

MVPHD-24

Video Frame Rate Converter

Preliminary

Operations Manual

Firmware version 0.9.6



MVPHD-24 • Video Frame Rate Converter Operations Manual

- Part Number: MVPHD-24 **OM**
- Document Version: 0.9.6
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This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.



Warning

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Notice

The symbol with the word “**Notice**” within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.



**ESD
Susceptibility**

This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions



Caution

This product should only be operated with the chassis cover securely in place. Proper cooling can only be achieved with a closed chassis. In addition, an open chassis presents serious safety hazards to the operator.



Warning

Certain internal parts of this equipment namely the power supply area still present a safety hazard with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing this area.



Warning

The internal blower fan presents a safety hazard when powered on with an open chassis. The fan blades may cause bodily injury when coming into contact with hands and may grab clothing or hair.

This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product's power supply and power supply area, are not intended to be customer serviced and should be returned to the factory for repair. **There are no user serviceable fuses inside.**

Maintenance/User Serviceable Parts

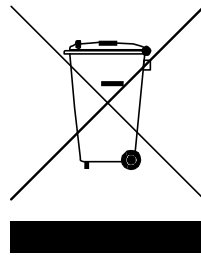
Routine maintenance to this product is not required. This product contains no user serviceable parts other than 5 output factory calibration adjustments. If this product does not appear to be working properly, please contact Technical Support using the contact information on the last page of this manual. The MVPHD-24 is covered by a generous 5-year warranty and will be repaired without charge for materials or labor within this period. Refer to the “Warranty” and “Repair Policy” sections in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Cal Media encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Cal Media for more information on the environmental performances of our products.

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Chapter 1

Introduction

In This Chapter

This chapter contains the following sections:

- A Word of Thanks
- Overview
- Functional Block Diagram
- Detailed Description

A Word of Thanks

Congratulations on choosing **Schindler Imaging's MVPHD-24 Video Frame Rate Converter**. The MVPHD-24 is the newest generation broadcast quality frame rate converter designed specifically for the film industry and widely used by studios and playback specialists. Conventional standards converters are not designed for the varied playback situations encountered in the industry, and often require the use of additional equipment. Schindler Imaging has incorporated the functionality of other equipment with our high quality processing, producing a single unit solution to simplify the task of 24 frame playback.

Should you have a question pertaining to the installation or operation of your MVPHD-24, please contact us at the numbers listed on the back cover of this manual, or through our web site at www.calmedia.com.

Overview

The MVPHD-24 is the newest generation HD Video Up/Down Frame-rate Converter developed specifically for the 24 frame playback industry.

From 2001 to 2009, Schindler Imaging (now known as California Media Engineering) produced the MVP-24 Frame-rate converter. The MVP-24 (often called “the Schindler”) quickly became the industry standard for 24 Frame playback specialists.

The design of the MVPHD-24 is based on the earlier MVP-24's functionality and has a similar look and feel. The MVPHD-24 maintains the same features as the earlier MVP-24 with many new standard features including full 10bit 1080p processing; up/down frame rate conversion; still image capture and display; custom test signals; HDMI, VGA, SDI, HD/SD component, and composite inputs and outputs.

Features

- ☐ Supports 23.98, 24.00, 25.00, 29.97, and 30.00 Fps frame-rates.
- ☐ Designed specifically for 24 frame video playback
- ☐ Similar look and feel to older model MVP-24
- ☐ Supports SD, HD, and graphic resolutions up to 1080p for inputs and outputs
- ☐ Full up/down/cross frame-rate converter
- ☐ Composite, component, SDI, VGA, and HDMI inputs and outputs.
- ☐ Auto input format/frame rate detection including VGA and HDMI resolutions
- ☐ 10 bits per channel
- ☐ 3 dimensional COMB filter (for composite input)
- ☐ Motion compensated de-interlacer
- ☐ Proc Amp controls
- ☐ High performance scaler with adjustable picture resizing
- ☐ RGB color correction controls
- ☐ Output Color Temperature controls with 3200, 4800, and 5600 degree presets
- ☐ Test signal generator for all outputs, including user generated full frame signals
- ☐ Four FLASH based still image buffers available as inputs
- ☐ Capture or Load still images to or from SD/MMC card
- ☐ Visual effects including freeze frame, synchronized snow, or MPEG blockiness dissolve
- ☐ Genlock to Frame-Drive, Vert-drive, HD tri-level, SD black burst, or SDI input
- ☐ Genlock phase controls: vertical (360 degree), horizontal, and subcarrier
- ☐ Genlock indicator LED on the front panel
- ☐ Audio channel mapping and level controls for embedded SDI and HDMI audio *
- ☐ Dedicated EFX, TSG, Color Temp, Monochrome, Goto Black, and FAN buttons
- ☐ User presets + factory default settings
- ☐ 1 RU chassis, 17 x 12 inches, with removable rack mount ears
- ☐ Front panel OLED graphic display for status and menu driven controls
- ☐ 1.5 inch Front panel video display for monitoring output video
- ☐ SD/MMC card interface to upgrade firmware and load or save still images
- ☐ Chassis fan on/off control with 16 speed selections (to reduce audible noise on set)
- ☐ Medical grade power supply
- ☐ Internal Raspberry PI to provide remote control via Ethernet connection and openGear Dashboard software, supporting multiple MVPHD-24 units. *
- ☐ Raspberry PI with connectable USB drive may also be a selectable HDMI input for 24 frame conversion of mp4 files, or customized websites. *

* future firmware release

Quick Start Guide – Basic Setup

Input Connection:

Connect the source to the appropriate input connector:

Composite video connects to **INPUTS** - **CBVS/R/Pr** BNC connector.

Y/C video connects to **INPUTS** - **Y/G/Y** and **C/B/Pb** BNC connectors.

Component YPbPr video connects to **INPUTS** - **CBVS/R/Pr**, **Y/G/Y** and **C/B/Pb** BNC connectors.

Component RGB video connects to **INPUTS** - **CBVS/R/Pr**, **Y/G/Y** and **C/B/Pb** BNC connectors.

VGA connects to **VGA IN**, HDMI connects to **HDMI IN**, SDI connects to **SDI IN**.

Input Menus:

Press **INPUT** button to access input menus.

Press NEXT or PREV buttons to locate **Input Source** menu.

⇒ Use the Knob or +/- buttons to select the desired source.

⇒ Once a source is selected, push on the knob to enter selection.

The new selection will now appear at the top left corner of the front panel display.

If input source is YPbPr, then press NEXT or PREV buttons to locate **Input YPbPr** menu.

⇒ Use the Knob or +/- buttons to select between EIA770/EBU or Betacam.

Note: EIA770/EBU is 100% color = 700mV, Betacam is 75% color = 700mV

Output Connection:

Connect a video monitor to the appropriate output connector:

Composite monitor connects to **OUTPUTS** - **CBVS/R/Pr** BNC connector.

Y/C monitor connects to **OUTPUTS** - **Y/G/Y** and **C/B/Pb** BNC connectors.

YPbPr monitor connects to **OUTPUTS** - **CBVS/R/Pr**, **Y/G/Y** and **C/B/Pb** BNC connectors.

RGB video monitor connects to **OUTPUTS** - **CBVS/R/Pr**, **Y/G/Y** and **C/B/Pb** BNC connectors.

VGA connects to **VGA OUT**, HDMI connects to **HDMI OUT**, SDI connects to **SDI OUT**.

Output Menus:

Press **OUTPUT** button to access output menus.

Press NEXT or PREV buttons to locate **Primary Output Mode** menu.

⇒ Use the Knob or +/- buttons to select the type of output being used:

(Composite, YPbPr, RGB, SDI, VGA, or HDMI).

⇒ Once the primary output is selected, push on the knob to enter selection.

The selected primary output is always shown on the top line status of the front panel display.

If output monitor is YPbPr, then press NEXT or PREV buttons to locate **Output YPbPr** menu.

⇒ Use the Knob or +/- buttons to select between EIA770/EBU or Betacam.

Note: EIA770/EBU is 100% color = 700mV, Betacam is 75% color = 700mV

If output monitor is Composite, then press NEXT or PREV buttons to locate **Composite Standard** menu.

⇒ Use the Knob (rotate) or +/- buttons to select the desired standard (NTSC, PAL-M, PAL, or PAL-N).

⇒ Once the color standard is selected, push on the knob to enter selection.

Press NEXT or PREV buttons to locate **Output Frame Rate** menu.

⇒ Use the Knob (rotate) or +/- buttons to select the desired output base frame rate.

⇒ Once the base frame rate is selected, push on the knob to enter selection.

The selected output frame rate is always shown on the top line status of the front panel display.

(Note: multiples of the base frame rates are possible, depending on the selected format)

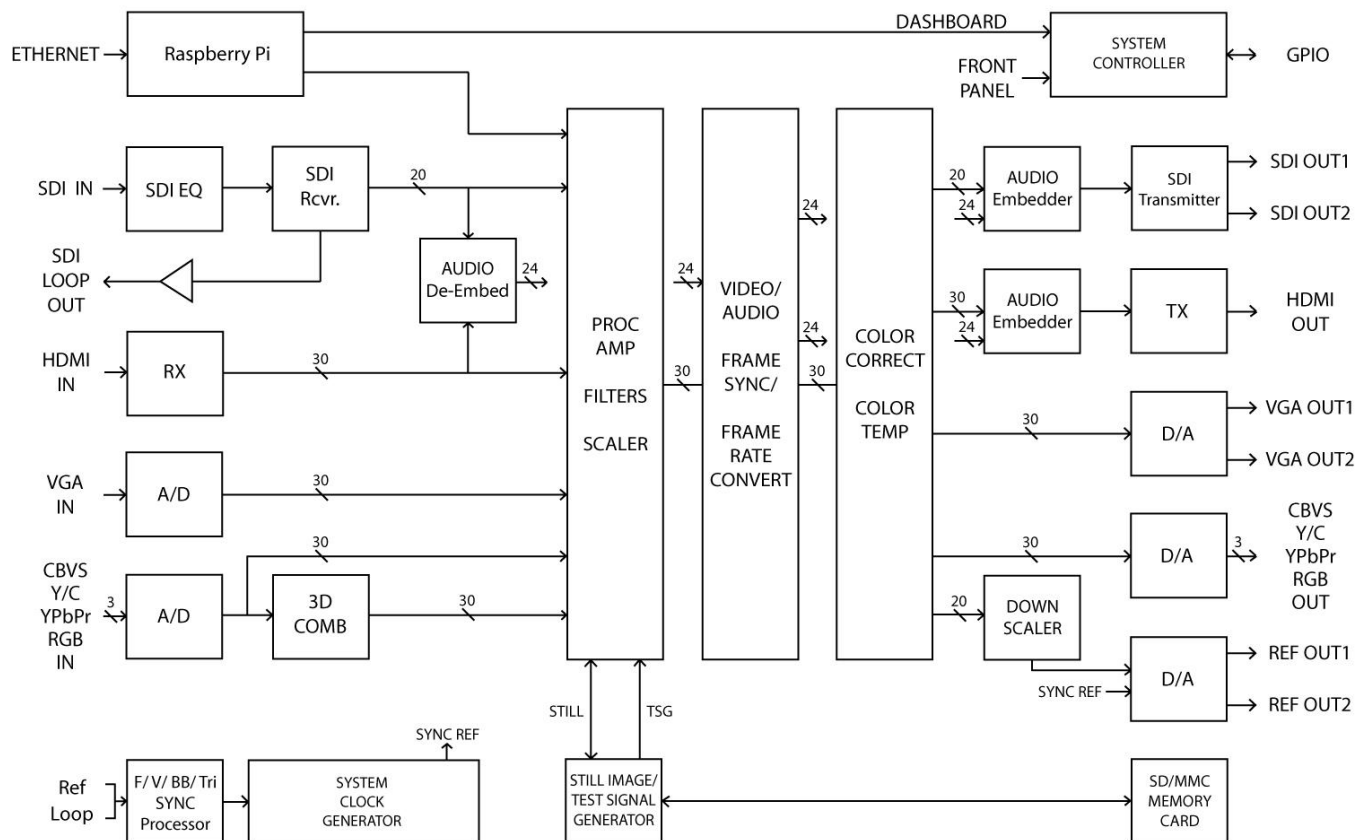
Press NEXT or PREV buttons to locate **Output Format** menu.

⇒ Use the Knob (rotate) or +/- buttons to select the desired format.

⇒ Once the format is selected, push on the knob to enter selection.

The selected output format is always shown on the top line status of the front panel display.

MVPHD-24 - BLOCK DIAGRAM



Detailed Description

Video Processing

The MVPHD-24 uses a 3 dimensional COMB filter for the composite input, and a motion compensated processor to de-interlace all interlaced video formats to full progressive video. All processing is performed on the progressive images at 10 bit resolution per channel. The input resolution is automatically detected and processed with a high performance scaler to produce the desired resolution at the outputs. Multi-tap frame rate conversion is performed when changing frame rates, and a secondary scaler is used to down-convert the output video to composite.

Composite / YC / Component Inputs

The analog video inputs use 3 multi-purpose BNC connectors for either composite/Y/C signals or component signals. These inputs accept standard NTSC or PAL video signals (videotape machines, video cameras, tuners, video disks, video games, etc.) having composite, Y/C and SVHS signals. Alternately these inputs accept SD/ED/HD component video signals with YPbPr (Betacam or SMPTE-EBU levels), and RGB (sync on green) color formats.

SDI Input

The SDI input supports SD (270Mb/s) and HD (1.485Gb/s – 2.97Gb/s) formats up to 1080p-60. A re-clocked loop output is provided.

HDMI Input

The HDMI input supports video formats from SD to HD resolutions and graphic formats up to 1920x1080p.

VGA Input

The VGA input accepts standard VGA resolutions up to 1920x1080p.

Still Image Buffers

The MVPHD-24 has four still image buffers which may be selected as input sources. Each image is stored in FLASH memory, and automatically reloaded on power-up. Images may be loaded from the front panel SD/MMC card. New images may be captured from the output video and saved to the SD/MMC card, or custom images may be converted using software.

Note: A memory card must be installed to save and load still images.

Video Proc Amps (FUTURE RELEASE)

The selected input signal has full color processing controls.

Setup:	adjusts the brightness of the picture
Video Level:	adjusts the contrast of the picture
Chroma:	adjusts the color saturation of the picture
Hue:	adjusts the tint or phase of the picture

Test Signal Generator

Using the TSG front panel button, the MVPHD-24 produces various test signals to assist the operator with level adjustments, color correction, color temperature, sizing the image, and adjusting the camera's shutter phase. Up to eight user created full-frame test signals may be added to the list of TSG signals. Test signals are produced on the input path allowing it to be resized with the scaler.

Scaler: Size and Centering Controls

The scaler is used to automatically change the input resolution to match the output. In addition, Size and Centering controls allow the vertical and horizontal size of the picture as well as its position to be adjusted. This provides easy calibration of monitors which were not setup for 24 frame playback. These controls can also be used for effects by shrinking or stretching the picture, or making non-standard aspect ratios. They can also be used to achieve increased vertical blanking time. This would allow for shutter angles greater than 180 degrees.

Color Correction

The MVPHD-24 provides color correction controls in the RGB color space to adjust output signals.

Color Temperature

Controls are provided for adjusting the color temperature of the picture to match the ambient lighting in the scene being filmed. The color temperature controls use the component X-Y color space. This allows various temperatures to be produced without desaturating the color image. The MVPHD-24 has menu controls for creating custom color temperatures, as well as presets for 3200, 4800, and 5600 degrees.

Primary Output Mode

The MVPHD-24 is not capable of producing perfect images on all outputs simultaneously. Therefore the primary output mode is used to select the desired output that is most important. The other outputs may continue to work but the quality may be degraded.

Output Frame Rate and Formats

All output signals from the MVPHD-24 operate at the chosen frame rate (23.976, 24.000, 25.000, 29.970, or 30.000 Fps). The available output formats are determined by the Output Frame Rate and the Primary Output Mode.

Composite / YC / Component Outputs

The analog video outputs use 3 multi-purpose BNC connectors for either composite/Y/C signals or component signals as chosen by the Primary Output Mode. The Composite/Y/C signals may be NTSC or PAL color subcarrier. Component signals are YPbPr (Betacam or SMPTE-EBU levels), and RGB (sync on green) color formats.

SDI Outputs

The SDI outputs supports SD (270Mb/s) and HD (1.485Gb/s – 2.97Gb/s) formats up to 1080p-60.

HDMI Output

The HDMI output supports video formats from SD to HD resolutions and graphic formats up to 1920x1080p.

VGA Outputs

The VGA outputs produce standard VGA resolutions up to 1920x1080p.

CBVS/Ref Outputs

The Ref outputs can be individually configured to output various sync reference signals, or composite video. Outputs include composite video, composite sync, black burst, tri-level, TTL composite sync, TTL Vertical Drive, and TTL Frame Drive. For composite outputs, a low quality secondary scaler is used to down convert any output resolutions that are higher than standard definition. This composite output is intended to be a reference only, when producing other non-composite output signals. For optimum composite quality, “composite” should be chosen for the Primary Output Mode.

Genlock

The Genlock input provides a high impedance “loop through” connection for an external sync reference. The reference may be composite sync, black-burst, tri-level sync, TTL vertical drive, or a TTL frame square wave. The reference signal may be daisy chained through several MVPHD-24s, or other equipment requiring external sync. If the unit is the last piece of equipment in the chain, then the second connection will require a termination. If no signal is applied to either connector then an internal sync generator is used for the reference.

Audio Processing (FUTURE RELEASE)

The MVPHD-24 contains synchronization and channel multiplexing for embedded audio signals.

SDI Audio Inputs (FUTURE RELEASE)

The SDI signal provides for sixteen channels of audio (4 embedded groups of 4 channels). When SDI is selected as the input, these sixteen audio channels are available as audio sources.

HDMI Audio Inputs (FUTURE RELEASE)

The HDMI signal provides for eight channels of audio (4 stereo pairs). When HDMI is selected as the input, these eight audio channels are available as audio sources.

Audio Synchronization and Delay (FUTURE RELEASE)

The selected audio inputs are passed along with video through an audio-video synchronizer. These signals are then processed by a variable delay buffer. All channels are delayed the same amount as the video signal, but with an adjustable offset. The audio delay may be offset from video +/- 500ms

Audio Output Mapping (FUTURE RELEASE)

Full Audio Mapping is possible with the Audio Output Source control. Any input channel may be selected for any output channel of both SDI and HDMI outputs, including one channel feeding multiple output channels. In addition to the SDI and HDMI inputs, four internal tone generators and silence are available as sources.

Audio Levels and Phase (FUTURE RELEASE)

The mapping function also provides individual level adjustment and phase control for all output channels. The level of each channel may be adjusted -40 to +20 dB, and the phase of each channel may be inverted (180 degree phase shift).

Remote Control

Raspberry Pi & Dashboard Control

The MVPHD-24 utilizes a Raspberry Pi for remote control. It has been configured with an openConnect driver to allow control with Dashboard software when the Ethernet port is connected to a network. The Raspberry Pi is also connected as an input source, for possible use as a video player. Contact Cal Media for further information.

Memory Card

The MVPHD-24 has a socket located on the front panel to support SD or MMC memory cards. The memory card is used for updating the firmware, and for storing or loading still images.

Compatible cards include MMC (multi-media card), SD (secure digital), and SDHC (high capacity). To support still images, the SD/MMC cards must be formatted with a FAT16 or FAT32 file structure (most cards greater than 64MB come pre-formatted as either FAT16 or FAT32). The MVPHD-24 conforms to the FAT32 specification so firmware and still image files may be exchanged easily with most computers.

Chapter 2

Installation and Setup

In This Chapter

This chapter contains the following sections:

- Static Discharge
- Unpacking
- Rear Panel Connections
- SD/MMC Memory Card

Static Discharge

Whenever handling the MVPHD-24 and other related equipment, please observe all static discharge precautions as described in the following note:



ESD
Susceptibility

Static discharge can cause serious damage to sensitive semiconductor devices. Avoid operating the device in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when operating the front panel or making connections to the device with other equipment.

Unpacking

Unpack the MVPHD-24 from the shipping container, and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Cal Media directly.

Rear Panel Connections



Figure 2-1. Rear Panel Connectors

Power Entry Module

Using an IEC-C13 power cord, connect to an AC power source. This product is intended to operate from a power source of 100 - 120 VAC (60 Hz), or 200 - 240 VAC (50 Hz). A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Ethernet / USB (Raspberry Pi)

Connect the Ethernet port to a network to allow remote control via Dashboard software.

GPIO Port (DB-15) (FUTURE RELEASE)

Reserved for future remote control via switch closure(s), and status outputs.

Genlock Loop Input

These BNC connectors provide a high impedance “loop through” connection for an external sync reference. The reference may be composite sync, black-burst, tri-level sync, TTL vertical drive, or a TTL frame square wave. The reference signal may be daisy chained through several MVPHD-24s, or other equipment requiring external sync. If the unit is the last piece of equipment in the chain, then the second connection will require a termination. If no signal is applied to either connector then an internal sync generator is used for the reference.

CBVS/Ref 1 and CBVS/Ref 2 Outputs

These BNC connectors provide a reference output signal for synchronizing other film equipment or cameras, or monitoring the output video. Each BNC is individually configured at the front panel using the “*Reference 1 Output*” and “*Reference 2 Output*” menus under *OUTPUTS*. Possible outputs include composite video, composite sync, black burst, tri-level, TTL composite sync, TTL Vertical Drive, and TTL Frame Drive. For composite outputs, a low quality secondary scaler is used to down convert any output resolutions that are higher than standard definition. This composite output is intended to be a reference only, when producing other non-composite output signals. For optimum composite quality, “composite” should be chosen for the Primary Output Mode.

Analog Video Outputs (CBVS / YC / YPbPr / RGB)

These three BNC connectors are the main analog video outputs. They are multi-format outputs and are configured at the front panel by using the menu “*Primary Output Mode*” under *OUTPUTS*. The three connectors will be configured as either: [Composite, Y, C] ; [Red, Green, Blue] ; or [Pr, Y, Pb].

VGA Outputs

These DB15-HD female connectors produce standard VGA resolutions up to 1920x1080p.

HDMI Output

This HDMI Type A connector produces video formats from SD to HD resolutions and graphic formats up to 1920x1080p.

SDI Outputs

These BNCs connectors produce standard SDI signals at SD (270Mb/s) and HD (1.485Gb/s – 2.97Gb/s) formats up to 1080p-60.

SDI Loop Output

This BNC connector provides a re-clocked output of the SDI input.

SDI Input

This BNC connector accepts standard SDI signals at SD (270Mb/s) and HD (1.485Gb/s – 2.97Gb/s) formats up to 1080p-60.

HDMI Input

This HDMI Type A connector accepts video formats from SD to HD resolutions and graphic formats up to 1920x1080p.

VGA Input

This DB15-HD female connector accepts standard VGA resolutions up to 1920x1080p.

Analog Video Inputs (CBVS / YC / YPbPr / RGB)

These three BNC connectors are the main analog video inputs. They are multi-format inputs and are configured at the front panel by using the menu “*Input Source*” under *INPUTS*. The three connectors will be configured as either: [Composite, Y, C] ; [Red, Green, Blue] ; or [Pr, Y, Pb].

SD/MMC Memory Card

The memory card is used for updating the firmware, and for storage of still images. This section provides information for using a memory card on the MVPHD-24.

Hot Swappable

The memory card is “hot-swappable”, which means it can be installed and removed while the MVPHD-24 is powered and running, without causing interruption.

Compatible Cards

MMC (multi-media card)

SD (secure digital)

SDHC (secure digital high capacity)

Requirements

To support storage of still images, the SD/MMC cards must be formatted with a FAT16 or FAT32 file structure (most cards greater than 64MB come pre-formatted as either FAT16 or FAT32). The MVPHD-24 conforms to the FAT32 specification so firmware and still image files may be exchanged easily with most computers.

Installation

Locate the SD/MMC socket at the left side of the MVPHD-24’s front panel.

The SD or MMC card should be positioned with the corner notch pointing down. Using gentle pressure, carefully slide the memory card all the way into the socket until it clicks. The memory card should now be locked into place.

If the socket will not accept the memory card then check if the card is backwards, upside-down, or damaged. **Do not force the memory card into the socket.**



Removal

To remove the SD or MMC card, press the memory card further into the socket until it clicks. Release the card and it should spring part way out. The memory card is now unlocked and should slide easily out of the socket.

To prevent damage to the socket, do not pull on the SD/MMC card when it is locked into the socket.

Chapter 3

Operation

The MVPHD-24 is controlled by the front panel, or remotely by using DashBoard™ Control Software.

Front Panel Control

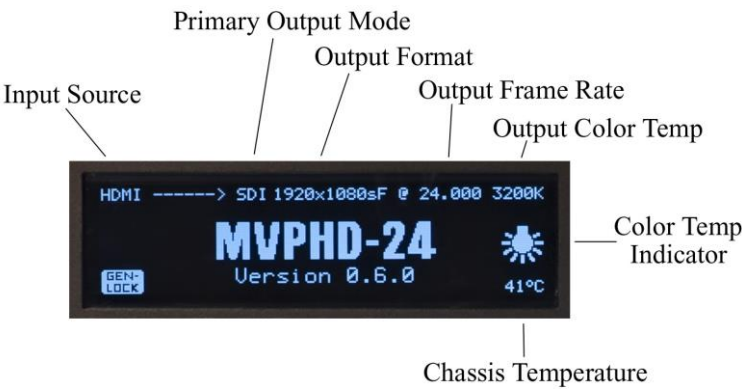


Figure 3-1. Front Panel Controls

Display

The MVPHD-24 utilizes a graphic OLED display to report status information, and to assist the operator while making adjustments.

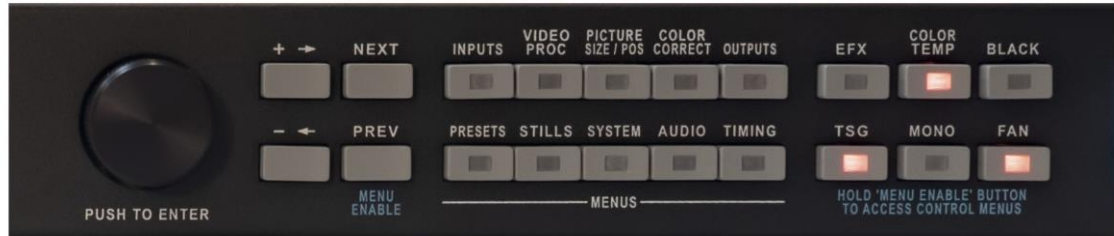
The top line of the display always indicates important status about the operation of the MVPHD-24. This allows the operator to see at a glance, how the MVPHD-24 is configured.



The remainder of the display is used for various adjustment and status menus.

Controls

The MVPHD-24 is controlled by a menu driven system. Control menus are divided into categories and selected by pressing one of the ten category buttons. When a category is active, the corresponding button will illuminate yellow and a control menu will appear on the front panel display.



Pressing NEXT or PREV (previous) will step through all the control menus available for that category.

The rotary knob and the + and – buttons are used to make changes and adjustments to the displayed menus. Icons will appear on the display to indicate which controls are active.  indicates that the rotary knob is active.  indicates that the + and – buttons are active.

For some control menus, a “PUSH KNOB TO ENTER” message will appear along the bottom of the menu. In these cases, pushing in on the rotary knob will activate the new selection.

Control Menus

INPUTS:

This button is used to access menus for selecting and configuring inputs.

Menu: *Input Source:*

This menu is used to select the video input source for the MVPHD-24.

The current selected source is always shown at the top left corner of the front panel display.

Options are: Composite*, Y/C*, YPbPr*, RGB*, SDI, VGA, HDMI, Buffer1-4, and RasPi.

⇒ Use the Knob or +/- buttons to select the desired source.

⇒ Once a source is selected, push on the knob to enter selection.

The new selection will now appear at the top left corner of the front panel display.

**See Rear Panel Connections for proper use of the multi-format video inputs.*

Menu: *Input YPbPr Level:*

This menu is used to configure the input signal levels when using the YPbPr source.

Options are: EIA770/EBU, or Betacam.

Note: EIA770/EBU is 100% color = 700mV, Betacam is 75% color = 700mV

⇒ Use the Knob or +/- buttons to change the signal level.

Menu: VGA Input Vert Position:

This menu is used to adjust the vertical position of the VGA input's capture window.

In auto mode (default), the MVPHD-24 automatically adjusts the position.

In manual mode, the current position is indicated in BOLD on the second line.

**See Chapter 7 for further discussion of the VGA capture window.*

- ⇒ Push the knob to alternate between auto position and manual position.
- ⇒ Use the Knob or +/- buttons to adjust the position in manual mode.

Menu: VGA Input Horz Position:

This menu is used to adjust the horizontal position of the VGA input's capture window.

In auto mode (default), the MVPHD-24 automatically adjusts the position.

In manual mode, the current position is indicated in BOLD on the second line.

**See Chapter 7 for further discussion of the VGA capture window.*

- ⇒ Push the knob to alternate between auto position and manual position.
- ⇒ Use the Knob or +/- buttons to adjust the position in manual mode.

Menu: VGA Input Horz Adjust:

This menu is used to adjust the horizontal width adjustment of the VGA input's capture window.

In auto mode (default), the MVPHD-24 automatically adjusts the width.

In manual mode, the current adjustment value is indicated in BOLD on the second line.

**See Chapter 7 for further discussion of the VGA capture window.*

- ⇒ Push the knob to alternate between auto adjust and manual adjust.
- ⇒ Use the Knob or +/- buttons to adjust the width in manual mode.

Menu: VGA Input Sample Phase:

This menu is used to adjust the sampling phase of the VGA input's capture window.

In auto mode (default), the MVPHD-24 automatically adjusts the phase.

In manual mode, the current phase is indicated in BOLD on the second line.

**See Chapter 7 for further discussion of the VGA capture window.*

- ⇒ Push the knob to alternate between auto adjust and manual adjust.
- ⇒ Use the Knob or +/- buttons to adjust the width in manual mode.

Menu: Input Status:

This is a status menu for the selected input video signal. The first line indicates the selected input. The second line indicates the detected resolution and frame rate of the input signal.

VIDEO PROC:

This button is used to access menus for the video proc amp.

The Proc Amp controls allow adjustments of the selected input signal. Video Level, Setup, Chroma Level, Hue, and Y/C Delay may be used to correct errors in the incoming signal.

Note: a “PROC” icon will appear on the left side of the display when any Proc Amp control is set to a non-unity value.

Menu: *Proc Amp Enable:*

This menu is used to enable or disable all Proc Amp controls.

When set to **ON**, the Proc Amp controls (Level, Setup, Chroma, Hue, and Y/C Delay) are active. When set to **OFF**, the Proc Amp controls are bypassed (unity gain) and any control settings are ignored.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Level (Contrast):*

This menu is used to adjust the level (or contrast) of the video inputs.

Range of adjustment is 0 to 200%, with a default value of 100%.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Setup (Brightness):*

This menu is used to adjust the black level (or brightness) of the video inputs.

Range of adjustment is -58% to +58%, with a default value of 0%.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Chroma (Color):*

This menu is used to adjust the color saturation of the video inputs.

Range of adjustment is 0 to 200%, with a default value of 100%.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Hue (Tint): (HUE MODE)*

This menu is used to adjust the color hue (or tint) of the video inputs, and select the hue mode.

Range of adjustment is -50 to +50 degrees with a default value of 0 degrees.

⇒ Rotate the Knob or use +/- buttons to adjust.

The Hue Mode selects which method is used to calculate hue. The Hue Mode is displayed as “(component)” or “(composite)”.

The **Component Hue** setting calculates the video hue based on equal scaling of the x,y color space. This method is typically used in component digital equipment.

The **Composite Hue** setting calculates the video hue based on the unequal scaling of NTSC/PAL color space. This method more closely resembles a traditional NTSC hue control.

⇒ Push on Knob to change (toggle) the Hue Mode.

Menu: *Y/C Delay:*

This menu is used to adjust the horizontal (side to side) position of the color portion of the video inputs with respect to the luminance (black and white) portion.

Can be used to correct color smear artifacts produced by VTR's.

⇒ Use the Knob or +/- buttons to adjust.

PICTURE SIZE/POS:

This button is used to access menus for the picture size and position controls.

Menu: *Vert Size:*

This menu is used to adjust the size of the video outputs' active picture in the vertical (up-down) direction. This menu displays the size in both percent and number of active lines.

- ⇒ Use the +/- buttons to adjust in 5 line increments.
- ⇒ Use the Knob to adjust in 1 line increment.

Menu: *Vert Center:*

This menu is used to position the center of the video outputs' active picture in the vertical (up-down) direction.

- ⇒ Use the +/- buttons to adjust in 5 line increments.
- ⇒ Use the Knob to adjust in 1 line increment.

Menu: *Horz Size:*

This menu is used to adjust the size of the video outputs' active picture in the horizontal (side to side) direction. This menu displays the size in both percent and number of pixels.

- ⇒ Use the +/- buttons to adjust in 5 pixel increments.
- ⇒ Use the Knob to adjust in 1 pixel increments.

Menu: *Horz Center:*

This menu is used to position the center of the video outputs' active picture in the horizontal (side to side) direction.

- ⇒ Use the +/- buttons to adjust in 5 pixel increments.
- ⇒ Use the Knob to adjust in 1 pixel increments.

Menu: *Zoom: H&V*

This menu is used to control the amount of zoom applied to the video input. The amount is displayed in percent. Adjustments are made in the horizontal direction, vertical direction or both directions simultaneously. The direction is selected by pushing the Knob. The top line indicates the direction selected for adjustment.

- ⇒ Push Knob to select direction for adjustment.
- ⇒ Use the +/- buttons to adjust in 20% increments.
- ⇒ Use the Knob to adjust in 2% increments.

Menu: Zoom Center: Horz or Vert

This menu is used to position the video input when “Video Zoom” is greater than 100%. The position is displayed in percent. Adjustments are made in the horizontal or vertical direction, indicated on the top line. The direction is selected by pushing the Knob. (Note: This setting has no effect if “Video Zoom” = 100%.)

- ⇒ Push Knob to select direction for adjustment.
- ⇒ Use the +/- buttons to adjust in 5% increments.
- ⇒ Use the Knob to adjust in 0.5% increments.

Menu: Aspect Ratio Conversion:

This menu configures how video images are converted from one aspect ratio to another. These settings only apply to standard video aspect ratios of 4x3 and 16x9. Some VGA formats may not be converted.

- ⇒ Use the Knob or +/- buttons to adjust.

The display indicates how both directions are processed for a given setting.

16x9 → 4x3 = [off (anamorphic)]
4x3 → 16x9 = [off (anamorphic)]

Anamorphic:

In this configuration, there is no processing. The image will appear stretched vertically or horizontally.

16x9 → 4x3 = [16x9 Letter Box]
4x3 → 16x9 = [4x3 Pillar Box]

Letter / Pillar Box:

In this configuration, black padding is added to the image to maintain the original aspect ratio. For 16x9 to 4x3, black bars are added to the top and bottom to produce a letter boxed image. For 4x3 to 16x9, black bars are added to the left and right sides to produce a pillar boxed image.

16x9 → 4x3 = [14x9 Letter Box]
4x3 → 16x9 = [14x9 Pillar Box]

14x9 Letter / Pillar Box:

In this configuration, a combination of black padding and cropping is performed. For 16x9 to 4x3, the sides of the image are cropped to produce a 14x9 aspect ratio. Black bars are also added to the top and bottom to produce a letter boxed image. For 4x3 to 16x9, the top and bottom are cropped to produce a 14x9 image. Black bars are also added to the left and right sides to produce a pillar boxed image.

16x9 → 4x3 = [Center Cut]
4x3 → 16x9 = [Vertical Crop]

Cut / Crop:

In this configuration, portions of the image are cropped to convert to the new aspect ratio. For 16x9 to 4x3, the sides of the image are cropped (also known as center cut) to produce a 4x3 image. For 4x3 to 16x9, the top and bottom are cropped to produce a 16x9 image.

COLOR CORRECT:

This button is used to access menus for color correction.

The Color Correct controls (Gain, Gamma, and Pedestal) may be used to adjust the video image in the RGB color space. All output signals are affected by these controls.

Note: a special icon will appear on the right side of the display when any Color Correction control is set to a non-unity value.

Menu: *Color Correction:*

This menu is used to enable or disable all Color Correction controls.

When set to **ON**, the Color Correction controls (Gain, Gamma and Pedestal) are active.

When set to **OFF**, the Color Correction controls are bypassed (unity gain) and any control settings are ignored.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Output Gain (%): RGB*

This menu is used to adjust the red, green and blue gain of the output video signal.

Adjustments are made individually to the red (RED), green (GRN), or blue (BLU) channels; or all channels (RGB) simultaneously. The color channel is selected by pushing the knob. The top line indicates the color channel selected for adjustment.

Range of adjustment is 0 to 200%, with a default value of 100%.

⇒ Push Knob to select color channel for adjustment.

⇒ Use the Knob (rotate) or +/- to adjust.

Menu: *Output Gamma: RGB*

This menu is used to adjust the red, green and blue gamma of the output video signal.

Adjustments are made individually to the red (RED), green (GRN), or blue (BLU) channels; or all channels (RGB) simultaneously. The color channel is selected by pushing the knob. The top line indicates the color channel selected for adjustment.

Range of adjustment is 0.45 to 2.20, with a default value of 1.00.

⇒ Push Knob to select color channel for adjustment.

⇒ Use the Knob (rotate) or +/- to adjust.

Menu: *Output Pedestal (%): RGB*

This menu is used to adjust the red, green and blue pedestal (black levels) of the output video signal.

Adjustments are made individually to the red (RED), green (GRN), or blue (BLU) channels; or all channels (RGB) simultaneously. The color channel is selected by pushing the knob. The top line indicates the color channel selected for adjustment.

Range of adjustment is -58.4 to +58.3, with a default value of 0.

⇒ Push Knob to select color channel for adjustment.

⇒ Use the Knob (rotate) or +/- to adjust.

OUTPUTS:

This button is used to access menus for output configuration.

Menu: *Output Frame Rate:*

This menu is used to select the base frame rate of all the outputs of the MVPHD-24. The base frame rates 23.976, 24.000, 25.000, 29.970, and 30.000 are supported. Multiples of these frame rates are possible, depending on the selected format.

This selection has no effect on the color standard of the composite output (see *Composite Standard* to select color standard). Any color standard can be produced at any frame rate; for example NTSC is not limited to 29.970 but can also be 25.000, 24.000 etc.; PAL is not limited to 25.000 but can also be 29.970, 24.000 etc.

- ⇒ Use the Knob (rotate) or +/- buttons to select the desired frame rate.
- ⇒ Once the frame rate is selected, push on the knob to enter selection.

Menu: *Output Format:*

This menu is used to select the video format for all outputs (except the composite reference output). The video format options depend on the frame rate, and the output mode. For example, VGA resolutions are only available when VGA is the selected output mode.

- ⇒ Use the Knob (rotate) or +/- buttons to select the desired format.
- ⇒ Once the format is selected, push on the knob to enter selection.

Menu: *Primary Output Mode:*

The MVPHD-24 is not capable of producing perfect images on all outputs simultaneously. Therefore the primary output mode is used to select the output that is most important. The other outputs may continue to work but the quality may be degraded. This setting affects what video formats are available. For example, VGA resolutions are only available when VGA is the selected output mode. The selected primary output is always shown on the top line status of the front panel display.

- ⇒ Use the Knob (rotate) or +/- buttons to select the primary output.
- ⇒ Once the primary output is selected, push on the knob to enter selection.

Menu: *Composite Standard:*

This menu is used to select the composite outputs' color standard. The MVPHD-24 supports NTSC, PAL-M, PAL, and PAL-N. This selection has no effect on the frame rate of the output (see *Output Frame Rate* to select frame rate). Any color standard can be produced at any frame rate; for example NTSC is not limited to 29.970 but can also be 25.000, 24.000 etc.; PAL is not limited to 25.000 but can also be 29.970, 24.000 etc.

- ⇒ Use the Knob (rotate) or +/- buttons to select the desired color standard.
- ⇒ Once the color standard is selected, push on the knob to enter selection.

Menu: *Output YPbPr Level:*

This menu is used to configure the signal levels when YPbPr is the selected output. (see *Primary Output Mode* to select YPbPr). Options are: EIA770/EBU, or Betacam.

Note: EIA770/EBU is 100% color = 700mV, Betacam is 75% color = 700mV

- ⇒ Use the Knob or +/- buttons to change the signal level.

Menu: VGA Frequency Trim:

This menu is only available when VGA is the selected output mode (see *Primary Output Mode* to select VGA).

This menu is used to adjust the VGA outputs' horizontal frequency. The MVPHD-24 allows the total number of lines per frame to be increased or decreased, thus changing the horizontal frequency while maintaining the correct refresh (frame) rate. This may allow some VGA monitors to lock to non-standard frame rates.

The number of lines per frame, and the horizontal frequency of the VGA output are displayed at the bottom of the menu.

⇒ Use the Knob or +/- buttons to adjust.

Menu: VGA Frequency Status:

This menu is available when any output except VGA is the selected output mode (see *Primary Output Mode* to select output).

This is a VGA output status menu. The number of lines per frame, and the horizontal frequency of the VGA outputs are displayed.

Menu: Reference 1 Output:

This menu is used to configure the CBVS/REF1 Output BNC. Possible outputs include composite video, composite sync, black burst, tri-level, TTL composite sync, TTL Vertical Drive, and TTL Frame Drive.

When composite video is selected, and the *Primary Output Mode* is not Composite, then a low quality secondary scaler is used to down convert any output resolutions that are higher than standard definition. This composite output is intended to be a reference only, when producing other non-composite output signals. For optimum composite quality, "Composite" should be chosen for the *Primary Output Mode*.

⇒ Use the Knob (rotate) or +/- buttons to select the desired reference signal.

⇒ Once the reference signal is selected, push on the knob to enter selection.

Menu: Reference 2 Output:

This menu is used to configure the CBVS/REF2 Output BNC. Possible outputs include composite video, composite sync, black burst, tri-level, TTL composite sync, TTL Vertical Drive, and TTL Frame Drive.

When composite video is selected, and the *Primary Output Mode* is not Composite, then a low quality secondary scaler is used to down convert any output resolutions that are higher than standard definition. This composite output is intended to be a reference only, when producing other non-composite output signals. For optimum composite quality, "Composite" should be chosen for the *Primary Output Mode*.

⇒ Use the Knob (rotate) or +/- buttons to select the desired reference signal.

⇒ Once the reference signal is selected, push on the knob to enter selection.

TIMING:

This button is used to access menus for output timing.

Menu: *Genlock Source:*

This menu selects the source to be used for locking the output timing of the MVPHD-24.

[Genlock BNC] This selection locks the output timing to a reference signal connected to the rear panel's *GENLOCK LOOP* BNCs. The reference may be composite sync, black-burst, tri-level sync, TTL vertical drive, or a TTL frame square wave. The MVPHD-24 automatically detects the type of signal present.

The Genlock loop input provides a high impedance "loop through" connection for an external sync reference. The reference signal may be daisy chained through several MVPHD-24s, or other equipment requiring external sync. If the unit is the last piece of equipment in the chain, then the unused BNC will require a termination.

[SDI Input] This selection locks the output timing to a serial digital signal at the SDI input. This allows the MVPHD-24 to lock to a HD camera's SDI output signal. Note, the SDI input must be either a 270 MHz (SD), 1.485GHz (HD), or 2.97GHz (3G) serial digital signal.

[Free Run] This selection ignores all genlock input references, and free-runs the output timing of the MVPHD-24 (see *Free Run Freq Adjust* menu below).

- ⇒ Use the Knob (rotate) or +/- buttons to select the desired genlock source.
- ⇒ Once the genlock source is selected, push on the knob to enter selection.

If a signal is not present at the selected source, the MVPHD-24 automatically goes into free-run. See the *Genlock Status* menu below for details of the selected signal.

The following controls adjust the timing of the video frame synchronizer. Because of internal processing delays (approx. 3+ lines), a phase setting of zero clocks / zero lines will guarantee one frame of delay in the synchronizer.

Menu: *Vert Phase:*

This menu is used to vary the vertical phase of all the output signals from the MVPHD-24 (including the sync reference outputs). When genlocked, this phase adjustment is with respect to the genlock source. This menu indicates the phase in both degrees, and lines of video. See chapter 5 for tips on using this feature.

- ⇒ Use the Knob or +/- buttons to adjust.
 - Rotating Knob increments by 1 line. Pressing + or – button increments by 5 lines.*
 - Holding down + or – button auto-increments by 10 lines.*

Menu: *Horiz Phase:*

This menu is used to vary the horizontal phase of all the output signals from the MVPHD-24 (including the sync reference outputs). When genlocked, this phase adjustment is with respect to the genlock source. This menu indicates the phase in both micro-seconds, and video pixel clocks.

- ⇒ Use the Knob or +/- buttons to adjust.
 - Rotating Knob increments by 1 clock. Pressing + or – button increments by 50 clocks.*

Menu: *Subcarrier Phase:*

This menu is used to vary the subcarrier phase of the composite and Y/C outputs. When genlocked, this phase adjustment is with respect to the genlock source. This menu indicates the phase in degrees.

- ⇒ Use the Knob or +/- buttons to adjust.

Menu: *Free Run Freq Adj:*

This menu is used to vary the MVPHD-24's master clock frequency while in Free Run mode.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Genlock Status:*

This menu provides detailed status information on the selected genlock source.

The lock status is displayed to the right of "Genlock Status:" on the top line of the menu.

"LOCKED" will appear when the MVPHD-24 is both frequency locked and vertically locked.

"UNLOCKED" will appear when the MVPHD-24 is not frequency locked, or it is not vertically locked. This can occur if the MVPHD-24's frame rate does not match the genlock source.

The second line of the status menu indicates the selected genlock source, and a description of the signal detected.

"BNC Input" refers to the rear panel *GENLOCK LOOP* BNC connectors.

"SDI Input" refers to the serial digital SDI input.

The third line of the status menu indicates the lock status of both frequency (Clk) and Vertical.

The bottom line of the status menu will indicate warnings or other conditions.

The "INCORRECT FRAME RATE" message will appear if the MVPHD-24's frame rate does not match the genlock source.

The "FREE RUN" message will appear if *Free Run* is the selected genlock source.

AUDIO: (FUTURE RELEASE)

This button is used to access menus for audio processing.

Menu: *No menus available for the function.*

SYSTEM:

This button is used to access various MVPHD-24 system menus.

Menu: *Display Brightness:*

This menu is used to adjust the brightness of the front panel OLED control display.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Video Reference A.R.C.:*

This menu is used to select the Aspect Ratio Conversion (A.R.C.) used for the front panel video display and the composite reference outputs, when the selected *Output Format* is 16x9.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *CBVS Vertical Filter:*

This menu is used to enable a vertical filter to minimize interlace flicker on composite outputs. This filter is primarily used when down converting from VGA graphics.

⇒ Use the Knob or +/- buttons to adjust.

Menu: *Update Firmware:*

This menu is used to update the MVPHD-24's firmware from a SD/MMC memory card.

See *Chapter 11* for complete instructions.

To update the firmware, install a memory card containing the update folder on the front panel of the MVPHD-24 (see section *Installation and Setup* for details).

Press the + and – buttons together to begin the update.

The front panel display will show the progress of the update.

The update should complete in approximately 60 seconds.

Once the update has finished, the MVPHD-24 will automatically re-boot.

Note: Some updates may require additional time to process new firmware files. After the automatic re-boot, secondary files may begin updating. Check the front panel display for update status. Once the additional files have updated, the MVPHD-24 will again automatically re-boot.

Verify that the new version number is displayed on the front panel display's home screen.

Menu: *System Date & Time:*

This menu is used to adjust the system date and time. The MVPHD-24 has a real time clock that is used when writing files (such as still images) to the SD/MMC memory card. The real time clock continues running even when the MVPHD-24 is turned off and unplugged (typically over six weeks without power).

To change the date and time:

⇒ Use the + or – buttons to move a cursor, selecting the parameter to be changed.

⇒ Use the Knob (rotate) to adjust the parameter.

Menu: *Motion Filter:*

This menu is used to select the type of motion filtering that is used when frame rate converting.

Note: the motion filter setting is automatically reset to “Quadratic” on power-up.

- | | |
|-------------|---|
| [Quadratic] | This is the highest quality filter which uses information from three consecutive frames to minimize any video motion artifacts. |
| [Linear] | This filter uses information from two consecutive frames to reduce any video motion artifacts. |
| [OFF] | This setting turns off the motion filter. Video frames will be dropped or repeated producing judder in a moving sequence. |
- ⇒ Use the Knob (rotate) or +/- buttons to select the desired filter.
⇒ Once the filter is selected, push on the knob to enter selection.

Menu: *3:2 Cadence Detect:*

This menu is used to enable (“Enabled”) or disable (“OFF”) the 3:2 cadence detector.

Note: the 3:2 Cadence Detect setting is automatically reset to “Enabled” on power-up.

When enabled, the MVPHD-24 analyzes the video input for a 24 Fps 3:2 cadence. If a 3:2 cadence is detected, it will extract the original 24 Fps sequence to produce a clean 24 Fps output without using motion filtering.

Disabling the 3:2 cadence detector will prevent motion artifacts from occurring if the video has broken 3:2 cadences from poorly edited or time compressed content.

The 3:2 cadence detector is only used when converting from 29.97/30 Fps or 59.94/60 Fps to 23.98/24 Fps.

- ⇒ Use the Knob (rotate) or +/- buttons to select the desired mode.
⇒ Once the mode is selected, push on the knob to enter selection.

STILLS (*Still Image Buffers*):

This button is used to access the Still Image Buffer menus.

See Chapter 9 for detailed information on using the Still Image Buffers.

The MVPHD-24 contains four FLASH Still Image Buffers named Buffer-1, Buffer-2, Buffer-3, and Buffer-4. Each buffer can contain one still image at any resolution up to 1080p. The contents of the Still Image Buffers are stored in non-volatile FLASH memory, and retained even when power is removed from the unit.

Once an image is stored into a buffer, it can be viewed as an input source (See *Input Source* menu).

Note: any image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. Using the menu “Load Buffer #? from SD Card:”, select “<blank>” by rotating the knob counter-clockwise until it appears. Push the knob to enter. Blanking may be performed without a SD/MMC Memory Card present.

Menu: *Capture Output to Buffer #?:*

This menu is used to capture an image from the MVPHD-24’s output, and store it into the selected BUFFER. A suggested name for the image is provided, which can be edited.

- ⇒ Use the Knob (rotate) to select the desired buffer.
⇒ Once selected, use the + or – buttons to move the cursor within the image name.
⇒ Use the Knob (rotate) to change the character where the cursor is located.
 Hint: pushing on the knob will jump the selected character to either ‘A’, ‘a’, ‘_’, or ‘0’.
⇒ Press both + and – together to capture the output image and save it to the selected buffer with the suggested or edited name.

Menu: Load Buffer #1 from SD Card:

This menu is used to load a still image into BUFFER #1 from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Blanking may be performed without a SD/MMC Memory Card present.

Menu: Load Buffer #2 from SD Card:

This menu is used to load a still image into BUFFER #2 from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Blanking may be performed without a SD/MMC Memory Card present.

Menu: Load Buffer #3 from SD Card:

This menu is used to load a still image into BUFFER #3 from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Blanking may be performed without a SD/MMC Memory Card present.

Menu: Load Buffer #4 from SD Card:

This menu is used to load a still image into BUFFER #4 from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Blanking may be performed without a SD/MMC Memory Card present.

Menu: Save Output Image to SD Card:

This menu is used to capture an image from the MVPHD-24’s output, and save it to the SD/MMC Card. A suggested name for the image is provided, which can be edited.

- ⇒ Use the + or – buttons to move the cursor within the image name.
- ⇒ Use the Knob (rotate) to change the character where the cursor is located.
 - Hint: pushing on the knob will jump the selected character to either ‘A’, ‘a’, ‘_’, or ‘0’.*
- ⇒ Press both + and – together to capture the output image and save it to the SD/MMC Card with the suggested or edited name.

Menu: *Delete Image from SD Card:*

This menu is used to remove an image from the SD/MMC Card.

- ⇒ Use the Knob (rotate) to select the image to be deleted.
- ⇒ Once selected, press both + and – together to delete the image.

PRESETS:

This button is used to access menus for Presets.

Various configurations of the MVPHD-24 may be saved as custom presets. All menu settings for the entire unit will be saved to the selected preset. When a preset is recalled, all menu settings will be overwritten by the previously stored values in the preset.

Menu: *Recall all Settings from:*

This menu is used to recall settings from a previously stored preset. Recalling a preset will overwrite all current menu settings of the MVPHD-24.

Options are: DEFAULT, Preset#1, Preset#2, Preset#3, and Preset#4.

Selecting “DEFAULT” will overwrite all menus settings with factory default values.

(Preset#1-4 are user created presets. *See below*)

- ⇒ Use the Knob to select a preset. Press + and – buttons simultaneously to recall preset.

Menu: *Store all Settings to:*

This menu is used to store the current settings of all MVPHD-24 controls to a preset. Each preset may be assigned a unique eight character name.

- ⇒ Use the Knob to select a preset number (1, 2, 3 or 4).

Note: “DEFAULT” preset is a factory setting and cannot be written to.

Hint: To load a suggested preset name, push the knob while the cursor is positioned below the preset number.

- ⇒ To edit the name, press the + or – button to move the cursor and select a character. Use the Knob to change the character where the cursor is positioned.

Hint: pushing on the knob will jump the selected character to either ‘A’, ‘a’, ‘_’, or ‘0’.

- ⇒ Once the desired preset and name are selected, press + and – buttons simultaneously to store all settings to the preset.

Active Buttons

There are six active buttons which are located to the right of the ten category buttons. They are used to turn on and off effects, test signals, color temperature, monochrome, go to black, and the chassis fan. When an active button is pressed alone, it activates or de-activates the named function. Upon activation, the button will illuminate red.

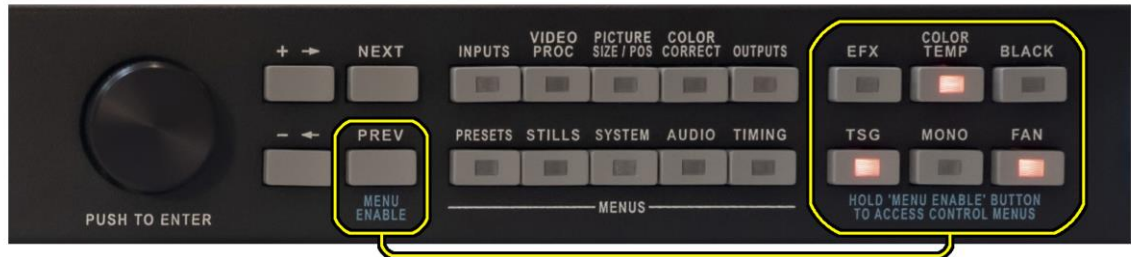


Figure 3-4. Hold Down Menu Enable Button to Access Active Button Control Menus.

Control menus are available to configure each of the active buttons. To access the control menus for an active button, press the MENU ENABLE (also labeled PREV) button down and continue holding it down when pressing the desired active button. A control menu should appear on the front panel display for the selected button. Release the MENU ENABLE button once the control menu appears. While the menu mode is active, the button will illuminate yellow, or flash between red and yellow if that function is also active.

Note, the active buttons will not activate (turn on or off) while the MENU ENABLE button is being held down.

Pressing NEXT or PREV (previous) will step through all the control menus available for that button.

(Active Buttons continued)

EFX (*Effects*):

Limited effects can be applied to the video signal using the EFX button, such as: Freeze, Fade to Black, Video Noise, and Synchronized Snow. The EFX button (when pressed alone) toggles the selected effect ON or OFF.

Pressing EFX while holding down the MENU ENABLE button will open the EFX control menus. Pressing NEXT or PREV (previous) will step through the EFX control menus.

Menu: *EFX Effect*

This menu selects the type of effect the EFX button will produce.

Options are: Freeze Frame, Random Noise, Small Blocks, Large Blocks, and fade to Black.

Menu: *EFX Mixer*

This menu controls the transparency of the selected effect by adjusting the mixture between the EFX source (noise, block, or black) and the video signal. 0% = no EFX source and 100% video, 100% = 100% EFX source and no video.

Range of adjustment is 0 – 100% (value ignored when *Freeze Frame* is the selected effect).

⇒ Use the +/- buttons to adjust in 10% increments.

⇒ Use the Knob to adjust in 1 % increments.

Menu: *EFX Transition Time*

This menu is used to set the time interval for the selected effect to transition from OFF to ON, or ON to OFF. The EFX indicator will flash during the transition.

Range of adjustment is 0 – 240 frames (value ignored when *Freeze Frame* is the selected effect).

⇒ Use the +/- buttons to adjust in 10 frame increments.

⇒ Use the Knob to adjust in 1 frame increments.

EFX Programming Examples:

Synchronized Snow: This will produce a full frame 100% noise signal (“snow”)
EFX Effect = Random Noise Generator
EFX Mixer = 100% (all noise + no video)
Transition Time = 0 (instant ON/OFF)

Fade to Black: This will produce a Fade to Black in 1 second.
EFX Effect = Fade to Black
EFX Mixer = 100% (all black + no video)
Transition Time = 30 (30 frames)

Video Noise: This will add noise (“snow”) to the video signal.
EFX Effect = Random Noise Generator
EFX Mixer = 10% (noise + video)
Transition Time = 100 (noise fades in and out)
Note: Mixer can be manually adjusted once EFX is ON
to vary the amount of noise in the picture.

Freeze Frame: This will freeze the video signal.
EFX Effect = Freeze Frame
EFX Mixer = <n/a> (value ignored)
Transition Time = <n/a> (value ignored)

(Active Buttons continued)

TSG (*Test Signal Generator*):

This button (when pressed alone) will enable or disable the video test signal generator.

Pressing TSG while holding down the MENU ENABLE button will open the TSG control menus.
Pressing NEXT or PREV (previous) will step through the TSG control menus.

Menu: *Video Test Signal*

This menu is used to select which video test signal is displayed.

⇒ Use the Knob or +/- buttons to select test signal. Push knob to enter selection.

List of Test Signals:

16:9 Sizing Chart	(circle, 16:9 square grid and over scan markings)
4:3 Sizing Chart	(circle, 4:3 square grid and over scan markings)
75% Color Bars	
100% Color Bars	
Bars Reversed	
Tartan Bars	
SMPTE Color Bars	
RP219	(HD formats)
NTC-7 Composite	(SD formats)
Alignment Chart	
Multipulse	(Luma and Chroma Multipulse)*
Multiburst	(Luma and Chroma Multiburst)*
Horz Sweep	(Luma and Chroma Horz Sweep)*
10 Step	(Luma and Chroma 10 Step)*
100% Ramp	(Luma and Chroma 100% Ramp)*
5% Shallow Ramp	
Digital Ramp	(Luma and Chroma Digital Ramp)*
75% Red Field	
75% Green Field	
75% Blue Field	
50% Gray Field	
75% Window	(75 IRE, 75% square)
12 field pulse	(Window signal once every 12 fields)
F1-Blue/F2-Yellow	(Alternating field signal, F1=Blue, F2=Yellow)
SMPTE Checkfield	
Digital Test	
(custom test signal #1)	(see Chapter 10 for details)
(custom test signal #2)	(see Chapter 10 for details)
(custom test signal #3)	(see Chapter 10 for details)
(custom test signal #4)	(see Chapter 10 for details)
(custom test signal #5)	(see Chapter 10 for details)
(custom test signal #6)	(see Chapter 10 for details)
(custom test signal #7)	(see Chapter 10 for details)
(custom test signal #8)	(see Chapter 10 for details)

* These signals contain active signals on both Luma and Chroma channels. Use the MONO button to disable the Chroma signal to produce a traditional Luma only test signal.

Menu: *Test Signal Levels*

This menu selects whether test signals can be modified by the Proc Amp controls (video level, setup, saturation, hue), or fixed at unity levels.

Options are: *Fixed at unity* or *Adjusted by Proc*.

⇒ Use the Knob or +/- buttons to select.

(Active Buttons continued)

COLOR TEMP (*Color Temperature*):

This button (when pressed alone) will enable or disable color temperature settings. When enabled, the status line of the display will indicate the color temperature, preset or USER. When disabled, the status line of the display will indicate 6500°, which is the default color temperature for a video monitor. *See chapter 6 for more information.*

Pressing COLOR TEMP while holding down the MENU ENABLE button will open the COLOR TEMP control menus. Pressing NEXT or PREV (previous) will step through the COLOR TEMP control menus.

Menu: *Color Temperature Adjust**

This menu is used to adjust the color temperature settings in Kelvins (default), or x and y axis of the color circle. COLOR TEMP button must be enabled for these settings to take effect. *See chapter 6 for more information.*

- ⇒ Rotate the Knob or use +/- buttons to adjust value.
- ⇒ Push Knob and hold for 2 seconds to access X and Y adjustments.
- ⇒ Push Knob momentarily to toggle between X and Y adjustments.

Menu: *Load Temperature Presets*

This menu is used to load user created presets for color temperatures. Loading a preset will overwrite all color temperature adjustments. COLOR TEMP button must be enabled for these settings to take effect.

Options are: PST1°, PST2°, PST3°, and PST4°. (PST1-4 are user created presets. *See below*)

- ⇒ Use the Knob or +/- buttons to select a preset value. Push knob to load preset.

Menu: *Store Temperature Settings*

This menu is used to store the current *Color Temp Adjust* settings to a color temperature preset. Each preset may be assigned a unique five character name.

- ⇒ Use the Knob to select a preset number (1, 2, 3 or 4).

Hint: To load the default name, push the knob while the cursor is positioned below the preset number.

- ⇒ To edit the name, press the + or – button to move the cursor and select a character. Use the Knob to change the character where the cursor is positioned.

Hint: pushing on the knob will jump the selected character to either 'A', 'a', '_ ', or '0'.

- ⇒ Once the desired preset and name are selected, press + and – buttons simultaneously to store the settings to the preset.

Color Temperature adjustments only add color to the white or lighter areas of the picture. No color is added to black.

* The predefined color temperatures are correct assuming the monitor has been properly calibrated for the television standard of 6500K color temperature. *See chapter 6 for more information.*

Tip: Achieve a black-and-white **Security-cam Effect** by using both the COLOR TEMP and MONO buttons. This maintains the proper color temperature, ensuring the filmed image is truly black and white.

(Active Buttons continued)

MONO (*Monochrome*):

This button (when pressed alone) will enable or disable monochrome mode. When enabled, all color information is removed from the video outputs leaving a black and white picture.

There are no menus available for this function.

BLACK (*Go to Black*):

This button (when pressed alone) will enable or disable Black mode. When enabled, the video outputs go to black level (0 IRE).

There are no menus available for this function.

FAN (*Chassis Fan Enable*):

This button (when pressed alone) will enable or disable the chassis fan.

Pressing FAN while holding down the MENU ENABLE button will open the FAN control menu.

Menu: *Fan Speed*

This menu is used to adjust the speed of the fan when enabled.

⇒ Use the Knob or +/- to adjust.

DashBoard™ Controls

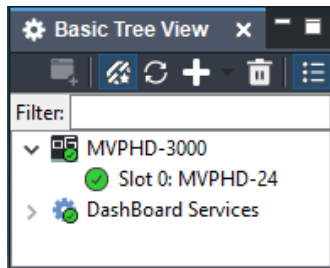
The MVPHD-24 can be controlled using the DashBoard™ Control System.

Add section about Dashboard software and how to download.

Note: The MVPHD-24 must be connected to the network before turning the power on, to enable a connection with Dashboard. The MVPHD-24 usually takes approximately 90 seconds after power is turned on, before communications with Dashboard begin.

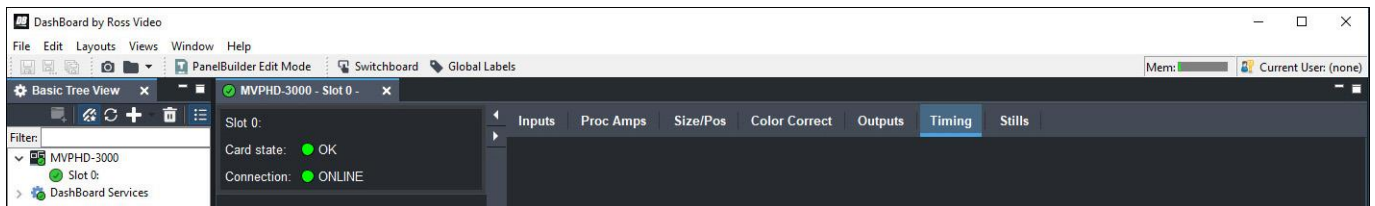
When connected to a network, DashBoard™ will identify the MVPHD-24 by its unique name “MVPHD” followed by the serial number. If the MVPHD-24 is not visible, click on the Dashboard’s refresh button to search for new devices.

Click on the “>” symbol next to the unique name. “Slot 0: MVPHD-24” will become visible.



Open the selected unit’s control panel by right-clicking on “Slot 0: MVPHD-24” and selecting “Open”.

Control Menus

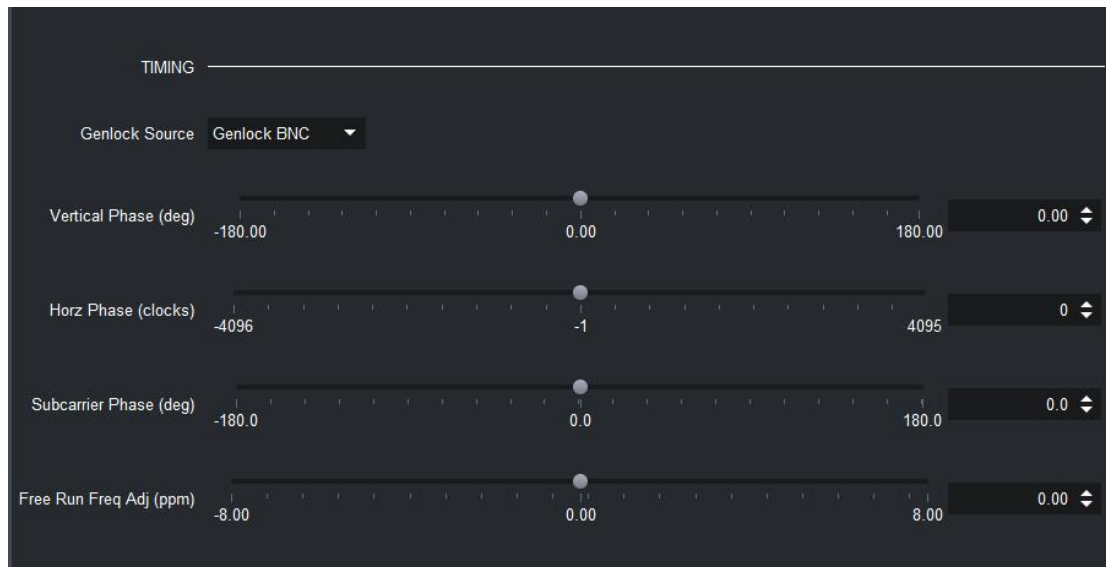


The Controls for the MVPHD-24 are divided into multiple menu tabs (similar to the front panel):

- Inputs
- Proc Amps
- Size/Position
- Color Correct
- Outputs
- Timing
- Stills

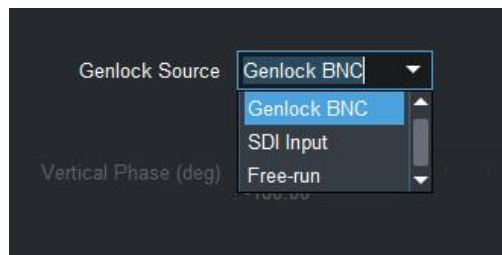
TIMING:

This menu tab is used to access output timing controls.



Genlock Source:

This control selects the source to be used for locking the output timing of the MVPHD-24.



Use the **Genlock Source** drop-down control to choose which signal will be used as the genlock reference (The Product menu tab indicates the genlock status for the selected reference).

[Genlock BNC] This selection locks the output timing to a reference signal connected to the rear panel's *GENLOCK LOOP* BNCs. The reference may be composite sync, black-burst, tri-level sync, TTL vertical drive, or a TTL frame square wave. The MVPHD-24 automatically detects the type of signal present.

The Genlock loop input provides a high impedance “loop through” connection for an external sync reference. The reference signal may be daisy chained through several MVPHD-24s, or other equipment requiring external sync. If the unit is the last piece of equipment in the chain, then the unused BNC will require a termination.

[SDI Input] This selection locks the output timing to a serial digital signal at the SDI input. This allows the MVPHD-24 to lock to a HD camera's SDI output signal. Note, the SDI input must be either a 270 MHz (SD), 1.485GHz (HD), or 2.97GHz (3G) serial digital signal.

[Free Run] This selection ignores all genlock input references, and free-runs the output timing of the MVPHD-24 (see *Free Run Freq Adjust* menu below).

If a signal is not present at the selected source, the MVPHD-24 automatically goes into free-run.

The following controls adjust the timing of the video frame synchronizer. Because of internal processing delays (approx. 3+ lines), a phase setting of zero clocks / zero lines will guarantee one frame of delay in the synchronizer.

Vertical Phase (deg):

This slider control is used to vary the vertical phase of all the output signals from the MVPHD-24 (including the sync reference outputs). When genlocked, this phase adjustment is with respect to the genlock source. This control indicates the vertical phase in degrees.
See chapter 5 for tips on using this feature.

Horiz Phase (clocks):

This slider control is used to vary the horizontal phase of all the output signals from the MVPHD-24 (including the sync reference outputs). When genlocked, this phase adjustment is with respect to the genlock source. This control indicates the horizontal phase in video pixel clocks.

Subcarrier Phase (deg):

This slider control is used to vary the subcarrier phase of the composite and Y/C outputs. When genlocked, this phase adjustment is with respect to the genlock source. This menu indicates the subcarrier phase in degrees.

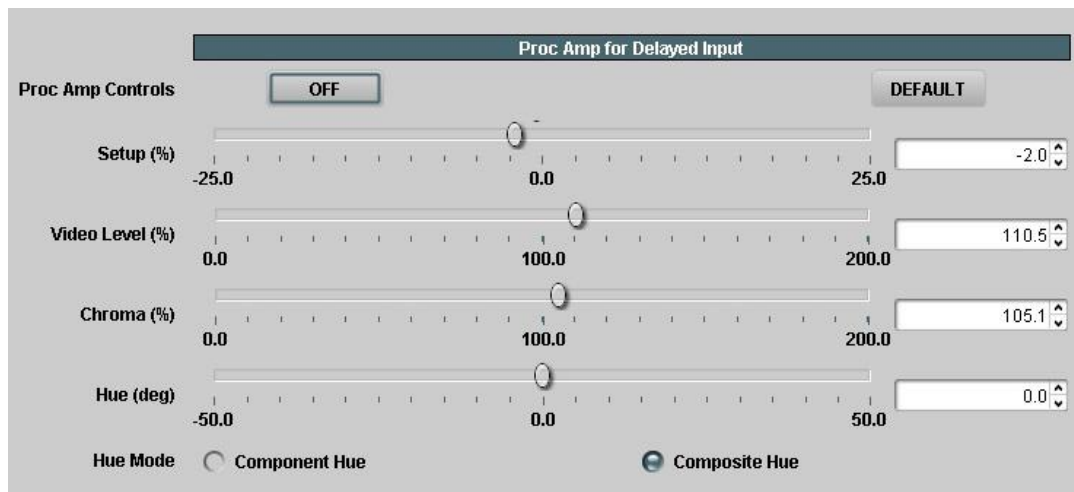
Free Run Freq Adj (ppm):

This slider control is used to vary the MVPHD-24's master clock frequency while in Free Run mode. This menu indicates the adjustment in parts-per-million (ppm). The range is +/- 8ppm which is equivalent to 0.0008%.

Proc Amp: (FUTURE RELEASE)

The *Proc Amps* menu tab contains controls for adjusting the selected video input.

Note: these controls apply to the video signal before images are captured for stills or freezing.



The **Proc Amp Controls** button is used to enable or disable all four Proc Amp controls.

When set to **ON**, the Proc Amp controls are active. When set to **OFF**, the Proc Amp controls are bypassed (unity gain) and any control settings are ignored.

Use the **Setup** control to adjust the video signal's brightness.

Use the **Video Level** control to adjust the video signal's contrast.

Use the **Chroma** control to adjust the video signal's color saturation.

Use the **Hue** control to adjust the video signal's color hue (or chroma phase).

Use the **Hue Mode** control to select which method is used to calculate hue.

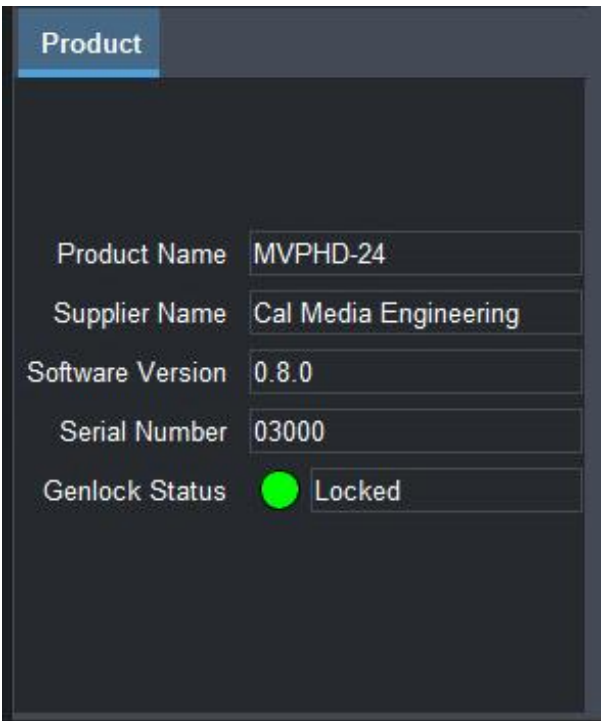
The **Component Hue** setting calculates the video hue based on equal scaling of the x,y color space. This method is typically used in component digital equipment.

The **Composite Hue** setting calculates the video hue based on the unequal scaling of NTSC/PAL color space. This method more closely resembles a traditional NTSC hue control.

Clicking on the **Default** button will set all four Proc Amp controls to their default values (unity gain).

Product Menu (Status)

The *Product* menu tab displays various information about the MVPHD-24.

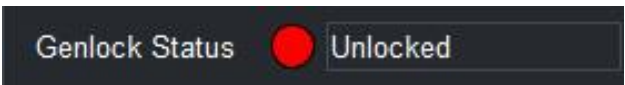


Hours of Operation indicates how long this particular MVPHD-24 card has been powered. This is only an approximate time. The value is updated every 3.75 minutes.
Note: Brand new units will have a typical value between 72 and 80 hours. This is due to standard 72 hour “burn-in” followed by final testing time.

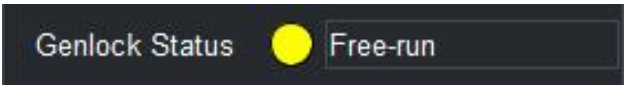
The **Status** indicator displays the operating condition of the MVPHD-24.
Green indicates the MVPHD-24 is operating correctly.
Yellow indicates an unusual condition such as “Loading Firmware”.
Red indicates that a failure has been detected.

The **Memory Card** indicator displays the type of memory card installed.
Green indicates the memory card is working correctly.
Gray indicates no memory card detected.

The **Genlock Status** indicator shows the current genlock condition for the MVPHD-24.
Green indicates the MVPHD-24 is successfully locked to the selected Genlock Reference.



Red indicates an unlocked condition.
Either the wrong reference is selected, the reference is incorrect, or no signal is preset.



Yellow indicates the MVPHD-24 is in Free-run mode.

Overview of 24 Fps Video Playback

Introduction

There are three factors that affect the camera's ability to film a television monitor; the frame rates of the camera and monitor, the phase of the camera's shutter and the monitor, and the shutter angle of the camera. What follows is a simplified description of these factors.

Frame Rates

The frame rate of a film camera is typically 24 Frames Per Second (FPS), while a television's frame rate is 30 FPS (for NTSC). When a 30 FPS television is filmed with a 24 FPS camera the result is a picture with light and dark horizontal bands that roll through the picture. This is caused by the shutter's exposure time not equaling the video's scanning time. Figure 4-1 below, demonstrates this phenomenon.

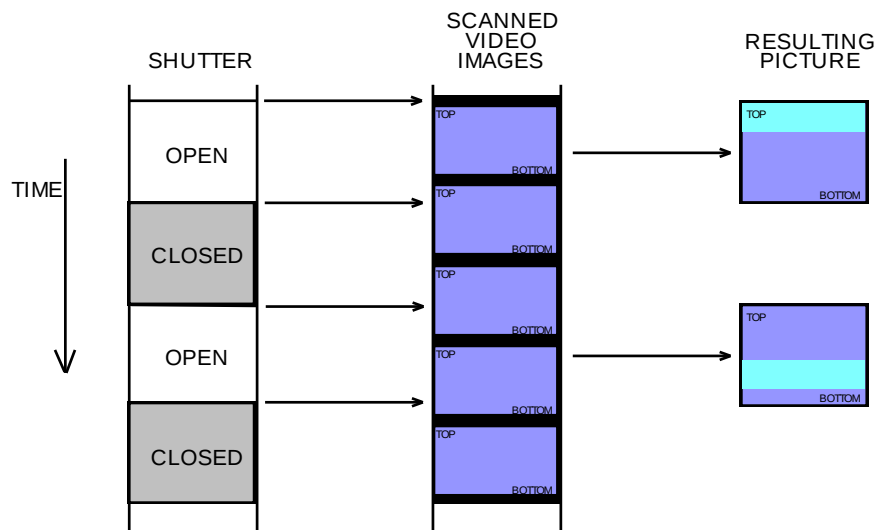


Figure 4-1. 24 FPS Camera filming 30 FPS video.

As can be seen from figure 4-1, when the camera's shutter opens, one and a fraction video images are exposed to the film. The overlapping portion of the video image becomes double exposed, thus producing a light band in the image. Since each succeeding shutter opening occurs at different places in the video, the band appears in different locations in the picture. The final result is a light band that appears to move or roll through the picture.

If the video's frame rate is made equal to the film camera's 24 FPS rate, then exactly one whole image can be exposed on to the film, thus eliminating the problem.

Shutter Phase

Once the video's frame rate is made equal to the camera's frame rate, then the phases of the camera's shutter and the monitor become important. It will be assumed that the camera's shutter is open 50% of the time and closed the other 50%. Because the time period of one shutter opening equals one video image, one complete picture will always be exposed onto the film with no light or dark bands. However, depending on the phase of the shutter with respect to the video, the exposed picture may actually contain portions of different video images. This becomes a problem when there is motion in the video image. Figure 4-2 demonstrates the effects of shutter phase and motion.

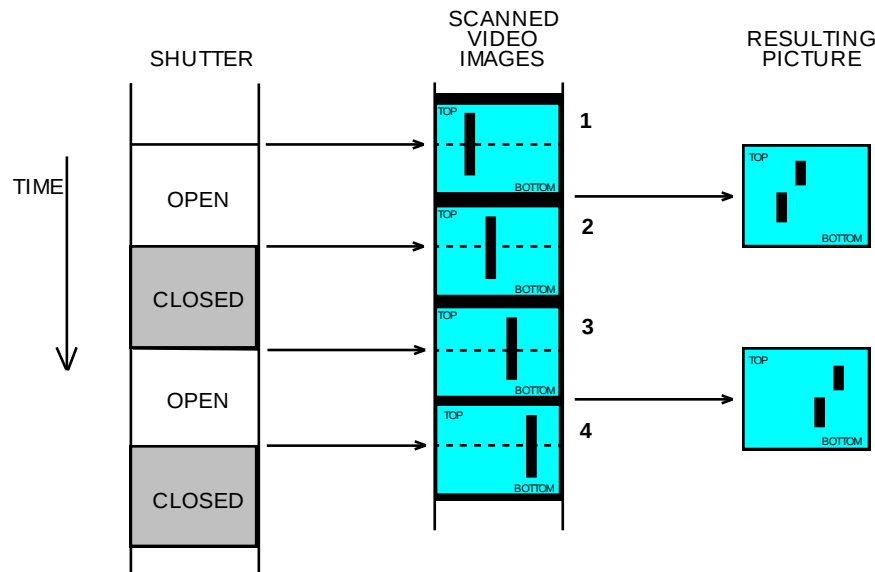


Figure 4-2. Effect of phase difference on motion.

In figure 4-2, the sequence of video images shows an object moving left to right. The time that the shutter opens is occurring in the middle of a video image. The film will be exposed with the bottom portion of image 1 and the top portion of image 2. This results in a picture where any objects in motion may be split in half.

The preceding example demonstrated a 90 degree phase difference between the shutter and the video image. If the phase of the camera's shutter or the phase of the video image can be adjusted to bring these two into alignment (or 0 degrees), then a whole picture without motion splitting will be produced.

Shutter Angles

The preceding discussion assumed that the camera's shutter was open 50% of the time and closed the other 50%. This 50/50 condition is referred to as a 180 degree shutter angle.

Referring back to figure 4-2, it was seen that with a 180 degree shutter angle, one whole picture was produced from two halves (even though there may be motion artifacts). This worked because the time of the shutter opening was exactly the time of one video image. If the shutter angle is now changed to 51% open and 49% closed (~184 degrees), then the open time is now greater than one video image. This will result in one and a fraction video images being exposed onto the film. If the shutter and the video image are not in alignment (as in figure 4-2), then a light horizontal band will be produced in the middle of the picture. Figure 4-3 demonstrates this effect.

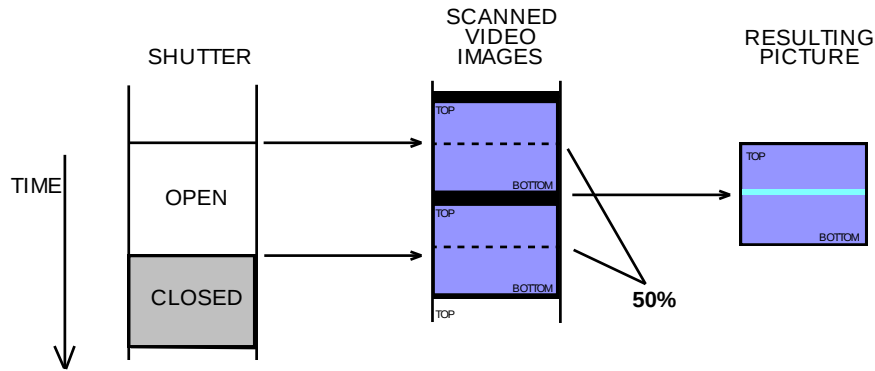


Figure 4-3. Example of shutter angle > 180 degrees.

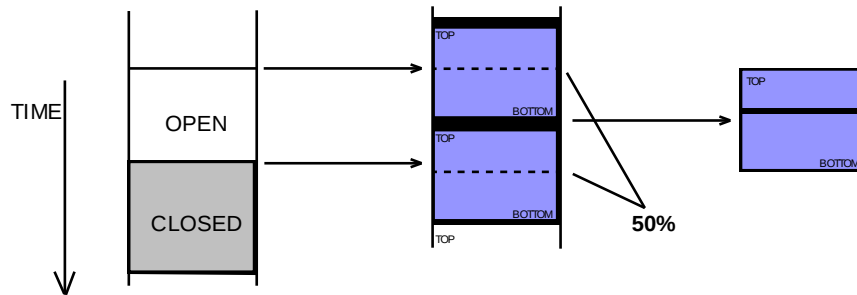


Figure 4-4. Example of shutter angle < 180 degrees.

In Figure 4-3, the shutter angle is greater than 180 degrees. As can be seen from this example, a small portion of the image is seen by the film twice, double exposing it and creating a light horizontal band in the picture. Conversely, figure 4-4 demonstrates the condition when the shutter angle is less than 180 degrees. In this case a small portion of the image is never seen by the film, thus leaving a black horizontal band in the picture. It should be apparent that the larger the shutter angle differs from 180 degrees, the larger this banding artifact is.

If the examples in figures 4-3 and 4-4 were aligned so that the shutter opening occurred at the top of the video image (shutter phase equals 0 degrees), then this banding artifact goes away. This is due to the video image's blanking interval.

In a television system, the image is scanned from the top left corner down to the bottom right corner. The television then requires time to move back to the top so it can begin another scan. During this time, the video signal is blanked, so that no light appears at the output of the television's picture tube. This time is referred to as the blanking interval.

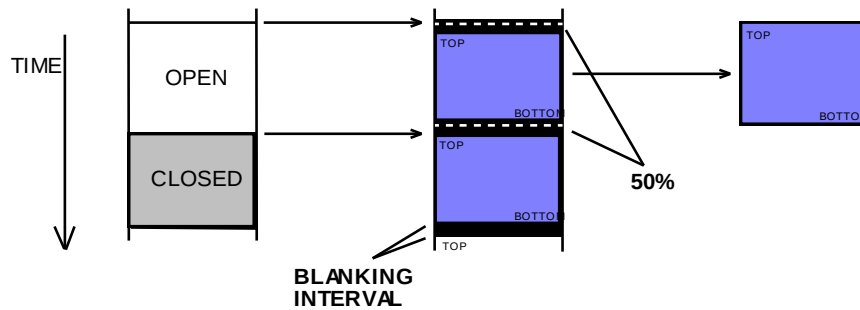


Figure 4-5. Example of shutter angle > 180 degrees, with 0 degrees of shutter phase.

Figure 4-5 demonstrates the condition when the shutter and the image are in alignment. Even though the shutter angle is greater than 180 degrees, the area of the image that would be double exposed is now blanked. The result is a perfect picture.

It should be noted that the blanking interval of a standard video image is approximately eight percent. This means that the shutter angle must not differ from 180 degrees by more than the 8 percent (14 degrees) or else a visible artifact will occur. The phase stability and frequency tolerance of the system also become more critical as the phase difference approaches the 8 percent.

Chapter 5

Tips and Suggestions

Introduction

The MVPHD-24 comes equipped with many features to help with the varying demands of video playback. This chapter offers suggestions on various configurations and the use of the MVPHD-24’s special features to simplify the task of video playback.

Monitors

The selection of the video monitor is very important, and unfortunately this choice is often made by set designers or directors with little thought to the logistics involved in making it work. The MVPHD-24 has several features that were designed for this situation.

Vertical Lock Requirement	There is one important requirement of the monitors used, <u>they must be able to vertically lock to a 24 FPS video signal</u> . Most older monitors which have a vertical hold control will most likely have a range large enough to lock up. However, newer televisions and monitors having a digital locking circuit with no controls might not be able to lock at 24 FPS. These monitors must be modified in order to be used.	
Video Format	The MVPHD-24 produces various output formats to feed to the monitor depending on what the monitor is capable of receiving.	
	Component (YPbPr or RGB)	- produces the best quality picture.
	Y/C (SVHS)	- produces a high quality picture.
	Composite	- the standard format for monitors.
Size & Centering Controls	The MVPHD-24 has controls which allow the video image to be resized to match the monitor being used. This could save time when presented with a monitor which is still calibrated for standard NTSC. A “Sizing Chart” test signal is provided for making these adjustments to ensure the correct aspect ratio of the image. <i>See Chapter 3 for more information.</i>	
Level (Proc Amp) Controls	Level controls allow the brightness, contrast, color saturation, and tint to be adjusted to compensate for the monitor. <i>See Chapter 3 for more information.</i>	
Sharpness	The Horz and Vert Sharpness feature can be used to improve the sharpness on low resolution monitors. <i>See Chapter 3 for more information.</i>	

Synchronization

For proper setup, the Camera(s) and the television monitor(s) must be synchronized. This is typically done by supplying a master reference to all the cameras and video equipment used.

MVPHD-24 as Master Reference

The MVPHD-24 has an internal sync generator which may be used for the master reference. The MVPHD-24 generates TTL Frame, TTL Vertical Drive, TTL composite sync, Tri-level sync, and Black Burst signals to synchronize other equipment.

Single Film Camera as Reference

For single film camera shots, it is possible to use the shutter signal from the film camera as the master reference. This eliminates the need and expense for a camera sync box. The MVPHD-24(s) will receive the camera's frame or V-drive signal and synchronize the video monitor(s) to it.

Note: If the shutter signal is created mechanically, color phase (tint) errors may occur in composite and Y/C outputs. For mechanical shutter signals, it is recommended to use component video as the output format.

Genlocking: No Need For Black Burst

Unlike most video converters which require a black burst video signal for genlock, the MVPHD-24 will lock to most anything. The MVPHD-24 only requires a vertical signal which can be in the form of a Frame square wave, Vertical Drive, Composite sync (no burst), Black burst, or high definition Tri-level sync. The MVPHD-24 will also generate all of the above regardless of the form of the input (*see Chapter 3: Reference Outputs*). This eliminates the need and expense for miscellaneous sync converter boxes.

Phasing the Camera's Shutter

It is important to vertically phase the camera with the television monitors to eliminate any artifacts. As described in Chapter 4 (*Overview of 24 FPS Playback*), even if the shutter angle is exactly 180 degrees there can still be motion splitting if the camera and monitor are not in alignment. Traditionally, the camera is phase aligned by looking at the television monitor with the view finder and adjusting the camera phase until the artifact is out of the picture. This can be difficult if the shutter angle is exactly 180 degrees because the artifact may not always be visible. The MVPHD-24 generates a special test signal to simplify this task (see below).

Phasing Using a Sync Box

For multiple camera shots, it's usually required that each camera have its own synchronizer box. This allows the shutter phase of each camera to be adjusted with respect to a reference. This reference can be a master sync generator, or the MVPHD-24. The camera sync box will have a phase control which will be used to vertically phase the camera.

Single Camera Phasing Using the MVPHD-24

For single camera shots, it is possible to lock the MVPHD-24(s) to the sync or shutter signal from the camera, and eliminate the camera sync box. In this configuration, the television monitor(s) will be phase adjusted instead of the camera. The procedure is similar, except the "Vertical Phase" control menu on the MVPHD-24 is used to make the adjustment (*see chapter 3: Vertical Phase*).

Note: The phase of the sync reference outputs will also be adjusted by the vertical phase control. If multiple MVPHD-24s are genlocked together, one unit can serve as the master reference. The slaved units will automatically stay in phase alignment with the master MVPHD-24.

Phasing Using F1-BLU/F2-YEL Test Signal

The MVPHD-24 generates a special test signal for the purpose of phasing the camera with the monitor (“F1-BLU/F2-YEL”). It is a field alternating signal that appears to the eye as a gray flashing image. The signal is actually blue in field one, and yellow in field two. Since the camera shutter sees only 50% of the picture (with a 180 degrees shutter), it will only see one of two fields. When phased correctly, the shutter will see either an all blue or an all yellow picture. If the shutter phase is not correct, there will be a split image that is part blue and part yellow.

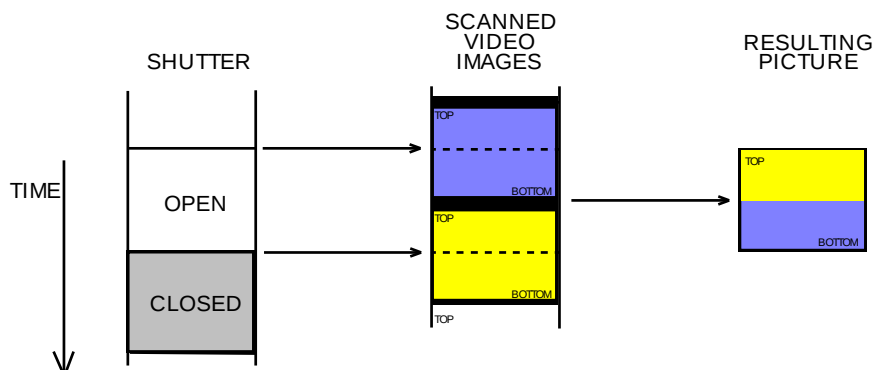


Figure 5-1. Vertical Phase difference of 90 degrees.

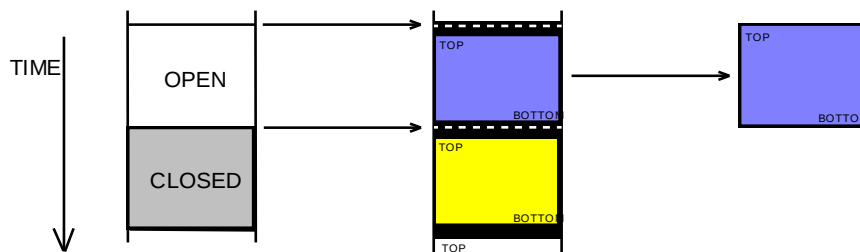


Figure 5-2. Vertical Phase difference of 0 degrees.

Wide Camera Shutter Angles (>> 180 degrees)

In order to film standard 24 Fps video, the camera shutter angle needs to be approximately 180 degrees. Often times however, larger shutter angles are desired or required by the director. Using the MVPHD-24, it is possible to increase the shutter angle and still avoid any artifacts in the picture.

As explained in Chapter 4 (*Overview of 24 FPS Playback*), the blanking interval of the video signal allows some variance of the shutter angle when the phase of the shutter is at 0 degrees. By increasing the blanking interval, larger shutter angles can be achieved.

Calculating the Range of Shutter Angles

Standard 24 Fps video has 300 active lines of picture information per field (1/2 frame) of video, and 655 lines in the complete frame. It can be seen that $300 / 655 = 0.458$ or 45.8%. 45.8% of 360 degrees is 164.9 degrees, which is the minimum shutter angle required to capture the entire image of field 1. It can also be seen that $(655-300) / 655 = 0.542$ or 54.2%. 54.2% of 360 degrees is 195.1 degrees, which is the maximum shutter angle before the second field image begins to be exposed.

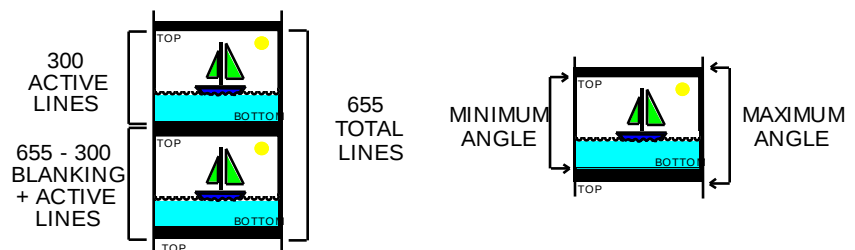


Figure 5-3. Calculation of shutter angles for normal blanking.

Increasing the Shutter Angle by Resizing the Image

One method to get larger shutter angles is to increase the blanking interval by reducing the vertical image size. The MVPHD-24 has Vertical Size and Center controls which can be used for this purpose. The minimum size that the image can be reduced is 50%, or 150 active lines per field (50% of 300 lines/frame). Calculating the maximum shutter angle yields: $(655 - 150) / 655 = .771$ or 77.1%. 77.1% of 360 degrees is 278 degrees.

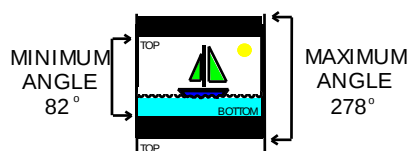


Figure 5-4. Maximum shutter angle by reducing vertical size.

Once the image has been sized to achieve the desired shutter angle, the picture will probably look compressed when viewed on the television monitor. Using the monitor's Vertical Size and Centering controls, adjust the monitor to correct the picture's aspect ratio back to normal (use the "Sizing Chart" test signal).

Note: when using this method, additional blanking should be added to compensate for phase and frequency tolerances.

Chapter 6

Color Temperature

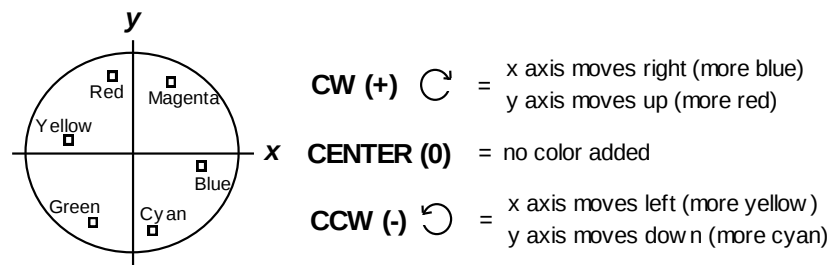
Introduction

Standard television monitors are calibrated to 6500 Kelvin (6500K), but when filmed, their color temperatures must align with the scene's ambient lighting. Since manually adjusting multiple monitors on a professional set is impractical and time-consuming, the common solution is to alter the video signal's colorimetry using external color correction devices. The MVPHD-24 offers a more practical solution, with dedicated controls and a unique process for quickly setting the output color temperature, which bypasses the need for individual monitor adjustments.

MVPHD-24's Color Temperature Process vs. Standard Color Correction

Standard color correctors operate in the RGB color space, where 100% white is produced by combining the maximum intensities of red, green, and blue. On a standard monitor, this balance yields a 6500K color temperature. Shifting this output to a warmer temperature, such as 3200K, requires adding a reddish-orange hue; however, because the red channel is already at its peak, additional red cannot be added. Instead, the green and blue signals must be reduced. Consequently, achieving 3200K via color correction results in an image that appears darker due to lower green levels and desaturated because of the substantial reduction in blue.

The MVPHD-24 uses the YUV color space (where Y represents luminance and U and V represent color) for its color temperature process. This color space offers a distinct advantage over RGB by supporting higher color saturation, which allows more red to be added to warm up the color temperature. Within the YUV color space, colors are represented by a color circle, and rectangular coordinates x (U) and y (V) indicate a specific color or hue (see the vectorscope image below). The MVPHD-24 adjusts the color temperature by adding specific, luminance-modulated x and y values — corresponding to a desired color (such as a reddish-orange hue for 3200K) — to the existing color signal. This process successfully maintains brightness and saturation while changing the output color temperature.



Color Temperature Adjustment in K (Kelvin) or x/y

Use the “Color Temperature Adjust” control* to set the color temperature using either Kelvin (K) or x/y coordinates. By default, the control is set to Kelvin and includes predefined x and y values for temperatures between 2500K and 6500K (in 100K increments) for rapid adjustments. To switch to manual x/y controls, press and hold the knob for more than two seconds.

* press **MENU ENABLE** + **COLOR TEMP** buttons to access control (see [COLOR TEMP \(Color Temperature\):](#)).

MVPHD-24: Kelvin Color Temperature values

Selecting a color temperature in Kelvin (K) triggers an internal Look-Up Table (LUT) to load predefined x and y chromaticity values, which are then reflected on the menu control in real-time.

The Kelvin color temperature LUT values (x and y) were determined experimentally by using a high end camera and a CRT display.

Equipment used:

- Panasonic Lumix DC-S5M2X: A critically acclaimed, top-tier hybrid camera with excellent color science. This camera serves as the reference, offering color temperature settings that range from 2500K to 10000K in 100K steps.
- SONY PVM-14L5: A professional multi-standard CRT monitor.
- Tektronix WFM8300: An advanced digital waveform monitor.
- Tektronix TG8000: A multi-standard test signal generator, which provides SMPTE Color Bars, 10-step Luma, and 50% Flatfield signals.

Setup:

The test signal generator's composite output was connected to the MVPHD-24's composite input.

The MVPHD-24 was configured for composite input to YPbPr 483i @ 29.970 6500K output.

The MVPHD-24's component outputs were connected to the CRT monitor's component inputs.

The camera was positioned 12 inches from the front of CRT monitor.

The camera's HDMI output was connected to the WFM8300 via a HDMI-to-SDI converter.

The WFM8300 was configured to display a RGB parade waveform, and a vectorscope display (gain x 10).

Camera Configuration:

The camera's color temperature was set to 6500K. Next, it was adjusted to produce a full-frame, 100% signal on the waveform monitor's green channel while displaying a 100% white field. Finally, the camera was slightly defocused to filter out individual CRT pixels, which ensured a clean waveform.

Monitor Calibration:

For monitor calibration, the RGB waveform and the vectorscope display (set to 10x gain) were used. Because equal red, green, and blue signals produce a central dot on the vectorscope, this was used as the reference point. The MVPHD-24's COLOR TEMP button was set to OFF (6500K), and a 10-step Luma test signal (10% to 100% gray) was applied. By adjusting the monitor's red and blue bias and screen controls, the gray-level dots were converged toward the center to achieve the smallest possible cluster ensuring a linear CRT response. Finally, the SMPTE Color Bars signal was used in the monitor's "Blue Only" mode to match the upper bars with their respective sub-bars, ensuring precise color-level calibration.

Color Temperature Measurements:

To prepare for taking measurements, the MVPHD-24's COLOR TEMP button was turned ON. Next, the "Color Temperature Adjust" menu control was accessed, and x/y mode was enabled with a two-second push of the knob. Both x and y values were set to zero, and the camera's color temperature was initially selected to be 6500K. Measurements began, and the x and y values were adjusted to center the dot on the vectorscope for each selected color temperature of the camera. These values were saved to the LUT for every increment from 6500K to 2500K.

Limitations on Composite Outputs

When composite outputs are used, the monitor's maximum input signal may be exceeded by the chroma portion if the video is at 100% white and the color temperature is set below 3800K. Although the maximum level for composite video is defined as 120%, additional chroma signal is added as the color temperature is lowered, which can result in an overall level greater than 120% (e.g., 145% at 2500K). Consequently, the signal may be clipped by some monitors, leading to potential image discoloration.

Chapter 7

VGA Input Processing

Introduction

The MVPHD-24 is a digital processing unit. In order to process analog signals, the MVPHD-24 must first convert the signal from analog to digital. This is achieved by a method called “digital sampling”. The analog signal is “sampled” every pixel time, and that sample is converted into a number representing the magnitude (brightness) of that pixel. The following sections describe the steps involved in accurately sampling the VGA input to produce the best possible picture.

VGA Input Signals

It is often said that the only standard for VGA signals is that there is no standard. Since there are no exact standards, manufacturers are free to use whatever timing works best for them. As a result, each VGA device manufacturer can produce different signal timings for the same resolution, causing large variations in picture position from one device to another.

In order to successfully sample a VGA image, the exact horizontal and vertical positions must be known. If the exact position cannot be determined, part of the image might not be sampled, resulting in a cropped picture. Because of the variations of input positions, the MVPHD-24 employs a “Capture Window” and an “AUTO” positioning algorithm to accurately sample the image.

VGA Capture Window

When a new signal is applied to the VGA input, the MVPHD-24 analyzes the horizontal and vertical frequencies of the signal to determine what its resolution is. Based on pre-programmed tables for each resolution, the MVPHD-24 is able to nominally sample the input signal. A capture window is then produced which is the nominal position settings +/- 5%.

Auto Positioning

If the MVPHD-24 is operating in “Auto” mode, it analyzes the sampled image to find the outside edges of the picture. If each of the four edges (left, right, top and bottom) land inside the capture window, the MVPHD-24 will “Auto” size and position the image to these four edges. Once the “Auto” mode has locked, it will remain with those settings until a new input is detected.

The “Auto” mode requires that the VGA’s picture does not have any black information on any edge (left, right, top and bottom). If there is black information on a picture edge (often caused by a screen saver, or video), the “Auto” mode may incorrectly position or resize the image. (Note: if all edges are not detected within the capture window, auto-positioning does not occur, and the previous settings are retained).

Horizontal and Vertical Position Controls

Two menus are provided to control the position of the sampled picture:
“VGA Input Vert Position” and “VGA Input Horz Position”

In “Auto” mode, these menus indicate the position values determined by the “Auto” positioning algorithm.

These menus can also be used to override the “Auto” mode and manually position the image. “Manual” mode is provided to allow the operator to adjust the position when the “Auto” mode has not positioned the image correctly based on the image content.

Pushing on the Knob will change the mode from “Auto” to “Manual” and vice-versa.

When switching to “Manual” mode the last “Auto” position values are maintained to allow the user a starting point for adjusting the position. Switching back to “Auto” from “Manual” will restart the “Auto” position algorithm.

Sampling Phase (Sharpness)

VGA cards often drive their outputs directly from a DAC (Digital to Analog Converter). This produces a signal with a “stair-step” component to it (see figure 7-1). This is different than traditional video processing which filters the DAC outputs to produce a smooth linear signal (see figure 7-2).

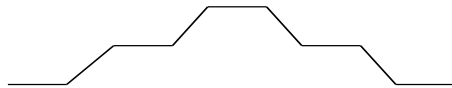


Figure 7-1
Example of VGA “stair-step” signal



Figure 7-2
Example of Video “linear” signal

Because of this “stair-step” signal the position of each sample (or “sample phase”) is very important in producing a clear sharp image (see figures 7-3 and 7-4). The sample phase is given in degrees, and represents the sample position within one pixel period (the time period between each pixel).

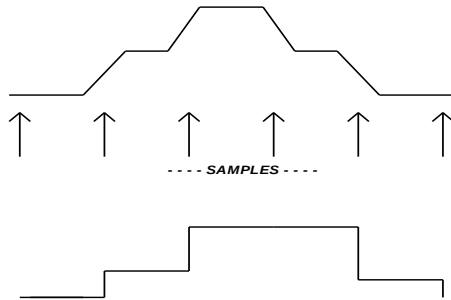


Figure 7-3
Example of incorrect sampling phase (distorted)

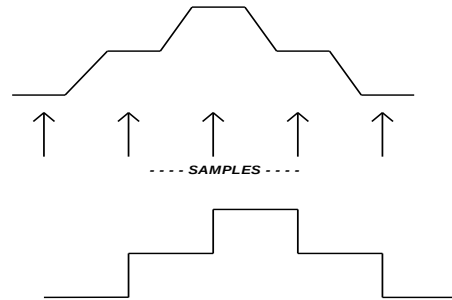


Figure 7-4
Example of centered sampling phase (sharp)

In order to achieve an accurate sample of the VGA image, sampling must be performed near the center of each step. If instead, the sample occurs near the steps’ transitions, incorrect samples will be taken resulting in a distorted or blurred picture.

Auto Sample Phase

If the MVPHD-24 is operating in “Auto” phase mode, it analyzes every pixel of the sampled image at every sample phase position, and determines the best sample phase. Once the “Auto” mode has locked, it will remain with that phase setting until a new input is detected.

Sample Phase Control

A menu is provided to control the sampling phase: **“VGA Input Sample Phase”**

In “Auto” mode, this menu indicates the phase value determined by the “Auto” phase algorithm.

This menu can also be used to override the “Auto” mode and manually adjust the sample phase. “Manual” mode is provided to allow the operator to adjust the phase when the “Auto” mode has incorrectly phased the image.

Pushing on the Knob will change the mode from “Auto” to “Manual” and vice-versa.

When switching to “Manual” mode the last “Auto” phase value is maintained to allow the user a starting point for adjusting the phase. Switching back to “Auto” from “Manual” will restart the “Auto” phase algorithm.

Universal Lock (FUTURE RELEASE)

The MVPHD-24 relies on pre-programmed tables to define nominal timing information for all common resolutions. These tables allow the system to recognize and lock to signals such as 1024x768 @ 60Hz.

Rarely a non-standard signal might be applied for which there is no table. In this case, the “Universal Lock” feature allows the MVPHD-24 to still display an image based on the input signal.

The Universal Lock feature must determine the following parameters to achieve lock:

Horz Resolution	It is first decided that the horizontal sampling will be 1920 pixels per line. This value is chosen because it is the maximum resolution of the MVPHD-24.
Horz Overscan	Since the signal is unknown, the horizontal position of the image cannot be determined. To compensate, the picture size is assumed to be 10% larger than actually expected. This should prevent any cropping of the sampled image.
Vert Resolution	By analyzing the sync signals of the unknown input, the total number of vertical lines can be determined. From that value the vertical resolution of the image is approximated, again using a 10% overscan approach to prevent cropping.
Pixel Clock	By combining the measured frame rate, total vertical lines, and the estimated horizontal samples, a pixel clock can then be calculated.

If all these parameters are successfully determined and the results are within the operating range of the hardware, then a stable picture should result.

Once the signal has locked, the user may need to manually adjust the **“VGA In Horz Position”** and **“VGA In Vert Position”** controls to center the image (see section 7.5).

Note: This method is an approximation and the final image will be scaled. Therefore the resulting picture may not be as sharp as the original signal.

Chapter 8

E-EDID files for VGA & HDMI Inputs

Introduction

The MVPHD-24 contains two remotely readable E-EDID (Enhanced Extended Display Identification Data) files for the VGA and HDMI Inputs. The data in these files identifies the characteristics, features and video timing modes supported by the MVPHD-24's VGA and HDMI inputs. The contents of these data files are accessed by a video source through the VGA and HDMI connections and are used to configure its graphics processing unit to generate correctly formatted video and to provide additional information for certain application programs.

The MVPHD-24's E-EDID file structure conforms to VESA's E-EDID specification version 1.3.

Note: The MVPHD-24 must be powered on before the E-EDID data files are accessible.

VGA E-EDID File

The VGA E-EDID file contains the following information:

Product Name: MVPHD-24

Display color: RGB

GTF Limits: V-Rate = 22-86 Hz, H-Rate = 15-111 KHz, Max Clock=170 MHz

Established Timings: 720x400@70Hz, 720x400@88Hz, 640x480@60Hz, 640x480@67Hz, 640x480@72Hz, 640x480@75Hz, 800x600@56Hz, 800x600@60Hz, 800x600@70Hz, 800x600@88Hz, 832x624@75Hz, 1024x768@60Hz, 1024x768@70Hz, 1024x768@75Hz, 1024x768@87Hz, 1152x870@75Hz, 1280x1024@75Hz

Standard Timings: 640x480@85Hz, 800x600@85Hz, 1024x768@85Hz, 1152x864@70Hz, 1280x960@60Hz, 1280x1024@75Hz, 1280x1024@85Hz, 1600x1200@60Hz

Detailed Timings: 1920x1080@60Hz (preferred default), 1280x720@60Hz

HDMI E-EDID File

The HDMI E-EDID file contains the following information:

Product Name: MVPHD-24

Display color: RGB

GTF Limits: V-Rate = 22-86 Hz, H-Rate = 15-111 KHz, Max Clock=170 MHz

Established Timings: 720x400@70Hz, 720x400@88Hz, 640x480@60Hz, 640x480@67Hz, 640x480@72Hz, 640x480@75Hz, 800x600@56Hz, 800x600@60Hz, 800x600@70Hz, 800x600@88Hz, 832x624@75Hz, 1024x768@60Hz, 1024x768@70Hz, 1024x768@75Hz, 1024x768@87Hz, 1152x870@75Hz, 1280x1024@75Hz

Standard Timings: 640x480@85Hz, 800x600@85Hz, 1024x768@85Hz, 1152x864@70Hz, 1280x960@60Hz, 1280x1024@75Hz, 1280x1024@85Hz, 1600x1200@60Hz

Detailed Timings: 1920x1080@60Hz (preferred default), 1280x720@60Hz, 1024x768@60Hz, 800x600@60Hz, 1280x960@60Hz, 1344x1008@60Hz

Video Timings:	640x480p - 59.94Hz/60.00Hz	4:3	VIC=1
	720x480p - 59.94Hz/60.00Hz	4:3	VIC=2
	720x480p - 59.94Hz/60.00Hz	16:9	VIC=3
	720x576p - 50.00Hz	4:3	VIC=17
	720x576p - 50.00Hz	16:9	VIC=18
	720(1440)x480i - 59.94Hz/60.00Hz	4:3	VIC=6
	720(1440)x480i - 59.94Hz/60.00Hz	16:9	VIC=7
	720(1440)x576i - 50.00Hz	4:3	VIC=21
	720(1440)x576i - 50.00Hz	16:9	VIC=22
	1280x720p - 23.98Hz/24.00Hz	16:9	VIC=60
	1280x720p - 25.00Hz	16:9	VIC=61
	1280x720p - 29.97Hz/30.00Hz	16:9	VIC=62
	1280x720p - 50.00Hz	16:9	VIC=19
	1280x720p - 59.94Hz/60.00Hz	16:9	VIC=4
	1920x1080i - 50.00Hz	16:9	VIC=20
	1920x1080i - 59.94Hz/60.00Hz	16:9	VIC=5
	1920x1080p - 23.98Hz/24.00Hz	16:9	VIC=32
	1920x1080p - 25.00Hz	16:9	VIC=33
	1920x1080p - 29.97Hz/30.00Hz	16:9	VIC=34
	1920x1080p - 50.00Hz	16:9	VIC=31
	1920x1080p - 59.94Hz/60.00Hz	16:9	VIC=16

Accessing All Screen Resolutions in Mac OS X

Mac users who connect their computer to the MVPHD-24 may find only a limited number of ‘Scaled’ resolutions available. Since the preferred default resolution of the MVPHD-24 is 1920x1080@60, Mac OS X tends to list only other 16x9 resolutions. Additional resolutions including those that are 4x3 are available when following the procedure described below.

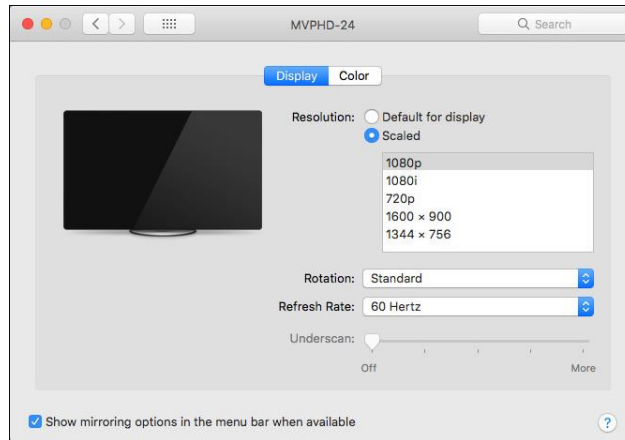


Figure 8-1. Default selection of “Scaled” resolutions shown on a Mac Mini.

This procedure works to reveal additional screen resolution choices when connected to a modern Mac computer:

- ⇒ Open System Preferences from the Apple menu in Mac OS X.
- ⇒ Click on “Display”.
- ⇒ Under the ‘Display’ dialog box, hold down the OPTION / ALT key while you click on the ‘Scaled’ button alongside ‘Resolution:’ to reveal all available screen resolution options for the display.
- ⇒ Choose the resolution desired from the complete list of available screen resolutions, then close out of System Preferences as usual.



Figure 8-2
Enabling additional resolutions.

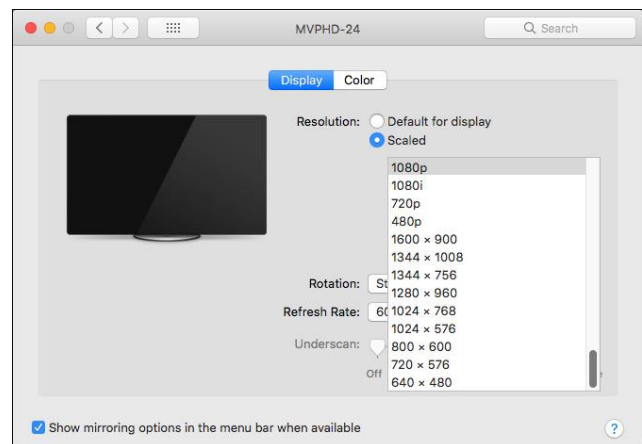


Figure 8-3
List of all possible resolutions.

The Option key must be held down when clicking on ‘Scaled’ to reveal all possible screen resolutions for the MVPHD-24 as shown in figures 8-2 and 8-3.

Chapter 9

Using Still Image Buffers

Introduction

The MVPHD-24 has four FLASH Still Image buffers available for use as input sources. The contents of these Still Image buffers are stored in non-volatile FLASH memory and retained even when power is removed from the unit.

Still Images

The Still Image buffers can hold full-frame full-color images up to 1080p resolution. These images can be captured from the output image of the MVPHD-24, or loaded from the SD/MMC Card.

Still Image Names

The Still Image name that appears in the Input Select menu for Buffers1-4, is either specified when capturing the output image of the MVPHD-24, or is based on the image's filename when loaded from the SD/MMC Card.

Capturing Still Images

The output image of the MVPHD-24 can be captured and saved to a Still Image Buffer. This allows the operator to use any input as the source material. The MVPHD-24 uses a high performance scaler when converting from the input's format, to the output's format. The operator should keep this in mind when capturing the output image. The resolution of the captured image will be determined by the MVPHD-24's Output Format setting. For best quality, it is recommended that the Output Format is either set to the same resolution as the input source, or that it is set to the maximum resolution of 1080p.

To access Still Image Buffer menus, press the STILLs button. This will open the Still Image Buffer control menus. Pressing NEXT or PREV (previous) will step through the control menus.

Menu: *Capture Output to Buffer # ?*:

This menu is used to capture an image from the MVPHD-24's output, and store it into the selected Still Image buffer. A suggested name for the image is provided, which can be edited.

- ⇒ Use the Knob (rotate) to select the desired Still Image Buffer (1 – 4).
- ⇒ Once selected, use the + or – buttons to move the cursor within the image name.
- ⇒ Use the Knob (rotate) to change the character where the cursor is located.
Hint: pushing on the knob will jump the selected character to either 'A', 'a', '_', or '0'.
- ⇒ Press both + and – together to capture the output image and save it to the selected Still Image buffer with the suggested or edited name.

Loading Still Images from SD Card

The Still Image Buffers can be loaded from the SD/MMC Card. Still image files must be located on the SD/MMC Card in a folder named “STILLS”. The MVPHD-24 uses a proprietary format for loading or storing images of various resolutions at 20bit 4:2:2 quality. This format uses the .HD2 filename extension. Only .HD2 files will be recognized by the MVPHD-24. These image files are produced by the MVPHD-24, or a software image converter provided by California Media Engineering.

To load images to the Still Image buffers, a SD/MMC Card must be installed on the front panel which contains the “STILLS” folder (located in the root directory).

To access Still Image Buffer menus, press the STILLS button. This will open the Still Image Buffer control menus. Pressing NEXT or PREV (previous) will step through the control menus.

Menu: Load Buffer #1 from SD Card:

This menu is used to load a still image into Buffer #1 from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any Still Image can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Blanking may be performed without a SD/MMC Memory Card present.

Menu: Load Buffer #2 from SD Card:

This menu is used to load a still image into Buffer #2 from the SD/MMC memory card (*see above for more details*).

Menu: Load Buffer #3 from SD Card:

This menu is used to load a still image into Buffer #3 from the SD/MMC memory card (*see above for more details*).

Menu: Load Buffer #4 from SD Card:

This menu is used to load a still image into Buffer #4 from the SD/MMC memory card (*see above for more details*).

Managing SD Card Images

The MVPHD-24 uses a proprietary format for loading or storing images of various resolutions at 20bit 4:2:2 quality. This format uses the .HD2 filename extension. Only .HD2 files will be recognized by the MVPHD-24. These image files are produced by the MVPHD-24, or a software image converter provided by California Media Engineering.

To support storage of still images, the SD/MMC cards must be formatted with a FAT16 or FAT32 file structure (most cards greater than 64MB come pre-formatted as either FAT16 or FAT32). The MVPHD-24 conforms to the FAT32 specification so firmware and still image files may be exchanged easily with most computers.

There is a maximum limit of 253 stills per SD/MMC Card.

Still images may be captured and saved to a SD/MMC Card for later use, or to transfer to other MVPHD-24s.

To access Still Image Buffer menus, press the STILLS button. This will open the Still Image Buffer control menus. Pressing NEXT or PREV (previous) will step through the control menus.

Menu: *Save Output Image to SD Card:*

This menu is used to capture an image from the MVPHD-24's output, and save it to the SD/MMC Card. A suggested name for the image is provided, which can be edited.

- ⇒ Use the + or – buttons to move the cursor within the image name.
- ⇒ Use the Knob (rotate) to change the character where the cursor is located.
Hint: pushing on the knob will jump the selected character to either 'A', 'a', '_', or '0'.
- ⇒ Press both + and – together to capture the output image and save it to the SD/MMC Card with the suggested or edited name.

The MVPHD-24 can delete unwanted still images from a SD/MMC Card. This feature can be used to free up space on the SD/MMC Card (limit of 253 stills), or to declutter the list of available stills.

To access Still Image Buffer menus, press the STILLS button. This will open the Still Image Buffer control menus. Pressing NEXT or PREV (previous) will step through the control menus.

Menu: *Delete Image from SD Card:*

This menu is used to remove an image from the SD/MMC Card.

- ⇒ Use the Knob (rotate) to select the image to be deleted.
- ⇒ Once selected, press both + and – together to delete the image.

Warning, this action permanently deletes the image from the SD/MMC Card.

Adding Custom Test Signals

Introduction

The MVPHD-24 has eight FLASH Image buffers available for use as customer created test signals. The contents of these TSG buffers are stored in non-volatile FLASH memory and retained even when power is removed from the unit. To load a custom TSG image, a Custom Key is required. Once a TSG buffer has been loaded, it will appear in the list of available test signals.

Custom Key

In order to access menus for loading custom TSG images, a Custom Key is required. Each purchaser of the MVPHD-24 is provided with a unique Custom Key which is assigned to the serial number or group of serial numbers registered to that customer. The Custom Key is a security feature that prevents field operators or rental customers from altering the custom test signals without having the correct key.

The Custom Key is a special file (“**Customize-xxxxxx.MVP**”) which must be located on the root directory of an SD/MMC card. When the SD/MMC card containing the Custom Key file is installed on the front panel of the MVPHD-24, additional menus will become available to load custom TSG images.

Custom TSG Images

The Custom TSG buffers can hold full-frame full-color images up to 1080p resolution. These images can be captured from the output image of the MVPHD-24, or loaded from the SD/MMC Card.

Custom TSG Signal Names

The Custom TSG signal name that appears in the list of test signals is either specified when capturing the output image of the MVPHD-24, or is based on the image’s filename when loaded from the SD/MMC Card.

Capturing Custom TSG Images

The output image of the MVPHD-24 can be captured and saved as a Custom test signal. This allows the operator to use any input as the source material. The MVPHD-24 uses a high performance scaler when converting from the input’s format, to the output’s format. The operator should keep this in mind when capturing the output image. The resolution of the stored test signal will be determined by the MVPHD-24’s Output Format setting. For best quality, it is recommended that the Output Format is either set to the same resolution as the input source, or that it is set to the maximum resolution of 1080p.

To capture images to the Custom TSG buffers, a SD/MMC Card must be installed on the front panel which contains the Custom Key (located in the root directory).

To access Custom TSG menus, press the TSG button while holding down the MENU ENABLE (also labeled PREV) button. This will open the TSG control menus. Pressing NEXT or PREV (previous) will step through the TSG control menus.

Menu: *Capture Output to CustomTSG ?:*

This menu is used to capture an image from the MVPHD-24's output, and store it into the selected Custom TSG buffer. A suggested name for the test signal is provided, which can be edited.

- ⇒ Use the Knob (rotate) to select the desired Custom TSG buffer (1 – 8).
- ⇒ Once selected, use the + or – buttons to move the cursor within the test signal name.
- ⇒ Use the Knob (rotate) to change the character where the cursor is located.
Hint: pushing on the knob will jump the selected character to either 'A', 'a', '_', or '0'.
- ⇒ Press both + and – together to capture the output image and save it to the selected Custom TSG buffer with the suggested or edited name.

Loading Custom TSG Images from SD Card

Loading images from the SD/MMC card works the same as with loading the Still Image Buffers.

The image files must be located on the SD/MMC Card in a folder named “STILLS”. The MVPHD-24 uses a proprietary format for loading or storing images of various resolutions at 20bit 4:2:2 quality. This format uses the .HD2 filename extension. Only .HD2 files will be recognized by the MVPHD-24. These image files are produced by the MVPHD-24, or a software image converter provided by California Media Engineering.

To load images to the Custom TSG buffers, a SD/MMC Card must be installed on the front panel which contains both the Custom Key and the “STILLS” folder (both located in the root directory).

To access Custom TSG menus, press the TSG button while holding down the MENU ENABLE (also labeled PREV) button. This will open the TSG control menus. Pressing NEXT or PREV (previous) will step through the TSG control menus.

Menu: *Load CustomTSG1 from SD Card:*

This menu is used to load a still image into the CustomTSG1 buffer from the SD/MMC memory card. The image currently contained in the buffer is displayed in bold.

- ⇒ Use the Knob (rotate) or +/- buttons to select desired still image.
- ⇒ Once selected, push on the knob to load the still image.

Note: any Custom TSG can be effectively erased from a buffer by loading a “<blank>” image to that buffer. “<blank>” may be selected by rotating the knob counter-clockwise until it appears. Custom TSGs that are “blanked”, will not appear in the list of available test signals under the *Video Test Signal* menu.

Menu: *Load CustomTSG2 from SD Card:*

This menu is used to load a still image into the CustomTSG2 buffer from the SD/MMC memory card (*see above for more details*).

Menu: *Load CustomTSG3 from SD Card:*

This menu is used to load a still image into the CustomTSG3 buffer from the SD/MMC memory card (*see above for more details*).

Menu: *Load CustomTSG4 from SD Card:*

This menu is used to load a still image into the CustomTSG4 buffer from the SD/MMC memory card (*see above for more details*).

Menu: Load CustomTSG5 from SD Card:

This menu is used to load a still image into the CustomTSG5 buffer from the SD/MMC memory card (*see above for more details*).

Menu: Load CustomTSG6 from SD Card:

This menu is used to load a still image into the CustomTSG6 buffer from the SD/MMC memory card (*see above for more details*).

Menu: Load CustomTSG7 from SD Card:

This menu is used to load a still image into the CustomTSG7 buffer from the SD/MMC memory card (*see above for more details*).

Menu: Load CustomTSG8 from SD Card:

This menu is used to load a still image into the CustomTSG8 buffer from the SD/MMC memory card (*see above for more details*).

Batch Loading of Multiple Custom TSG Images

The MVPHD-24 can quickly load multiple Custom TSG Image files in a batch process. This feature is useful when adding the same custom test signals to multiple MVPHD-24s. This method will require a computer or some means of editing the filename extensions for the Custom TSG Image files.

The MVPHD-24 uses a proprietary format for loading or storing images of various resolutions at 20bit 4:2:2 quality. These image files are produced by the MVPHD-24, or a software image converter provided by California Media Engineering. This proprietary format normally uses the .HD2 filename extension and is stored in the “STILLS” folder located on the SD/MMC Card.

The Batch Load feature requires the desired stills to be renamed and stored in a folder named “CUSTOM”. The filename extension must be changed from .HD2 to .TSn where n represents the Custom TSG number 1 – 8.

For example, an image file with the name “My test signal.HD2” is renamed to “My test signal.TS1” and stored in the “CUSTOM” folder on the SD/MMC Card. This Image file will be batch loaded into the Custom TSG1 buffer.

To begin the batch process, first turn the MVPHD’s power switch off. A SD/MMC Card must be installed on the front panel which contains both the Custom Key and the “CUSTOM” folder (both located in the root directory). Press the TSG button while turning the power switch on, and continue pressing the TSG button until the message “Loading *.TSn...” appears on the front panel display. The MVPHD-24 will then proceed to load all the image files in the CUSTOM folder, before the unit completes booting.

Customizing Sizing Chart Test Signals

The two test signals named “16:9 Sizing Chart” and “4:3 Sizing Chart” can be updated with a customized version provided by California Media Engineering. (Note: Only files provided by California Media Engineering should be used to update these test signals. The signal names shown in the list of test signals are always “16:9 Sizing Chart” and “4:3 Sizing Chart” and will not change regardless of the image actually loaded.)

The provided custom files will be named “xx 16x9SizeChart.TSA” and “xx 4x3 SizeChart.TSB” and should be placed in a folder named “CUSTOM” on the SD/MMC Card (located in the root directory).

Updating the Sizing Charts uses the Batch Load process. To begin the update process, first turn the MVPHD's power switch off. A SD/MMC Card must be installed on the front panel which contains both the Custom Key and the "CUSTOM" folder (both located in the root directory). Press the TSG button while turning the power switch on, and continue pressing the TSG button until the message "Loading *.TSn..." appears on the front panel display. The MVPHD-24 will then proceed to load all the image files in the CUSTOM folder, before the unit completes booting.

To restore the Sizing Charts back to default, remove (or rename) the CUSTOM folder from the SD card. Place the most recent update folder "MVP-###.cme" on the root directory of the SD/MMC Card. Turn the MVPHD's power switch off. The SD/MMC Card must be installed on the front panel which contains both the Custom Key and the "MVP-###.cme" folder (both located in the root directory). Press the TSG button while turning the power switch on, and continue pressing the TSG button until the message "Loading *.TSA..." appears on the front panel display. The MVPHD-24 will then proceed to load the default Sizing Charts, before the unit completes booting.

Chapter 11

Updating the Firmware

The MVPHD-24 can be quickly and easily updated using a MMC or SD memory card, or remotely through Dashboard.

Obtaining New Firmware

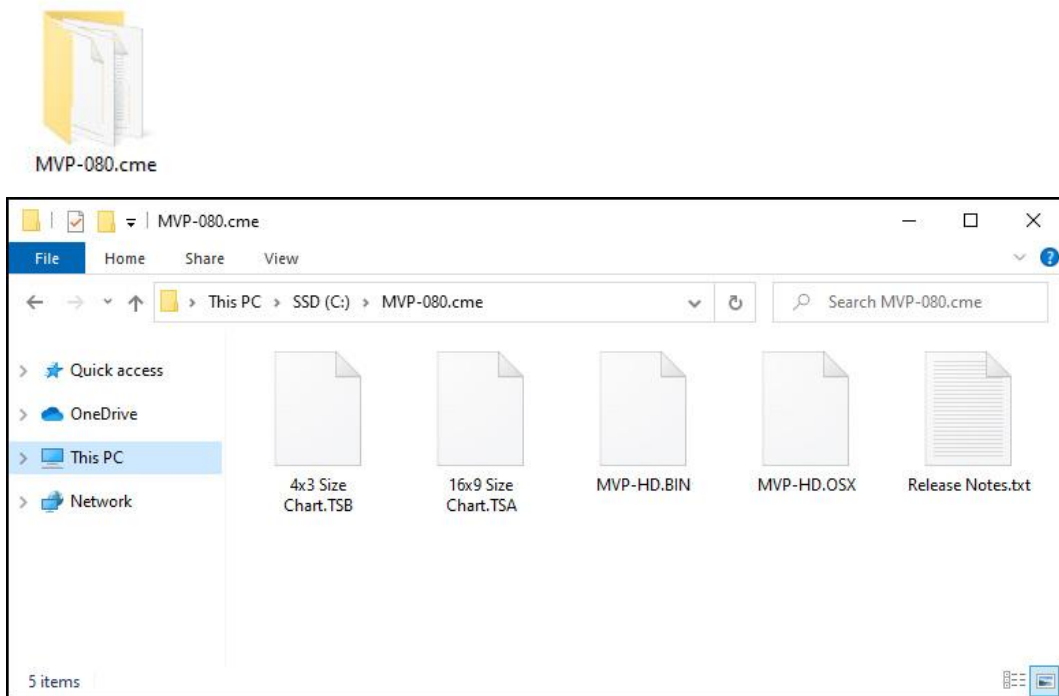
The current version of firmware can be obtained from California Media Engineering (www.calmedia.com).

Preparing Firmware Files

The firmware will be provided as a .zip file. Before it can be used, the file must be unzipped.

Be certain that no errors occur during the unzip process.

Once unzipped, the firmware update should be a folder with a “.cme” extension, containing several files.



To update the MVPHD-24 using a MMC or SD memory card, copy the entire folder to the memory card's root directory.

Note: The MVPHD-24 can only have one folder with a “.cme” extension. If the memory card already has a “.cme” folder from an earlier update, then the earlier folder must be moved from the root directory or renamed or deleted. Do not combine files from other versions into the same “.cme” folder, otherwise the MVPHD-24 may install the wrong firmware (.osx) file.

To update the MVPHD-24 using Dashboard™, copy or move the folder to a location accessible from Dashboard™.

Installing Firmware using a SD or MMC Memory Card

1. Install the memory card containing the update folder on the front panel of the MVPHD-24 (see section *Installation and Setup* for details).
2. Press the "SYSTEM" button to bring up system menus.
3. Using the NEXT or PREV buttons, locate the "Update Firmware" menu.
4. Press the + and – buttons together to begin the update.

The front panel display will show the progress of the update.

The update should complete in approximately 60 seconds.

Once the update has finished, the MVPHD-24 will automatically re-boot.

Note: Some updates may require additional time to process new firmware files. After the automatic re-boot, secondary files may begin updating. Check the front panel display for update status. Once the Additional files have updated, the MVPHD-24 will again automatically re-boot.

5. Verify that the new version number is displayed on the front panel display's home screen.

WARNING! Do not remove the memory card or cycle power once the firmware begins copying until the firmware is completely loaded and the MVPHD-24 has rebooted.

If the firmware installation process is interrupted, then the update must be performed again.

Retrying Firmware Installation

1. Turn power off.
2. Install the memory card containing the update folder on the front panel of the MVPHD-24.
3. Turn on power. The MVPHD-24 may automatically resume updating.
4. If the MVPHD-24 boots to the home screen without updating, then repeat the firmware installation described above.

Internal Firmware Installation

If the first attempt has failed or was interrupted, the MVPHD-24 may not function correctly or even boot. To install the firmware under these conditions, an internal firmware installation may be required.

1. Turn power off.
2. Remove the top cover of the chassis.
3. Copy the firmware ".cme" folder to a micro SD card.
4. Install the micro SD card on the main board inside the unit.
5. Press and hold down the "FLASH" button on the main board inside the unit, and turn the power on.
6. Keep holding the "FLASH" button down until the internal LED begins to rapidly flash. (The firmware update should now begin from the micro SD card).
7. Once the update has completed, remove the micro SD card, and replace the top cover of the chassis.

Firmware Installation if Boot File has failed

In the unlikely event that the MVPHD-24 will not boot, and will not accept a firmware installation, a jumper may be installed which will force the card to use the factory default boot file.

1. Turn power off.
2. Remove the top cover of the chassis.
3. Unplug the ribbon cable from J100.
4. Install a jumper on J100 (pins 1-2) as shown (right).
5. Perform the internal firmware installation as described above.
6. Once the MVPHD-24 has booted, turn power off, remove the jumper, reinstall the ribbon cable, and remove the micro SD card.
7. Turn the power on. The MVPHD-24 should automatically generate a new boot file. This should take approximately 15 seconds as the internal LED will rapidly flash red, then green.
8. Upon completion, the MVPHD-24 should successfully reboot.

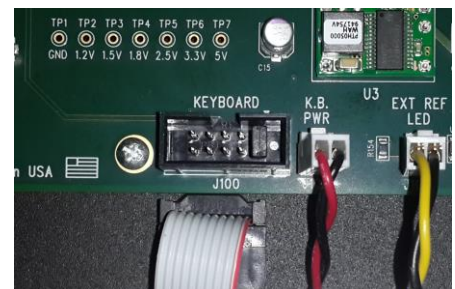
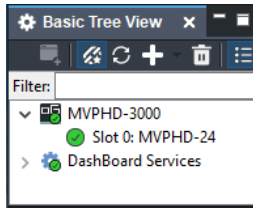


Figure 11-2 Boot-Loader jumper location

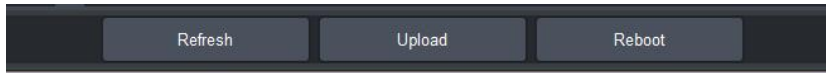
Installing Firmware using Dashboard™ (FUTURE RELEASE)

Note: This process typically takes about 2 minutes.

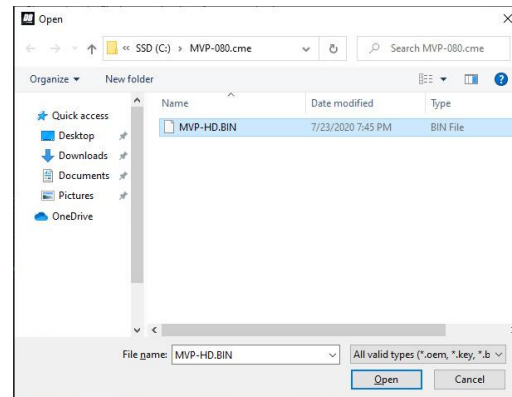
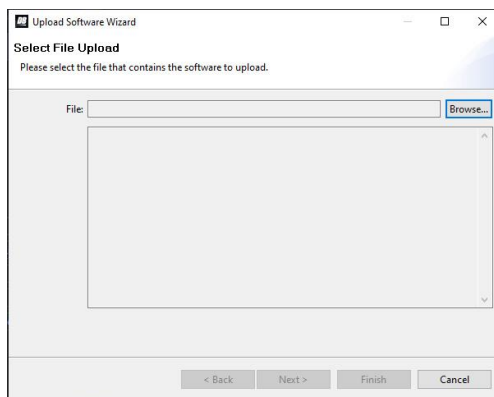
1. Launch the Dashboard™ application and open the MVPHD-24 device listed in the Basic Tree View.



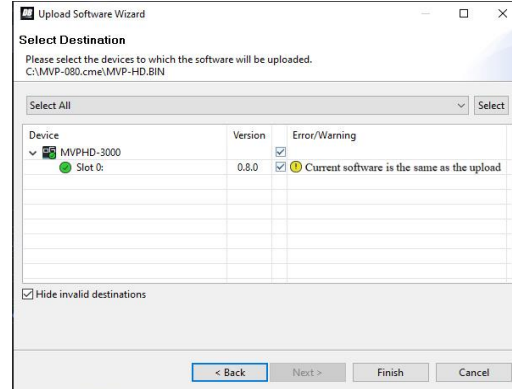
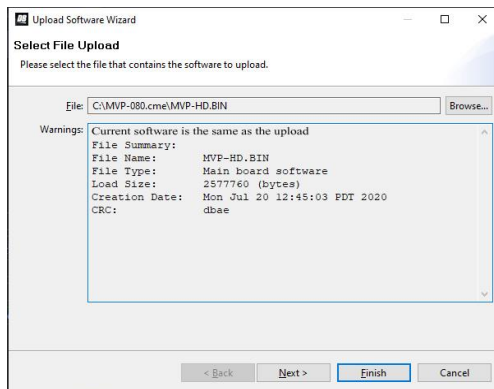
2. Click on the **Upload** button at the bottom of the Dashboard™ control screen.



3. The *Upload Software Wizard* will open. Click **Browse** and navigate to the location of the firmware file folder. Select the “.bin” file and click **Open**.



4. The *Upload Software Wizard* will now display the selected firmware file and its description. Click **Next**. The MVPHD-24 should be selected to receive this file.



5. Click **Finish** to begin installing the new firmware. When the installation is complete Click **OK**. The Upload Wizard will close and the MVPHD-24 will automatically reboot with the new firmware. Verify that the new version numbers are displayed on the Dashboard™ control **Product** menu.

Note: Some updates may require additional time for the initial reboot cycle (approx. 15 seconds).

WARNING! Do not cancel the upload or cycle power once the firmware begins copying until the firmware is completely loaded and the MVPHD-24 has rebooted.

If the firmware installation process is interrupted then the MVPHD-24 may not be able to reboot. If Dashboard™ then fails to open the MVPHD-24, the firmware must be reinstalled using a memory card (see *Install Firmware using a SD or MMC Memory Card - Retrying Firmware installation*).

Troubleshooting Firmware Installation

Troubleshooting Memory Card Firmware Installation

If nothing happens when the + and – buttons are pressed together, check the following:

1. The MMC or SD memory card is not fully installed.
2. Possible bad memory card. Check if the memory card is correctly identified on the front panel display. Try a different memory card.
3. Incorrect Firmware. Check that the Firmware files are meant for the MVPHD-24.
4. Incorrect Firmware files or folder. See **Preparing Firmware Files** section above.
Only one folder with a “.cme” extension can be located in the root directory of the memory card.
Only one file with a “.osx” extension can be located within the “.cme” folder.

If the update fails to verify, then the firmware file (“.osx”) may be incorrect or damaged. Check the files. Try again with a different memory card.

If the MVPHD-24 has not re-booted after several minutes, then the firmware update has probably failed. Try again with a different memory card.

Note: It is safe to remove the memory card and/or power cycle the MVPHD-24 ONLY if the update is NOT “Loading” the file.

If the MVPHD-24 still does not properly operate after trying all suggestions, contact customer support at support@calmedia.com.

Troubleshooting Dashboard™ Firmware Installation

Use the following information if the firmware upload process has failed:

- If the error message “**Selected file does not exist**” or “**Selected file is not a valid upload file**” are displayed in the **Upload Failed** dialog box, select **OK** from the dialog box and re-start the upload process and select the correct file.
- If a “**No response from device**” condition is encountered, the upload failed while in progress due to loss of power or communications. Verify that the MVPHD-24 is powered up and there is communication with the openGear™ frame. Restart the upload process.

In the unlikely event the MVPHD-24 becomes unresponsive, try the following:

1. Power off the MVPHD-24 and wait a few seconds.
2. Power on the MVPHD-24.
3. Wait approximately 90 seconds for the Network driver to load.
4. If Dashboard™ is able to open the control panel for the MVPHD-24, repeat the installation process using Dashboard™.
5. If Dashboard™ is not able to open the control panel for the MVPHD-24, perform the installation using a SD or MMC memory card (*see previous section*).
6. If the MVPHD-24 still does not properly operate after trying all suggestions, contact customer support at support@calmedia.com.

Appendix A

Specifications

ANALOG INPUTS:

	Composite	1.0 Vpp (including sync)	CBVS / R / Pr	BNC, 75Ω
	Y/C	(Y) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(C) 700 mVpp	C / B / Pb	BNC, 75Ω
or	RGB	(Red) 700 mVpp	CBVS / R / Pr	BNC, 75Ω
		(Green) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(Blue) 700 mVpp	C / B / Pb	BNC, 75Ω
or	YPbPr	(Pr) 700 mVpp	CBVS / R / Pr	BNC, 75Ω
		(Y) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(Pb) 700 mVpp	C / B / Pb	BNC, 75Ω
	VGA	RGB = 700 mVpp, TTL Horz and Vert Sync Pixel clock up to 170MHz VESA EDID version 1.3 - Plug and Play	VGA	HD-15 Male, 75Ω
	GENLOCK (External Ref)	1.0 Vpp video (286 mVpp composite sync), or +/- 2.3 Vpp min, 5.5 Vpp max Frame or Vertical Drive	GENLOCK	2 BNCs ,Hi-Z loop

DIGITAL INPUTS:

SDI	800 mVpp, SD/HD/3G (270MHz / 1.485GHz / 2.97GHz) SD - Auto EQ to 400 meters (Belden 1694A) HD - Auto EQ to 200 meters (Belden 1694A) 3G - Auto EQ to 120 meters (Belden 1694A)	SDI	BNC, 75Ω
Loop Out	800 mVpp, SD/HD/3G (270MHz / 1.485GHz / 2.97GHz) Re-clocked loop-through output	SDI	BNC, 75Ω
HDMI	HDMI v1.4, EDID v1.3	HDMI	HDMI Type A

Specifications subject to change without notice.

ANALOG OUTPUTS:

	Composite	1.0 Vpp (including sync)	CBVS / R / Pr	BNC, 75Ω
	Y/C	(Y) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(C) 700 mVpp	C / B / Pb	BNC, 75Ω
or	RGB	(Red) 700 mVpp	CBVS / R / Pr	BNC, 75Ω
		(Green) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(Blue) 700 mVpp	C / B / Pb	BNC, 75Ω
or	YPbPr	(Pr) 700 mVpp	CBVS / R / Pr	BNC, 75Ω
		(Y) 1.0 Vpp (including sync)	Y / G / Y	BNC, 75Ω
		(Pb) 700 mVpp	C / B / Pb	BNC, 75Ω
	VGA	RGB = 700 mVpp, TTL Horz and Vert Sync	VGA	2 x HD-15 Male, 75Ω
	Composite	1.0 Vpp (including sync)	CBVS/REF1	BNC, 75Ω
	Sync Ref	2.5V TTL SYNC	CBVS/REF1	BNC, Hi-Z
	Composite	1.0 Vpp (including sync)	CBVS/REF2	BNC, 75Ω
	Sync Ref	2.5V TTL SYNC	CBVS/REF2	BNC, Hi-Z

COMPOSITE OUTPUT FORMATS: (interlaced 2:1 with user controlled active lines of video)

NTSC / NT443 / PAL-M

23.976 FPS	15.752KHz @ 657 lines
24.000 FPS	15.720KHz @ 655 lines
25.000 FPS	15.625KHz @ 625 lines
29.970 FPS	15.734KHz @ 525 lines
30.000 FPS	15.750KHz @ 525 lines

PAL / SECAM / PAL-N

23.976 FPS	15.608KHz @ 651 lines
24.000 FPS	15.624KHz @ 651 lines
25.000 FPS	15.625KHz @ 625 lines
29.970 FPS	15.734KHz @ 525 lines
30.000 FPS	15.750KHz @ 525 lines

DIGITAL OUTPUTS:

SDI Out	800 mVpp, SD/HD/3G (270MHz / 1.485GHz / 2.97GHz)	SDI	2 x BNC, 75Ω
HDMI	HDMI v1.4	HDMI	HDMI Type A

CONTROL:

GPIO	General purpose I/O Activates on closure to ground	GPIO	DB-15, internal pullup
Remote	Dashboard control software via Network connection	Ethernet	RJ-45

MEMORY CARD:

Type	MMC, SD, SDHC
Format	FAT16 or FAT32 required for STILL storage (cards > 64MB are typically FAT16 or FAT32)
Still Capacity	253 stills maximum

Specifications subject to change without notice.

VIDEO PERFORMANCE

Composite, Y/C Inputs:

Bandwidth	5.0 MHz
Signal Filter	Digital Adaptive 3D-COMB filter
Signal to Noise Ratio	>58 dB (weighted, 10KHz to 5 MHz)
Differential Phase	<2 deg
Differential Gain	<2%
K-Factor (2T Pulse)	<2%
4 x over-sampling	10 bit ADC 4:2:2, 54 MHz

Component YRB/RGB Inputs:

Bandwidth	5.5 MHz
Signal to Noise Ratio	>61 dB
Differential Phase	<1 deg
Differential Gain	<1%
K-Factor (2T Pulse)	<1%
SD - 4 x over-sampling	10 bit ADC 4:2:2, 54 MHz
HD - 2 x over-sampling	10 bit ADC 4:2:2, 148.5 MHz

Composite, Y/C Outputs:

4 x over-sampling	10 bit DAC 54MHz
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Component YRB/RGB Outputs:

SD - 4 x over-sampling	10 bit DAC 4:2:2, 54 MHz
HD - 2 x over-sampling	10 bit DAC 4:2:2, 148.5 MHz

PROCESSING

Internal sampling

CBVS Input Processing

De-interlace

Frame rate conversion

Residual time base error

Delay through unit

@ 24.000 FPS

4:2:2 10 bit per channel

Adaptive 3D COMB filter, Full Frame TBC.

– Accepts non-interlace video games, and Macrovision encoded sources.

Motion compensated adaptive de-interlacer

Progressive processing with 3 frame

motion filtering.

+/- 15 nsec

approx. 1 frame +/- 1 field

(measured) 46ms or 2.75 fields on average

ENVIRONMENTAL

Power Supply

Power Dissipation

Operating Temperature

Operating Humidity

Dimensions

47 - 63 Hz, 85 -264 VAC auto ranging

70 Watts MAX

+32° F (0° C) to +113° F (45° C)

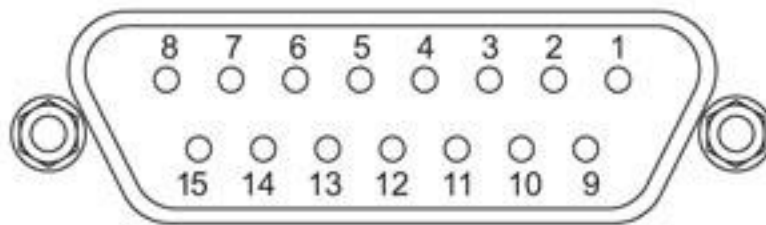
10% to 85% RH

2.25 inches (with feet) x 12 inches x 19 inches

Specifications subject to change without notice.

Appendix B

Pinouts



GPIO Pin out

1	GPIO1	9	GND
2	GPIO2	10	GND
3	GPIO3	11	SPARE
4	GPIO4	12	+5v 500mA
5	GPIO5	13	SPARE
6	GPIO6	14	GND
7	GPIO7	15	GND
8	GPIO8		

5 YEAR LIMITED WARRANTY

California Media Engineering Inc. warrants that this product (MVPHD-24) is free from defects in material or workmanship for a period of five (5) years from the date of original purchase. In the event this product becomes defective through normal usage, California Media Engineering Inc. agrees to repair or at its option replace the defective product without charge.

This warranty is limited to the original end-purchaser and is not assignable or transferable. This warranty does not apply to damage caused by negligence, accidents, inadequate shipping containers, water, fire, or an act of God. Only a California Media Engineering Inc. factory representative is authorized to repair this product. Any unauthorized attempt to repair this product will immediately void the warranty. Any unauthorized alterations or modifications to this product will immediately void the warranty.

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Repair Policy

Should any problem arise with your MVPHD-24, please contact Cal Media's Technical Support Department at support@calmedia.com or use the contact information on the back cover of this manual.

If required, a Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions. Do not return any product before obtaining a RMA number. Any shipping costs incurred are the customer's responsibility. If available, a temporary replacement unit may be provided at a nominal charge.

Cal Media's Technical Support Department will continue to provide advice on any product manufactured by Cal Media, beyond the warranty period without charge, for the life of the product.

California Media Engineering Inc.

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