TELEDYNE LECROY
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804/804A/804B Video Test Generators User Guide

Rev: B3

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1 Overview

This section provides an overview of the 804/804A/804B Video Test Generator and the scope of the User Guide.

1.1 804, 804A and 804B Models

There are three models in the 804 series. The 804 Video Test Generator and the 804A Video Test Generator. The 804 supports HDMI pixel rates up to 165MHz. The 804A model supports pixel rates up to 300MHz (at 24 bit color). The 804A therefore supports resolutions up to 4K x 2K at 50/60Hz with 4:2:0 pixel encoding as specified by the HDMI 2.0 specification. The 804B model supports pixel rates up to 600MHz (at 24 bit color) at 50/60Hz with 4:4:4 pixel encoding. Each model supports deep color.

1.2 Intended Use of the Product

The 804 series video generators are optimized for testing modern HDMI flat panel TVs. They feature 4 HDMI outputs—all active simultaneously—for testing HDTVs with multiple HDMI inputs. This eliminates the cost of splitters often required for testing each HDMI input on a TV. Each HDMI interface supports up to 36 bit/pixel (12-bit/component) deep color mode. The 804 series video generators can also output component analog and composite analog.

1.3 Scope of this User Guide

The 804 series Video Test Generator User Guide includes the necessary information to operate your 804 instrument. There is a Quick Start Guide that covers some of the 804/804A/804B features as well.

2 Customer Support for the 804/804A/804B

The 804/804A/804B Video Test Generator is manufactured by Quantum Data:

Quantum Data, Inc.

2111 Big Timber Road

Elgin, IL USA

60123

Please check the Quantum Data website for updates to the user documentation and the firmware:
www.quantumdata.com/downloads

If you have a product support request you can contact Quantum Data customer support either by phone or by a web page.

The phone number is: 847-888-0450 x 456

For web support: http://www.quantumdata.com/support/index.asp

Note: This Guide is updated frequently. Please be sure to check the Quantum Data website for updates at: www.quantumdata.com/downloads or www.quantumdata.com/products/804.asp.

3 Descriptions of Input and Outputs – Technical Specifications

This section describes the video and audio interfaces on the 804/804A/804B instrument:

3.1 Video Interfaces - Technical Specifications

Table 3-1 below describes the video interfaces on the 804/804A/804B instrument, these interfaces are used to render test patterns for testing consumer electronic HDTVs and computer displays.

Note: All video interfaces on the 804/804A/804B shall be connected to only SEL V / double insulated circuits of other devices.

Note: SPDIF and Optical audio input connectors are not available on the newer 804 and 804A units.

Table 3-1: 804/804A Video Interfaces

Video Connector	Description
HDMI (4) Output Type A	Menu Selection: **HDMI** ▪ Bit Depth: 24/30/36 bit. ▪ Video type: RGB, YCbCr. ▪ Sampling: 4:4:4, 4:2:2 (and 4:2:0 for 4K formats on the 804A) . ▪ Pixel rate (**804**): Timings up to 1080p60 (up to 165MHz). ▪ Pixel rate (**804A**): HDMI timings up to 4K x 2K at 30Hz (up to 300MHz) as specified by the HDMI 1.4a specification and 4K x 2K at 50/60Hz with 4:2:0 pixel encoding as specified by the HDMI 2.0 specification. ▪ Pixel rate (**804B**): HDMI timings up to 4K x 2K at 50/60Hz (up to 600MHz) with 4:4:4 pixel encoding as specified by the HDMI 2.0 specification. ▪ Audio: LPCM, Dolby Digital and DTS (more details below). Menu Selection: **DVI** for DVI Single Link (HDMI to DVI adapter cable). ▪ Video type: RGB.
3 BNC	Menu Selection – Format Type: **BNC + S-Video + CVBS** (when ED/HD is selected) ▪ Video type: YPbPr. ▪ Bit Depth: 24 bit color depth. ▪ Pixel rates: 27MHz, 27.027MHz, 74.176MHz, 74.25MHz (max 80MHz; resolutions greater than 80MHz use pixel doubling). ▪ Sync type: Composite.

VGA D-Sub	Menu Selection: **VGA(HD15) Analog YPbPr** for CE component analog. ▪ Bit Depth: 24 bit color depth. ▪ Video type: YPbPr (requires converter cable). ▪ Pixel rates: 27MHz, 27.027MHz, 74.176MHz, 74.25MHz (max 80MHz; resolutions greater than 80MHz use pixel doubling). ▪ Pixel repetition to support higher pixel rates. ▪ Sync types: Composite. Menu Selection: **VGA(HD15) Analog RGB** for CE and IT component analog. ▪ Bit Depth: 24 bit color depth. ▪ Pixel rates (804/804A): 27MHz, 27.027MHz, 74.176MHz, 74.25MHz (max 80MHz; resolutions greater than 80MHz use pixel doubling). ▪ Pixel rates (804B): 27MHz, 27.027MHz, 74.176MHz, 74.25MHz, 162MHz (max 162MHz). ▪ Pixel repetition to support higher pixel rates. ▪ Sync types: Separate.
(1) BNC CVBS & S-Video Analog Composite Output	Menu Selection: **BNC + S-Video + CVBS** ▪ Encodings: NTSC & PAL ▪ Pixel Range: 13.5-13.52. ▪ Sync type: Composite.

3.2 Audio Outputs - Technical Specifications

Table 3-2 below describes the audio outputs supported on the 804/804A/804B instrument.

Note: All audio interfaces on the 804/804A/804B shall be connected to only SEL V / double insulated circuits of other devices.

Table 3-2: 804/804A/804B Audio Outputs

Interface	Description
HDMI (4) Output Type A	Single link HDMI output connector. Supports the following HDMI features: ▪ Channels: 8. ▪ Bits per sample: 16, 20, 24. ▪ Sampling rates (kHz): 32.0, 44.1, 48.0, 88.2, 96.0, 176.4, 192.0. ▪ Formats: LPCM, Dolby Digital, Dolby Digital Plus, DTS-ES. ▪ LPCM formats - Frequency adjustment: 10Hz to 20kHz in 1Hz increments. ▪ LPCM formats - Amplitude adjustment: -99dB to 0dB in 1dB increments.

Analog Audio	(2) RCA audio connectors: ▪ Channels: 2 (L/R). ▪ Signal: Sine Wave. ▪ Frequency: 10Hz to 20kHz in 1Hz increments. ▪ Amplitude: -99dB to 0dB in 1dB increments.

3.3 Audio Inputs – Technical Specifications

Table 3-3 below describes the audio inputs supported on the 804/804A/804B instrument.

Note: All audio interfaces on the 804/804A/804B shall be connected to only SEL V / double insulated circuits of other devices.

Table 3-3: 804/804A/804B Digital Audio Inputs
Note: These connectors and the associated functions, are not available on new 804, 804A and 804B units

Interface	Description
SPDIF - RCA	SPDIF RCA audio connector
Optical – JIS FO5	Optical audio connector

3.4 Control Interfaces and Devices – Technical Specifications

The following illustrations and Table 3-4 describe the control interfaces and devices on the 804/804A.

Note: All control interfaces on the 804/804A/804B shall be connected to only SEL V / double insulated circuits of other devices.

Table 3-4: 804/804A/804B Control Interfaces and Devices	
Interface	**Function**
RS-232	Command line control or control through Automated Test System (ATS). You can also connect a keypad to the RS-232 port for control through a keypad. Keypad mode for the RS-232 interface is enabled or disabled through the Preferences menu.
USB Device	Updating firmware and gateware and command line control.
USB Host	Keyboard control.
SD Card	Updating firmware and gateware and loading bitmap test patterns.

3.5 Size and Weight

Table 3-5 provides the dimensions and weight of the 804/804A/804B:

Table 3-5: 804/804A/804B Dimensions and Weight	
Parameter	**Value**
Height	3.25 inches; 8.3 cm
Width	16.5 inches; 41.9 cm
Depth	6.1 inches; 15.5 cm
Weight	6.62 lbs; 3.0 kg

3.6 Power Considerations

The 804/804A/804B has a rocker style power switch on the front panel and on the rear panel adjacent to the power line connector. Both have to be on to operate the unit. Refer to the photos below.

Note: If the 804/804A/804B is used in a manner not specified in the guide, the protection provided by the equipment may be impaired.

Table 3-6 provides the power requirements of the 804/804A/804B.

Table 3-6: 804/804A804B Power Parameters	
Parameter	**Value/Range**
Volts, Power	100 – 240 VAC, 24VA
Frequency	50Hz to 60Hz

3.7 Environmental Specifications

Table 3-7 provides the environmental requirements and ratings of the 804/804A/804B.

Table 3-7: 804/804A/804B Environmental Parameters	

Parameter	Value/Range
Operating Temperature Range	0 – 40 Deg C
Humidity	30% to 80%
Environmental IP rating	IP20

4 Installation Instructions

This section describes how to install the 804/804A/804B. The 804/804A/804B can be installed either as a desktop instrument or it can be rack mounted in a standard 19 inch relay rack.

4.1 The 804/804A/804B Shipping Box

Table 4-1 below describes the video interfaces on the 804/804A/804B instrument, these interfaces are used to render test patterns for testing consumer electronic HDTVs and computer displays.

Table 4-1: What is in the 804/804A/804B Shipping Box

Item	Part Number
(optional) Cable kit	95-00068
Mounting kit; either or both: - 804 Desktop kit (feet already installed) - 804 Rack Mount Kit (not installed)	 95-00066 95-00067
Power cord; one of: - USA Power Lead - European Power Lead - UK Power Lead	 30A00400A03 30-00174 30-00175
Quick Start Guide	68-00222

4.2 Ventilation Requirements

The 804/804A/804B has an internal fan and two vents, one in the front and the other in the rear. Please be sure that the vents are not blocked with debris or by other equipment. Be sure to leave at least 4 inches of room between the 804/804A/804B vents and any other equipment or object.

4.3 ESD Warning

Uncontrolled electrostatic discharge can damage sensitive electronic equipment. Please follow proper electrostatic control procedures including using ground straps when working with the model 804/804A/804B. While the 804/804A/804B contains circuitry to protect it from reasonable electrostatic discharge, it can still be damaged by excessive discharge. Moderate discharge may degrade operation such as the user display. If that is observed, restarting the unit should eliminate the problem.

4.4 Cleaning Considerations

Please be sure that the vents are not blocked with debris or dust. Periodically check to ensure that there is no dust or debris blocking the ventilation openings of the 804/804A/804B.

4.5 Desktop Installation Instructions

If you have ordered the desktop option, the feet will be installed on the bottom of the 804/804A. There will be no mounting ears included. There are no special installation instructions for a desktop application.

4.6 Rack mount Installation Instructions

If you have ordered the rack mount option, the unit will be shipped with the mounting ears attached but there will be no feet on the bottom of the 804/804A/804B. You will need to screw the unit into the 19 inch rack using screws appropriate for the rack. Quantum Data does not provide screws for this purpose.

5 Instructions for Use

This section provides the Instructions for Use for the 804/804A/804B describes power up and general operation.

Note: If the 804/804A/804B is used in a manner not specified in the guide, the protection provided by the equipment may be impaired.

5.1 Powering up the 804/804A/804B

The procedures below describe how to power up the 804/804A/804B.

1. Connect the power cable provided with the 804/804A/804B to the connector on the back. Refer to the illustration below.

   Note: Any replacement power cord that you use should be certified to the requirements in IEC 60799.

2. Apply power on the power connector switch on the back near the power connector.

3. Power up the 804/804A/804B using the rocker switch on the front panel.

5.2 Powering down and uninstalling the 804/804A/804B

In the event you have to remove the 804/804A/804B from its normal operating location, use the following instructions:

1. Power down the 804/804A/804B using the rocker power switch on the front of the unit.

2. Turn the power of using the rocker power switch on the back near the power connector.
3. Disconnect the power cable from the rear of the unit. Note that the power cord is easily accessible when fully plugged in such that an operator can manually remove the power cord.

5.3 Front Panel Display

The 804/804A/804B has a 480(H) by 272(V), 24 bit color status display shown below. There are two modes of operation: 1) Manufacturing mode enabled (Status only displayed) and 2) Manufacturing mode disabled (active touch panel display). When Manufacturing mode is enabled, the display shows the following information:

- Active format
- Active test pattern
- Active interface(s)
- Keypad Status
- RS-232 Baud Rate
- S/W version
- FPGA version

Table 5-1 below shows functions available in the top level menu.

Table 5-1: Top Level Menu

Item	Submenu - Pattern	Third Level Menu	Value
Top Menu Bar	Home	See Below	N/A
	Preferences	Audible Touch	▪ Off ▪ On
		Screen Brightness	▪ Min ▪ 25% ▪ 50% ▪ 75% ▪ Max
		USB Mode	▪ COM for commands ▪ Disk for downloading files and upgrades
		Startup Mode	▪ Default – Use default menus on touch screen on startup. ▪ Custom Menu – Use custom menus on touch screen on startup.
		AVmute on Format Change	▪ Enables or disables AVMute on the HDMI output when there is a format change.
		RS-232 Keypad Mode	▪ Off – Keypad operation on the RS-232 interface is disabled. ▪ On – Keypad on the RS-232 interface is enabled.
		RS-232 Baud Rate	▪ One of: 1200, 2400, 4800, 9600,14400,19200, 28800, 38400, 57600, 115200, 230400
	Help	Upgrades	▪ Erase ▪ Update (Application Flash) ▪ Update (FPGA Flash)
Function Buttons	Video Patterns	See below: Selecting Test Patterns	
	Audio Tones	See below: Testing HDMI Audio on an HDTV or A/V Receiver	
	3D Output		

	Tests	See below: Testing HDMI Protocols
Bottom Status Buttons	Signal Type	See below: Selecting a Signal Type
	Resolution	See below: Procedures for selecting a resolution and frame rate
	Video Pattern	See below: Selecting Test Patterns

5.4 Calibrating the LCD

You can calibrate the touch screen of your 780 if necessary.

Important Note: Please follow the procedures below carefully. Improper calibration can lock the unit up. It is preferable that you contact Quantum Data Support unless you have learned how calibrated the screen properly.

Use the following procedures to perform the calibration.

1. From the **Home** menu, navigate to the **Help** menu by pressing the **Help** activation button on the upper status bar. The **Home** menu is shown below.

   The **Help** menu appears as shown below:

2. Touch select the **Calibrate** activation button to launch the calibration screen.

   Alternatively you can initiate the calibration screen using the following command:

   `TCAL`

   The calibration screen instructs you to touch each of four red squares.

When you finish touch selecting the fourth box, the calibration is completed and you will return to the **Home** menu.

5.5 Front Panel LEDs

The 804/804A/804B has two LEDs on the front to indicate the status of the Tx and Rx activity of the RS-232 interface. Note that when you send a command you will see the Tx and Rx lights on the 804/804A/804B front panel flash briefly.

5.6 Setting the 804/804A/804B Front Panel Mode

The 804/804A/804B front panel can be operated in one of two modes: 1) Touch screen mode and 2) 804/804A/804B Manufacturing (Status only) mode. The Touch Screen mode enables you to fully operate the 804/804A/804B through the color touch display. The procedures for operating the 804/804A/804B through the front panel are provided in the section Running Protocol Tests - Using the Front Panel GUI.

Typically you would use the Manufacturing (status only) mode when you were operating the 804/804A/804B through the command line via either a keypad or an automated test system.

Use the following procedure to set the 804/804A/804B front panel display mode.

1. Set the 804/804A/804B display mode to the Touch Screen mode using the following command.

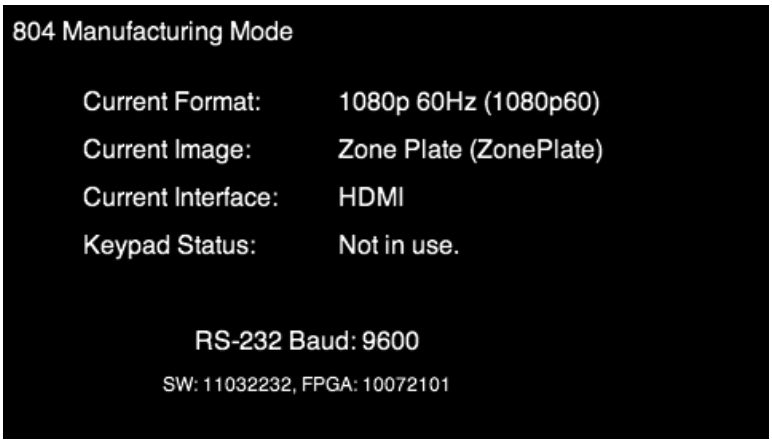
```
MFGM 0
```

The front panel display will show the Home screen as shown in the following screen shot.

2. Set the 804/804A/804B display mode to the Manufacturing mode using the following command.

```
MFGM 1
```

The front panel display will appear as shown in the following screen (example only).



6 Using the 804 Series Command Line

This section provides procedures on controlling the 804/804A/804B through the command line for testing HDTVs. Refer to the section entitled, Command Reference for a complete list of commands. You can connect from a PC either through an RS-232 cable or a USB cable.

6.1 Establishing an RS-232 connection to the 804/804A/804B

The procedures below describe how to connect to the 804/804A/804B through the RS-232 interface for command line control or control from an automated test system.

1. Connect an RS-232 cable between your host PC and the 804/804A/804B. The illustration below shows the location of the RS-232 interface.

2. (optionally) Connect USB cable between your host PC and the 804/804A/804B on the USB connector on the front. The illustration below shows the location of the USB interface.

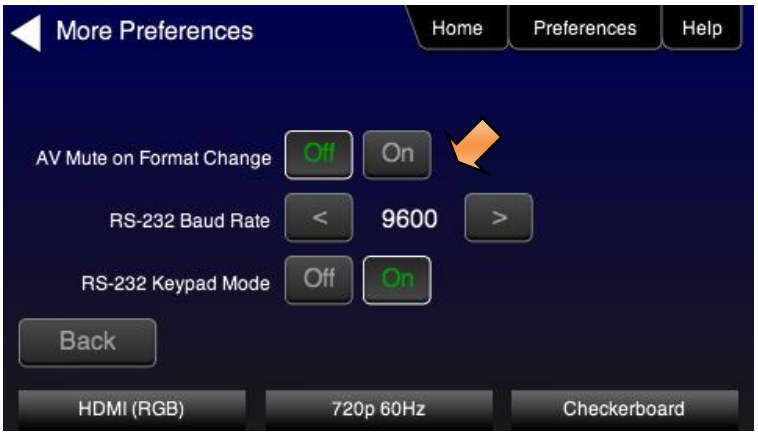
3. Download the .INF file from the Quantum Data website at:

   http://www.quantumdata.com/support/804readme.asp#supplemental or
   http://www.quantumdata.com/support/804Areadme.asp#supplemental to your PC and unzip the file. Store it in a convenient location on your PC.

4. Set the **USB mode** to COM from the **Preference** menu as shown below. Reboot the 804/804A/804B if you changed this USB mode from Disk to COM.

5. Establish a connection using a terminal program such as Hyperterm or an Automated Test System (ATS). You will need to know the port number for the USB connector. This can be found in the Device Manager in a Windows OS.
6. Press the **More** button to access the **RS-232 Baud Rate** setting as follows:
   - Bits per second: 115200 or 9600
   - Data bits: 8
   - Parity: None
   - Stop bits: 1
   - Flow control: None

   Note: You do not need to set the baud rate if you are using the USB connection.



When you send a command you will see the Tx and Rx lights on the 804/804A/804B front panel flash briefly.

6.2 Sending commands to activate the outputs

The following examples depict some commonly used commands for controlling the 804/804A/804B outputs.

1. Activate the HDMI interfaces:

```
XVSI 4
ALLU
```

2. Load and activate a format.

```
FMTL 720p60
```

```
FMTU (or ALLU)
FMTU?

720p60
```

Note: Please refer to the section: List of Formats for a list of format timings supported.

3. Select and activate a test image:

```
IMGL SMPTEbar
IMGU
```

Note: Please refer to the section: List of Test Patterns for a list of test patterns supported.

4. Change the sampling to 4:2:2:

```
DVSM 2
ALLU
```

5. Set the digital audio to HDMI:

```
DASI 6
ALLU
```

6. Enable the analog audio:

```
AASI 1
ALLU
```

7. Set all channels to 1kHz on LPCM formats on the HDMI digital audio output:

```
SRAT 1000
ALLU
```

8. Set audio sampling rate to 48kHz on LPCM formats on the HDMI digital audio output:

```
ARAT 48000
ALLU
```

9. To view the summary page of the EDID report for the display connected to the third HDMI port:

```
DIDT? 2
```

7 Running Video Pattern Tests

This section provides the Instructions for running video tests on the 804/804A/804B. Procedures are provided for operation both through the front panel and the command line.

Note: If the 804/804A/804B is used in a manner not specified in the guide, the protection provided by the equipment may be impaired.

7.1 Selecting a Signal Type

Use the information in Table 7-1 below as a guide:

Table 7-1: Signal Type

Signal Type Menu Selection	Physical Connector(s)	Option	Output Selections
HDMI	HDMI via HDMI to HDMI cable (available with optional cable kit)	Color Space	▪ RGB ▪ YCbCr 4:4:4 ▪ YCbCr 4:2:2 ▪ YCbCr 4:2:0 (804A for 4K formats @ 60Hz)
		Bit Depth	▪ 8 ▪ 10 ▪ 12
		Format Type	▪ TV – CE formats ▪ Computer – VESA formats
DVI	HDMI via HDMI to DVI cable (available with optional cable kit)	Format Type	▪ TV – CE formats ▪ Computer – VESA formats
VGA(HD15) Analog YPbPr	HD-15 (VGA) via VGA cable to 3 RCA converter cable (available in the optional cable kit)	Sync Type	▪ Sep[arate] Sync ▪ Sync on Y
VGA(HD15) Analog RGB	HD-15 (VGA) via VGA cable (available in the optional cable kit)	Format Type	▪ TV – CE formats ▪ Computer – VESA formats
		Sync Type	▪ Sep[arate] Sync ▪ Sync on Green
BNC + S-Video + CVBS	CVBS (BNC) and S-Video (3) BNC (ED/HD)	Format Type	▪ SD – TV composite video (NTSC & PAL formats) ▪ ED/HD – TV formats for component video

1. Power up the 804/804A/804B using the rocker switch on the back panel and the front panel. The On position is with the toggle switch depressed on the inner side of the switch.

   Refer to the procedures in the section Instructions for Use.

2. Make the cable connection between the appropriate output connector(s) on the 804/804A/804B and the input connectors of the HDTV using the cables supplied. Refer to the figure below to view the locations of the video outputs.

3. Touch select the **Signal Type** activation button on the panel on the left. The following screen appears:

4. (For HDMI) Touch select the HDMI option using the associated activation button as shown below.

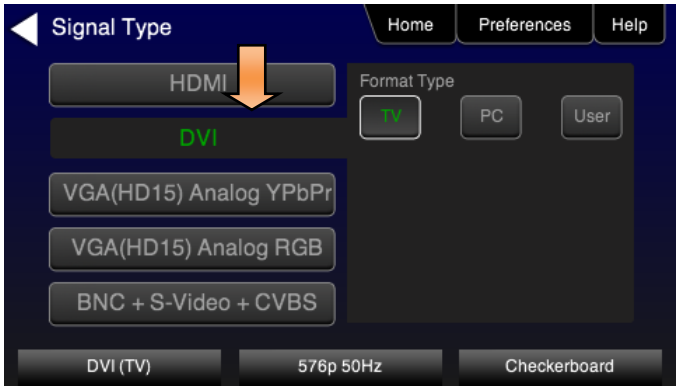
Alternatively, to activate HDMI output through the command line:

```
XVSI 4   // selects the HDMI output
ALLU     // activates the output
```

Note: There are several optional settings and features related to HDMI that you may wish to utilize. They pertain to enabling and disabling various HDMI metadata and AVmute. These options are executed through the command line. Refer to the Command Reference chapter for information on these commands. The following is an example of how you would enable or disable AVmute.

```
AVMG 1   // sets (enables) AVmute on the HDMI output
AVMG 0   // clears (disables) AVmute on the HDMI output
```

(For DVI TVs) Touch select the DVI option and then the TV option using the associated activation buttons as shown below.



Alternatively, to activate DVI for computer formats through the command line:

```
XVSI 3  // selects the DVI TV output through the HDMI connector
ALLU    // activates the output
```

(For DVI computers) Touch select the DVI option and then the Computer option using the associated activation buttons as shown below.

Alternatively, to activate DVI output through the command line:

```
XVSI 2  // selects the DVI computer through the HDMI connector
ALLU    // activates the output
```

5. (For component analog displays) Touch select the **VGA (HD15) Analog YPbPr** option and then the desired sync option using the associated activation buttons as shown below.

Alternatively, to activate the **VGA (HD15) Analog YPbPr** output through the command line:

```
XVSI 9  // selects YPbPr Analog output through the VGA connector
SSST 1  // selects separate sync. Use SSST 3 for sync on Y
ALLU    // activates the output
```

6. (For component analog TV displays) Touch select the **VGA(HD15) Analog RGB** option with the TV Format Type and then the desired sync option using the associated activation buttons as shown below.

Alternatively, to activate RGB Analog output through the command line:

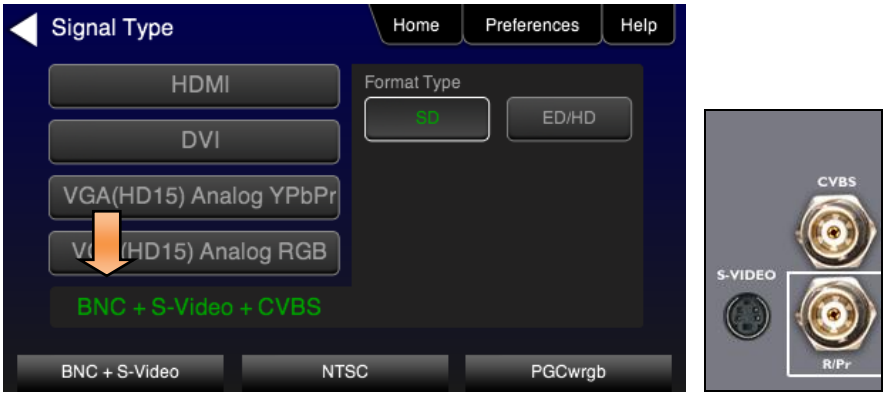
```
XVSI 9  // selects RGB component analog for TVs through VGA output
SSST 1  // selects separate sync. Use SSST 3 for sync on Y
ALLU    // activates the output
```

7. (For component analog computer displays) Touch select the **VGA(HD15) Analog RGB** option with the Computer Format Type and then the desired sync option using the associated activation buttons as shown below.

Alternatively, to activate RGB component analog for computers through the command line:

```
XVSI 9  // selects component analog for computers through VGA output
ALLU    // activates the output
```

8. (For composite TV) Touch select the **BNC + S-Video + CVBS** option with the SD Format Type using the associated activation buttons as shown below.



Alternatively, to activate composite video output through the command line:

```
XVSI 6  // selects analog composite video through CVBS and S-Video outputs
ALLU    // activates the output
```

9. (For component TV) Touch select the **BNC + S-Video + CVBS** with the **ED/HD** Format Type using the associated activation buttons to activate component video through the BNC connectors as shown below.

```
XVSI 6  // selects analog component through BNC outputs
ALLU    // activates the output
```

7.2 Procedures for selecting a resolution and frame rate

The procedures below describe how to select the resolution.

1. From the **Home** menu select **Tests**.

   The front panel display will show the Home screen as shown in the following screen shot.

The Sink Tests menu appears as shown below.

2. Touch select **EDID Test** from the Sink Tests menu.

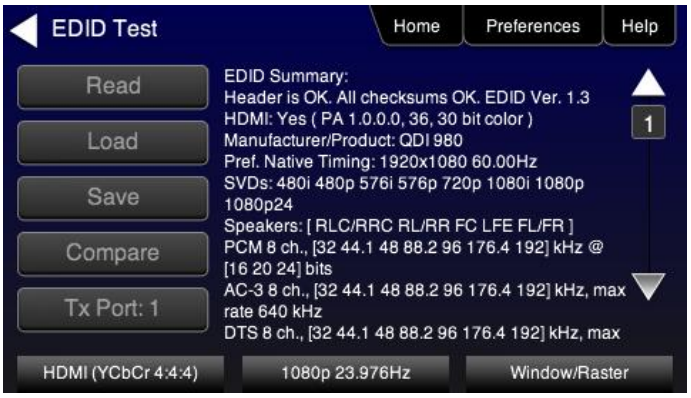
   The **EDID Test** menu appears as shown below.

3. Touch select the lower button (**Tx Port x**) on the **EDID Test** menu shown below.

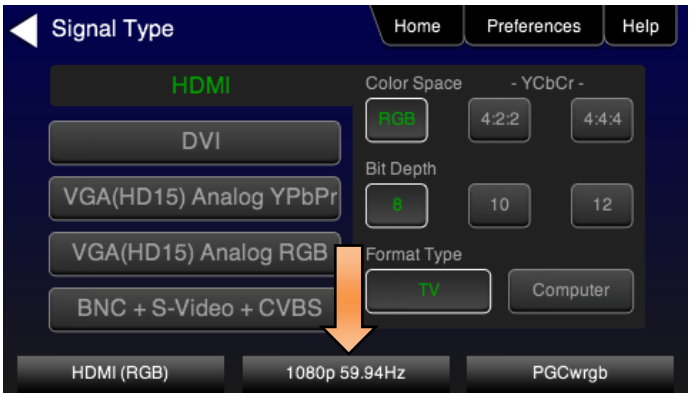
   Note: You will have to select each HDMI port in sequence.

4. Touch select **Read** from the **EDID Test** menu shown below.

   The EDID test results are shown. A summary page appears first.



5. (For HDMI) Repeat for each HDMI port you wish to test.
6. Touch select the resolution and frame rate (middle button on the bottom panel). Refer to the figures below which show HDMI examples.



The HDMI TV Format screen appears as shown below. The first screen is from the 804. The second and third screens are from the 804A with its support for 4K x 2K resolutions at 30Hz or 50/60Hz with HDMI 2.0 4:2:0 pixel encoding. The third screen shows an example from the 804B with its support for 4K x 2K resolutions with 4:4:4 pixel encoding.

Sample screen for the 804A:

The following screen shows an 804A screen with 4K selected at 50/60Hz using 4:2:0 pixel encoding.

The following screen shows an 804B screen with 4K selected at 50/60Hz using 4:4:4 pixel encoding.

For the HDMI, DVI and VGA computer formats, there are color codes that are applied to the Resolution and Frame Rate selections. The following is a summary of their meaning:

- A Resolution or Frame Rate with white lettering but with no outline – The Resolution or Frame Rate has a short video descriptor associated with it.
- A Resolution with green lettering – The Resolution that is currently selected.
- Frame Rate(s) with green lettering and with white outline – The Frame Rate along with the currently selected Resolution.
- A Frame Rate with black lettering but with no outline – The Frame Rate is not supported by the standard for the selected resolution.

7. Touch select the resolution and frame rate.

   Alternatively, to select the resolution and frame rate through the command line:

```
FMTL 720p60 // loads format (resolution and frame rate)
FMTU        // activates format
```

   Note: There are 4 HDMI connectors on the 804/804A. You can set a marker to indicate which output is currently active. To set the marker use the following command:

```
HPMG 1      // enables markers (0 disables markers)
```

   To change the size of the markers:

```
HPMX 100    // changes the size of the marker's width to 100 pixels
HPMY 50     // changes the size of the marker's height to 50 lines
```

7.3 Selecting Test Patterns

This subsection describes how to select test patterns once the desired signal type and format (resolution / frame rate) has been selected.

The procedures below cover cases where there is a direct connection between the 804/804A/804B and the display and also where the 804/804A/804B is connected to a display through a repeater device.

1. From the main menu screen (shown below), touch select **Video Pattern**.

The following menu appears.

2. Touch select the desired test pattern from the menu shown below. You can select patterns that are standard with the 804/804A/804B or bitmaps that you have imported.

   Note: A "+" on the lower right portion of the pattern indicates that there are options related to the specific pattern. In these cases you double touch select to access the lower level menu.

Alternatively, to load a test patterns through the command line:

```
IMGL smptebar  // loads image
IMGU           // activates image
```

3. (If applicable) Specify the test pattern options. Refer to the section List of Test Patterns for a description of each option.

7.4 Using Image Caching to render bitmaps quickly

The Image Cache feature enables you to render bitmap images quickly. This feature is ideal for production lines in manufacturing.

The Image Cache feature is configured using the command line interface. Once configured the 804/804A/804B renders bitmap images in advance and stores them in memory for immediate recall. The number of images that can be stored in cache depends on the resolution and bit depth of the chosen format. The cached images are stored in video RAM, and are lost on power cycle, reboot, or issuance of the ICHC command.

Use the procedure below to render bitmap images quickly with the Image Cache feature.

1. Load the desired bitmaps into the 804/804A/804B using the procedures in the section Workflow for Importing Bitmaps.
2. Create the userpats.txt file which maps the bitmap images to aliases. Use the example below:

   The structure of the UserPats file is:

   <bmpname.bmp> space <description>

   The contents of the UserPats.txt text file would be:

   720Img1.bmp Master 1280x720 - (this maps to alias “User00”)
   720Img2.bmp Master 1280x720 - (this maps to alias “User01”)
   720Img3.bmp Master 1280x720 - (this maps to alias “User02”)

   1080Img1.bmp Master 1920x1080 - (this maps to alias “User03”)
   1080Img2.bmp Master 1920x1080 - (this maps to alias “User04”)
   1080Img3.bmp Master 1920x1080 - (this maps to alias “User05”)

   Note 1: The bitmap name has to match the name of the stored bitmap.

   Note 2: The bitmap name uses the 8.3 character structure.

   Note 3: The description is limited to 20 characters.

3. Establish a command line session to the 804/804A/804B using the procedures in the section Establishing an RS-232 connection to the /804B.
4. Create and load the bitmap images in cache. The example below illustrates how to load formats and cached images.

```
ICHC          // clears the cache
FMTL 720p60   // loads the 720p60 format
FMTU          // applies the format
IMGL User00   // loads the first bitmap image stored in the userpats.txt file
IMGU          // applies the image
ICHS          // save the bitmap into cache
IMGL User02   // loads the third bitmap image stored in the userpats.txt file
IMGU          // applies the image
ICHS          // save the bitmap into cache
FMTL 1080p60  // loads the 1080p60 format
FMTU          // applies the format
IMGL User03   // loads the fourth bitmap image stored in the userpats.txt file
IMGU          // applies the image
ICHS          // save the bitmap into cache
IMGL User05   // loads the sixth bitmap image stored in the userpats.txt file
```

```
IMGU          // applies the image
ICHS          // save the bitmap into cache
```

Note: Whenever you load these bitmap images either from the front panel or the command line they will be loaded from cache and will be rendered on the display more quickly. But it is important to understand that each bitmap image is specific to a particular format resolution. Therefore, you will have to select the bitmap such that it is consistent with the resolution of the format that is active.

7.5 Rendering 3D Test Patterns on an HDTV

This subsection describes how to render 3D test patterns and bitmaps on an HDTV. The 804/804A/804B supports Side-by-Side, Top-and-Bottom and Frame Packing (for both interlaced and progressive timings) 3D format structures. You can render bitmaps that you have or create or you can render 3D test patterns in the 804/804A/804B test pattern library.

You can obtain 3D bitmaps in three ways:

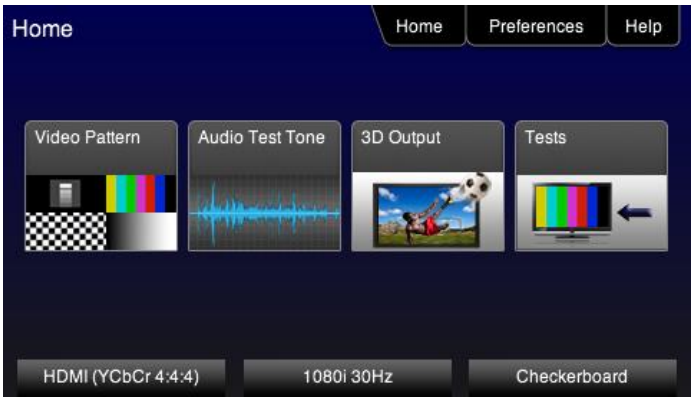
- Develop your own 3D bitmaps.
- Sample 3D bitmaps from the Quantum Data website (www.quantumdata.com/downloads).
- Generate 3D bitmaps from your own stereoscopic image pairs using the Quantum Data 3D Bitmap Conversion Tool available from the Quantum Data website (www.quantumdata.com/downloads).
- Once you have the 3D bitmaps you can transfer them to the 804/804A/804B using the procedures described in the section Importing Custom Bitmaps.

Use the following procedures to render 3D Bitmaps or 3D Test Patterns on HDMI Sink Device.

1. Select a format that is suitable for rendering 3D images such as 720p60 and 1080. Use the procedures above in the section Procedures for Selecting an HDMI Resolution and Frame Rate.

   If you have used the Quantum Data 3D Bitmap Conversion Tool, there is a naming convention for the 3D bitmaps which also provides the required format for each specific bitmap.

2. Touch select **3D Output** option from the top level menu shown below.



The following screen will appear:

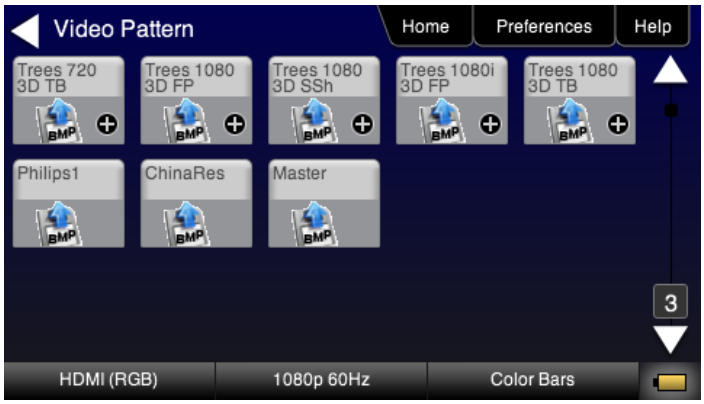
3. Select the 3D mode (Side-by-Side, Top-and-Bottom or Frame Packing) and then select the subtype and Left/Right options (if applicable).
4. Select the 3D bitmap image or test pattern from the Test Pattern list (see screen example below). Refer to the section: List of Test Patterns for a complete list of 3D test patterns.

   Note: When rendering bitmaps, you will have to make sure that the 3D bitmap you use matches your selection of 3D formats and timing (resolution). In the example above, a 3D Frame Packing bitmap is selected for 1280 x 720. Therefore you have to make sure that you select that specific timing (i.e. 1280 x 720) and that specific 3D format structure (Frame Packing).

7.6 Using Custom Test Image Packs

The 804/804A/804B provides licensed image packs for certain sets of test images. You need to have a license key to use these custom test image packs. You can arrange to get access to them by contacting Quantum Data customer support at: http://www.quantumdata.com/support.

When you purchase an image pack it appears as an icon at the end of the list of Test Patterns. A sample screen is shown below (Philips1, ChinaRes, Master). You simply select one of the test patterns (e.g. ChinaRes in the screen example below). They will take a few seconds to load. They will load at the resolution of the format that you have selected.



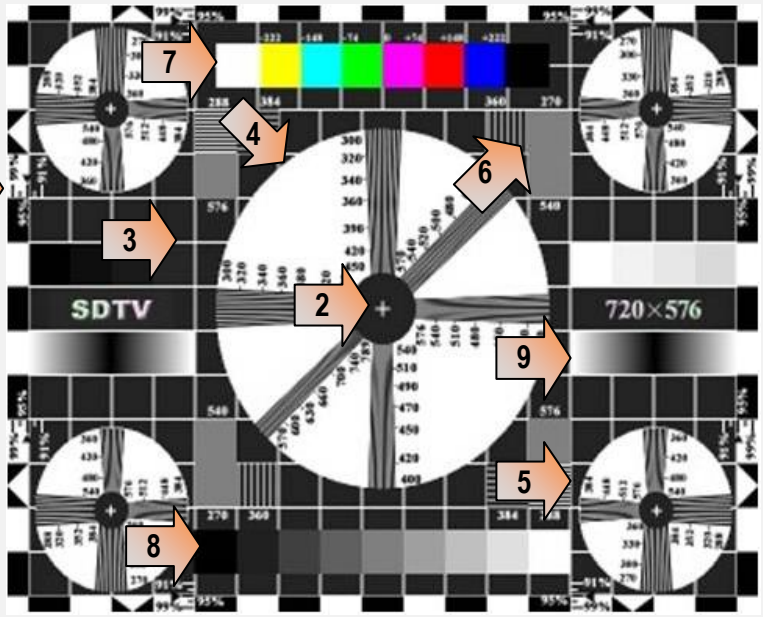
Refer to the table 7-2 below for a description and depiction of the Image Packs currently offered.

Table 7-2: Custom Test Image Packs

ChinaRes Pattern Pack

This is a bitmap that is available through the Image Packs option. The ChinaRes test pattern is specified by the National Testing and Inspection Center for Radio and TV Products of China.

The image pack includes both a standard definition aspect ratio (shown right) and a high definition aspect ratio. This test pattern is supported at: 1920x1080, 1280x720, 720x576 and 720x480 resolutions.



The following is a description of the elements in this test image

1. Overscan gauges to determine percentage of overscan.
2. Centered cross, centered circles, and centered grid to test centering and concentricity.
3. White grid to test convergence.
4. Central resolution wedge gauges for vertical, horizontal, and diagonal resolutions.
5. Corner resolution wedge gauges for vertical and horizontal resolutions.
6. 4-quadrant horizontal and vertical test areas to judge resolution and display artifacts.
7. Color bar for testing color purity and chroma delay.
8. 10-step grayscale to test brightness, contrast, and luminance.
9. Split (left and right) grayscales for testing dark-field and bright-field gray levels.

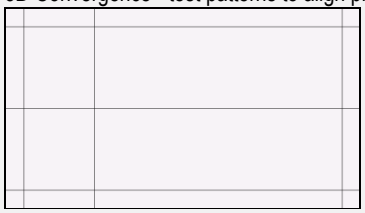
- Average picture level is approximately 50%.

Table 7-3: Custom Test Image Packs – THX Test Patterns

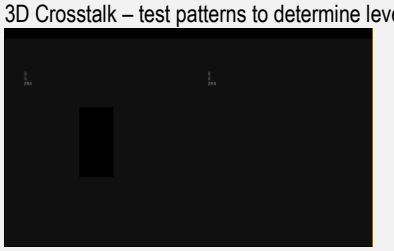
THX Test Patterns

The THX Pattern Pack offers a variety of test patterns for calibrating the luminance and chrominance of high end 3D-capable HDTVs. The following is a list of test patterns provided in this optional test pattern package.

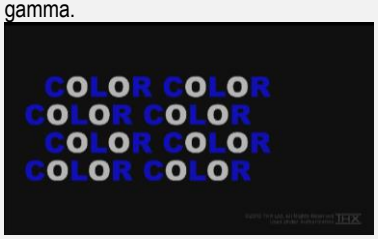
3D Convergence - test patterns to align pixels for proper convergence.



3D Crosstalk – test patterns to determine level of 3D crosstalk.

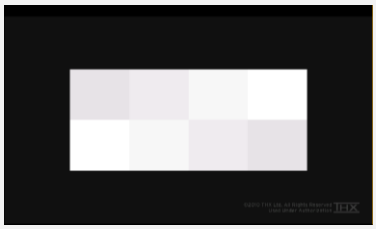


Color Gamut – 2D/3D primary and secondary color patterns to fine-tune colors and gamma.



Picture performance – pattern within THX Optimizer to verify accuracy of skin tones.

THX Optimizer - test patterns to easily adjust brightness, contrast, color, tint, etc.

Table 7-3: Custom Test Image Packs – THX Test Patterns	
	THX box - 2D/3D grayscale test patterns to accurately adjust white point and gamma. 

8 Importing Custom Bitmaps

You can import your own bitmaps into the 804/804A/804B through the USB interface or from an SD card. The 804A and 804B support 4K x 2K bitmaps. Note that when bitmaps are imported into the 804/804A/804B, they are rendered at their native resolution, i.e. they do not scale to the resolution of the video format you have selected as the standard test patterns do. Therefore, if you want to test with a specific bitmap pattern for each resolution and you want the bitmap to fill the entire display, you would need to import a separate bitmap of that image for each resolution you wish to test.

8.1 Workflow for Importing Bitmaps through USB

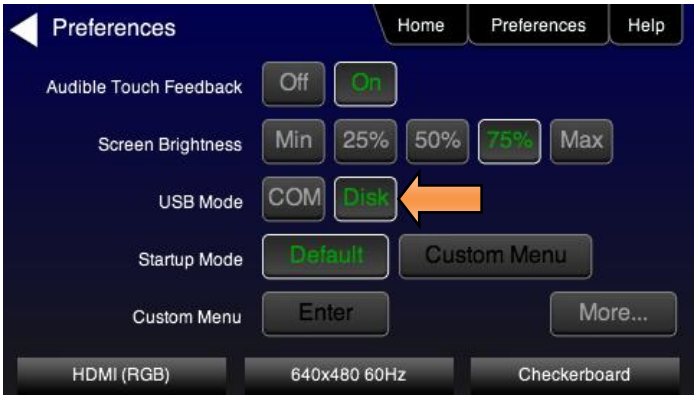
In order to import and use bitmaps in the 804/804A/804B you must take the following high level steps (detailed procedures are provided further below):

- Place the 804/804A/804B's USB interface in the Disk mode.
- Create a text file called "UserPats.txt" that lists each bitmap stored for use. The name in the file has to match the name of the bitmap. The procedures below provide an example of this text file.
- Transfer the UserPats.txt file to the 804/804A/804B over the USB interface.
- Transfer the bitmap(s) over to the 804/804A/804B flash memory through the USB interface.

8.2 Procedures for Importing Bitmaps through USB

Use the procedures below to import bitmaps.

1. Connect the 804/804A/804B to a PC host via the USB cable provided.
2. Select the **Preferences** from the 804/804A/804B top level menu. The following screen appears.



3. Choose **Disk** mode.

   The Disk selection for USB Mode in the above screen will be highlighted in green.

4. Power cycle the 804/804A/804B using the rocker switch on the back panel.

   The 804/804A/804B will appear as a mass storage device on your PC like any other USB drive.

5. Create the UserPats.txt text file listing your bitmaps. Use the information in Table 8-1 below to construct your text file:

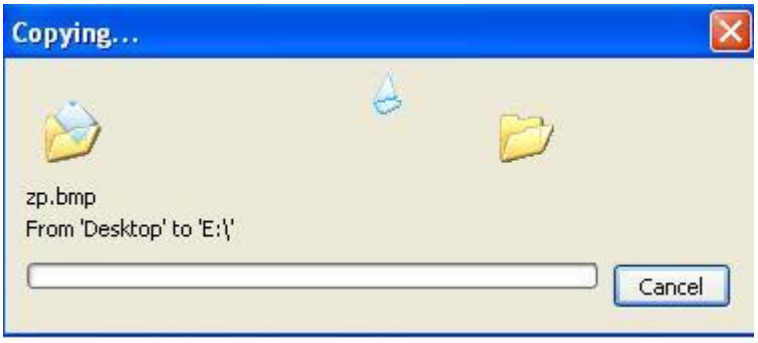
Table 8-1: Importing Bitmaps – UserPats.txt file

Bitmap Name (use 8.3 naming convention)	Bitmap Resolution	UserPats.txt Text File Structure
Mast480.bmp	720x480	The structure of the UserPats file is: <Bitmap Name> space <Description> The contents of the UserPats.txt text file would be: Mast480.bmp Master 720x480 Mast720.bmp Master 1280x720 Mast1080.bmp Master 1920x1080 Mast4k2k.bmp Master 4Kx2K **Note 1:** The bitmap name has to match the name of the stored bitmap. **Note 2:** The description is limited to 20 characters.
Mast720.bmp	1280x720	
Mast1080.bmp	1920x1080	
Mast4k2k.bmp	4Kx2K	

6. Transfer your UserPats.txt file from your PC to the 804/804A/804B using standard Windows methods for transferring files to a USB drive, i.e. by dragging and dropping or copying and pasting.

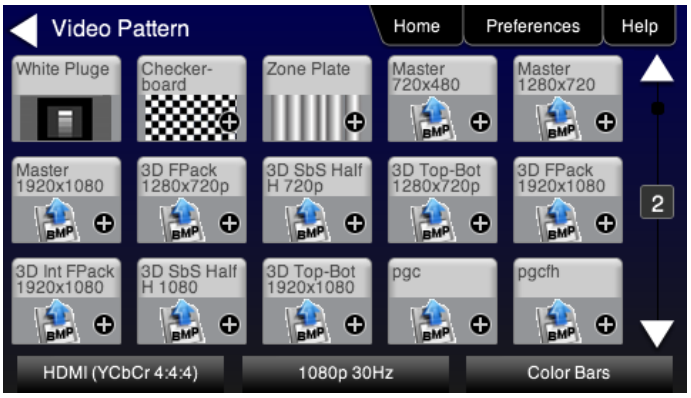
   Note: Your bitmaps are limited to 8 characters with an extension (.bmp).

7. Transfer your bitmap(s) from your PC to the 804/804A/804B using standard windows procedures for transferring files to a USB drive, i.e. dragging and dropping or copying and pasting.



8. Navigate to the **Video Pattern** menu.

   You should now see the new bitmap image(s) on the pattern list (below).



8.3 Workflow for loading bitmaps from the SD card

In order to load bitmaps from the 804's SD card you must take the following high level steps (detailed procedures are provided further below):

- Create a text file called "UserPats.txt" that lists each bitmap stored for use. The name in the file has to match the name of the bitmap. The procedures below provide an example of this text file.
- Transfer the UserPats.txt file to the 804 to an SC card using a card reader.
- Insert the SC card into the 804 SD slot on the front (below).

8.4 Procedures for Loading Bitmaps from SD Card

Use the procedures below to load bitmaps from an SD card.

1. Load your bitmaps on to the SD card from your PC using a USB SD card reader.
2. Create the UserPats.txt text file listing your bitmaps. Use the information in Table 8-2 below to construct your text file:

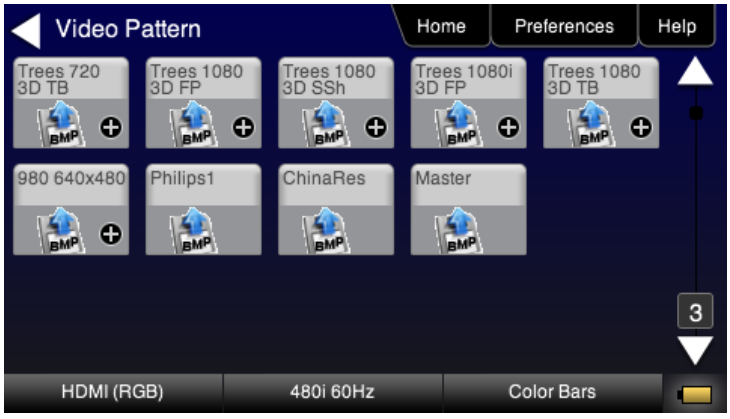
Table 8-2: Importing Bitmaps – UserPats.txt file

Bitmap Name (use 8.3 naming convention)	Bitmap Resolution	UserPats.txt Text File Structure
Mast480.bmp	720x480	The structure of the UserPats file is: <Bitmap Name> space <Description> The contents of the UserPats.txt text file would be: Mast480.bmp Master 720x480 Mast720.bmp Master 1280x720 Mast1080.bmp Master 1920x1080 **Note 1:** The bitmap name has to match the name of the stored bitmap. **Note 2:** The description is limited to 20 characters.
Mast720.bmp	128x720	
Mast1080.bmp	1920x1080	

3. Transfer your UserPats.txt file from your PC to the SD card using standard Windows methods for transferring files to a USB drive, i.e. by dragging and dropping or copying and pasting.
4. In this example, you would have created a bitmap called for example 980_640.bmp and stored it on the SD card. In this example the bitmap is 640 x 480 resolution. You would then create a userpats.txt file as follows:
5. 980_640.bmp 980 640x480

   Note: Your bitmaps are limited to 8 characters with an extension (.bmp).
6. Insert the SD card into your 804.
7. Power cycle the 804.
8. Navigate to the **Video Pattern** menu.

   You should now see the new bitmap image(s) (980 640x480) on the pattern list (below).



9 Creating and Using Custom Formats

You can create your own formats using the Quantum Data Format Editor available at: www.quantumdata.com/downloads. The Format Editor will create an .xml format file that you can store in the 804. The instructions for using the Format Editor are included with the 882 User Guide also available on at: www.quantumdata.com/downloads. Once created you can load your custom formats either through the command line or by selecting them through the User buttons on the Signal Type menu.

9.1.1 Workflow for Using Custom Formats

In order to import and use custom formats in the 804 you must take the following high level steps (detailed procedures are provided further below):

- Create custom formats with the Quantum Data Format Editor available from www.quantumdata/com/downloads page. The instructions for using the Format Editor are provided in the 882 User Guide also available from www.quantumdata/com/downloads page.
- Store the .xml format files on your PC.
- Place the 804's USB interface in the **Disk** mode. This is not the default mode for the USB interface.
- Transfer the .xml format file(s) to the FMT directory of 804 over the USB interface.
- Establish a command line session with the 804 from your PC over the USB port.
- Select the custom format through the User Signal Type menu.
- Apply the custom formats using the FMTL and FMTU commands.

9.1.2 Procedures for Creating and Loading Custom Formats

Use the following procedures to add custom formats to your 804.

1. Create a new custom format or modify existing formats with the Quantum Data Format Editor. You can use some of the sample formats available from the Quantum Data website as a starting point for creating a new format. Be sure to save the file. The format files will be saved as .xml files by the Format Editor.

2. Select the **Preferences** from the 804/804A/804B top level menu.

   The following screen will appear:

3. Choose **Disk** mode.

   The Disk selection for **USB Mode** in the above screen will be highlighted in green.

4. Power cycle the 804/804A/804B using the rocker switch on the back panel.

   The 804 will appear as a mass storage device on your PC like any other USB drive.

   Note: If this is the first time you have used the 804 in the **Disk** mode you will have to reformat the disk. The system will prompt you through the format process.

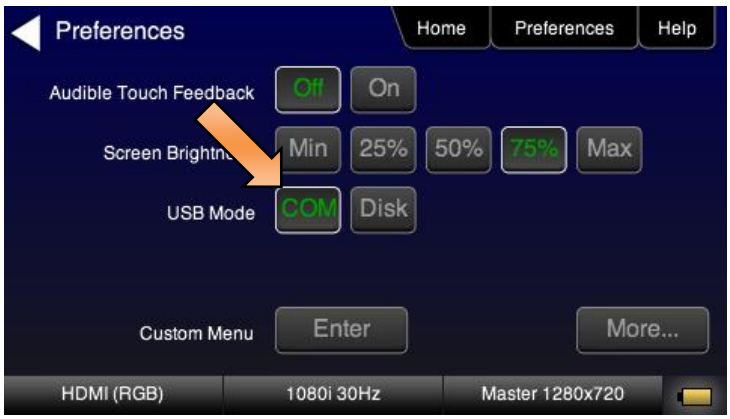
5. Connect the 804/804A/804B to a PC host via the USB cable provided.

   The 804/804A/804B should appear as a USB storage device.

6. Transfer your custom format .xml files from your PC to the FMT directory of the 804 using standard Windows methods for transferring files to a USB drive, i.e. by dragging and dropping or copying and pasting.

   Note: Your formats are limited to 8 characters with an extension (.xml).

7. Touch select the **Preferences** from the 804/804A/804B top level menu. Refer to the screen below.

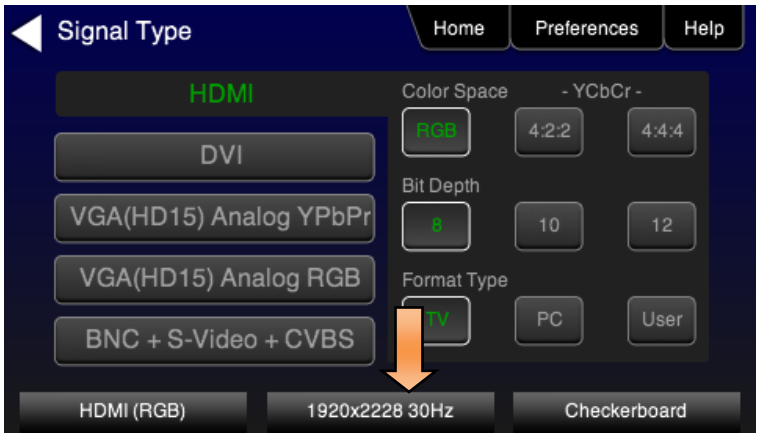


8. Touch select **COM** for the **USB Mode** (refer to the screen above).

9. Power cycle the 804/804A/804B.

10. Navigate to the Signal Type menu of the desired interface and select User for the Format Type as indicated below.

11. Navigate to the formats menu to view the list of custom User Formats.



The following screen appears which shows the list of custom formats.

12. (Alternatively) Establish a command line session with the 804/804A/804B from your PC using the procedures described in Command Reference.

13. Load a custom format using the following commands:

```
FMTL <formatName>  // where formatName is the name of the custom format
FMTU
```

10 Creating Custom Menus

This section describes how to configure custom menus on the 804/804A/804B. Custom menus enable you to display a menu of commonly used functions on the 804/804A/804B touch display. This allows you to save time by quickly executing a specific set of resolution and image combinations.

The custom menus are setup using two text files that you create on your PC and transfer over to the 804/804A/804B. The two files are: 1) UserKeys.txt and 2) SeqMap.txt. The UserKeys.txt is a set of commands with menu key codes. Each set of commands is a line in the text file.

10.1.1 To create a custom menu:

Use the following procedure to create a custom menu on your 804/804A/804B.

1. Create a UserKeys.txt file or edit an existing file. An example of a UserKeys.txt file is shown below.

```
#F0 fmtl 720p60;imgl user01;fmtu
#F1 fmtl 1080p60;imgl pgcwrgb;fmtu
#F2 fmtl 480p60;imgl smptebar;fmtu
#F3 fmtl dmt0660;imgl ramp;fmtu
#F4 fmtl 1080i30;imgl focus;fmtu
#FF mfgm 0
```

Note that the commands are separated by a semicolon. In the example above in the first line there is a custom bitmap image “user01” that is used.

2. Create a SeqMap.txt file or edit an existing file. An example of a SeqMap.txt file is shown below.

The SeqMap.txt then maps the commands listed in the UserKeys.txt file to a name and a location on the custom menu. The following is an example of a SeqMap.txt file.

```
#F0 720p Master
#F1 1080p PGCWrgb
#F2 480p SMPTEbar
#F3 DMT0660 Ramp
#F4 1080i Focus
#FF Go Home
```

The result of these two files would be the following custom menu:

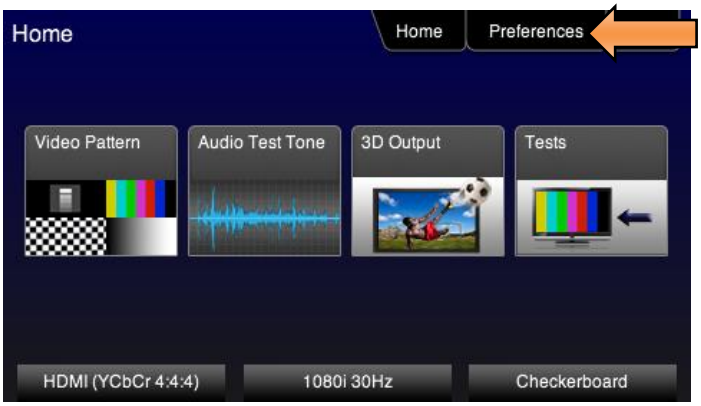
Touch selecting the key labeled “1080p PGCWrgb” would cause the following command sequence to execute:

```
#F1 fmtl 1080p60;imgl pgcwrgb;fmtu  // loads 1080p60 format,
                                       displays pgcwrgb test pattern
```

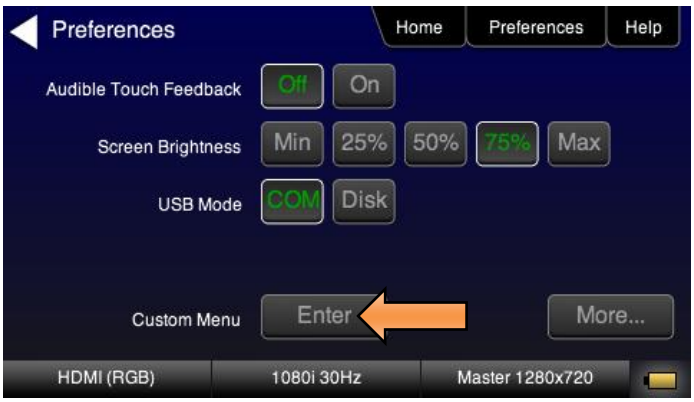
10.1.2 To access custom menus:

Use the following procedure access the custom menu on your 804/804A/804B.

1. Navigate to the Preference menu by selecting the Preferences tab from the Home menu.



2. Navigate Touch select **Custom Menu** from the Preference screen as shown below.



The following screen appears.

Custom Menu
720p Master
1080p PGCWrgb
480p SMPTEbar
DMT0660 Ramp
1080i Focus
Go Home
1

11 Running Audio Tests

This section provides the Instructions for running audio tests on the 804/804A/804B. Procedures are provided for operation both through the front panel and the command line.

11.1 Testing HDMI Audio on an HDTV or A/V Receiver

This section provides procedures for testing HDMI audio on an HDTV or A/V Receiver.

Note: It is recommended not to select bitmap images when outputting compressed audio clips.

Table 11-1 below summarizes the 804/804A/804B support for digital audio.

Table 11-1: Audio Signal Type

Audio Format	Audio Interface	Audio Test Tone Description	Audio Test Tone Options
Dolby 5.1	Supported on the following interfaces: ▪ HDMI	Provides a set of Dolby 5.1 noise patterns: ▪ 500-2kHz Pink ▪ 20-20kHz Pink ▪ Impulse ▪ Polarity ▪ Auto Time Delay (no options)	Channel Selection (gating control): ▪ L – turn left channel on ▪ C – turn center channel on ▪ R – turn right channel on ▪ LFE – turn low frequency effects channel on ▪ Rs – turn right surround channel on ▪ Ls – turn left surround channel on ▪ All – turn all channels on ▪ Cycle – cycle through all channels in sequence; 8 seconds per channel
		Provides a set of Dolby 5.1 sine waves: ▪ Sine Wave	Channel control: ▪ 63Hz ▪ 125Hz ▪ 1kHz ▪ 4kHz For frequency you can select: ▪ Cycle – cycle through all channels in sequence; 8 seconds per channel ▪ All – turn all channels on
Dolby Digital Plus 7.1	Supported on the following interfaces: ▪ HDMI	Provides a set of Dolby Digital Plus sine wave clips: ▪ 2.0 – 2 channel @ 192kHz sampling rate ▪ 5.1 – 6 channel @ 192kHz sampling rate ▪ 7.1 – 8 channel @ 192kHz sampling rate	Not applicable
Dolby TrueHD	Supported on the following interfaces: ▪ HDMI	Provides a set of TrueHD sine wave clips: ▪ 2.0 2kHz – 2 channel @ 192kHz sampling rate ▪ 7.1 1kHz – 8 channel @ 192kHz sampling rate	Not applicable

Table 11-1: Audio Signal Type

Audio Format	Audio Interface	Audio Test Tone Description	Audio Test Tone Options
DTS-ES 6.1	Supported on the following interfaces: ▪ HDMI	Provides a set of DTS 6.1 noise patterns: ▪ 500-2kHz Pink ▪ 20-20kHz Pink ▪ Impulse ▪ Polarity ▪ Auto Time Delay (no options)	Channel Selection (gating control): ▪ L – turn left channel on ▪ C – turn center channel on ▪ R – turn right channel on ▪ LFE – turn low frequency effects channel on ▪ Rs – turn right surround channel on ▪ Ls – turn left surround channel on ▪ Cs – turn center surround channel on ▪ All – turn all channels on ▪ Cycle – cycle through all channels in sequence; 8 seconds per channel
		Provides a set of DTS 6.1 sine waves: ▪ Sine Wave	Channel control: ▪ 63Hz ▪ 125Hz ▪ 1kHz ▪ 4kHz For frequency you can select: ▪ Cycle – cycle through all channels in sequence; 8 seconds per channel ▪ All – turn all channels on
DTS HD HRA	Supported on the following interfaces: ▪ HDMI	Provides a set of DTS-HD Hi Bit Rate sine wave clips: ▪ 192kHz 7.1 5376kb HDHRA – 8 channel @ 192kHz sampling rate ▪ 192kHz 5.1 3840kb HDHRA – 6 channel @ 192kHz sampling rate ▪ 192kHz 7.1 5760kb HDHRA – 8 channel @ 192kHz sampling rate	Not applicable
DTS-HD Master Audio	Supported on the following interfaces: ▪ HDMI	Provides a set of DTS HD Master Audio sine wave clips: ▪ 5.1 192kHz – 6 channel @ 192kHz sampling rate ▪ 7.1 192kHz – 8 channel @ 192kHz sampling rate	Not applicable

Table 11-1: Audio Signal Type			
Audio Format	**Audio Interface**	**Audio Test Tone Description**	**Audio Test Tone Options**
PCM Sine Wave (programmable)	Supported on the following interfaces: ▪ HDMI ▪ Analog	Provides programmable sine waves for a range of bit depths, sampling rate, amplitudes (levels), sampling rates, frequencies and channel counts.	Provides programmable sine waves: ▪ Bits per sample – 16, 20, 24 ▪ Sampling rate (kHz) – 32, 44.2, 48, 88.2, 96, 176.4, 192 ▪ Channels – 2.0, 2.1, 5.1, 6.1, 7.1 ▪ Level – 0dB to -99dB in 3dB increments (per channel) ▪ Frequency – 8Hz to 20kHz in 1Hz, 10Hz ,100Hz 1kHz increments (per channel) ▪ Mute – On/Off (per channel)

11.1.1 Procedures for Testing HDMI uncompressed PCM audio on an HDTV

Use the following procedures to run audio tests using LPCM audio test patterns on the HDMI ports of an HDTV.

1. From the main menu screen (shown below), touch select **Audio Test Tone**.

The **Audio Pattern** menu appears as shown below:

2. Touch select the HDMI Interface from the **Audio Pattern** menu.

   Alternatively, to select HDMI audio through the command line:

   ```
   DASI 6      // selects the HDMI audio output
   FMTU        // activates format
   ```

3. Touch select the PCM Sine Wave on the Audio Pattern menu (refer to the screen shot above).

   The following screen appears:

4. Select the audio parameters:

   - Touch select the values for the **Bits per Sample** using the three buttons provided. (16 bits is selected in the example above.)
   - Touch select the **Sampling Rate** by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 48 kHz selected.)
   - Touch select the **Channels** by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 2.0 selected.)
   - Specify the **Level** by touch selecting the associated increment or decrement buttons showing +3dB and -3dB. (Refer to the screen shot above which shows the level at -3dB.) Repeat for each channel. You can specify the level for each channel individually.
   - Specify the **Frequency** of the sine wave by touch selecting the associated increment or decrement buttons. There are four buttons on the left of the current value. (1.00 kHz is shown selected in the screen shot above) The four buttons provide a variety of increment and decrement values for convenience. Repeat for each channel. You can specify the frequency for each channel individually.
   - Specify which channels you want to mute by touch selecting a channel and then touch selecting the **Mute** activation button. You can only select one channel at a time. Note that only the active channels (the ones specified in Channels will be selectable. (Refer to the screen shot above.)

   Alternatively, to select HDMI audio parameters for PCM Sine Wave through the command line as follows:

   ```
   ARAT 48000      // selects the sampling rate to 48kHz
   NBPA 24         // selects the number of bits per sample
   SRAT 1000       // sets the sine wave frequency of the audio
   SAMP -9         // sets the amplitude of the PCM sine wave audio
   ALLU            // activates analog audio parameter settings
   ```

11.1.2 Procedures for Testing HDMI compressed audio on an HDTV

Use the following procedures to run audio tests using Dolby and or DTS audio test patterns on the HDMI ports of an HDTV. Refer to Table 11-1 above for specific examples for setting the options.

1. From the main menu screen (shown below), touch select **Audio Pattern**.

   The **Audio Pattern** menu appears as shown below:

2. Touch select the HDMI Interface from the **Audio Pattern** menu as shown above.

   Alternatively, to select HDMI audio through the command line:

```
DASI 6      // selects the HDMI audio output
FMTU        // activates format
```

3. Touch select a compressed audio format (e.g. Dolby 5.1) on the Audio Pattern menu (refer to the screen shot above).

   The following screen is an example:

4. Touch select the desired audio test pattern. (Sine Wave shown in the screen shot above.)

11.1.3 Procedures for Testing Analog Audio on an HDTV

Use the following procedures to run audio tests using PCM Sine Wave audio test patterns on the analog audio output.

1. From the main menu screen (shown below), touch select **Audio Test Tone**.

2. Touch select the Analog interface from the **Audio Pattern** menu. The following screen appears:

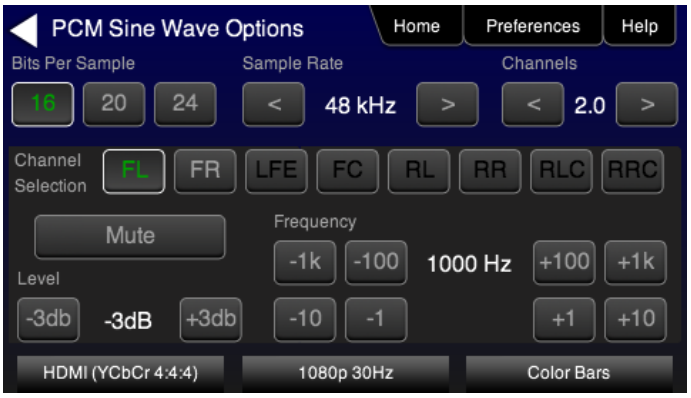
   The **Audio Pattern** menu appears as shown below:

   Alternatively, to select analog audio through the command line:

```
AASI 1      // selects the analog audio output
ALLU        // activates analog audio
```

3. Touch select the **PCM Sine Wave** on the **Audio Pattern** menu.

   The following screen appears:



4. Select the audio parameters:

   - Touch select the values for the Bits per Sample using the three buttons provided. (16 bits is selected in the example above.)
   - Touch select the Sampling Rate by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 48 kHz selected.)
   - Touch select the Channels by incrementing the associated arrows adjacent to the current value. (Refer to the screen shot above which shows 2.0 selected.)
   - Specify the Level by touch selecting the associated increment or decrement buttons showing +3dB and -3dB. (Refer to the screen shot above which shows the level at -3dB.) Repeat for each channel. You can specify the level for each channel individually.
   - Specify the Frequency of the sine wave by touch selecting the associated increment or decrement buttons. There are four buttons on the left of the current value. (1.00 kHz is shown selected in the screen shot above) The four buttons provide a variety of increment and decrement values for convenience. Repeat for each channel. You can specify the frequency for each channel individually.
   - Specify which channels you want to mute by touch selecting a channel and then touch selecting the Mute activation button. You can only select one channel at a time. Note that only the active channels (the ones specified in Channels will be selectable. (Refer to the screen shot above.)

   Alternatively, to select audio parameters through the command line:

```
NBPA 24         // selects the number of bits per sample
ARAT 48000      // selects the sampling rate to 48kHz
SRAT 1000       // sets the sine wave frequency of the audio
SAMP -9         // sets the amplitude of the PCM sine wave audio
ALLU            // activates analog audio parameter settings
```

12 Running Protocol Tests - Using the Front Panel GUI

This section provides the Instructions for Use for the running the HDMI protocol tests. Refer to Table 9-1 above for specific examples for setting the options.

Note: If the 804/804A/804B is used in a manner not specified in the guide, the protection provided by the equipment may be impaired.

12.1 Testing HDMI Protocols

You can test HDMI protocols (such as HDCP, EDID and CEC) on an HDTV or A/V Receiver.

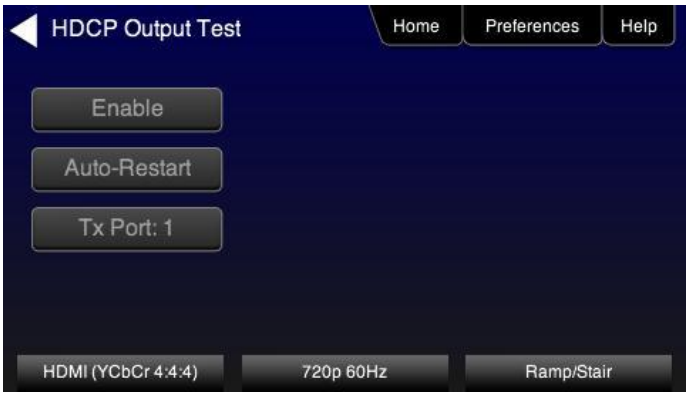
Note: Only the 804B supports HDCP 2.2 authentication testing.

12.1.1 Procedures for Testing HDMI-HDCP 1.4 protocol on an HDTV

Use the following procedures to run HDCP test on an HDTV.

1. Power up the 804/804A using the rocker switch on the back panel and the front panel. The On position is with the toggle switch depressed on the inner side of the switch. Refer to the procedures in Chapter entitled: Instructions for Use.
2. From the main menu screen (shown below), touch select **Tests**.

3. Select **HDCP Test** from the **Sink Tests** menu shown below.



4. Touch select the lower button (**Tx Port x**) on the **HDCP Output Test** menu shown below.
5. Touch select **Enable** from the **HDCP Output Test** menu shown above.

   Touch select Auto-Restart to restart HDCP authentication.

   The Pass/Fail results and the key values exchanged during the authentication are presented on the screen as shown below.

6. Repeat for each HDMI port you wish to test by selecting the lower button (**Tx Port x**).

   Note: You will have to select each HDMI port in sequence.

12.1.2 Procedures for Testing HDMI-HDCP 2.2 protocol on an HDTV (804B only)

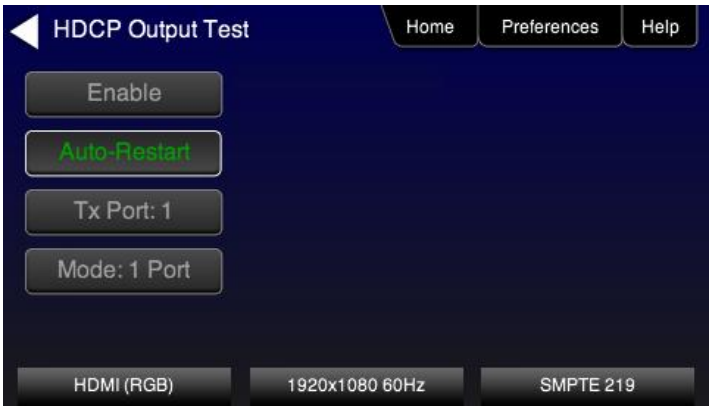
Use the following procedures to run HDCP 2.2 test on an HDTV with the 804B.

1. Power up the 804B using the rocker switch on the back panel and the front panel. The On position is with the toggle switch depressed on the inner side of the switch. Refer to the procedures in Chapter entitled: Instructions for Use.

2. From the main menu screen (shown below), touch select **Tests**.

3. Select **HDCP Test** from the **Sink Tests** menu shown below.

The **HDCP Output Test** screen will appear as shown below.



4. Touch select the **Mode**

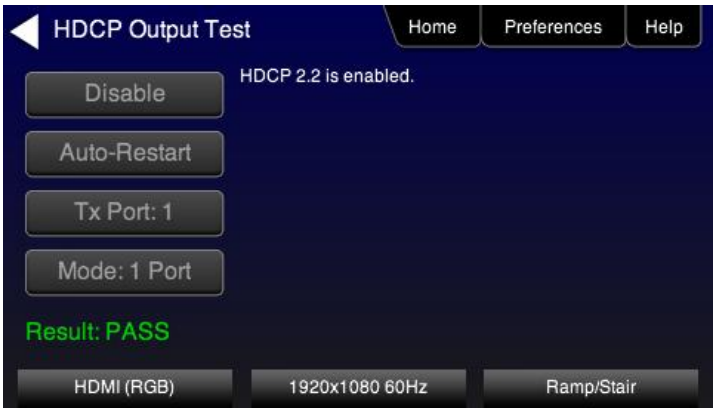
activation button to determine which ports you want to run the authentication on. You can either select **All Ports** or only a single port which you specify using the **Tx Port button**

5. Touch select the **Tx Port x**

until the desired port is shown.

   Touch select Auto-Restart to restart HDCP 2.2 authentication in the event that it fails.
6. Touch select **Enable** from the **HDCP Output Test** menu shown above.

   The Pass/Fail results are presented on the screen as shown below.



7. Repeat for each HDMI port you wish to test by selecting the lower button (**Tx Port x**).

12.1.3 Procedures for Testing HDMI-EDID protocol on an HDTV

Use the following procedures to run EDID test on an HDTV.

1. From the main menu screen (shown below), touch select **Tests**.

   The **Sink Tests** menu appears as shown below.

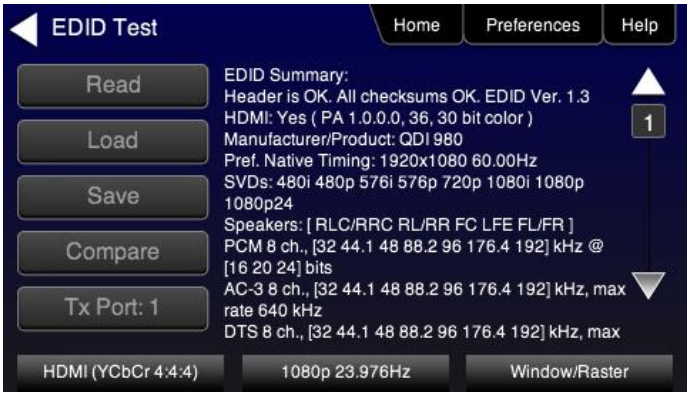
2. Select **EDID Test** from the **Sink Tests** menu shown below.

3. Touch select the lower button (**Tx Port x**) on the **EDID Test** menu shown below.

   Note: You will have to select each HDMI port in sequence.

4. Touch select **Read** from the **EDID Test** menu shown below.

   The 804/804A/804B indicates whether the checksum and header are okay.



5. Repeat for each HDMI port you wish to test.

12.1.4 Procedures for Testing HDMI-CEC protocol on an HDTV

Use the following procedures to run CEC test on an HDTV.

1. From the main menu screen (shown below), touch select **Tests**.

   The **Sink Tests** menu appears as shown below.

2. Select **CEC Test** from the **Sink Tests** menu shown below.

3. Touch select the lower button (**Tx Port x**) on the **CEC Test** menu shown below.

   Note: You will have to select each HDMI port in sequence.

4. Touch select **Ping** from the **CEC Test** menu shown below.

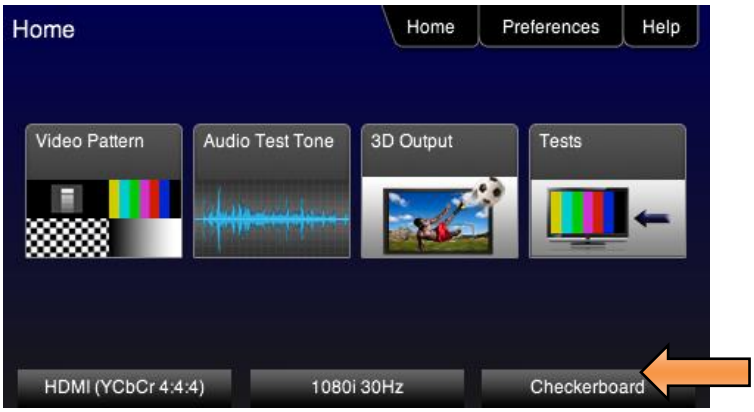
   The results are presented on the screen.

5. Repeat for each HDMI port you wish to test.

12.1.5 Procedures for running multi-protocol tests on an HDMI Sink Device

Use the procedures below to run a multi-protocol test on an HDMI sink.

1. Make the physical connections between the 804/804A/804B HDMI OUT connector and the display device under test.
2. Enable the HDMI output using the procedures at Selecting a Signal Type and Resolution.
3. Touch select video pattern status and activation button on the lower right of the LCD interface.



4. Touch select the Aux Combo Test pattern from the second page of the Video Pattern menu shown below.

The results will appear on the connected display. An example of the results is shown below:

5. Alternatively you can run the AuxComboTest from the command line as follows:

```
IMGL AuxTest
IMGU
```

13 Using the Keypad

This section provides information and procedures for operating the 804/804A/804B with a keypad. The 804/804A/804B can support keypad operation to enable efficient production test operation. A USB numeric keypad or RS-232 numeric keypad can be used for this application. Supported keypad functions include selection of interface, timing, pattern, and test sequences.

13.1 Connecting a Keypad

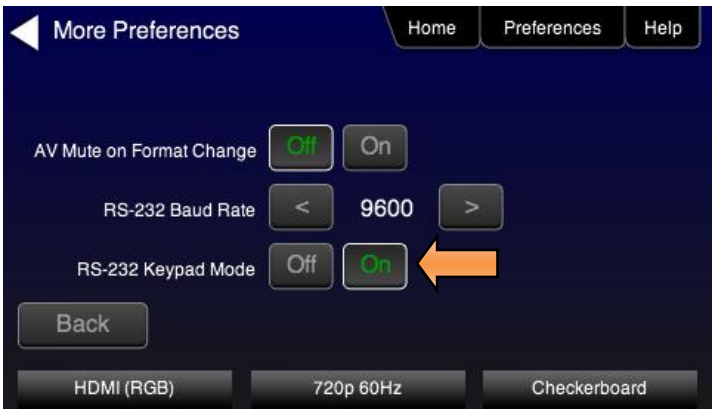
A USB keypad can be connected to the 804/804A/804B rear panel USB Host connector. Alternatively, an RS-232 keypad can be connected to the 804/804A/804B rear panel RS-232 connector.

13.2 Enabling and Configuring an RS-232 Keypad

If an RS-232 keypad is used, it must be enabled and configured from the 804/804A/804B **Preferences** menu. Use the following procedures to enable a keypad.

1. From the 804/804A/804B **Home** menu, select the Preferences tab. The **Preferences** menu will be displayed as shown below.
2. For the **Keypad Mode** menu item, select the ON button.

   When selected, the **ON** button will be highlighted green.



3. Under RS-232 Baud Rate, use the arrow keys to select the correct baud rate for the keypad to be used. For the Genovation keypad supplied by Quantum Data, choose 1200 baud. After selecting the correct baud rate, use either power switch to power-cycle the 804/804A/804B so that the changes take effect.

13.3 Keypad Functionality

For keypad support, the 804/804A/804B uses four configuration files stored in the root directory of the internal flash. Here are the names and functions of the four files:

- **UserKeys.txt**: This file provides mappings of key codes so that the 804/804A/804B knows which key has been pressed. This file may be different for each model of keypad that is used. This file should be configured by Quantum Data Engineering, and should not be changed by the customer unless you wish to create a specific test sequence. Procedures for creating a test sequence in the UserKeys.txt file are provided further below. Please contact Quantum Data Applications Engineering if you need this file changed, or if you want to use a different model of keypad.
- **fmtmap.txt**: This file provides mapping of format numbers to specific formats on specific interfaces. Each interface has a range of format numbers associated with it, and these ranges are specified in file intmap.txt. An example of the mapping for this file is depicted in Table 13-2.
- **intmap.txt**: This file specifies the ranges of format numbers assigned to each video interface. An example of the mapping for this file is depicted in Table 13-3.
- **imgmap.txt**: This file provides a mapping of test pattern numbers to the actual test patterns. An example of the mapping for this file is depicted in Table 13-4.

Keypad functions are assigned as shown in Table 13-1 below:

Table 13-1 – Keypad Functions

Key	Function
Num Lock	Timing - Select a format
/	Pattern - Select an image
*	Program – Create a sequence
. or Del	Out or End
-	Go to Previous item
+	Go to Next item

13.4 Selecting a Format (Timing)

A format can be selected by pressing the TIMING key followed by the number that represents the desired timing and interface. The following is an example of how you would select a format using the Format Map file shown in Table 13-2 below. Table 13-3 further below shows a sample mapping between formats (timings) and interfaces.

```
TIMING

352

ENTER
```

This will change the timing format to 1080p60 on the HDMI interface. Then the “Previous” and “Next” keys can be pressed to sequence through the format list. The following table is an example of a map between formats and keypad numbers that you would select.

Table 13-2 – Example Format Map File

Format Number	Format Name	Interface-Specific
301	NTSC44	
302	NTSC-J	
303	NTSC-M	
304	PAL-BDGH	
305	PAL-N	TV

306	PAL-NC	
307	PAL-M	
308	PAL-60	
310	480i30	BNC (YPbPr)
311	576i25	
312	480p59	
313	576p50	
314	720p60	
315	720p59	
316	720p50	
317	1035i30	
318	1035i24	
319	1152i25	
320	1080i25	
321	1080i24	
322	1080i29	
323	1080i30	
324	1080p24	
325	1080p24	
326	1080p25	
327	1080p29	BNC (YPbPr)
328	1080p30	
329	1080p50	
330	1080p59	
331	1080p60	
332	480i24	DVI
333	480p60	
334	1080i30	
335	720p60	
336	1080p59	
341	480i24	
342	480i24	
343	576i25	
344	480p60	

345	480p59	HDMI
346	576p50	
347	720p60	
348	720p50	
349	1080i30	
350	1080i25	
351	1080p50	
352	1080p60	
353	DMT0659	
354	DMT0860	
355	DMT1060	
368	1080p59	
370	720p59	
371	1080p50	
372	1080i25	
373	1080i24	
374	576i25	
375	480i30	
396	720p59	
397	DMT0660	
398	480p60	

Table 13-3 – Format Range per Interface Map

Interface Number	Interface Name
301 - 309	TV
310 - 331	BNC + S-Video + CVBS (ED/HD)
332 - 336	DVI
341 - 398	HDMI
400 - 499	VGA(HD15) Analog RGB
500 - 599	VGA(HD15) Analog YPbPr

13.5 Selecting a Test Pattern (Image)

A test pattern (image) can be selected by pressing the PATTERN key followed by the number that represents the desired pattern. The following is an example of how you would select a test pattern using the Image Map file shown in Table 13-4 below.

```
PATTERN
001
ENTER
```

This will display the SMPTEBar pattern at the current format and on the current interface. Then the “Previous” and “Next” keys can be pressed to sequence through the pattern list.

Table 13-4 – Example Image Map File

Image Number	Image Name
001	SmpteBar
002	TVBar100
003	TVBar_75
004	H_Stair
005	Pluge
100	Ramp
101	SplitGray
200	LG_V_CBAR
300	EcoFlower
301	Halation
302	Loading
400	Flat
401	Flat93
402	Flat87
403	Flat80
404	Flat73
405	Flat67
406	Flat60
407	Flat53
500	PRN24Bit

13.6 Programming a Test Sequence using the keypad

You can create and run test sequences in one of two ways.

1) You can program a test sequence through the keypad using the procedures below.
2) You can create a sequence by adding a set of commands to the UserKeys.txt file using the procedures below.

The following is an example of how to create a typical test sequence file using the keypad.

1. Touch select the **Preferences** from the 804/804A/804B top level menu. Refer to the screen below.

2. Touch select **COM** for the **USB Mode** (refer to the screen above).

Keypad functions are assigned as shown in Table 13-5 below:

Table 13-5 – Keypad Functions

Key	Function
Num Lock	**TIMING** - Select a format
/	**PATTERN** - Select an image
*	Program **PROG** – Create a sequence
. or Del	**OUT** or **END**
-	Go to Previous item
+	Go to **NEXT** item

3. Define a sequence as follows:

Note: Information after "//" are comments to help you understand.

```
OUT          // press the OUT key to start the creation of the sequence
001          // enter the sequence number
PROG         // press the PROG key to begin programming
TIMING
344          // 480p60 HDMI
PATTERN
001          // SmpteBar pattern
NEXT
TIMING
347          // 720p60 HDMI
PATTERN
004          // horizontal stair
```

```
NEXT
TIMING
352          // 1080p60 HDMI
PATTERN
100          // ramp
END          // press the END key to halt the of sequence programming
```

4. Play back a sequence as follows.

```
OUT
001
NEXT
NEXT
(repeat NEXT or PREVIOUS)
```

13.7 Programming a Test Sequence in the UserKeys file

You can also create a test sequence by including a set of commands in the UserKeys.txt file. The UserKeys.txt file is primarily used internally for mapping the keypad keys to a set of commands for general keypad use. However you can also use the UserKeys.txt file to store programming test sequences similar to macros.

The following is an example of a UserKeys.txt file which shows the keypad mapping and more importantly a test sequence instruction set (#F0, #F1 and #FF). Note that there are two macro test sequences defined #F0 and #F1. The #FF definition is a macro that simply disables manufacturing mode in the 804 test instrument. The #F0 macro also shows a special use case for the kbrd command. In this case the kbrd f0 command will cause the macro to loop back on itself such that the #F0 macro continuously loops.

Note: Do not change any of the keypad mapping commands. These are the commands such as xkpm, xkpkj, xkpu, xkpi. Modifying these commands will affect the general functions of the keypad.

```
S xkpm 2
T xkpm 1
U xkpm 4
V xkpj 1
W xkpj -1
X xkpu
Y xkpi 1
Z xkpi 2
[ xkpi 3
\ xkpi 4
] xkpi 5
^ xkpi 6
_ xkpi 7
` xkpi 8
a xkpi 9
```

```
b xkpi 0

c xkpm 3

#F0 xvsi 4;fmtl 720p60;imgl smptebar;fmtu;dlay 5000;fmtl 480p60;imgl h_stair;fmtu;dlay
5000;fmtl 1080i30;imgl needle;fmtu;dlay 5000;fmtl 1080p60;imgl decodchk;fmtu;dlay
5000;fmtl 480i30;imgl v_3bars;fmtu;dlay 5000

#F1 xvsi 4;fmtl cvt1460d;imgl checkby6;fmtu;dlay 5000;fmtl dmt1170_;fmtu;dlay 5000;fmtl
dmt0660;fmtu;dlay 5000

#FF mfgm 0
```

To run a test sequence macro stored in the UserKeys.txt file you use the kbrd command on the command line as follows.

```
KBRD F0    // This command would run the F0 macro in the UserKeys.txt file
              (case is not important)
```

14 Upgrading the 804/804A/804B

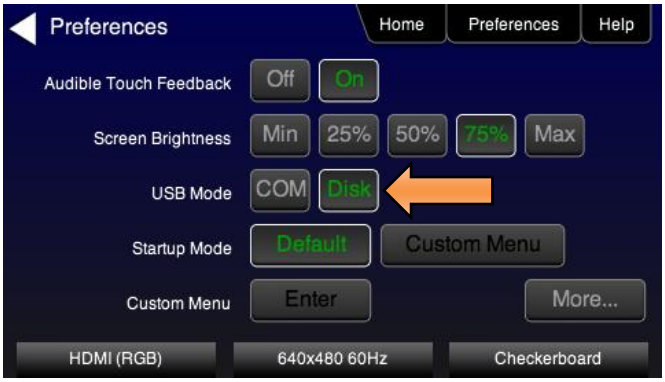
14.1 Upgrading the Firmware and Gateware on your 804/804A/804B

You can upgrade the firmware and gateware on your 804/804A/804B through the USB interface. In order to upgrade the 804/804A/804B firmware and gateware you have to put the 804/804A/804B in the “Disk” mode.

Important Note: Be sure to check the Release Notes on the Quantum Data website for additional information on upgrading for a particular release. The instructions below may not apply in all upgrade scenarios.

Use the following procedure to upgrade the firmware and gateware for your 804/804A/804B.

1. Download the 804/804A/804B firmware and gateware (if necessary) files from the Quantum Data website http://www.quantumdata.com/downloads/index.asp to your PC and unzip the file.
2. Connect the 804/804A/804B to a PC host via the USB cable provided.
3. Touch select the **Preferences** from the 804/804A/804B top menu.
4. Choose **Disk** for the USB Mode. Refer to the screen below.



5. Power cycle the 804/804A/804B.
6. The 804/804A/804B appears as a mass storage device like any other USB drive.
7. Transfer the new firmware (VP500app.bin) and Bootstrap (bootstrp.bin) file from your PC to the 804/804A/804B using standard Windows drag and drop techniques.
8. Transfer the new gateware (mltfpga.bin [804]) & mlt2fpga.bin [804A]) from your PC to the 804/804A/804B using standard Windows drag and drop techniques.
9. Use Windows Eject function on the 804/804A/804B USB device then physically disconnect the 804/804A/804B from your PC.
10. Power cycle the 804/804A/804B.
11. Navigate to the **Help** window.

12. Activate the gateware (if you are updating the FPGA Flash) by touching the associated **Update** button.

    A confirmation prompt is displayed. Touch select Confirm to initiate the firmware upgrade. (**Note**: The screen on your unit may appear slightly different.)

    The screen will show several messages indicating the progress of the update. Once the gateware update has completed the following screen appears.

13. Reboot the 804/804A/804B by power cycling.
14. Navigate back to the **Help** menu to access the upgrade screen.
15. Activate the firmware (Application Flash) by touch selecting the associated **Update** button.

    A confirmation prompt is displayed as shown below. Touch select Confirm to initiate the firmware upgrade.

The screen will show several messages indicating the progress of the update. Once the firmware update has completed the following screen appears.

16. Reboot the 804/804A/804B by power cycling.
17. Navigate back to the Help menu to verify the upgraded versions.

15 Command Reference

This section provides a list of commands available for use with the 804/804A/804B.

Note: The 804/804A/804B front panel can operate in one of two modes: 1) Manufacturing mode enabled (read only) or 2) Manufacturing mode disabled (front panel touch mode – read and write). ***Please be aware that if the manufacturing mode is disabled, the 804/804A/804B front panel touch display will not always reflect the true state of the 804/804A/804B outputs when you make changes in the configuration through the command line.***

15.1 Video-Related commands

ALLU	
Command supported?: Y	Query supported?: N

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

ACRG	
Command supported?: Y	Query supported?: Y

Enables or disables the sending of the Audio Clock Regeneration packets on the HDMI outputs. Valid values are: 0 = disable; 1 = enable.
Requires FMTU or ALLU to activate.
Query returns the current setting of the ACR gating.
Example to set ACR:
`ACRG 1  // enables audio clock regeneration packets.`
`ACRG?  // returns the current setting.`	

ANIM	
Command supported?: N	Query supported?: Y
Reports whether an image is animated. (This product does not support “animated images” currently. Therefore the query will always return 0.)	
ASCT	
Command supported?: Y	Query supported?: Y
Sets or queries the analog sync composite type. It sets the analog sync type properly for TV vs PC formats for HDMI, DVI, HDBaseT and RGB analog. Valid values: 2 = American ORed. Used for HDMI, DVI, HDBaseT when PC formats are used. Used with RGB Analog when PC formats are used. 4 = American with Serrations and equalization pulses. Used for Component Analog. Used for RGB Analog with TV formats. 10 = American HDTV with Serrations and equalization pulses. Used for HDMI, DVI, HDBaseT with TV formats. Requires FMTU or ALLU to activate. Query returns the current setting of the sync signal swing. Examples: ASCT 4 // sets the analog sync composite type on the RGB Analog interface for TV formats.	

ALLU

ASCT 2 // sets the analog sync composite type on the HDMI format for PC formats:

ALLU

ASCT? // returns the current value of the analog sync composite type.

ASSS

Command supported?: Y	Query supported?: Y

Sets analog sync signal swing in volts.

Requires FMTU or ALLU to activate.

Query returns the current setting of the sync signal swing.

Example:

```
ASSS 0.286
ASSS?        // returns the current setting.
```

ASSG

Command supported?: Y	Query supported?: Y

Sets analog sync signal gating on the R/Pr, G/Y and B/Pb channels.

Requires FMTU or ALLU to activate.

Query returns the current setting of the analog sync signal gating.

Example to set the analog sync on the green or Y channel:

```
ASSG 0 1 0  // disables R/Pr and B/Pb channels; enables G/Y.
```

Or

```
ASSG 1      // shortcut to enable sync on all 3 channels.
ASSG?       // returns the current setting.
```

AVMG

Command supported?: Y	Query supported?: Y

Sets or clears AVmute on the HDMI outputs.

Requires FMTU or ALLU to activate.

Query returns the current setting of the AVmute gating.

Example to set AVmute:

```
AVMG 1     // enables (sets) AVmute.
AVMG?      // returns the current setting.
```

AVMM

Command supported?: Y	Query supported?: Y

Enables or disables AVMute on format change on the HDMI output.

Requires FMTU or ALLU to activate.

Query returns the current setting.

Example to set AVMM:

```
AVMM 1     // enables AVmute when a format change occurs on the HDMI Output.
```

```
AVMM 0      // disables AVmute when a format change occurs on the HDMI Output.
AVMM?       // returns the current setting.
```

AVST

Command supported?: Y	Query supported?: Y

Sets the analog video signal type. Valid values are: VGA RGB = 4; VGA YPbPr = 7; BNC RGB/YPbPr = 16

Requires FMTU or ALLU to activate.

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

Example:

```
AVST 4      // Activates the VGA output for RGB video.
AVST?       // returns the current setting.
```

BMDG

Command supported?: Y	Query supported?: Y

Enables or disables “bitmap decimation” mode. Valid values are: Valid values are: 0 = disable; 1 = enable. If enabled and the format is too demanding for 804(A)'s analog outputs (faster than 75 or 80MHz, depending on the output), the bitmap image will be rendered using every Nth pixel. Useful for photo image rendering, not as useful for test patterns.

Requires FMTU or ALLU to activate.

Query returns the current setting value.

Example:

`BMDG 1` (enables bitmap decimation)

CSPP

Command supported?: Y	Query supported?: Y

Sets the polarity of the composite sync. Enter a value of 0 for a negative going pulse. Enter a value of 1 for a positive going pulse.

Requires FMTU or ALLU to activate.

Query returns the current setting for the polarity of the composite sync.

Example:

```
CSPP 1     // sets polarity of composite sync to positive.
CSPP?      // returns the current setting.
```

CSPG

Command supported?: Y	Query supported?: Y

Sets the enable gate of the composite sync signal. Enables and disables all of the digital composite sync outputs when digital composite sync is selected via the SSST command (SSST = 3).

Requires FMTU or ALLU to activate.

Query returns the current setting for the composite sync gate.

Example:

```
CSPG 1     // sets composite sync.
CSPG       // returns current setting of composite sync.
```

DSCT

Command supported?: Y	Query supported?: Y
Sets or queries the digital sync composite type. It sets the digital sync type properly for TV vs PC formats for HDMI, DVI, HDBaseT and RGB analog. Valid values: 0 = None. Used for HDMI, DVI, HDBaseT when TV formats are used. 2 = American HDTV w/ Serrations and equalization pulses. Used for HDMI, DVI & RGB Analog with PC formats. 4 = American HDTV w/double serrations. Used for Component Analog all formats. Used for RGB Analog when TV formats are selected. Requires FMTU or ALLU to activate. Query returns the current setting of the sync signal swing. Examples: DSCT 4 // sets the digital sync composite type on the RGB Analog interface for TV formats. ALLU DSCT 2 // sets the digital sync composite type on the HDMI format for PC formats: ALLU DSCT? // returns the current value of the digital sync composite type.	
DSST	
Command supported?: Y	Query supported?: Y
Sets or queries the digital separate sync type. It sets the sync type properly for TV vs PC formats for HDMI, DVI, HDBaseT and RGB Analog. Valid values: 1 = None. Used for HDMI, DVI, HDBaseT when TV formats are used. 4 = American HDTV w/ Serrations and equalization pulses. Used for HDMI, DVI & RGB Analog with PC formats. 10 = American HDTV w/double serrations. Used for Component Analog all formats. Used for RGB Analog when TV formats are selected. Requires FMTU or ALLU to activate. Query returns the current setting of the sync signal swing. Examples: DSST 1 // sets the digital separate sync type on the RGB Analog interface for PC formats. ALLU DSST 10 // sets the digital separate sync composite type for the HDMI interface for TV formats. ALLU DSST? // returns the current value of the digital separate sync type.	
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:	

```
DVQM 2       // sets the mode or range to 16-235).
```
or
```
DVQM 0       // sets the mode or range to 0-255).
DVQM?        // returns the current value.
```

DVSM

Command supported?: Y	Query supported?: Y

Sets the sampling mode between 4:4:4 and 4:2:2 in YCbCr mode 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:

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

DVST

Command supported?: Y	Query supported?: Y

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

Requires FMTU or ALLU to activate.

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

Example:

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

EQUA

Command supported?: Y	Query supported?: Y

Sets how many lines of equalization come after VSYNC.

Requires FMTU or ALLU to activate.

Query returns the current setting for the number of lines of equalization.

Example:

```
EQUA 1       // sets the equalization to 1 line after vsync.
EQUA?        // returns the current value.
```

EQUB

Command supported?: Y	Query supported?: Y

Sets how many lines of equalization come before VSYNC.

Requires FMTU or ALLU to activate.

Query returns the current setting for the number of lines of equalization.

Example:

```
EQUB 2        // sets the equalization to 2 line before vsync.
EQUB?         // returns the current value.
```

FMTL	
Command supported?: Y	Query supported?: Y

Loads a format. Takes a format name as a parameter. Requires FMTU or ALLU to activate.
Requires FMTU or ALLU to activate.
Query returns the currently loaded format.
Examples:
`FMTL 720p60  // loads the 720p60 format.`
`FMTL?  // returns the current value.`	

FMTU	
Command supported?: Y	Query supported?: Y

Uses the currently loaded format. Takes no parameters.
Query returns the currently used format.
Example:
`FMTL 720p60`
`FMTU`	

HRAT	
Command supported?: Y	Query supported?: Y
Sets the line rate in Hz. Requires FMTU or ALLU to activate. Query returns the line rate of the currently loaded image. Example: `HRAT 15750`	
HRES	
Command supported?: Y	Query supported?: Y

Sets the number of active pixels in a line of video.
Requires FMTU or ALLU to activate.
Query returns the number of active pixels in a line of the currently loaded format.
Example:
`HRES 1920  // sets horizontal resolution to 1920 pixels.`
`HRES?  // returns the current value.`	

HSPD	
Command supported?: Y	Query supported?: Y
Sets the number of pixel periods of the front porch (delay) of horizontal blanking. (H_ACTIVE to HSYNC in HDMI terminology) Requires FMTU or ALLU to activate. Query returns the number of total pixels in the front porch of the currently loaded format. Example: `HSPD 88  // sets horizontal blanking to 88 pixels.`	

```
HSPD?        // returns the current value.
```

HSPW

Command supported?: Y	Query supported?: Y

Sets the number of pixel periods (width) of the horizontal sync pulse (HSYNC).

Requires FMTU or ALLU to activate.

Query returns the horizontal sync pulse width in pixels.

Example:

```
HSPW 44       // sets horizontal sync pulse width to 44 pixels.
HSPW?         // returns the current setting.
```

HSPP

Command supported?: Y	Query supported?: Y

Sets the polarity of the HSYNC pulse. Enter 0 for negative going pulse. Enter 1 for a positive going pulse.

Requires FMTU or ALLU to activate.

Query returns the polarity of the sync pulse.

Example to set the horizontal sync pulse to a positive going pulse:

```
HSPP 1        // sets horizontal pulse to positive polarity.
HSPP?         // returns the current setting.
```

HSPG

Command supported?: Y	Query supported?: Y

Sets the enable gate of the HSYNC signal. Enter a value of 0 to disable the HSYNC gate. Enter a value of 1 to enable the HSYNC gate.

Requires FMTU or ALLU to activate.

Query returns the current state of the HSYNC gate.

Example:

```
HSPG 1         // enables horizontal sync output.
HSPG?          // returns the current setting.
```

HTOT

Command supported?: Y	Query supported?: Y

Sets the number of total pixels in a line of video.

Requires FMTU or ALLU to activate.

Query returns the number of total pixels in a line of the currently loaded format.

Example:

```
HTOT 2200      // sets horizontal total to 2200 pixels.
HTOT?          // returns the current setting.
```

IFGC

Command supported?: Y	Query supported?: Y

Enables or disables HDMI Infoframe checksum calculation. This enables you to send corrupted infoframes.

Example:

```
IFGC 1          // enables HDMI infoframe checksum calculation.
IFGC 0          // disables HDMI infoframe checksum calculation.
IFGC?           // returns the current setting.
```

IFGU

Command supported?: Y	Query supported?: N

Activates an infoframe command.

Examples:

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

IFTG

Command supported?: Y	Query supported?: Y

Enables infoframe transmission.

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

Example:

```
IFTG 138        // ensure particular infoframe is enabled (being transmitted).
IFTG?           // verify that it is enabled.
138
XAVI:S 1        // sets scan parameter to overscanned.
IFGU            // required to invoke the command.
```

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.

Examples:

```
IMGL SMPTEBar    // loads smptebar image
IMGL User00      // first bitmap in UserPats.txt
```

IMGU

Command supported?: Y	Query supported?: Y

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

Query returns the currently used image.

```
IMGL SMPTEBar
IMGU
```

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:

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

OUTG

Command supported?: Y	Query supported?: Y

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

Requires FMTU or ALLU to activate.

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

Example:

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

REDG/GRNG/BLUG

Command supported?: Y	Query supported?: Y

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

Requires FMTU or ALLU to activate.

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

Examples:

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

SCAN

Command supported?: Y	Query supported?: Y

Sets the current format to either progressive (SCAN 1) or interlaced (SCAN 2).

Requires FMTU or ALLU to activate.

Query returns the current setting for the scan type.

Example:

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

SIRE

Command supported?: Y	Query supported?: Y

Sets the IRE level on specific flat-color images.

Examples:

```
SIRE 50     // sets the ire level to 50%.
SIRE?       // returns the current setting.
```

SSST

Command supported?: Y	Query supported?: Y

Sets or queries the sync signal type. It sets the sync type properly for the RGB Analog interface and the Component Analog interface.

Valid values:

1 = digital separate horizontal and vertical sync. Used for the HDMI, DVI, HDBaseT interfaces. Used with RGB Analog and Component Analog interface when separate sync is selected.

3 = digital separate composite sync. Used for Component Analog and RGB Analog interface when sync on Y or sync on green are used. Requires FMTU or ALLU to activate.

Query returns the current setting of the sync signal swing.

Examples:

SSST 1 // sets the digital separate sync type on the RGB Analog interface for PC formats.

ALLU

SSST 3 // sets the digital separate sync composite type for the HDMI interface for TV formats.

ALLU

SSST? // returns the current value of the sync signal type.

VRES

Command supported?: Y	Query supported?: Y

Sets the number of active lines in a frame of video.

Requires FMTU or ALLU to activate.

Query returns the number of active lines in a frame of the currently loaded format.

Example:

```
VRES       // sets the vertical resolution to 1080 lines
VRES?      // returns the current value.
```

VTOT

Command supported?: Y	Query supported?: Y

Sets the number of total lines in a frame of video.

Requires FMTU or ALLU to activate.

Query returns the number of total lines in a frame of the currently loaded format.

Example:

```
VTOT 1125    // sets the vertical total to 1125 lines.
VTOT?        // returns the current value.
```

VSPD

Command supported?: Y	Query supported?: Y

Sets the number of line periods of the front porch (delay) of vertical blanking. (V_ACTIVE to VSYNC in HDMI terminology)

Requires FMTU or ALLU to activate.

Query returns the number of line periods of the front porch (delay) of vertical blanking for the loaded format.

Example:

```
VSPD 4       // sets the vertical front porch to 4 lines.
VSPD?        // returns the current value.
```

VSPW

Command supported?: Y	Query supported?: Y

Sets the number of line periods (width) of the vertical sync pulse (VSYNC).

Requires FMTU or ALLU to activate.

Query returns the number of line periods (width) of the vertical sync pulse (VSYNC) for the loaded format.

Example:

```
VSPW 4          // sets the vertical pulse width to 4 lines.
VSPW?           // returns the current value.
```

VSPP

Command supported?: Y	Query supported?: Y

Sets the polarity of the VSYNC pulse. Setting polarity to 1 causes the leading edge of vertical sync to be a low-to-high transition. Setting polarity to 0 causes the leading edge of vertical sync to be a high-to-low transition.

Requires FMTU or ALLU to activate.

Query returns current setting of the polarity for the VSYNC pulse for the loaded format.

Example:

```
VSPP            // sets the vertical pulse polarity to low to high.
VSPP?           // returns the current value.
```

VSPG

Command supported?: Y	Query supported?: Y

Sets the enable gate of the VSYNC signal. Enter a value of 0 to disable the VSYNC gate. Enter a value of 1 to enable the VSYNC gate.

Requires FMTU or ALLU to activate.

Query returns the current status of the gate of the VSYNC.

Example:

```
VSPG            // enables the vertical pulse.
VSPG?           // returns the current value.
```

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:

```
X3DM:1 0           // enables the HDMI output for 3D and sets structure to Frame Packing.
IFGU               // required to invoke the command.
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.
IFGU               // 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:

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

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

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

XSPD

Command supported?: Y	Query supported?: Y

Enables you to send Source Product Descriptor infoframes 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.
IFGU                        // required to invoke the command.
XSPD                        // returns the current value.
```

XSPP

Command supported?: Y	Query supported?: Y

Sets the polarity of both the HSYNC and VSYNC pulses.

(0 = both low, 1 = H high, V low, 2 = H low, V high, 3 = both high)

Requires FMTU or ALLU to activate.

Query returns the current status of the gate of the VSYNC.

Example:

```
XSPP 3    // sets the HSYNC and VSYNC both to high
XSPP?     // returns the current setting of polarity of VSYNC and HSYNC
```

XVSG	
Command supported?: Y	Query supported?: Y

Enables red/green/blue gates.
Requires FMTU or ALLU to activate.
Examples:
`XVSG 1 0 1  // enables Red and Blue gates)`
Or
`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:
`XVSI 2      // Sets DVI Computer formats`
`XVSI 3      // Sets DVI TV formats`
`XVSI 4      // Sets active interface to HDMI`
`XVSI 6      // Sets active interface to BNC + S-Video + CVBS:  Composite for CVBS and S-Video; Analog component through BNC connectors`
`XVSI 9      // Sets component analog (YPbPr) or RGB analog through VGA connector`
`XVSI ?      // returns the current setting of the active interface.`	

15.2 Administrative Commands

BOOT	
Command supported?: Y	Query supported?: N
Reboots the unit. Please note that certain functions (such as FPGA or firmware updates) will not function as intended.	
DLAY	
Command supported?: Y	Query supported?: N
Causes a delay before moving to the next action. DLAY: *delay* Where *delay* is the amount of time to wait before executing the next command. Examples: `DLAY 500 // delays 500 millisecond before executing the next command in a command sequence.`	
ECHO	
Command supported?: Y	Query supported?: Y

Enables or disables local echo on the serial/USB COM ports.
Examples:
`ECHO 0 // disables echo.`
`ECHO 1 // enables echo.`
`ECHO? // returns the current setting.`	

KBRD	
Runs a sequence file that has been created and stored in the USERKEYS.TXT file. Examples: `KBRD F1 // runs a sequence text string (#F1) created in the USERKEYS.TXT file.`	
MFGM	
Command supported?: Y	Query supported?: Y
Enables “Manufacturing Unit” mode which disables the touch screen and displays a status screen in its place. Setting this mode to 1 enables the status-only screen on 804/804A units only. Setting the value to 0 enables the touch screen. Examples: `MFGM 1`	
MODE	
Command supported?: Y	Query supported?: Y
Sets the baud rate of the unit. (Common baud rates between 1200 baud and 230400 baud are supported.) Examples: `MODE 9600`	
***OPT**	
Command supported?: N	Query supported?: Y
Returns a list of options supported on the particular 804/804A unit.	

TCAL	
Command supported?: Y	Query supported?: N
Launches the touch display calibration screen.	
***TST**	
Command supported?: N	Query supported?: Y
Performs an internal diagnostic to verify some functional blocks within the 804/804A. Returns 0 if no errors are detected.	
USBM	
Command supported?: Y	Query supported?: Y

Sets the USB mode to COM or DISK. Requires a power cycle of the 804 to invoke.
Examples:
`USBM 1 // sets USB mode to DISK.`
`USBM 0 // sets USB mode to COM.`	

VERF/VERG/*IDN	
Command supported?: N	Query supported?: Y
Provides the firmware/gateware versions and model information for the queried product.	

15.3 HDMI Protocol Test Commands

EDID/DIDT	
Command supported?: N	Query supported?: Y

Reads the EDID and provides the information to the user. EDID? returns the binary EDID as-is, where DIDT? returns a parsed version that describes some useful details about the EDID.
Examples:
`EDID?` (reads the EDID from the first HDMI port and returns the binary data)
`DIDT? 2` (reads the EDID from the third HDMI port and returns details. Ports are 0-3.)
`Header is valid. All checksums valid. EDID Version 1.3`
`HDMI: Yes ( PA 1.0.0.0, Deep color: none )`
`Manufacturer/Product: ABC 6211`
`Pref. Native Timing: 1440x900 59.88Hz`
`SVDs: 480i 480p 576i 576p 720p 1080i 1080p`
`Speakers: [ FL/FR ]`
`PCM 2 ch., [32 44.1 48 88.2 96 176.4 192] kHz sampling @[16 20 24] bits`	

HDCP?	
Command supported?: N	Query supported?: Y

Runs an HDCP authentication test on an HDMI sink device. Take two arguments: 1) Port number (0,1,2,3); 2) number of frames rounded down to the nearest 128 frames.
Examples:
`HDCP? 0 255 // runs an HDCP test on the sink device connected to port 1 for 128 frames`
`HDCP? 1 257 // runs an HDCP test on the sink device connected to port 2 for 256 frames`
`HDCP? 2 // runs an HDCP test on the sink device connected to port 3 for 512 frames`
`HDCP? // runs an HDCP test on the sink device of port selected by the GUI for 512 frames`	

15.4 Memory Commands

MEMT/MEM2/MEM3/MEM4	
Command supported?: N	Query supported?: Y
Performs different memory testing algorithms for diagnostic purposes.	

15.5 Image Drawing Commands

BOXP	
Command supported?: Y	Query supported?: Y
Sets the box size in percent for Halation, Loading, and EcoFlower patterns.	
BOXG	
Command supported?: Y	Query supported?: Y
Enables a moving white box with a black background on any non-bitmap image. Examples: `BOXG 1`	

15.6 Image Cache Commands

ICHC	
Command supported?: Y	Query supported?: N
Clears out the current image cache. Takes no parameters.	
ICHS	
Command supported?: Y	Query supported?: N
Saves the current bitmap image to the image cache for faster recall. Takes no parameters.	

15.7 Markers Commands

HPMG	
Command supported?: Y	Query supported?: Y
Enables/disables markers. Takes a Boolean parameter (0 or 1).	
HPMX/HPMY	
Command supported?: Y	Query supported?: Y
Sets the X (horizontal)/Y (vertical) sizes for the markers in pixels.	
HPPS	
Command supported?: N	Query supported?: Y
Tells the status of the CEC and HPD lines as an 8-bit hexadecimal value. The upper 4 bits (presented as the first character of two, if applicable) represent the HPD pins of the four HDMI connectors. The MSB represents Out 4, while the LSB represents Out 1. The lower 4 bits (presented as the second character of two, or the only character if HPD is low on all HDMI ports) represents the status of the CEC line on all four HDMI connectors. The MSB represents Out 4, while the LSB represents Out 1.	

15.8 Audio-Related commands

AUDL	
Command supported?: Y	Query supported?: Y

Sets the digital audio format, audio tone and channels.

Requires FMTU or ALLU to activate.

The following parameters apply:

Type:
- 0 = LPCM
- 1 = Dolby 5.1
- 2 = DTS-ES 6.1
- 3 = DD+/TrueHD/DTS-HDHRA/DTS-HDMA

Subtype (for Dolby and DTS):
- 1 = Narrow pink noise
- 2 = Wide pink noise
- 3 = Sine wave
- 4 = Impulse
- 5 = Polarity
- 6 = Auto Time Delay

Subtype for compressed audio formats (Type = 3):
- 2 = 7.1 5376kb DTS-HDHRA
- 3 = 5.1 3840kb HDHRA
- 4 = 7.1 5760kb HDHRA
- 5 = 5.1 DTS-HDMA
- 6 = 7.1 HDMA
- 8 = DD+ 2.0
- 9 = DD+ 5.1
- 10 = DD+ 7.1
- 11 = TrueHD 7.1
- 12 = TrueHD 2.0

Channel Select (if subtype is not 3 (sine wave):
- 0 = Left channel
- 1 = Center channel
- 2 = Right channel
- 3 = Cycle
- 4 = LFE
- 5 = All
- 6 = Left rear
- 7 = Center rear
- 8 = Right rear

Sine type (if subtype is 3 (sine wave):
- 0 = 63Hz cycle
- 1 = 63Hz all
- 2 = 125Hz cycle
- 3 = 125Hz all
- 4 = 1kHz cycle
- 5 = 1kHz all
- 6 = 4kHz cycle
- 7 = 4kHz all

Examples:

```
AUDL 0 3 5 7   // LPCM audio, using a sine wave on all channels with a 4kHz tone
AUDL 1 2 1     // Dolby Digital 5.1, wide pink noise, center channel
AUDL 3 11 3    // Dolby TrueHD 7.1, cycle through all channels
```

AASI	
Command supported?: Y	

Sets the analog audio signal interface.
Requires FMTU or ALLU to activate.
Valid values are:
0 – off (if previously selected audio is analog)
1 – Analog
Examples:
`AASI 1  // enables the analog audio.`
`AASI?  // returns the current setting.`	

ARAT	
Command supported?: Y	Query supported?: Y

Sets the audio rate on SPDIF/HDMI. (Also affects the sampling rate on the analog audio – should not go over 96000Hz on analog.)
Requires FMTU or ALLU to activate.
Examples:
`ARAT 48000  // sets the audio sampling rate to 48kHz.`
`ARAT?  // returns the current setting.`	

DASI	
Command supported?: Y	Query supported?: Y

Sets the digital audio signal interface.
Requires FMTU or ALLU to activate.
Valid values are:
0 – off (if previously selected audio is not analog)
6 – HDMI
Examples:
`DASI 6  // sets the digital audio signal to HDMI.`
`DASI?  // returns the current setting.`	

DAPT **Note: This function is not supported on the newer 804 and 804A units.**	
Command supported?: Y	Query supported?: Y
Digital audio pass-through enables the audio input from ARC, Optical or SPDIF to be passed through on the HDMI outputs. Requires FMTU or ALLU to activate. There are two arguments: 1) Enable/disable and 2) audio source. Valid values are: Enable/disable: 0 – disable 1 – enable Audio source: 0 – SPDIF	

1 – Optical
2 – ARC from HDMI Tx 1
3 – ARC from HDMI Tx 2
4 – ARC from HDMI Tx 3
5 – ARC from HDMI Tx 4

Examples:

```
DAPT 1 3 // causes the ARC on HDMI Tx 2 to be transmitted on all HDMI Tx outputs
DAPT 1 1 // causes the optical audio input to be transmitted on all HDMI Tx outputs
DAPT 0   // disables audio pass-through
DAPT?    // queries the current setting for DAPT
```

NBPA

Command supported?: Y	Query supported?: Y

Sets the number of bits per sample in analog and HDMI PCM audio.

Requires FMTU or ALLU to activate.

Could be one of: 16, 20 or 24.

Examples:

```
NBPA 24    // sets the value of audio depth.
NBPA?      // returns the current setting.
```

SAMP

Command supported?: Y	Query supported?: Y

Sets the amplitude on either a specific channel or all channels.

Requires FMTU or ALLU to activate.

Examples:

```
SAMP -12    // sets all channels to -12dB.
```

Or

```
SAMP -3 1   // sets channel #1 to -3dB – valid channels are 0-7.
SAMP?       // returns the current setting.
```

SRAT

Command supported?: Y	Query supported?: Y

Sets the sine wave frequency on either a specific channel or all channels.

Requires FMTU or ALLU to activate.

Examples:

```
SRAT 1000    // Sets all channels to 1KHz.
Or
SRAT 440 1   // Sets channel #1 to 440Hz – valid channels are 0-7.
SRAT?        // returns the current value.
```

16 List of Formats

The table below provides a list of formats (timings) supported by the 804/804A/804B. An example is provided for how to load the format by name using the command line.

480i29

Example:
`FMTL 480i29`
`FMTU`

480p59

Example:
`FMTL 480p59`
`FMTU`

720p59

Example:
`FMTL 720p59`
`FMTU`

1080i29

Example:
`FMTL 1080i29`
`FMTU`

1080p50

Example:
`IMGL 1080p50`
`IMGU`

1080p59

Example:
`IMGL 1080p59`
`IMGU`

1080p60

Example:
`FMTL 1080p60`
`FMTU`

480i30

Example:
`FMTL 480i30`
`FMTU`

480p60

Example:
`FMTL 480p60`
`FMTU`

576i25

Example:
`FMTL 576i25`
`FMTU`

576p50

Example:
`FMTL 576p50`
`FMTU`

720p50

Example:
`FMTL 720p50`
`FMTU`

720p60

Example:
`FMTL 720p60`
`FMTU`

1080i25

Example:
`FMTL 1080i25`
`FMTU`

1080i30

Example:
`FMTL 1080i30`
`FMTU`

480i59

Example:
`FMTL 480i59`
`FMTU`

480i60

Example:
`FMTL 480i60`
`FMTU`

480i119

Example:
`FMTL 480i119`
`FMTU`

480i120

Example:
`FMTL 480i120`
`FMTU`

480p119
Example:

```
FMTL 480p119
FMTU
```

480p120

Example:

```
FMTL 480p120
FMTU
```

480p239

Example:

```
FMTL 480p239
FMTU
```

480p240

Example:

```
FMTL 480p240
FMTU
```

576i50

Example:

```
FMTL 576i50
FMTU
```

576i100

Example:

```
FMTL 576i100
FMTU
```

576p100

Example:

```
FMTL 576p100
FMTU
```

576p200

Example:

```
FMTL 576p200
FMTU
```

720p23

Example:

```
FMTL 720p23
FMTU
```

720p24

Example:

```
FMTL 720p24
FMTU
```

720p25

Example:

```
FMTL 720p25
FMTU
```

720p29

Example:
`FMTL 720p29`
`FMTU`

720p30

Example:
`FMTL 720p30`
`FMTU`

720p100

Example:
`FMTL 720p100`
`FMTU`

720p119

Example:
`FMTL 720p119`
`FMTU`

720p120

Example:
`FMTL 720p120`
`FMTU`

1080i50

Example:
`FMTL 1080i50`
`FMTU`

1080i59

Example:
`FMTL 1080i59`
`FMTU`

1080i60

Example:
`FMTL 1080i60`
`FMTU`

1080p23

Example:
`FMTL 1080p23`
`FMTU`

1080p24

Example:
`FMTL 1080p24`
`FMTU`

1080p25

Example:
`FMTL 1080p25`
`FMTU`

1080p25

Example:
`FMTL 1080p25`
`FMTU`

1080p29

Example:
`FMTL 1080p29`
`FMTU`

1080p30

Example:
`FMTL 1080p30`
`FMTU`

2160p24

Example:
`FMTL 2160p24`
`FMTU`

2160p25

Example:
`FMTL 2160p25`
`FMTU`

2160p30

Example:
`FMTL 2160p30`
`FMTU`

NTSC

Example:
`FMTL NTSC`
`FMTU`

NTSC-J

Example:
`FMTL NTSC-J`
`FMTU`

PAL

Example:
`FMTL PAL`
`FMTU`

PAL-Nc
Example:

```
FMTL PAL-Nc
FMTU
```

PAL-60

Example:

```
FMTL PAL-60
FMTU
```

NTSC44

Example:

```
FMTL NTSC44
FMTU
```

PAL-M

Example:

```
FMTL PAL-M
FMTU
```

640x350_85Hz

Example:

```
FMTL 640x350_85Hz
FMTU
```

DMT0685D

Example:

```
FMTL DMT0685D
FMTU
```

DMT0660

Example:

```
FMTL DMT0660
FMTU
```

DMT0672

Example:

```
FMTL DMT0672
FMTU
```

DMT0685

Example:

```
FMTL DMT0685
FMTU
```

DMT0785H

Example:

```
FMTL DMT0785H
FMTU
```

DMT0856

Example:

```
FMTL DMT0856
FMTU
```

DMT0860

Example:
`FMTL DMT0860`
`FMTU`

DMT0860

Example:
`FMTL DMT0860`
`FMTU`

DMT0872

Example:
`FMTL DMT0872`
`FMTU`

DMT0875

Example:
`FMTL DMT0875`
`FMTU`

DMT0885

Example:
`FMTL DMT0885`
`FMTU`

DMT1043

Example:
`FMTL DMT1043`
`FMTU`

DMT1060

Example:
`FMTL DMT1060`
`FMTU`

DMT1070

Example:
`FMTL DMT1070`
`FMTU`

DMT1075

Example:
`FMTL DMT1075`
`FMTU`

DMT1085

Example:
`FMTL DMT1085`
`FMTU`

DMT1175

Example:
`FMTL DMT1175`
`FMTU`

CVT1260E

Example:
`FMTL CVT1260E`
`FMTU`

CVT1275E

Example:
`FMTL CVT1275E`
`FMTU`

CVT1285E

Example:
`FMTL CVT1285E`
`FMTU`

DMT1260

Example:
`FMTL DMT1260`
`FMTU`

DMT1285

Example:
`FMTL DMT1285`
`FMTU`

DMT1260G

Example:
`FMTL DMT1260G`
`FMTU`

DMT1275G

Example:
`FMTL DMT1275G`
`FMTU`

DMT1285G

Example:
`FMTL DMT1285G`
`FMTU`

DMT1285G

Example:
`FMTL DMT1285G`
`FMTU`

DMT1296G
Example:

```
FMTL DMT1296G
FMTU
```

1365x1024_60Hz

Example:

```
FMTL 1365x1024_60Hz
FMTU
```

1365x1024_75Hz

Example:

```
FMTL 1365x1024_75Hz
FMTU
```

1600x1024_60Hz

Example:

```
FMTL 1600x1024_60Hz
FMTU
```

DMT1660

Example:

```
FMTL DMT1660
FMTU
```

DMT1665

Example:

```
FMTL DMT1665
FMTU
```

DMT1670

Example:

```
FMTL DMT1670
FMTU
```

DMT1685

Example:

```
FMTL DMT1685
FMTU
```

DMT1760

Example:

```
FMTL DMT1760
FMTU
```

DMT1775

Example:

```
FMTL DMT1775
FMTU
```

DMT1860

Example:

```
FMTL DMT1860
FMTU
```

DMT1875

Example:
`FMTL DMT1875`
`FMTU`

DMT1960

Example:
`FMTL DMT1960`
`FMTU`

DMT1975

Example:
`FMTL DMT1975`
`FMTU`

DMT0667

Example:
`FMTL DMT0667`
`FMTU`

APP0875

Example:
`FMTL APP0875`
`FMTU`

APP1075

Example:
`FMTL APP1075`
`FMTU`

APP1175

Example:
`FMTL APP1175`
`FMTU`

DMT0860H

Example:
`FMTL DMT0860H`
`FMTU`

APP1175

Example:
`FMTL APP1175`
`FMTU`

852x480_60Hz

Example:
`FMTL 852x480_60Hz`
`FMTU`

1024x576_60Hz

Example:
`FMTL 1024x576_60Hz`
`FMTU`

1280x720_60Hz

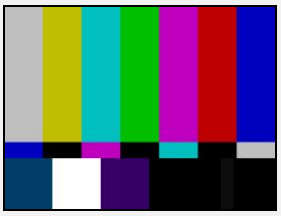
Example:
`FMTL 1280x720_60Hz`
`FMTU`

17 List of Test Patterns

The table below provides a list of test patterns. For each pattern, there is an example of how to load the pattern by name using the command line.

Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values

ColorBar Patterns
Applications:
SMPTEBars - To adjust color and hue.
Colorbars - To test a display's ability to product fully saturated primary and secondary color.
Command examples:
`IMGL smptebar`
`IMGU`
`IMGL tvbar_75`
`IMGU`
`IMGL tvbar100`
`IMGU`
`IMGL colorbar`
`IMGU`
	SMPTE
	 
		N/A	N/A

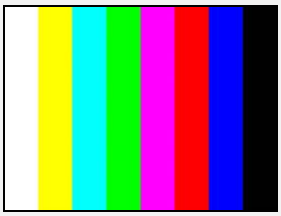
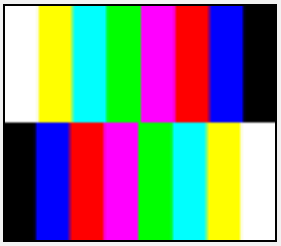
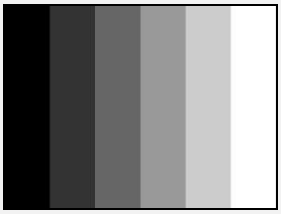
	ColorBar 	Orientation - Vertical	Direction: ▪ Left to Right ▪ Right to Left
		Orientation - Horizontal	Direction: ▪ Top / Bottom ▪ Bottom / Top
	Split 	Orientation - Vertical	Direction: ▪ Left to Right ▪ Right to Left
		Orientation - Horizontal	Direction: ▪ Top / Bottom ▪ Bottom / Top
Ramp/Stair Patterns **Applications:** Stair - To visually check grayscale tracking performance of a rear projection display. Ramp – To check the digitizing linearity of video signal processors. **Command examples:** `IMGL ramp`	Stair - Full 	Orientation - Vertical	Direction: ▪ Left to Right ▪ Right to Left
		Orientation - Horizontal	Direction: ▪ Top / Bottom ▪ Bottom / Top
		Bars	▪ 5 ▪ 11 ▪ 21

Table 17-1: Test Patterns

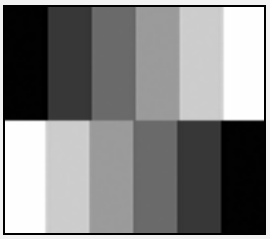
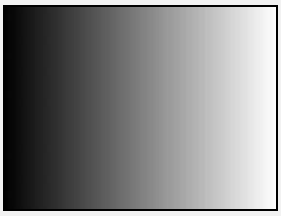
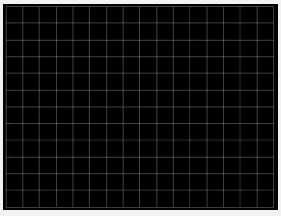
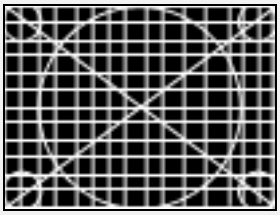
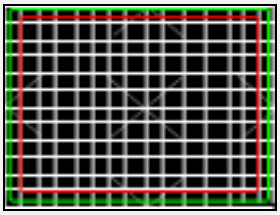
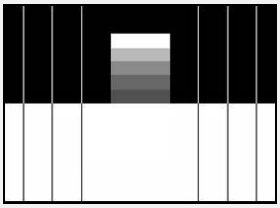
Pattern Name	Variant	Options	Range of Values
IMGU IMGL h_stair IMGU IMGL splitgray IMGU IMGL ramp IMGU		Color	▪ R ▪ G ▪ B ▪ C ▪ M ▪ Y ▪ W
	Stair – Split 	Orientation - Vertical	Direction: ▪ Left to Right ▪ Right to Left
		Orientation - Horizontal	▪ Direction: ▪ Top / Bottom ▪ Bottom / Top
		Bars	▪ 5 ▪ 11 ▪ 21
		Color	▪ R ▪ G ▪ B ▪ C ▪ M ▪ Y ▪ W
	Ramp 		
Geometry/Resolution Patterns **Applications:** Grid (Crosshatch) – To check and adjust convergence of red, green and blue pictures. Linearity – for testing deflection linearity testing and alignment. Overscan – To check and adjust for the proper geometry of display	Crosshatch (Grid) 	Color	▪ White on Black ▪ Black on White

Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values

including picture centering, size, pincushion and linearity.
Command examples:
`IMGL crosshtch`
`IMGU`
`IMGL linearity`
`IMGU`
`IMGL overscan`
`IMGU`
	Linearity
	 
		Color	▪ White on Black
			▪ Black on White

	Overscan 	N/A	N/A

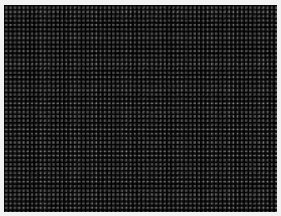
Needle Pattern
Application: To detect whether scan velocity modulation is enabled on display.
Command example:
`IMGL needle`
`IMGU`
	N/A
	 
		N/A	N/A

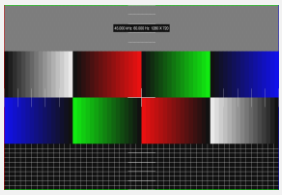
Window/Raster Pattern
Applications:
Window1 - To calibrate display drive chromaticity.
Window2 - To calibrate display cutoff chromaticity.
Raster – To check color purity and display chrominance uniformity.
Command example:
`IMGL window1`
`IMGU`
`IMGL window2`
`IMGU`
`IMGL raster`
`IMGU`
	Window1
	
		IRE Level	▪ -5
			▪ -1
			▪ +1
			▪ +5

		IRE Label	▪ Off ▪ On
		Color	▪ R ▪ G ▪ B ▪ C ▪ M ▪ Y ▪ W
	Raster	IRE Level	▪ -5 ▪ -1 ▪ +1 ▪ +5
		IRE Label	▪ Off ▪ On

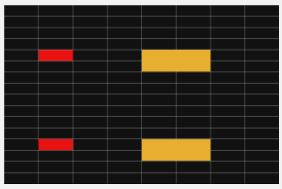
Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values
		Color	▪ R ▪ G ▪ B ▪ C ▪ M ▪ Y ▪ W

Focus Pattern
Application: To detect whether scan velocity modulation is enabled on display.
Command example:
`IMGL focus`
`IMGU`
	N/A
	 
		N/A	N/A

PGCWRGB Pattern
Application: This is a scrolling pattern used to test for noise on analog displays and motion artifacts.
Command example:
`IMGL pgcwrgb`
`IMGU`
	N/A
	 
		Show Text	On / Off

		Show Center Cross	On / Off
		Scroll Video	On / Off
		Show Overscan	On / Off
		Grid Type	▪ 10x50 ▪ 5% H/V

3D Box Pattern
Application: This is a 3D pattern used to test 3D displays. The pattern enables you to set the offset between the left and right image components.
Command example:
`IMGL 3dbox`
`IMGU`
	N/A
	 
		Box 1 Offset	-64 to +64

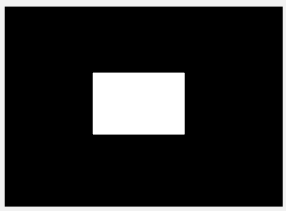
		Box 2 Offset	-64 to +64
		Background Brightness	0 to 63
3D Contrast Pattern **Application:** This is a 3D pattern used to test 3D displays. The pattern enables you to test for contrast and crosstalk (extinction ratio). Method – Color uniformity: 1. Select Left Eye 2. Close left eye to view image from right eye. Image area of box should be black if there is no cross talk. 3. Repeat for Right Eye.	N/A 	Eye Select	Left or Right eye or both eyes
		Field Size (of box)	6.3% or full screen. Full size is used when Eye select is set to Both Eyes
		Level (IRE) (of box)	0 to 100 in +5 or 0.5 increments (+/-)

Table 17-1: Test Patterns			
Pattern Name	**Variant**	**Options**	**Range of Values**

4. Modify IRE of box to determine threshold.
Command example:
`IMGL 3dxtalk`
`IMGU`
		Color	▪ R
			▪ G
			▪ B
			▪ C
			▪ M
			▪ Y
			▪ W

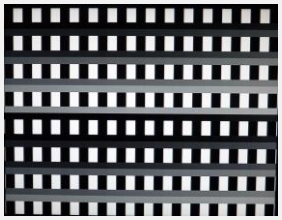
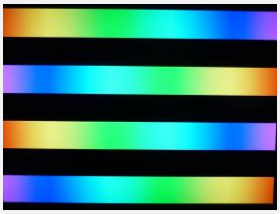
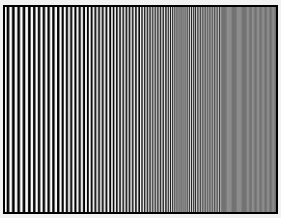
3D Cross Talk
 	
Application: This is a 3D pattern used to measure the crosstalk (extinction ratio) for frame packing, top and bottom and side by side 3D format structures.
 	
Description: This image is divided in two sections with four rows of 16 white boxes each. The top section is for testing with the left eye open. The bottom section is for testing with the right eye open. The background area surrounding the boxes is a series of grayscale ramps. The ramps begin at 100 IRE and transitions to 50 IRE at the left end of the fourth row of each series.
 	
Method – Calculating percent crosstalk:
1. Close right eye to test the left eye using the top section.
2. Check the visibility of the boxes. Any deviation from black indicates crosstalk.
3. Assess where the box and its background blend such that they are not distinguishable.
4. Calculate the degree of crosstalk as a percent by counting the number of boxes (from the beginning of the series to the box identified in step 3) and divide that by 127. Example if the 20th box blends with its background, the crosstalk would be 20/127 * 100 = 15.7%
5. Repeat with the left eye closed to test the right eye.
 	
Command example:
 	
`IMGL 3dxtalk2`
`IMGU`
	N/A
	 		

Table 17-1: Test Patterns			
Pattern Name	**Variant**	**Options**	**Range of Values**

3D Color Ramp
 	
Application: This is a 3D pattern used to test 3D color uniformity and crosstalk or extinction ratio.
 	
Description: There are 4 pairs of horizontal color bars. Each bar depicts a color gradation from red to purple; two from left to right and one from right to left.
 	
Method – Color uniformity:
1. Close left eye to view image from right eye.
2. Assess the color gradation on each bar.
3. Close right eye to view image from left eye.
4. Subjectively compare the images to assess color uniformity.
 	
Method – Crosstalk (extinction ratio):
1. Close left eye to view image from right eye.
2. Verify that the bottom bar is extinguished. The extent to which the bar is not extinguished represents the amount of crosstalk.
3. Repeat for a test of the left eye
 	
Command example:
`IMGL 3dclrramp`
`IMGU`
	N/A
	 
		N/A	

Multiburst Pattern
 	
Application: To check a display's ability to produce sharply defined stripes at equal brightness up to full resolution.
 	
Command example:
`IMGL multibrst`
`IMGU`
	N/A
	 
		N/A	N/A

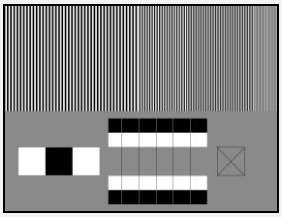
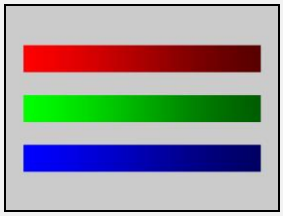
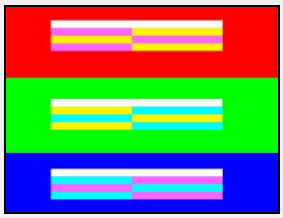
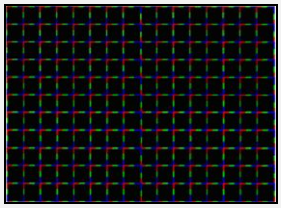
Sharpness Pattern
 	
Application: To align display sharpness, picture, aperature and scan velocity modulation adjustments.
 	
Command example:
`IMGL sharpness`
`IMGU`
	N/A
	 		

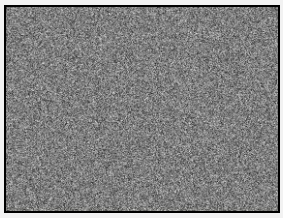
Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values

Decoder Check Pattern
Application: To check the color decoder performance to determine if the decoder over-emphasizes red or green colors.
Command example:
`IMGL decodchk`
`IMGU`
	N/A
	 
		N/A	N/A

Decoder Adjust Pattern
Application: To adjust a display's color decoder/matrix circuit for most accurate color reproduction.
Command example:
`IMGL decodadj`
`IMGU`
	N/A
	 
		N/A	N/A

Converge Pattern
Application: To color converge a display throughout the entire picture area.
Command example:
`IMGL converge`
`IMGU`
	N/A
	 
		N/A	N/A

Pseudo Random Pattern
Application: To test for pixel errors on an HDMI cable.
Command example:
`IMGL PRN24bit`
`IMGU`
	N/A
	 
		N/A	N/A

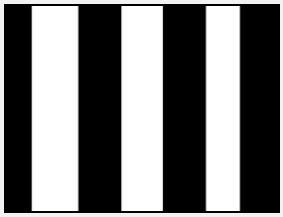
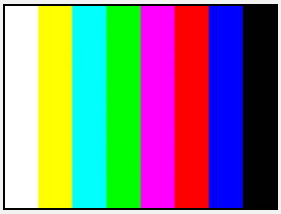
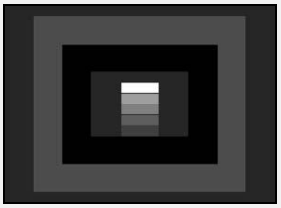
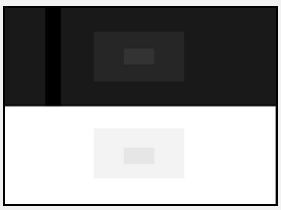
UL 3 Bar Pattern
Command example:
`IMGL V_3BARS`
`IMGU`
	N/A
	 
		N/A	N/A

Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values

LG Color Bar Pattern
 	
Application: To test a display's ability to product fully saturated primary and secondary color.
 	
White is 100 IRE
Yellow is 100 IRE
Cyan is 100 IRE
Gray is 35 IRE
Red is 100 IRE
Blue is 100 IRE
 	
Command example:
 	
`IMGL LG_H_CBAR`
`IMGU`
 	
`IMGL LG_V_CBAR`
`IMGU`
		Orientation	▪ Vertical
			▪ Horizontal

Black Pluge Pattern
 	
Application: To set the picture black level and check the DC restoration performance of a display.
 	
Command example:
 	
`IMGL pluge`
`IMGU`
	Fine
	 
		N/A	N/A

White Pluge Pattern
 	
Application: To set the contrast and brightness controls on fixed pixel displays.
 	
Command example:
 	
`IMGL hilotrk`
`IMGU`
	N/A
	 
		N/A	N/A

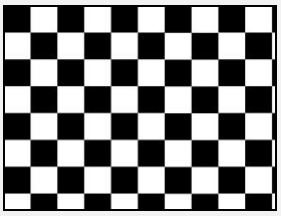
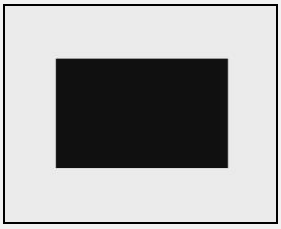
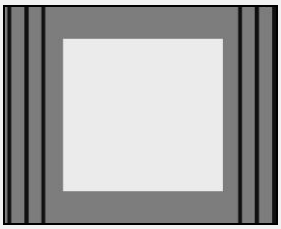
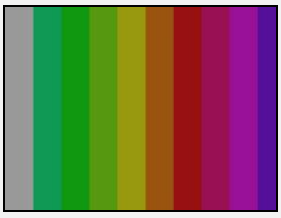
Checkboard Pattern
 	
Application:
 	
To check the regulation of CRT video drive power supply circuits.
 	
Command example:
 	
`IMGL checby6`
`IMGU`
 	
`IMGL check`
`IMGU`
	N/A
	 
		Rows
		
		Columns
			▪ 2
			▪ 3
			▪ 4
			▪ 5
			▪ 6
			
			▪ 2
			▪ 3
			▪ 4
			▪ 5
			▪ 6

Table 17-1: Test Patterns

Pattern Name	Variant	Options	Range of Values

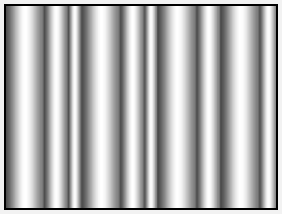
Halation/Loading Patterns
Applications:
Manufacturing test.
Command examples:
`IMGL halation`
`IMGU`
 	
`IMGL loading`
`IMGU`
 	
`IMGL ecoflower`
`IMGU`
	Halation
	 
		Not applicable	

	Loading 	Not applicable	
	Ecoflower 	Not applicable	

HSVnRGB Pattern
Application:
Manufacturing test.
Command example:
`IMGL HSVnRGB`
`IMGU`
	N/A
	 
		N/A	N/A

Flat Pattern
Application:
Manufacturing test.
Command example:
`IMGL flat`
`IMGU`
	N/A
	
		N/A	N/A

Table 17-1: Test Patterns			
Pattern Name	**Variant**	**Options**	**Range of Values**

Zone Plate Pattern
This is a bitmap that can be scrolled to test motion artifacts. You can replace particular bitmap with any other bitmap image to allow scrolling. You just need to ensure that you assign it the same name.
Loading Pattern
Application:
Manufacturing test.
Command example:
`IMGL zoneplate`
`IMGU`
	Vertical
	 
		Vertical Movement	▪ Stop
			▪ Slow
			▪ Medium
			▪ Fast

		Horizontal Movement	▪ Stop ▪ Slow ▪ Medium ▪ Fast

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