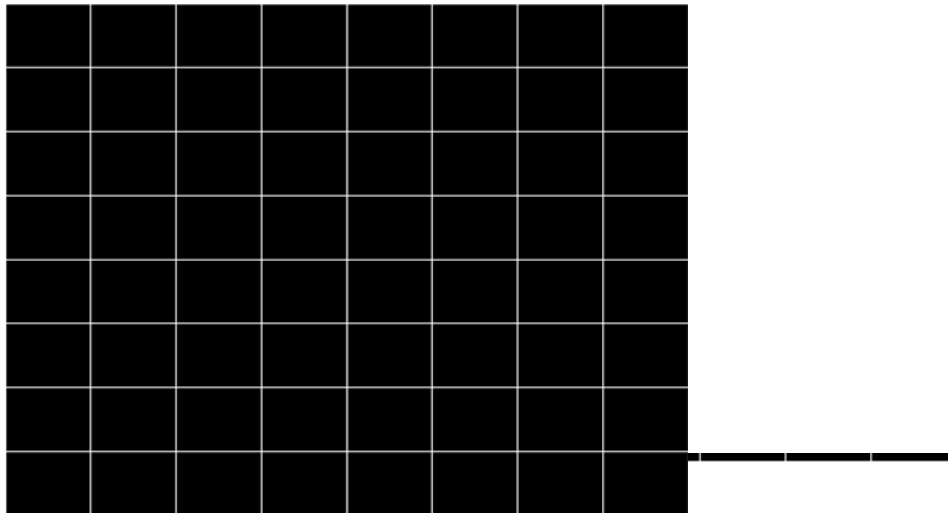
12.123   P5

12.123.1   Description

This image is an 8x8 white crosshatch with a border and a small, centered white patch on a black background.
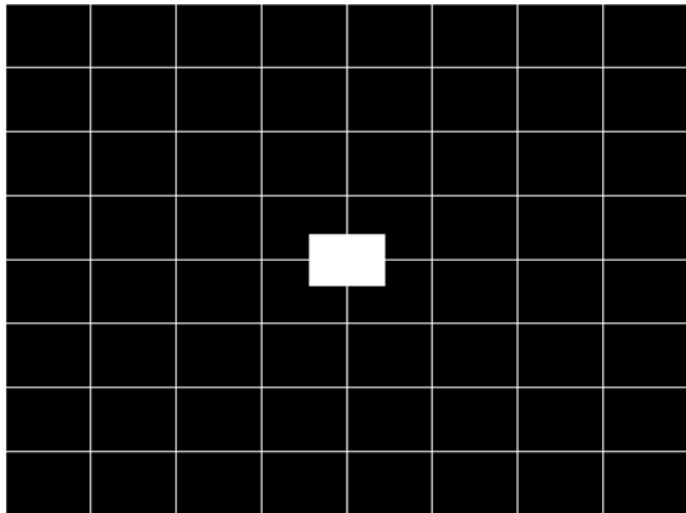
12.124   P6

12.124.1   Description

16x12 pixel white crosshatch with a border on a black background.
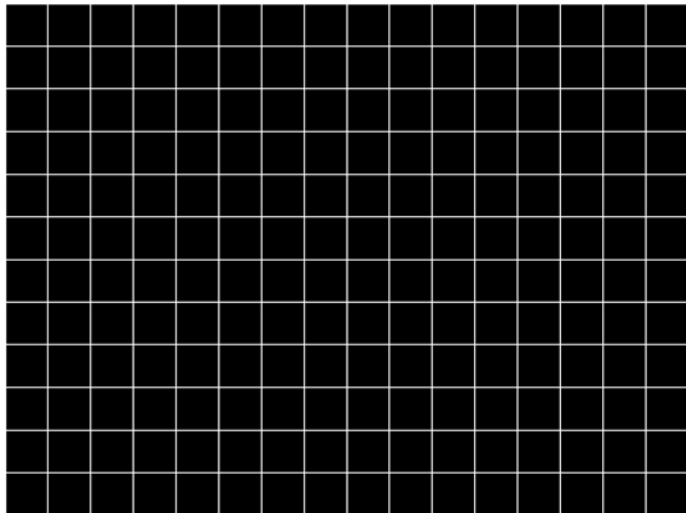
12.125   P6_Sony

12.125.1   Description

6x12 pixel white crosshatch with a border on a black background.
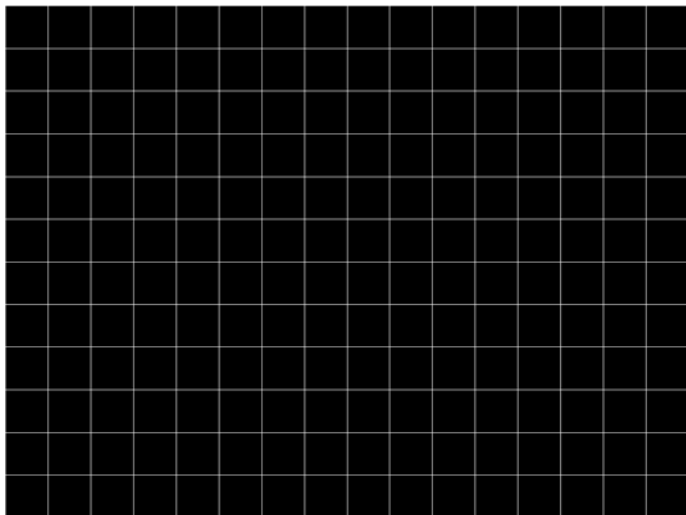
12.126   P7

12.126.1   Description

16x12 white crosshatch with a border and a small, centered white patch on a black background.
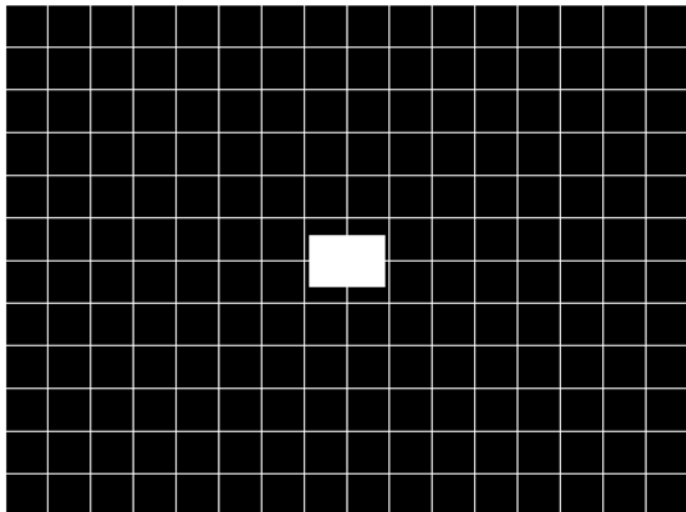
12.127 P8

12.127.1 Description

This image is an all black active video area. The secondary version draws an all white video area.
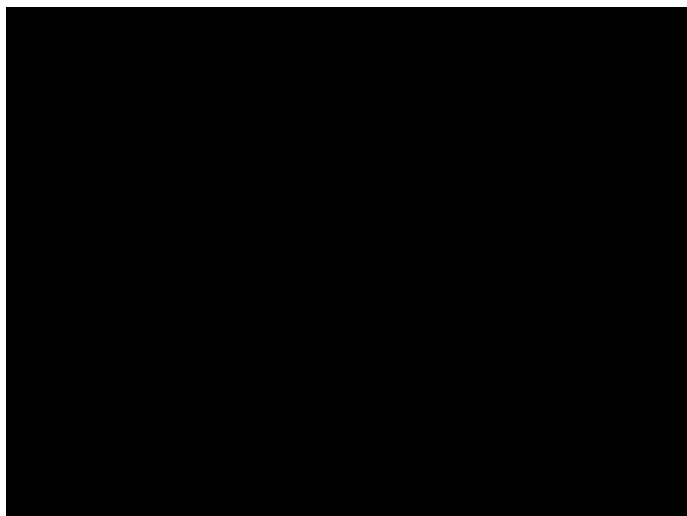
12.128   P9

12.128.1   Description

This image is an all white active video area. The secondary version draws an all black video area.

12.129 PacketTx

12.129.1 Description

Displays the InfoFrame data transmitted from the HDMI transmitter.

12.130   Pairing

12.130.1   Description

Displays the InfoFrame data transmitted from the HDMI transmitter.
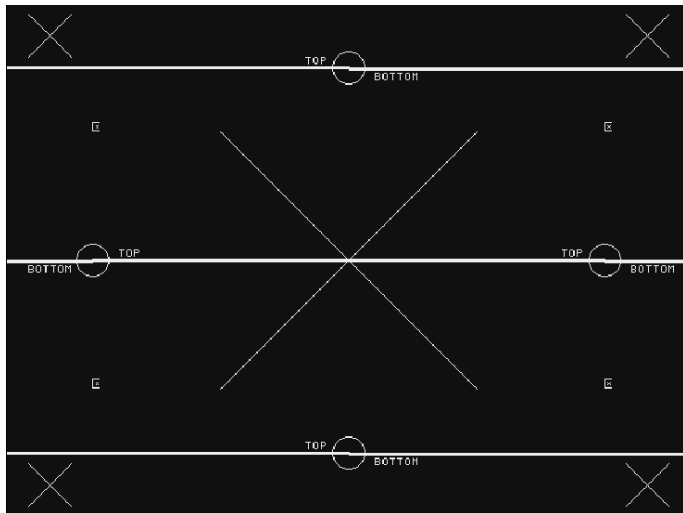
12.131   PanBars

12.131.1   Description

Special test images developed per customer specifications.
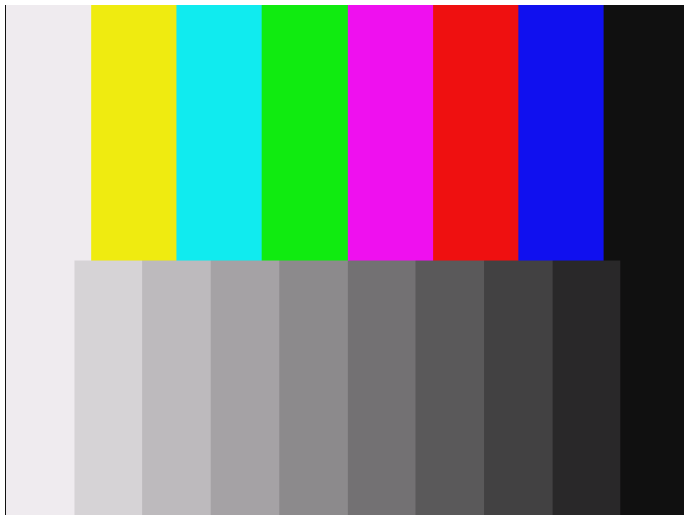
12.132   PdsCrt1

12.132.1   Description

Special test image developed per customer specifications.
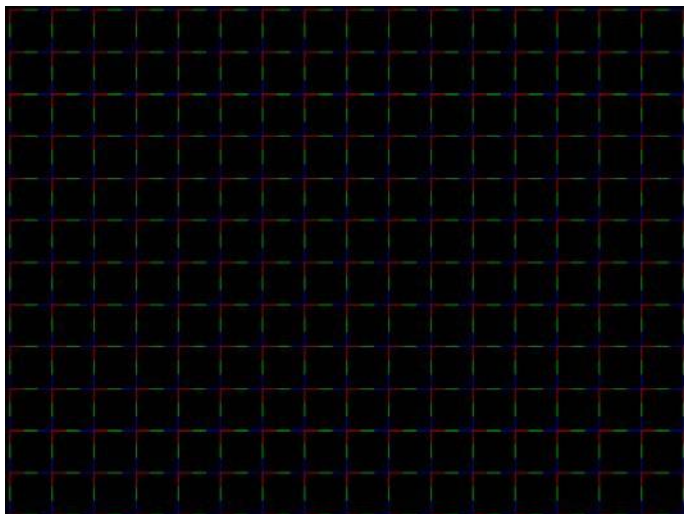
12.133   PdsCrt2

12.133.1   Description

Special test image developed per customer specifications.
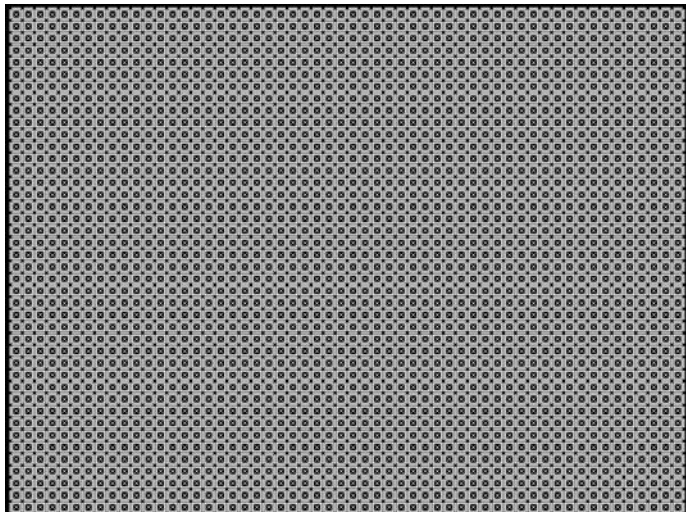
12.134   Persist

12.134.1   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:
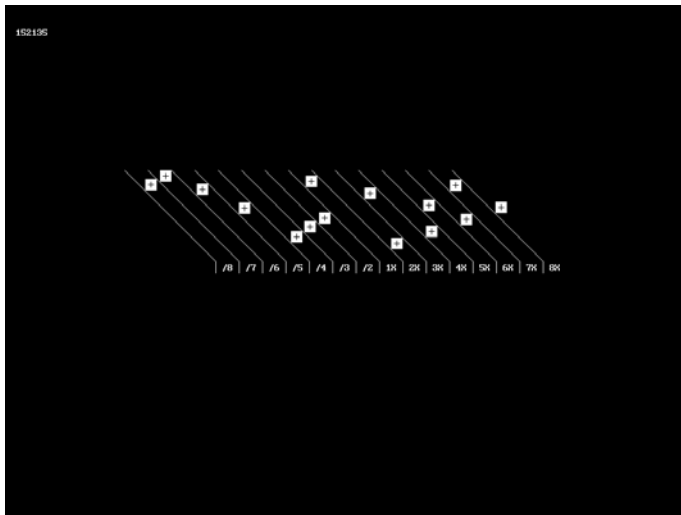
12.134.2   Test

Phosphor persistence

12.134.3   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.

12.134.4   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.

12.135   PgBar64H, PgBar64V

12.135.1   Description

Special test image developed per customer specifications. The PgBar64H image is shown below.
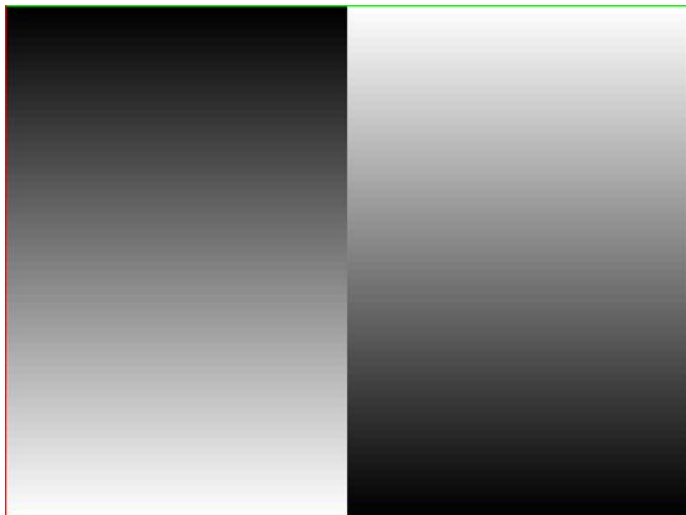
12.136   PgCB, PgCG, PgCR, PgCW, PgCWrgb

12.136.1   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.
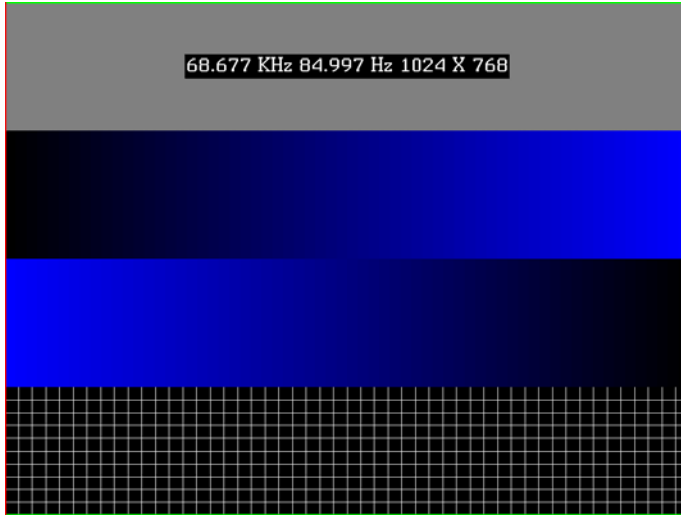
The PGCWrgb is shown below.
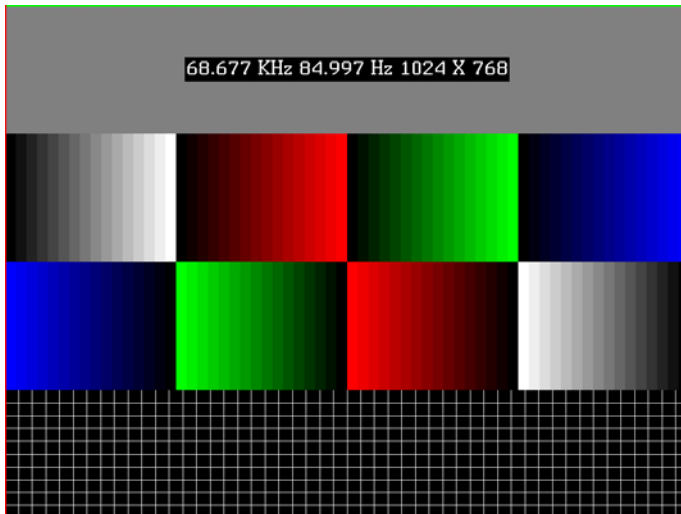
12.137   Philips1

12.137.1   Description

Special test image developed per customer specifications.
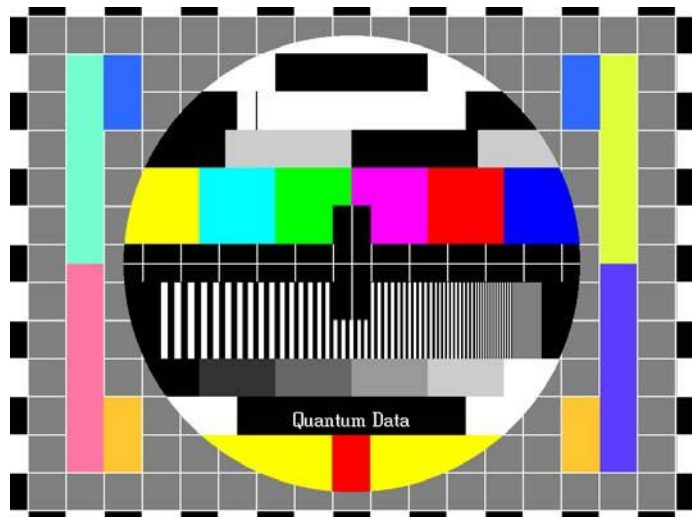
12.138   PixelRep

12.138.1   Description

Used to test HDMI pixel repetition. There are 10 different versions of this image to support the different pixel repetition settings. You can access these additional versions through the **Settings/Rendition** dialog box.

MISSING IMAGE

12.139   Pluge

12.139.1   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.

12.140 PRN24bit

12.140.1 Description

This image displays pseudo-random noise using 24-bits-per-pixel color depth.

MISSING IMAGE

12.141   PRN_5, PRN_9

12.141.1   Description

Used with analyer to verify the analyzer's pseudo-random noise analysis capability. The PRN_5 image introduces 5 pixel errors per color component, while the PRN_9 image introduces 9 pixel errors per color component.

The PRN_5 image is shown below. **MISSING IMAGE**

12.142   PulseBar

12.142.1   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.

12.142.2   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).

12.143   QuartBox

12.143.1   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.
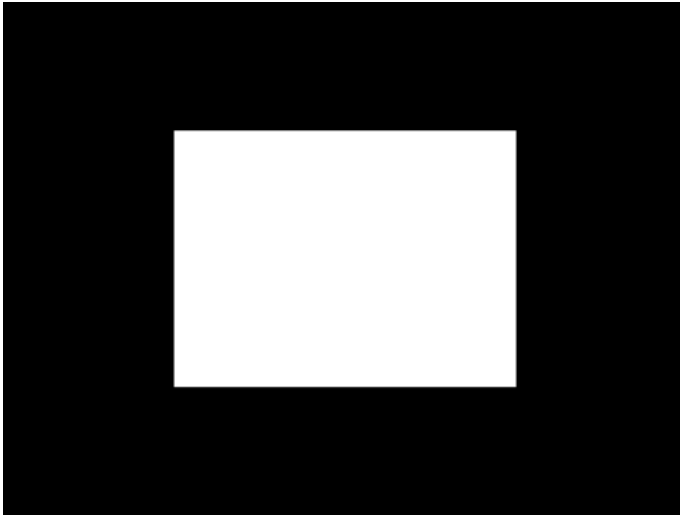
12.143.2   Test

Brightness control adjustment.

12.143.3   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.

12.143.4   Method

Place your light meter probe within the center box and adjust the monitor's brightness control to obtain the required light meter reading.

12.143.5   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
```

12.144   Ramp

12.144.1   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.
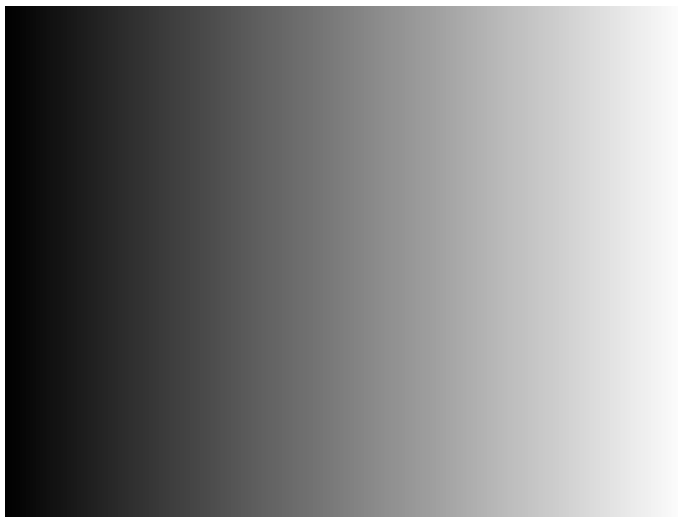
You can access additional versions of this image through the **Settings/Rendition** dialog box.

12.145   Ramp12

12.145.1   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.

12.146 RampDif

12.146.1 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.

12.147   RampX

12.147.1   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.
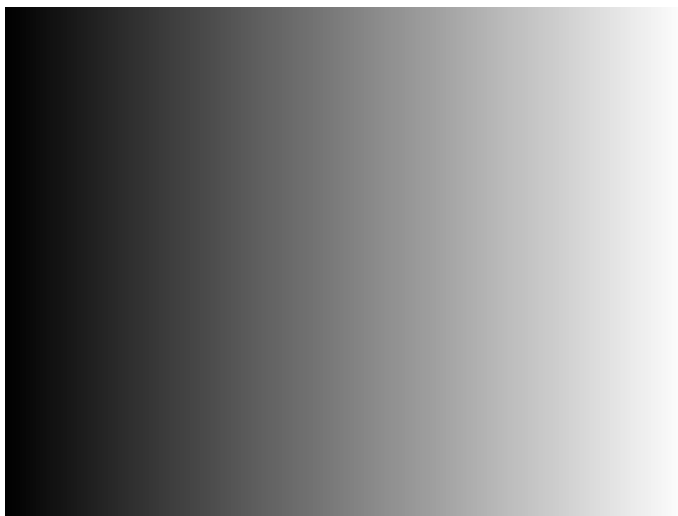
You can access additional versions of this image through the **Settings/Rendition** dialog box.

12.148   Ramp_B, Ramp_G, and Ramp_R

12.148.1   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.

12.148.2   Test

Video gain linearity.

12.148.3   Method

When viewed on a TV screen, the full range of grays should be visible. There should be no color shifts visible.

12.149   Raster

12.149.1   Description

The primary version shows a totally black display (nothing being displayed). The secondary version shows a totally white display.
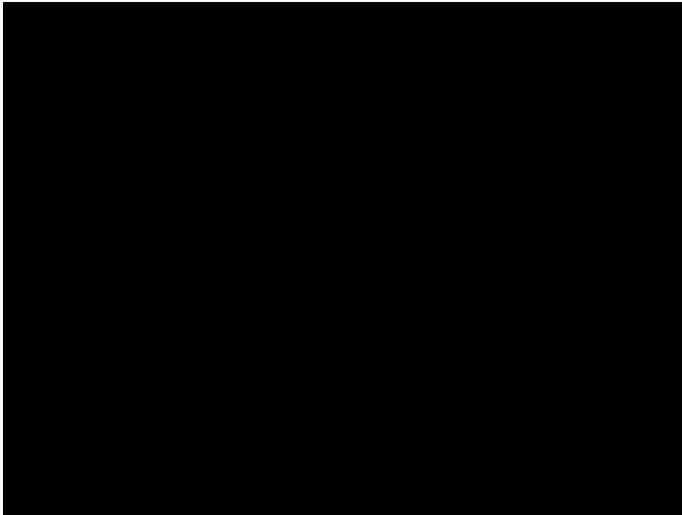
12.149.2   Test

Raster centering.

12.149.3   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.

12.149.4   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.

12.150   RED_EM, RED_EM+

12.150.1   Description

In the primary version, the screen is filled with red (RED) EM character blocks on a black background.
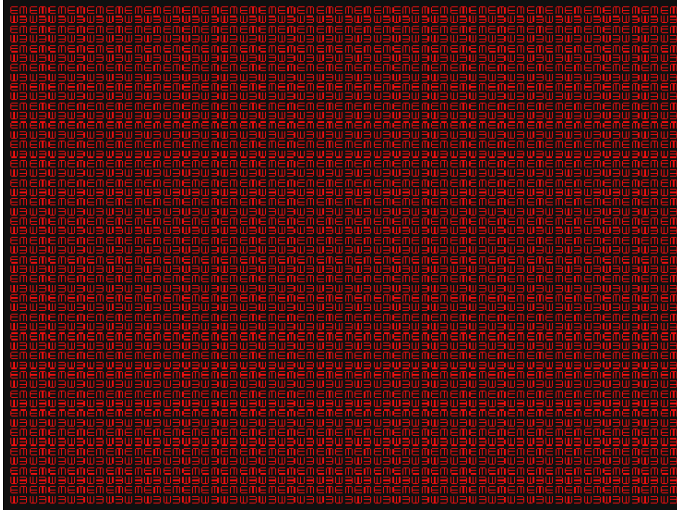
12.151   Regulate

12.151.1   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.

12.151.2   Test

High voltage regulation.

12.151.3   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.

12.152   Samsung1, Samsung2

12.152.1   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.
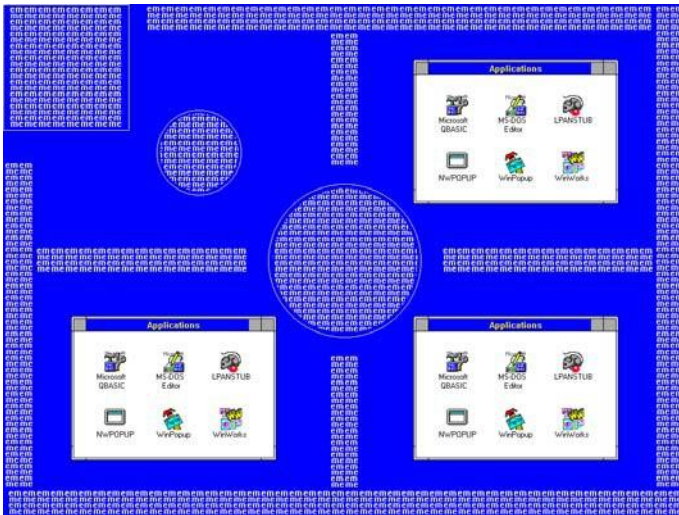
12.153   Samsung3

12.153.1   Description

Special test image developed per customer specifications.
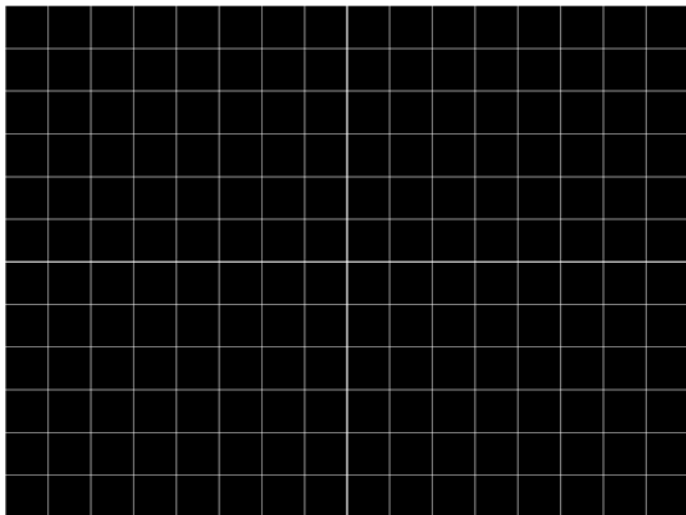
12.154   Samsung 4

12.154.1   Description

Special test image developed per customer specifications.

12.155   Samsung5

12.155.1   Description

Special test image developed per customer specifications.

12.156   Samsung6

12.156.1   Description

Special test image developed per customer specifications.
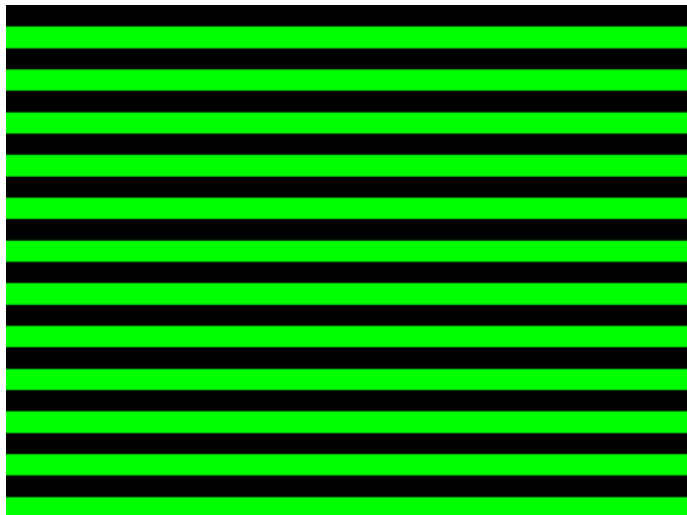
12.157   SansungB

12.157.1   Description

Special test image developed per customer specifications.
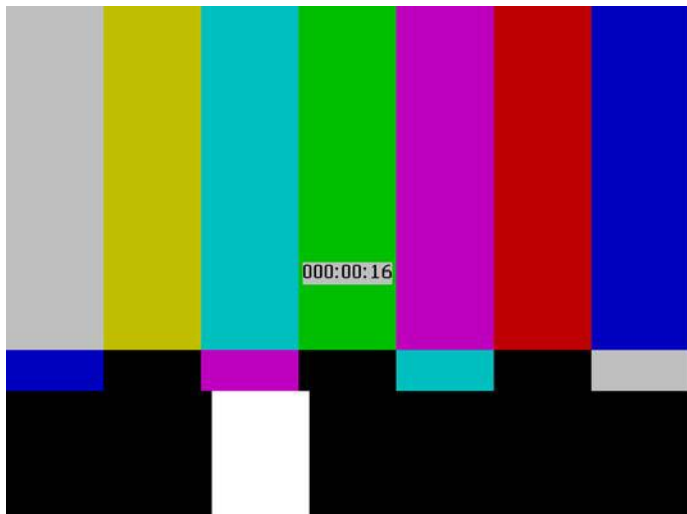
12.158   SamsungT

12.158.1   Description

Special test image developed per customer specifications. There are four versions of this image. When selected, the following image is displayed.
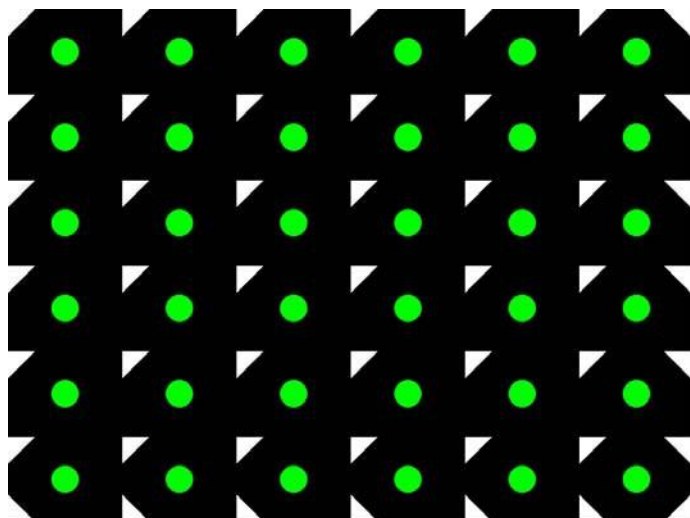
12.159   Set01k

12.159.1   Description

Special test image developed per customer specifications. There are 8 shades of gray from full black (0 volts) to full white.
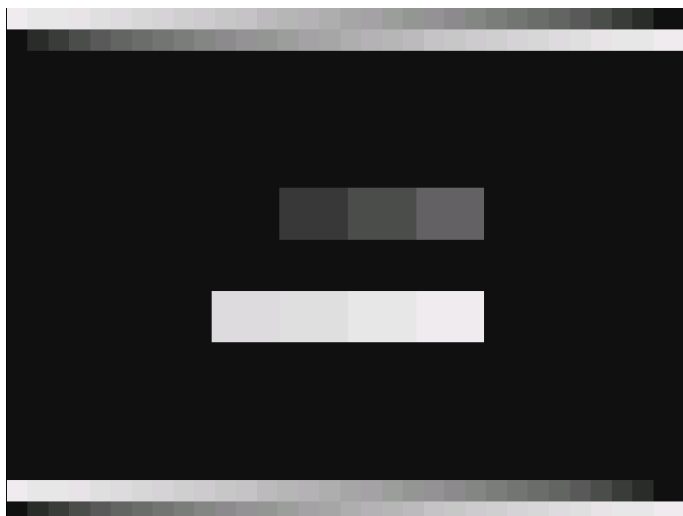
12.160   Sharpnes

12.160.1   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.
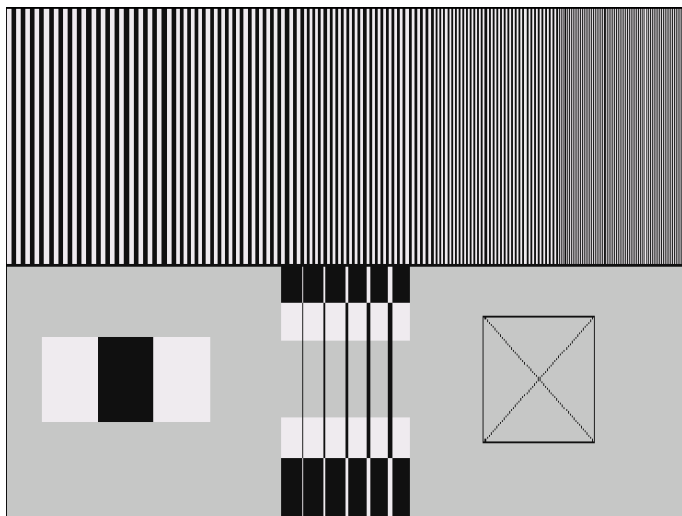
12.161   SlideBox

12.161.1   Description

This image displays a 16x9 white crosshatch with a large white patch moving across the screen.
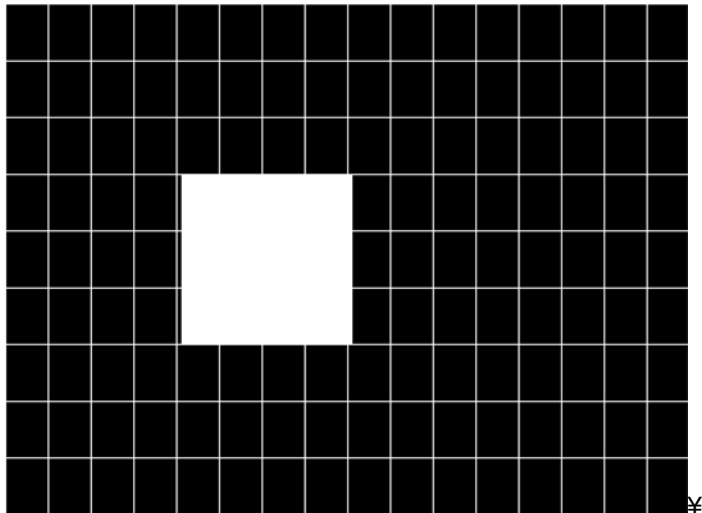
To change the animation speed:

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
   ```

12.162   SMPTE133

12.162.1   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.
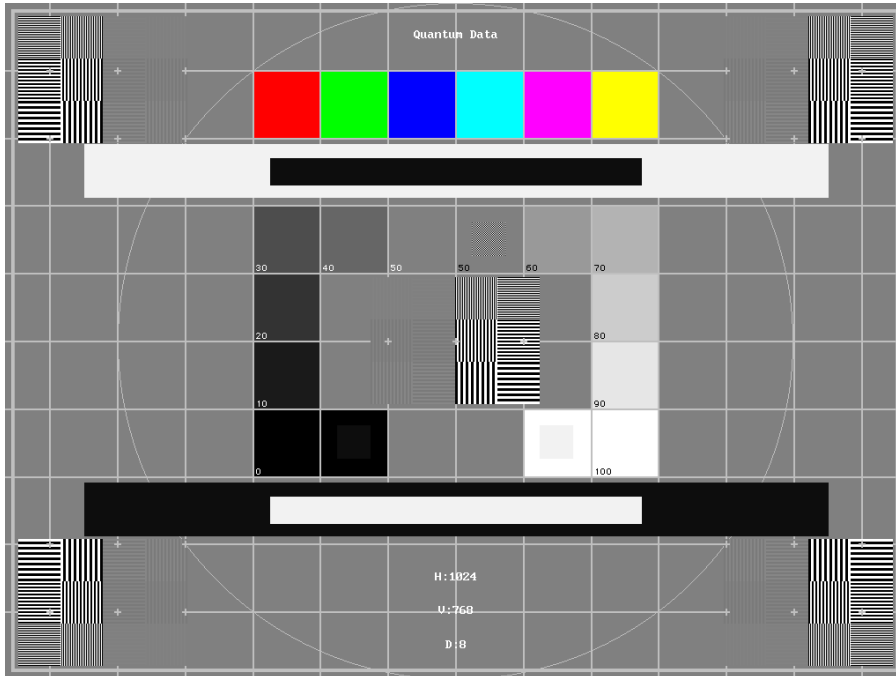
These differences are noted in descriptions of the individual elements.

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.

12.162.2   Test

Deflection linearity.

12.162.3   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.

12.162.4   Test

High contrast resolution.

12.162.5   Method

All the 0 and 100% level stripes in all the resolution patches should be separate and distinct.

12.162.6   Test

Low contrast resolution and noise.

12.162.7   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.

12.162.8   Test

Quick gamma check.

12.162.9   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.

12.162.10   Test

Video gain linearity and gamma.

12.162.11   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.

12.162.12   Test

Contrast and brightness check.

12.162.13   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.

12.162.14   Test

Video amplifier stability.

12.162.15   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.

12.162.16   Test

Excessive overscan and off-center alignment

12.162.17   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.

12.162.18   Test

Interlace flicker.

12.162.19   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.

12.163   SMPTEbar, SMPTEbr2

12.163.1   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.

12.163.2   Test

Color video performance.

12.163.3   Purpose

This general purpose pattern can be used to check the video handling capabilities of most parts of a television system.

12.163.4   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.

12.163.5   Test

Color decoder performance.

12.163.6   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.

12.163.7   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:

12.163.8   Test

Visual chroma gain adjustment.

12.163.9   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.

12.163.10   Test

Visual chroma phase adjustment.

12.163.11   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.

12.163.12   Test
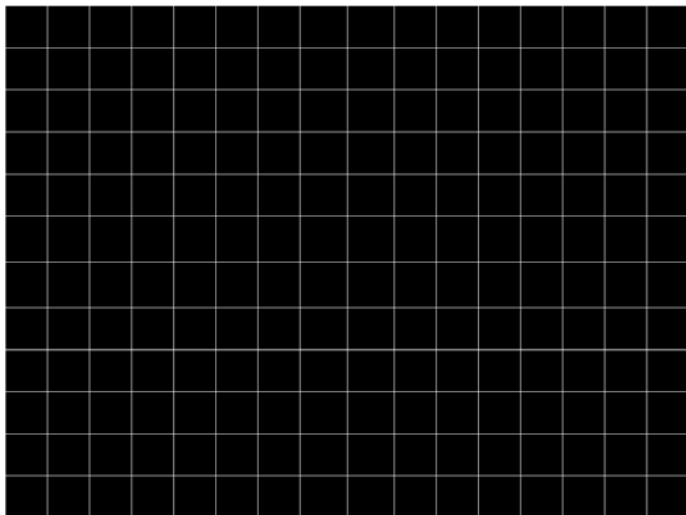
Visual black level adjustment.

12.163.13   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.

12.164   Sony6
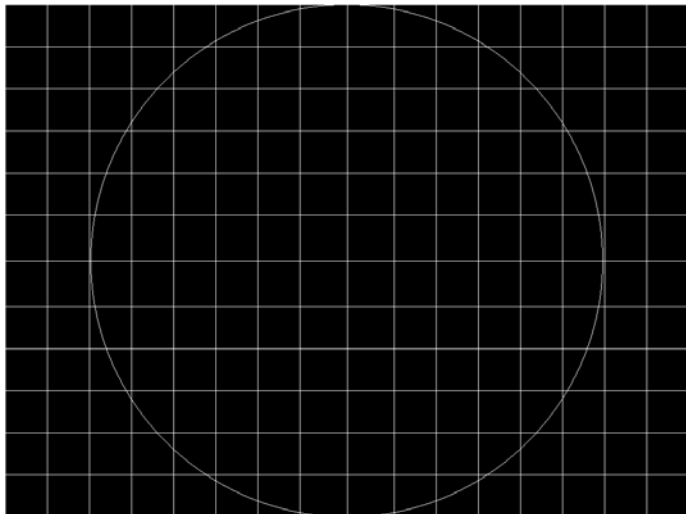
12.164.1   Description

Special test image developed per customer specifications.

12.165   Sony6WLC

12.165.1   Description

Special test image developed per customer specifications.

12.166   sRGBflat

12.166.1   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:
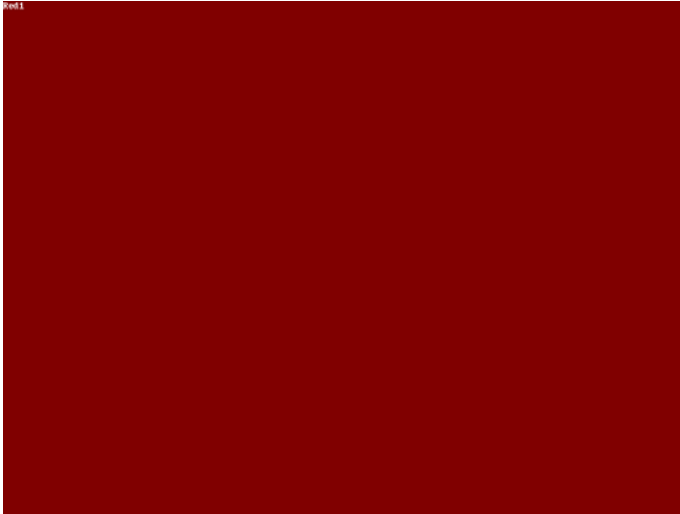

A small label in the upper left corner of the image indicates the Microsoft name for the color that is currently being displayed (for example, "sRGB-Gray5"). Note that some of the names that appear conflict with generator color names (for example, "sRGB-Gray5" is not the same as the generator color "Gray5").

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.

12.167   Staircase

12.167.1   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.
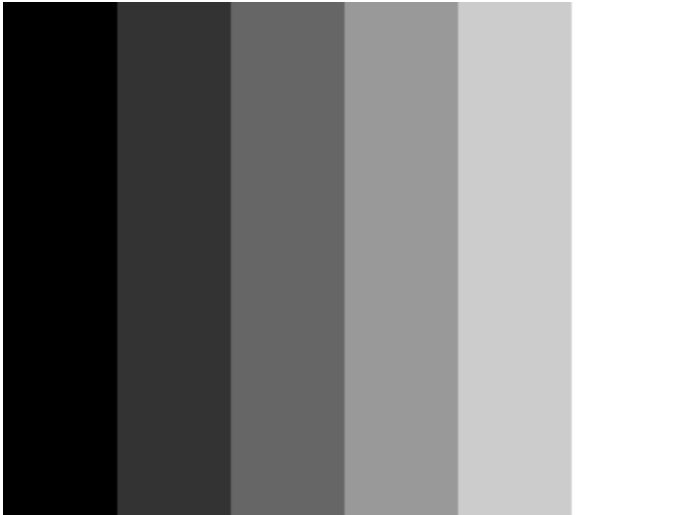
12.167.2   Test

Video gain linearity

12.167.3   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.

12.168   Strokes0, Strokes1

12.168.1   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.
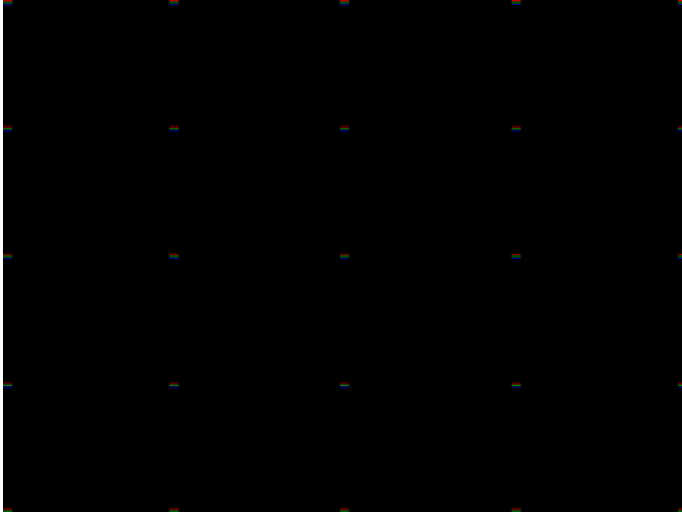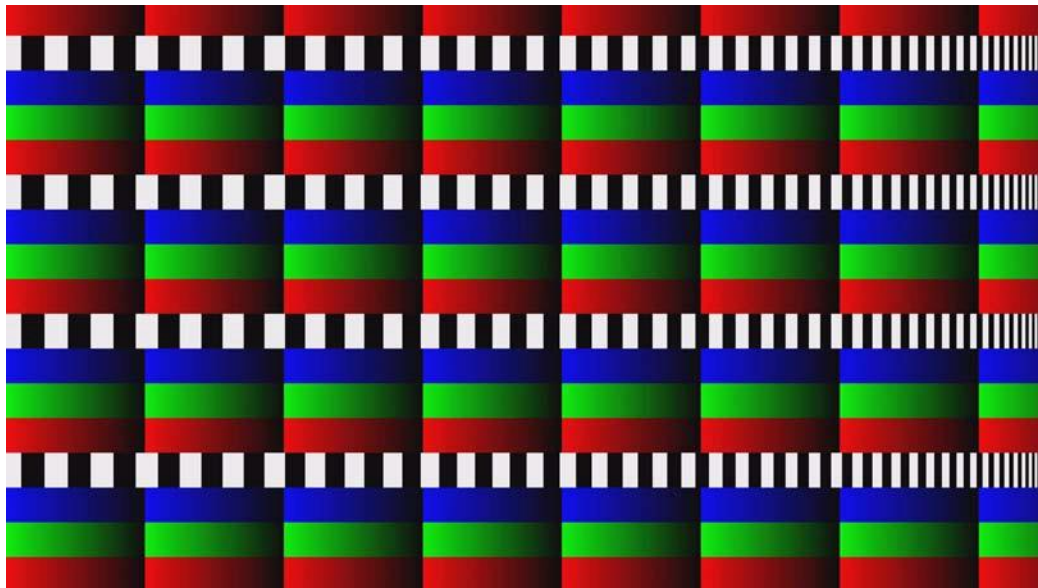

12.168.2   Purpose

These images are special-purpose test patterns used in test and alignment procedures specified by some display manufacturers.

12.169   TAARamp

12.169.1   Description

The TAARamp pattern is shown below.

12.170 Taffeta

12.170.1 Description

12.171 Text_9, Text_9T, Text_11, Text_12T, Text_16

12.171.1 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.

12.171.2 Test

Word processor simulation

12.171.3 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.

12.171.4 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.

12.172   TextFlat
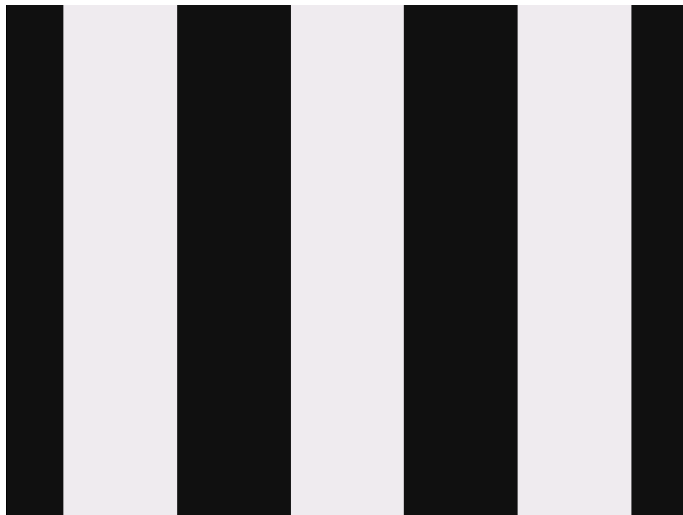
12.172.1   Description

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.
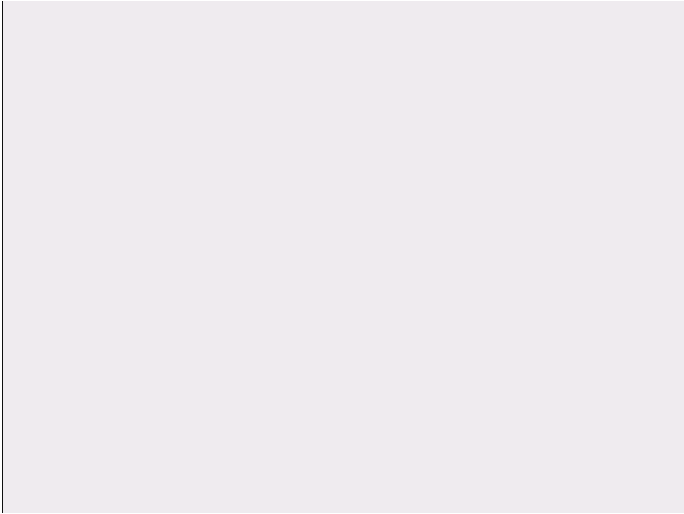
12.173   ThreeBar

12.173.1   Description

The screen is filled three vertical white bars on black background.

## 12.174   TintAlign

12.174.1   Description

## 12.175   Toshiba

12.175.1   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.
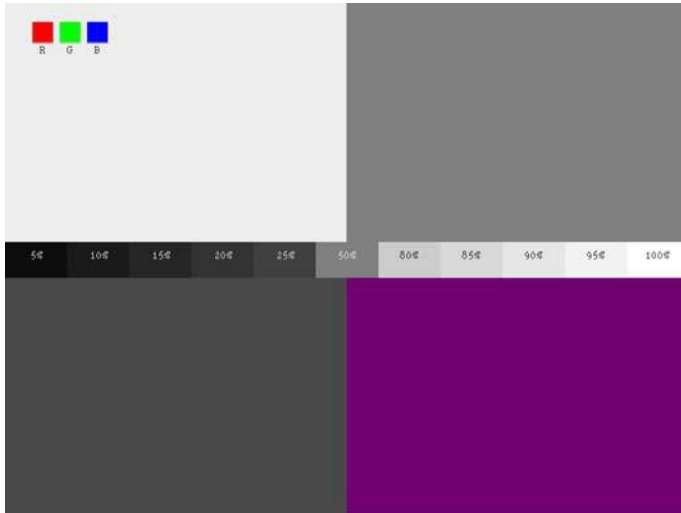
12.176   TPVAOC1 and TPVAOC2
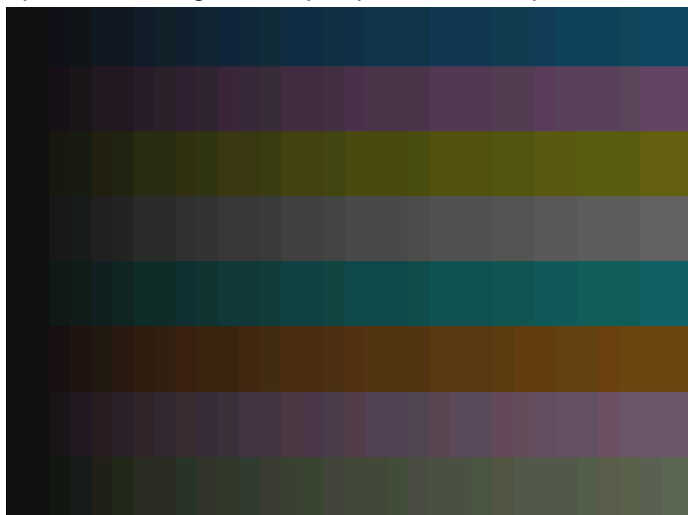
12.176.1   Description

The TPVAOC1 pattern is shown below.
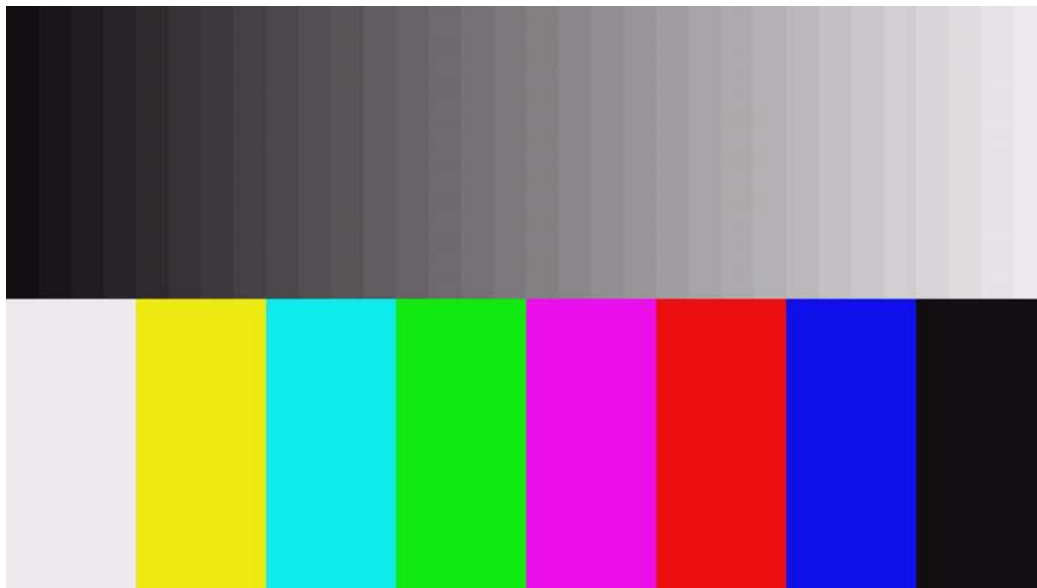
12.177   TTECorp1

12.177.1   Description

Special test image developed per customer specifications.
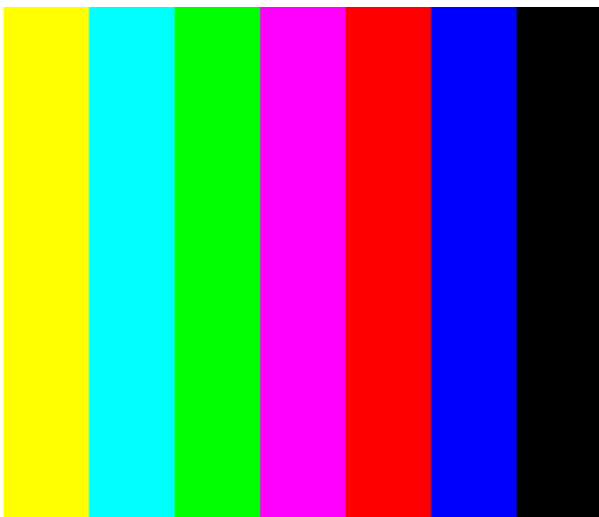
12.178   TVBar100 & TVBar_75 (TV formats only)

12.178.1   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.

12.178.2   Test

Color video performance.

12.178.3   Purpose

This general purpose pattern can be used to check the video handling capabilities of most parts of a television system.

12.178.4   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).
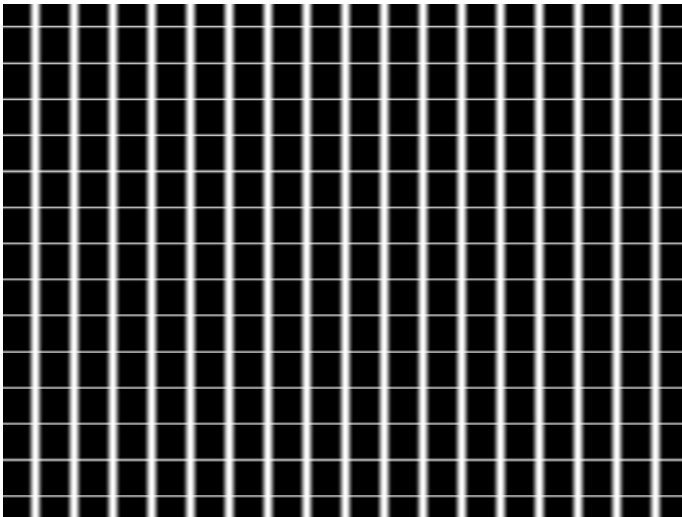
12.178.5   Test

Convergence adjustment.

12.178.6   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.

12.178.7   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.

12.178.8   Test

Sweep linearity adjustment.
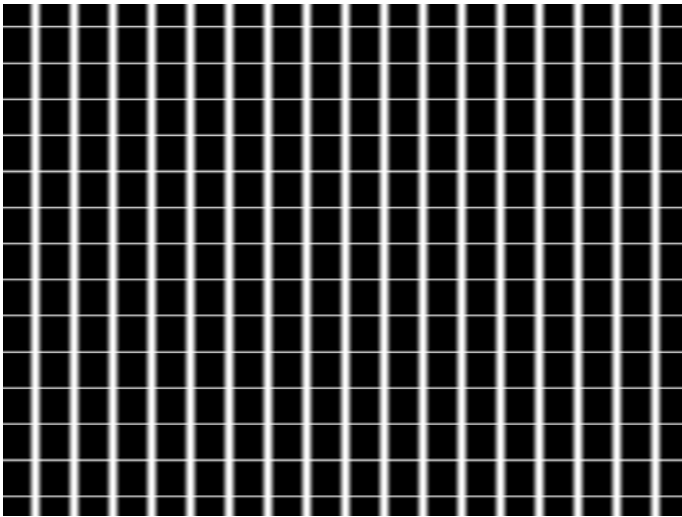
12.178.9 Purpose

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.

12.178.10 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.
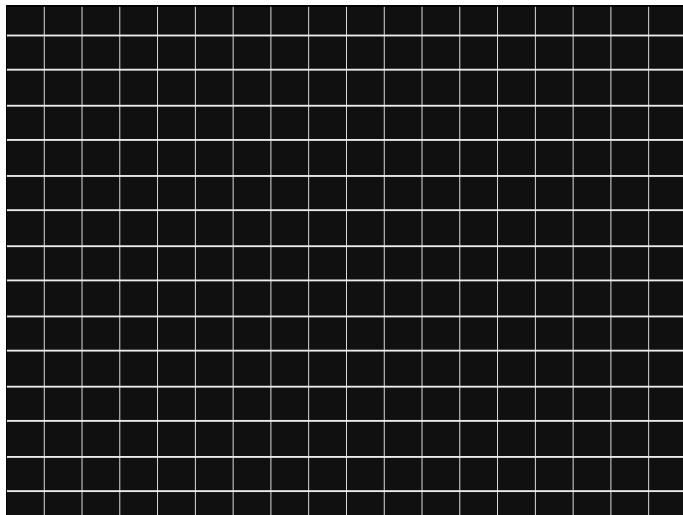
12.179   TVBarH

12.179.1   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.

12.180   TVHatch

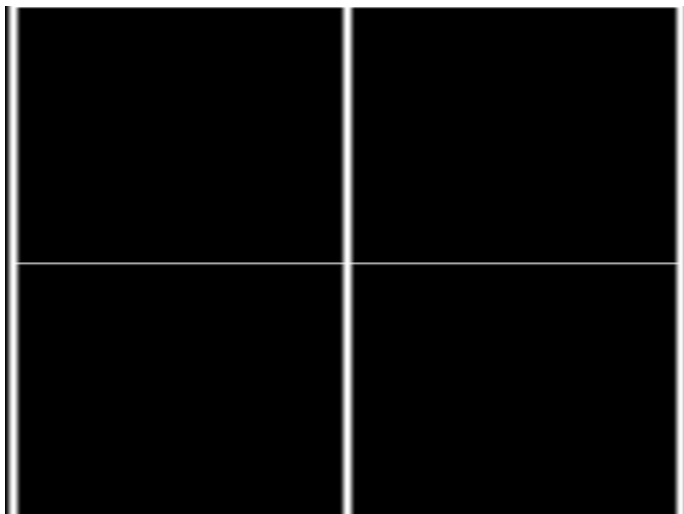### 12.180.1   Description

Primary version of TVHatch is shown below.

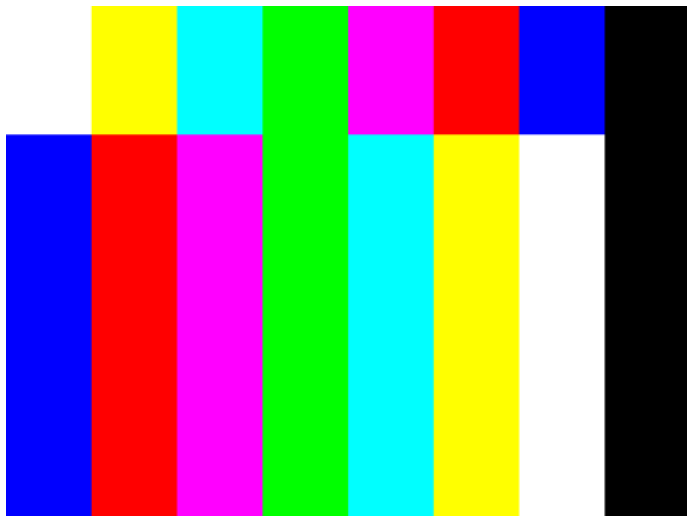## 12.181   TVoutLin

12.181.1   Description

Equivalent to Outline1 image but it uses anti-aliasing for vertical bars and double horizontal lines, which reduces flickering.

12.182   TVSplBar
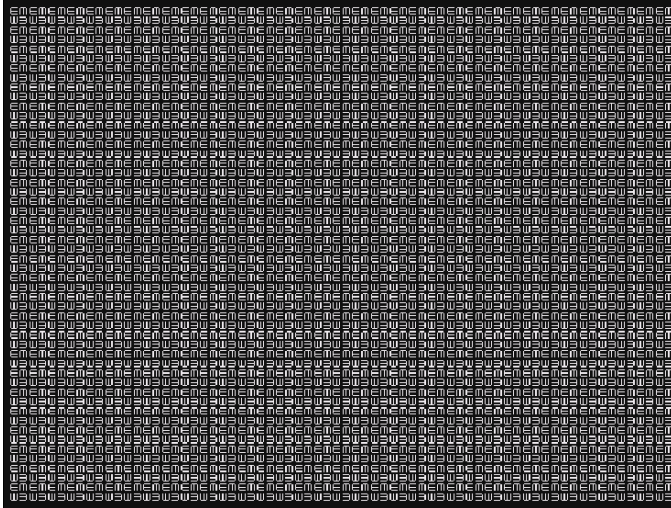
12.182.1   Description

Special test image developed per customer specifications.

12.183   WHT_EM, WHT_EM+
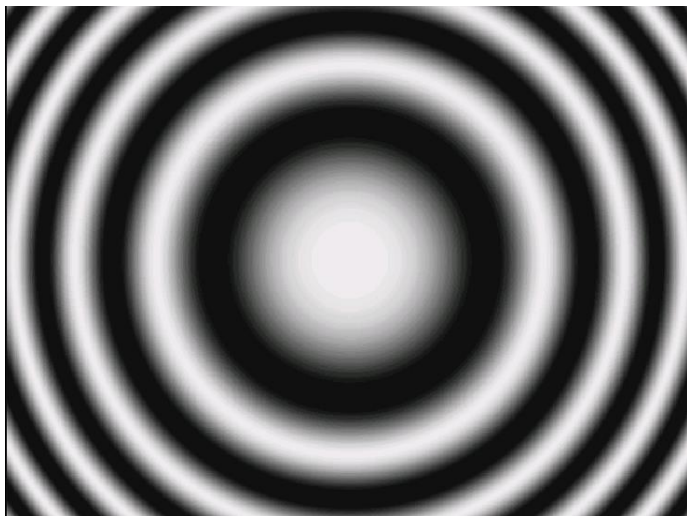
12.183.1   Description

In the primary version, the screen is filled with white (WHT) EM character blocks on a black background.

12.184   ZonePlt

12.184.1   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