

SpectraCal

User Manual



VideoForge PRO

Rev. 1.3

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Introduction

Thank you for purchasing the VideoForge PRO, a next generation HDMI reference test pattern generator.

The VideoForge PRO is a low-cost, battery-operated HDMI 2.0a/b 18 Gbps video generator, designed specifically for new, advanced methods of calibration, including HDR, HLG and Dolby Vision. Brought to you by SpectraCal and the team that developed CalMAN, the world's most advanced display calibration software.

Five top reasons for owning VideoForge PRO:

1. Provides HDMI source signals, up to 18 Gbps, for video testing and calibration
2. Enables Dolby Vision, HDR10, and HLG calibration
3. Validates HDCP 2.2 compliance
4. Verifies display and projector HDMI ports for maximum signal capability
5. Troubleshoots video systems

Important Safety Information

- Follow all instructions
- Read all warnings
- Use only the supplied 5V DC/AC power supply/charger
- Do not block side vents on unit
- Indoor use only: To reduce the risk of electric shock, do not use near water or expose to rain or moisture. Keep away from excess moisture.
- Use only a dry cloth to clean
- Do not use near heat sources such as room heaters, hot A/V equipment.
- Keep away from open flames.
- Unplug the device during lightning storms or when unused for long periods of time.
- Protect all connected cords including power cords from being pinched, compressed, or stepped on.
- Opening the case will void the warranty. All servicing should be done only by factory approved service personnel.
- Electrical Input Rating: Power over 5V/DC 700mA.
- Operating temperature range: 0 to 40C.

Electrostatic Discharge (ESD) Protection

1. CAUTION: During a hot-plug between HDMI devices (when HDMI devices are powered on), due to the potential differences between powered equipment, an electrostatic discharge (ESD) can occur. These potential differences can be at an extremely high level.
2. To protect the VideoForge PRO and any connected device from possible damage, power on the VideoForge PRO and the device under test only after the VideoForge PRO HDMI output is connected to the input of the tested device (repeater, video processor or display).
3. Power off the VideoForge PRO and the device under test before the VideoForge PRO HDMI output is disconnected from the tested device.
4. The VideoForge PRO HDMI output is protected against ESD discharge up to 7KV. In the case of a massive discharge, this value can be exceeded and will cause serious damage to the VideoForge PRO internal circuitry rendering the VideoForge PRO HDMI output completely inoperable.
5. The VideoForge PRO high voltage protection circuits provide evidence of ESD discharge events, which automatically void the VideoForge PRO warranty. Please pay full attention to create a static-safe working environment to prevent ESD discharges.

Key Features

- HDMI 2.0 Support. 600 MHz - 2160P @60 4:4:4 Maximum Resolution
- Dolby Vision, HDR, and SDR Calibration Capable.
- HDCP Pass/Fail - HDCP 2.2, 1.4 or None Indicator Light - The VideoForge PRO will tell you what HDCP version the TV supports.
- Status Light - Instant notification if hot plug detect (HPD) and 5V are active. On the fly indicator for troubleshooting, especially when switching, splitting and extending HDMI.
- Deep Color Testing – Up to 36 bit per pixel color depth.
- Audio test tones for HDMI audio confidence testing.
- A/B memories to store and recall preferred unit configurations.
- Portable - Battery Operated. Rechargeable batteries included make field troubleshooting much easier.
- Optimized Ergonomics – 2.5” LCD display and simple menu system makes VideoForge PRO very user friendly.
- Field upgradable via firmware.

What's in the Box

- VideoForge PRO
- 5V DC/AC power supply/charger (110-240 VAC) with four international plug adapters (US, UK, AU, EU).
- Mini USB to USB A cable

Control & Indicator Functions

Following is a description of the controls and indicators provided on the VideoForge PRO. This description divides the controls into three sections.

1. Circular Navigation Pad
2. Selection Buttons & Indicators
3. Top Panel Connectors

Circular Navigation Pad

Connector and indicator descriptions, from top-left:

- *Up/Down* arrows – Use these to scroll through patterns or scroll through sub-menu items.
- *OK* button – Use this to select menu items – change timing, HDCP type, HDR, etc.
- *A & B* preset buttons – Press and hold either A or B button for three seconds to store the current unit configuration. Stores current timing, color, HDCP status, and test pattern.



Figure 1. VideoForge PRO circular navigation pad.

Selection Buttons & Indicators

Button and indicator descriptions, from top-left:

- *HDCP* indicator – Indicates that HDCP output is enabled

- Status indicator – Indicates that there is a successful hot plug connection between the source, sink and repeaters in the system
- 4K button –Lists supported 4K and Ultra High Definition (UHD) timings up to 18 Gbps
- 1080 button – Lists supported High Definition (HD) 1080 timings
- 720 button - Lists supported High Definition (HD) 720 timings
- Power button – Press and hold to power the unit on or off



Figure 2. VideoForge PRO buttons & indicators.

- VESA button - Lists supported VESA (PC) timings
- Auto button –Displays the connected sink device’s EDID and outputs the preferred timing specified by the EDID.

Note: Auto screen also indicates unit’s battery charge level.

- SD button - Lists supported Standard Definition (SD) timings
- HDCP button – Lists supported HDCP modes (HDCP Off, HDCP 2.2, HDCP 1.4)
- Audio button - Lists supported audio output formats for audio confidence testing
- Color button – Lists supported Color (chroma subsampling) selections.
- HDR button – Tests for HDR10 or HLG (Hybrid Log Gamma)
- Back button – Returns to pattern selection screen

Note: Some functions, such as RGB triplets, windows patterns, APL patterns, and Dolby Vision can be accessed ONLY with CalMAN software.

Top Panel Connectors

Connector and indicator descriptions, from top-left:

- *HDMI OUT* connector – Video output connection for test pattern generator
- *USB ISP* port – Mini USB for CalMAN unit control and for installing firmware updates, if required
- *DC/5V* port – Connection for supplied 5V DC/AC power supply/charger for internal battery charging and/or unit operation
- *Charge Status* indicator – Indicates when internal battery is charging.



Figure 3. VideoForge PRO top connector panel.

HDMI System Overview

The VideoForge PRO is designed for testing HDMI distribution systems and the devices in these systems. Understanding what happens when these devices are connected in a simple or distributed system is useful in troubleshooting an actual system. All A/V HDMI systems consist of three basic component types:

1. **Source** – A transmitter device that sources HDMI video output (e.g. set top boxes, game consoles, optical players, computers, etc.). Substitute the VideoForge PRO for the source during system testing.
2. **Sink** – A receiver device that displays HDMI video input (e.g. TV or projector). Inject a signal timing that should normally pass through the distribution system into a sink from the VideoForge PRO during system testing.
3. **Repeater** – A combination device that receives and retransmits HDMI video. Connects between one or several source and sink devices (e.g. AVR (audio video receiver) or matrix switch).

Display (sink) Device Testing

To test an HDMI sink device:

1. Connect an HDMI cable from the VideoForge PRO HDMI output port to the input of the display you want to test.
2. Select a familiar test pattern from the VideoForge PRO using the up down arrows. Then choose the timing you want to distribute by selecting either "4K", "1080", "720" or "VESA", click "OK" when you are on the desired timing. For testing a full 4K system, select 3840x2160 60 Hz and Color Space "RGB Full Range" or similar full HDMI 2.0 resolution.
3. The test pattern should appear on the display. If it does not, decrease the timing resolution until the test pattern is displayed. The currently selected timing resolution is the display's maximum resolution.

Test Pattern Descriptions

Test patterns are used for visual performance evaluation of a display or control adjustments (brightness, contrast, sharpness, etc.). Test patterns are also used for display measurements during automated display calibration.

Test patterns supplied with the VideoForge PRO include the following:

Brightness - Black pluge pattern for setting TV brightness control (black level)

Contrast – Center-mirrored white to black gradient for setting TV contrast control

Sharpness – Black lines on gray background for setting TV sharpness control

SMPTE Bars – SMPTE standard color bars for evaluating TV color and tint controls

Gray Steps 16 – Grayscale steps for evaluating white balance and grayscale tracking

CCRA L20C100 – Corner contrast pattern for measuring Dolby Vision contrast

Multiburst – Single-pixel to multi-pixel bars for setting TV sharpness control

ANSI Checkerboard – 4x4 white/black blocks for measuring in-plane contrast

ANSI Checkerboard Inverted - 4x4 inverted blocks for measuring in-plane ANSI contrast

White Window – Centered window for automated display measurements (addressable with CalMAN RGB Triplets)

Note: The VideoForge PRO does not support custom test patterns.

Supported Timings

<u>Supported Timing Resolutions</u>	
SD Button:	1080 Button:
480p @ 59.94Hz	1080P @ 60Hz
576p @ 50Hz	1080P @ 59.94Hz
480i @ 59.94Hz	1080P @ 50Hz
576i @ 50Hz	1080P @ 30Hz
720 Button:	1080P @ 29.976Hz
720P @ 60Hz	1080P @ 25Hz
720P @ 59.94Hz	1080P @ 24Hz
720P @ 50Hz	1080P @ 23.97
VESA Button (All timings @ 60Hz):	1080I @ 60Hz
640x480	1080I @ 59.94Hz
800x600	1080I @ 50Hz
1024x768	4K Button:
1280x1024	3840x2160 @ 60Hz
1366x768	3840x2160 @ 59.94
1400x1050	3840x2160 @ 30Hz
1440x900	3840x2160 @ 29.97Hz
1600x900	3840x2160 @ 24Hz
1600x1200	3840x2160 @ 23.98 Hz
1680x1050	4096x2160 @ 60Hz
1920x1200	4096x2160 @ 59.94Hz
	4096x2160 @ 30Hz
	4096x2160 @ 29.97Hz
	4096x2160 @ 24Hz
	4096x2160 @ 23.98Hz

Supported Color Formats

When the *Color* button is pressed on the VideoForge PRO, the following color encoding formats are available for selection:

RGB Limited (16-235) - HDTV SMPTE Range – Movies are viewed and produced within this range.

1. RGB Limited 8-bit
2. RGB Limited 10-bit
3. RGB Limited 12-bit

RGB Full (0-255) - Generally reserved for PC monitors, since PCs use full range RGB.

4. RGB Full 8-bit
5. RGB Full 10-bit
6. RGB Full 12-bit

YCbCr 4:2:0 (16-235) - ½ color H. resolution, ½ color V. resolution.

7. YCbCr 4:2:0 8-bit
8. YCbCr 4:2:0 10-bit
9. YCbCr 4:2:0 12-bit

YCbCr 4:2:2 (16-235) - ½ color H. resolution, full color V. resolution.

10. YCbCr 4:2:2 8-bit
11. YCbCr 4:2:2 10-bit
12. YCbCr 4:2:2 12-bit

YCbCr 4:4:4 (16-235) - full color horizontal & vertical resolution; no chroma subsampling.

13. YCbCr 4:4:4 8-bit
14. YCbCr 4:4:4 10-bit
15. YCbCr 4:4:4 12-bit

YCbCr 4:2:0 and YCbCr 4:2:2 are the color encoding formats output from most consumer video sources (e.g. Blu-ray players, cable and satellite set top boxes). The new 4K/60 Hz timing is standardized with YCbCr 4:2:0.

Firmware Updates

Field firmware updates are enabled via the USB port. When a firmware update is available, it will be posted on the Spectracal.com web site, with instructions.

FCC Compliance Statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution

To comply with the limits for an FCC Class B computing device, always use the shielded signal cable supplied with this unit. The Federal Communications Commission warns that changes or modifications of the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CE mark for Class B ITE (Following European standard EN55022/1998; EN61000-3-2/1995; EN61000-3-3/1995, EN55024/1998, EN60950-1/2001)

Radio Frequency Interference Statement Warning: This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Product Warranty

General Warranty Terms

Portrait Displays, Inc. offers a limited warranty for its VideoForge PRO product. Any product first sold to you is guaranteed to be free from defects in both components and workmanship under regular uses. The warranty period commences on the date the item ships.

Attention: Your invoice with the date of purchase, model number and serial number of the product is your proof of the date of purchase. The International Limited Warranty is applicable and shall be honored in every country where Portrait Displays, Inc. or its Authorized Service Providers offer warranty service subject to the terms and conditions provided in this International Limited Warranty Statement.

Portrait Displays Products Warranty Period

The warranty terms for Portrait Displays products are: Domestic & Asia EU & UK

Portrait Displays – VideoForge PRO 1 Year

Specifications

Parameter	Specification
HDMI Version	up to 2.0a/b
HDCP	2.2 and 1.x
HDR Support	Dolby Vision, HDR10, HLG
Maximum Clock Rate	600Mpsc (594 MHz)
Maximum Throughput per Channel	6.0 Gbits/sec (18Gbps total)
Timings	VESA; Video Standard with 60, 59.94, 30, 29.97, 24, 23.98 fps; Video Standard with 50, 25 fps; 4k timings; AUTO (see full list on separate chart)
Encoding	RGB, YCbCr
Video Sampling Modes	RGB 4:4:4, YUV 4:4:4, YUV 4:2:2, YUV 4:2:0
Color Bit Depth (Deep Color)	8, 10, 12 Bit
Audio	LPCM Only
Audio Source	Internal iKHz Test Tone (Sine Wave)
Control	Mini USB
Power Supply	Input: 100-240VAC -- 50/60Hz @ .5A Output: 5VDC @ 2A
Size (Unit Only) HxWxD inches	5.25x3x1
Weight (Unit Only)	
Interface:	
HDMI Out	Type A
Control	Mini USB
Power	3.5mm Barrel Connector

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About / Contact

About Portrait Displays

Portrait Displays, Inc., since 1993, is a leading application software provider (ASP) for PC, smartphone, and tablet displays. The Portrait Displays team now includes **SpectraCal**, the world's leading provider of video display calibration software. The combined companies offer value-added, feature-rich solutions to both OEM display manufacturers and end users seeking improved accuracy and manageability of their displays.

Portrait Displays, an Intel Capital Portfolio company, is a private corporation with headquarters in Pleasanton, California, USA with representatives in Europe, Taiwan, China, Japan, and Korea.

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