

FS-HDR

Frame Sync/Converter/HDR-WCG Processor



Installation and Operation Guide

Version 4.1
Published June 2, 2021



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Chapter 1 – Introduction



Overview

FS-HDR, a 1RU, rack-mount, universal converter/frame synchronizer, is designed specifically to meet the HDR (High Dynamic Range) and WCG (Wide Color Gamut) needs of broadcast, OTT, post and live event AV environments, where real time, low-latency processing and color fidelity is required for 4K/UltraHD/2K/HD/SD and 2K/HD/SD workflows.

Developed in partnership with Colorfront, the FS-HDR's HDR/WCG functionality is powered by Colorfront Engine™ proprietary video processing algorithms. FS-HDR also comes with a set of licensed BBC HLG LUTs carefully designed for specific HDR color transforms and NBCU LUTs designed for single master workflow live television productions.

FS-HDR also serves as a full, 1-channel up, down, cross-converter for 4K/ UltraHD/2K/HD conversion and frame sync needs and in 4-Channel mode, offers 4 independent channels of 2K/HD conversion. FS-HDR offers ganged operational control of multiple FS-HDRs to support 8K/UltraHD2 workflows.

The pursuit of moving from Standard Dynamic Range (SDR) to High Dynamic Range (HDR) is the dream of getting closer to the Human Visual System (HVS) in all that we experience as viewers. FS-HDR has been designed to get us all there faster with a low profile, stand alone and real time device uniquely designed to bridge SDR to HDR, HDR to SDR and HDR to HDR, all in real time.

HDR Conversions:

- HDR to HDR
- SDR to HDR
- HDR to SDR

WCG Conversions:

- BT.709 and BT.2020

Up and Down Conversion Examples:

- Converting HD SDR BT.709 sources to UltraHD HDR BT.2020
- Converting UltraHD HDR BT.2020 sources to HD SDR BT.709 or HD HDR BT.2020

FS-HDR's extensive digital video connectivity is only matched by its expansive digital audio flexibility. The growth of 5.1 and 7.1 audio has increased the number of audio channels that must be managed in a production as well as needing to create stereo mixdowns from 5.1 and 7.1 sources. The MADI standard provides a convenient way to transport large numbers of audio channels along a single cable, simplifying the cabling demands for broadcasters, mobile trucks and production. FS-HDR supports both fiber and coax connections with 128-channel MADI input and output. An internal 277x208 audio matrix allows full routing of MADI, mixdowns and all audio coming from SDI, fiber and AES sources for an incredible amount of audio processing capability in a single box.

Video Features

- Video Processing Transforms: Each processing channel can independently select from:
 - Colorfront Engine TV mode provides specific conversions and simplified controls for live television broadcast productions.
 - Knee Point and Knee Slope controls for highlight and roll-off management
 - Color Correction and Camera Correction
 - Colorfront Engine-Live mode meets the High Dynamic Range (HDR) and Wide Color Gamut (WCG) needs of broadcast, OTT, production, and live event AV environments, where real time, low latency processing and color fidelity is required for 4K/UltraHD and 2K/HD workflows.
 - Input and Output Dynamic Range and Gamut selections
 - SDR Preview mode selectable when viewing HDR content
 - Nit Level control for PQ output, from 48 to 4000 Nits, to meet delivery and display requirement
 - Colorfront Engine-Film mode supports real-time color grading tasks for on-set look creation with a rich grading toolset.
 - Supports ACES colorspace (ACEScct) and ASC Color Decision List (CDL) controls
 - LOOK selection including film stock emulation and popular aesthetic looks
 - Nit Level control for PQ output, from 48 to 4000 Nits, to meet delivery and display requirements

NOTE: See ["Appendix A Specifications"](#) for lists of available Colorfront parameters.

- Seventeen licensed BBC HLG 3-D LUTs per ITU-R BT.2408

NOTE: See ["Appendix A Specifications"](#) for a list of supported BBC 3D LUTs.

- NBCU LUT mode enables single-master live production workflows for simultaneous HDR and SDR content. Designed for television broadcasters to maximize the dynamic range and color volume in HDR, without compromising core SDR broadcasts.
 - Six NBCU LUTs
 - Imperceptible round-tripping of SDR BT.709
 - Conversions designed with a knee that is natural with latitude for live video shading
 - Scene-light and Display-light conversions
 - SDR, HLG, and PQ conversions
 - Utilizes 33 point Tetrahedral 3D LUT Interpolation
 - Developed by NBCUniversal Media, LLC in collaboration with Cromorama for live television production

NOTE: See ["Appendix A Specifications"](#) for a list of supported NBCU LUTs.

- User 3-D LUTs
 - Supports custom 33 point .cube format 3-D LUTs
 - Configurable Colorspace, Scale, and HDR Transfer Characteristic
 - Non-volatile storage of 10 fixed LUTs
 - Utilizes 33 point Tetrahedral 3D LUT Interpolation
- Dynamic 3-D LUTs
 - Supports third party apps for automatic loading and display of 3-D LUTs
 - Reflects dynamic changes in real time from source software
 - Supported by Pomfort LiveGrade Pro
 - Supported by TV Logic WonderLookPro

- Operating modes:
 - Four Channel Mode - Four Independent 2K, HD, or SD Video Processors
 - Single Channel Mode - One 4K, UltraHD, 2K, HD, or SD Video Processor
 - Enhanced Single Channel Mode - One 4K, UltraHD Video Processor with simultaneous 4K/UltraHD and 2K/HD/SD outputs
- 4K/UltraHD/2K/HD/SD video processing and up, down, cross-conversion; easily frame sync any camera feed for UltraHD production
- Full range of I/O options for 4K/UltraHD include Dual 3Gb, Quad 3Gb, 6Gb, 12Gb over a range of SDI and optional SFP choices
- Single-link, dual-link, quad link conversion
- Automatic link timing alignment for dual and quad link SDI inputs
- Frame Synchronization
- Genlock to external loop through reference or SDI input
- YCbCr, 4:2:2, 10-bit
- BNC and HDMI monitoring outputs 2K/HD/SD, 4K/UHD automatically downconverted to 2K/HD
- Frame Rate Conversion (3:2, 1:2, 2:1, but not for 4K/UltraHD converted to 4K/UltraHD)
- Quadrant and Two Sample Interleave (2SI) mapping conversion
- De-interlacing and Interlacing
- Video Proc Amp controls
- RGB Color Corrector
- 3:2 cadence detection and removal for interlaced inputs and 3:2 cadence generation on interlaced outputs
- Built in Test Pattern Generators
- Crop/Fill controls
- Matte generators for background fill
- Closed caption conversion (CEA-608/CEA-708)
- SCTE-104 pass-through
- Ancillary Timecode (ATC) pass-through or translation (LTC, VITC1, VITC2)
- Adjustable output timing and delay, up to 20 frames

Audio Features

- 48kHz, 24 bit audio (20 bit for SD)
- Balanced AES I/O (16 ch input, 16 ch output)
- MADI I/O (128 ch input, 128 ch output, via BNC and Fiber)
- Embedded Audio (4x16 ch I/O in Four Channel Mode)
- 277x208 routable mono audio matrix
- Audio Sample Rate Conversion available on all audio inputs
- Independent level, phase, delay controls for each audio channel
- Maintain A/V Sync feature: Video timing changes can be linked to audio delay settings so audio and video remain in sync
- 5.1 and 7.1 to Stereo mixdown processors

Other Features

- Simple operation, redesigned menu structure and quick access to features via front panel buttons or web UI
- Built in web server. Supports remote status and control and remote software updates
- Presets
- Redundant power

- Configurable Alarms
- EIA 19" Rack mountable 1RU frame, offering space, power and cost efficiencies ideal for outdoor broadcast trucks, post production or broadcast settings
- Five-year international warranty with unlimited technical support

FS-HDR Control

FS-HDR operation can be monitored and changed in a number of ways. Feature sets in each of the control methods vary, although the front panel and web browser interfaces offer many of the same features.

Front Panel Control

The FS-HDR front panel offers the most direct control, ideal for use in machine rooms or wherever quick changes and status checks must be made. The buttons and knobs control menus in the display, allowing you to fully configure the system according to your purposes. You can control inputs, outputs, processing paths, keying, and much more.

Remote Web Browser Control

The FS-HDR internally contains an optimized web server that allows remote monitoring and parameter setting via an Ethernet 10/100/1000 network-attached computer running a web-browser. Networks can be closed local area networks, a straight computer-to-FS-HDR cable, or for greatest flexibility, exposed through a firewall to a broadband WAN. From a network-connected computer you can communicate with one or more FS-HDR devices, and you can identify the one you are connected to via LEDs on the FS-HDR's front and rear panels.

GPI Inputs and Outputs

General Purpose Inputs and Outputs are available on the FS-HDR back panel to provide contact closure control. Using the inputs, an external contact closure activates a specified function on the FS-HDR. Using the outputs, specific FS-HDR functions can produce a contact closure to activate any desired function on external equipment. The functions to be activated by an input or that can activate an output are set using the front panel and browser menus.

SNMP Interface Monitoring

SNMP offers remote network monitoring of alarm conditions.

Technical Description

The FS-HDR features an incredibly flexible architecture, offering powerful Video Processors for video conversion and processing, a separate Audio Processor, and input and output video and audio signal routing. The FS-HDR has two operating modes.

Four Channel Mode

In Four Channel Mode four independent HD/SD Video Processors are available, Frame synchronization, genlock, and up, down, cross conversion is available for a variety of video inputs and outputs. This mode also allows each Video Processor to use any one of the other Video Processor's video as a background or sidebar key.

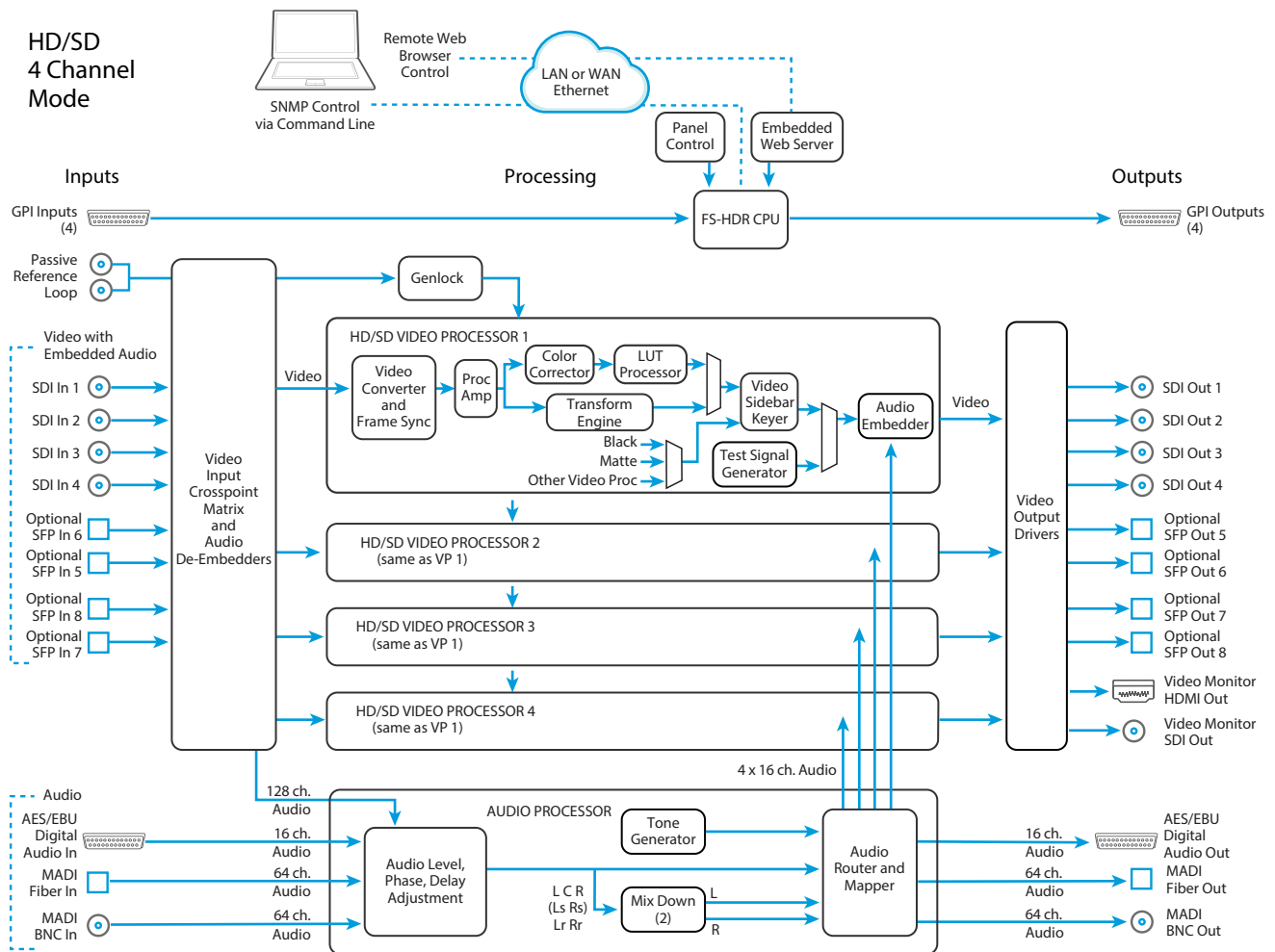
Each Video Processor routes its output to dedicated SDI output ports, depending on the transport configuration. For single link transport the output of Video Processor 1 is sent to SDI Out 1 and SDI Out 5 (for use with an optional SFP module). For dual link transport, the output of Video Processor 1 is routed to the SDI Out 1 and SDI Out 2 pair, and also to the SDI Out 5 and SDI Out 6 pair. In addition, any Video Processor output can be routed to the monitor BNC and HDMI outputs.

Four Channel Mode supports frame rate conversion within the same "family" of frame rates. These families are:

- 59.94/29.97/23.98
- 50/25
- 60/30/24

Audio processing is available for all input audio, and audio can be routed to any of the Video Processors for embedding, and to any of the audio output connectors.

Figure 1. FS-HDR Simplified Block Diagram, Four Channel Mode



Single Channel Mode

In Single Channel Mode a single 4K/UltraHD capable Video Processor is available, allowing up, down, and cross conversion between a variety of 4K, UltraHD, 3G, HD, and SD video formats.

The same processed output signal is sent to all the FS-HDR output connectors, depending on transport configuration. For example, when in Quad Link mode, the same signal is routed to the SDI Out 1-4 connectors, and also to the SDI Out 5-8 connectors (for use with optional SFP modules). In Dual Link mode four copies of the processed video are routed to the SDI Out 1 & 2 pair, SDI Out 3 & 4, SDI Out 5 & 6 and SDI Out 7 & 8. The Video Processor output is also available on the monitor BNC and HDMI ports, and will be down-converted if necessary.

In Single Channel Mode only matte and black sidebar keying is available. Scale, Position, Crop, and ROI are also available in Single Channel Mode for all formats except when both the input and output formats are 4K/UltraHD.

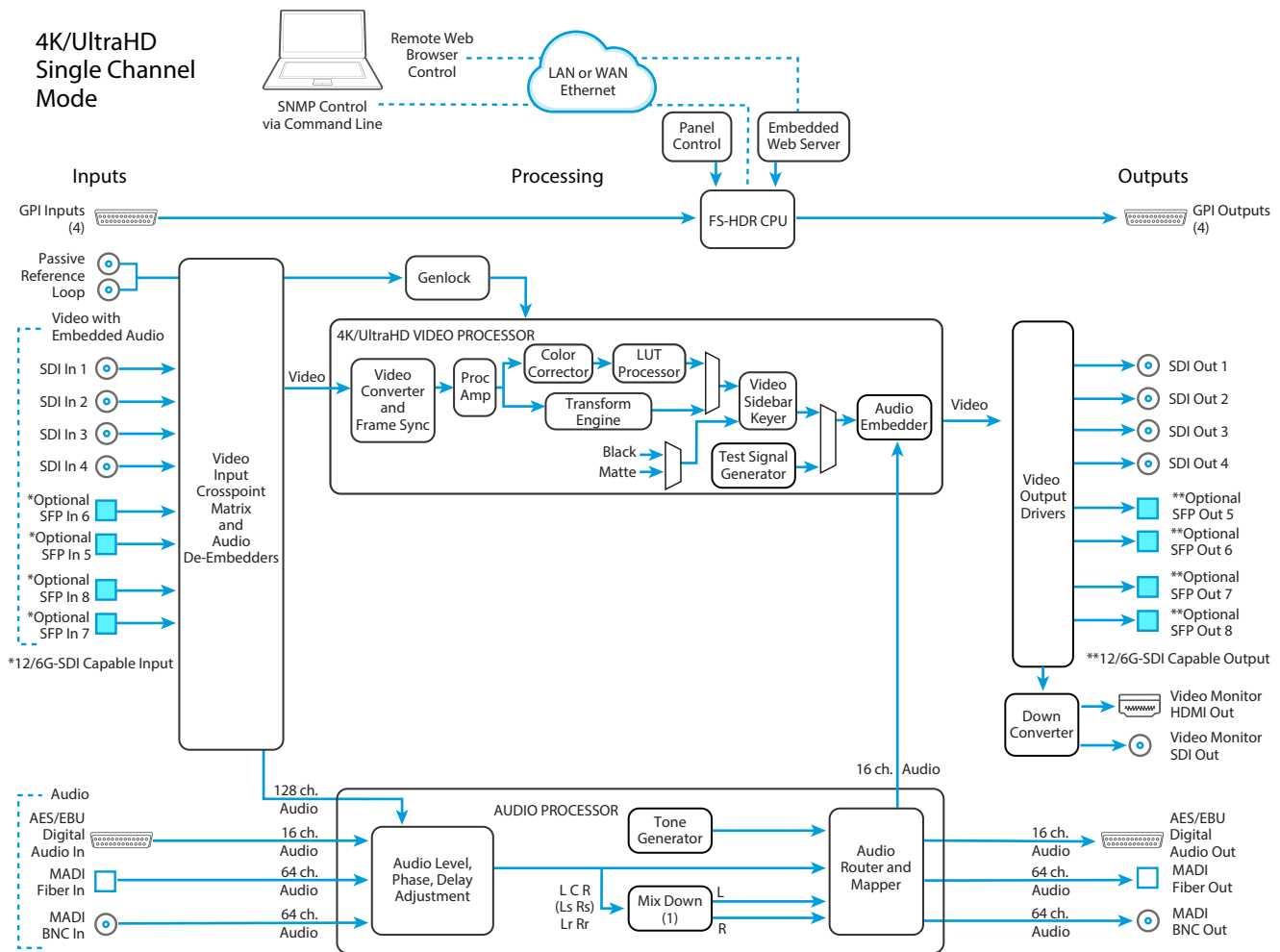
Single Channel Mode frame rate conversion within the same “family” of frame rates are supported for HD/SD signals, and for up and down format conversion only to or from 4K/UltraHD signals. These frame rate families are:

- 59.94/29.97/23.98
- 50/25
- 60/30/24

However, when the FS-HDR’s input and output are both 4K or UltraHD, the frame rates must be the same even within the same family. For example, if the FS-HDR receives UltraHD 59.94, when it is configured for UltraHD output, that frame rate must also be 59.94.

Audio processing and routing in Single Channel Mode is similar to Four Channel Mode.

Figure 2. FS-HDR Simplified Block Diagram, Single Channel Mode



Enhanced Single Channel Mode

When Single Channel Mode is selected and both the video input and output are 4K/UltraHD, the FS-HDR automatically enters Enhanced Single Channel Mode. In this mode, the SDI (BNC) Monitor output can be configured differently from the main 4K/UltraHD output. A variety of formats and frame rates (up to 2Kp 60) can be selected, providing a second configurable video output. In addition, when using any color transform except Dynamic LUT, different color settings can be applied to the SDI Monitor output, independently of the main output.

Enhanced Single Channel Mode Monitor configuration changes only affect the SDI (BNC) Monitor output, and are not applied to the HDMI Monitor output.

When Dynamic LUT is selected, the SDI (BNC) Monitor output color settings always match the main output.

Video Processor(s)

Each Video Processor performs format conversion, frame synchronization, signal processing, and keying operations. Conversion is done with very high quality scalars. De-interlacing is performed with high quality motion-adaptive processing including diagonal filters.

The video transform processor can be configured to implement the Colorfront Engine algorithm or a 3-D LUT processor. The integrated Colorfront Engine proprietary video processing algorithms in each Video Processor provide the highest quality transforms between different video dynamic ranges and color spaces. The 3-D LUT processor, utilizing tetrahedral interpolation, supports BBC HLG LUTs, NBCU LUTs, User 3-D LUTs, and Dynamic 3-D LUT operation. The Video Processor also supports color adjustment with standard Proc Amp controls.

The FS-HDR can embed 16 channels of audio from any of the audio inputs to each complete video output. On multiple link outputs, the audio is embedded on the first link. When signals are duplicated on multiple outputs, the same embedded audio is present on the first link of all the duplicated outputs.

Audio Processor

The Audio Processor accepts AES, MADI and embedded SDI audio and performs high quality sample rate conversions as required. Full audio channel mapping supports any mixture of inputs to outputs.

Dolby 5.1 and similar schemes of non-PCM digital encoded audio can be passed unaltered, provided the input is genlocked to the FS-HDR output.

Internal mixers are available that permit mixing down five inputs (5.1) or seven inputs (7.1) to a left/right stereo mix. Two Mixdown mixers are available in Four Channel Mode, and one Mixdown mixer is available in Single Channel Mode.

Optional FS-HDR Features

SFP I/O

All FS-HDR's SFP I/O ports support up to 3G-SDI data rates. In Single Channel mode the FS-HDR's SFP ports also support 12G-SDI and 6G-SDI, when equipped with a compatible SFP module. See "[Appendix A Specifications](#)" for listings of the types of SFPs supported. Only AJA SFP modules are supported; use of other manufacturer's modules is not supported and may void the warranty.

NOTE: See <https://www.aja.com/software/configurator> for specific information about compatible SFP modules.

Operation Overview

About Inputs and Outputs

In general, to use the FS-HDR for video conversion, select a Video Processor Channel, select an Output Format that is compatible with the current FS-HDR reference signal (see "[About Reference and Genlock Source](#)" on page 16), and then select an Input port. The FS-HDR will automatically determine the selected input video format and convert it to the selected Output Video Format. The converted video is routed to the FS-HDR output ports.

About Reference and Genlock Source

A source being used by the FS-HDR for reference must be compatible with the FS-HDR video output format. These signals are compatible when they are both in the same frame rate family (59.94/29.97/23.98, or 50/25, or 60/30/24).

The FS-HDR can be configured to operate with one of a variety of references, including genlock to the signal from the Reference input connector, genlock to the current video input signal, or Free Run. Your choice of reference needs to meet your individual facility requirements, and must be accounted for when you configure an FS-HDR video output format.

HDR and WCG Background

High Dynamic Range (HDR) and Wide Color Gamut (WCG) are relatively new ways to present video programming that gives brighter highlights, more detailed shadows, and enhanced colors with smoother gradients. HDR and WCG are display oriented features, dependent on the capabilities of the device presenting the video material.

Standards have been developed to help manage HDR signal flows, including:

- HDR-10 (for HDMI) - Uses a Perceptual Quantizer (PQ) curve that accounts for the human visual response to maximize coding efficiency. This standard also uses static metadata to communicate signal characteristics to the monitor so it can optimize its display characteristics to match the signal.
- Hybrid Log Gamma (HLG) - Uses a combination log and gamma curve to achieve coding efficiency of HDR signals while also allowing the same signal to be shown on both standard and HDR displays. No metadata is required.

Other standards exist, or are in development, including some that have dynamic metadata, which can be used by displays to adjust for the best possible picture from scene to scene.

Retained Settings

The FS-HDR stores the current value of each configurable parameter in non-volatile memory so that the system returns to the same state after a power cycle. Most of the settings for Single Channel mode are stored separately from those for Four Channel Mode, and vice-versa. These separate settings for each mode can be changed only when operating in that mode.

The FS-HDR also stores independent values for many settings, so that if the unit is configured for one operation, changed to a different operation, and then returned to that prior operation, the settings for that prior operation are restored.

For example, changing the Video Input selection automatically selects new values for Proc Amp parameters and RGB Proc Amp parameters. This is referred to as Source Memory.

Each video source remembers its own Proc Amp settings.

Similarly, changing the Output Format selection automatically selects new values for H & V timing parameters. This is referred to as Output Timing Memory. Each Output Format mode remembers its own Frame Delay and H & V timing settings.

As another example, Output Format Mapping stores the Output Format selected for any of the frame rates. That Mapped Output Format is recalled if the frame rate selection is changed.

Presets can also be used to restore the FS-HDR to a previous state. Many parameters can be individually reset to factory values using individual menus, or the entire FS-HDR can be reset to defaults (with the PRESET, Factory Preset menu). Presets for Single Channel mode are separate from those for Four Channel Mode. Preset changes made in one mode will not affect settings for the other mode.

In This Manual

Chapter 1: Introduction provides an overview and a list of box contents.

Chapter 2: Controls, Indicators, and Connections describes controls, indicators, and connections.

Chapter 3: Installation and Configuration provides complete instructions for installing and configuring the unit.

Chapter 4: Display Menus explains how to use the controls and display menus.

Chapter 5: Browser Control explains how to use the unit remotely via a web browser on a network-attached computer.

Chapter 6: SNMP discusses support of SNMP.

Appendix A: Specifications presents a list of technical specifications for the product.

Appendix B: Pinouts explains the rear panel connector pinouts.

Appendix C: Safety & Compliance provides regulatory compliance statements, advisories and warnings.

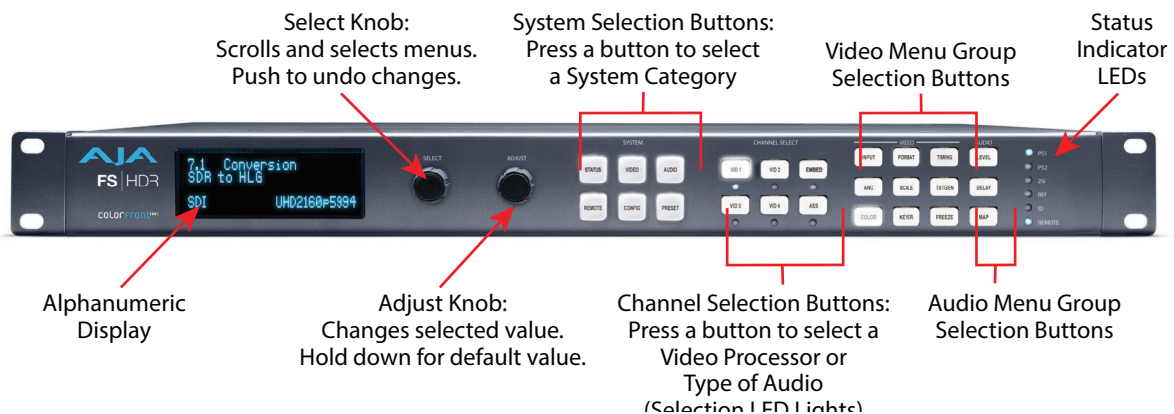
Warranty and Index

Chapter 2 – Controls, Indicators, and Connections

Overview

The controls, indicators, and connectors illustrated and described in this chapter allow you to connect, operate, and monitor the FS-HDR system and to troubleshoot problems if you encounter them. Becoming familiar with the front and rear panels also simplifies system installation, setup, and operation.

Front Panel Description



Front Panel Layout and Operation

The FS-HDR's front panel control system is designed to be quick and easy to use. The alphanumeric display on the left shows status and parameter information. SELECT and ADJUST knobs provide fast menu scrolling, parameter selection and adjustment. Status LEDs on the right report important system information.

The buttons on the front panel operate interactively. At the center of the panel are System Selection buttons, which provide direct access to parameter menus that control basic FS-HDR operation (like setting the output frame rate or selecting Single or Four Channel Mode). In addition, the STATUS button brings up menus that report FS-HDR status information, and the PRESET button displays Preset selection menus for rapid reconfiguration. When a System Selection button is pressed, the parameter menu that was last selected from that group will be displayed. Pressing any of these buttons de-selects all other SYSTEM buttons, CHANNEL SELECT buttons, VIDEO menu group buttons, and AUDIO menu group buttons to the right.

The four VID1-4 Channel Selection buttons to the right allow immediate access to separate parameter menus for each Video Processor (when in Four Channel Mode). The button for the currently selected Video Processor is illuminated. In Single Channel Mode pressing any of the four buttons will light the VID1 button, indicating that single Video Processor is selected for control. After a Video

Processor has been selected, the nine VIDEO Menu Group buttons on the right are activated. The VIDEO Menu Group button that was last selected for that Video Processor will be illuminated, and the alphanumeric display will show the last selected parameter menu for that Video Menu Group.

Similarly, the EMBED and AES Channel Select buttons selects either Embedded or AES audio, and activates the three AUDIO Menu Group buttons to the far right. The last selected AUDIO Menu Group button for that audio type will be illuminated and its last selected parameter menu will be displayed. Pressing an Audio Channel Select button de-selects the Video Channel Select button, and vice-versa.

This design allows rapid menu access, reducing the number of menus to scroll through, and time is saved when button presses automatically return to their last selected menus.

Operational Summary

To change FS-HDR operational parameters with the front panel controls:

1. Select a system component and menu group for the alphanumeric display:
 - For overall system control, press one of the six SYSTEM buttons,
 - For control of a Video Processor, press one of the four VID1-4 Channel Select buttons and then press one of the VIDEO Menu Select buttons,
 - For Embedded audio control, press the EMBED button and then press one of the AUDIO Menu Select Buttons,
 - For AES or MAD1 audio control, press the AES button and then press one of the AUDIO Menu Select Buttons.
2. Scroll through menus in a group: Turn SELECT.
3. Edit a menu parameter: Stop SELECT on the menu, then turn ADJUST to set the value. Changes are applied immediately.

Multiple Part Parameter Editing

To edit a multiple part parameter, such as an IP address:

1. Push the ADJUST knob momentarily (the value blinks).
2. To save the whole parameter after editing, push ADJUST momentarily again.

Coarse Adjust Editing

To coarse adjust a value (for use with parameters that have more than 10 selections):

- 10x speed - Hold down the SYSTEM or currently active CHANNEL SELECT button (the button turns dark blue) and turn ADJUST. The values will change in approximately 10x increments.
- 100x speed (available for extremely wide-range parameters, like Audio Delay)
 - After enabling 10x speed above, momentarily release and press that group button a second time (the button turns light blue). Turning ADJUST will now change the value in approximately 100x increments.

Undo a Change

To restore a previous setting:

- Push SELECT momentarily.

Reset to Factory Default:

To return to the factory default of a parameter:

- Hold down ADJUST for 4 seconds.

Alphanumeric Display

The four-line alphanumeric display shows either status menus that can be scrolled through but not altered, or parameter adjustment menus that are numbered and grouped by function, whose parameters can be altered.

Status Menus

Status menus generally have a feature on the left, and the current status or setting for that feature next to it. Information can generally be shown in two columns, three columns, or four columns (two columns side by side).

Figure 3. Status Menu Front Panel Displays

System Name											
Feature 1	STATUS			Feature1	SETTING	STATUS		Feat1	STATUS	Feat5	STATUS
Feat2	STATUS			Feat2	SETTING	STATUS		Feat2	STATUS	Feat6	STATUS
Feat3	STATUS			Feat3	SETTING	STATUS		Feat3	STATUS	Feat7	STATUS
				Feat4	SETTING	STATUS		Feat4	STATUS	Feat8	STATUS

Parameter Menus

Parameter menu lines display the following information:

- First line—parameter number and name.
- Second line—the editable value set for a parameter.
- Third and fourth lines—current status, labels, or prompts.

Figure 4. Four Lines of the Front Panel Display

1	Param number & name
2	Current value setting
3	Legend, info or prompt
4	Legend, info or prompt

When you edit a parameter containing multiple values, such as the IP address, the value currently being edited blinks.

Control Knobs

The general rules of SELECT and ADJUST knob operation are:

SELECT

Turning the SELECT knob performs these actions:

- Turn SELECT in either direction to scroll through the menus.
- Stop on a menu to enter that menu for editing.
- Turn SELECT within a menu to scroll through multiple parameters.
- Pause on a parameter to select it for editing. For multiple fields in a parameter, use SELECT to move through the fields (after pressing ADJUST to enter field editing mode).
- Push SELECT momentarily to undo and restore the previous setting.

ADJUST

Turning the ADJUST knob performs these actions:

- Turn ADJUST to change the values of a selected parameter.
- In most cases, leaving a value in place for a moment sets that value.
- To perform special actions, such as recalling a register, push the knob to confirm the displayed value. Display line 4 indicates such special actions.
- Some parameters having multiple fields, such as IP Address require you to push the ADJUST knob to select a field, and push again to save changes.
- Hold down the knob to reset a value to the factory default; for multiple field values, all fields are reset to the default.
- When the STATUS button is selected, pressing ADJUST returns the user to the last mode and menu selected before SYSTEM -> STATUS was selected.

Button Menus

The general functions accessed by the front panel buttons are listed below:

System Buttons

STATUS

Displays the Status Menu Group, which shows current machine status and error conditions:

- Video Input and status
- Caption status
- Reference and Genlock status
- Output status
- Power and Temperature status
- System Name display
- Alarms

REMOTE

Displays the Remote Menu Group, which lets you select how to control the FS-HDR:

- Control by local front panel only, remote sources only, or local and remote
- Authentication
- GPI input and output behavior

VIDEO

Displays the System Video Menu Group, which lets you change or enable system wide video functions:

- Output frame rate selection
- Genlock reference source selection
- Video input format settings, including 3G setup

CONFIG

Displays the Config Menu Group, which lets you configure the FS-HDR for your environment:

- System Name setting
- FS-HDR Mode (Single Channel or Four Channel)
- IP settings, MAC address

- SNMP settings
- Alarm control
- Screen Saver and Display intensity
- Fan speed
- System serial number and software version
- System reboot

AUDIO

Displays the System Audio Menu Group, which lets you change or enable system audio functions:

- MADI Output mode
- Audio Input Sample Rate Conversion (Embedded, AES, MADI)
- 5.1 and 7.1 Mixdown
- Global Audio Output
- Reset Channel Mapping (Embedded, AES, MADI)

PRESET

Displays the Preset Menu Group, which accesses the memory registers:

- Store, Recall, and edit the names of Presets
- Factory Preset (defaults)

Channel Select Buttons

VID1-4

Selects which Video Processor the nine VIDEO buttons will access menus for control. In Single Channel Mode any button can be pressed.

Blue = A valid video source is present.

Red = An invalid video source is detected (unless the alarm has been suppressed, in which case the LED will be turned off).

Off = No video is present, or invalid video is detected and the alarm is suppressed.

NOTE: *The FS-HDR operating mode can be determined by the VID 1-4 button tallies. In Four Channel Mode all four LEDs light, with the selected Video Processor high tally. In Single Channel Mode only the VID1 button tally is low tally or high tally.*

EMBED

Selects Embedded Audio for control by menus accessed by the three AUDIO Menu Group buttons.

Blue = Valid embedded audio is present on any video source.

Off = No embedded audio is detected.

AES

Selects AES and MADI for control by menus accessed by the three AUDIO Menu Group buttons.

Blue = Valid AES or MADI audio is present.

Off = No AES or MADI audio is detected.

Video Menu Group Buttons

INPUT

- Input source selections
- Loss of input selection
- Reverse Telecine
- Input scan format settings (PsF or interlaced)
- Input Image Mapping (Single Channel Mode only)

ANC

- Active Format Descriptor (AFD) settings
- Caption translation selection
- SD line 21 blanking selection
- VPID override
- Timecode translation selection

COLOR

- Proc amp settings
- Color Corrector settings
- Transform mode
- Colorfront Engine settings
- LUT settings
- SDI Monitor Range & Gamut (Enhanced Single Channel Mode only)
- SDI Monitor LUT (Enhanced Single Channel Mode only)
- Legalizer settings

FORMAT

- Output format
- SDI Monitor Format (Enhanced Single Channel Mode only)
- Link Configuration
- SD Aspect Ratio
- Up and Down Convert settings
- Output Image Mapping (Single Channel Mode only)

SCALE

- Custom Size and Position and ROI settings
- 1080i Output Filter settings

KEYER

- Background fill selection
- Sidebar Edge
- Matte adjustments

TIMING

- H and V timing and delay settings
- Maintain A/V Sync settings
- Frame Delay settings

TSTGEN

- Test Pattern settings

FREEZE

- Freeze Output setting

Audio Menu Group Buttons

LEVEL

- Audio level and phase settings

DELAY

- Audio delay settings

MAP

- Output mapping controls

Status LED Indicators

Indicators on the front panel are multi-state LEDs that light when a condition is present. The indicators and the conditions that cause them to light are as follows:

PS1/PS2

- Blue = Power Supply 1 or 2 is operational and receiving power. Both PS1 and PS2 LEDs must be lit blue to indicate redundant power is available.
- Red = Power supply is not receiving power or not operating within 10% of nominal value (unless the alarm has been suppressed, in which case the LED will be turned off).
- Off = Power supply alarm is suppressed and nominal power is not being received.

2SI

- Blue = (Single Ch only) The processor's output mapping is set to 2SI (2 Sample Interleave).
- Off = In Single Channel Mode the processor's output mapping is set to Quadrant (Square Division). In Four Channel Mode this LED is always off.

REF

- Blue = The FS-HDR is operating with a valid reference.
- Red = A reference alarm condition exists (unless the alarm has been suppressed, in which case the LED will be turned off).

ID

Blinks blue on and off when you right-click on an FS-HDR system name and choose Identify in the web interface Network list. This action helps identify which system you're controlling when multiple units are operated from a single computer. The ID LEDs on the front and rear panels perform the same function. No matter which side of a rack you're facing, you'll be able to see one of the LEDs.

REMOTE

This multicolor LED indicates the current control mode:

- Blue = Local Only (front panel control only)
- Red = Remote Only (remote browser or panel control only)
- Purple = Local + Remote (front panel and remote control both enabled)

Incompatibility Alarms

The FS-HDR produces signal incompatibility alarms for a number of reasons. For example, incompatible conversion alarms can occur because the FS-HDR cannot convert between frame rate families (59.94/29.97/23.98, or 50/25, or 60/30/24).

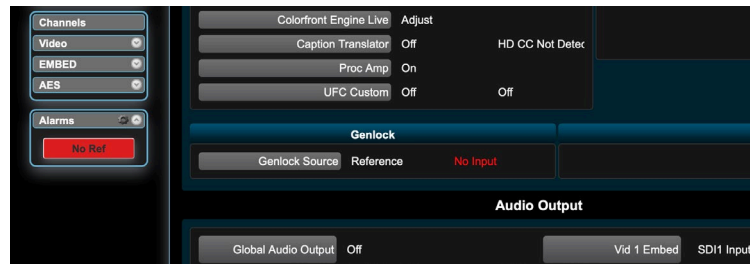
Example Reference and Video Incompatibility Alarms

Video incompatibilities that the FS-HDR may detect include the following examples:

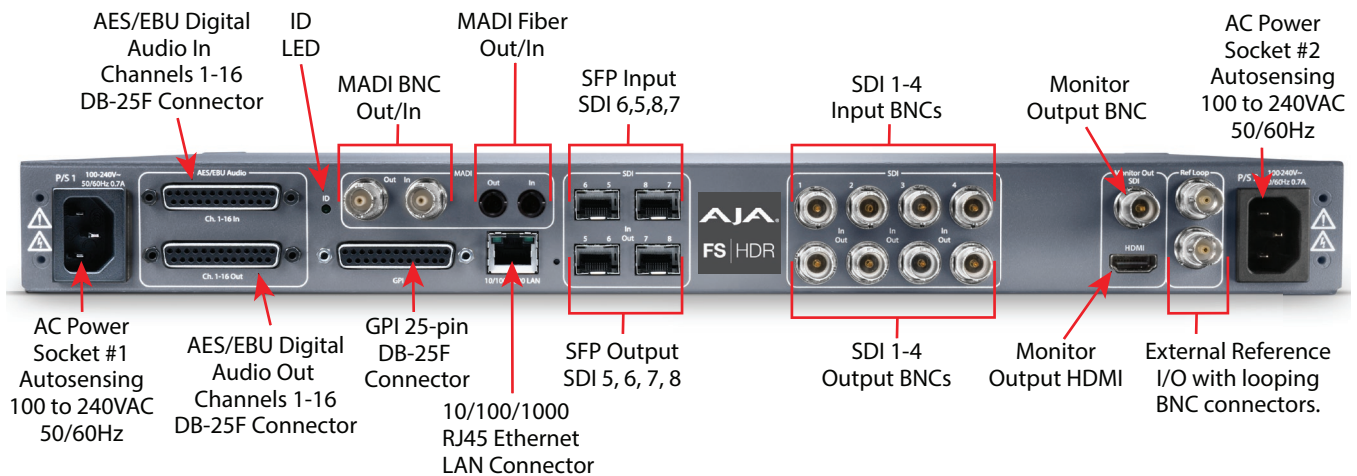
Table 1. Video Incompatibility Examples

Video Incompatibility Detected	Alarm Status screen will show			Video Status screen will show		
Genlock Source is set to "Reference", but no Reference signal is detected. In this example the cable has been disconnected.	IN BKGD GEN OUT1	SDI 1 Matte Ref	OK OK No Ref 1080i59	IN BKGD GEN OUT1	SDI 1 Matte Ref	1080i59 No Input UHDp59
Reference signal format is not compatible with selected Output Format. In this example the reference signal is 50 Hz but output is 59.94 Hz.	IN BKGD GEN OUT	SDI 1 Matte Ref	OK OK incompat 1080i59	IN BKGD GEN OUT1	SDI 1 Matte Ref	1080i59 1080i50 UHDp59

Figure 5. Web page example of unsupported signals alarm.



Rear Panel Description



Connectors

The FS-HDR rear panel connectors are summarized below:

P/S 1 and P/S 2

Two IEC-60320 3-pin grounded connectors provide AC power to the two independent power supplies. The supplies are autosensing for 100–240 VAC, 50/60 Hz. Only one connection is required for operation, but both connectors must be plugged into AC power for redundant power protection.

AES/EBU Digital Audio

Two DB-25F connectors provide input and output of 16 channels of balanced digital audio. See ["Audio Connection Pinouts" on page 170](#).

MADI BNC

64 channel MADI output and input, on separate BNC connectors.

MADI Fiber

64 channel MADI output and input, on separate Multi-Mode fiber ST connectors.

GPI

The GPI DB-25F connector provides connection to external equipment or circuits via an isolated TTL-compatible interface. Four GPI inputs and four outputs are available. See ["GPI Pinouts" on page 169](#).

Using the REMOTE menu group, you can program the actions of the GPI inputs and outputs individually. Contact closures on the inputs can trigger a wide variety of FS-HDR functions. Alarms or loss of video can trigger the GPI outputs.

10/100/1000 LAN

This RJ-45 connector provides an Ethernet 10/100/1000 port for connection directly to a computer or to a LAN through an Ethernet hub or switch.

SFP In/Out (optional)

All FS-HDR's optional SFP I/O ports support up to 3G-SDI operation. In addition, in Single Channel mode the FS-HDR's SFP ports 5 through 8 In and Out also support 12G-SDI and 6G-SDI, when equipped with a compatible SFP module.

SDI In/Out

Digital video with embedded audio. Four SDI input and Four SDI Output BNCs. 3G-SDI is supported. The input and output signals carried on each BNC connector varies, depending on the link configuration and format selection.

SDI Monitor Output (BNC)

The SDI Monitor output BNC connector supports 3G-SDI up to 2Kp 60 video with embedded audio. In Four Channel Mode you can select which Video Processor output is sent to this output connector. In Single Channel Mode any 4K/UltraHD output signal is automatically down-converted to 2K/HD and routed to this BNC connector.

In Enhanced Single Channel Mode you can configure a target down-conversion for this SDI (BNC) Monitor Output and apply selected Colorfront or LUT color transforms that can be different from the FS-HDR's main output.

NOTE: The SDI Monitor output cannot display down-converted 4K/UltraHD PsF signals.

HDMI Monitor Output

The HDMI Monitor output connector supports up to 2Kp 60 HD HDMI video with embedded audio. In Four Channel Mode you can select which Video Processor output is sent to this connector. In Single Channel Mode any 4K/UltraHD output signal is automatically down-converted to 2K/HD and routed to this HDMI connector. In both these modes the HDMI Monitor output signal is the same as the SDI (BNC) Monitor output.

In Enhanced Single Channel Mode the HDMI Monitor output uses the same automatic down-conversion as Single Channel Mode. SDI Monitor output configuration changes described above for the SDI Monitor (BNC) output do not apply to the HDMI Monitor output.

NOTE: The HDMI Monitor output cannot display down-converted 4K/UltraHD PsF signals.

NOTE: 4K/Ultra HD and HDR signals can be monitored locally using the FS-HDR's extra outputs (optional SFP modules required). See ["Local Monitoring with the FS-HDR" on page 42](#) for more information.

Ref Loop

The Reference Loop BNCs accept an Output timing reference signal. The reference can be analog SD blackburst or HD tri-level sync. Examples of permissible reference video input signals:

- 525 Color Black
- 625 Color Black
- 1080i Tri-level Sync
- 720p Tri-level Sync

The 2 BNCs are a passive loop: one BNC is for the Input, and the remaining BNC can be connected to another piece of equipment in the reference chain or terminated.

NOTE: For proper operation the input Reference signal must be stable and properly terminated using a 75-ohm terminator on either the unused loop connector or the last piece of downstream equipment to which the Ref Video is connected.

Chapter 3 – Installation & Configuration

Installation Overview

The installation and set up of an FS-HDR is very simple. Plug both AC supply cords into AC mains power (separate branch circuits for redundancy), connect the LAN connector to a LAN, WAN or local computer with a web-browser, and then connect source and destination video and audio equipment.

NOTE: *The AJA FS-HDR should be plugged into 3-wire 100-240 VAC 50/60 Hz power (autosensing) before you make connections to other equipment. The AC cords provide a path to ground for accidental static discharge to protect system equipment. The unit has two fully independent and redundant power supplies and will operate with one or both AC power cords plugged into the unit. However, fault-tolerance exists only if both power supplies are connected and plugged into separate branch circuits. Then if power is lost on a branch or one of the supplies, the unit will continue to operate on the remaining circuit and power supply.*



Warning! To meet safety regulations for leakage current and to ensure redundancy in the event that a branch circuit breaker shuts off a branch, connect the dual power supplies to separate branch circuits.

Installation Summary

All the steps of installation and configuration are documented in this chapter and are summarized as follows:

1. Unpack the shipping box, removing the FS-HDR and two power cords.
2. Install any physical options, such as SFP I/O modules.
3. Mount the physical chassis as desired: front rack, rear rack, or desk mount. If you are mounting multiple FS-HDR units, try to place them visually in the same area so you can use an attached computer to turn on and see the ID LED of the FS-HDR you're communicating with. For physical installation details see ["FS-HDR Chassis Installation" on page 30](#).
4. Connect the two FS-HDR power cords to mains AC. For redundancy, use both power supplies and connect them to separate branch circuits so that the FS-HDR will continue to operate even if a circuit breaker opens on one branch.
5. If you plan to use remote control, connect your computer to the FS-HDR directly using an Ethernet cable, or connect both the computer and the FS-HDR to a local area network through an appropriate hub or router. Also set the FS-HDR IP address in the menus, and then use a computer to test (ping) the FS-HDR over the network connection to verify communication. For details, see ["Networking" on page 31](#).
6. Install a web browser on the computer, if not already present, for accessing the FS-HDR web pages. You can access the pages simply by entering the FS-HDR IP address in the browser address field. See ["Web Browser Control" on page 33](#).
7. Connect the FS-HDR to system audio and video sources, including VTRs, monitors, DVD players, video switchers, and audio mixers. For details, see ["System Cabling" on page 35](#).
8. Test the FS-HDR with all of your devices to verify everything is working.

Unpacking

Shipping Box Contents

An FS-HDR chassis is shipped with two AC power cords and any late-breaking news bulletins (if applicable). Chassis rackmount brackets are provided as part of the chassis with screws.

As you unpack the shipping box, carefully examine the contents. Ensure you received everything and that nothing was damaged during shipment. If you find any damage, immediately notify the shipping service and supply them with a Description of the damage. AJA will repair or replace damaged items.

If you find shipping damage, contact your AJA dealer or distributor for details on how to have your FS-HDR repaired or replaced.

NOTE: Save packing materials and the shipping box. If your FS-HDR ever requires service or you move your system, use the packaging materials and box for safe shipment.

Installing Optional SFP I/O Modules

The optional AJA SFP I/O modules are purchased separately from the FS-HDR. Install the optional SFP I/O modules by inserting them into the rectangular cages on the back panel with the electrical connectors facing downward. Press gently but firmly until the modules seat in the inside connectors.

You must remove any connected fiber or coaxial cables from the SFP modules before you remove the modules from the FS-HDR. Pull down the SFP lever to free the module before you withdraw the module from the cage.

For additional installation and operation details, see the instructions provided with the SFP modules.

FS-HDR Chassis Installation

The following information will help you install the FS-HDR chassis correctly.

Physical Requirements for Mounting the Chassis

You can mount the FS-HDR chassis in two ways:

- Rack mounting—attach the FS-HDR (rear or front mounted) to a standard 19-inch wide equipment rack. The chassis occupies only one vertical rack unit.
- Desktop—lay it on a horizontal flat surface.

Chassis Dimensions

When planning the equipment location, consider the chassis dimensions:

- Height—1 rack unit, 1.75 inches (4.5 cm)
- Depth—16 inches (40.65 cm)
- Width—17.5 inches (44.45cm)
- Weight—7.85 pounds, 3.56 kilograms

Cabling and Cooling Requirements

Observe these precautions when placing your FS-HDR:

- Plan adequate space for cable routing from the back of the chassis. Ensure that cable connectors are not stressed and cables are not bent or crimped.
- When rack mounting or stacking multiple FS-HDR chassis, ensure adequate airspace for cooling around the FS-HDR units. Note the location of cooling vents on all equipment next to the FS-HDR and ensure none are obstructed.

NOTE: FS-HDR units can be stacked vertically without limit as long as there is an adequate supply of cool air around the FS-HDR side vents.

Power Requirements

The FS-HDR requires the following input voltage and power.

- Input Voltage—Chassis: autosensing 100VAC to 240VAC, 50/60Hz, fully redundant with both power supplies diode isolated.
- Power Consumption—55 Watts (70 Watts maximum)

Networking

You can network the FS-HDR directly to a laptop or other desktop computer using a single Ethernet cable (straight or cross-over), or connect it to a local area network (LAN). In either case, the FS-HDR connects via its 10/100/1000 Base-TX Ethernet connector. A LAN is a shared network that includes other Ethernet devices all attached via a hub or digital switch. LANs may be divided into zones separated by software or hardware routers. Routers may also be used to connect the LAN to an outside wide area network (WAN) such as the Internet.

Devices on a LAN have IP addresses which may be fixed and permanent or dynamically assigned by the network (DHCP). When attaching the FS-HDR to a LAN, talk to your network administrator to find out how they want it connected (static IP or DHCP). Your IT department will be able to supply the information you need to install the FS-HDR on a LAN.

FS-HDR Default Network Settings

The FS-HDR ships from the factory set for DHCP networking, and can be manually reset to the following default network settings:

IP Address	192.168.0.2
Subnet Mask	255.255.255.0
Gateway	192.168.0.1

The following topics discuss two ways to set up the unit to communicate over a TCP/IP network connection: via DHCP or via a static IP address.

Networking Using DHCP or Default Static IP

The FS-HDR factory default configuration automatically looks for a DHCP server to issue an IP address. If your network includes a DHCP server, plug the FS-HDR into the network and connect with the unit as follows:

1. Press the CONFIG button.
2. Turn the SELECT knob to navigate to config parameter 3.2. Note on a piece of paper the DHCP-supplied IP address shown.
3. With your laptop or desktop computer connected to the same LAN as the FS-HDR and DHCP enabled, launch a web browser, type the IP address you noted on the FS-HDR's display into the browser address field and press Enter. You should now see the FS-HDR's browser Status screen.

If the FS-HDR cannot get an IP address from the network DHCP server, the FS-HDR will automatically use a preset factory static IP address of 192.168.0.2. You can access the FS-HDR using the default static address as follows:

1. Set your computer's IP address to whatever address you prefer in the 192.168.0 (class C) network.
2. Set the computer's Subnet mask to 255.255.255.0 (most PCs default to the proper netmask when the address is set).
3. Set the gateway address, if used, to match the FS-HDR default: 192.168.0.1. Alternatively, change the FS-HDR gateway address to match your gateway:
 - A. Press CONFIG, turn SELECT to 3.4 Default Gateway, push and then turn ADJUST to change the first group of digits.
 - B. Turn SELECT to advance to the next set of numbers, and turn ADJUST to set these numbers.
 - C. Continue using SELECT and ADJUST to set the full address.
 - D. When finished, push ADJUST momentarily to save the address.
4. Run a browser on the computer and type "192.168.0.2" (the factory static IP address). You should now see the FS-HDR's browser status screen.

When you can access the FS-HDR screens, see ["Browser Remote Control" on page 124](#) for details about configuring the FS-HDR using a browser.

Networking the FS-HDR Using Your Own Static IP

If you don't want to use DHCP or the default static IP address, you can set your own static IP address:

1. Select the CONFIG button and use the SELECT knob to navigate to parameter 2.1 IP CONFIG. Use the ADJUST knob to select Static.
2. Turn SELECT to navigate to parameter 3.2 IP ADDRESS. The display shows the default static IP address: 192.168.0.2.
3. Change the IP address as follows.
 - A. Push the ADJUST knob momentarily so that the first octet (set of numbers) blinks, and then turn ADJUST to change the numbers.
 - B. Turn SELECT to advance to the next set of numbers, and turn ADJUST to set these numbers.
 - C. Continue using SELECT and ADJUST to set the full address.
 - D. When finished, push ADJUST momentarily to save the address.
4. Turn SELECT to advance to 3.3 Subnet Mask. Use the SELECT and ADJUST knobs as in the previous step to set the desired subnet mask.
5. Turn SELECT to advance to 3.4 Default Gateway. Use the SELECT and ADJUST knobs as in the previous step to set the desired gateway address.
6. Run a browser on the computer and type in the IP address you set for the FS-HDR. You should now see the FS-HDR's Status screen.

When you can access the FS-HDR screens, see ["Browser Remote Control" on page 124](#) for details about configuring the FS-HDR using a browser.

Using Ping to Test the Network Connection

If you have connected the FS-HDR to a computer and set up the IP address and still do not see the FS-HDR screens in your browser, you can ping the network to verify the connection. Simply run the Ping utility from a Mac OS X or Windows PC computer attached directly or on the same LAN as the FS-HDR as described below:

Mac Ping Procedure

1. Find the Utilities Folder inside of the Applications Folder.
2. Locate the "Terminal" utility application and double-click it.
3. On the FS-HDR, select the STATUS button and go to System Status menu (with the FS-HDR name) to read the unit's currently configured IP address.

NOTE: The STATUS menu always shows the FS-HDR's current IP address. The IP address on the CONFIG menu is a database entry, which occasionally may not be the address the unit is using.

4. At the Mac terminal prompt, enter ping and the IP address noted in [Step 3](#) above. For example: ping 192.168.0.2 (and press Return).
5. If successful, the ping utility will respond that packets were sent, received and how long it took. For example:
64 bytes from 192.168.0.2: icmp_seq=0 ttl=64 time=0.590 ms
6. If unsuccessful, check the FS-HDR network settings and resolve the problem with your IT administrator.

Windows PC Ping Procedure

1. From the Start button, select the All Programs menu.
2. Select Accessories/Command Prompt from the All Programs list.
3. On the FS-HDR, select the STATUS button and go to System Status menu (with the FS-HDR name) to read the unit's currently configured IP address.

NOTE: The STATUS menu always shows the FS-HDR's current IP address. The IP address on the CONFIG menu is a database entry, which occasionally may not be the address the unit is using.

4. In the PC Command Prompt utility, enter ping and the IP address noted in step 3. For example: ping 192.168.0.2 (and press Return)
5. If successful, the ping utility will respond that packets were sent, received and how long it took. For example:
64 bytes from 192.168.0.2: icmp_seq=0 ttl=64 time=0.590 ms
6. If unsuccessful, check the FS-HDR network settings and resolve the problem with your IT administrator.

Web Browser Control

To control the FS-HDR from a web browser on a network attached computer, enter the FS-HDR IP address as a URL in the browser. For example, if the FS-HDR IP address were "90.0.6.31", you would then type into the web browser: http://90.0.6.31. This topic is explained in greater detail in Chapter 5: Browser Remote Control.

NOTE: The web UI (browser GUI) will keep up with most changes initiated at the front panel. However, the web UI may not reconnect (displays "Disconnected") when network changes are initiated at the FS-HDR front panel. To manually reconnect, type the new IP address into the browser, or click the browser Refresh button. Sometimes the browser caches the old FS-HDR address. If you can't get the browser to connect, try clearing the Browser history to clear the cache, and then enter the new address again.

Software Update Installation

Although the FS-HDR comes from the factory pre-installed with software, it may not be as up-to-date as software posted on the AJA website. This topic describes the steps required to update the software in your AJA FS-HDR.

Download the Latest Software

Current and past releases of FS-HDR software are available on the World Wide Web from AJA's website. To get the software, point your browser to the FS-HDR support page, which will contain helpful FS-HDR information and links to the updates.

<https://www.aja.com/en/family/fs>

Once you're at the update page, you can select FS-HDR software files to download to your Mac or PC for upgrading your local FS-HDR machine.

Unpack the Software

FS-HDR software update files are "ZIP" files that you can open with a number of standard and third party file compression applications. The software image that you'll install on the FS-HDR is a file with a name like FS-HDR_ver_1.0.0.0.bin or similar.

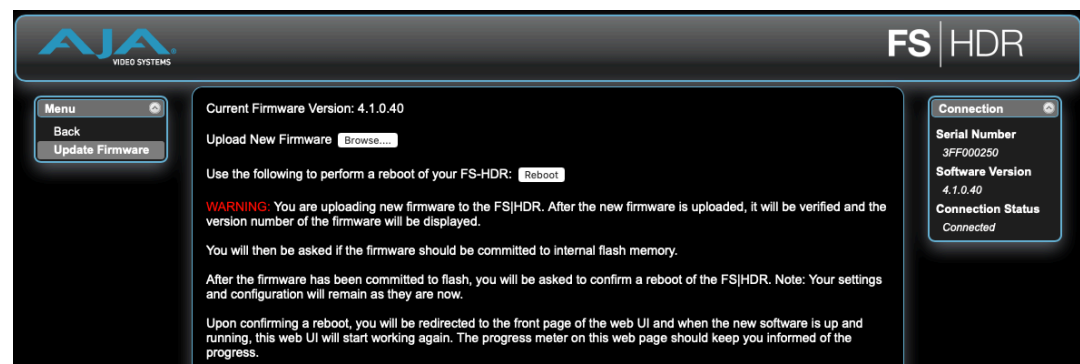
NOTE: Depending on your PC or Mac operating system settings, the ".bin" extension may not be visible to you in a file directory.

Uploading and Installing the Software to the FS-HDR

Uploading and installing the software update requires a PC or Mac that can "see" the FS-HDR via its Ethernet connection. Follow this procedure to install the software:

1. Point your browser at the FS-HDR's upgrade page by clicking on the Firmware link at the bottom of the navigation box on the left-hand side of any FS-HDR web page. The FS-HDR web pages are discussed in Chapter 5.

Figure 6. Update Firmware Browser Screen



2. Click the Browse... button to find and select the downloaded file. For example: FS-HDR_ver_1.0.0.10.bin contained in the file downloaded from AJA.
3. Click OK when asked if you want to Upload Firmware. The file uploads to the FS-HDR and is tested for validity. Incomplete, corrupted, or non-FS-HDR files are rejected. Wait for the procedure to complete—it will take only a few minutes. Progress bars show upload progress.

4. Click Commit Uploaded Firmware when prompted after the upload is finished. Progress bars show progress as the file is written to flash memory.
5. Click Restart FS-HDR with New Firmware to restart the FS-HDR. This will take the FS-HDR off line for a minute or two. During the restart, progress is shown in the connection area in the upper right corner of the FS-HDR Status screen. After restart, the FS-HDR will be running the new software.

NOTE: If upgrading an FS-HDR from v2.5 (or earlier) to v2.6 (or newer) firmware, the ten User LUT slots can be pre-loaded with a Unity LUT. This simple operation can be performed in the FS-HDR web GUI. In the "User LUT" menu, select "Overwrite All" in the "Overwrite with Unity" parameter at the bottom of the page.

6. Once these steps are complete, the FS-HDR will be running the software, and the Software Version on the Status screen shows the new version number. Check that the new software is running by bringing up the FS-HDR web page again; the software version is displayed at the top of all FS-HDR web screens. If the FS-HDR did not update successfully, run through the update steps again.

NOTE: The configuration of the FS-HDR prior to the upgrade is preserved. The unit returns to service exactly as it was before the upgrade.

If there is a power outage or glitch during the software download, the FS-HDR will boot the older software version and you can restart the upgrade process. This happens because the FS-HDR has been designed with a safety feature where an internal "safe" copy of the previous software is retained in the event the updating process fails.

System Cabling

Four Channel Mode Configuration Examples

In Four Channel Mode each Video Processor can receive a different video signal and independently process that signal. All incoming embedded audio, even on inputs not routed to a Video Processor, are dis-embedded and sent to the Audio Processor.

NOTE: In the following examples, U, V, W, X, Y, and Z represent different complete signals, which may be carried on one or more connectors.

Four Channel Mode Input Examples

Figure 7. Four Channel Mode, Four BNC Inputs

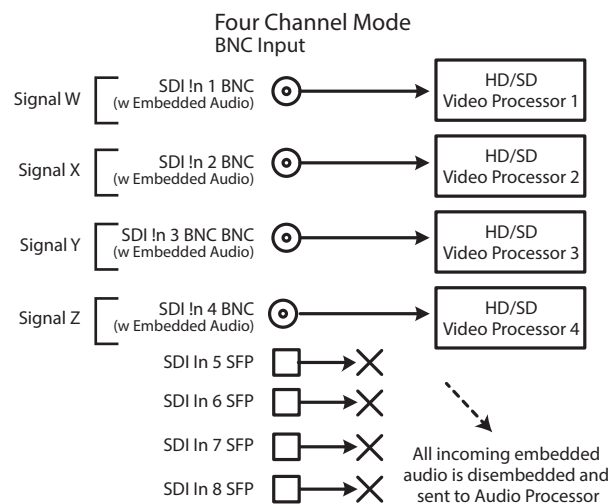


Figure 8. Four Channel Mode, Four SFP Inputs

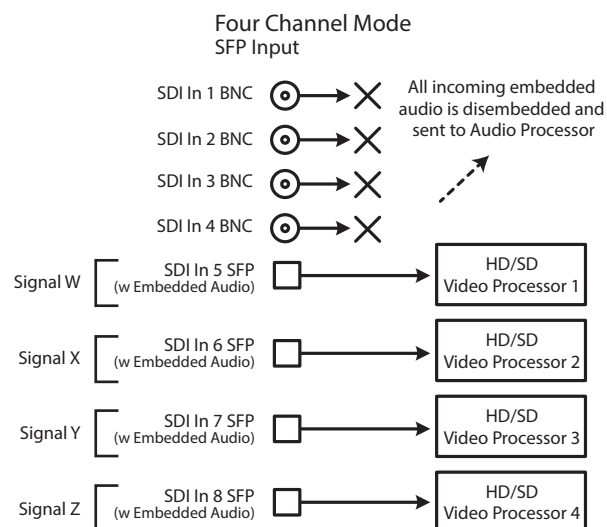


Figure 9. Four Channel Mode, BNC and SFP Inputs

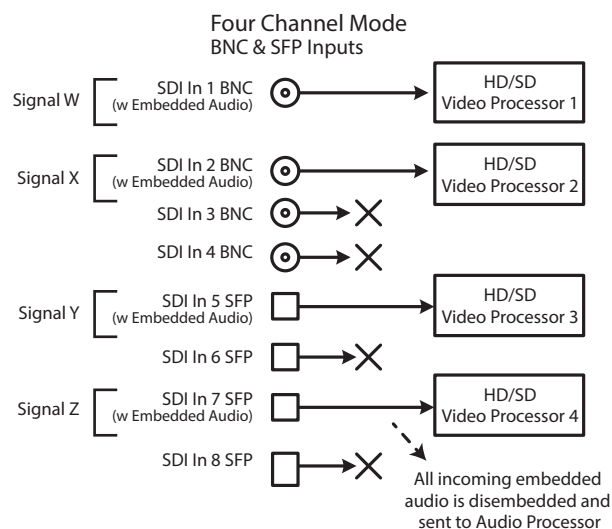
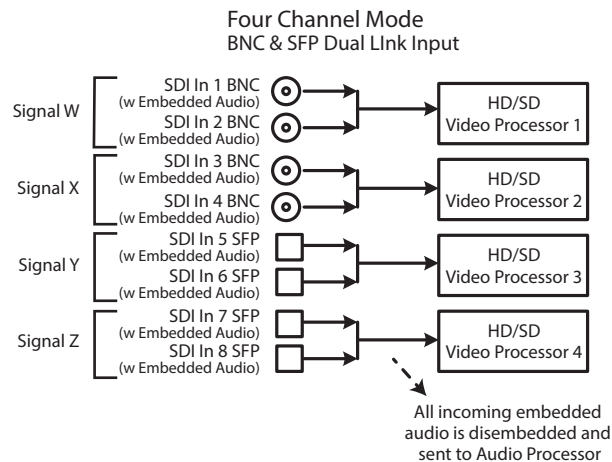
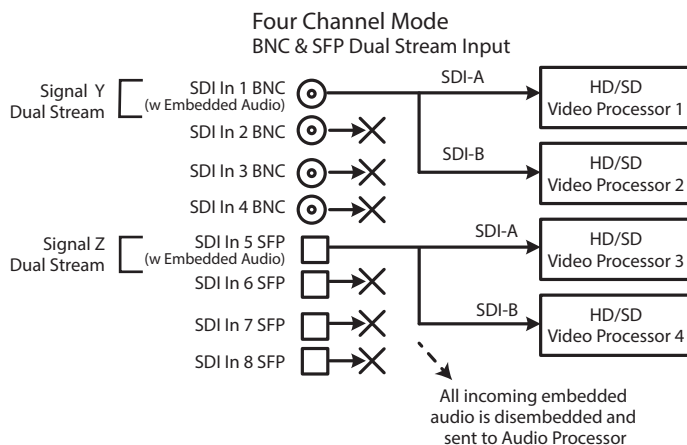


Figure 10. Four Channel Mode, Dual Link Inputs



For Dual Stream input, two independent video image signals are transported over a single link (SDI-A and SDI-B). Each video image requires a separate Video Processor, so a total of two Dual Stream signals can be received for processing. Sixteen channels of embedded audio can be carried on each video signal, so up to 64 embedded audio channels can be routed to the FS-HDR Audio Processor.

Figure 11. Four Channel Mode, Dual Stream Inputs



Four Channel Mode Output Examples

In Four Channel Mode each Video Processor can output a different processed video signal. Depending on configuration, output signals can be duplicated on additional available output connectors.

The video output signal from each Video Processor can also carry embedded audio on the first link of that signal. When video signals are duplicated, the first link of that duplicated video signal will also carry that same embedded audio.

Figure 12. Four Channel Mode, Single Link Outputs

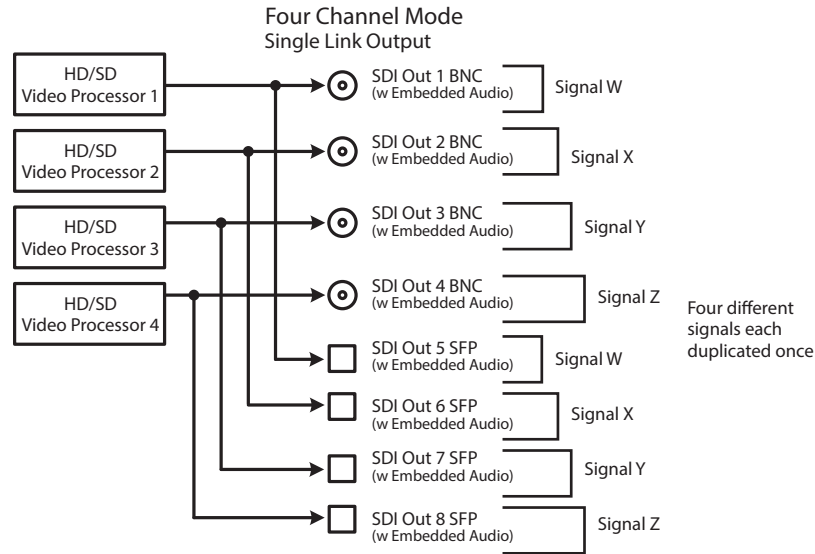
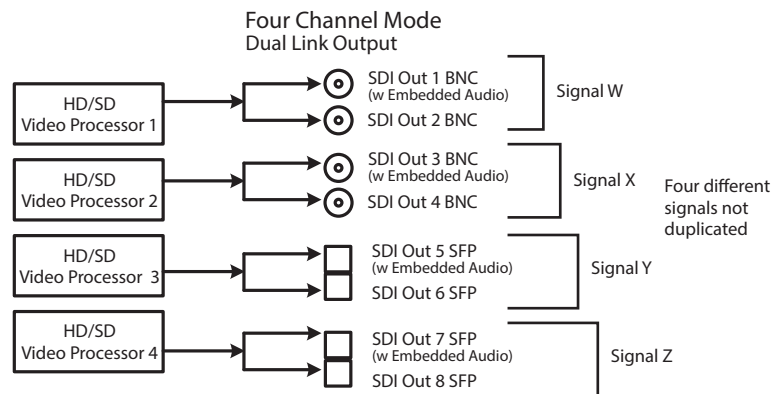


Figure 13. Four Channel Mode, Dual Link Outputs

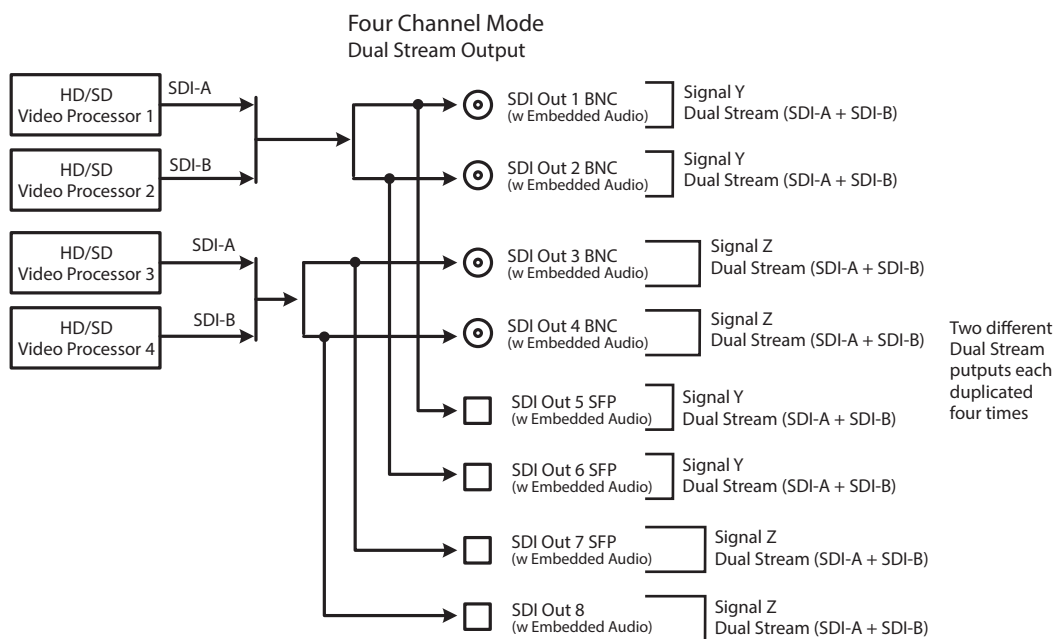


For Dual Stream output, video images from two Video Processors can feed a single output connector, so two different Dual Stream signals can be output. A Dual Stream signal carries two video images (SDI-A and SDI-B).

The FS-HDR can also be configured to route only the Dual Stream SDI-A or SDI-B video image signal to an output connector.

Sixteen channels of embedded audio can be carried on each video signal, so each Dual Stream output can carry up to 32 embedded audio channels.

Figure 14. Four Channel Mode, Dual Stream Outputs



Single Channel Mode Configuration Examples

Single Channel Mode has one 4K/UltraHD Video Processor, and all incoming video is routed to that processor. All incoming embedded audio, even on inputs not routed to the Video Processor, are dis-embedded and sent to the Audio Processor.

Single Channel Mode Input Examples

Figure 15. Single Channel Mode, 1-4 Quad Link BNC Input

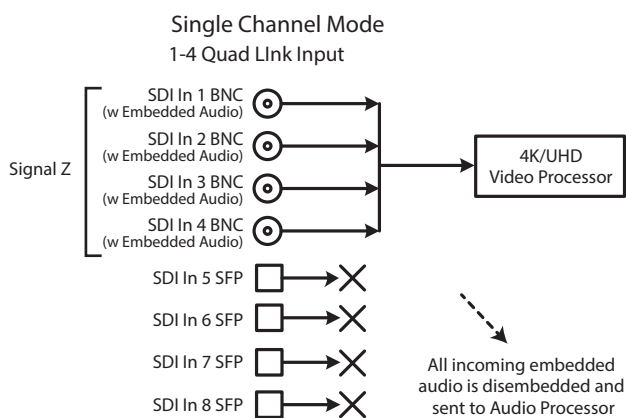


Figure 16. Single Channel Mode, 5-8 Quad Link SFP Input

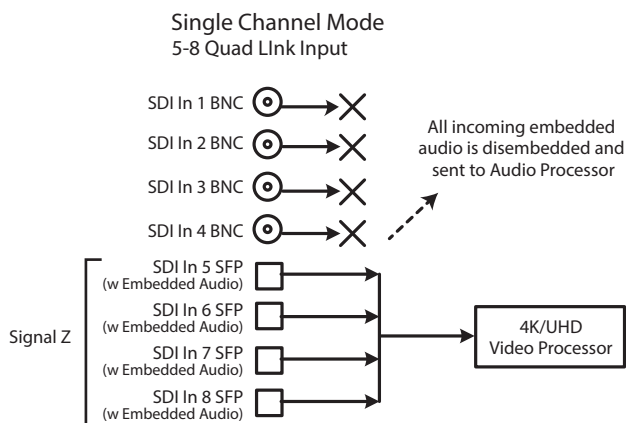


Figure 17. Single Channel Mode, Dual Link Input

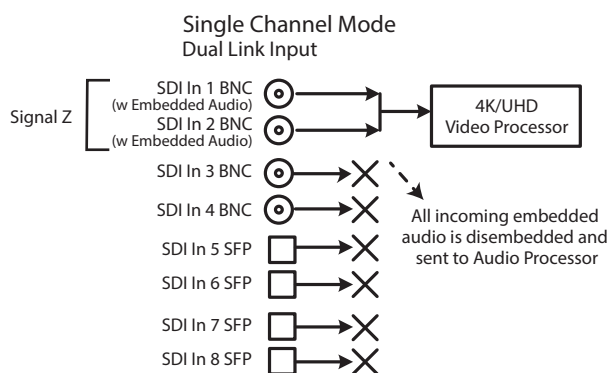
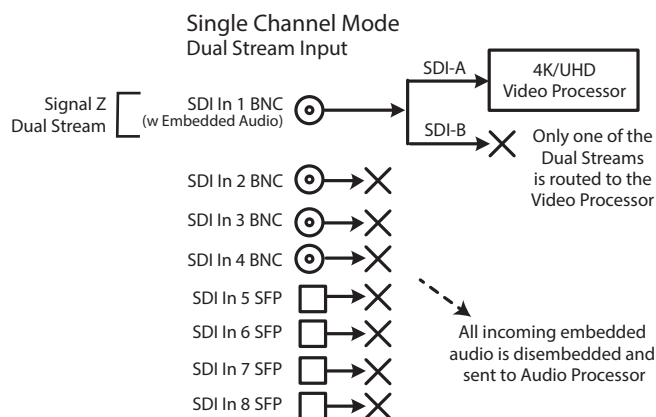


Figure 18. Single Channel Mode, Dual Stream Input



Single Channel Mode Output Examples

In Single Channel Mode, depending on configuration, output signals can be duplicated on additional available output connectors.

The video output signal from the Video Processor can also carry embedded audio on the first link of that signal. When video signals are duplicated, the first link of that duplicated video signal will also carry that same embedded audio.

Figure 19. Single Channel Mode, Quad Link Outputs

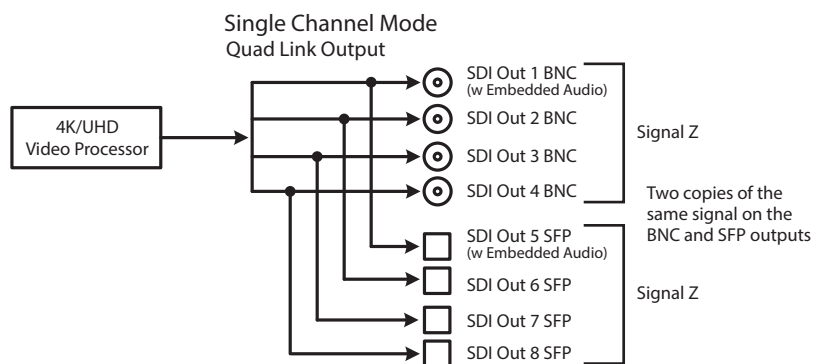


Figure 20. Single Channel Mode, Single Link Outputs

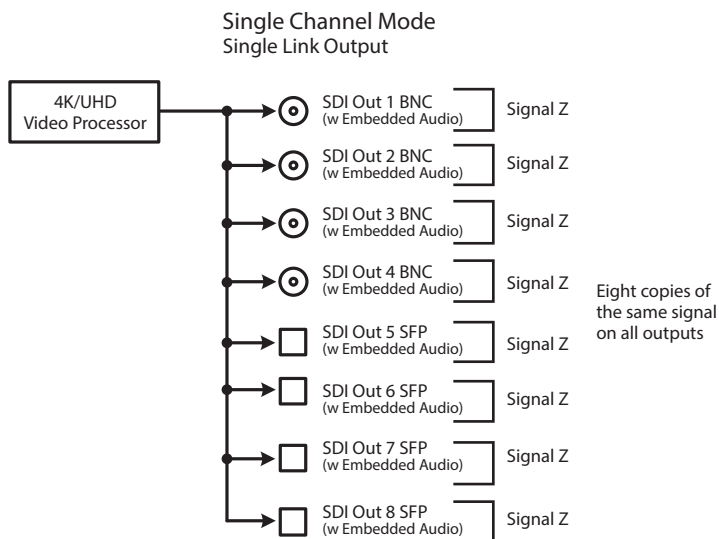
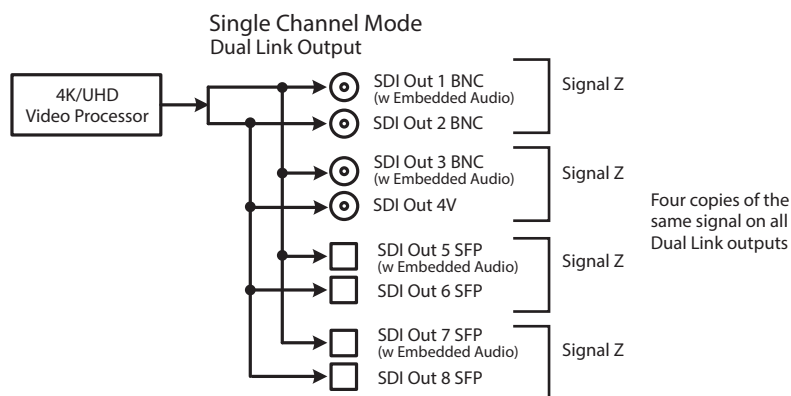
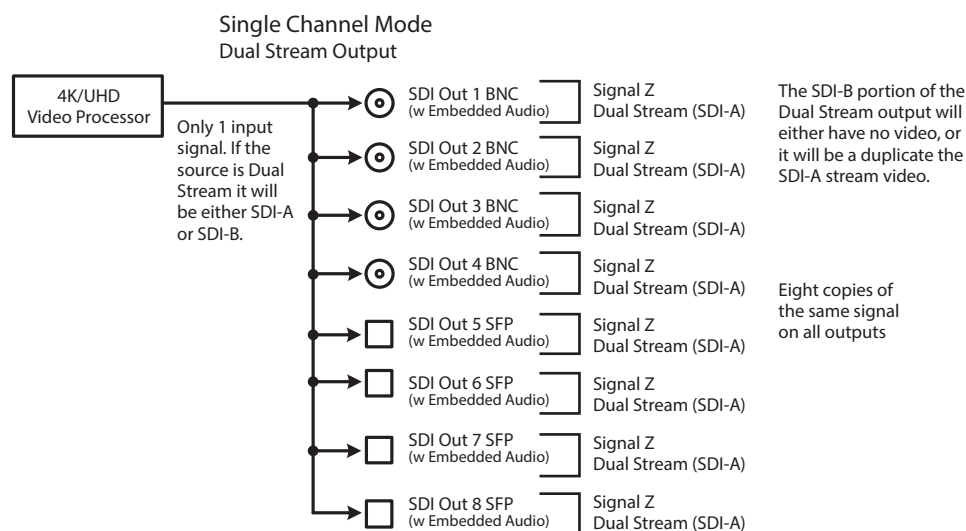


Figure 21. Single Channel Mode, Dual Link Outputs



Because Single Channel Mode has only one Video Processor, two different video output images cannot be created. When configured for Dual Stream output in Single Channel Mode, the SDI-B portion of the output signal will either have no video, or will be a copy of the SDI-A stream ([Figure 22 on page 42](#)).

Figure 22. Single Channel Mode, Dual Stream Outputs



Local Monitoring with the FS-HDR

Using the SDI (BNC) and HDMI Monitor Outputs

To support the widest range of monitoring devices, the FS-HDR provides both an SDI (BNC) and an HDMI Monitor output connector. These connectors support up to 2Kp 60 video, with embedded audio.

These two connectors output the same signal in Four Channel and Single Channel Modes. For example if the monitored output is HLG, the SDI and HDMI Monitor outputs will also be HLG. In addition, the HDMI Monitor output signal carries HDR metadata, so HDR capable HDMI displays will show accurate colors. In Four Channel Mode, these outputs can be assigned to monitor any one of the four FS-HDR channels. In Single Channel Mode, a 4K/UltraHD signal is automatically down-converted to 2K/HD on the monitor outputs. This permits easy confidence monitoring of an FS-HDR output on an HD display.

In Enhanced Single Channel Mode (4K/UltraHD input and output), the signals sent to the SDI (BNC) Monitor output and the HDMI Monitor output can be different. The HDMI output is the same as above, being a down-converted version of the FS-HDR's main output with the same HDR or SDR color processing. In this mode, however, you can configure the SDI (BNC) Monitor output to be a different down-converted format, and you can apply different color transforms to that SDI Monitor output, which can be very useful. For example:

- If you are creating a live UltraHD HDR program, you can configure the SDI Monitor output to also deliver a 1080i or 720p SDR signal.
- You can do a side by side comparison of an UltraHD/HDR program with an HD/SDR version. The configured SDI Monitor output shows what the HDR content will look like if transformed to SDR with the FS-HDR at a later time.

Using SFPs for Monitoring

Additional monitoring solutions are available with the FS-HDR when using optional SFPs for additional SDI outputs.

- When delivering a 4K/UltraHD output in Single Channel mode, the FS-HDR can be equipped with optional SFPs to provide a second 12G-SDI or quad-link 3G-SDI 4K/UltraHD output. This output can be used to feed a 4K SDI monitor.

- You can provide four channel monitoring when in Four Channel mode. By using the SFPs to provide an additional four outputs, each channel will have a second SDI output for monitoring.

GPI Connections

The FS-HDR has four GPI inputs and four GPI outputs. The GPI inputs and outputs are electrically isolated from the power and ground on the FS-HDR frame. Electrical isolation is provided for up to four pieces of external equipment.

See ["GPI Pinouts" on page 169](#) for information on how to wire the GPI connector to work with external devices that you want to use to control the FS-HDR or that you want the FS-HDR to control.

Stand Alone Tests

The stand alone tests can be performed without a computer, using the FS-HDR front panel controls and rear connections. The following procedures assume the FS-HDR is at factory defaults (taken from a newly opened box). If not set to defaults, the FS-HDR may behave differently.

NOTE: FS-HDR units are configured at the factory to operate in Four Channel Mode.

First Power Up

The following workflow powers up a default FS-HDR and demonstrates some example alarms.

Setup

- Ensure the FS-HDR is completely disconnected (all video, audio, network, and power connector ports are empty).

Procedure

1. Connect both FS-HDR power cords to mains AC and allow time for the unit to boot up. Observe the front panel LEDs.
 - The REF LED will light red, indicating an alarm condition. By default the FS-HDR is configured to operate genlocked to an external reference signal.
2. Press the front panel STATUS button, then turn the SELECT knob to view various Status menus.
 - The Status menu for Video Processor 1 will report No Input for IN1, the port is disconnected), and the GEN (Genlock) parameter will report Ref (configured for external reference) but will also report No Input.

Video Format Status screen			Video Format Alarm Status screen		
IN1	SDI 1	No Input	IN1	SDI 1	OK
BKGD	Black	1080i59	BKGD	Black	OK
GEN	Ref	No Input	GEN	Ref	No Ref
OUT1		1080i59	Rate		59/29/23

3. Connect a 1080i59.94 HD tri-level sync reference signal to one of the FS-HDR Ref Loop BNCs, and connect a 75 ohm terminator to the other Ref BNC.
 - The REF LED will light blue, indicating the FS-HDR is genlocked to reference.
 - The Status menu GEN parameters will report Ref and indicate the format of the incoming reference signal or OK.

- However, because the FS-HDR is still not receiving a compatible video input, No Input, will be reported for IN1.

Video Format Status screen			Video Format Alarm Status screen		
IN1	SDI 1	No Input	IN1	SDI 1	OK
BKGD	Black	1080i59	BKGD	Black	OK
GEN	Ref	1080i59	GEN	Ref	OK
OUT1		1080i59	Rate		59/29/23

4. Connect a 1080i59.94 SDI video source to the SDI 1 input BNC.
 - The front panel will report 1080i59 and an OK status for SDI 1. This indicates no alarm condition exists.

Video Format Status screen			Video Format Alarm Status screen		
IN1	SDI 1	1080i59	IN1	SDI 1	OK
BKGD	Black	1080i59	BKGD	Black	OK
GEN	Ref	1080i59	GEN	Ref	OK
OUT1		1080i59	OUT1		1080i59

5. Disconnect one of the power cords, leaving the other attached.
 - The front panel PWR LED will light red for the power supply with the removed cord.
 - The PS status will report PS1 (or 2) OFF.
6. Reconnect the power cable. The PWR LED for that power supply will light blue and the power supply status will report OK.

This workflow confirms the FS-HDR powers up successfully and reports reference and power supply alarms.

NOTE: FS-HDR Reference, Power Supply, and Video Format alarms can be disabled, if desired. This will prevent the LEDs from going red, but will not affect SNMP or front panel status displays.

FS-HDR Processing Examples

About FS-HDR Operating Modes

The FS-HDR has two operating modes.

- Single Channel Mode (4K/UltraHD) has one video processing channel capable of 4K/UltraHD video, and supports up and down-conversion between 4K/UltraHD and 2K/HD as well as SD. Single Channel Mode also has a special feature when receiving and outputting 4K or UltraHD, called Enhanced Single Channel Mode. This mode is entered automatically if the output format is set to 4K or UltraHD, and a 4K or Ultra HD input signal is detected. When the FS-HDR is in Enhanced Single Channel Mode it can output both 4K/UltraHD and HD/SD video simultaneously, using the SDI (BNC) Monitor Output.
- 4 Channel Mode (HD/SD) has four video processing channels capable of HD video, and each channel supports independent up and down-conversion between HD and SD video.

NOTE: A reboot is required to change to the other FS-HDR operating mode.

Both operating modes support various types of High Dynamic Range (HDR) and Wide Color Gamut (WCG) video, and can perform conversions between them.

The appropriate FS-HDR operating mode should be selected first, because most parameter setting changes only affect the current operating mode.

To change the FS-HDR operating mode:

1. Press the **CONFIG** System button:

2. Select *2 FS-HDR Mode*
3. Select either *4K/UHD* or *HD/SD* and press ADJUST twice. The FS-HDR will reboot into the other operating mode.

General FS-HDR Setup

For any FS-HDR operation the following general menu items will need to be set correctly for your workflow. Some default FS-HDR settings may be applicable. The following items assume front panel control. Web browser control may require additional network configuration steps.

Select Single or Four Channel Mode (Reboot Required)

Config Menu: *2 FS-HDR Mode*

- HD/SD (Four Channel mode), or 4K/UHD (Single Channel mode)

NOTE: See [Step 1 on page 31](#) for procedure.

Select Frame Rate

Video Menu: *1 Output Frame Rate*

- 59/29/23 (default), or 50/25, or 60/30/24

Select Genlock

Video Menu: *2 Genlock Source*

- Reference (default), or Freerun, or SDI (n)

Configure Video Input

VID (n), INPUT Menu, *1 Input*

- SDI (n) (default), or (n/n) Dual Link, or Quad Link

VID (n), COLOR Menu

- Various HDR input color settings

Configure Video Output

VID (n), FORMAT Menu, *1 Output Format*

- Follow Input (default), or Follow Ref, or (raster/frame rate)

VID (n), COLOR Menu

- Various HDR output color settings

SDR Preview (HDR Output Only)

VID (n), COLOR Menu, *2.3/5.3 SDR Preview*

The SDR Preview parameter can be used to quickly preview what an HDR signal may look like on an SDR monitor, without having to switch between HDR and SDR modes on that monitor (which may go black during the change-over). The FS-HDR default setting is *Off*, and this generally should be used during production. When set to *On*, the HDR signal is cleanly transformed to SDR, allowing quick A/B comparison on an HDR display in HDR mode.

NOTE: *SDR Preview is only active when using the Colorfront Engine Live and Film modes with PQ BT.2020 1000 Nits or Hybrid Log Gamma BT.2100 video is being output.*

Additional Settings

Other more specialized settings not discussed in the Quick Start Guide may also apply to your workflow. Detailed information is presented elsewhere in this *FS-HDR Installation and Operation Guide*.

HD Video Camera to UltraHD HDR Live Production

The following workflow demonstrates feeding an HD video camera signal to an UltraHD HDR capable video switcher through the FS-HDR for a live production. In this example a Canon camera's HD Log 2 output is converted to UltraHD Hybrid Log Gamma.

Figure 23. Single Channel Mode, HD Up Conversion to UltraHD HDR

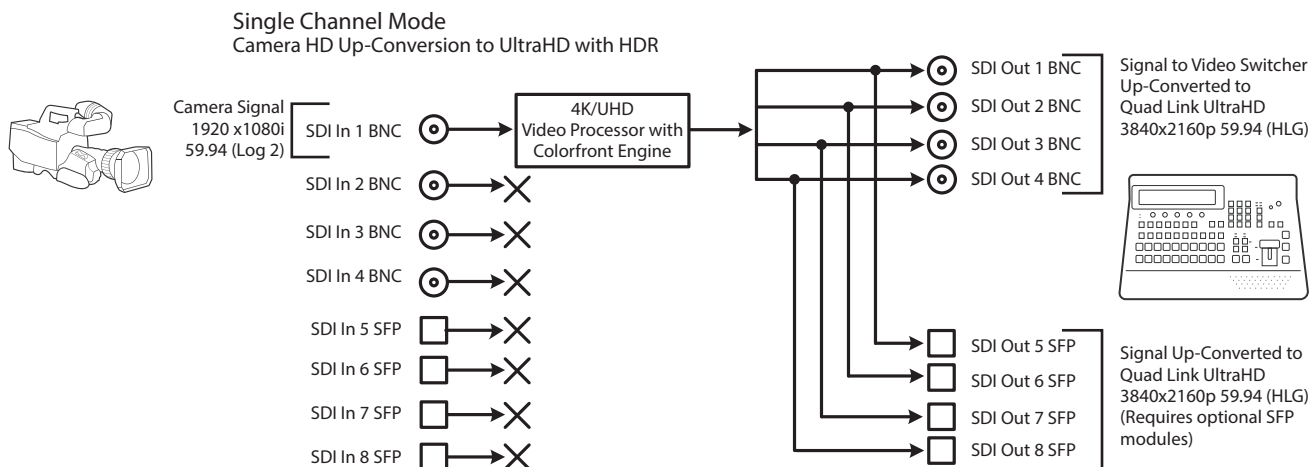


Table 2. Menu Settings for Single Channel Mode, Up Conversion

Channel Select Button	Video Button	Menu Name	Setting
VID1	INPUT	1 Input	SDI1
VID1	FORMAT	1 Output Format	UHD2160p5994
VID1	FORMAT	3.0 Link Cfg SDI1-4	Quad Link LvlA
VID1	FORMAT	4.0 Link Cfg SDI5-8	Quad Link LvlA
VID1	FORMAT	5.0 Output Image Mapping	Quadrant or 2SI (as required)
VID1	COLOR	3.0 Transform	Colorfront Engine Live
VID1	COLOR	3.1 Dyn Range&Gamut IN	Canon Log 2 (match to camera)
VID1	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID1	COLOR	3.3 SDR Preview	Off (default)

Setup

- Ensure the FS-HDR is receiving a valid reference signal. Connect a 1080i59.94 HD tri-level sync signal to one of the Ref Loop BNC connectors, and terminate the other Ref Loop BNC connector.
- Configure the camera (for example, SDI 1080i59.94 Canon Log 2)
- Connect the camera's SDI output connector to the SDI1 input on the rear of the FS-HDR. Once connected the FS-HDR front panel VID IN LED will light.
- Connect the four FS-HDR SDI1-4 video output BNC connectors to a UltraHD video production switcher that supports Hybrid Log Gamma.
- View the FS-HDR SDI output signal on a compatible HDR display.

Procedure

System Configuration

1. If the FS-HDR is not already in Single Channel Mode, press the *CONFIG* System button:
 - Select 2 *FS-HDR Mode*, select *4K/UHD* and press the *ADJUST* knob. Wait for the FS-HDR to reboot (not longer than 90 seconds).
2. Press the *VIDEO* System button.
 - Select 1 *Output Frame Rate*, and adjust to *59/29/23*.
 - Select 2 *Genlock Source*, and adjust to *Reference*.

Video Processor Setup

3. Press the *VID1* Channel Select button.
4. Press the *INPUT* Video button.
 - Select 1 *Input*, and adjust to *SDI 1*.
5. Press the *FORMAT* Video button.
 - Select 1 *Output Format*, and adjust to *UHD2160p5994*.
 - Select 3.0 *Link Cfg SDI1-4* and adjust to *QuadLnk LvIA*.
 - Select 5 *Output Image Mapping* and select either *Quadrant* (default) or *2SI* as required for your production.
6. Press the *COLOR* Video button.
 - Select 3.0 *Transform*, and choose *Colorfront Engine Live*.
 - Select 3.1 *Dyn Range&Gamut IN*, and match to the camera, in this example *Canon Log 2*.
 - Select 3.2 *Dyn Range&Gamut OUT* and select *Hybrid Log Gamma BT.2100*.
 - Select 3.3 *SDR Preview* and ensure it is *Off* (default).

NOTE: Turning SDR Preview On allows you to quickly A/B preview on a connected HDR monitor how the video may appear on an SDR display.

7. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI5-8* and adjust to *QuadLnk LvIA* for an additional copy of that converted signal.

The video switcher should now be able to accept the up-converted UltraHD HLG camera signal.

4K HDR to HD HDR Down and Cross-Conversion

The following workflow demonstrates down-converting a Quad Link 4K input to HD, and simultaneously cross-converting the HDR/WCG format, from PQ (HDR-10) to HLG. The 4096x2160 input will be cropped to 3840x2160 and then down-converted.

Figure 24. Single Channel Mode, Down and HDR Cross-Conversion

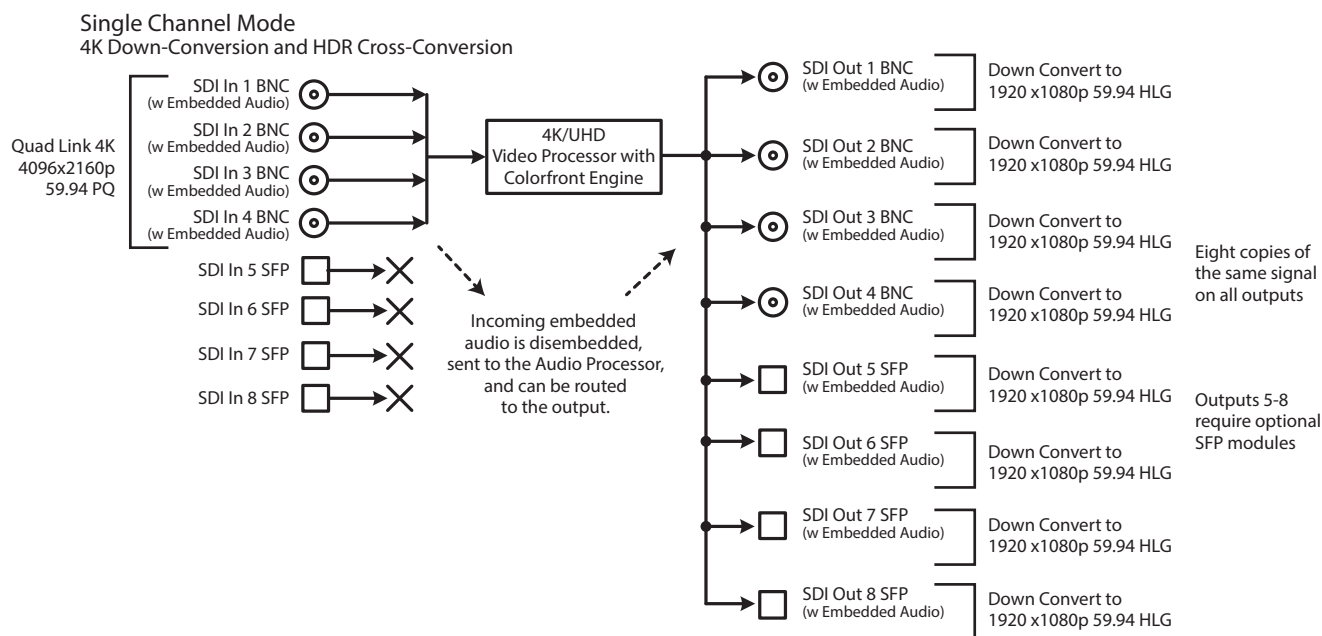


Table 3. Menu Settings for Single Channel Mode, Down and Cross Conversion

Channel Select Button	Video Button	Menu Name	Setting
VID1	INPUT	1 Input	1-4 QuadLink
VID1	FORMAT	1 Output Format	1080p5994
VID1	FORMAT	3.0 Link Cfg SDI1-4	Sngl Link LvIA
VID1	FORMAT	4.0 Link Cfg SDI5-8	Sngl Link LvIA
VID1	COLOR	3.0 Transform	Colorfront Engine Live
VID1	COLOR	3.1 Dyn Range&Gamut IN	PQ BT.2020 1000 Nits
VID1	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID1	COLOR	3.3 SDR Preview	Off (default)

Setup

- Ensure the FS-HDR is receiving a valid reference signal. Connect a 1080p 59.94 HD tri-level sync signal to one of the Ref Loop BNC connectors, and terminate the other Ref Loop BNC connector.
- Connect a Quad Link 4K 59.94 signal to the FS-HDR SDI 1, 2, 3, and 4 video input BNC connectors.
- Connect any one of the FS-HDR SDI BNC output connectors to a compatible HDR video monitor.
- Ensure the FS-HDR Vid (n) COLOR 3.3 *SDR Preview* parameter is set to *Off* (default).

Procedure

System Configuration

1. If the FS-HDR is not already in Single Channel Mode, press the *CONFIG System* button:
 - Select *2 FS-HDR Mode*, select *4K/UHD* and press the ADJUST knob. Wait for the FS-HDR to reboot (not longer than 90 seconds).
2. Press the *VIDEO System* button
 - Select *1 Output Frame Rate*, and adjust to *59/29/23*.
 - Select *2 Genlock Source*, and adjust to *Reference*.

Video Processor Setup

3. Press the *VID1 Channel Select* button
4. Press the *INPUT Video* button
 - Select *1 Input*, and adjust to *1-4 QuadLnk*.
5. Press the *FORMAT Video* button.
 - Select *1 Output Format*, and adjust to *1080p5994*.
 - Select *3.0 Link Cfg SDI1-4* and adjust to *Sngl Lnk LvlA*
6. Press the *COLOR Video* button.
 - Select *3.0 Transform*, and choose *Colorfront*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *PQ BT.2020 1000Nits*.
 - Select *3.2 Dynamic Range&Gamut OUT*, and select *Hybrid Log Gamma BT.2100*.
 - Select *3.3 SDR Preview* and ensure it is *Off* (default).
7. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI5-8* and adjust to *Sngl Lnk LvlA* for an additional copy of that converted signal.

The down-converted HD signal should now be present on the connected HDR video monitor.

Multiple Legacy Device SDR To HDR Live Conversion

The following workflow demonstrates simultaneously converting multiple legacy device SD and HD signals for an HD HDR production. In this example, signals from two legacy SDR HD cameras, a legacy SD Video Replay system, and a legacy SD Character Generator are up-converted or transformed to HLG for a live HDR production. Four Channel mode operation is required.

Figure 25. Four Channel Mode Example, Four Conversions

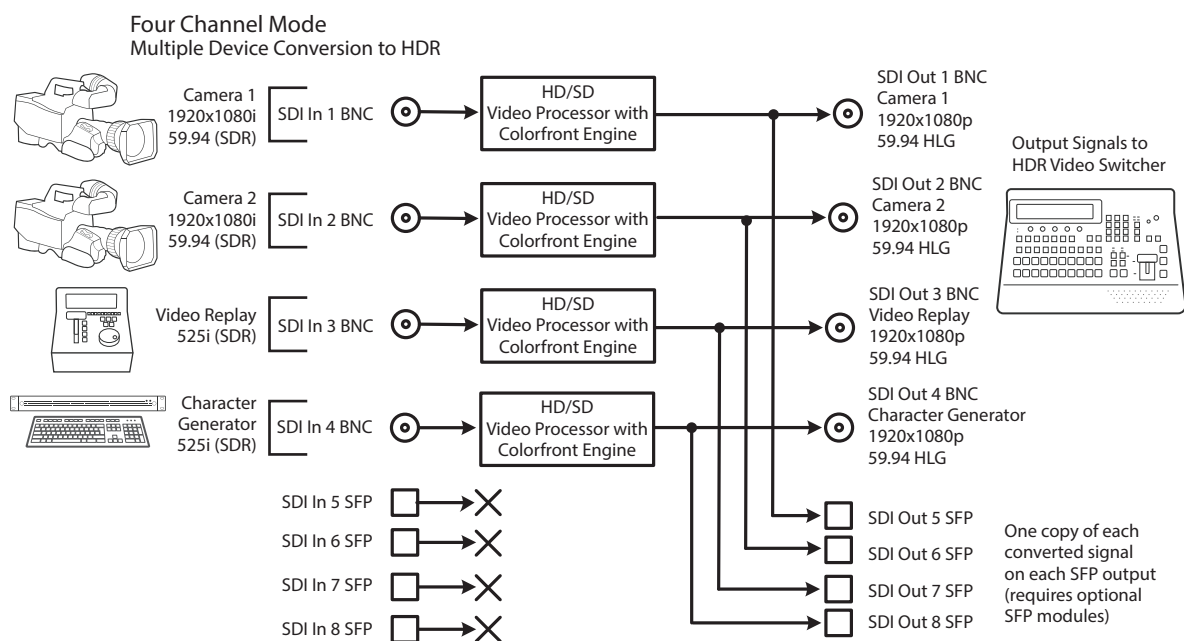


Table 4. Menu Settings for Four Channel Mode Example, Two Conversions

Channel Select Button	Video Button	Menu Name	Setting
VID1	INPUT	1 Input	SDI1
VID1	FORMAT	1 Output Format	1080p5994
VID1	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvlA
VID1	FORMAT	4.0 Link Cfg SDI5	Sngl Link LvlA
VID1	COLOR	3.0 Transform	Colorfront Engine Live
VID1	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID1	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID2	INPUT	1 Input	SDI2
VID2	FORMAT	1 Output Format	1080p5994
VID2	FORMAT	3.0 Link Cfg SDI2	Sngl Link LvlA
VID2	FORMAT	4.0 Link Cfg SDI6	Sngl Link LvlA
VID2	COLOR	3.0 Transform	Colorfront Engine Live
VID2	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID2	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID3	INPUT	1 Input	SDI3
VID3	FORMAT	1 Output Format	1080p5994
VID3	FORMAT	3.0 Link Cfg SDI3	Sngl Link LvlA
VID3	FORMAT	4.0 Link Cfg SDI7	Sngl Link LvlA
VID3	COLOR	3.0 Transform	Colorfront Engine Live
VID3	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID3	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100

Channel Select Button	Video Button	Menu Name	Setting
VID4	INPUT	1 Input	SDI4
VID4	FORMAT	1 Output Format	1080p5994
VID4	FORMAT	3.0 Link Cfg SDI4	Sngl Link LvlA
VID4	FORMAT	4.0 Link Cfg SDI8	Sngl Link LvlA
VID4	COLOR	3.0 Transform	Colorfront Engine Live
VID4	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID4	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100

Setup

- Ensure the FS-HDR is receiving a valid reference signal. Connect a 1080i59.94 HD tri-level sync signal to one of the Ref Loop BNC connectors, and terminate the other Ref Loop BNC connector.
- Configure the source devices to the desired settings and connect them to SDI1 through SDI 4 BNC inputs on the rear of the FS-HDR. Once connected the LED below the VID1 button on the FS-HDR front panel will light.
- Connect the FS-HDR SDI1 through SDI4 BNC output connectors to a HDR compatible video switcher.
- Ensure the FS-HDR Vid (n) COLOR 3.3 *SDR Preview* parameter is set to *Off* (default).
- View the FS-HDR SDI output signal on a compatible HDR display.

Procedure

System Configuration

1. If the FS-HDR is not already in Four Channel Mode, press the *CONFIG* System button:
 - Select *2 FS-HDR Mode*, select *HD/SD* and press the ADJUST knob. Wait for the FS-HDR to reboot (not longer than 90 seconds).
2. Press the *VIDEO* System button.
 - Select *1 Output Frame Rate*, and adjust to *59/29/23*.
 - Select *2 Genlock Source*, and adjust to *Reference*.

Video Processor 1 Setup

3. Press the *VID1* Channel Select button
4. Press the *INPUT* Video button
 - Select *1 Input*, and adjust to *SDI1*.
5. Press the *FORMAT* Video button.
 - Select *1 Output Format*, and adjust to *1080p5994*.
6. Press the *COLOR* Video button.
 - Select *3.0 Transform*, and choose *Colorfront Engine Live*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *SDR BT.709 100 Nits*.
 - Select *3.2 Dyn Range&Gamut OUT*, and select *Hybrid Log Gamma BT.2100*.
7. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI5* and adjust to *Sngl Lnk LvlA* for an additional copy of that converted signal.

8. Press the **VID2, 3 or 4 Channel Select** buttons and repeat the Video Processor 1 setup steps described above.

The video switcher should now be able to accept all the converted to HLG signals.

Multiple Simultaneous HDR and SDR Distribution

The following workflow demonstrates simultaneously distributing HDR and SDR content. In this example, the FS-HDR converts one HDR input to a different HDR format output and also converts it to an SDR output. Simultaneously the FS-HDR also converts two other signals, one from a BNC input, and the other from an SFP module input. Four Channel mode operation is required.

Figure 26. Four Channel Mode Example, Four Conversions of Three Sources

Four Channel Mode
Simultaneous HDR and SDR Distribution

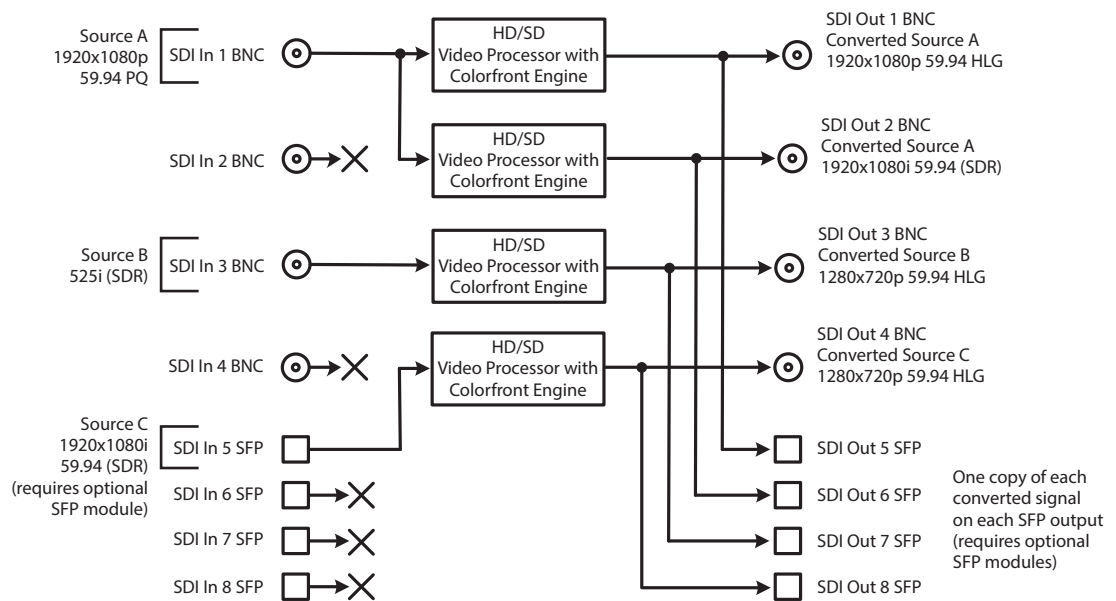


Table 5. Menu Settings for Four Conversions of Three Sources

Channel Select Button	Video Button	Menu Name	Setting
VID1	INPUT	1 Input	SDI1
VID1	FORMAT	1 Output Format	1080p5994
VID1	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvIA
VID1	FORMAT	4.0 Link Cfg SDI5	Sngl Link LvIA
VID1	COLOR	3.0 Transform	Colorfront Engine Live
VID1	COLOR	3.1 Dyn Range&Gamut IN	PQ BT.2020 1000 Nits
VID1	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID2	INPUT	1 Input	SDI1
VID2	FORMAT	1 Output Format	1080i5994
VID2	FORMAT	3.0 Link Cfg SDI2	Sngl Link LvIA
VID2	FORMAT	4.0 Link Cfg SDI6	Sngl Link LvIA
VID2	COLOR	3.0 Transform	Colorfront Engine Live
VID2	COLOR	3.1 Dyn Range&Gamut IN	PQ BT.2020 1000 Nits

Channel Select Button	Video Button	Menu Name	Setting
VID2	COLOR	3.2 Dyn Range&Gamut OUT	SDR BT.709 100 Nits
VID3	INPUT	1 Input	SDI3
VID3	FORMAT	1 Output Format	720p5994
VID3	FORMAT	3.0 Link Cfg SDI3	Sngl Link LvIA
VID3	FORMAT	4.0 Link Cfg SDI7	Sngl Link LvIA
VID3	COLOR	3.0 Transform	Colorfront Engine Live
VID3	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID3	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100
VID4	INPUT	1 Input	SDI5
VID4	FORMAT	1 Output Format	720p5994
VID4	FORMAT	3.0 Link Cfg SDI4	Sngl Link LvIA
VID4	FORMAT	4.0 Link Cfg SDI8	Sngl Link LvIA
VID4	COLOR	3.0 Transform	Colorfront Engine Live
VID4	COLOR	3.1 Dyn Range&Gamut IN	SDR BT.709 100 Nits
VID4	COLOR	3.2 Dyn Range&Gamut OUT	Hybrid Log Gamma BT.2100

Setup

- Ensure the FS-HDR is receiving a valid reference signal. Connect a 1080i59.94 HD tri-level sync signal to one of the Ref Loop BNC connectors, and terminate the other Ref Loop BNC connector.
- Connect sources A and B to the FS-HDR SDI 1 and SDI 3 Input BNCs.
- Install an optional SFP module into the FS-HDR SDI 5 Input cage and connect the source cable.
- Connect the FS-HDR SDI outputs to the downstream devices.
- Ensure the FS-HDR Vid (n) COLOR 3.3 *SDR Preview* parameter is set to *Off* (default).
- View the FS-HDR SDI output signals on a compatible HDR or SDR display.

Procedure

System Configuration

1. If the FS-HDR is not already in Four Channel Mode, press the *CONFIG* System button:
 - Select 2 *FS-HDR Mode*, select *HD/SD* and press the ADJUST knob. Wait for the FS-HDR to reboot (not longer than 90 seconds).
2. Press the *VIDEO* System button
 - Select 1 *Output Frame Rate*, and adjust to 59/29/23.
 - Select 2 *Genlock Source*, and adjust to *Reference*.

Video Processor 1 Setup

3. Press the *VID1* Channel Select button.
4. Press the *INPUT* Video button.
 - Select 1 *Input*, and adjust to *SDI1*.
5. Press the *FORMAT* Video button.
 - Select 1 *Output Format*, and adjust to 1080p5994.

6. Press the *COLOR* Video button.
 - Select *3.0 Transform*, and choose *Colorfront Engine Live*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *PQ BT.2020 1000 Nits*.
 - Select *3.2 Dyn Range&Gamut OUT*, and select *Hybrid Log Gamma BT.2100*.
7. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI5* and adjust to *Sngl Lnk LvIA* for an additional copy of that converted signal.

Video Processor 2 Setup

8. Press the *VID2* Channel Select button.
9. Press the *INPUT* Video button.
 - Select *1 Input*, and adjust to *SDI1* (same input as Video Processor 1).
10. Press the *FORMAT* Video button.
 - Select *1 Output Format*, and adjust to *1080p5994*
11. Press the *COLOR* Video button.
 - Select *3.0 Transform*, and choose *Colorfront Engine Live*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *PQ BT.2020 1000 Nits*.
 - Select *3.2 Dyn Range&Gamut OUT*, and select *SDR BT.709 100 Nits*.
12. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI6* and adjust to *Sngl Lnk LvIA* for an additional copy of that converted signal.

Video Processor 3 Setup

13. Press the *VID3* Channel Select button.
14. Press the *INPUT* Video button.
 - Select *1 Input*, and adjust to *SDI3*.
15. Press the *FORMAT* Video button.
 - Select *1 Output Format*, and adjust to *720p5994*.
16. Press the *COLOR* Video button.
 - Select *3.0 Transform*, and choose *Colorfront Engine Live*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *SDR BT.709 100 Nits*.
 - Select *3.2 Dyn Range&Gamut OUT*, and select *Hybrid Log Gamma BT.2100*
17. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI7* and adjust to *Sngl Lnk LvIA* for an additional copy of that converted signal.

Video Processor 4 Setup

18. Press the *VID4* Channel Select button.
19. Press the *INPUT* Video button.
 - Select *1 Input*, and adjust to *SDI5*.
20. Press the *FORMAT* Video button.
 - Select *1 Output Format*, and adjust to *720p5994*.
21. Press the *COLOR* Video button.
 - Select *3.0 Transform*, and choose *Colorfront Engine Live*.
 - Select *3.1 Dyn Range&Gamut IN*, and select *SDR BT.709 100 Nits*.
 - Select *3.2 Dyn Range&Gamut OUT*, and select *Hybrid Log Gamma BT.2100*
22. If you have optional SFP output modules installed, you can select *FORMAT 4.0 Link Cfg SDI8* and adjust to *Sngl Lnk LvIA* for an additional copy of that converted signal.

Dual Stream Signal Separation

The following workflow demonstrates separating two Dual Stream inputs and routing the signals to different outputs.

NOTE: In the following example, U, V, W, X, Y, and Z represent different complete signals, which may be carried on one or more connectors.

Figure 27. Four Channel Mode, Dual Stream Inputs Separated

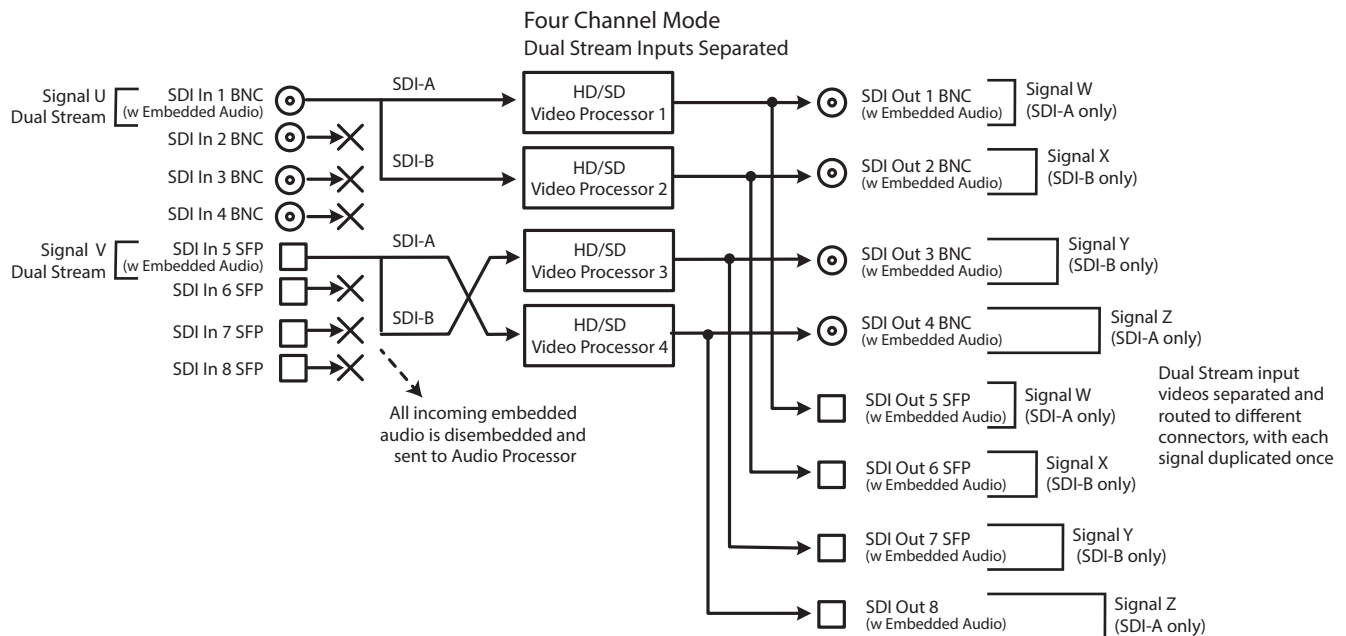


Table 6. FS-HDR Menu Settings for Figure 28.

System Button		Menu Name	Setting
VIDEO		4.1 SDI1 3G Detect	Dual Stream
VIDEO		4.2 SDI2 Input Protect	Dual Stream
Channel Select Button	Video Button	Menu Name	Setting
VID1	INPUT	1 Input	SDI1
VID1	FORMAT	1 Output Format	Follow Input
VID1	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvIA
VID2	INPUT	1 Input	SDI2
VID2	FORMAT	1 Output Format	Follow Input
VID2	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvIA
VID3	INPUT	1 Input	SDI6
VID3	FORMAT	1 Output Format	Follow Input
VID3	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvIA
VID4	INPUT	1 Input	SDI5
VID4	FORMAT	1 Output Format	Follow Input
VID4	FORMAT	3.0 Link Cfg SDI1	Sngl Link LvIA

Chapter 4 – Display Menus

Overview

The FS-HDR is generally controlled using two different methods: (1) direct control using the front panel buttons, knobs, and display menus, (2) remote control using a web browser. This chapter describes the first, using the front panel controls, which is the most direct way to configure and use an FS-HDR. The method, using a web browser is described in the next chapter.

Other FS-HDR control methods include:

- External GPI contacts, described in various locations in this manual.
- The FS-HDR Control Link application, described in ["Chapter 6 FS-HDR Control Link" on page 151](#).
- The AJA REST interface (used by the Control Link application).

FS-HDR Modes, System Parameters, and Video Parameters

The FS-HDR has two operating modes, Four Channel Mode and Single Channel Mode. A fundamental difference between Four Channel Mode and Single Channel Modes is the number of FS-HDR Video Processors available, either four or one.

Menu parameters settings made in Single Channel Mode may or may not affect the operation of FS-HDR when it is set to Four Channel Mode. For example, in Single Channel Mode, setting Output Image Mapping to 2SI will not affect operations in Four Channel Mode, because that parameter only affects 4K or UltraHD formats that are not available in Four Channel mode.

In general, settings made for FS-HDR system operation, like IP address, Output Frame Rate, Genlock, etc. affect operation in both operating modes. These front panel menu settings are accessed via the three System buttons (VIDEO, CONFIG, and AUDIO).

The Channel Select AES menus (and associated LEVEL and DELAY menu parameters for AES and MADI), also affect the FS-HDR in both operating modes. Separate MAP parameters for audio routing, however, are saved for each Video Processor, so changing mapping in one operating mode will not affect mapping in the other mode.

The Channel Select EMBED menus provide LEVEL, DELAY, and MAP menu parameters for embedded SDI audio. Because all operating modes use the same SDI inputs, adjustment to these parameters affects both modes.

Video parameter settings in the Channel Select VID1-4 menus (and associated VIDEO submenus) apply to only the current FS-HDR operating mode. In Four Channel Mode, each VID channel accesses separate settings for only that channel, allowing four different conversions to take place simultaneously. In Single Channel Mode, only one set of video parameters exists that apply to that single channel. Changing video parameters in Four Channel Mode will not affect any video settings stored in Single Channel Mode.

NOTE: One exception is in the REMOTE Menu Group. The Remote Control setting (Local, Remote) affects both Four Channel and Single Channel mode, but separate sets of GPI In and GPI Out settings exist. Four Channel Mode has four sets, while Single Channel Mode has only one set. Separate GPI inputs and outputs are needed for the different functionality available in these modes.

Presets and FS-HDR Operating Mode

Independent sets of FS-HDR Presets exist for Four Channel and Single Channel mode. Forty presets are available in each mode, each can be given a different name, and storing or recalling a preset in Four Channel mode will not affect FS-HDR operation in Single Channel mode.



Caution! In Four Channel Mode, each Preset saves all the settings for all four channels. Storing and recalling a Preset will affect all the settings for all four channels in that mode. Care must be taken to establish a policy for the use of FS-HDR Presets, especially if the FS-HDR is operated in Four Channel mode and the different channels have different users.

NOTE: Presets can be version specific regarding backwards compatibility. For example, presets saved by an FS-HDR running v4.0 firmware cannot be imported to an FS-HDR running older firmware, because the parameters are incompatible.

Parameter Menus

The FS-HDR display presents five major types of menu pages:

- Status pages—present status information that cannot be changed.
- Simple parameter menus—contain a parameter number and name on line 1 and its current value setting on line 2. The line 2 value can be changed using SELECT and ADJUST. Example: Output Format.
- “Take action” parameter menus—contain a parameter number and name on line 1, and the value to “take” on line 2. A “take” prompt may appear on line 3. The line 2 value can be changed using SELECT and ADJUST, and the take or switch to the new value occurs when you press ADJUST momentarily. Examples: Preset Save/Recall.
- Multiple field parameter menus—contain a parameter number and name on line 1 and its current value setting on line 2, consisting of multiple letter or number fields that must each be set individually. The line 2 fields can be changed using SELECT and ADJUST. Example: IP Address.

NOTE: In this chapter, menus unique to an FS-HDR operating mode will be indicated as (4Ch only) or (SingleCh only). Other menus are identical in both Four Channel and Single Channel modes.

STATUS Menu Group

The Status Menu Group contains a series of Status display pages that you can scroll using the SELECT knob. The various Status pages are actually just displays, not menus, since they don’t include menu numbers or editable values. The ADJUST knob doesn’t affect the Status Menu Group display pages.

System Status

This menu shows the FS-HDR’s System Name, IP address and mask, and version number.

System Name		
IP addr	value	Displays the System Name as set in Config menu 1.
IP Mask	value	Shows the IP address.
Version	value	Shows the IP mask.
		Shows the software version number.

NOTE: The STATUS menu always shows the FS-HDR’s current Ethernet settings. The parameters shown on the CONFIG Menu Group IP configuration menu may not display the values the unit is currently using.

Vid 1/2 I/O

(4Ch only) This menu shows the current primary video settings for Video Processors 1 and 2.

IN1	Input Source	Format	Selected (physical) video 1 input & detected format. Selected video output 1 format & selected audio input used on output.
OUT1	Output Source	Format	
IN2	Input Source	Format	Selected (physical) video 2 input & detected format. Selected video output 2 format & selected audio input used on output.
OUT2	Output Source	Format	

Vid 3/4 I/O

(4Ch only) Same as Vid 1/2 I/O status menu, except for Video Processors 3 and 4.

Vid I/O

(SingleCh only) This menu shows the current primary video settings for Video Processor.

IN	Input Source(s)	Format	Selected (physical) video 1-4 inputs & detected format. Selected Genlock source and format.
GEN	Genlock Source	Status	
OUT	Format	AudIn	Selected video output format & selected audio input used on output
Vid CC		Status	Closed Caption status

Vid 1 Format

(4Ch only) This menu shows the current primary video settings for Video Processor 1.

IN1	Input Source	Format	Selected video input source and format.
BKGD	Backgd Source		Selected Background video source.
GEN	Genlock Source	Format	Selected Genlock source and format.
OUT1		Format	Selected video output format.

Vid 2-4 Format

(4Ch only) Same as Vid 1 Format menu, except for Video Processors 2-4.

Vid 1 Alarm

(4Ch only) This menu shows the Video Processor 1 alarm status. Absence of alarm shows as OK. If selections are incompatible, the status of the affected signal shows Incompat.

IN1	Input Source	Status	Video input source alarm status.
BKGD	Backgd Source	Status	Selected Background video source alarm status.
GEN	Genlock Source	Status	Selected Genlock source alarm status.
Rate		Status	System Output Frame Rate (59/29/23.98, 50/25, 60/30/24)

Vid 2-4 Alarm

(4Ch only) Same as Vid 1 Alarm menu, except for Video Processors 2-4.

Vid Alarm

(Single Ch only) This menu shows the Video Processor 1 alarm status. Absence of alarm shows as OK. If selections are incompatible, the status of the affected signal shows Incompat.

IN	Input Source(s)	Status	Video input source alarm status.
GEN	Genlock Source	Status	Selected Genlock source alarm status.
Rate		Status	System Output Frame Rate (59/29/23.98, 50/25, 60/30/24)

Channel Name

Displays the user defined channel names (up to nine characters), as entered through the FS-HDR's web interface.

Vid 1	<Channel Name>	Default channel name is "." (period).
Vid 2	<Channel Name>	
Vid 3	<Channel Name>	
Vid 4	<Channel Name>	

SDI Input

This menu shows the status of all eight SDI inputs.

SDI1	Status	SDI5	Status	Statuses for SDI inputs 1-8: (Format, No Input, No SFP)
SDI2	Status	SDI6	Status	
SDI3	Status	SDI7	Status	
SDI4	Status	SDI8	Status	

Monitor Output

This menu shows the status of the monitor outputs (BNC and HDMI).

Monitor	Status	Output selected for monitoring (Vid1-4 Out)
SDI Fmt	Status	SDI monitor output format.
HDMI Fmt	Status	HDMI monitor output format.
Crop	Status	Crop status (Off, On).

Image Mapping and HDR In and Out

This menu shows the status of Image Mapping (4 Ch Mode) and HDR in and out settings.

IN image	Status	Input Image Mapping setting.
OUT image	Status	Output Image Mapping setting.
IN HDR	Status	Dynamic Range & Gamut IN setting.
OUT HDR	Status	Dynamic Range & Gamut OUT setting.

AES Input

This menu shows the status of all eight AES channel pair inputs. Each can carry a stereo digital audio signal.

AES1	Status	AES5	Status	Statuses for AES inputs 1-8: (Present, No Input)
AES2	Status	AES6	Status	
AES3	Status	AES7	Status	
AES4	Status	AES8	Status	

MADI In/Out

This menu shows the status of the MADI audio inputs and outputs.

BNC In	Mode	Status	BNC input mode (56ch, 64ch), status (Present, No Input)
BNC Out	Mode		BNC output mode
Fib In	Mode	Status	Fiber input mode, status
Fib Out	Mode		Fiber output mode.

Power/Temp Alarm

This menu shows the power supply status of the FS-HDR and the temperature status. If a power supply is unplugged, the display indicates PS OFF or PS Error.

PS1 Status	Status	Displays the state of the PS1 power supply (OK or ERROR).
PS2 Status	Status	Displays the state of the PS 2 power supply (OK or ERROR).
TmpAlarm	Status	Displays a temperature alarm if the FS-HDR overheats.

Caption Status

(4Ch only) This menu shows what type of closed caption data is selected and whether closed caption data is present on the selected video input.

Vid1 CC	Caption Type & Presence	For Video Processors 1-4, selected caption type (SD/HD/Invalid), and presence (Detected/Not detected/Pass Thru).
Vid2 CC	Caption Type & Presence	
Vid3 CC	Caption Type & Presence	
Vid4 CC	Caption Type & Presence	

REMOTE Menu Group

The REMOTE Menu Group lets you set up how you want the FS-HDR to be controlled. Control options include the front panel, a remote computer running a browser, and GPI inputs and outputs.

NOTE: *The Remote Menu Group parameters available on the front panel interact with the browser parameters available on an attached computer, and vice versa. For example, once the Remote Control parameter is set to 'Local Only' from either the browser or front panel, all future settings will only be able to be changed from the front panel. The opposite is true if set to 'Remote Only'. However the Remote Control parameter is always available from the front panel, regardless of how it is set.*

1 Remote Control

Determines whether the FS-HDR panel responds to controls locally from the front panel, from a network attached computer with a web browser, or both. The selected mode is indicated by the color of the REMOTE LED.

Local + Remote (default)	Control from the front panel, a remote control panel, or a network-attached browser. The <i>REMOTE</i> LED lights purple.
Local Only	Control only from the front panel (browsers cannot change parameters). The <i>REMOTE</i> LED lights blue.
Remote Only	Control only from a network attached browser or remote control panel. The <i>REMOTE</i> LED lights red.

1.1 Authentication

Enables or disables an authentication login requirement. By default this parameter is set to Disabled.

When you select Login via the front panel parameter, you must then go to the browser interface to perform a login each time you access the FS-HDR. The browser presents the login screen first, requiring you to log in before you can access any other browser screens. The password is initially set to the default value, but you can change it using the Remote browser screen.

The default password is password.

NOTE: *If authentication is used, it provides only a minimum security safeguard against unauthorized use of the FS-HDR. The authentication mechanism is simple and does not provide robust security.*

Disabled (default)	Disables the requirement for a login password. No password is needed.
Login	Login is required via the web browser interface before changes can be made. After selecting Login, depending on the browser a new browser window may be necessary (i.e. just a page refresh or reload may not get rid of the login page).

2.1–4 GPI IN 1–4 Response

The setting of this parameter determines what happens when a GPI trigger is received at the FS-HDR's GPI Inputs (1–4). A GPI Edge Trigger is defined as a TTL high to low transition. A GPI Level Trigger is a TTL low level.



Caution! GPI Inputs can be used to trigger Presets. When you recall a Preset Configuration, the recalled preset immediately replaces the system's existing configuration. All previous settings are lost unless you have previously stored them in another preset configuration or an exported file.

In Four Channel Mode, each FS-HDR Video Processor can be programmed to perform an action on each of the four GPI Inputs. This means the same GPI input trigger could cause different actions on each channel. In Single Channel Mode, each GPI input can only trigger one action on that Video Processor.



Caution! In Four Channel Mode, each Preset saves all the settings for all four channels. Storing and recalling a Preset will affect all the settings for all four channels in that mode. Care must be taken to establish a policy for the use of FS-HDR Presets, especially if the FS-HDR is operated in Four Channel mode and the different channels have different users.

NOTE: *In the table below, Vid<n> indicates which Video Processor will perform the action in Four Channel Mode, and V1-V4 is displayed on the FS-HDR front panel. In Single Channel Mode Vid appears on the front panel, because only one Video Processor is available.*

No Action (default)	Performs no action.
PRESET 1–10	Recalls the specified PRESET configuration for the current FS-HDR operating mode.
Vid<n> Freeze	Freezes the current video frame at its outputs when the GPI contact is closed, and stops the freeze when the GPI contact is open.

Vid<n> SDI1 In Vid<n> SDI2 In Vid<n> SDI1.2 D Vid<n> SDI3 In Vid<n> SDI4 In Vid<n> SDI3.4 D Vid<n> SDI1-4 Q Vid<n> SDI5 In Vid<n> SDI6 In Vid<n> SDI5.6 D Vid<n> SDI7 In Vid<n> SDI8 In Vid<n> SDI7.8 D Vid<n> SDI5-8 Q	Selects SDI1 as the video input. Selects SDI2 as the video input. Selects Dual-Link mode as the video input. Selects SDI3 as the video input. Selects SDI4 as the video input. Selects Dual-Link mode as the video input. Selects Quad-Link mode as the video input (Single Ch only) Selects SDI5 (SFP) as the video input. Selects SDI6 (SFP) as the video input. Selects Dual-Link mode as the video input. Selects SDI7 (SFP) as the video input. Selects SDI8 (SFP) as the video input. Selects Dual-Link mode for the SDI input. Selects Quad-Link mode as the video input (Single Ch only)
Vid<n> ARC Off Vid<n> ARC LTBX Vid<n> ARC H CP Vid<n> ARC PLBX Vid<n> ARC V CP Vid<n> ARC 14X9	Turns Off aspect ratio conversion. Converts 16:9 anamorphic video to letterbox. Converts 16:9 anamorphic video to 4:3 standard (H crop—crops left and right edges of video). Converts 4:3 standard video to 16:9 anamorphic (pillarbox). Converts letterbox video to 16:9 anamorphic (V crop). Converts 16:9 anamorphic video to 14:9 cropped.
Vid<n> DC Crop Vid<n> DC ANA Vid<n> DC 14X9 Vid<n> DC AuAFD Vid<n> DC LTBX	Down-converts source to cropped 4x3 picture. Down-converts source to anamorphic picture. Down-converts source to 14x9 picture. Down-converts source automatically using the best mode for the input video Active Format Description (AFD) code. Down-converts source to letterbox picture.
Vid<n> UC 4X3PB Vid<n> UC14X9PB Vid<n> UCFLSCR Vid<n> UC LBFUL Vid<n> UC WDZM Vid<n> UC CSTM	Up-converts source to 4x3 pillarbox. Up-converts source to 14x9 pillarbox. Up-converts source to full screen. Up-converts source from letterbox to full. Up-converts source to a wide zoom. Up-converts source to a Custom size.
V<n>in<HDR format> V<n>o<HDR format> V<n>SDR Preview	Selects input SD or High Dynamic Range/Wide Color Gamut to the selected format Selects output SD or High Dynamic Range/Wide Color Gamut to the selected format SDR Preview is On when the GPI contact is closed, and SDR Preview is Off when the CPI contact is open.

Interaction of Presets and GPIs

If you use a GPI input trigger to recall a preset, the recall changes the GPI IN Response setting to whatever GPI IN Response setting the preset contains. As the following examples explain, this feature offers both the power of serial recalls and the possibility of triggering a recall that changes GPI IN Response to something unintended.

Example of a Serial Recall

The advantage of using GPI IN Response with presets is that you can trigger a series or even a looping series of preset recalls. For example, suppose GPI IN 1 Response in Preset 1 is set to Preset 2, and GPI IN Response in Preset 2 is set to Preset 1. Triggering the GPI will toggle between the two presets.

Example of an Unintended Recall

Suppose you trigger GPI IN 1 while the current GPI IN 1 Response parameter is set to Preset 1. This recalls Preset 1 as expected. However, suppose Preset 1 contains a stored GPI IN 1 Response setting of No Action. If you trigger GPI IN 1 later, expecting to recall Preset 1 again, the FS-HDR instead performs No Action. To prevent unexpected changes in the GPI IN Response parameters, set these parameters as desired before storing presets; in the example, set GPI IN 1 to Preset 1 before you store Preset 1.

3.1–4 GPI 1–4 OUT

Determines whether certain FS-HDR events will generate a GPI trigger output at GPI outputs 1, 2, 3, or 4. The GPI interface pinout is presented in ["GPI Pinouts" on page 169](#).

No Action (default) Alarm No Vid<n> input No Ref	Does not trigger a GPI output regardless of event. Generates a GPI out trigger if an internal alarm condition occurs. Generates a GPI out trigger if no video is detected at the input. Generates a GPI out trigger if no video is detected at the Ref input.
---	--

VIDEO Menu Group

The VIDEO Menu Group includes parameters for setting up various FS-HDR system related features (video formats, audio level standards, etc).

1 Output Frame Rate

Selects the system output video frame rate family associated with the video standard.

59/29/23 (default) 50/25 60/30/24	Selects the desired output frame rate family.
---	---

NOTE: Changing the Output Frame Rate selection automatically selects a new value for ["1 Output Format" on page 102](#). Each Frame Rates selection remembers its own Output Format settings.

2 Genlock Source

Selects the source of reference video used for genlock, either automatically or explicitly.

Reference (default) Free run Input SDI<n>	Use the signal on the <i>Ref</i> connector as the genlock source. Free run mode (FS-HDR syncs to its own timebase, not locked to an external source) Use the selected SDI input signal as the genlock source.
--	---

3.1 HDMI Mon 2K Crop

Selects whether to crop 2K HDMI monitor output rasters to 1920 wide (and has no effect on the SDI monitor output).

Off (default) Crop	No cropping occurs on the Monitor Outputs. Left and right sides of the Monitor Outputs are cropped to 1920.
-----------------------	--

3.2 HDMI RGB Range

Selects the output range for the HDMI monitor output (and has no effect on the SDI monitor output). Full allows a range of 0-255 and SMPTE limits the range to 16 to 235 (see note for details).

Full (default) SMPTE	Selects an HDMI output range of 0-255. Selects an HDMI output range of 16-235.
-------------------------	---

3.3 Monitor Map

(4Ch only) Selects which Video Processor output will be sent to the Monitor output. The same video and embedded audio is sent to both the BNC and HDMI connectors.

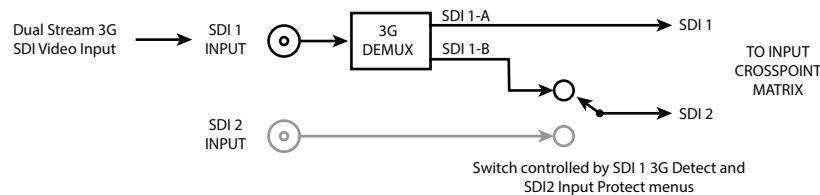
VID1 Output (default) VID2 Output VID3 Output VID4 Output	Selects which Video Processor's output appears on the Monitor Outputs.
--	--

4.1 SDI1 3G Detect

Configures 3G operation of the SDI 1 video input.

Auto Detect (default) 1080p50/60 Dual Stream	Automatically detects presence of 1080p50/60 or Dual Stream video. Configures the SDI1 input for 1080p50/60 (single) video. Configures SDI 1 for Dual Stream 3G video (uses SDI 1 and SDI 2 in Input Crosspoint matrix).
--	--

Figure 28. Dual Stream 3G DeMux Schematic



See [Figure 11 on page 37](#) and [Figure 18 on page 40](#) for more information.

In Auto Detect mode, the hardware looks for SMPTE 352 Payload ID ANC data on the video inputs to determine whether there are two independent 1.5G signals (Dual Stream) or a single 1080p50/60 signal. If there is no SMPTE 352 data, the default is to assume 1080p50/60 (single), but you can manually instruct the FS-HDR to always assume either 1080p50/60 or Dual Stream by selecting one of those choices.

In 1080p50/60 mode, the system always assumes that the input is a single 1080p50/60 signal (even if there is SMPTE 352 data to the contrary).

In Dual Stream mode, the system always assumes that the input consists of two multiplexed independent video streams i.e. 3G-LvIB-DS (even if there is SMPTE 352 data to the contrary). The signals are demuxed as shown.

4.2 SDI2 Input Protect

This parameter allows you to protect Input SDI 2 from being taken by a Dual Stream selection made with SDI1 3G Detect above.

Normal (default) Dual Stream	SDI2 cannot be used by Dual Stream 3G-SDI video on SDI Input 1. Allows SDI2 to be used by a Dual Stream 3G-SDI input present on SDI 1.
---------------------------------	---

In the Normal setting (default), the SDI 2 video signal always comes from the SDI 2 physical input. Choosing Auto Detect or Dual Stream in SDI1 3G Detect does not switch away from the physical input.

In the Dual Stream setting, the FS-HDR assumes both channels of Dual Stream 3G video are muxed onto a single wire at the SDI1 input. The SDI 2 video signal is then taken internally from the SDI 1 Stream B signal instead of the SDI2 In connector.

The following table shows the selections and their results. In the table, SDI1-A and SDI1-B are the two muxed streams entering the SDI1 Input.

SDI-3G Detect Setting	SDI2 Input Protect Setting	1 Video Input Setting	Resulting Input to Crosspoint Matrix
3G-LvIB-DS signal Dual Stream setting, or Auto Detect with ANC Dual Stream data	Dual Stream	SDI1	SDI1-A
		SDI2	SDI1-B
	Normal	SDI1	SDI1-A
		SDI2	SDI2
3G-LvIA signal 1080p 50/60 setting, or Auto Detect with ANC 1080p data, or Auto Detect with no ANC data	Dual Stream	SDI1	SDI1
		SDI2	SDI2
	Normal	SDI1	SDI1
		SDI2	SDI2

See [Figure 11 on page 37](#) and [Figure 18 on page 40](#) for more information.

4.3, 4.5, 4.7 SDI3/5/7 3G Detect

Configures 3G operation of the SDI 3, 5, and 7 video input, using settings similar to ["4.1 SDI1 3G Detect" on page 64](#).

4.4, 4.6, 4.8 SDI4/6/8 Input Protect

This parameter allows you to protect Input SDI 4, 6, and 8 from being taken by a Dual Stream selection, using settings similar to ["4.2 SDI2 Input Protect" on page 65](#).

5 VidProc Bypass

(4Ch only) Routes the input signal assigned to each video processor to the output of that video processor (e.g. - Vid1 outputs are SDI1 and SDI5). All video processor input SDI signals must be locked to each other and the Genlock Source must be set to one of the SDI inputs assigned to a video processor input.

Off (default) On	Video Processor(s) operate normally. Video Processor(s) are bypassed.
---------------------	--

CONFIG Menu Group

The CONFIG Menu Group includes parameters for setting up the FS-HDR's network, system name, SNMP, alarm, and screen saver configurations.

1 System Name

Defines a unique name for the FS-HDR. This same name is used both when displaying systems via the web interface and when displaying the FS-HDR's screen saver.

Variable	Set the system name, up to 20 characters. <i>Default: aja-FS-HDR</i>
----------	--

Name Entry Procedure

Set the name as follows:

1. Push ADJUST momentarily to enter character editing mode.
2. Turn SELECT to advance the blinking cursor to each character.
3. Turn ADJUST to scroll through the choices for each character. These characters are allowed: A through Z (uppercase), a through z (lowercase), numerals, hyphen (-), period (.), and space (blank). Leave the desired character selected and advance to the next one.
4. Push ADJUST to save and activate the name after all characters are defined.
 - To abandon changes before saving, push SELECT.
 - To return to the default name at any time, hold down ADJUST.

NOTE: To eliminate trailing characters to shorten an existing system name, overwrite them with a hyphen (-) or space.

2 FS-HDR Mode

Selects whether the FS-HDR will operate in Four Channel or Single Channel mode. Pressing the ADJUST knob at the "Change Mode?" prompt will reboot the FS-HDR in the other operating mode. During reboot, the display shows [Rebooting], goes dark momentarily, and then shows the percentage of progress as the system reboots. Reboot should take no longer than 90 seconds. This parameter has no default setting (is only be used to change to the other mode) and is not saved in Presets.

HD/SD 4K/UHD	After reboot the FS-HDR will operate in Four Channel (HD/SD) mode. After reboot the FS-HDR will operate in Single Channel (4K/UHD) mode.
-----------------	---

3.1 IP Config

Determines the type of TCP/IP network configuration used by the FS-HDR. Consult your network administrator about how to set this value.

DHCP (default)	Select automatic IP address assignment from the LAN DHCP server. If the FS-HDR cannot find a DHCP server, it fails over to the static IP address.
Static Addr	Assign a static IP address manually (using the following parameter menus). The FS-HDR factory default static IP address is 192.168.0.2.

3.2 IP Address

Determines the static IP address used by the FS-HDR for TCP/IP networking. Consult your network administrator about how to set this value.

IP Address variable	If <i>IP Config</i> is set to <i>DHCP</i> dynamic addressing (default), the IP Address is set automatically by the network's DHCP server. If <i>IP Config</i> is set to <i>Static Addr</i> , manually enter an IP address. If <i>IP Config</i> is set to <i>DHCP</i> and there is a DHCP failure, the IP address is set to the static IP address. The factory default static IP address is 192.168.0.2.
---------------------	---

Octet Value Entry Procedure

Set the octets (numbers between periods) values as follows:

1. Push ADJUST momentarily to enter edit mode.
2. Turn SELECT to select the octet you want to edit, indicated by blinking.
3. Turn ADJUST to enter the new value.
 - If you need to revert to the previous setting (undo changes), push SELECT.
4. Push ADJUST momentarily to save and activate the new setting.
 - If you want to revert to the default value, hold down ADJUST for 4 seconds.

3.3 Subnet Mask

Determines the subnet mask used by the FS-HDR for TCP/IP networking. Consult your network administrator about how to set this value.

Subnet Mask variable	Enter a subnet mask compatible with your LAN. This is only needed for Static IP configurations. If <i>IP Config</i> is set to DHCP, the Subnet Mask is set by the DHCP server and cannot be changed by the user. If <i>IP Config</i> is set to <i>Default Addr</i> , the default <i>Subnet Mask</i> is 255.255.255.0
----------------------	--

3.4 Default Gateway

Determines the gateway or router used on your LAN for TCP/IP networking. Consult your network administrator about how to set this value.

Without a properly configured default gateway (whether you have a router/gateway or not), the FS-HDR will be unable to see other FS units on the network, although you may still be able to control this unit via a web browser. Also, without a proper gateway defined, the discovery feature on the Network web page will fail to list other FS units on the network.

Gateway Address variable	Enter the address of the gateway or router used to connect the FS-HDR to the network. <i>Default:</i> 192.168.0.1
--------------------------	---

3.5 MAC Address (view only)

Selecting this parameter allows you to view the MAC address. The MAC address is a unique value associated with the FS-HDR's internal network adapter. MAC addresses are also known as hardware addresses or physical addresses. MAC addresses uniquely identify an Ethernet adapter on a LAN.

MAC address format: MM:MM:MM:SS:SS:SS

The value is 12-digit hexadecimal, where the first half identifies the manufacturer and the second half identifies the unique serial number.

4 SNMP Enable Parameters

The following parameters are used to setup the FS-HDR SNMP (Simple Network Management Protocol) feature.

- 4.0 SNMP Enable
- 4.1 SNMP Trap Destination 1
- 4.2 SNMP Trap Port 1
- 4.3 SNMP Trap Destination 2
- 4.4 SNMP Trap Port 2

Refer to "[Chapter 7 SNMP](#)" on page 158 for a description of SNMP and how the FS-HDR supports it.

About FS-HDR Alarms

The following FS-HDR alarm parameters affect how the front panel LEDs and Web UI report error conditions. When suppressed, front panel LEDs will not light red, and the Web UI will not report that particular error status. Suppressed alarms do not affect the information reported on the FS-HDR front panel Status menus, and does not affect SNMP messaging.

5.1, 5.2 Power Supply 1-2 Alarm

These parameters control how the FS-HDR alarm responds to a power supply disconnection or failure. If the FS-HDR will be connected using only one power cord, you can suppress the alarm, which only changes the color of the front panel LED for the disconnected power supply.

Normal (default)	Alarm triggers if either internal power supply experiences a failure or is disconnected from mains power.
Suppress	Alarm will not be triggered by a power supply failure or disconnection from power.

6 Vid Format Alarm

(Single Ch only) When set to Normal (default), an alarm is triggered (the Channel Select LED of that video processor VID1 will light red) whenever the selected input video signal format for that Video Processor is incompatible with the selected output format. You can suppress the Format Alarm if you wish.

Normal (default)	Alarm triggers if the format of the selected input video signal is incompatible with the selected output format.
Suppress	Alarm will not be triggered by a format incompatibility.

6.1-6.4 Vid1-4 Format Alarm

(4Ch only) Same as Vid 1 Format Alarm menu, except for Video Processors 1-4.

7 Reference Alarm

Controls how the FS-HDR responds when the Video Processors has a format that is incompatible with the Reference video signal. When set to NORMAL, the alarm triggers (the REF LED on the FS-HDR front panel will light red) if the Reference signal is not detected or is incompatible with the processor format. You can suppress the Reference alarm if you wish.

Normal (default)	Alarm triggers if the reference signal is not detected or is incompatible with the processor format.
Suppress	Alarm will not be triggered by reference errors.

NOTE: For proper operation the Input reference signal must be stable and properly terminated using a 75-ohm terminator on either the unused loop connector or the last piece of downstream equipment to which the Ref Video is connected.

9 Screen Saver

This parameter lets you choose the menu screen saver.

On (AJA Logo) (default)	AJA logo screen saver is displayed
Off	The screen saver is not displayed.
System Name	Screen saver displays the system name.

10 Display Intensity

Determines the brightness of the alphanumeric display and front panel LEDs.

Variable	Dim or brighten the alphanumeric display and activity indicator LEDs in steps from 1 (dim) to 8 (brightest). Default: 6
----------	---

11 Fan Speed

Determines the speed (and sound level) of the FS-HDR's internal cooling fans. For long term reliability, the fan speed should be set as high as possible, only lowering the speed if fan noise is a concern. At 25C (77F) ambient temperature any speed setting (1 to 10) provides adequate cooling. At 40C (104F) ambient, a fan speed of 5 or higher is recommended. The FS-HDR also has built-in thermal protection that will increase the fan speed automatically if necessary.

Variable	Changes the fan speed in steps from 1 (slow) to 10 (fast). Default is 10.
----------	---

12 Serial Number

Displays the FS-HDR's unique serial number. Please reference this number if you contact AJA customer support.

13 Software Version

Displays the FS-HDR's software version number.

14 Reboot

This parameter lets you reboot the FS-HDR. Press and hold in both front panel knobs simultaneously to reboot.

During reboot, the display shows [Rebooting], goes dark momentarily, and then shows the percentage of progress as the system reboots. Reboot should take no longer than 90 seconds.

AUDIO Menu Group

The following descriptions explain the AUDIO Menu Group, which allows you to make adjustments to the FS-HDR's sample rate converters, Mix Down Modes, and some other system wide settings.

1 MADI Output Mode

Controls the number of MADI channels sent to both the MADI BNC and Fiber output connectors, 64 or 56.

If the FS-HDR receives 56 channels and is set to output 64 channels, active silent channels 57 to 64 are added to the output. When the FS-HDR receives 64 channels and is set to output 56 channels, channels 57 to 64 are dropped on the output.

64ch (default) 56ch	Sixty four audio channels selected for MADI output. Fifty six audio channels selected for MADI output. MADI output channels 57-64 will not be available.
------------------------	---

2.1-2.8 SDI1-8 SRC Mode

These parameters control the use of sample rate converters for the incoming SDI embedded audio. This setting affects all 16 embedded audio channels for that SDI input, if present.

Auto (default) On Off	The system decides how to handle sample rate conversion. PCM uses SRC, compressed data doesn't use SRC. Sample rate conversion is always performed on the inputs. Sample rate conversion is never performed on the inputs.
---------------------------------	--

In Auto mode, normal PCM audio passes through the Sample Rate Converters and gets converted, as appropriate. If any of the active input signals are non-PCM the SRC is turned off for all audio inputs.

2.9 AES SRC Mode

These parameters control the use of sample rate converters for the incoming AES audio. This setting affects all 16 AES input channels.

Auto (default) On Off	The system decides how to handle sample rate conversion. PCM uses SRC, compressed data doesn't use SRC. Sample rate conversion is always performed on the inputs. Sample rate conversion is never performed on the inputs.
---------------------------------	--

NOTE: For SRC, all AES channels must be synchronous to AES1 (channel pair 1&2), or to the lowest numbered AES pair if AES1 is not present.

2.10 MADI BNC SRC Mode

These parameters control the use of sample rate converters for the incoming MADI BNC audio. This setting affects all 64 MADI BNC input channels

Auto (default)	The system decides how to handle sample rate conversion. PCM uses SRC, compressed data doesn't use SRC.
On	Sample rate conversion is always performed on the inputs.
Off	Sample rate conversion is never performed on the inputs.

In Auto mode, normal PCM audio passes through the Sample Rate Converters and gets converted, as appropriate. If any of the active input signals are non-PCM the SRC is turned off for all audio inputs.

2.11 MADI Fiber SRC Mode

These parameters control the use of sample rate converters for the incoming MADI Fiber audio. This setting affects all 64 MADI Fiber input channels

Auto (default)	The system decides how to handle sample rate conversion. PCM uses SRC, compressed data doesn't use SRC.
On	Sample rate conversion is always performed on the inputs.
Off	Sample rate conversion is never performed on the inputs.

In Auto mode, normal PCM audio passes through the Sample Rate Converters and gets converted, as appropriate. If any of the active signal pairs are non-PCM the SRC is turned off for all audio inputs.

3.0 Mix Down 1 Mode

Activates the Mix Down mixer, and selects either 5.1 or 7.1 mix down mode.

Off (default)	Mix down feature is turned off.
5.1 Channel	Selects 5.1 mix down mode.
7.1 Channel	Selects 7.1 mix down mode.

When set to 5.1 or 7.1 Channel Mode, additional menus follow that are used to select the source of the incoming multi-channel audio, adjust the level of each of the incoming channels routed to the Left and Right output channels, and adjust the level of the Left and Right output channels.

About Mix Down Mode

Multi-channel audio uses more than two speakers to represent the sound field.

NOTE: The LFE channel is not used in the stereo mix down output, but is passed through the FS-HDR audio routing matrix.

The Mix Down outputs are available as inputs to the FS-HDR audio matrix and can be mapped to any audio output.

3.1 Mix Down Input

When 5.1 Channel or 7.1 Channel is selected above, this parameter selects the source of the multi-channel audio coming into that mixer.

SDI 1(default) SDI 2-8	Selects the indicated source. The channel assignments are as follows. All unused channels are muted: Input Ch 1 - Left Front Input Ch 2 - Right Front Input Ch 3 - Center Input Ch 4 - Left Rear Input Ch 5 - Right Rear Input Ch 6 - LFE (not used in mix down output) Input Ch 7 - Left Surround (mute in 5.1 mode) Input Ch 8 - Right Surround (mute in 5.1 mode)
Sig Gen 1KHz Sig Gen 400Hz	Routes the indicates signal generator to all the active multi-channel inputs.
Map	This parameters activates a series of related menus to map a specific input channel to each of the 5 or 7 mixer input channels.

3.2 - 3-8 Mix Down Input Mapping (LF, RF, CTR, LR, RR, LS, RS)

When Map is selected above, these menus permit the mapping of any FS-HDR audio input channel or signal generator to any of the mixer inputs (L Front, R Front, Center, L Rear, R Rear, and in 7.1 mode L Surround and R Surround). Each mixer input can also be turned Off (muted). Default setting is Off.

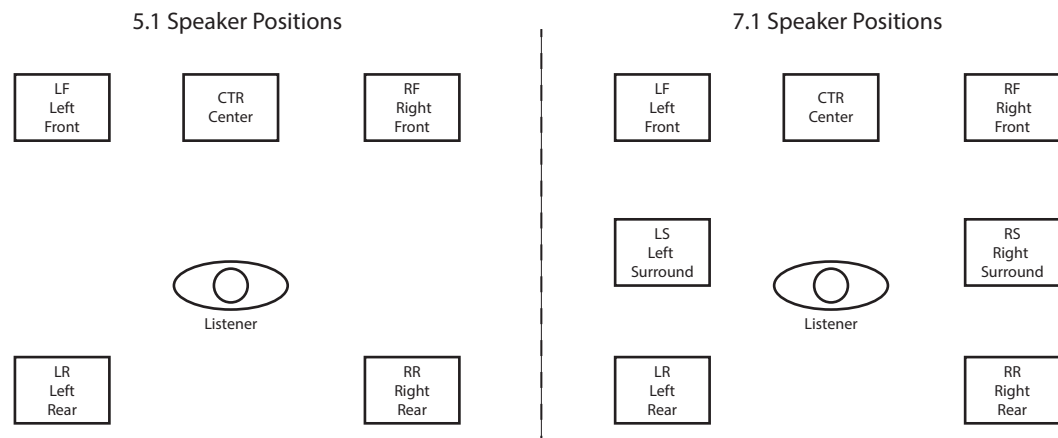
3.9 - 3.14 Mix Down Input Level

In Mix Down Mode, multi-channel input channels are mixed to the Left and Right output channels. The level of each input signal sent to its mixed output can be adjusted plus or minus 18 dB, in half dB increments, using these menu controls.

The default settings are set to the basic equations above, and are listed below.

LF Level RF Level CTR Level LR Level RR Level LS Level (7.1 mode only) RS Level (7.1 mode only)	0 dB (unity) to Left output. 0 dB (unity) to Right output. -3 dB from unity to both the Left and Right outputs. -3 dB from unity to the Left output. -3 dB from unity to the Right output. -3 dB from unity to the Left output. -3 dB from unity to the Right output.
---	---

Figure 29. Multi-Channel 5.1 and 7.1 Speaker Positions



Multi-channel audio, typically embedded in an SDI signal, can be passed through the FS-HDR converter unchanged. The multi-channel sound can also be mixed down to stereo, using the two Mix Down Modules built into the FS-HDR Audio Processor.

The default 5.1 to 2 ch. mix-down equation is:

- Left Ch Output = $LF + (-3dB * CTR) + (-3dB * LR)$
- Right Ch Output = $RF + (-3dB * CTR) + (-3dB * RR)$

The default 7.1 to 2 ch. mix-down equation is:

- Left Ch Output = $LF + (-3dB * CTR) + (-3dB * LS) + (-3dB * LR)$
- Right Ch Output = $RF + (-3dB * CTR) + (-3dB * RS) + (-3dB * RR)$

These default settings can be adjusted using the front panel menus or web interface.

NOTE: The LFE channel is not used in the stereo mix down output, but is passed through the FS-HDR audio routing matrix.

3.16 - 3.17 Mix Down Output Lft Rt Level

The level of the Left and Right mixer output signal can be adjusted plus or minus 18 dB, in half dB increments, using these menu controls. Default is 0 dB (unity).

4.0 Mix Down 2 Mode

(4Ch only) Same as Mix Down 1 Mode menu and related sub-menus, except for the Mix Down 2 mixer.

7 Mix Down Reset

Resets all of the mix down levels (five or seven input, two output) for the selected mixer to the factory defaults. Turn the ADJUST knob to select the mixer. Two mixers are available in Four Channel Mode, and only one mixer is available in Single Channel mode. After selecting a mixer, press ADJ. An "Are you sure" prompt is displayed. Pressing ADJUST again resets that mixer.

Mix Down 1	Resets the Mix Down 1 mixer levels to default settings.
Mix Down 2 (4Ch only)	Resets the Mix Down 2 mixer levels to default settings.

8 Global Audio Out

Allows routing the same source or set of sources to all the FS-HDR audio outputs. The rules used for Audio Out apply if the number of outputs do not match the number of inputs.

Off (default)	No Global output configuration is imposed. When Off all other AUDIO OUTPUT menus are enabled and displayed.
SDI1 SDI2-8 (4Ch only) AES/EBU MADI BNC MADI Fiber	The selected source channels are routed to all the FS-HDR audio output channels.
Sig Gen 1KHz Sig Gen 400Hz Mute	The selected tone or mute is routed to every FS-HDR audio output channel.
Mix Down 1 L:R Mix Down 2 L:R (4Ch only)	The stereo output of Mix Down module is routed to all the FS-HDR audio output channels. The Left mixer channel goes to FS-HDR output channel 1 and the Right mixer channel goes to output channel 2. If the output has more than two channels (i.e. embedded SDI), mute (silence) is routed to the higher numbered output channels.

NOTE: No Global Map source is available.

9 Reset Mapped Output

Resets the selected output map to the factory default values

Choose a Map (default)	Prompt for selecting an Output to map.
SDI1 SDI2-8 (4Ch only) AES/EBU MADI BNC MADI Fiber	After selecting an output, press <i>ADJUST</i> to reset that output to the factory default mapping (i.e. SDI1 to SDI1, SDI2 to SDI2, etc.).
All	Sets all outputs to their factory default mappings.

PRESET Menu Group

The PRESET Menu Group provides the means of saving, editing the names of, and loading FS-HDR presets. A preset is a set of all System, Video, Audio, and most Config parameters as they were set at the time the preset was stored.



Caution! When you recall a Preset Configuration, the recalled preset immediately replaces the system's existing configuration. All previous settings are lost unless you have previously stored them in another preset configuration or an exported file



Caution! In Four Channel Mode, each Preset saves all the settings for all four channels. Storing and recalling a Preset will affect all the settings for all four channels in that mode. Care must be taken to establish a policy for the use of FS-HDR Presets, especially if the FS-HDR is operated in Four Channel mode and the different channels have different users.

During recall, the display reads, Recalling until the recall is finished. On recall completion, the displays shows the success or failure: Recalled, Failed, or Empty. A failed or empty recall does not recall anything and leaves the FS-HDR as it was. (Preset registers are empty until you store something in them.)

During a store, the display reads Storing until the store is finished. On store completion, the display shows Complete or Failed. A failed store does not store anything and leaves the preset register as it was. To retry a failed store, turn SELECT to another preset number and then back to the desired preset number.

1 Factory Preset

Recalls a read-only Factory Preset.

Factory Recall	Recalls factory values for all <i>System, Video, Audio</i> , and most <i>Config</i> parameters. Push <i>ADJUST</i> for four seconds to perform the recall. The display reports "Factory values" during the recall. User preferences, network settings, and existing Presets are not affected by recalling the Factory Preset.
----------------	---

1.1-1.40 Presets #1-#40

These parameters let you recall, edit the name of, and store an FS-HDR preset configuration for the selected storage register. Forty storage registers are available.

Preset #1-#40	Shows the currently selected preset register number. Turn <i>SELECT</i> choose the desired register. Then turn <i>ADJUST</i> to choose Recall, Edit Name, or Store for the selected register.
[Preset Name]	Shows the name of the selected preset register, which can be edited.
Recall	Recalls that preset. Push <i>ADJUST</i> momentarily to perform (take) the recall. The display reports "Loading" and "Complete" during the recall.
Edit Name	Enables editing the name of the preset register. Push <i>ADJUST</i> to enable editing (blinking character), use the <i>SELECT</i> and <i>ADJUST</i> knobs to edit the name and then press <i>ADJUST</i> to save the edited preset register name.
Store	Stores the current set of all <i>System, Video, Audio</i> , and most <i>Config</i> parameters to the selected preset register.

Video with Audio Routing

Presets can be used to coordinate audio and video routing. Store and name presets that match the desired audio inputs to each desired video input, and use those presets to select the video inputs, causing the configured audio to follow.

Interaction of Presets and GPIs

Triggering presets using GPI inputs offers considerable power but also requires some care to avoid unexpected results. If you plan to trigger presets using GPIs, please see the information about the ["Interaction of Presets and GPIs" on page 62](#).

Video Select Buttons VID1-VID4

As described in ["Operational Summary" on page 20](#) the VID1, VID2, VID3 and VID4 front panel buttons select a Video Processor channel. When selected, the nine Video buttons on the right are used to select a category of menus.

Table 7. Video Menu Group Buttons activated with Channel Select buttons.

INPUT	FORMAT	TIMING
ANC	SCALE	TSTGEN
COLOR	KEYER	FREEZE

Single Channel Mode has one Video Processor, to which all the parameter settings in these menu groups apply. Four Channel Mode has four Video Processors. Changes to Video Select Button parameter settings only apply to the currently selected Video Processor, whose VID1-4 button will be illuminated.

INPUT Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

1 Input

These parameters perform input video source selection for the Video Processor.

SDI1 (4Ch default) SDI2-8 1/2, 3/4, 5/6, 7/8 DualLink	Select SDI1 as the input source. Selects either SDI2 through SDI8 as the input source. Selects SDI 1/2, or SDI 3/4, or SDI 5/6 or SDI 7/8 DualLink as the input source, linking both SDI inputs.
1-4 Quad Link (Single Ch default) 5-8 Quad Link	(Single Ch only) Select SDI 1-4 SDI QuadLink as the input source, linking all four of the inputs (Single Ch only) Select SDI 5-8 SDI QuadLink as the input source, linking all four of the inputs.

Source Memory

Changing the Video Input selection automatically selects new values for Proc Amp parameters and Color Corrector (RGB) parameters. Each video source remembers its own Proc Amp and Color Corrector settings. This is referred to as Source Memory.

Dual Link

Dual Link referred to here is 1080p50/59.94/60 on two 1.5 Gb HD-SDI connections, or 4K/UltraHD low frame rate video on two 3 Gb connections. Selecting Dual Link as the Video Input will allocate both SDI Inputs for Dual Link use. The SFP inputs operate the same way.

Quad Link

Quad Link referred to here is 4K/UltraHD on four 1.5 Gb HD-SDI connections, or 4K/UltraHD high frame rate video on four 3 Gb connections. Selecting Quad Link as the Video Input will allocate all four SDI Inputs for Quad Link use. The SFP inputs operate the same way.

See "[System Cabling](#)" on page 35 for more information about FS-HDR signal routing.

2 Loss of Input

Selects the automatic action that occurs if the video input is lost. The Black selection (default) cuts the video to black. The Freeze selection freezes video on the last available good frame.

Black (default)	Switches to black if input video is lost.
Freeze	Freezes on the last available good video frame if input is lost.

3 Reverse Telecine

This parameters can be used to control film cadence detection.

Off (default)	Film cadence detection is disabled. This setting should remain Off unless you are processing interlaced pulldown input.
Auto	3:2 pull down field removal is enabled for interlaced video sources.

About Reverse Telecine and Film Cadence

Film cadence is a way to convert film frame rates to interlaced field rate video suitable for broadcast, commonly employed by telecine equipment when converting film to video (for example, converting from 24 frames to 60 interlaced fields, or 23.98 frames to 59.94 fields). This requires a 4/5 conversion ratio. For 3:2 pulldown cadence, the most common, two fields are duplicated for every four input frames, with a resulting 2:3:2:3 field output pattern. 3:2 pulldown outputs four fields of the original two input frames, then one duplicate field, then four more fields of the next two input frames, and then another duplicate field. This provides the smoothest motion, but results in two of the five video output frames being “dirty”, having fields from different original frames. Another commonly used film cadence is 2:3:3:2, which has only one “dirty” frame but results in motion that is slightly less smooth. Many other more exotic film cadences exist, but they are rarely used.

Film cadence removal reverses pulldown (Reverse Telecine), and can turn interlaced video originally sourced from film with pulldown back to progressive frame rate video, removing the duplicated fields. This can be useful for post-production facilities that have a need to accurately re-edit this type of material.

FS-HDR Reverse Telecine Conditions

The FS-HDR converter can perform film cadence removal under the following conditions:

- Input signal must be 525i59.94, 1080i59.94 and output format selected must be p23.98 or PsF23.98, OR the input signal must be 1080i60 and output format p24 or PsF24.
- Input signal must have consistent 3:2 pulldown.
- The Reverse Telecine parameter must be set to Auto.

Under the conditions above, the FS-HDR will automatically identify and remove the duplicate fields, and perform motion detection and de-interlacing processing to create high quality output with clean frames.

NOTE: *Approximately 10 incoming frames are required before film cadence can be detected and correctly processed. If the cadence pattern changes (for example, the source pulldown video may have been edited) that same approximately 10 frame interval is required after the discontinuity to detect and process the new cadence pattern.*

4 Input Scan Format

Determines how the de-interlacer handles interlaced vs. PsF inputs.

Auto (default)	De-interlacer detects input source payload ID data and sets the processing format accordingly.
Progressive	Assumes all input sources are progressive
Interlaced	Assumes all input sources are interlaced.

Normally, this control will only be used to indicate that a 1080PsF25 input is PsF and not interlaced.

Auto

When Auto is selected, the system will look for clues in the source's SMPTE 352 (Payload ID) data and respond accordingly. If there is no SMPTE 352 information, the system will assume that 23.98/24 fps sources are PsF, and 25/29.97/30 fps sources are interlaced.

Progressive

When Progressive is selected, the system will assume that all sources are PsF (even if there is SMPTE 352 data to the contrary).

Interlaced

When Interlaced is selected, the system will assume that all sources are interlaced (even if there is SMPTE 352 data to the contrary).

5 Input Image Mapping

(Single Ch only) Selects the structure of the UltraHD or 4K input video. The image can be divided into four quadrants (Square Division [Quadrant] format, see SMPTE 425-3, Appendix B), or be interleaved (2 Sample Interleave [2SI] format, see SMPTE 425-5, Section 8). Two Sample Interleave video can carry VPID to identify it, but Square Division video lacks a corresponding VPID.

Auto (default)	Automatically sets Quadrant (no VPID) or 2SI format (VPID present), depending on the input.
Quadrant	Interprets incoming 4K/UltraHD video as being Quadrant (Square Division) mapped.
2SI	Interprets incoming 4K/UltraHD video as being 2SI (Two Sample Interleave) mapped.

ANC Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

1.1 AFD Out

These parameters determine if and where the Video Processor will insert a SMPTE 2016 Active Format Descriptor (AFD) packet into its output video. The inserted AFD code does not affect the Video Processor's conversion, but it may affect downstream video processing if the signal is later converted.

Off (default)	The FS-HDR does not insert an AFD code into the output.
Auto	If there is no AFD code on the input video, a "Full Frame" (8) code is inserted. If the FS-HDR is converting, the appropriate AFD code will be chosen based on the convert mode (see "7 Up Convert Mode" on page 106 and "8 Down Convert Mode" on page 107).
>16:9	Always inserts a "Box > 16:9 (center)" AFD code (4), which indicates that the image has an aspect ratio greater than 16:9 as a vertically centered letterbox within the 16:9 frame.
Full Frame	Always inserts a "Full Frame" AFD code (8), which indicates that the image is full frame, with an aspect ratio that is 16:9.
Pillarbox	Always inserts a "4:3 (center)" AFD code (9), which indicates that the image has a 4:3 aspect ratio as a horizontally center pillarbox image within the 16:9 frame.
Letterbox	Always inserts a "16:9 (with complete 16:9 image protected)" AFD code (10), which indicates that the image is full frame, with a 16:9 aspect ratio and all image areas are protected.
14:9	Always inserts a "14:9 (center)" AFD code (11), which indicates that the image has a 14:9 aspect ratio as a horizontally centered pillarbox within the 16:9 frame.
4:3 Alt 14:9	Always inserts a "4:3 (with alternate 14:9 center)" AFD code (13), which indicates that the image has a 4:3 aspect ratio and with an alternative 14:9 centered pillarbox image within the 16:9 frame.
16:9 Alt 14:9	Always inserts a "16:9 (with alternative 14:9 center)" AFD code (14), which indicates that the image has a 16:9 aspect ratio with an alternative 14:9 center within the 16:9 frame.
16:9 Alt 4:3	Always inserts a "16:9 (with alternative 4:3 center)" AFD code (15), which indicates that the image has a 16:9 aspect ratio with an alternative 4:3 center within the 16:9 frame.

1.2 AFD Output Lines

Determines which video output lines have AFD VANC inserted on the output.

10 (default) 9–42	Adds AFD VANC to line 10. Select which line other than 10 will have AFD VANC added.
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1.3 Down Convert AFD dfl

Selects what occurs when the Down Convert Mode parameter has been set to "Auto AFD" (see ["8 Down Convert Mode" on page 107](#) and no AFD codes are detected at the selected input source.

Hold Last (default)	Hold the last setting.
Crop	Image is cropped to fit new screen size.
Anamorphic	HD image is converted to full-screen SD with a 16x9 aspect ratio (anamorphic).
14x9	Image is reduced slightly with aspect ratio preserved. Black is added top and bottom, and the left and right sides are cropped.
Letterbox	Image is reduced with black top and bottom added to image area, with the aspect ratio preserved.

2 Caption Xlator

This parameter translates closed captioning from the SD CEA-608 format on line 21 to the HD CEA-708 format and inserts it into the output video stream.

Off (default) On	When Off, caption translation is not performed. When On, the FS-HDR will automatically translate incoming line 21 captions to CEA-708 format and insert the VANC packets into the converted video stream. This is a complete translation from CEA-608 format to CEA-708 format (including embedded SD captions).
---------------------	---

NOTE: This parameter interacts with parameter SD Line 21 Blanking, see below.

In standard definition video (525i/59.94 or 625i/50), closed captioning data is encoded and sent on line 21 of both fields, using a format defined by the Consumer Electronics Association standard, CEA-608. This is traditionally called "line 21", "SD", or "608" captioning, and is used for analog composite, analog component, and serial digital (SDI) video.

In high definition video, closed captioning is encoded and sent as Vertical Ancillary (VANC) packets in SDI video, using a format defined by the Consumer Electronics Association standard CEA-708 (there is no equivalent for analog HD video). This is traditionally called "HD," "DTV," or "708" captioning. The data formatting and encoding for 708 captions is very different from the data contained in 608 (SD) captioning, reflecting the added features and capabilities available with the CEA-708 standard.

When the Caption Translator is on, the FS-HDR up-converter automatically translates incoming line 21 captions to CEA-708 format and inserts the VANC packets into the converted HD video stream. This is a complete translation from CEA-608 format to CEA-708 format (including the embedded SD captions).

3 SD Line 21 Blanking

Determines whether the FS-HDR blanks line 21 closed captioning data prior to video processing of an SD 525i video input. (Line 21 normally occurs at the top of the raster in the overscan area of video, so the presence of captioning data or blanking does not interfere with the visible SD or up-converted video.)

Blank

In Blank mode, the FS-HDR copies and remembers the contents of SD line 21 and then blanks those lines before transformation to ensure captioning data does not get included in the transformed video. If the Caption Xlator parameter is On, the copied caption gets translated into an HD caption and inserted into the transformed output. If the Caption Xlator parameter is Off, the output does not contain caption data. This is the setting to use if the SD input includes a caption and you want to retain it at the output (Caption Xlator must be On), or you want to blank it at the output (Caption Xlator must be Off).

Pass

In Pass mode, the FS-HDR does not blank line 21 of the SD video input and passes the unaltered video to the Video Processor for transformation. This is the setting to use if there is no captioning data present on line 21 of a 525i video input.

Auto blank

In Auto Blank mode, the FS-HDR automatically detects presence or absence of line 21 caption data on the SD input. If no line 21 caption is present, the FS-HDR passes the video unaltered. If line 21 data is detected, the FS-HDR copies the data, blanks line 21, and reinserts translated captioning on the transformed output if

the Caption Xlator parameter is On. If the Caption Xlator is Off, the output will not contain captioning. This is the setting to use if your SD input video sometimes contains captions and other times does not, or if you are uncertain which setting to use.

4 Override VPID

Video Payload Identifier (VPID) data provides a way to unambiguously set the Colorimetry and Transfer Characteristic of a video payload. This parameter allows the user to edit this data for that channel's output.

Off (default)	No change to VPID data.
On	Overrides this output channel's VPID data, and displays the following two parameter menus to allow data adjustment.

When "On" is selected above, the following two parameters are made available:

4.1 Colorimetry

Sets that channel's video output signal colorimetry data bit. Select from:

Auto (default)	Automatically sets colorimetry.
BT.709	Standard Definition BT.709 colorspace VPID data applied.
BT.2020	High Definition BT.2020 colorspace VPID data applied.

4.2 Transfer Characteristic

Sets the channel's video output signal transfer characteristic data bit. Select from:

Auto (default)	Automatically sets transfer characteristic.
SDR	Standard Dynamic Range VPID data applied.
HLG	Hybrid Log Gamma VPID data is applied.
PQ	Perceptual Quantization VPID data is applied.

5 SDI Mon Override VPID

In Enhanced Single Channel Mode the format of the SDI Monitor Output display format can be independently set. This parameter can be used as above to edit that signal's VPID data.

Off (default)	No change to VPID data on the SDI Monitor Output signal.
On	Overrides existing SDI Monitor Output VPID data, and displays the Colorimetry and Transfer Characteristic parameters listed above.

6 Timecode Xlator

Beginning with v4.1 firmware, FS-HDR is able to handle Ancillary Timecode (ATC) packets with Timecode Xlator when performing a conversion. Previously these packets only passed-through when the FS-HDR was not performing a conversion. When Timecode Xlator is turned On, the FS-HDR will pass-through or translate LTC, VITC1, and VITC2 type ATC packets during conversion.

Off (default)	The FS-HDR will perform as it did previously, by passing-through ATC packets when it is not converting, and stripping them when it is converting.
On	Pass-through ATC packets with or without conversion, and during conversion translate/convert LTC, VITC1 and VITC2 packets to match the target/configured Output Format.

NOTE: For SD conversions, ATC packets are dropped and Timecode Xlator will not work.

NOTE: For HD/UltraHD to HD/UltraHD conversions, the ATC packet will only pass-through if the Timecode Xlator parameter is turned On.

NOTE: For 23.98/24Hz conversions, ATC packets will pass-through as long as the input and output frame rates match.

NOTE: Other ATC packets associated with "film" video formats are not supported.

COLOR Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID 1- VID 4).

1.0 Proc Amp Enable (YUV)

This parameter turns the Proc Amp On and Off for signals composed of YUV components. When it is On, you can set additional parameters to control video Gain, Black Level, Hue, and Saturation.

Off (default) On	Sets the YUV Proc Amp to Off. Sets the YUV Proc Amp to On.
---------------------	---

Source Memory

Independent Proc Amp parameter values are kept for each input format.

1.1 Proc Amp Gain

Adjusts the video gain from 0 to 1.5 times luma in 0.01 steps

Variable	Adjusts Proc Amp Gain from zero to 1.5 in 0.01 steps. <i>Default (unity): 1.0</i>
----------	--

1.2 Proc Amp Black

Adjusts the video black level from -20 IRE to +20 IRE in 0.5 steps.

Variable	Adjusts Proc Amp Black level from -20 IRE to +20 IRE in 0.5 steps. <i>Default (unity): 0 IRE</i>
----------	---

1.3 Proc Amp Hue

Adjusts the video color hue through 360 degrees (color wheel) in 1 degree steps.

Variable	Adjusts Proc Amp Hue from -179 to +180 in steps of 1 degree. <i>Default (unity): 0 degrees</i>
----------	---

1.4 Proc Amp Sat

Adjusts the video color saturation from black and white to 1.5 times chroma in steps of 0.01.

Variable	Adjusts Proc Amp Saturation from 0 (black & white) to 1.5 (Chroma) in steps of 0.01. <i>Default: 1.0</i>
----------	---

2.0 Color Corrector (RGB)

NOTE: The Color Corrector is not available when a Colorfront Transform is selected.

Turns the RGB Color Corrector On and Off. When it is On, you can set additional parameters to control RGB Video Gain, Black Level, and Gamma. When set to Off, all RGB Color Corrector settings are programmed for unity (or bypass).

Color Corrector settings are applied before LUT settings, so Color Corrector RGB and LUT color adjustments are additive.

Off (default) On	Sets the RGB Color Corrector to Off. Sets the RGB Color Corrector to On, enabling the following Color Corrector parameters.
---------------------	--

Source Memory

Independent RGB Color Correct parameter values are kept for each input format.

2.1 CC Red Gain

This parameter adjusts the RGB Red Gain.

Variable	Adjusts Red Gain from zero to 1.5 in 0.01 steps. <i>Default (unity): 1.0</i>
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2.2 CC Red Black Level

This parameter adjusts the RGB Red Black level.

Variable	Adjusts Red Black level from -20 IRE to +20 IRE in 0.5 steps. <i>Default (unity): 0 IRE</i>
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2.3 CC Red Gamma

This parameter adjusts the RGB Red Gamma.

Variable	Adjusts Red Gamma level from -1.0 to +1.0 in 0.01 steps. <i>Default (unity): 0</i>
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2.4 -2.6 CC Green

This set of parameters adjusts the Gain, Black Level, and Gamma for CC Green, same as CC Red described above.

2.7-2.9 CC Blue

This set of parameters adjusts the Gain, Black Level, and Gamma for CC Blue, same as CC Red described above.

3.0 Transform

NOTE: The original RGB Color Corrector controls are not available when a Colorfront Transform is selected. The RGB Color Corrector's current settings are preserved, however, and will be re-applied to the output if a LUT transform is re-selected. Colorfront Engine Modes have built-in Color Corrector controls that operate independently from the original RGB Color Corrector, and are applied only when in a Colorfront Engine Mode.

Selects the color transformation approach to be applied to the output. Appropriate parameters will be displayed below, and on other menus, depending on your selection.

Colorfront Engine-Live (default)	Selects CF Engine-Live color transformation, presents unique parameters in related menus, and disables RGB Color Corrector.
Colorfront Engine-Film	Selects CF Engine-Film color transformation, presents unique parameters in related menus, and disables RGB Color Corrector.
Colorfront Engine-TV	Selects CF Engine-TV color transformation, presents unique parameters in related menus including independent Color Correction controls, and disables the original RGB Color Corrector.
BBC HLG LUT	Selects one of the supplied BBC HLG LUTs.
NBCU LUT	Selects one of the supplied LUTs developed by NBCUniversal Media, LLC.
User LUT	Selects a user provided LUT file color transformation.
Dynamic LUT	Selects a Dynamic LUT for use with third-party Look Management systems.
Off	No color transformation is applied to the output.

Colorfront Parameters

When the **Colorfront Engine Live** or **Colorfront Engine Film** mode is selected above, the following Colorfront related parameters are available:

NOTE: Parameter values set for the multiple numbered parameter menus described below are applied only to the currently selected Colorfront Engine mode. For example, In Colorfront Engine Live mode, the value set for 3.1 Dynamic Range&Gamut IN no longer applies to that channel's output if the FS-HDR's mode is changed to Colorfront Engine Film. The differently numbered 5.1 Dynamic Range&Gamut IN menu value is applied when in that mode.

3.1/5.1 Dynamic Range&Gamut IN

This parameter is used to identify the Dynamic Range, OETF, and Color Gamut of the incoming video. This information is used by the Video Processor to choose the appropriate internal processing to be used with that input signal.

SDR BT.709 100 Nits (default)	Standard Dynamic Range input with BT.709 color space.
SDR Extended BT.709	Standard Dynamic Range input with BT.709 color space with values between SMPTE and Full Range Max preserved.
PQ BT.2020 1000 Nits	HDR input with PQ curve and BT.2020 color space.
PQ P3D65 1000 Nits	HDR input with PQ curve and P3 (cinema) color space.
Hybrid Log Gamma BT.2100	HDR input with HLG curve and BT.2100 color space.
Hybrid Log Gamma BT.709	HDR input with HLG curve and BT.709 color space.
HLG Extended BT.709	BT.709 color space, values between SMPTE and Full Range Max are preserved for more headroom, and support for HLG superwhites.
HLG Extended BT.2020	BT.2020 color space, values between SMPTE and Full Range Max are preserved for more headroom, and support for HLG superwhites.
Sony S-Log3 S-Gamut3	A Sony proprietary format with wide dynamic range and an almost native camera color space.
Sony S-Log3 S-Gamut3 Cine	A Sony proprietary format with wide dynamic range and a slightly wider than DCI-P3 color space.
Sony S-Log3 BT.2020	A Sony proprietary format with wide dynamic range and a BT.2020 color space.
Arri Log C Wide Gamut	An Arri proprietary camera format.
Panasonic V-Log	A Panasonic proprietary camera format.
Red Log3G10 Wide Gamut	A Red proprietary camera format.
Canon Log 2	Canon Log 2 proprietary camera format.
Canon Log 3	Canon Log 3 proprietary camera format.
ACEScct	(Colorfront Film Mode only) ACES Color Correction Toe, for grading behavior similar to traditional log film scans.

3.2/5.2 Dynamic Range&Gamut OUT

This parameter can be used to specify the Dynamic Range, OETF, and Color Gamut of the outgoing video, and determines the color conversion (if any) to be applied. The following are available:

SDR BT.709 100 Nits (default) SDR Extended BT.709	Standard Dynamic Range output with BT.709 color space. Standard Dynamic Range input with BT.709 color space with values between SMPTE and Full Range Max preserved.
PQ BT.2020 1000 Nits PQ P3D65 1000 Nits Hybrid Log Gamma BT.2100 HLG Extended BT.709	HDR output with PQ curve and BT.2020 color space. HDR output with PQ curve and P3D65 color space. HDR output with HLG curve and BT.2100 color space. BT.709 color space, values between SMPTE and Full Range Max are preserved for more headroom, and support for HLG superwhites.
HLG Extended BT.2020	BT.2020 color space, values between SMPTE and Full Range Max are preserved for more headroom, and support for HLG superwhites.
Sony S-Log3 S-Gamut3	A Sony proprietary format with wide dynamic range and an almost native camera color space.
Sony S-Log3 BT.2020	A Sony proprietary format, with wide dynamic range and a BT.2020 color space.
Arri Log C Wide Gamut ACEScct	An Arri proprietary camera format. (Colorfront Film Mode only) ACES Color Correction Toe, for grading behavior similar to traditional log film scans.

3.3/5.3 SDR Preview

The SDR Preview parameter can be used to quickly preview what the SDR version of the current HDR output will look like on an SDR monitor, without having to switch between HDR and SDR modes on the FS-HDR and the monitor. In other words, the FS-HDR continues to inform the monitor that the content is HDR (so it doesn't change modes) and then maps the HDR content to SDR (as if the FS-HDR's output were set to SDR) but with values that will display correctly while the monitor is in HDR mode. This feature saves time as HDR and SDR versions of the content can be quickly compared in an A/B fashion.

NOTE: The SDR Preview parameter only applies when the FS-HDR's Dyn Range&Gamut OUT parameter is set to HDR (PQ or HLG).

Off (default) On	Off (no preview processing). Output is transformed to 100 Nits SDR.
---------------------	--

3.4/5.4 SDI Mon Range&Gamut

In Enhanced Single Channel mode (4K or UltraHD input and output), the down-converted SDI Monitor output can be configured with the same Dynamic Range and Gamut settings listed for ["3.2/5.2 Dynamic Range&Gamut OUT" on page 85](#).

4.0/6.0/8.0 Colorfront Engine

When one of the **Colorfront Engine** parameters is selected in the Color menu, the following parameter settings affect that channel's current video output.

NOTE: Colorfront Engine setting adjustments create subtle image differences. Multiple colors can also be affected by the change of a single knob, especially when translating between color spaces.

The Colorfront Engine parameter Enables and Disables Colorfront Engine user adjustments. When Default is selected all Colorfront settings are temporarily reset. When Adjust is selected, the previously set Colorfront adjustments are restored, and additional Colorfront parameters become available for further adjustment.

Default	Colorfront Engine settings are set to default, but adjustment settings are retained, allowing easy A/B visual comparison.
Adjust	Currently configured Colorfront adjustments are reapplied to the system output. In this mode further adjustments can be made.

NOTE: You can save a Preset of the current Colorfront adjustment settings for reuse. Loading alternative Presets allow further A/B visual comparison, and presets can also be triggered using GPIs.

Colorfront Engine Live Settings

When the **Colorfront Engine-Live** parameter is selected in Transform, the following parameters are available.

4.1 HDR Amount

This adjustment guides the Colorfront Engine's color volume expansion algorithm. The setting applies to all conversions whether SDR to HDR, HDR to HDR, HDR to SDR, and SDR to SDR.

- Range +/-1.000, Default 0.000

4.2 Amb Light Comp

Ambient Light Compensation adjusts the signal based on the intended ambient light settings of the of the mastering or viewing environment. Of course a variety of ambient light environments exist, but this knob may be useful, for example, at an outdoor sports stadium when driving an LED scoreboard and video display at either mid-day or at night.

- Range +/-1.000, Default 0.000

4.3 HDR Log Look

If the Input Dynamic Range and Gamut is set to a Log format (e.g. Sony S-Log3 or Canon Log3), this control adjusts the look between dramatic (cinema) and broadcast (television), with dramatic being 0.0 and broadcast 1.0.

- Range +1.000/0.000, Default 0.500

NOTE: This parameter is only available in Live Mode, and only applies if the FS-HDR's input is a camera log format.

4.4 SDR Softness

If the Input Dynamic Range and Gamut is set to SDR BT.709 100 Nits, this control adjusts how the SDR brights/highlights are mapped into brights and speculars of the 1000 nit HDR output range. This control can be used to accommodate SDR source material that was produced at different "knee" points and slopes.

- Range +1.000/0.000, Default 0.000

NOTE: This parameter is only available in Live Mode, and only applies if the FS-HDR's input is SDR.

4.5 Master Lift

Simultaneously adjusts the bottom side of the Reds, Greens, and Blues.

- Range +/-1.000, Default 0.000

4.6 Red Lift

Adjusts the bottom side of the Reds.

- Range +/-1.000, Default 0.000

4.7 Green Lift

Adjusts the bottom side of the Greens.

- Range +/-1.000, Default 0.000

4.8 Blue Lift

Adjusts the bottom side of the Blues.

- Range +/-1.000, Default 0.000

4.9 Master Gamma

Simultaneously adjusts the midlevel (between shadows and highlights) of the Reds, Greens, and Blues.

- Range +2.000/0.000, Default 1.000

4.10 Red Gamma

Adjusts the midlevel (between shadows and highlights) of the Reds.

- Range +2.000/0.000, Default 1.000

4.11 Green Gamma

Adjusts the midlevel (between shadows and highlights) of the Greens.

- Range +2.000/0.000, Default 1.000

4.12 Blue Gamma

Adjusts the midlevel (between shadows and highlights) of the Blues.

- Range +2.000/0.000, Default 1.000

4.13 Master Gain

Simultaneously adjusts the top side of Reds, Greens, and Blues.

- Range +5.000/0.000, Default 1.000

4.14 Red Gain

Adjusts the top side of the Reds.

- Range +5.000/0.000, Default 1.000

4.15 Green Gain

Adjusts the top side of the Greens.

- Range +5.000/0.000, Default 1.000

4.16 Blue Gain

Adjusts the top side of the Blues.

- Range +5.000/0.000, Default 1.000

4.17 Saturation

Adjusts the chrominance saturation of the signal. At 0.0 a monochrome image is created.

- Range +2.000/0.000, Default 1.000

4.18 Exposure

Scene referred linear light adjustment to compensate for scene lighting intensity. The Exposure control is the equivalent of adjusting the photons landing on the camera sensor.

- Range +4.000/-4.000, Default 0.000

4.19 Color Temp

Scene referred linear light adjustment to compensate for color temperature. The Color Temp control affects the image the same as changing the lighting color temperature in front of the camera.

- Range +10.000/-10.000, Default 0.000

4.20 Tint

The Tint Control compensates for the coloration that most neutral-density (ND) filters add to the image.

- Range +16.000/-16.000, Default 0.000

4.21 PQ Output Nit Level

This parameter sets the maximum output Nit level for a PQ signal. Currently almost all PQ production is mastered to 1000 Nits maximum, so a processing step is required to fit any video data above 1000 nits down to 1000 nits or less. The Colorfront Engine transform remaps PQ output video data above the set level.

- Variable adjustments from 48-4000 Nits, default 1000 Nits.

NOTE: This parameter only applies if the FS-HDR's Dyn Range&Gamut OUT setting is PQ BT.2020 1000 Nits.

4.22 P3 Colorspace Clamp

This parameter limits the PQ output video data to be within the P3 gamut. If the Clamp is on and the output signal contains colors that extend past P3 into BT.2020, the Colorfront Engine transform will remap PQ output video data to be within P3.

- Select On or Off (default).

NOTE: This parameter only applies if the FS-HDR's Dyn Range&Gamut OUT setting is PQ BT.2020 1000 Nits.

4.23 BT.2408 Mode

This function provides a transform that meets the targets defined in the ITU publication ITU-R BT.2408 Operational Practices in HDR Television Production for converting SDR to HDR or HDR to SDR. Specifically, 100% reference white is mapped to 203 nits in 1000 nit HDR, which is a 75% signal level in HLG and 58% signal level in PQ, and vice versa.

NOTE: This parameter is only effective when the input is configured for SDR and the output is configured for PQ or HLG, or the input is configured for PQ or HLG and the output is configured for SDR.

- Range 0.000/+1.000, Default 0.0
- When set to 0 this function is off (no BT.2408 mapping)
- When set to 1 the function is on (full BT.2408 mapping)
- Values between 0 and 1 will apply an intermediate BT.2408 mapping).

NOTE: This parameter is only available in Live Mode, and only applies to SDR > HDR (PQ or HLG), or HDR (PQ or HLG) > SDR conversions.

4.24 CFE-Live Reset

Turn the ADJUST knob and press in response to the prompts to reset the Colorfront adjustment settings to unity.

NOTE: This reset cannot be undone. For A/B visual comparisons, use the 2.0 Colorfront Engine Unity/Adjust settings, or load alternative Presets.

Colorfront Engine Film Settings

When the **Colorfront Engine-Film** parameter is selected in Transform, the following parameters are available.

6.1 Grading Colorspace

For graded content, it is important to use matching grading colorspaces. Select from:

- LogC (default)
- ACEScct
- SLog3

About Looks and Color Mixing

FS-HDR includes pre-defined "looks" that emulate classic film stocks and other aesthetic color adjustments. Two different looks can be loaded simultaneously, and an adjustable color blend of these two looks can be achieved using the A/B Mix parameter. You can then save a preset with a particular blend to quickly recreate this exact color adjustment.

NOTE: Look adjustments only apply if the FS-HDR's Dyn Range&Gamut IN is set to Camera or ACEScct, and the Dyn Range&Gamut OUT setting has an SDR, PQ, or HLG setting (output cannot be a Camera or ACEScct)

6.2 Look A Select

Various color adjustments are available for selection, with descriptive names indicating each type of color effect.

MasterLook (default)	MasterPastelD60	FilmBlendedLoCon
MasterBroadcast	MasterPastelD65	FujiDI
MasterLookBright	Agfa	FujiXD
MasterLookCool	ARRI K1S1	GenericFilm
MasterLookLoCon	Bleach	Kodachrome
MasterLookSoftColor	ClassicFilm	ReversalClassic
MasterLookVivid	Ektachrome	
MasterLookWarm	FilmBlended	

6.3 Look B Select

Allows selection of the second "look", using the same parameters listed above.

6.4 A/B Mix

Adjusts the mix of the two looks selected above.

- Range is 0.000 to 1.000. Default value is 0.500.

6.5 HDR Amount

This adjustment guides the Colorfront Engine's color volume expansion algorithm. The setting applies to all conversions whether SDR to HDR, HDR to HDR, HDR to SDR, and SDR to SDR.

- Range +/-1.000, Default 0.000

6.6 Amb Light Comp

Ambient Light Compensation adjusts the signal based on the intended ambient light settings of the of the mastering or viewing environment. In Colorfront Engine-Film Mode, this adjustment can be used to better match the HDR display being used on-set (which will have a different ambient lighting level than the grading suite) to the "look" that was created in that grading suite.

- Range +/-1.000, Default 0.000

6.7 Master Offset

Simultaneously adjusts the top side of Reds, Greens, and Blues.

- Range +/-1.000, Default 0.000

6.8 Red Offset

Adjusts the top side of the Reds.

- Range +/-1.000, Default 0.000

6.9 Green Offset

Adjusts the top side of the Greens.

- Range +/-1.000, Default 0.000

6.10 Blue Offset

Adjusts the top side of the Blues.

- Range +/-1.000, Default 0.000

6.11 Master Power

Simultaneously adjusts the midlevel (between shadows and highlights) of the Reds, Greens, and Blues.

- Range +2.000/0.000, Default 1.000

6.12 Red Power

Adjusts the midlevel (between shadows and highlights) of the Reds.

- Range +2.000/0.000, Default 1.000

6.13 Green Power

Adjusts the midlevel (between shadows and highlights) of the Greens.

- Range +2.000/0.000, Default 1.000

6.14 Blue Power

Adjusts the midlevel (between shadows and highlights) of the Blues.

- Range +2.000/0.000, Default 1.000

6.15 Master Slope

Simultaneously adjusts the bottom side of the Reds, Greens, and Blues.

- Range +5.000/0.000, Default 1.000

6.16 Red Slope

Adjusts the bottom side of the Reds.

- Range +5.000/0.000, Default 1.000

6.17 Green Slope

Adjusts the bottom side of the Greens.

- Range +5.000/0.000, Default 1.000

6.18 Blue Slope

Adjusts the bottom side of the Blues.

- Range +5.000/0.000, Default 1.000

6.19 Saturation

Adjusts the chrominance saturation of the signal. At 0.0 a monochrome image is created.

- Range +2.000/0.000, Default 1.000

6.20 Exposure

Scene referred linear light adjustment to compensate for scene lighting intensity. The Exposure control is the equivalent of adjusting the photons landing on the camera sensor.

- Range +4.000/-4.000, Default 0.000

6.21 Color Temp

Scene referred linear light adjustment to compensate for color temperature. The Color Temp control affects the image the same as changing the lighting color temperature in front of the camera.

- Range +10.000/-10.000, Default 0.000

6.22 Tint

The Tint Control compensates for the coloration that most neutral-density (ND) filters add to the image.

- Range +16.000/-16.000, Default 0.000

6.23 PQ Output Nit Level

This parameter sets the maximum output Nit level for a PQ signal. Currently almost all PQ production is mastered to 1000 Nits maximum, so a processing step is required to fit any video data above 1000 nits down to 1000 nits or less. The Colorfront Engine transform remaps PQ output video data above the set level.

- Variable adjustments from 48-4000 Nits, default 1000 Nits.

NOTE: This parameter only applies if the FS-HDR's Dyn Range&Gamut OUT setting is PQ BT.2020 1000 Nits.

6.24 P3 Colorspace Clamp

This parameter limits the PQ output video data to be within the P3 gamut. If the Clamp is on and the output signal contains colors that extend past P3 into BT.2020, the Colorfront Engine transform will remap PQ output video data to be within P3.

- Select On or Off (default).

NOTE: This parameter only applies if the FS-HDR's Dyn Range&Gamut OUT setting is PQ BT.2020 1000 Nits.

6.25 CFE-Film Reset

Turn the ADJUST knob and press in response to the prompts to reset the Colorfront adjustment settings to unity.

NOTE: This reset cannot be undone. For A/B visual comparisons, use the 2.0 Colorfront Engine Unity/Adjust settings, or load alternative Presets.

Colorfront Engine TV Mode Settings

Colorfront Engine-TV mode provides simplified color correction tools similar to those used in traditional video workflows. This mode provides familiar Knee Point and Knee Slope adjustments for highlight and roll-off management, as well as Camera Correction settings like Exposure, Color Temp, and Tint. These controls helps you rapidly dial in color matching adjustments by eye while viewing the live results of your changed color settings.

When the **Colorfront Engine-TV** parameter is selected in Transform, the following parameters are available.

7.1 Conversion

Sets the basic direction of the color conversion between Standard Dynamic Range (SDR), Hybrid Log Gamma (HLG), or Perceptual Quantization (PQ) color coding).

Select from:

- SDR to SDR (default)
- SDR to HLG
- SDR to PQ
- HLG to HLG
- HLG to SDR
- HLG to PQ
- PQ to PQ
- PQ to SDR
- PQ to HLG

7.2 SDI Mon Conversion

(Enhanced Single Channel mode only)

Sets the basic direction of the color conversion used for the SDI Monitor output. Available selections are the same same as 3.1 Conversion above.

8.1 Knee Point

Adjusts the location of the Knee Point, setting the starting point for gamut remapping and roll off.

- Range -1.000 to +1.000 (default 0)

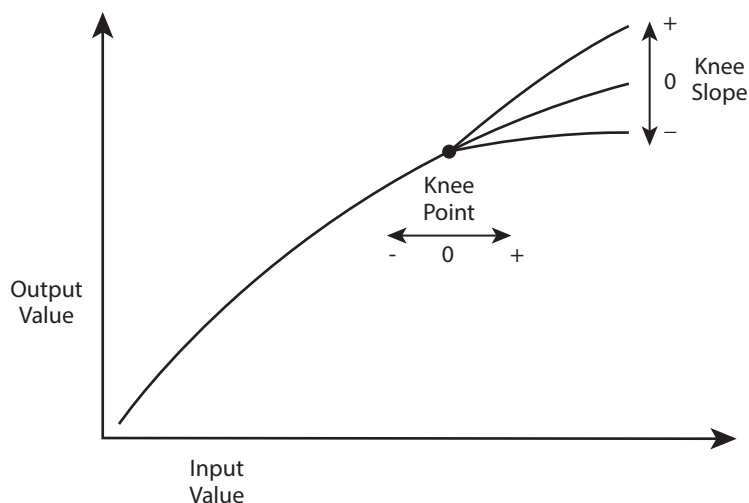
8.2 Knee Slope

Adjusts the slope above the Knee Point to compress or expand highlights.

- Range -1.000 to +1.000 (default 0)

The graphical representation shown in [Figure 30](#) is intended to convey how the Knee Point and Knee Slope controls work. The actual processed output provides a non-linear roll-off producing a high quality image.

Figure 30. Knee Point and Knee Slope Diagram



9.0 Color Corrector

Colorfront Engine TV Mode incorporates its own color corrector, separate from the FS-HDR's Color Corrector available in other modes. The parameters available when this Color Corrector is on include:

Master Lift	Red Lift	Green Lift	Blue Lift
Master Gamma	Red Gamma	Green Gamma	Blue Gamma
Master Gain	Red Gain	Green Gain	Blue Gain
Saturation			

See ["4.5 Master Lift" on page 87](#) through ["4.17 Saturation" on page 88](#) for details about these parameter functions.

10.0 Camera Correction

Enables or disables Exposure, Color Temp, and Tint adjustments.

Off (default)	Camera correction settings are not applied, hiding the following parameters.
On	Camera correction settings are applied, and can be adjusted using the following parameters.

10.1 Exposure

Scene referred linear light adjustment to compensate for scene lighting intensity. The Exposure control is the equivalent of adjusting the number of photons landing on the camera sensor.

- Range +4.000/-4.000 (default 0.000)

10.2 Color Temp

Scene referred linear light adjustment to compensate for color temperature. The Color Temp control affects the image the same as changing the lighting color temperature in front of the camera.

- Range + 10.000/-10.000 (default 0.000)

10.3 Tint

The Tint Control compensates for the coloration that most neutral-density (ND) filters add to the image. Adjusts an equivalent of an image's color tint.

- Range +16.000/-16.000 (default 0.000)

11.0 CFE-TV Reset

Turn the ADJUST knob and press in response to the prompts to reset the Colorfront adjustment settings to default values.

NOTE: *This reset cannot be undone. For A/B visual comparisons, use the 2.0 Colorfront Engine Unity/Adjust settings, or load alternative Presets.*

BBC HLG LUT Parameters

When **BBC HLG LUT** is selected in ["3.0 Transform" on page 83](#), the following parameters are available:

12.1 BBC HLG LUT

This parameter controls placing a LUT on the current video output. BBC HLG LUTs provide basic, mathematical transforms.

Description abbreviations:

SDR = Standard Dynamic Range

PQ = High Dynamic Range using Perceptual Quantization curve

HLG = High Dynamic Range using Hybrid Log Gamma curve

SLog3 = High Dynamic Range using SLog3 curve

SR = Scene Referred

DR = Display Referred

UC = Up Conversion (inverse tone mapping)

P3 = RGB color space for digital movie projection

Table 8. Convert to HLG, BBC HLG LUT Detailed Information

BBC HLG LUT Number and Name	Description
#4-1a, v1.5 SDR Scene > HLG	For use with most compact SDR cameras that approximate the BT.709 OETF with a square root. BT.709 signals are directly-mapped into BT.2100 HLG at the BT.2408 signal levels using a scene-light conversion. The "look" of the original BT.709 content is changed to match the subjective look of "native" BT.2100 HLG cameras. 100% SDR signal is directly-mapped to 75% HLG ("HDR Reference White"). This LUT is intended to be used with compact SDR cameras with a limited dynamic-range, so no highlight "boost" is applied.
#4-2a, v1.5 SDR Scene > HLG Strict	For use with compact SDR cameras that implement a strict BT.709 OETF. BT.709 signals are directly-mapped into BT.2100 HLG at the BT.2408 signal levels, using a scene-light conversion. The "look" of the original BT.709 content is changed to match the subjective look of "native" BT.2100 HLG cameras. 100% SDR signal is mapped to 75% HLG ("HDR Reference White"). This LUT is intended to be used with compact SDR cameras with a limited dynamic-range, so no highlight "boost" is applied. NOTE: Unlike BT.2100 HLG, SDR cameras that implement a strict BT.709 OETF tend to crush detail in the shadows of a scene. Such detail will become more evident after applying this conversion. It is often better to adjust the SDR camera's native OETF to approximate a square root (which provides a better match to HLG) and then use LUT 4-1 rather than this LUT.

BBC HLG LUT Number and Name	Description
#6-1a, v1.5 SDR Scene UpMap > HLG	For use with SDR cameras that approximate the BT.709 OETF with a square root. BT.709 signals are up-mapped (inverse tone-mapped) to BT.2100 HLG, using a scene-light conversion. The “look” of the original BT.709 content is changed to match the “look” of native BT.2100 HLG cameras. While the ITU-R BT.2408 signal levels are taken into account, a small boost is applied to the SDR highlights so that there is a close match to natively produced HDR content. 100% SDR signal is up-mapped to 79% HLG. 105% SDR signals (EBU R.103 “preferred range” signals) are up-mapped to 83% HLG.
#6-2a, v1.5 SDR Scene UpMap > HLG Strict	For use with SDR cameras that implement a strict BT.709 OETF BT.709 signals are up-mapped (inverse tone-mapped) to BT.2100 HLG using a scene-light conversion. The “look” of the original BT.709 content is changed, so that the native look of BT.2100 HLG cameras is achieved. While the ITU-R BT.2408 signal levels are taken into account, a small boost is applied to the SDR highlights so that there is a closer match to natively produced HDR content. A 100% SDR signal is up-mapped to 79% HLG. 105% SDR signals (EBU R.103 “preferred range” signals) are up-mapped to 83% HLG. NOTE: Unlike BT.2100 HLG, SDR cameras that implement a strict BT.709 OETF tend to crush detail in the shadows of a scene. Such detail will become more visible after applying this conversion. It is often better to adjust the SDR camera’s native OETF to approximate a square root (which provides a better match to HLG) and then use LUT 6-1.
#3c, v1.5 SDR Display > HLG	For use with SDR Graphics. BT.709 signals are directly-mapped into BT.2100 HLG at the BT.2408 signal levels using a display-light conversion. The “look” of the original BT.709 content is therefore preserved on conversion. A 100% SDR signal is mapped to 75% HLG (“HDR Reference White”).
#5c, v1.5 SDR Display UpMap > HLG	For use with SDR Graded Content. BT.709 signals are up-mapped (inverse tone-mapped) to BT.2100 HLG using a display-light conversion. This LUT is designed to complement LUTs 8 and 9 (BT.2100 HLG to BT.709 down-mapping) so that losses associated with ‘round-tripping’ (i.e. SDR-to-HDR-to-SDR conversion) are minimized. While the ITU-R BT.2408 signal levels are taken into account, a modest boost is applied to the SDR highlights so that there is a closer match to natively-produced HDR content. The LUT does, however, attempt to preserve the artistic intent of the original BT.709 content. 100% SDR signal is up-mapped to 82% HLG.
#17c, v1.5 SDR BT.2020 Disp > HLG	For use with SDR Graded Content. BT.2020 signals are directly-mapped into BT.2100 HLG at the BT.2408 signal levels using a display-light conversion. The “look” of the original BT.2020 content is therefore preserved on conversion. A 100% SDR signal is mapped to 75% HLG (“HDR Reference White”).
#18c, v1.5 SDR BT.2020 Disp UpMap > HLG	For use with SDR BT.2020 Graded Content. BT.2020 signals are up-mapped (inverse tone-mapped) to BT.2100 HLG using a display-light conversion. While the ITU-R BT.2408 signal levels are taken into account, a modest boost is applied to the SDR highlights so that there is a closer match to natively produced HDR content. The LUT does, however, attempt to preserve the artistic intent of the original BT.2020 content. 100% SDR signal is up-mapped to 82% HLG.
#1e, v1.5 PQ 1000 Nits Display > HLG	For use with Graded Content. BT.2100 PQ signals are converted to BT.2100 HLG in the 1000 cd/m ² “bridge” condition, so that 1000 cd/m ² PQ maps to 100% HLG. Please refer to ITU-R report BT.2390 Section 7.2 (“Conversion concepts using a reference condition at 1000 cd/ m ² ”). With the Type III LUTs, PQ signals above 1000 cd/m ² are mapped into the HLG “superwhite” signal range up to 109% signal, equivalent to 1811 cd/m ² (PQ).
#2e, v1.5 PQ 4000 Nits Display > HLG	For use with Graded Content. 4000 cd/m ² BT.2100 PQ signals are converted to BT.2100 HLG by first tone-mapping to the 1000 cd/m ² “bridge” condition, and then converting to HLG. The tone-mapping is applied to the luminance component so that hue distortions are avoided NOTE: that 4000 cd/m ² PQ maps to 100% HLG. For more information, please refer to ITU-R report BT.2390 Section 7.4 (“Handling PQ signals with greater than 1000 cd/m ² peak-luminance”). With Type III LUTs, PQ signals above 4000 cd/m ² are mapped into the HLG “super-white” signal range.

BBC HLG LUT Number and Name	Description
#10a, v1.5 S-Log3 100% Scene > HLG	For use with Sony S-Log3 cameras in non-live workflows. S-Log3 (BT.2020 color) signals produced using the Sony's "100%" workflow (i.e. 100% IRE input equals 90% reflectance) are converted to BT.2100 HLG with ITU-R BT.2408 signal levels. A 100% IRE input signal (90% reflectance) thus maps to 73% HLG. A scene-light conversion is used, so that the converted S-Log3 signal is a close subjective-match to the "look" of BT.2100 HLG cameras.
#11a, v1.5 S-Log3 200% Scene > HLG	For use with Sony S-Log3 cameras in "SR Live" workflows. S-Log3 (BT.2020 color) signals produced using Sony's "SR Live" "200%" workflow (i.e. 200% IRE input equals 90% reflectance) are converted to BT.2100 HLG with ITU-R BT.2408 signal levels. A 200% IRE input signal (90% reflectance) thus maps to 73% HLG. 200% workflows are commonly encountered whenever the S-Log3 curve has been used in live productions. A scene-light conversion is used, so that the converted S-Log3 signal matches the "look" of BT.2100 HLG cameras.

Table 9. Convert From HLG, BBC HLG LUT Detailed Information

BBC HLG LUT Number and Name	Description
#12-1c, v1.5 HLG > SDR Scene	For matching downstream SDR cameras that approximate the BT.709 OETF with a square root function. BT.2100 HLG signals are down-mapped (tone-mapped) to BT.709, using scene-light conversion. The "look" of the original BT.2100 HLG content is changed to match "native" BT.709 cameras with a square-root approximation of the BT.709 OETF. This LUT is the exact inverse of LUT 6-1 (BT.709 to BT.2100 up-mapping, scene-light), so that the losses associated with 'roundtripping' (i.e. SDR-to-HDR-to-SDR conversion) are minimized. "HDR Reference White" (75% HLG) is tone-mapped to 95% BT.709, allowing for some soft-clipping of highlights. A 79% HLG signal is tone-mapped to 100% BT.709. With Type III LUTs that process sub-blacks and super-whites, the LUT outputs are clipped to EBU R.103 signal levels. The 3D-LUT interpolation errors are greatest for the HDR to SDR down-mapping LUTs, as the output signals reach the extremities of the RGB signal range. For that reason, in addition to the "ideal" output values for the EBU Tech 3373 HLG Color Bars, we also provide the expected output values from a trilinear interpolator. Errors should be smaller with tetrahedral interpolation, the 65-cubed LUTs and also with real pictures.
#12-2c, v1.5 HLG > SDR Scene Strict	For use with SDR cameras that implement a strict BT.709 OETF. BT.2100 HLG signals are down-mapped (tone-mapped) to BT.709, using a scene-light conversion. The "look" of the original BT.2100 HLG content is changed to match "native" BT.709 cameras, with a strict implementation of the BT.709 OETF. This LUT is the exact inverse of LUT6-2 (BT.709 to BT.2100 HLG inverse tone-mapping, scene-light), so that the losses associated with 'round-tripping' (i.e. SDR-to-HDR-to-SDR conversion) are minimized. "HDR Reference White" (75% HLG) is tone-mapped to 95% BT.709, allowing for some soft-clipping of highlights. 79% HLG signal is tone-mapped to 100% BT.709. With Type III LUTs that process sub-blacks and super-whites, the LUT outputs are clipped to EBU R.103 signal levels. NOTE: Unlike BT.2100 HLG, SDR cameras that implement a strict BT.709 OETF tend to crush detail in the shadows of a scene. Shadow-detail visible in the HDR image will, as a result, become less evident after applying this conversion. The 3D-LUT interpolation errors are greatest for the HDR to SDR down-mapping LUTs, as the output signals reach the extremities of the RGB signal range. For that reason, in addition to the "ideal" output values for the EBU Tech 3373 HLG Color Bars, we also provide the expected output values from a trilinear interpolator. Errors should be smaller with tetrahedral interpolation, the 65-cubed LUTs and also with real pictures.

BBC HLG LUT Number and Name	Description
#8c, v1.5 HLG > SDR Display	<p>BT.2100 HLG signals are down-mapped (tone-mapped) to BT.709 using a display-light conversion. Colors and the appearance of mid-tones and lowlights are maintained after conversion. The LUT, therefore, attempts to preserve the artistic intent of the original HLG content. This LUT is designed to complement LUT 5 (BT.709 to BT.2100 HLG up-mapping) so that the losses associated with 'round-tripping' (i.e. SDR-to-HDR-to-SDR conversion) are minimized. "HDR Reference White" (75% HLG) is tone-mapped to 87% BT.709, facilitating signal headroom for compressed highlights. 100% HLG signal is tone-mapped to 100% BT.709. With Type III LUTs that process sub-blacks and super-whites, the HLG super-white signals are tone-mapped to SDR super-white signals. The LUT outputs are clipped to EBU R.103 signal levels. The 3D-LUT interpolation errors are greatest for the HDR to SDR down-mapping LUTs, as the output signals reach the extremities of the RGB signal range. For that reason, in addition to the "ideal" output values for the EBU Tech 3373 HLG Color Bars, we also provide the expected output values from a trilinear interpolator. Errors should be smaller with tetrahedral interpolation, the 65-cubed LUTs and also with real pictures.</p> <p>NOTE: Neither the EBU Tech 3373 HLG color bars nor the ITU-R BT.2111 HLG color bars will look like standard BT.709 color bars after conversion, as the BT.2100 color-primaries are quite different to those of BT.709. Furthermore, the converted color bars will not look like BT.2111 color bars displayed on a current reference display as their color-primaries tend to be closer to DCI-P3 than BT.2100. Most noticeable might be the BT.2100 green, which is much more cyan in color than the DCI-P3 and BT.709 greens.</p>
#9c, v1.5 HLG > SDR Display Super	<p>BT.2100 HLG signals are down-mapped (tone-mapped) to BT.709 using a display-light conversion. Colors and the appearance of mid-tones and lowlights are maintained after conversion. The LUT, therefore, attempts to preserve the artistic intent of the original HLG content. "HDR Reference White" (75% HLG) is mapped to 95% BT.709 and HDR highlights extend into the SDR super-white region; for that reason, only "Full-Range Mode" Type III LUTs are made available. 100% HLG signal is mapped to the EBU R103 preferred maximum of 105% BT.709. HLG signals above 100% are clipped. This LUT is recommended for use in scenarios where minimizing SDR>HDR>SDR "round-trip" losses is of the utmost importance. Minimal round-trip losses are achieved when used with the display-light up-mapping LUT5. Where the program delivery and distribution chain preserves the SDR super-white signal range, this LUT9 usually gives better results than LUT8 as its output color volume is larger. Where there is a risk of the SDR super-white signal range being clipped, LUT8 should be used instead. The 3D-LUT interpolation errors are greatest for the HDR to SDR down-mapping LUTs, as the output signals reach the extremities of the RGB signal range. For that reason, in addition to the "ideal" output values for the EBU Tech 3373 HLG Color Bars, we also provide the expected output values from a trilinear interpolator. Errors should be smaller with tetrahedral interpolation, the 65-cubed LUTs and also with real pictures.</p> <p>NOTE: Neither the EBU Tech 3373 HLG color bars nor the ITU-R BT.2111 HLG color bars will look like standard BT.709 color bars after conversion, as the BT.2100 color primaries are quite different from those of BT.709. Furthermore, the converted color bars will not look like BT.2111 color bars displayed on a current reference display, as their color primaries tend to be closer to DCI-P3 than BT.2100. Of these, the most noticeable might be the BT.2100 green. This contains more cyan content than the DCI-P3 and BT.709 greens.</p>
#7c, v1.5 HLG > PQ 1000 Nits Display	<p>BT.2100 HLG signals are converted to BT.2100 PQ at the 1000 cd/m² "bridge" condition, so that 100% HLG maps to 1000 cd/m² PQ. See ITU-R report BT.2390 Section 7.2 ("Conversion concepts using a reference condition at 1000 cd/m²"). For Type III LUTs, HLG signals above 100% are mapped to PQ signals greater than 1000 cd/m², up to a maximum of 1810 cd/m² (corresponding to 109% HLG 'super-white', i.e. 10-bit code value 1019).</p>

12.2 SDI Monitor BBC LUT

(Enhanced Single Ch only) This parameter controls adding a LUT to the current SDI monitor output. In Enhanced Single Channel mode, an independent 33 point 3-D LUT processor is added to the SDI Monitor output processing path. This parameter selects which BBC HLG LUT is used. The same settings in the table above are available.

NBCU 3-D LUT LUT Parameters

When **NBCU LUT** is selected in ["3.0 Transform" on page 83](#), the following parameters are available, developed by NBCUniversal Media, LLC.

13.1 NBCU LUT

1-NBCU_SDR2HLG_DL_v1, SDR UpMap to HLG using Display Light	For use with SDR playback sources. NBCU LUT 1 up-maps legacy SDR signals into a native HLG production using display-light conversion.
2-NBCU_SDR2HLG_SL_v1, SDR to HLG using Scene Light	For use with SDR camera sources. Tonemaps and matches SDR cameras with the HLG "Look" for a native HLG production using scene-light conversion.
3-NBCU_HLG2SDR_DL_v1.1, HLG to SDR using Display Light	For SDR camera shading and production output. Down-maps native HLG BT.2100 signals to SDR as a predictive LUT for legacy SDR-BT.709 transmission.
4-NBCU_SDR2PQ_DL_v1, SDR UpMap to PQ using Display Light	For SDR to PQ conversion preserving the artistic intent or "SDR look." Up-Maps legacy SDR signals into a native PQ production or transmission.
5-NBCU_PQ2SDR_DL_v1, PQ to SDR using Display Light	For PQ to SDR conversion for transmission. Down-maps native PQ-BT.2100 signals to SDR-BT.709 as a predictive LUT or for legacy SDR transmission.
7-NBCU_HLG10002PQ_v1, HLG 1000 Nits to PQ	For HLG to PQ conversion. BT.2100 HLG signals are converted to BT.2100 PQ at the 1,000nits "bridge" condition so that 100% HLG maps to 1,000nits PQ. This is a transparent conversion.

NOTE: NBCU LUT numbering goes from #5 to #7. LUT #6 is skipped intentionally.

13.2 SDI Monitor NBCU LUT

(Enhanced Single Ch only) This parameter controls adding a LUT to the current SDI monitor output. In Enhanced Single Channel mode, an independent 33 point 3-D LUT processor is added to the SDI Monitor output processing path. This parameter selects which NBCU LUT is used. The same settings in the table above are available.

User LUT Parameters

When **User LUT** is selected in ["3.0 Transform" on page 83](#), you can apply custom user LUT files to an output. The FS-HDR has ten "slots" where different user LUT files can be loaded for use. Each slot has associated parameters that are used to define the intention of the loaded user LUT (Colorspace, Range, and Transfer Characteristic).

User LUT files are loaded using the FS-HDR Web interface System > User LUTs page (see ["User LUTs Screen" on page 139](#) for more information).

Once user LUTs have been loaded into the FS-HDR, you can then use either the Web interface or the following front panel controls to assign a user LUT to an FS-HDR output.

The same user LUT can simultaneously be applied to multiple FS-HDR outputs if desired.

User LUT File Requirements

- .cube format only
- 3D LUT only
- 33 point only
- Keywords in the LUT file:
 - LUT_3D_SIZE must be set to 33
 - DOMAIN_MIN is optional, but if set must be 0 0 0
 - DOMAIN_MAX is optional, but if set must be 1 1 1
 - LUT_3D_INPUT_RANGE is optional, but if set must be 0 1
 - NO LUT_1D_SIZE allowed
 - All other keywords or comments are optional.

14.1 User LUT

The User LUT parameter can be used to select and apply a previously loaded LUT file to that FS-HDR's output. LUTs (1) - (10) are listed by file name if a user LUT is loaded into that FS-HDR's user LUT slot.

Unity (default) (1) - (10) <user LUT file name>	LUT values are set to unity. Applies the selected user LUT to the output. If no file name is displayed, a unity LUT is applied.
--	--

14.2 SDI Monitor User LUT

(Enhanced Single Ch only) This parameter controls adding a user LUT to the current SDI monitor output. In Enhanced Single Channel mode, an independent 33 point 3-D LUT processor is added to the SDI Monitor output processing path. This parameter selects which User LUT is used. The same user LUT files are available as described above.

Dynamic LUT Parameters

(Single Ch only) A Dynamic LUT can be used with a third-party Look Management system to allow real-time modification of LUT information. Dynamic LUT operation allows a third party device/application to transfer 3D LUTs (33 point .cube format) to the FS-HDR over Ethernet without user intervention. As changes are made to the LUT in the third party application, the new LUT is instantly loaded into the FS-HDR's 3D LUT processor. These parameters have no effect if a third-party system is not being used.

NOTE: In Enhanced Single Channel mode, when Dynamic LUTs are being used the SDI (BNC) Monitor output color settings always match the main output.

When **Dynamic LUT** is selected in "[3.0 Transform](#)" on page 83, the following front panel control parameters are available:

15.1 In Colorspace

BT.709 (default) BT.2020	Selects a BT.709 input colorspace. Selects a BT.2020 input colorspace.
-----------------------------	---

15.2 Out Colorspace

BT.709 (default) BT.2020	Selects a BT.709 output colorspace. Selects a BT.2020 output colorspace.
-----------------------------	---

15.3 In Range

SMPTE.Full (default)	Selects a full input scaling/range, which includes sub-blacks and super-whites. Input video values of 0-1023 are scaled to 0-1 before being sent to the LUT processor.
SMPTE.Narrow	Selects a narrow input scaling/range, such that an input video value of 0 represents black, and an input video value of 1 represents white. Input video values of 64-940 are scaled to 0-1 before being sent to the LUT processor

NOTE: The "In Range" and "Out Range" parameters were previously named "In Scale" and "Out Scale" (v3.2.0 and earlier). These terms were changed to better match industry conventions.

Previous Parameter Name	New Parameter Name
In/Out Scale > Full	In/Out Range > SMPTE.Narrow
In/Out Scale > SMPTE	In/Out Range > SMPTE.Full

15.4 Out Range

SMPTE.Full (default)	Selects a full output scaling/range, which includes sub-blacks and super-whites. Output values from 0-1 are scaled to 0-1023.
SMPTE.Narrow	Selects a narrow output scaling/range. Output values from 0-1 will be scaled to 64-940.

15.5 Transfer Characteristic

This parameter defines what transfer characteristic metadata (VPID for SDI, Infoframe for HDMI) will be added to the output signal.

SDR (default) PQ HLG	Selects Standard Dynamic Range. Selects Perceptual Quantizer. Selects Hybrid Log Gamma.
----------------------------	---

16.0 Video Legalizer

These parameters allow adjustment of signal levels to meet legal broadcast requirements. When set to Off, the Video Legalizer is not enabled, and the following clip controls are not active. The White Clip, Black Clip, and (in YUV mode) Chroma Clip controls are enabled and clip any values that exceed the set limits.

Off (default) YUV RGB	Disables the Video Legalizer. Enables the Video Legalizer to clip YUV to legal levels. Enables the Video Legalizer to clip RGB to legal levels..
-----------------------------	--

16.1 Legalizer White Clip

This parameter limits the white level so that it does not exceed the adjusted limit. Limit can be set from +80 IRE to +120 IRE.

Variable	Adjusts white clip level from +80 IRE to +120 IRE in 0.5 steps. Default (unity): 100 IRE
----------	---

16.2 Legalizer Black Clip

This parameter limits the black level to the adjusted limit. Limit can be set from -10 IRE to +20 IRE.

Variable	Adjusts black level limit from -10 IRE to +20 IRE in 0.5 steps. Default (unity): 0 IRE
----------	---

16.3 Legalizer Chroma Clip

When the Video Legalizer mode is YUV, this parameter limits the maximum chroma level to the adjusted limit. The limit can be set from +60% to +140%,.

Variable	Adjusts chroma clip level from +60% to +140% in 0.5 steps. Default (unity): 100 IRE
----------	--

FORMAT Menu Group

1 Output Format

Defines the output format of the Video Processor. Available choices depend on the frame rate selection.

Follow Input (default) Follow Ref <format><frame rate>	Match the output format to the incoming video format. Match the output format to the current Reference input. Select this format and frame rate as the output format.
--	---

Output Format Selection Constraint

Available frame rates depend on the ["1 Output Frame Rate" on page 63](#) parameter setting.

Output Timing Memory

Changing the Output Format selection automatically selects new values for H & V timing parameters (see ["1 Output Frame Rate" on page 63](#)). Each Output Format mode remembers its own Frame Delay and H & V timing settings.

Output Format Mapping

The Output Format selection is remembered for each of the frame rates. If you change the Output Frame Rate (["1 Output Frame Rate" on page 63](#)), the Output Format setting associated with the newly selected frame rate is recalled.

See ["System Cabling" on page 35](#) for more information about FS-HDR signal routing.

1.1 SDI Monitor Format

In Enhanced Single Channel mode (4K or UltraHD input and output), the SDI Monitor output can be configured to act as a second down-converted channel. The SDI Monitor output can be set to any of the following formats (frame rate depends on configured Reference family):

- (2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1920 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1920 x 1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1920 x 1080i 50, 59.94, 60
- (HD) 1280 x 720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94

The **Follow** setting in Enhanced Single Channel mode forces the SDI Monitor output format configuration to follow the format of the main output. For example, if the main output is UltraHDp29.97, the SDI Monitor output will be 1920x1080p29.97.

Follow (default) <format><frame rate>	The SDI Monitor output format configuration follows the configuration of the main output. Select the format and frame rate for the down-converted SDI Monitor output.
--	---

In Four Channel or Single Channel Mode this parameter is not available. In those modes the SDI Monitor output is controlled by the Format and the Color DynamicRange&Gamut settings of the main output.

3.0 Link Config SDI1, 2, 3, 4

(4Ch only) These parameters determine how 1080p50/60 signal transport is configured for the Video Processor output BNC connectors. The menu names and parameters available depend on the currently selected Video Processor. For example, if Video Processor 1 is selected, the menu title will be 3.0 Link Cfg SDI1 identifying the primary output BNC connector used by that Video Processor. For Video Processor 2 the menu title will be 3.0 Link Cfg SDI2, etc.

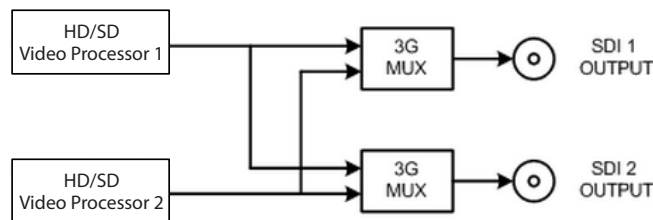
Sngl Link LvIA (default) Dual Link	Sets the output transport to 3Gb Level A (single connector). Sets the output transport to 1.5Gb Dual Link (two connectors, ST 372).
Sngl Link LvIB	Sets the output transport to 3Gb Level B-DL (single connector). When Level B is selected a sub menu becomes available to choose the Video Processor(s).

3.1 Level B SDI1, 2, 3, 4

(4Ch only) When Single Link Level B has been selected above, the parameters on the menu below become available for the selected Video Processor.

VID1	Vid1 (default) Vid1 + Vid 2	Selects only the Vid 1 Processor signal for output. Select both the Vid1 and Vid2 Processor signals for output (Dual Stream).
VID2	Vid2 (default) Vid1 + Vid 2	Selects only the Vid 2 Processor signal for output. Select both the Vid1 and Vid2 Processor signals for output (Dual Stream).
VID3	Vid3 (default) Vid3 + Vid 4	Selects only the Vid 3 Processor signal for output. Select both the Vid3 and Vid4 Processor signals for output (Dual Stream).
VID4	Vid4 (default) Vid3 + Vid 4	Selects only the Vid 4 Processor signal for output. Select both the Vid3 and Vid4 Processor signals for output (Dual Stream).

Figure 31. Dual Stream 3G Mux Schematic



See [Figure 14 on page 39](#) for more information.

3.0 Link Config SDI1-4

(Single Ch only) These parameters determine how 1080p50/60 signal transport is configured for the Video Processor output BNC connectors.

QuadLnk Lvl A (default)	Sets the output transport to Quad Link Level A (four connectors).
QuadLnk Lvl B	Sets the output transport to Quad Link Level B-DL (four connectors).
Sngl Lnk LvlA	Sets the output transport to 3Gb Level A (single connector).
Dual Link	Sets the output transport to 1.5Gb Dual Link (two connectors)
Sngl Lnk LvlB	Sets the output transport to 3Gb Level B-DL (single connector).

See ["Single Channel Mode Output Examples" on page 40](#) .

4.0 Link Config SDI5-8

(Single CH only) These parameters determine how 1080p50/60, 6Gb, and 12Gb signals are formatted for the Video Processor SFP output ports.

QuadLnk Lvl A (default)	Sets the output transport to Quad Link Level A (four connectors).
QuadLnk Lvl B	Sets the output transport to Quad Link Level B-DL (four connectors).
Sngl Lnk LvlA	Sets the output transport to 3Gb, 6Gb, or 12Gb Level A (single connector).
Dual Link	Sets the output transport to 1.5Gb or 3Gb Dual Link (two connectors)
Sngl Lnk LvlB	Sets the output transport to 3Gb Level B-DL (single connector).

NOTE: 6Gb and 12Gb signal output requires compatible SFP modules.

See ["Single Channel Mode Output Examples" on page 40](#) .

5 Output Image Mapping

(Single Ch only) Sets the structure of the UltraHD or 4K output video. The image can be divided into four quadrants (Square Division [SQD] format, see SMPTE 425-3, Appendix B), or interleave (2 Sample Interleave [2SI] format (see SMPTE 425-5, Section 8).

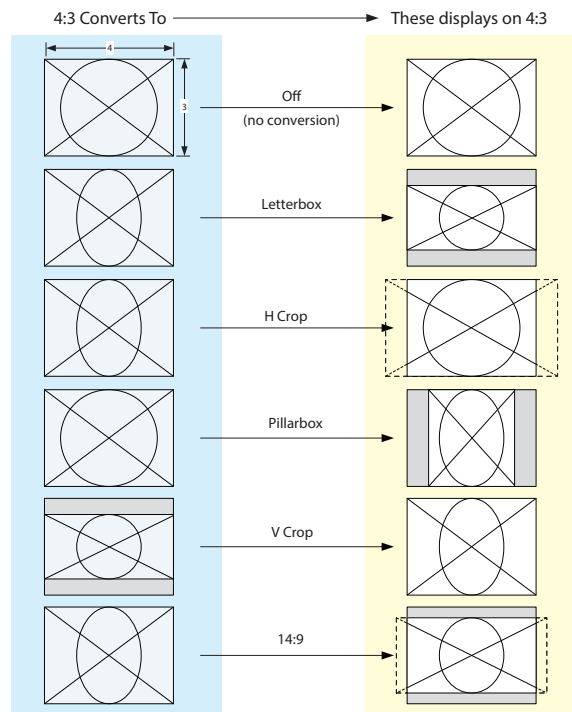
Quadrant (default) 2SI	The output is Quadrant format (Square Division). The output is Two Sample Interleave format. The front panel 2SI LED will light when selected.
---------------------------	---

6 SD Aspect Ratio

Selects the type of SD-to-SD Aspect Ratio Conversion (ARC) performed on an incoming selected SD source input. This parameter has an effect only when the input and output are both SD (525i or 625i).

Off (default) Letterbox H Crop Pillarbox V Crop 14x9	No ARC conversion will be performed. Selects the indicated ARC conversion.
---	---

Figure 32. SD Aspect Ratio Conversion Illustrations



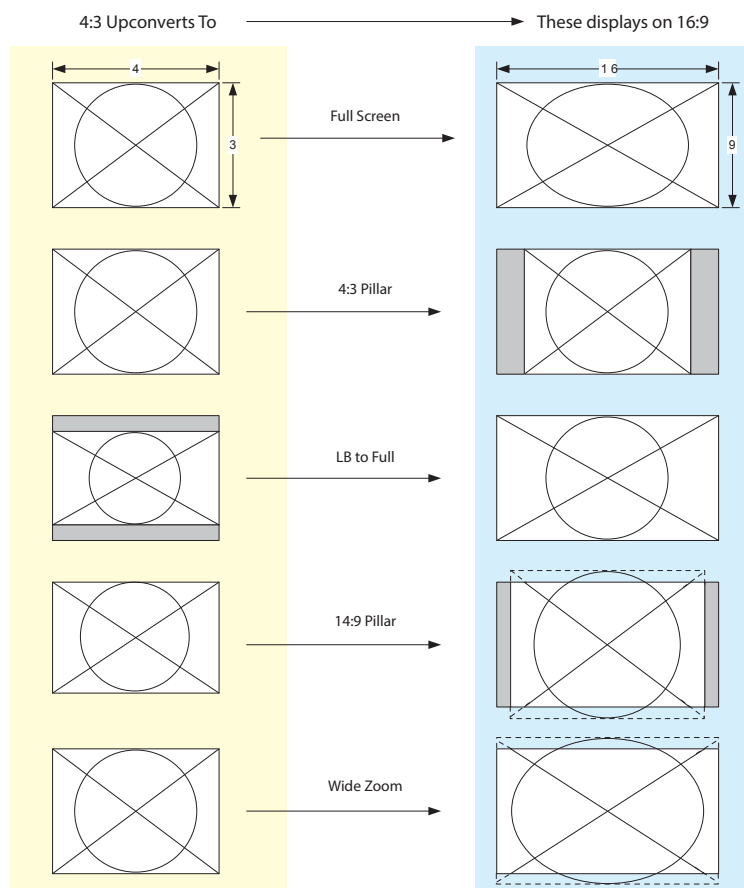
7 Up Convert Mode

These parameters select the type of up-conversion the Video Processor performs on the selected input. This parameter has an effect only when the input has a narrower aspect ratio than the output (SD > HD, HD > 2K). When converting from 2K, the selections do not precisely describe the resulting picture. For example, 4x3 pillar is not precisely 4x3, and 14x9 is not precisely 14x9. However, picture scaling is such that the visual effect closely resembles an SD-to-HD up-convert.

4x3 Pillar (default) 14x9 Pillar	Results in 4x3 image at center screen with black sidebars. Results in 14x9 image, zoomed slightly to fill a 14x9 image with sidebars.
Full Screen	Anamorphic full screen display. Image is zoomed to fit the full screen (letterbox).
LB to Full	Using a combination of zoom and stretch, the image is sized to fit a 16x9 screen (this can introduce a small aspect ratio change).
Wide Zoom	

NOTE: Any Custom Size/Pos values (only available in Four Channel Mode) will be applied on top of this settings.

Figure 33. Up-Convert Illustrations



8 Down Convert Mode

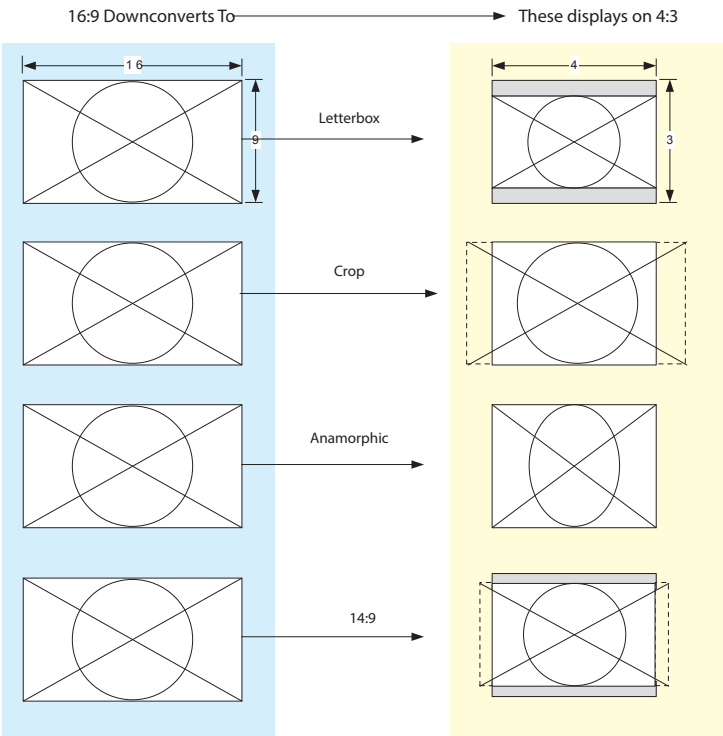
These parameters select the type of down conversion the Video Processor performs on the selected input. This parameter has an effect only when the input has a wider aspect ratio than the output (HD > SD, 2K>HD). When down converting from 2K, the selections do not precisely describe the resulting picture. For example, 14x9 is not precisely 14x9. However, picture scaling is such that the visual effect closely resembles an HD-to-SD down-convert.

Crop (default)	Image is cropped to fit new screen size.
Anamorphic	HD image is converted to full-screen SD with a 16x9 aspect ratio (anamorphic).
14:9	Image is reduced slightly with aspect ratio preserved. Black is added top and bottom, and the left and right sides are cropped.
Auto AFD	Automatically selects the best Down Convert mode based on the input video's Active Format Description (AFD) code. If the input video is not carrying an AFD VANC code, the down-converter defaults to the mode specified in the <i>Down Convert AFD Dflt</i> menu. With this selection any Custom Size/Pos settings and Region Of Interest settings are ignored.
Letterbox	Image is reduced with black top and bottom added to image area, with the aspect ratio preserved.

NOTE: Any Custom Size/Pos values (only available in Four Channel Mode) will be applied on top of this settings.

NOTE: Any Custom Size/Pos values (only available in Four Channel Mode) will be applied on top of this settings EXCEPT when Down Convert Mode is set to Auto AFD.

Figure 34. Down-Convert Illustrations



AFD and Conversion

Active Format Description (AFD) codes are carried in the vertical ancillary (VANC) portion of HD SDI video signals, specified in SMPTE 2016 as follows: "AFD information is intended to guide DTV receivers and/or intermediate professional video equipment regarding the display of video of one aspect ratio on a display of another aspect ratio." Because Auto AFD mode fully defines the size, position,

and aspect ratio of the output raster, any Custom Size/Pos settings and any Region Of Interest settings are ignored, and those menus are hidden. FS-HDR AFD processing (passing, removing, and re-inserting) occurs based on the setting of parameter ["1.1 AFD Out" on page 79](#).

SCALE Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

Custom Conversion Settings

The custom settings determine the image size and shape for Up Convert mode if you choose the Custom selection for those modes.

Custom settings are stored separately for each Conversion Mode. Values for each of the Up Convert modes and SD Aspect Ratio modes (excluding OFF), plus no conversion (or HD cross-convert), are independently stored.

1.0 Custom Size/Pos

This parameter turns custom image settings On or Off. The Custom Size/Position controls are only displayed when Custom Size/Pos is On. When Custom Size/Pos is Off, modified parameters are skipped in the menu system, and the UFC hardware is programmed for unity.

This menu is also not displayed when Active Format Description (AFD) is in control of the Conversion Mode.

NOTE: The Custom Size/Pos feature is not available in Single Channel Mode if both the inputs and outputs are UltraHD/4K.

Off (default) On	Sets this parameter and related custom size/pos parameters to off. Enables this parameter and related custom size/position parameters.
---------------------	---

1.1 Custom Size

Changes the H and V size of the output picture by the specified percentage (%) while maintaining the current aspect ratio.

100% (default) 10% to 200%	Maintains 100% picture size for the selected format. Enables changing the picture size.
-------------------------------	--

1.2 Custom Aspect

Changes the H/V aspect ratio of the output picture while maintaining the current V size (Aspect < 0) or H size (Aspect > 0).

0.000 (default) -0.500 to +0.500	Maintains the normal 100% aspect ratio for the selected format. Enables changing the aspect ratio.
-------------------------------------	---

1.3 Custom H Position

Changes the H position of the output picture.

0% (default) -100% to +100%	Maintains the normal horizontal position of the selected format. Enables changing the horizontal position.
--------------------------------	---

1.4 Custom V Position

Changes the V position of the output picture.

0% (default) -100% to +100%	Maintains the normal 100% vertical position of the selected format. Enables changing the vertical position.
--------------------------------	--

1.5 Custom Left Crop

Changes the Left picture crop position.

100% (default) +10.0% to +100.0%	Maintains the normal left side position of the selected format. Enables changing the left side position.
-------------------------------------	---

1.6 Custom Right Crop

Changes the Right picture crop position.

100% (default) +10.0% to +100.0%	Maintains the normal right side position of the selected format. Enables changing the right side position.
-------------------------------------	---

1.7 Custom Top Crop

Changes the Top picture crop position.

100% (default) +10.0% to +100.0%	Maintains the normal top position of the selected format. Enables changing the top position.
-------------------------------------	---

1.8 Custom Bottom Crop

Changes the bottom picture crop position.

100% (default) +10.0% to +100.0%	Maintains the normal bottom position of the selected format. Enables changing the bottom position.
-------------------------------------	---

Region of Interest (ROI)

The Region of Interest parameters select a portion of the input picture that will be used for scaling and/or positioning. The selected area can then be scaled to a standard pillarbox or letterbox size and shape (On Square), or it can be set to a full screen input image (On Full). On Full may cause image distortion if it is used to expand an odd-shaped region of interest to full screen.

NOTE: The ROI feature is not available in Single Channel Mode if both the inputs and outputs are UltraHD/4K.

The ROI Setup mode allows you to preview the edges of your selected Region Of Interest as you set it up. After selecting the desired region using the Setup Cursor, you can take the region to air by setting Region Of Interest to On Square or On Full.

The Setup mode is not required to operate the ROI feature. The edges of the Region Of Interest can also be adjusted while in On Square or On Full modes

2.0 Region of Interest

Turns the Region of Interest settings On or Off. When enabled, the ROI Left, Right, Top, and Bottom controls define the rectangular shape and position of the ROI.

Off (default) Setup On Square On Full	Turns off the ROI feature. Enables ROI cursor. Enables ROI and sets video to a pillarbox or letterbox shape. Enables ROI, and expands the ROI area to full screen.
--	---

Interactions occur between ROI settings and other parameters:

- The Region of Interest menu is not displayed when Active Format Description (AFD) is in control of the Conversion Mode.
- Custom Size and Position settings work interactively with ROI, but Custom Crop settings are disabled. Custom Size/Pos is also temporarily disabled while in the ROI Setup mode.

2.1 ROI Left

Sets the left boundary of the ROI.

Variable (default=100%)	Sets ROI left boundary to 10-100% of full screen in 0.1% increments. For 1% increments, hold down the Video button.
-------------------------	---

2.2 ROI Right

Sets the right boundary of the ROI.

Variable (default=100%)	Sets ROI right boundary to 10-100% of full screen in 0.1% increments. For 1% increments, hold down the Video button.
-------------------------	--

2.3 ROI Top

Sets the top boundary of the ROI.

Variable (default=100%)	Sets ROI top boundary to 10-100% of full screen in 0.1% increments. For 1% increments, hold down the Video button.
-------------------------	--

2.4 ROI Bottom

Sets the bottom boundary of the ROI.

Variable (default=100%)	Sets ROI bottom boundary to 10-100% of full screen in 0.1% increments. For 1% increments, hold down the Video button.
-------------------------	---

3.0 1080i Output Filter

Select On or Off. When On, displays the 1080i Output Filter Adj parameter slider below (default = Off).

3.1 1080i Output Filter Adj

A vertical filter control can improve the image quality of a 1080i Interlaced output when the source image has fine vertical detail and fast motion (like a camera pan). This feature is available when converting from 4K/UltraHD/2K/HD 23.98/29.97/59.94p to 1080i 59.94, or 4K/UltraHD/2K/HD 25/50p to 1080i50.

- Range 0 to 100, default = 0

KEYER Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

1 Background Fill

Selects the background source used to fill any part of the processor output raster not filled with video from the main input video. For example, when the Video Output Mode selection is Sidebars, this parameter selects the video source for the Sidebars.

Black (default) Matte Vid 1, 2, 3, 4 (4Ch only)	Selects black as the background fill video. Selects matte as the background fill video. Select the output of another Video Processor as background fill video.
---	--

2 Sidebar Edge

The parameter adjusts the sidebar position where the center video meets the pillarbox background video on both sides. The underlying hardware feature is the same as Custom Right Crop and Custom Left Crop. This is effectively an extra handle on the Left Crop and Right Crop parameters.

The Crop and Sidebar Edge controls are additive; increasing Sidebar Edge (making the sidebars larger and the center-video smaller), equates to setting Left and Right Crop values to smaller percentages. The Sidebar Edge can be set to 0 through +128. A value of 0 produces a 4:3 center. Positive values produce wider sidebars (and a narrower center).

0 (default) 0 to +128 (Variable)	Defaults to 0. Select a width value from 0 through +128 to expand or shrink the sidebars, which are filled with Background video (4 Background Fill). Selecting a larger value causes the center picture to become narrower while the sidebars expand.
-------------------------------------	--

3.1 Matte Luma

Determines the Matte Luma level of the background fill.

50% (default) 0–100% (Variable)	Sets the matte luminance level to the default 50% value. Sets the matte luminance level from 0–100%.
------------------------------------	---

3.2 Matte Chroma

Determines the Matte Chroma level of the background fill.

50% (default) 0–100% (Variable)	Sets the matte chrominance level to the default 50% value. Sets the matte chrominance level from 0–100%.
------------------------------------	---

3.3 Matte Hue

Determines the Matte Hue of the background fill.

0 degrees (default) 0–359 degrees (Variable)	Sets the matte hue to the default 0 degrees (red). Sets the matte hue to a value between 0 and 359 degrees.
---	--

NOTE: On the front panel, as you turn the Matte Hue ADJUST knob the values wrap from 359 back to 0 degrees.

TIMING Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

These parameters adjust Video Processor horizontal and vertical output timing in reference to the genlock source already selected, and permits adding up to 20 full frames of output delay.

1 Maintain A/V Sync

This parameter can be used to enable a one-way link from that Video Processor channel's video timing control to its audio input delay control. When On, adjustments made to video timing are also applied to the audio input delay, so the video and audio maintain sync.

The following conditions are required for this feature to operate properly:

- Vid1 (thru 4) Audio Out must be set to SDI1 (thru 8), AES or MADI.
- Selecting Mix Down, Sig Gen, Mute or Map disables Maintain A/V Sync.
- In 4Ch mode, that Video Processor must be the "master" (see ["Maintain A/V Sync with Multiple Video Processors" on page 114](#)).

NOTE: When this parameter is turned from Off to On, the existing audio delay value for that Video Processor does NOT immediately change, but that audio delay will subsequently be offset by matching values when the video timing setting is actually changed. This helps prevent unintended audio delay shifts from occurring, but means you cannot make A/B comparisons of audio delay simply by toggling this setting On and Off. Storing and Recalling Presets can be used for A/B comparison, however.

Off (default)	Video timing adjustments do not affect that Video Processor channel's current audio input delay setting (see Figure 35).
On	Video timing adjustments will also apply matching values to that Video Processor channel's current audio input delay setting (see Figure 36).

A real world example for using this feature is to easily adjust and maintain Audio Sync. During video processing, video frames can be shifted in time for proper frame synchronization. Because the FS-HDR de-embeds audio before video processing, even if the incoming audio was originally embedded on that same incoming SDI source, the audio can become offset from the video.

The following two diagrams illustrate the FS-HDR's Maintain A/V Sync behavior in Single Channel mode using SDI 1 input video and embedded audio. [Figure 35](#) show FS-HDR behavior when Maintain A/V Sync is Off, and [Figure 36](#) shows what happens when it is On.

Figure 35. Maintain A/V Sync Off, Single Channel Mode Example

Audio Delay Independent of Video Timing

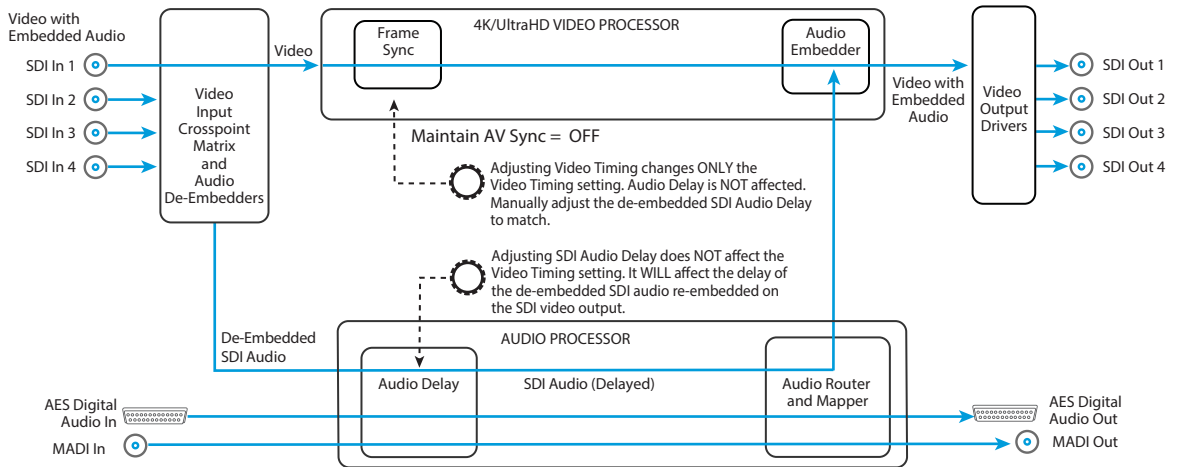
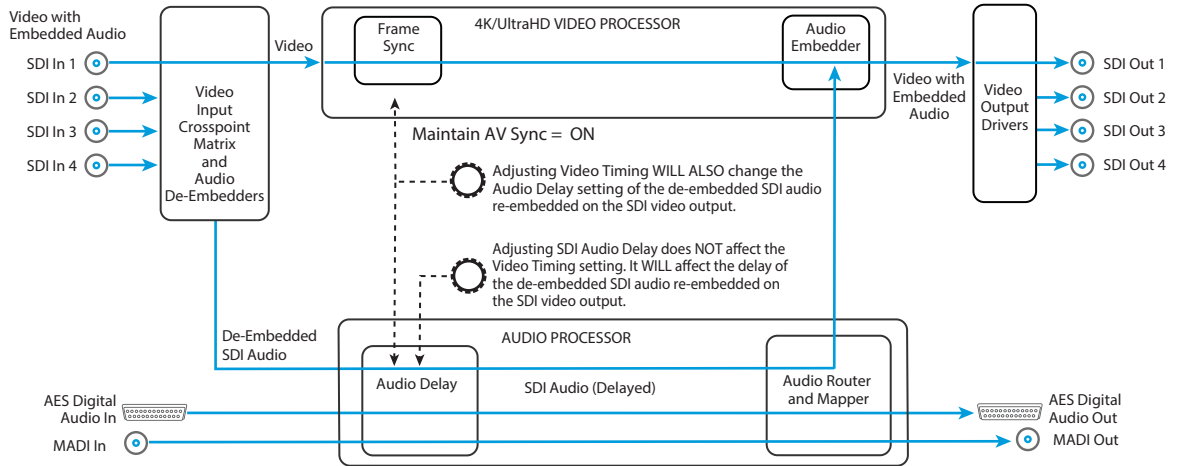


Figure 36. Maintain A/V Sync On, Single Channel Mode Example

Audio Delay Linked to Video Timing



Audio Sync Procedure Example

One procedure to maintain audio and video sync involves following the steps below in order (alternative procedures are also effective).

1. Configure your FS-HDR input and output routings. In this example, SDI 1 Input video is selected, SDI 1 embedded audio input is mapped as the Video 1 embedded audio output (default setting), and the combined output is sent to FS-HDR SDI Out 1.
2. With Maintain A/V Sync **OFF** (Figure 35), adjust the FS-HDR's Video 1 output timing as required for your situation.
3. With Maintain A/V Sync still **OFF**, adjust the EMBED SDI 1 Delay to match for Audio Sync.
4. If subsequent video timing adjustments become necessary for Video 1, turn Maintain A/V Sync **ON** (Figure 36) and adjust **ONLY** the Video timing. The audio will automatically be adjusted to match the new video timing setting.
5. If for some reason audio sync shifts, but the video timing is still correct, adjust **ONLY** the SDI 1 Embedded Audio Delay setting to match the audio to the video. This adjustment, independent of the video timing setting, can be made with the Maintain A/V Sync setting either **ON** or **OFF**.

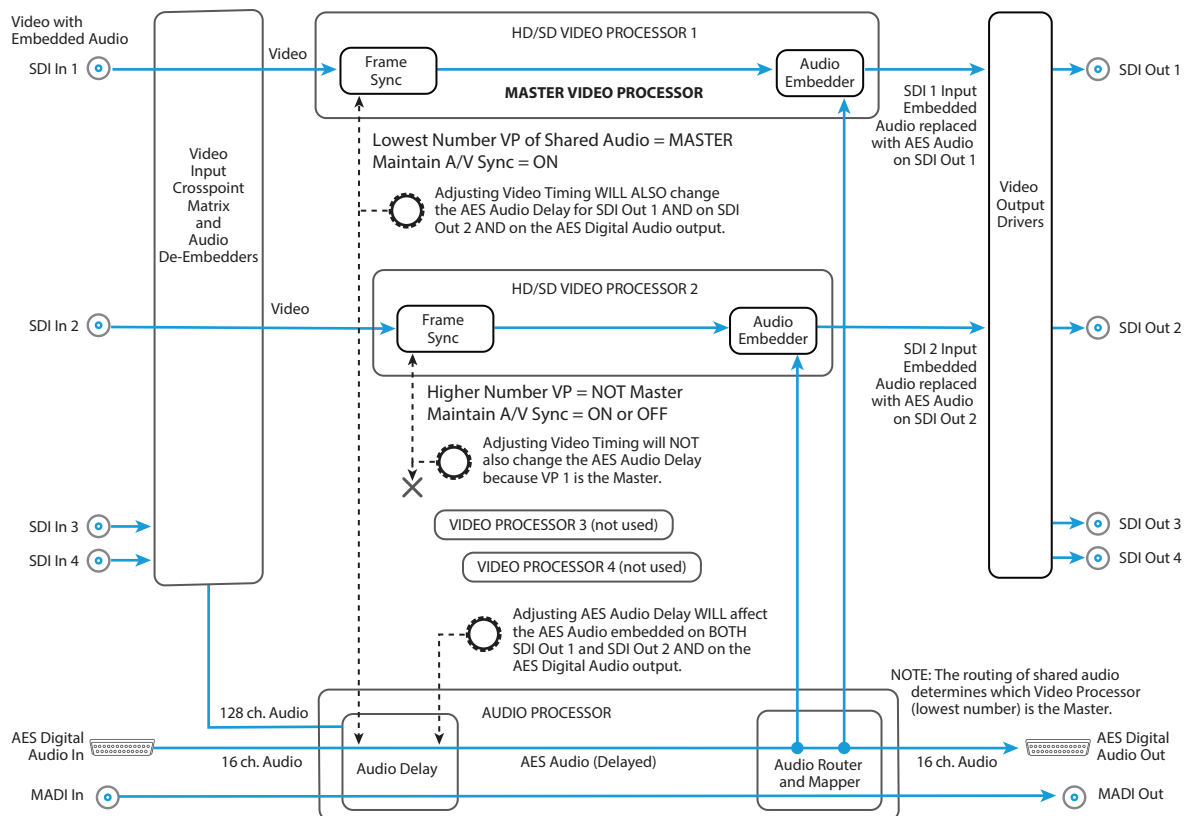
Understanding how these controls interact with each other will help you decide which adjustment to make, depending on your situation.

Maintain A/V Sync with Multiple Video Processors

In Four Channel mode, Maintain A/V Sync generally works the same as in Single Channel mode. However a special case occurs if audio from the same source is routed to more than one Video Processor. In this case a "master" Video Processor is required, because changing the Video Timing on both Video Processors could create conflicting Audio Delay changes for that shared audio source. In this situation, the lowest numbered Video Processor is considered the "master" and all other Video Processors will have their Maintain A/V Sync feature disabled (see [Figure 37](#)).

In the following example, AES input audio, instead of SDI 1 input embedded audio, is routed to multiple FS-HDR outputs. This will make each Video Processor's Video Timing adjustment behavior different, depending on which Video Processor is the master.

Figure 37. 4Ch Mode Example, Multiple Video Processors with Shared Audio



NOTE: The lowest numbered Video Processor with shared audio maintains its Master status even if its Maintain A/V Sync setting is turned Off. In that situation other Video Processors with that shared audio will NOT be able to change audio delay using the Maintain A/V Sync feature.

2 Output Timing H

When adjusting the horizontal timing (H), this parameter specifies a number of pixels to offset, from zero to full line width. Adjustment range increments from 0 to the width of the line in pixels. The maximum value varies, depending on the format already chosen.

Variable	Adjustment range increments from 0 to the width of the line in pixels. The maximum varies, depending on the format chosen. Default: 0
----------	---

NOTE: Unlike most knob-adjustable parameters, on the front panel menu this parameter automatically wraps from the maximum value to 0 (and vice versa).

3 Output Timing V

When adjusting the vertical timing (V), this parameter specifies a number of lines to offset, moving the screen up to a half a frame up or down.

Variable	Adjustment range increments from half a frame up to a half a frame down in single line increments. The maximum varies, depending on the format already chosen. Default: 0
----------	---

NOTE: Unlike most knob-adjustable parameters, on the front panel menu this parameter automatically wraps from the maximum value to 0 (and vice versa).

Output Timing Memory

Independent Frame Delay and horizontal and vertical timing values are kept for all available output formats.

Output Timing Ranges

The table below lists the output timing ranges for various video frame rates.

Table 10. Output Timing Ranges

Output Frame Rate	Horizontal		Vertical	
	Min	Max	Min	Max
UHD23.98	0	2749	-562	562
UHD24	0	2749	-562	562
UHD25	0	2639	-562	562
UHD29.97	0	2199	-562	562
UHD50	0	2639	-562	562
UHD59.94	0	2199	-562	562
4K1080p23.98	0	2749	-562	562
4K1080p24	0	2749	-562	562
4K1080p25	0	2639	-562	562
4K1080p29.97	0	2199	-562	562
4K1080p50	0	2639	-562	562
4K1080p59.94	0	2199	-562	562
1080i50	0	2639	-562	562
1080i59.94, 1080i60	0	2199	-562	562
1080p23.98, 1080p24	0	2749	-562	562
1080p25	0	2639	-562	562
1080p29.97, 1080p30	0	2199	-562	562

Output Frame Rate	Horizontal		Vertical	
	Min	Max	Min	Max
1080p50	0	2639	-562	562
1080p59.94, 1080p60	0	2199	-562	562
1080psf23.98, 1080psf24	0	2749	-562	562
1080psf25	0	2639	-562	562
1080psf29.97, 1080psf30	0	2199	-562	562
2Kx1080p23.98, 2Kx1080p24	0	2749	-562	562
2Kx1080p25	0	2639	-562	562
2Kx1080p29.97, 2Kx1080p30	0	2199	-562	562
2Kx1080p50	0	2639	-562	562
2Kx1080p59.94, 2Kx1080p60	0	2199	-562	562
525i59.94, 525psf29.97	0	857	-262	262
625i50, 625psf25	0	863	-312	312
720p23.98, 720p24	0	4124	-375	375
720p25	0	3959	-375	375
720p29.97, 720p30	0	3299	-375	375
720p50	0	1979	-375	375
720p59.94, 720p60	0	1649	-375	375

4 Frame Delay

Adjusts Video Processor output timing.

Variable	Adjustment output timing from 0 to 20 frames in one frame increments. Default: 0
----------	---

NOTE: This delay amount is in addition to the FS-HDR's default video latency. In Four Channel Mode and in Single Channel Mode with no UltraHD/4K up or down conversion, this default latency is nominally two frames at low frame rates (23.98/24/25/29.97/30 fps) or four frames at high frame rates (50/59.94/60 fps). In Single Channel Mode with UltraHD/4K up or down conversion being performed this default latency is nominally 3 frames at low frame rates or five frames at high frame rates.

TSTGEN Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

1 Test Pattern Gen

Selects whether test pattern is output by that Video Processor.

Off (default) On	Normal video is output (no test pattern). The output is the test pattern generator.
---------------------	--

NOTE: Normal output can be a version of its currently selected input, a Sidebar or Letterbox display, Black, or a Freeze of last good video, depending on the current configuration.

2 Test Pattern

Selects the type of test pattern output if Test Pattern Gen is on.

SDR Bars 75%	Sets test pattern to SDR 75% color bars.
SDR Bars 100%	Sets test pattern to SDR 100% color bars.
Black	Sets test pattern to black.
Flat Field	Sets test pattern to flat field gray.
HDR Bars PQ Narrow Range	Sets test pattern to HDR PQ Narrow Range
HDR Bars PQ Full Range	Sets test pattern to HDR PQ Full Range
HDR Bars HLG Narrow Range	Sets test pattern to HDR HLG Narrow Range

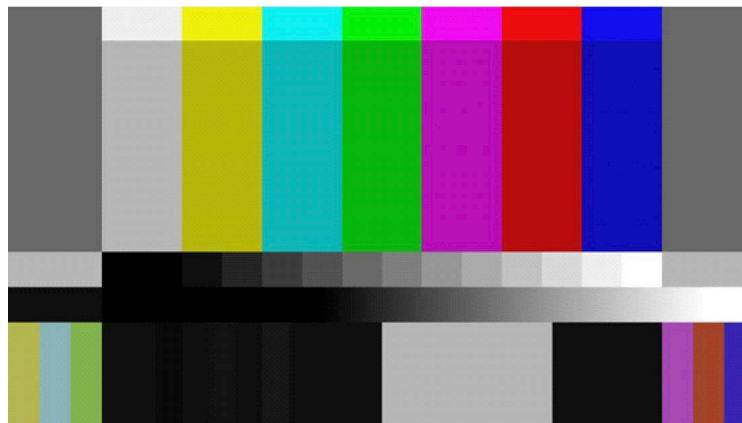
NOTE: The test pattern generator is downstream of the Colorfront Engine and LUT processor, so any settings for these have no effect on the test pattern.

Besides standard SDR color bars, black, and flat field (gray), three HDR Color bars are available.

- PQ narrow range
- PQ full range
- HLG narrow range

These patterns are only supported when the output format is 4Kp, UltraHDp, 2Kp, or 1080p. Note that PsF, 1080i, 720p, 625i, and 525i formats are not supported. If an HDR test pattern is selected for an unsupported output format, Flat Field will be output.

Figure 38. BT.2111 High Dynamic Range Color Bars Example



Each of the three HDR color bars displays calibrated colors for that HDR specification. See the *ITU-R BT.2111-0* standard for detailed information about these color values.

FREEZE Menu Group

IMPORTANT: In Four Channel Mode, the settings in this menu group apply only to the selected Video Processor (VID1- VID 4).

1 Freeze Output

Makes the FS-HDR freeze the current video frame on the Video Processor output. This may be useful either for testing or in case of loss of the input source.

Off (default)	Normal video is output (no freeze).
On	The FS-HDR captures and freezes the most current video frame and displays it on the outputs as long as this parameter is set to On.

NOTE: Normal output can be a version of its currently selected input, a Sidebar or Letterbox display, Black, or a Test Pattern, depending on the current configuration.

Audio Select Buttons EMBED, AES

IMPORTANT: These parameters are NOT affected by the selection of Single or Four Channel Mode.

As described in "[Operational Summary](#)" on page 20 the EMBED and AES front panel buttons select categories of audio.

- EMBED selects SDI embedded audio for control. The FS-HDR supports 16 embedded audio channels for each video channel.
- AES selects both AES and MADI audio for control, each with their own set of parameter menus. The FS-HDR supports up to 16 AES channels (eight pairs), and up to 64 MADI audio channels.

When the EMBED or AES button is selected, the three Audio buttons on the right are used to select a category of parameter menus.

Figure 39. Audio Menu Group Buttons

LEVEL
DELAY
MAP

LEVEL Menu Group

IMPORTANT: The settings in this menu group apply to the currently selected audio category (EMBED or AES/MADI). These settings are shared with both Four Channel and Single Channel modes.

The LEVEL menus provide Level and Phase adjustments for SDI Embedded, AES, MADI BNC, and MADI Fiber input audio.

EMBED Level Menus

When EMBED is selected, the following SDI Embedded Audio menus are available.

1.0 SDI1 Level

Selects the Audio Level Mode for all 16 SDI1 audio input channels. The default Unity setting applies 0.0 db gain to all the input channels

Unity (default)	All 16 SDI1 audio input channels are set to 0.0 dB. Individual channel adjustment menus are hidden.
Adjust	Each of the 16 SDI1 audio input channel adjusted values are applied to the audio processor, and the individual channel adjustment menus become available.

When Adjust mode is selected:

- After selecting an individual channel adjustment menu, the ADJUST knob changes the value shown by 0.5 dB (up or down) for each knob detent.
- The range of adjustment is -18.0dB to +18.0dB.

- Switching from Unity to Adjust will apply the individual level values that were set in the Adjust mode to the input for each of the channels. Switching from Adjust to Unity will apply unity (0.0dB) to all channels.

1.1-1.16 SDI1 Level Ch 1

When Adjust is selected above, individual SDI 1 audio channel menus become available, permitting +/- 18.0 dB level adjustment to each input channel.

2.0-8.0 SDI2-8 Level

Same as 1.0 SDI1 Level menu, except for SDI inputs 2 through 8, and similar level adjust submenus are available.

EMBED Phase Menus

9.0 SDI1 Phase

Selects the Audio Phase Mode for all 16 SDI1 audio input channels. The default Unity setting applies normal (non-inverted) phase to all the input channels.

Unity (default)	All 16 SDI1 audio input channels are set to Normal phase. Individual channel adjustment menus are hidden.
Adjust	Each of the 16 SDI1 audio input Phase values (either Normal or Invert) are applied to the audio processor, and the individual channel adjustment menus become available.

When Adjust mode is selected:

- After selecting an individual channel adjustment menu, the ADJUST knob toggles the Phase value shown between Normal and Invert. When Invert is selected the phase of the audio input on that channel will be inverted.

Switching from Unity to Adjust will apply the individual Phase values that were set in the Adjust mode to the input for each of the channels. Switching from Adjust to Unity will apply unity (Normal) to all channels.

9.1-9.16 SDI1 Phase Ch 1

When Adjust is selected above, individual SDI 1 audio channel menus become available, permitting inverting the phase of each input channel.

10.0-16.0 SDI2-8 Phase

Same as 9.0 SDI1 Phase menu, except for SDI inputs 2 through 8, and similar phase adjust submenus are available.

AES/MADI Level Menus

When AES is selected, Level and Phase parameter menus for AES and MADI input audio are displayed. These menus are the similar to those used for Embedded Audio SDI1 Level and Phase.

1.0 AES Level

Sixteen AES Level menus (and related submenus) are available.

2.0 MADIBNC Level

Sixty four MADI BNC Level (and related submenus) are available.

3.0 MADIFIB Level

Sixty four MADI Fiber Level (and related submenus) are available.

NOTE: For level adjustment information, see ["1.0 SDI1 Level" on page 118](#).

AES/MADI Phase Menus

4.0 AES Phase

Sixteen AES Phase menus (and related submenus) are available.

5.0 MADIBNC Phase

Sixty four MADI BNC Phase (and related submenus) are available

6.0 MADIFIB Phase

Sixty four MADI Fiber Phase (and related submenus) are available.

NOTE: For Phase adjustment information, see ["9.0 SDI1 Phase" on page 119](#).

DELAY Menu Group

IMPORTANT: The settings in this menu group apply to the currently selected audio category (EMBED or AES/MADI). These settings are shared with both Four Channel and Single Channel modes.

The DELAY Menu Group provides delay adjustments for SDI Embedded, AES, MADI BNC, and MADI Fiber input audio. Delay adjustments are applied to audio channel pairs.

EMBED Delay Menus

When EMBED is selected, the following SDI Embedded Audio menus are available.

1.0 SDI1 Delay

Selects the Audio Delay Mode for the eight SDI1 audio input channel pairs. Delay operates on channel pairs only. Delay cannot be adjusted on any single channel. Channel pairs are grouped as: Channel 1 and 2, Channel 3 and 4,..., Channel 15 and 16. The default Global setting applies the currently set Global delay value to all eight input channel pairs. The factory default Global setting is 0 seconds delay, but whatever value the user changes this setting to will be applied when Global is selected.

Global (default)	All eight SDI1 audio input channel pairs are set to the current Global delay value. Individual channel adjustment menus are hidden.
Channel Pair	Each of the eight SDI1 audio input channel pairs delay values are applied to the input of each channel pair, and the channel pair adjustment menus become available.

When Channel Pair mode is selected:

- Each of the individual eight SDI1 audio input channel pair delay values are applied to the input delay of each channel pair.
- The range of delay is -768 to +48,000 samples or -16ms to +1,000ms, where 48 samples = 1 millisecond.

Switching from Global to Channel Pair will apply the individual delay values that were set for each individual channel pair. Switching from Channel Pair to Global will apply the same currently set Global delay value to all the channel pairs.

1.1 SDI1 Delay Global

When Global is selected above, the individual SDI 1 audio channel pair menus are hidden

SDI1 Delay Global	The <i>ADJUST</i> knob sets the Global delay value. Adjustment range is -768 to +48,000 samples or -16ms to +1,000ms, where 48 samples = 1 millisecond. The Front Panel displays the delay in milliseconds and as fractions of milliseconds in units of samples.
-------------------	---

1.1-1.8 SDI1 Channel Pair Delay

When Channel Pair is selected above, eight individual SDI 1 audio channel pair menus become available, permitting adjusting the delay of each input channel pair.

- Delay adjustment range is -128 to +12288 in units of samples where 48 samples = 1 millisecond. The Front Panel displays the delay in milliseconds and as fractions of milliseconds in units of samples.

2.0 - 8.0 SDI2-8 Delay

Same as 1.0 SDI1 Delay menu, except for SDI inputs 2 through 8, and similar delay adjust submenus are available.

AES/MADI Delay Menus

When AES is selected, Delay parameter menus for AES and MADI input audio are displayed. These menus are the similar to those used for Embedded Audio SDI1 Delay.

1.0 AES Delay

Sixteen AES Level menus (and related submenus) are available.

2.0 MADI BNC Delay

Sixty four MADI BNC Level (and related submenus) are available.

3.0 MADIFIB Delay

Sixty four MADI Fiber Level (and related submenus) are available.

NOTE: For level adjustment information, see ["1.0 SDI1 Delay" on page 120](#).

MAP Menu Group

IMPORTANT: The settings in this menu group apply to the currently selected audio category (EMBED or AES/MADI). These settings are NOT shared with both Four Channel and Single Channel modes.

The MAP menus provide FS-HDR audio routing controls. Any audio input can be routed to any audio output, except the Monitor output embedded audio always matches the monitored video.

About Audio Routing

The following menus control the FS-HDR's audio routing. The general routing procedure using the front panel is to select the menu of the audio output with the SELECT knob, and then select the input source you wish to route to that output with the ADJUST knob. Channel mapping allows different individual audio channels to be routed to different individual outputs.

See "[System Cabling](#)" on page 35 for more information about FS-HDR signal routing.

1.0 Vid 1 Audio Out

Selects the audio input sources for the selected FS-HDR Video Processor's audio output channels. The factory default for each output is the corresponding input: i.e. SDI1 to SDI1, SDI2 to SDI2, etc.

SDI1 - 8 Input AES/EBU In MADI BNC In MADI Fiber In	The selected source channels are routed to the corresponding output channels.
Mix Down 1 L:R	The stereo output of the Mix Down 1 Module is routed to the output channels 1 and 2. The other channels are muted.
Mix Down 2 L:R	(4Ch only) The stereo output of the Mix Down 2 Module is routed to the output channels 1 and 2. The other channels are muted.
Sig Gen 1KHz Sig Gen 400Hz Mute	The selected tone or mute is routed to every output channel of the selected Video Processor.
Map	The currently configured mapping is applied to each output channel of the selected Video Processor. Channel mapping menus for each output become available.

When set to SDI1-8, AES/EBU, or MADI:

- The selected source channels are routed to the corresponding output channels. For example, SDI1 input Ch n to SDI1 output Ch n, where n = 1 thru 16.

When set to Mix Down

- The stereo output of the Mix Down Module is routed to audio channels 1 and 2 of the SDI output. The other channels are muted.

When set to Sig Gen 1KHz, Sig Gen 400Hz or Mute:

- The selected source (tone or silence) is routed to every output channel.

When set to Map:

- The mapped source is routed to each output channel according to the last configured mapped source for each channel in the output.
- The following channel map menus become available via the SELECT knob.

1.1-1.16 SDI1 Output Channel

When Map is selected, each listed source can be mapped to each output channel of the currently selected output menu.

SDI1 Output Ch 1 through SDI1 Output Ch 16	Select the source to route to the selected output from the following: <ul style="list-style-type: none">-SDI1-8 Ch 1 - Ch 16-AES Ch 1-16-MADI BNC 1-64-MADI Fiber 1-64-Mix Down 1 L-Mix Down 1 R-Mix Down 2 L (4Ch only)-Mix Down 2 R (4Ch only)-Sig Gen 1kHz-Sig Gen 400Hz-Mute
--	--

2.0-4.0 SDI2-4 Audio Out

See ["1.0 Vid 1 Audio Out" on page 122](#)

Chapter 5 – Browser Remote Control

Remote FS-HDR Control Via a Web Browser

The FS-HDR web interface consists of a built-in optimized web server that provides control via a web browser running on a network-attached computer. The browser screens are presented and described on the following pages, organized as they appear in the browser.

Supported browsers

- Chrome (all platforms)
- Firefox (all platforms)
- Safari (OSX, Mobile)
- Internet Explorer (versions 10 and higher)

Other browsers are likely to work but are not guaranteed.

Supported RJ-45 Ethernet network connections

- Closed local area network (LAN)
- Straight computer to FS-HDR cable connection
- Broadband wide area network (WAN) with the firewall opened for the FS-HDR (not recommended since anyone on the Internet can then access the FS-HDR)

Internally the FS-HDR senses and adapts to either a “straight-through” CAT 5 Ethernet cable or null-modem (crossover) cable using standard RJ-45 connectors. No setup or strapping is needed to adapt to the cable.

Browser connection

For browser access, enter the FS-HDR IP address in the browser’s address field.

By default, the FS-HDR is set to automatically connect to your network’s DHCP server to get an IP address and other network configuration data. You will find the IP address in the STATUS Menu Group as follows:

1. Press the STATUS button on the FS-HDR front panel.
2. Turn the SELECT knob until you reach status display with the FS-HDR name at the top.
3. Enter the IP address shown in the IP Addr field.

When the browser successfully connects to the FS-HDR, the main Status screen is displayed. If the browser fails to connect, make sure CONFIG settings for IP, Subnet, and Gateway match the network setup of the browser host. You can either make the computer match the FS-HDR, or make the FS-HDR match your computer.

General Web Browser Screen Description

The webpage screens are different, depending on the current FS-HDR operating mode. All FS-HDR screens share some common elements:

Menu

On the left of each screen is a navigational list of the available screens. Click any of these items to jump to that screen. Collapse/expand buttons on the upper right of each menu lets you open and close that menu’s selection list.

Alarms

The lower left side of the screen shows alarms that alert you to possible problem conditions, such as disconnected or failed power supplies and video format incompatibilities.

Status and Menu Display

In the center of each screen you'll find the main display showing the status and menu selections for the screen you are viewing. The content of FS-HDR web screens closely mirrors the parameter menus displayed on the front panel. On all menus except Status, if you hover the cursor over any parameter, the equivalent front panel parameter number is displayed.

Connection

The right side of the screen lists FS-HDR system details, including system serial number, installed software version, and connection status. This information is useful if you ever have to call AJA Technical Support for help.

Network

The right side of the screen lists AJA systems on the network. The network panel is divided into two sections by the white line- above the line will be a list of FS-HDR models on the network- below the line will be a list of other AJA devices (such as CION and other FS models) If you right-click any system in the list and select Identify, the ID LEDs on the unit will blink to identify it. Click on Identify again to stop the blinking. Another way to identify systems is to notice which system's EXT front panel LED flashes when you change any setting from a remote control device, such as the web browser.

Figure 40. FS-HDR Web Interface, Main Status Screen, Four Ch Mode

Menu of System Screens: Click a screen's name to display that screen.

Menu of Channel Screens: Click a screen's name to display that screen.

Collapse/Expand Button

Alarms

Status and Menu Display Area

AJA Systems on the Network

System Info

FS-HDR

System

Status

Config

Video

Audio

Presets

User LUTs

Remote

Network

Firmware

Channels

Vid 1 cam1

Input

Format

Timing

Scale

Keyer

Test Gen

Color

ANC

Freeze

Vid 2 Cam 2

Vid 3 Cam 3

Vid 4

EMBED

AES

Alarms

Video - HD/SD Mode

Vid 1

Channel Name

cam1

INPUT

SDI1

1080p2997

OUTPUT

1080i5994

1080i5994

Transform

Colorfront Engine-TV

Conversion

SDR to HLG

Colorfront Engine TV

Default

Caption Translator

Off

HD CC Not Detected

Proc Amp

Off

UFC Custom

Off

Off

Background

Black

Override VPID

Off

Vid 2

Channel Name

Cam 2

INPUT

SDI2

1080p2997

OUTPUT

Follow INPUT

1080p2997

Transform

Off

Caption Translator

Off

HD CC Not De

Proc Amp

Off

UFC Custom

Off

Off

Background

Black

Override VPID

Off

Vid 3

Channel Name

Cam 3

INPUT

SDI3

1080p2997

OUTPUT

Follow INPUT

1080p2997

Transform

Off

Caption Translator

Off

HD CC Not Detected

Proc Amp

Off

UFC Custom

Off

Off

Background

Black

Override VPID

Off

Vid 4

Channel Name

.

INPUT

SDI4

1080p2997

OUTPUT

Follow INPUT

1080p2997

Transform

Off

Caption Translator

Off

HD CC Not De

Proc Amp

Off

UFC Custom

Off

Off

Background

Black

Override VPID

Off

Genlock

Monitor

Connection

Serial Number

3FF000250

Software Version

4.1.0.40

Connection Status

Connected

Network

aja-fs-HDR

Controlling Multiple FS-HDRs

From any screen, you can see at-a-glance all of the AJA devices present on the same local LAN as well as the current FS-HDR you are controlling. Clicking on any of the listed systems will bring up the Status screen of that device.

NOTE: *The FS-HDR you control may be running a different software version, so screens may look different. It's a good idea to have all your devices running the most current software and the same version. Also, if the Default Gateway is not configured properly, other AJA devices will not be visible. If the display shows no devices found, check the gateway setting.*

Resetting Values To Factory Default Settings

FS-HDR web browser screens feature many user controls that can be reset to factory default values by simply "right-clicking" on the parameter label. When you right-click, the browser displays a Reset to Factory popup that if clicked will cause the parameter to be reset.

NOTE: *This reset procedure only works with computers that allow right-clicking. Some computers may not permit this operation.*

You can perform a global reset to factory values of all System, Video, Audio, and most Config parameters (the same set of parameters acted on by a Preset Recall).



Caution! Recall Factory Preset changes the settings for both FS-HDR operating modes (Four Channel and Single Channel) to their factory default values.

To perform a global reset:

1. Go to the Presets screen.
2. Click on the Recall button in the Factory Preset row.

User preferences, network settings, and existing Presets are not affected by recalling the Factory Preset.

Drop Down Parameter Operation

Most parameters available on the browser are selected from a drop-down list. The currently active parameter is displayed. Click on the down arrow symbol next to the parameter to display the list and select an alternative value. The FS-HDR will immediately operate with the new setting.

Slider Operation

Some screens contain slider controls for setting values. To set a value, you can click on a slider to select it and then use the mouse to drag the slider to the position you desire. For fine tuning, while the slider is selected (highlighted by a blue border), use the keyboard left and right arrow keys to change the value one unit at a time. Or you can enter the value directly by clicking on the number displayed above the slider, type in your number then hit Enter to have it take effect. After setting a slider's position, click on the page's background area (blue highlight turns off) to ensure the change is confirmed and saved.

Sub-Menus

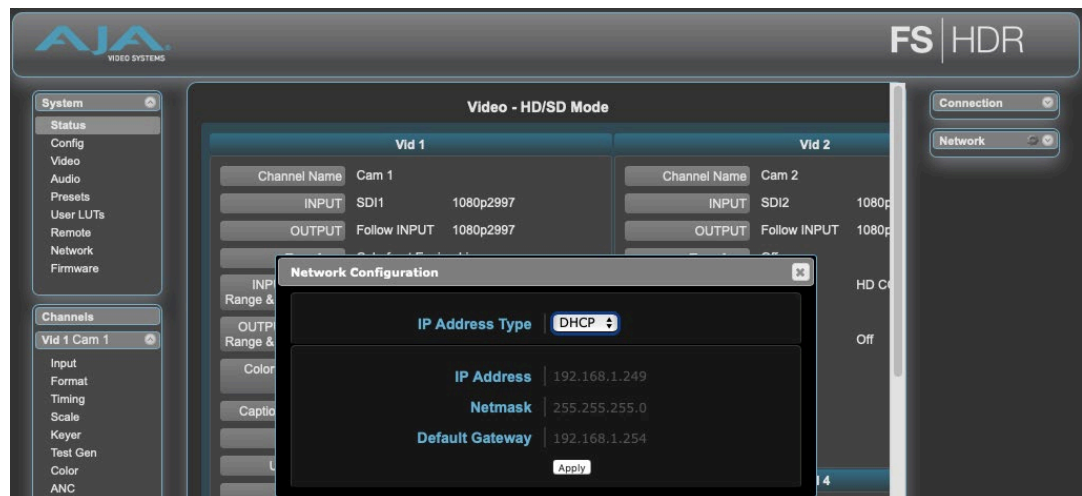
Some parameters, when activated, open sub-menus. The sub-menus are a lighter gray color and have a collapse/expand button on the parent selection. This lets you collapse the sub-menus to make it easier to configure the system. The collapsed setting only stays in effect until the user reconnects or refreshes the browser.

Screen Descriptions

Now that you have had an introduction to how the FS-HDR browser works and how to navigate the screens, each screen and its settings are described in detail (click to jump).

- ["Network Pane and Network Configuration Screen" on page 127](#)
- ["Alarm Configuration Screen" on page 129](#)
- ["Status Screen" on page 130](#)
- ["Config Screen" on page 133](#)
- ["Video Screen" on page 135](#)
- ["Audio Screen" on page 136](#)
- ["Presets Screen" on page 137](#)
- ["Remote Screen" on page 141](#)
- ["Firmware Screen" on page 141](#)
- ["Video Channel Screens" on page 142](#)
- ["Embedded Audio Channel Screens" on page 147](#)
- ["AES \(and MADI\) Audio Channel Screens" on page 148](#)

Network Pane and Network Configuration Screen



The Network pane on the right side of any screen lists the AJA devices that appear on the network. This pane includes three additional controls:

- Hover the cursor over any system name to see its IP address.
- Right-click any system and select Identify to blink the system ID LEDs.
- Click the gear-shaped icon in the Network pane (or select Network from the Menu list on the left side of the screen) to open the Network Configuration screen listing FS-HDR network settings.

The Network Configuration screen allows you to view and change your FS-HDR's network settings and then click Apply to activate them.

See ["Networking" on page 31](#) for detailed setup instructions for connecting the FS-HDR to a network. Consult your network administrator about how to configure network settings.

IP Address Type

IP Address Type determines the type of TCP/IP network configuration used by the FS-HDR. DHCP enables the FS-HDR to connect to the network DHCP server, which assigns the IP Address, Netmask, and Gateway automatically. Static lets you set these parameters manually.

NOTE: If the IP Address Type is DHCP, the IP Address, Netmask, and Default Gateway are gray, indicating they are set automatically and cannot be changed unless IP Address Type is first set to Static. Changes are saved and activated upon confirmation using the Apply button.

DHCP (default)	Select automatic IP address assignment from the LAN DHCP server. If the FS-HDR cannot find a DHCP server, it fails over to the static IP address.
Static Addr	Assign a static IP address manually. The factory default static IP address: 192.168.0.2

IP Address

IP Address determines the static IP address used by the FS-HDR for TCP/IP networking. (Networking is discussed in Chapter 3, Network Connection.) Consult your network administrator about how to set this value.

Variable	If IP Address Type is set to DHCP, the IP address is set automatically by the network DHCP server and cannot be entered here. If IP Address Type is set to Static, enter an IP address compatible with your LAN here. Also enter a netmask and default gateway address in the following two parameters. Click Apply when you are ready to apply all three entries to change the FS-HDR's network addressing. If IP Address Type is set to DHCP and there is a DHCP failure, the IP address is set to the static IP address. The default static IP address is 192.168.0.2
----------	--

Netmask

Netmask determines the subnet mask used by the FS-HDR for TCP/IP networking.

Variable	Enter a subnet mask compatible with your LAN. This is only needed for Static IP configurations. The factory default Subnet Mask is 255.255.255.0 If IP Address Type is set to DHCP, the Subnet Mask is set by the DHCP server and cannot be changed by the user.
----------	---

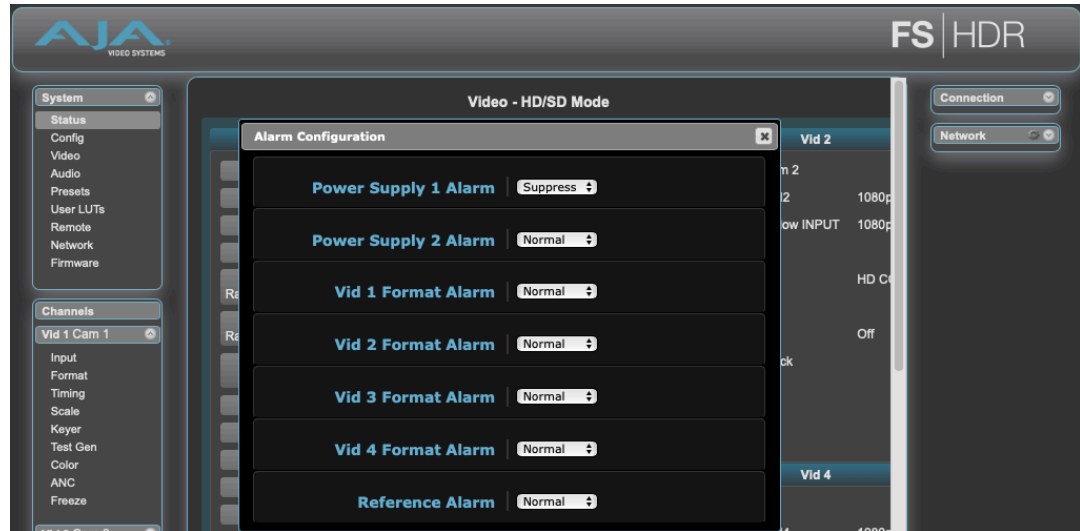
Default Gateway

Default Gateway determines the gateway or router used on your LAN for TCP/IP networking.

Without a properly configured default gateway (whether you have a router/gateway or not), the FS-HDR will be unable to see other AJA FS devices on the network, although you may still be able to control this FS-HDR via a web browser. Also, without a proper gateway defined, the discovery feature on the Network web page will not work correctly and list other FS devices on the network.

Variable	Enter a default gateway or router address. This is only needed for Static IP configurations. The factory Default Gateway is 192.168.0.1. If IP Address Type is set to DHCP, the Default Gateway is set by the DHCP server and cannot be changed by the user.
----------	---

Alarm Configuration Screen



You can pop open the Alarm Configuration display at any time and on any screen by clicking the gear button in the upper part of the Alarms panel.

To close the window, press the ESC key, or click the X in the upper right corner.

The Alarm Configuration display provides control over these alarm settings:

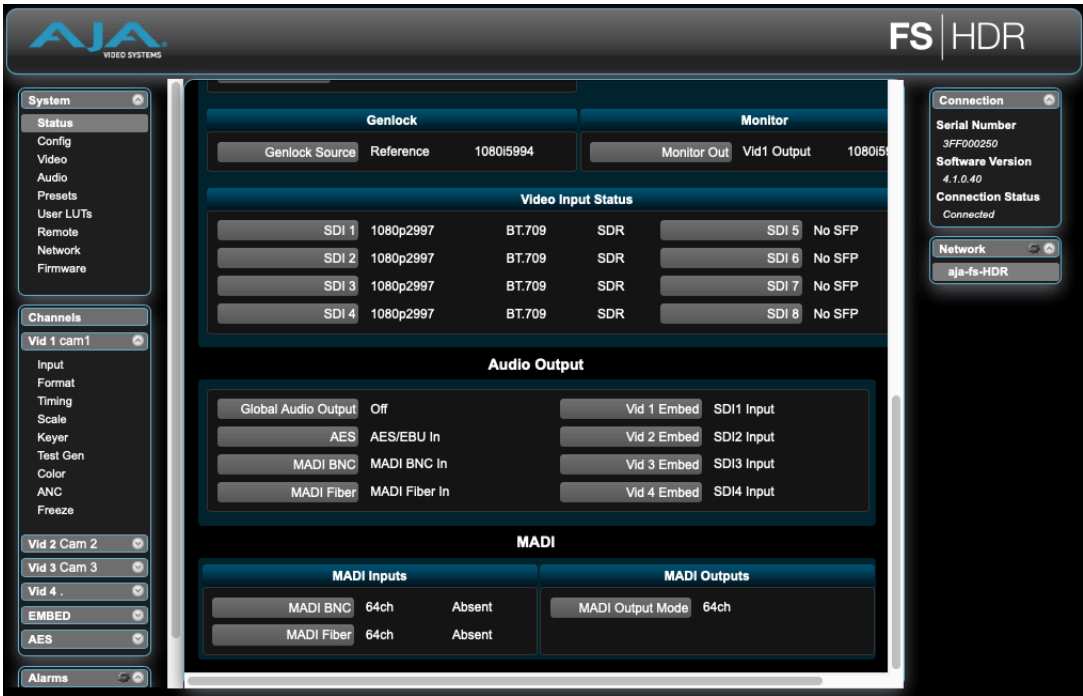
- Power Supply Alarm (see ["5.1, 5.2 Power Supply 1-2 Alarm" on page 68](#))
- Video Format Alarm (see ["6 Vid Format Alarm" on page 68](#))
- Reference Alarm (see ["7 Reference Alarm" on page 69](#))

Status Screen

Figure 41. Status Screen Top, Four Channel (HD/SD) Mode



Figure 42. Status Screen Bottom, Four Channel (HD/SD) Mode



The Status screen displays overall FS-HDR operational status. You can right-click most video values to change them, allowing you to edit many parameters in one place. Parameters with format incompatibilities or other alarms are highlighted in red.

Video 1-4	Channel Name INPUT OUTPUT Input and Output Image Mapping Transform Input Dynamic Range & Gamut Output Dynamic Range & Gamut Colorfront Engine-Live Colorfront Engine-Film BBC LUT NBCU LUT User LUT Caption Translator Freeze Output Proc Amp UFC Custom Background Override VPID	Click to enter a channel name of up to nine characters. Shows the input source and format. Shows the output video selection and format. In Enhanced Single Channel mode, identifies the transport method (Auto, Quadrant, 2Si) Shows the currently selected Transform Mode (Colorfront Live/Film, BBC HLG LUT, NBCU LUT, User LUT, Dynamic LUT, or Off). This selection affects what parameters are displayed below. Colorfront: Shows the current Input Dynamic Range & Gamut. Colorfront: Shows the current Output Dynamic Range & Gamut. Shows current Colorfront Engine-Live setting (Default or Adjust). Shows current Colorfront Engine-Film setting (Default or Adjust). Shows the currently selected BBC HLG LUT. Shows the currently loaded NBCU LUT. Shows the currently loaded User LUT. Shows the caption selection and caption signal presence. Shows whether Freeze Output is On or Off. Shows whether the Proc Amp is On or Off. Shows whether Custom conversion, AFD, and ROI are On or Off. Shows the current background signal (Black or Matte). Shows whether VPID is overridden or Off.
Genlock	Genlock Source	Shows the source of the genlock reference, and its format.
Video Input Status	SDI 1 - 8	Shows the status of each Video input (BNCs and SFPs), reporting the format, frame rate, colorimetry, and transfer characteristic.
Audio Output	Global Audio Output	Right-clicking on the Global Audio Out parameter value lets you select a global output. That same audio will be sent to all the FS-HDR audio outputs. When set to Off, the other Audio Outputs display their selected value, otherwise only the Global Audio Output setting is displayed.
MADI	AES MADI BNC MADI Fiber Vid1-4 Embed	Each of these settings, when visible, reports the audio that is currently being routed to that audio output. Mute and Sig Gen is reported when all of that port's outputs have that setting. Map is reported when the port's outputs are mapped.

Figure 43. Status Screen, Single Channel (4K) Mode



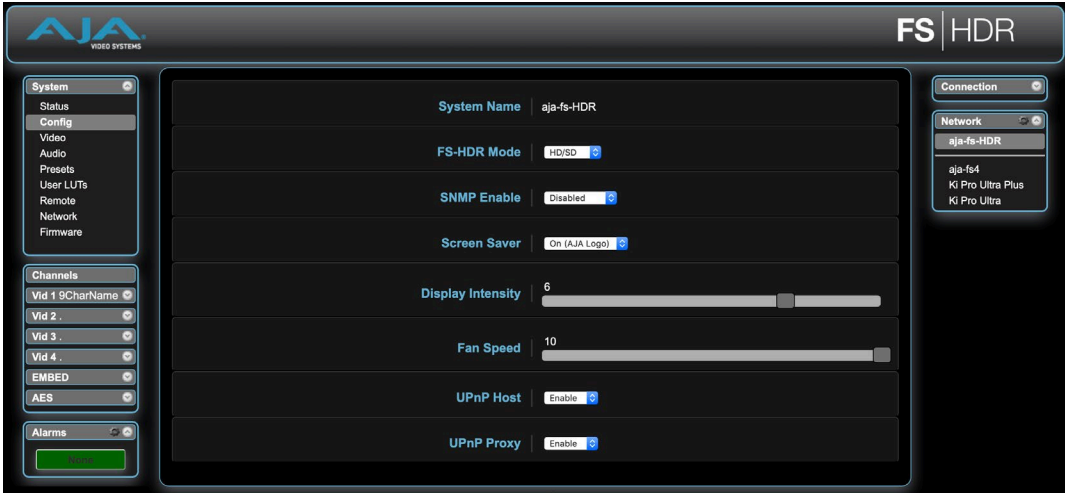
The Status screen in Single Channel (4K) Mode is the same as Four Channel (HD/SD) Mode, except:

- 4K or 4K Enhanced Mode is reported on the top of the screen.
- Status information for only Video 1 is displayed (no Vid Proc 2, 3, or 4).
- Background Video status is not displayed (can only be Black or Matte).
- Audio Vid 2-4 Embed parameters are not displayed.

The following additional items are also displayed:

Video	Input Image Mapping Output Image Mapping	Shows either Auto, Quadrant or 2SI. Shows either Quadrant or 2SI.
--------------	---	--

Config Screen



System Name

The System Name parameter sets the name of the FS-HDR system. To change the System Name, click on and drag the cursor across the displayed name, and type in a new name. Hit enter when finished or click outside the name control to cancel. The System Name is the same for both the Four Channel and Single Channel modes of operation.

Variable	Highlight the existing name and type in a new name, up to 20 characters. Allowed characters are A-Z, a-z, numerals, hyphen, spaces, and period.
----------	---

FS-HDR Mode

Selects whether the FS-HDR will operate in Four Channel or Single Channel mode. A confirm dialog displays a warning that a reboot of the FS-HDR system will occur.

HD/SD 4K/UHD	After reboot the FS-HDR will operate in Four Channel (HD/SD) mode. After reboot the FS-HDR will operate in Single Channel (4K/UHD) mode.
-----------------	---

SNMP Parameters

The following parameters are used to setup the FS-HDR SNMP (Simple Network Management Protocol) feature.

- SNMP Enable
- SNMP Trap Dest 1
- SNMP Trap Port 1
- SNMP Trap Dest 2
- SNMP Trap Port 2

Refer to ["Chapter 7 SNMP" on page 158](#) for a description of SNMP and how the FS-HDR supports it.

Screen Saver

This parameter lets you choose the menu screen saver.

On (AJA Logo) (default) Off System Name	AJA logo screen saver is displayed The screen saver is not displayed. Screen saver displays the system name.
---	--

Display Intensity

Display Intensity determines alphanumeric display and front panel LED brightness.

Variable	Use the slider to dim or brighten the alphanumeric display and activity indicator LEDs in steps from 1 (dim) to 8 (brightest). Default is 6
----------	--

Fan Speed

Determines the speed (and sound level) of the FS-HDR's internal cooling fans.

Variable	Changes the fan speed in steps from 1 (slow) to 10 (fast). Default is 10.
----------	--

UPnP Host

UPnP Host enables the FS-HDR to be discovered by a Windows network.

Enable (default) Disable	Enables the FS-HDR to be discovered by a Windows network. Disables Windows network discovery of the FS-HDR.
-----------------------------	--

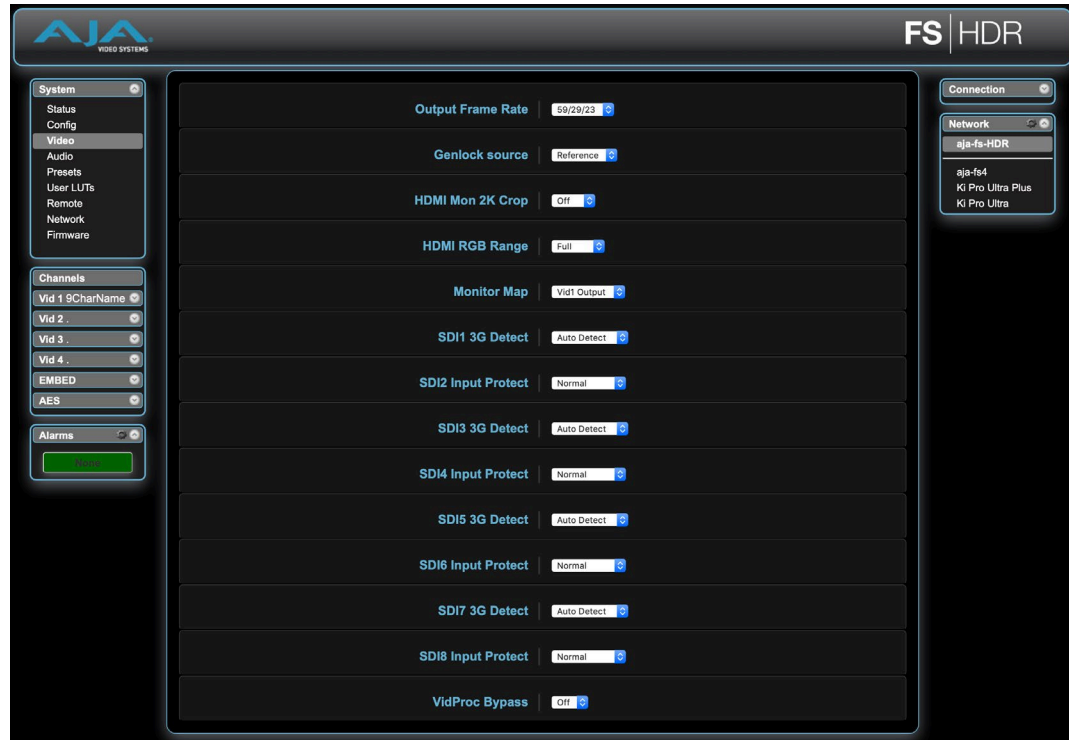
When this parameter is enabled, you can view the FS-HDR on a Windows Network by clicking these selections in Windows: Computer > Network (in left pane). Any FS-HDRs on the network will be listed under Other Devices below Computers and Media Devices. If your system does not have network discovery enabled, you may need to enable it following the Windows help instructions to make network devices visible in the Windows Network window.

UPnP Proxy

UPnP Proxy enables the FS-HDR to serve as a proxy for other AJA devices, allowing them to be discovered on a Windows network through the FS-HDR. When enabled, the FS-HDR acts as a proxy for all the AJA devices that it is able to connect to that have not already been discovered on the network. The devices will be listed in the FS-HDR Network window. Once the devices appear on the network, they can connect directly to other devices and computers without involving the FS-HDR.

Enable (default) Disable	Enables the FS-HDR to connect other AJA devices to the network. Disables the FS-HDR from serving as a proxy for AJA devices.
-----------------------------	---

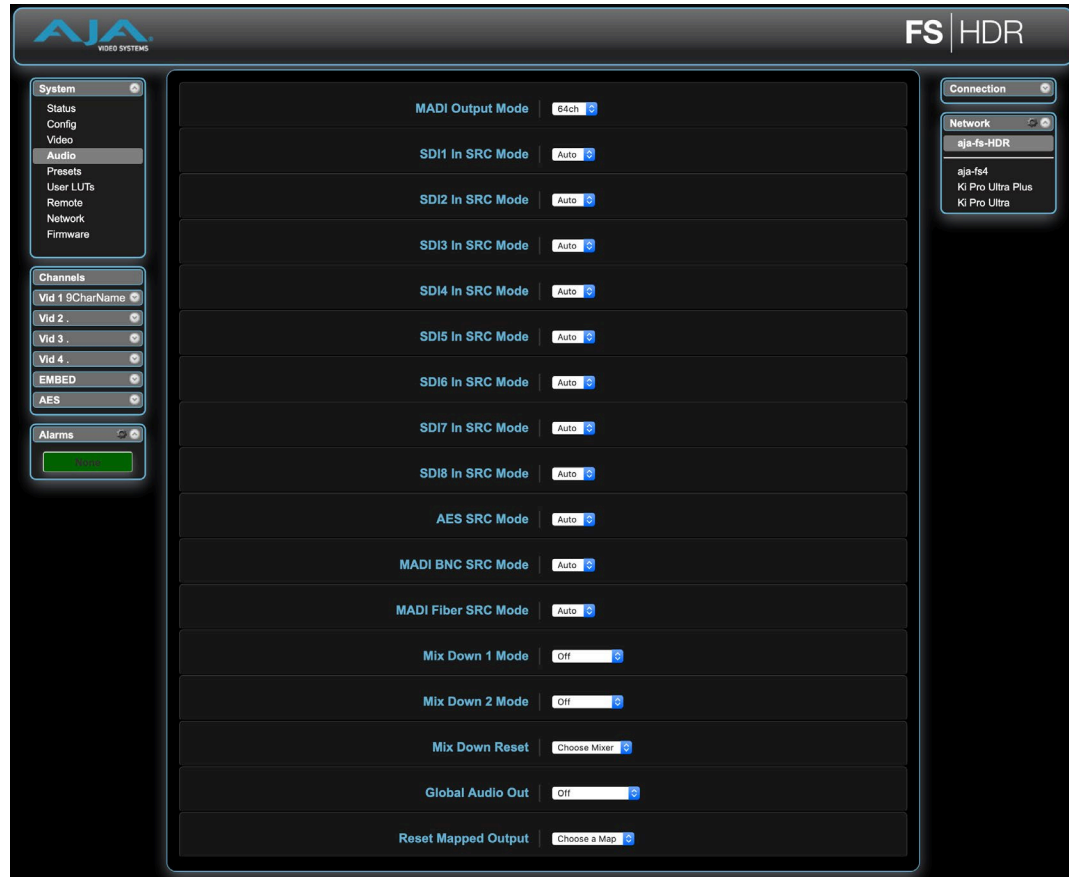
Video Screen



The Video screen controls the FS-HDR's system wide video signal processing. The parameters available on the Video browser screen are essentially identical to the front panel display menus. The only difference is parameters are set using webpage controls (drop down menus, slider adjustments) instead of control knobs. Descriptions of these parameters are accessible using the following cross references:

- ["1 Output Frame Rate" on page 63](#)
- ["2 Genlock Source" on page 63](#)
- ["3.1 HDMI Mon 2K Crop" on page 63](#)
- ["3.2 HDMI RGB Range" on page 64](#)
- ["3.3 Monitor Map" on page 64](#)
- ["4.1 SDI1 3G Detect" on page 64](#)
- ["4.2 SDI2 Input Protect" on page 65](#)
- ["4.3, 4.5, 4.7 SDI3/5/7 3G Detect" on page 65](#)
- ["4.4, 4.6, 4.8 SDI4/6/8 Input Protect" on page 65](#)
- ["5 VidProc Bypass" on page 65](#)

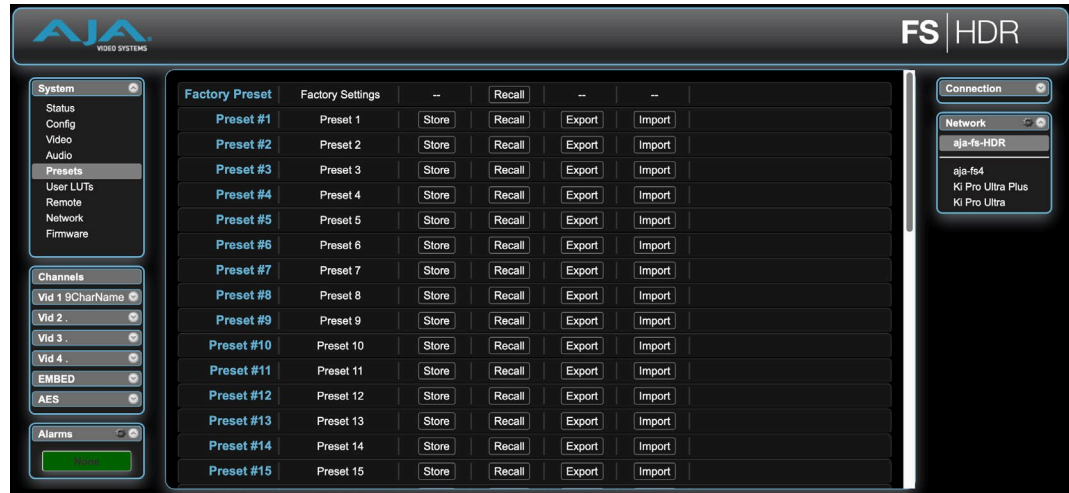
Audio Screen



The Audio screen controls the FS-HDR's system wide audio signal processing. The parameters available on the Audio browser screen are essentially identical to the front panel display menus. The only difference is parameters are set using webpage controls (drop down menus, slider adjustments) instead of control knobs. Descriptions of these parameters are accessible using the following cross references:

- ["1 MADI Output Mode" on page 70](#)
- ["2.1-2.8 SDI1-8 SRC Mode" on page 70](#)
- ["2.9 AES SRC Mode" on page 70](#)
- ["2.10 MADI BNC SRC Mode" on page 71](#)
- ["2.11 MADI Fiber SRC Mode" on page 71](#)
- ["3.0 Mix Down 1 Mode" on page 71](#)
- ["4.0 Mix Down 2 Mode" on page 73](#)
- ["7 Mix Down Reset" on page 73](#)
- ["8 Global Audio Out" on page 74](#)
- ["9 Reset Mapped Output" on page 74](#)

Presets Screen



The Presets screen allows you to save FS-HDR Preset Configurations into 40 separate memory registers and recall the presets whenever needed. Each FS-HDR operating mode (Four Channel and Single Channel) has its own set of 40 presets (80 total).



Caution! In Four Channel Mode, each Preset saves all the settings for all four channels. Storing and recalling a Preset will affect all the settings for all four channels in that mode. Care must be taken to establish a policy for the use of FS-HDR Presets, especially if the FS-HDR is operated in Four Channel mode and the different channels have different users.

The Presets screen also includes Export and Import functions that allow exporting one or all FS-HDR presets to your computer as files and importing exported preset files from your computer. A displayed message indicates successful or failed saves, recalls, exports, and imports.

Presets Screen Controls

Factory Preset

Factory Preset recalls all editable video and audio parameters to their factory default settings. Individual presets, user preferences, and Network settings, such as the IP Address, are not affected. Recall Factory Preset changes the settings for both FS-HDR operating modes (Four Channel and Single Channel) to their factory default values.

Recall

The Recall buttons recall saved FS-HDR preset configurations.



Caution! When you recall a Preset Configuration, the recalled preset immediately replaces the system's existing configuration. All previous settings are lost unless you have previously stored them in another preset configuration or an exported file.

Store

The Store buttons let you save the current FS-HDR configuration into the preset register with the associated name and number. A preset is a set of all System, Video, Audio, and Output parameters as they were set at the time the preset was stored. Only editable parameters are saved in the presets. Non-editable parameters are not saved.

To change a preset name, click in the name's text field, type a new name, and press Enter to save the name. After entering text, you can click the mouse outside of the edit box to exit without changing the name.

Export

The Export buttons save the associated preset contents to a file on your computer. The file gets exported to the default download location specified in your browser options. The file name is the same as the preset name with the suffix ".presets". If you export multiple files for the same preset, a number gets appended to ensure a unique file name. The file size is small, usually less than 100 kilobytes.

Import

The Import buttons let you browse for and import a preset file on your computer into the preset register associated with the selected button. A dialog box warns you that the operation will overwrite the current preset contents with the file contents. You can only import presets from a FS-HDR.

Export Presets 1–40 (All)

Export All lets you save the contents of all presets to a file on your computer.

The file gets exported to the default download location specified in your browser options with the name "all.presets". If you export multiple files, a number gets appended to ensure a unique file name.

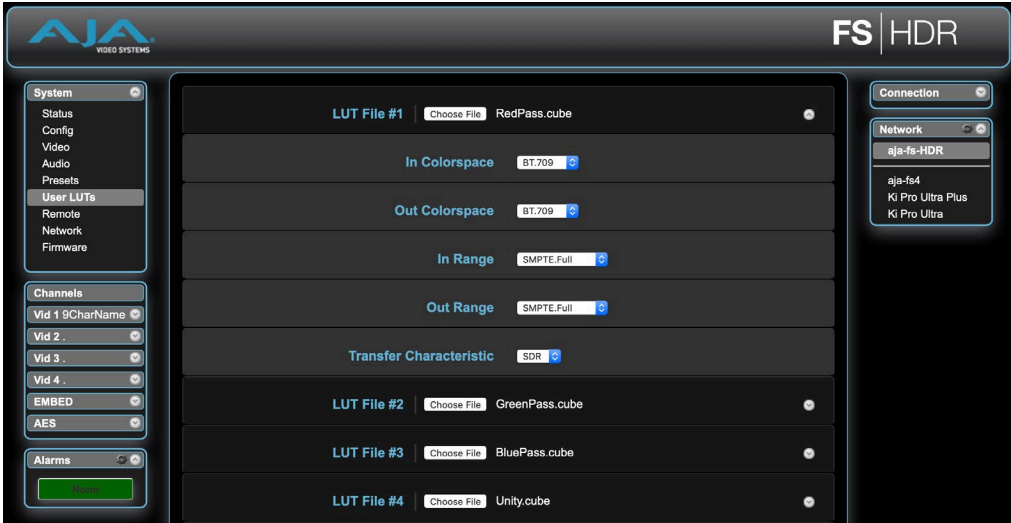
Import Presets 1–40 (All)

Import All lets you browse for and import a previously exported "all.presets" file from your computer. A dialog box warns you that the operation will overwrite all 40 current preset contents with the contents stored in the file.

Interaction of Presets and GPIs

Triggering presets using GPI inputs offers considerable power but also requires some care to avoid unexpected results. If you plan to trigger presets using GPIs, please see the information about the ["Interaction of Presets and GPIs" on page 75](#).

User LUTs Screen



The User LUTs screen is used for uploading up to ten custom 3D LUT files (33 point, .cube format) into numbered LUT File "slots". Once uploaded, a User LUT can be applied to an output using the FS-HDR's Web interface (Channel/Video/Color/User LUT), or using the FS-HDR's front panel controls (Video/Color/Transform/User LUT/ and selecting the slot loaded with that User LUT file).

NOTE: User LUT files cannot be uploaded using the FS-HDR's front panel controls, and additional settings (In and Out Colorspace, In and Out Range, and Transfer Characteristic) are only available on the FS-HDR's Web interface.

FS-HDRs shipping with v2.6 (or newer) firmware installed will apply a Unity LUT by default to all empty LUT slots, to ensure the FS-HDR passes video even if a slot is selected that hasn't been loaded with a User LUT file.

NOTE: If upgrading an FS-HDR from v2.5 (or earlier) to v2.6 (or newer) firmware, the ten User LUT slots can be pre-loaded with a Unity LUT. This simple operation can be performed in the FS-HDR web GUI. In the "User LUT" menu, select "Overwrite All" in the "Overwrite with Unity" parameter at the bottom of the page.

Loaded User LUTs are accessible in both Single Channel mode and Four Channel mode.

NOTE: LUT files (User or BBC) cannot be downloaded from the FS-HDR.

LUT File #1 - #10 Storage Slots

Ten numbered LUT File "slots" are available, each able to store one User LUT file. Click on the **Choose File** button to open a browser window from which you can navigate to and upload the desired User LUT file.

LUT File Slot Configuration

The User LUTs screen also allows you to configure the input and output range (SMPT-Full), Colorspace (BT.709/BT.2020), and the HDR output Transfer Characteristic (SDR/PQ/HLG) for each User LUT slot. These settings are used with whatever User LUT file has been loaded to that slot location.

In Colorspace

BT.709 (default)	Selects a BT.709 input colorspace.
BT.2020	Selects a BT.2020 input colorspace.

Out Colorspace

BT.709 (default) BT.2020	Selects a BT.709 output colorspace. Selects a BT.2020 output colorspace.
-----------------------------	---

In Range

SMPTE.Full (default)	Selects a full input scaling/range, which includes sub-blacks and super-whites. Input video values of 0-1023 are scaled to 0-1 before being sent to the LUT processor.
SMPTE.Narrow	Selects a narrow input scaling/range, such that an input video value of 0 represents black, and an input video value of 1 represents white. Input video values of 64-940 are scaled to 0-1 before being sent to the LUT processor

NOTE: The "In Range" and "Out Range" parameters were previously named "In Scale" and "Out Scale" (v3.2.0 and earlier). These terms were changed to better match industry conventions.

Previous Parameter Name	New Parameter Name
In/Out Scale > Full	In/Out Range > SMPTE.Narrow
In/Out Scale > SMPTE	In/Out Range > SMPTE.Full

2.4 Out Range

SMPTE.Full (default)	Selects a full output scaling/range, which includes sub-blacks and super-whites. Output values from 0-1 are scaled to 0-1023.
SMPTE.Narrow	Selects a narrow output scaling/range. Output values from 0-1 will be scaled to 64-940.

Transfer Characteristic

This parameter defines what transfer characteristic metadata (VPID for SDI, Infoframe for HDMI) will be added to the output signal.

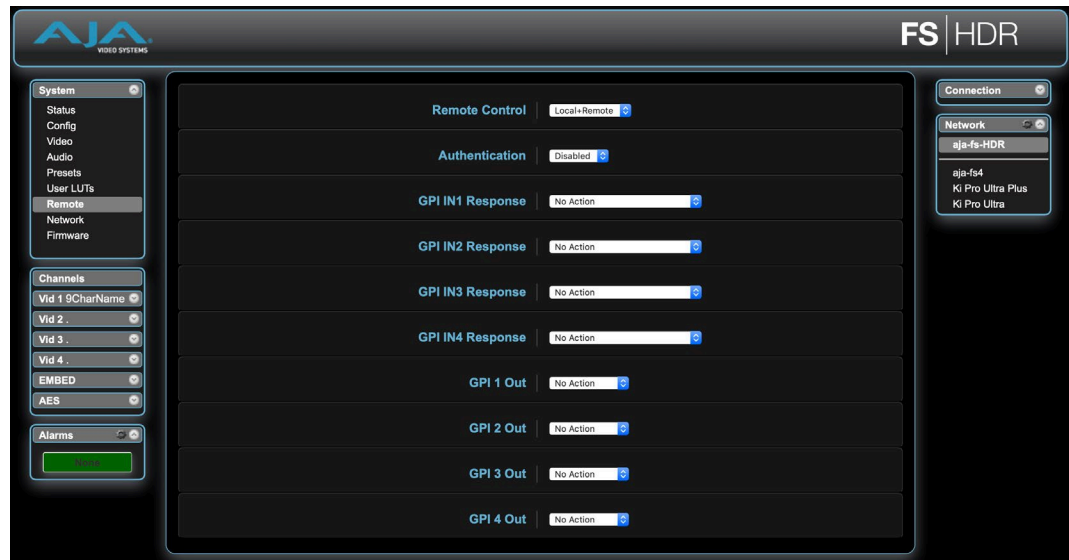
SDR (default) PQ HLG	Selects Standard Dynamic Range. Selects Perceptual Quantizer. Selects Hybrid Log Gamma.
----------------------------	---

Overwrite with Unity

Use this control to overwrite any one of the ten LUTs, or all ten LUTs, with a Unity LUT.

NOTE: If upgrading an FS-HDR from v2.5 (or earlier) to v2.6 (or newer) firmware, the ten User LUT slots should be pre-loaded with a Unity LUT. Select "Overwrite All" in the "Overwrite with Unity" parameter.

Remote Screen

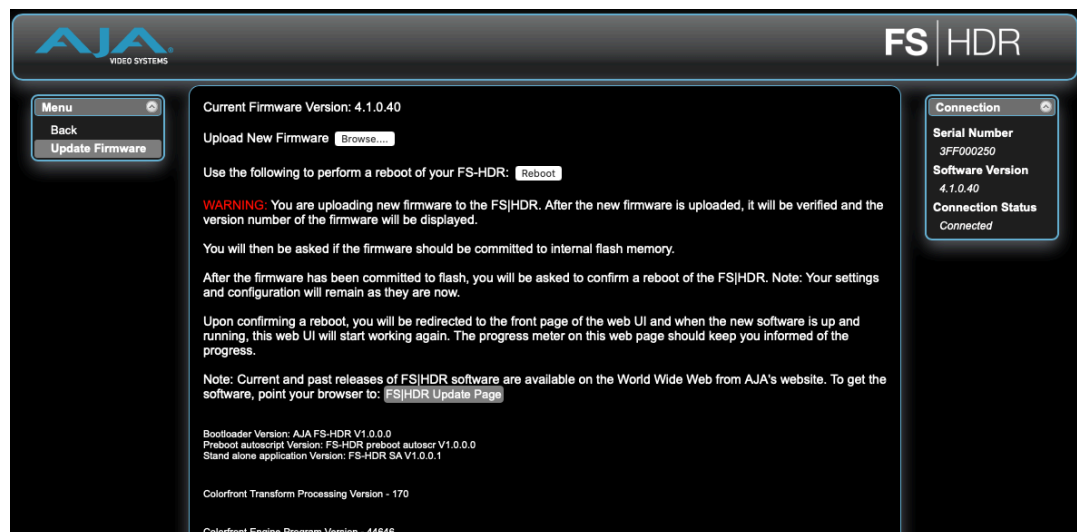


The REMOTE screen contains parameters that affect how the FS-HDR is controlled. Control options include the front panel, a remote computer running a browser, and GPI inputs and outputs.

NOTE: *The Remote Menu Group parameters available on the front panel interact with the browser parameters available on an attached computer, and vice versa. For example, once the Remote Control parameter is set to 'Local Only' from either the browser or front panel, all future settings will only be able to be changed from the front panel. The opposite is true if set to 'Remote Only'. However the Remote Control parameter is always available from the front panel, regardless of how it is set.*

See "[REMOTE Menu Group](#)" on page 60 for detailed information about FS-HDR remote control options.

Firmware Screen



The Update Firmware screen allows you to download and install a firmware update from AJA. You can also remotely reboot the FS-HDR using the Reboot button.

The FS-HDR Update Page link on the Firmware screen will take you to the correct AJA website page. Or you can visit the AJA website (aja.com) to locate and download the updated software. The following page provides FS-HDR support information and will include links to locations where you can download updates:

<https://www.aja.com/en/family/fs>

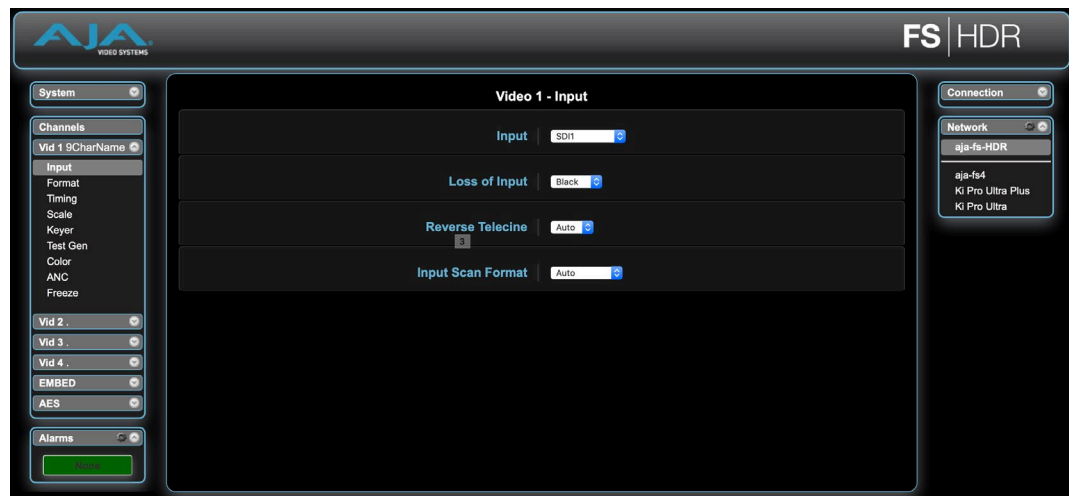
After downloading the software update to your local drive, use the Browse button to locate the local software copy. Follow the prompts to load the new firmware into the FS-HDR. See *"Software Update Installation" on page 34* for more information.

Video Channel Screens

The Video Channel screens control the FS-HDR's video signal processing of that channel (either four or one, depending on mode). In Four Channel Mode four menu groups are selected on the left. In Single Channel Mode only one menu group is available.

The parameters available on the Video Channel browser screens are essentially identical to the front panel display menus. The only difference is parameters are set using webpage controls (drop down menus, slider adjustments) instead of control knobs. Select the right arrow to display the video channel of interest, and select a category (such as 'Input') to view and change related parameters.

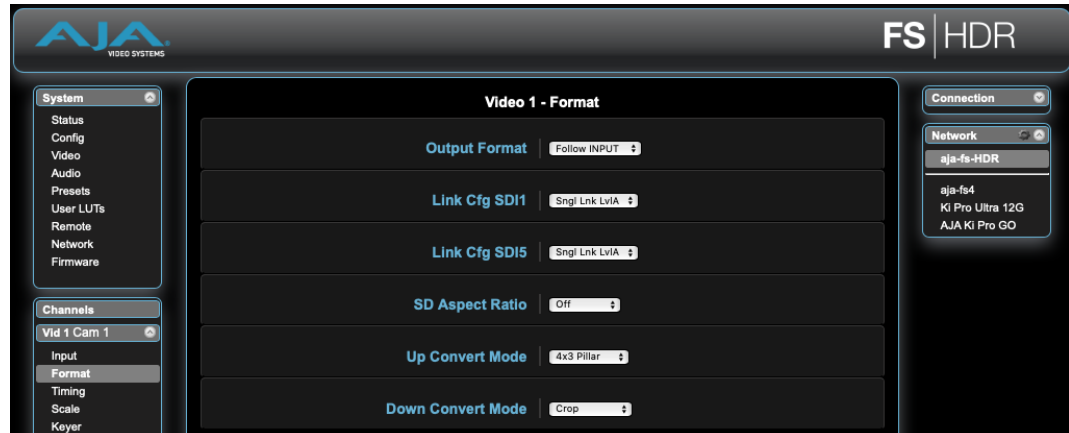
Input Screen



Descriptions of the parameters on this screen are accessible using the following cross references:

- *"1 Input" on page 76*
- *"2 Loss of Input" on page 77*
- *"3 Reverse Telecine" on page 77*
- *"4 Input Scan Format" on page 78*
- *"5 Input Image Mapping" on page 78* (Single Ch Mode only)

Format Screen

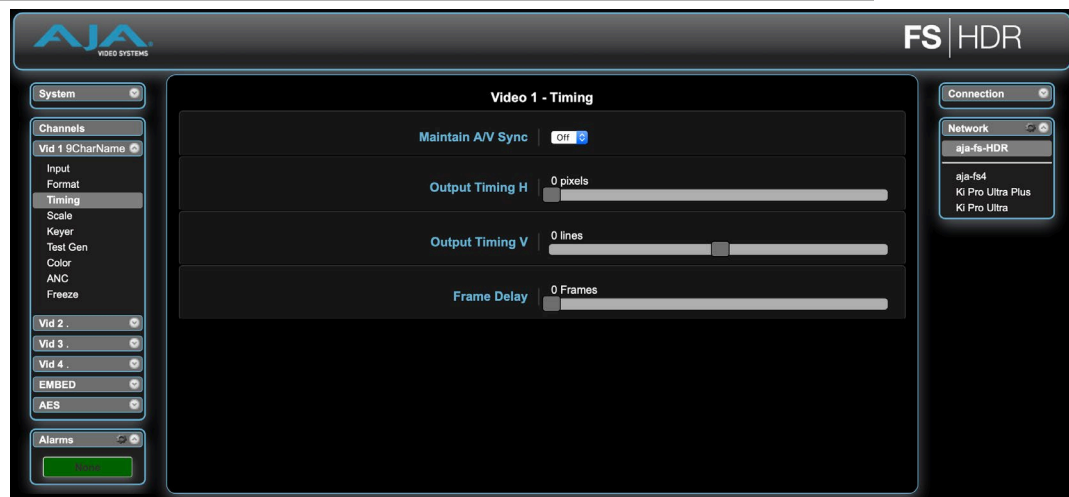


NOTE: Different parameters appear on this screen depending on the FS-HDR operating mode (Four Channel, Single Channel, Enhanced Single Channel) and the setting selected for the Color menu Transform mode.

Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1 Output Format" on page 102](#)
- ["1.1 SDI Monitor Format" on page 103](#)
- ["3.0 Link Config SDI1, 2, 3, 4" on page 103](#) (4Ch Mode only)
- ["3.1 Level B SDI1, 2, 3, 4" on page 104](#) (4Ch Mode only)
- ["3.0 Link Config SDI1-4" on page 104](#) (Single Ch Mode only)
- ["4.0 Link Config SDI5-8" on page 104](#) (Single Ch Mode only)
- ["5 Output Image Mapping" on page 105](#) (Single Ch Mode only)
- ["6 SD Aspect Ratio" on page 105](#)
- ["7 Up Convert Mode" on page 106](#)
- ["8 Down Convert Mode" on page 107](#)

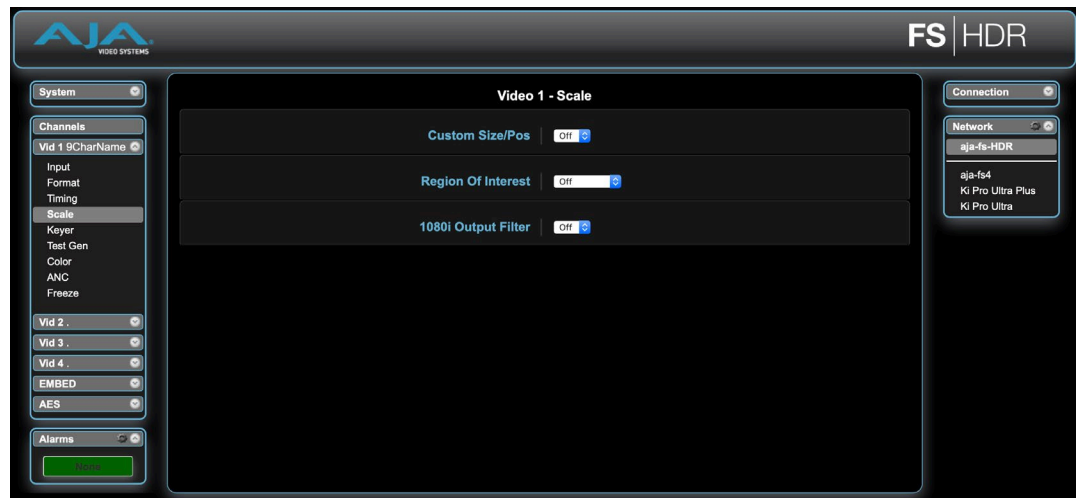
Timing Screen



Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1 Maintain A/V Sync" on page 112](#)
- ["2 Output Timing H" on page 115](#)
- ["3 Output Timing V" on page 115](#)
- ["4 Frame Delay" on page 116](#)

Scale Screen

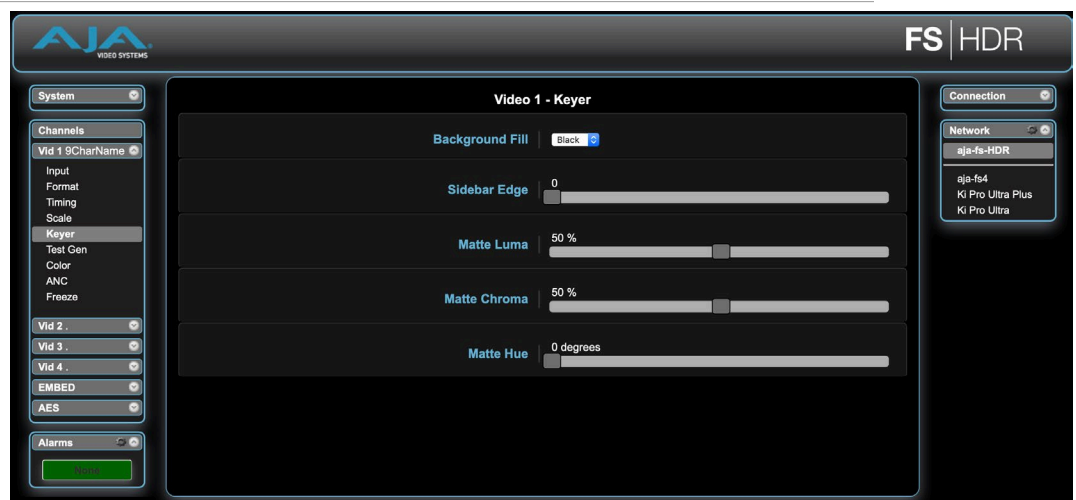


NOTE: If AFD is enabled, these parameters do not display.

Descriptions of the parameters on this screen are accessible using the following cross references:

- ["Custom Conversion Settings" on page 108](#)
- ["Region of Interest \(ROI\)" on page 109](#)
- ["3.0 1080i Output Filter" on page 110](#)

Keyer Screen

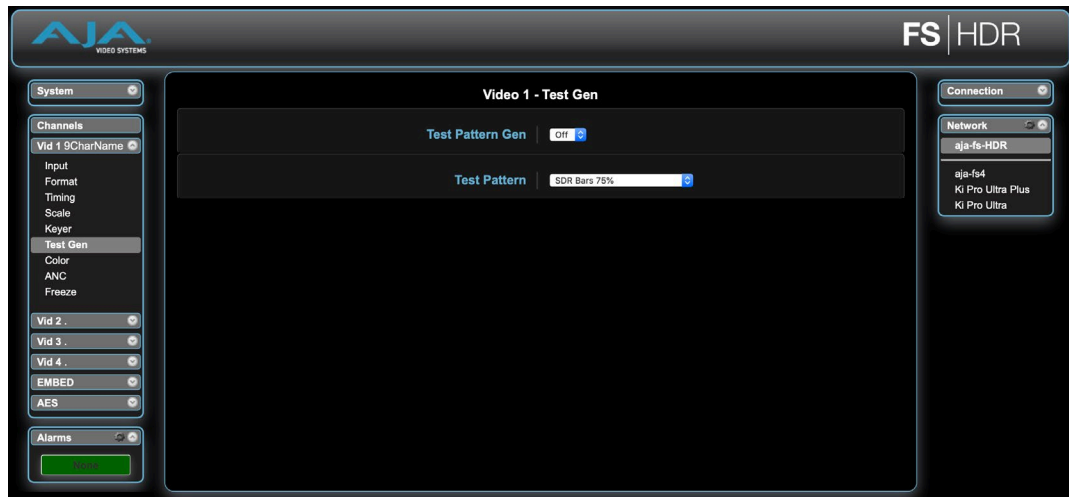


Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1 Background Fill" on page 111](#)
- ["2 Sidebar Edge" on page 111](#)
- ["3.1 Matte Luma" on page 111](#)

- ["3.2 Matte Chroma" on page 111](#)
- ["3.3 Matte Hue" on page 111](#)
- ["3.3 Matte Hue" on page 111](#)

Test Gen Screen

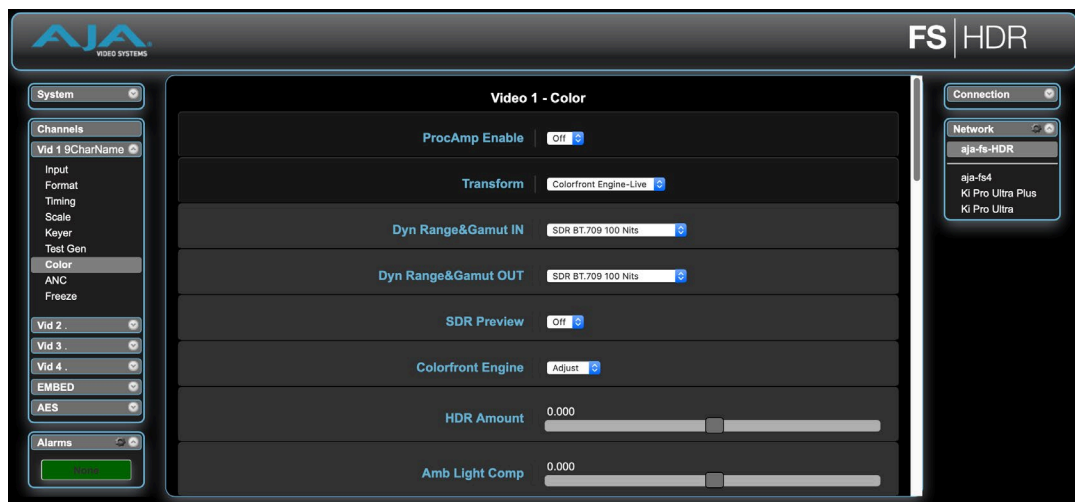


Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1 Test Pattern Gen" on page 116](#)
- ["2 Test Pattern" on page 117](#)

Color Screen

Figure 44. Video Channel Color Screen, Colorfront Transform Adjust



Different parameters are available on this screen, depending on the Transform setting (Colorfront Engine Live, Colorfront Engine Film, Colorfront Engine TV, BBC HLG LUT, NBCU LUT, User LUT, Dynamic LUT, or Off).

The following parameters are available on all screens:

- ["1.0 Proc Amp Enable \(YUV\)" on page 82](#)
- ["3.0 Transform" on page 83](#)
- ["16.0 Video Legalizer" on page 101](#)

When one of the **Colorfront** Transforms is selected, additional parameters are shown: See ["4.0/6.0/8.0 Colorfront Engine" on page 85](#) for more information.

When the **BBC HLG LUT** Transform is selected, the following parameters are shown:

- ["12.1 BBC HLG LUT" on page 95](#)
- ["12.2 SDI Monitor BBC LUT" on page 98](#)

When the **NBCU LUT** Transform is selected, the following parameters are shown:

- ["13.1 NBCU LUT" on page 99](#)
- ["13.2 SDI Monitor NBCU LUT" on page 99](#)

When the **User LUT** Transform is selected, the following parameters are shown:

- ["14.1 User LUT" on page 100](#)
- ["14.2 SDI Monitor User LUT" on page 100](#)

When the **Dynamic LUT** Transform is selected, the following parameters are shown:

- ["15.1 In Colorspace" on page 100](#)
- ["15.2 Out Colorspace" on page 100](#)
- ["15.3 In Range" on page 101](#)
- ["15.4 Out Range" on page 101](#)
- ["15.5 Transfer Characteristic" on page 101](#)

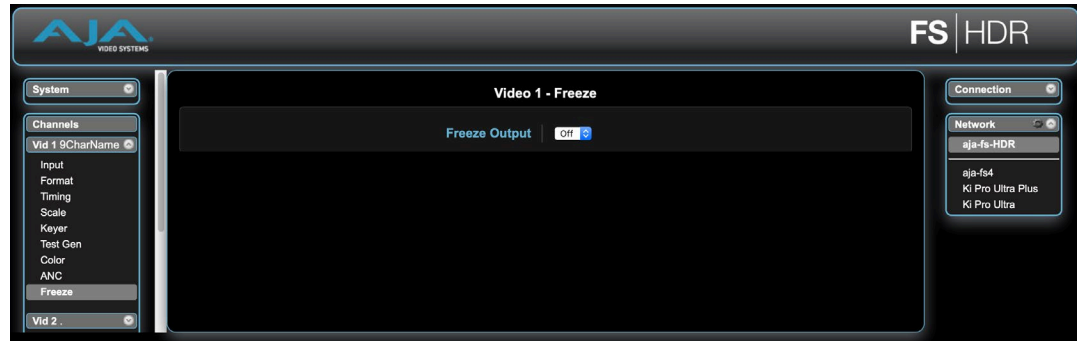
ANC Screen



Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1.1 AFD Out" on page 79](#)
- ["1.2 AFD Output Lines" on page 79](#)
- ["1.3 Down Convert AFD dflt" on page 79](#)
- ["2 Caption Xlator" on page 80](#)
- ["3 SD Line 21 Blanking" on page 80](#)
- ["4 Override VPID" on page 81](#)
- ["6 Timecode Xlator" on page 81](#)

Freeze Screen



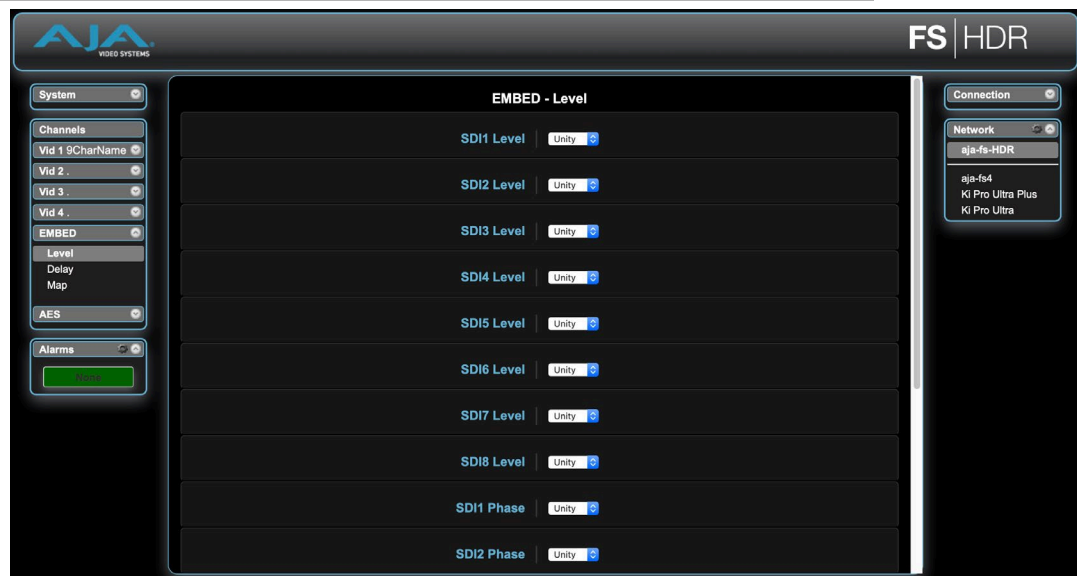
Description of the parameter on this screen are accessible using the following cross reference:

- ["1 Freeze Output" on page 117](#)

Embedded Audio Channel Screens

The Embedded Audio Channel browser screens display Level, Delay, and Mapping controls for the Embedded audio channels. When the SDI output signal has multiple links, the audio is always embedded on the first link of the SDI output channel.

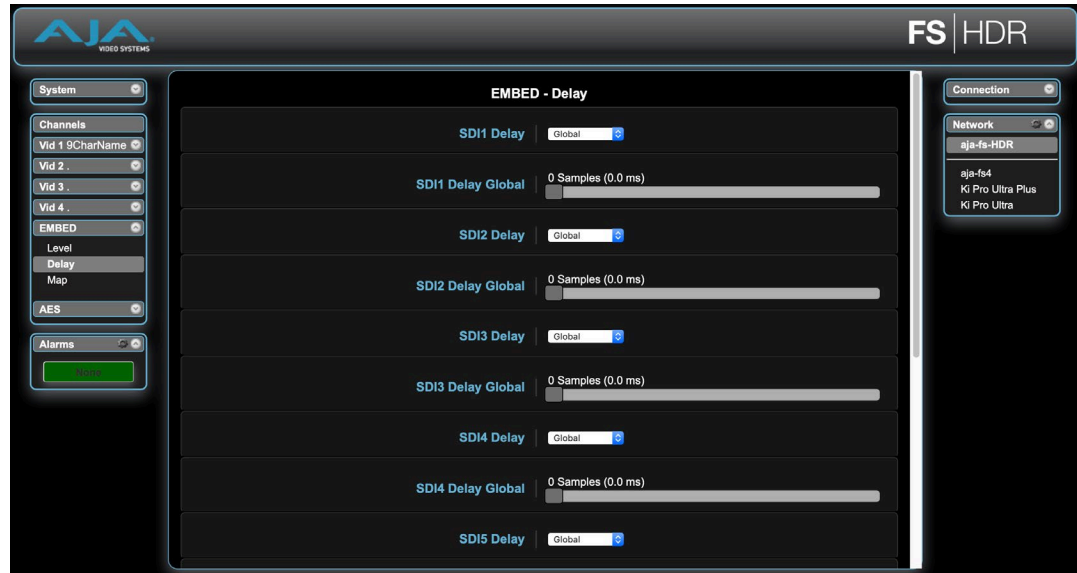
Embed Level Screen



Descriptions of the parameters on this screen are accessible using the following cross references:

- ["EMBED Level Menus" on page 118](#)
- ["EMBED Phase Menus" on page 119](#)

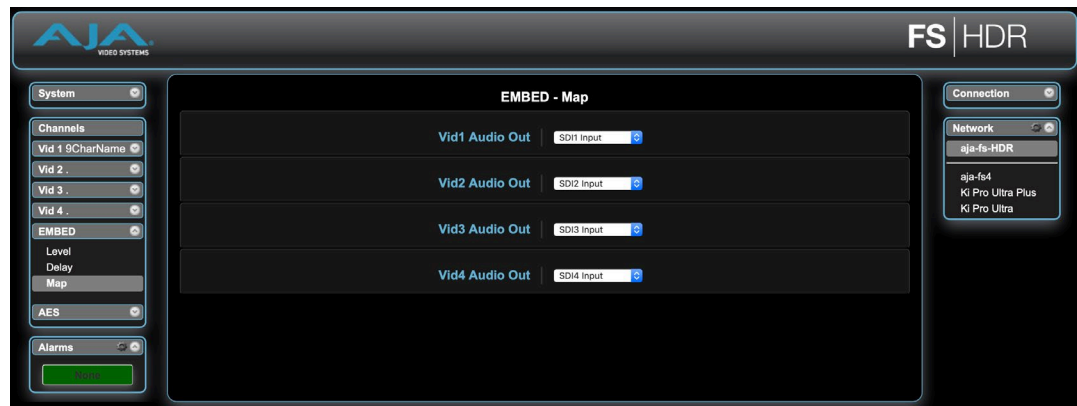
Embed Delay Screen



Descriptions of the parameters on this screen are accessible using the following cross references:

- ["EMBED Delay Menus" on page 120](#)

Embed Map Screen



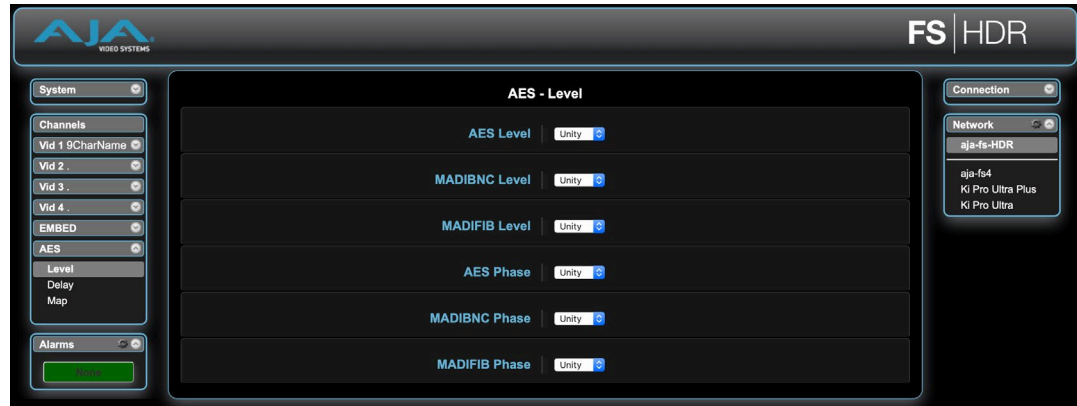
Descriptions of the parameters on this screen are accessible using the following cross references:

- ["1.0 Vid 1 Audio Out" on page 122](#)
- ["2.0-4.0 SDI2-4 Audio Out" on page 123](#)

AES (and MADI) Audio Channel Screens

The AES Audio Channel browser screens display Level, Delay, and Mapping controls for the AES, MADI BNC and MADI Fiber audio channels.

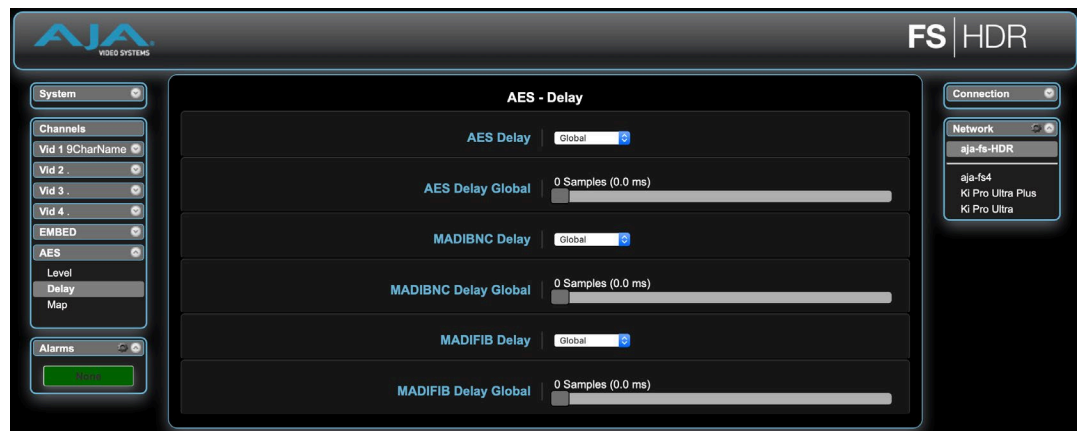
AES/MADI Level Screen



The parameters on this screen are similar to those for the Embedded Audio Channel screens, except they apply to either AES or MADI audio inputs. For more information see:

- ["AES/MADI Level Menus" on page 119](#)
- ["AES/MADI Phase Menus" on page 120](#)

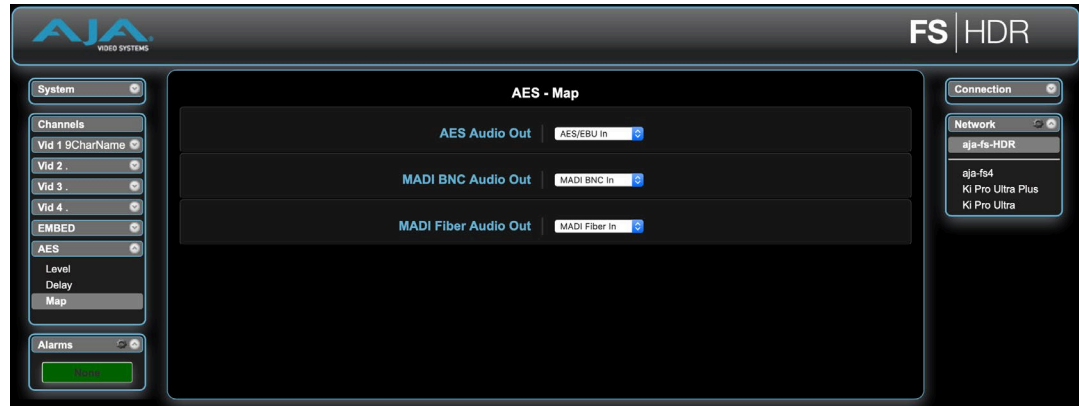
AES/MADI Delay Screen



The parameters on this screen are similar to those for the Embedded Audio Channel screens, except they apply to either AES or MADI audio inputs. For more information see:

- ["AES/MADI Delay Menus" on page 121](#)

AES/MADI Map Screen



The parameters on this screen are similar to those for the Embedded Audio Channel screens, except they apply to either AES or MADI audio inputs. For more information see:

- ["1.0 Vid 1 Audio Out" on page 122](#)
- ["2.0-4.0 SDI2-4 Audio Out" on page 123](#)

Chapter 6 – FS-HDR Control Link

NOTE: The FS-HDR Control Link v1.2 or higher application is required for use with FS-HDR v3.0 and higher versions of firmware.

NOTE: The FS-HDR Control Link v1.2 supports Colorfront Live Mode parameters only.

Overview

The FS-HDR Control Link application allows remote control of FS-HDR Colorfront HDR color parameters. It can also be used to connect, via USB, to a Tangent Element Kb panel for hardware knob control of those parameters.

HDR color parameters able to be controlled include the following. See "[Colorfront Parameters](#)" on page 84 for detailed information.

NOTE: Simultaneous control of these parameters can occur from that FS-HDR's front panel, Web GUI, REST interface, AJA Control Link application, and the Tangent hardware panel.

By default, one FS-HDR can be controlled with FS-HDR Control Link. In 4 Channel mode you can select which FS-HDR channel to control

NOTE: The FS-HDR must have Colorfront Engine-Live selected as its Transform before it can be controlled with the Control Link application. In 4 Channel Mode, each channel to be controlled must have Colorfront Engine-Live selected as its Transform.

FS-HDR Gang Control Feature

Control Link v1.1 and newer versions also have a feature that supports the ganging of any number of FS-HDRs on the same network for real-time control of Colorfront Engine parameters. This feature can be used, for example, to enable 8K workflows by simultaneously controlling the Colorfront Engine HDR color parameters on four ganged FS-HDRs.

In FS-HDR Control Link v1.1, the Gang Control feature is only supported by FS-HDRs operating in Single Channel mode.

Installation

Download

The FS-HDR Control Link application, available for both Windows and Mac OS, can be downloaded from the AJA website:

<https://www.aja.com/products/fs-hdr#support>

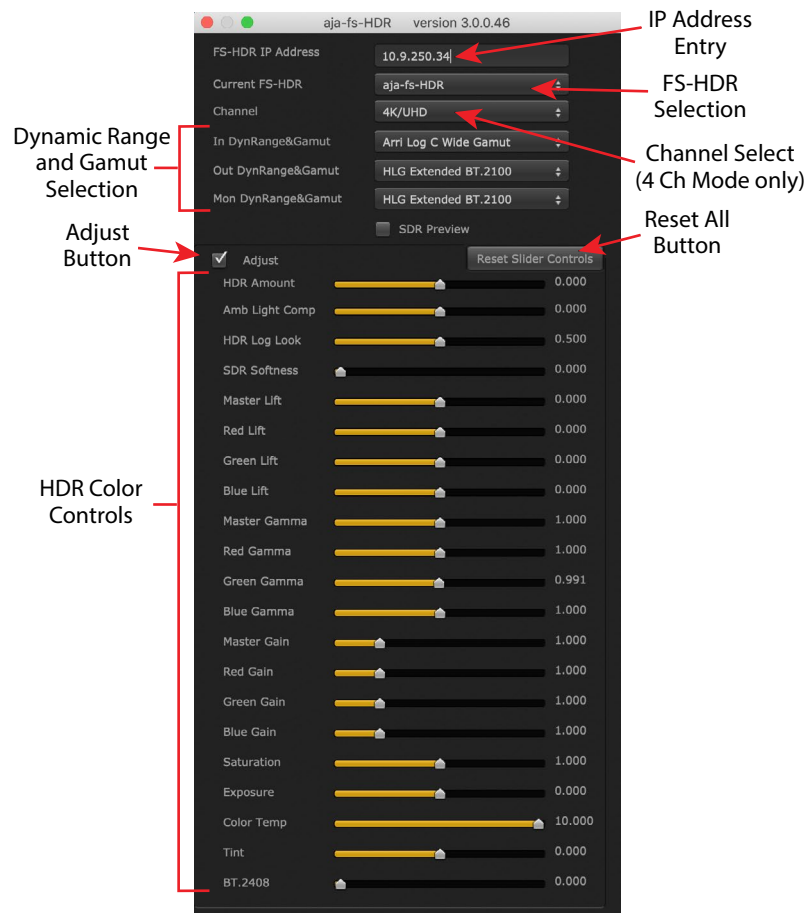
The downloaded file is a .zip archive (name of file.zip). Unzip the file and then install on your computer, using standard Windows or MacOS methods.

NOTE: An older version of the application should be uninstalled from the computer before you install the newer version.

If you intend to use a Tangent panel, you will need to download and install additional software. See "[Tangent Software Installation](#)" on page 155.

Operation Using Control Link UI

Figure 45. FS-HDR Control Link User Interface



Control Link Initialization

When Control Link is run for the first time the **FS-HDR IP Address** field will be empty. When you enter the IP Address, the application will discover that FS-HDR (if there is one at that IP Address on the network) and will also populate the **Current FS-HDR** drop down menu with all the FS-HDRs on the local network. You can change the FS-HDR you are controlling with this drop down menu.

Control Link User Interface

FS-HDR Selection Controls

Located at the top of the Control Link screen are FS-HDR selection controls:

IP Address - Field for entering the desired FS-HDR IP address for connection.

Current FS-HDR - Drop down list of FS-HDRs available on the network. The name of the currently controlled FS-HDR is shown.

Channel - Controls FS-HDR channel selection when in 4 Channel Mode.

NOTE: If the FS-HDR is changed from Single Channel to 4 Channel Mode or vice versa the Control Link connection will be lost. After the FS-HDR has rebooted, place the cursor in the IP Address field and press the keyboard Enter or Return key to reconnect.

HDR Dynamic Range and Gamut Controls

Below the FS-HDR Selection controls are Input, Output, and Monitor Dynamic Range and Gamut controls. Choose your selections from the drop down lists.

Adjust and Reset Buttons

Adjust Button - Activates or deactivates the slider controls.

Reset Slider Controls Button - Resets all slider parameters to their default values.

HDR Color Slider Controls

The remaining twenty one sliders control the listed Colorfront HDR color adjustments.

FS-HDR Gang Control

With Control Link v1.1 and newer, any number of FS-HDRs on the same network can be configured for simultaneous real-time control of Colorfront Engine HDR color parameters.

NOTE: *The Gang Control feature is only supported when all ganged FS-HDRs are operating in Single Channel mode.*

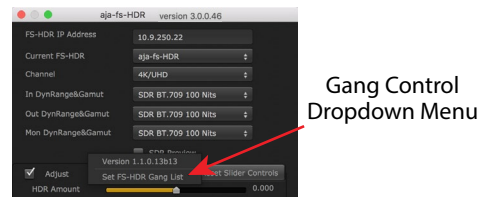
When FS-HDRs are under Gang Control, Colorfront Color parameters on all the ganged FS-HDRs can be simultaneously changed using the master FS-HDR's Control Link app, the master FS-HDR's web GU or front panel, the Tangent Kb panel connected to the Master FS-HDR, or through that Master FS-HDR's REST interface.

NOTE: *Color parameters can still be changed on a non-Master FS-HDR, but these changes will not be applied to the other ganged FS-HDRs. Any subsequent color parameter changes made using the Master FS-HDR will be immediately applied to all the ganged FS-HDRs, overwriting any local adjustments.*

Enabling FS HDR Gang Control

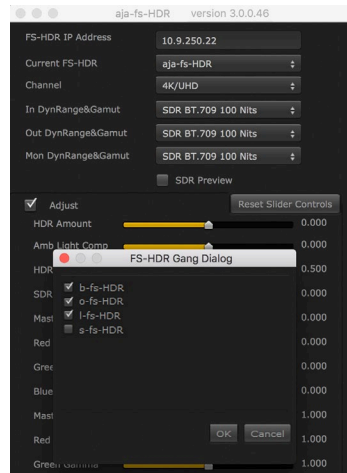
1. Right click anywhere on the Control Link UI to display a drop down menu.

Figure 46. Control Link Gang Control Drop Down Menu



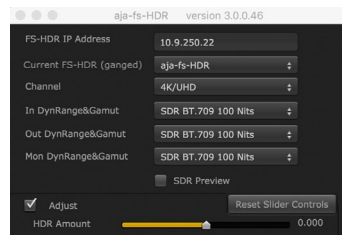
2. Select **Set FS-HDR Gang List**.
3. The available FS-HDRs will be listed. Check the boxes of the FS-HDRs you wish to gang for control.

Figure 47. Control Link FS-HDR Gang Dialog Menu



4. Click on **OK**. The menu item will now report (ganged).

Figure 48. Ganged Control Link Status



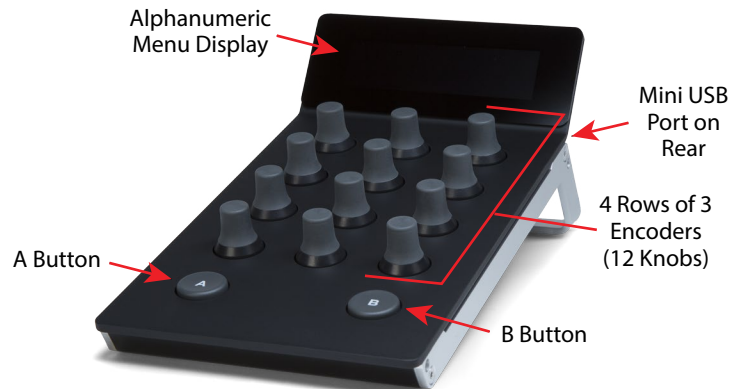
To release FS-HDR ganging, simply uncheck the box of the FS-HDR(s) and click OK.

Operation with Tangent Element Kb Panel

Tangent Panel Description

The Tangent Element Kb panel (not provided by AJA, purchased separately) is equipped with 12 rotary encoders, two buttons, an alphanumeric display, and a mini USB port. The unit is powered over the USB connection.

Figure 49. Tangent Element Kb Panel



Alphanumeric Display and Menus

The upper Alphanumeric Menu Display lists the parameters to be controlled by the encoder knobs. Four menus are available. Press the **A** button on the lower left to cycle through the menus.

Encoder Knobs

The twelve encoder knobs below are associated with the parameters currently displayed in the upper menu. The knobs rotate freely without limit. When moving between menus, the currently set value for each parameter is displayed.

- Turning a knob changes the associated parameter value settings up or down.
- Pressing the knob resets that individual parameter's value to the default, except for some parameters with only On Off settings, in which case pressing the knob toggles between the two states.

A and B Buttons

A Button - When pressed displays the next menu, which changes which parameters are controlled with the encoder knobs.

B Button - When pressed twice quickly, resets all slider parameters in all the menus to their default values.

Tangent Software Installation

The following software needs to be installed for the Tangent panel to be recognized by the FS-HDR Control Link application.

Windows:

<http://www.tangentwave.co.uk/download/tangent-hub-installer-win/>

Mac:

<http://www.tangentwave.co.uk/download/tangent-hub-installer-mac/>

Tangent Panel Operation

The four rows and three columns of encoder knobs are mapped to the menus as described below:

Figure 50. Encoder Knob Panel Locations

1-1	1-2	1-3
2-1	2-2	2-3
3-1	3-2	3-3
4-1	4-2	4-3

Menu Page 1

The page 1 menu is displayed first by default.

Figure 51. Page 1 of Tangent Kb Panel interface

	Lift	Gamma	Gain
Master	0.000	0.000	0.000
Red	0.000	0.000	0.000
Green	0.000	0.000	0.000
Blue	0.000	0.000	0.000

Table 11. Page 1 Encoder Knob Functions

	Column 1	Column 2	Column 3
Row 1	Master Lift	Master Gamma	Master Gain
Row 2	Red Lift	Red Gamma	Red Gain
Row 3	Green Lift	Green Gamma	Green Gain
Row 4	Blue Lift	Blue Gamma	Blue Gain

Menu Page 2

Figure 52. Page 2 of Tangent Kb Panel interface

HDRAmount	0.000	SDR Preview	Off
AmbLight	0.000		
LogLook	0.500	Adjust	On
SDRSoft	0.000		
Sat	1.000		

Table 12. Page 2 Encoder Knob Functions

	Column 1	Column 2	Column 3
Row 1	HDR Amount	x	SDR Preview (press toggle)
Row 2	Ambient Light Level	x	Adjust (press toggle)
Row 3	Log Look	x	x
Row 4	SDR Softness	Saturation	x

Menu Page 3

Figure 53. Page 3 of Tangent Kb Panel interface

Exposure	0.000
Col Temp	4300.0
Tint	0.000
BT2408	0.000

Table 13. Page 3 Encoder Knob Functions

	Column 1	Column 2	Column 3
Row 1	Exposure	x	x
Row 2	Color Temperature	x	x
Row 3	Tint	x	x
Row 4	BT2408	x	x

Menu Page 4

When a parameter on this page is being edited, two asterisk(**) will precede the selection. Press the knob button to activate the changed parameter value.

If the knob is not pressed within three seconds, the two asterisk(**) will go away and the parameter will return to the setting that was present before editing.

Figure 54. Page 4 of Tangent Kb Panel interface, Single Ch Mode

```

aja-fs-HDR          version 3.0.0.46
4K-UHD
InDynRg   SDR BT.709 100 Nits
OutDynRg  HLG BT.2100
MonDynRg  HLG BT.2100

```

Table 14. Page 4 Single Channel Mode Encoder Knob Functions

	Column 1	Column 2	Column 3
Row 1	x	x	x
Row 2	x	x	x
Row 3	In Dynamic Range and Gamut	x	x
Row 4	Out Dynamic Range and Gamut	Monitor Dynamic Range and Gamut	x

Figure 55. Page 4 of Tangent Kb Panel interface, Four Channel Mode

```

aja-fs-HDR          version 3.0.0.46
Video 1
InDynRg   SDR BT.709 100 Nits
OutDynRg  HLG BT.2100
MonDynRg  HLG BT.2100

```

Table 15. Page 4 Encoder Knob Functions

	Column 1	Column 2	Column 3
Row 1	x	x	x
Row 2	FS-HDR Channel (1-4) 4 Ch Mode only	x	x
Row 3	In Dynamic Range and Gamut	x	x
Row 4	Out Dynamic Range and Gamut	Monitor Dynamic Range and Gamut	x

Chapter 7 – SNMP

FS-HDR Simple Network Management Protocol

SNMP is defined as a “simple network management protocol” and was specified as a component of the Internet protocol suite by the Internet Engineering Task Force (IETF). The FS-HDR can act as a network element that issues SNMP trap messages signaling a detected alarm condition or other system condition. A device’s trap messages are defined in MIB (Management Information Base) files. The trap messages are sent to a server-based external NMS (Network Management System) destination. For example, the FS-HDR could send a trap message if one of its redundant power supplies becomes unplugged. A client software agent that communicates with the NMS might then get a message telling the operator what has happened.

The FS-HDR must be configured for SNMP messaging. By default SNMP is disabled on the FS-HDR. Besides activating SNMP, trap destinations must also be defined with fixed IP addresses.

When SNMP is enabled, one or more of these alarms may be sent by the FS-HDR to the client network management system (NMS) as a trap message:

- FS-HDR power supply 1 Alarm
- FS-HDR power supply 2 Alarm
- No Reference Alarm
- Incompatible Reference Alarm
- Format incompatibility Video Proc Alarm
- Format incompatibility Video Proc 1 Alarm
- Format incompatibility Video Proc 2 Alarm
- Format incompatibility Video Proc 3 Alarm
- Format incompatibility Video Proc 4 Alarm
- Video Proc 1 Background format Alarm
- Video Proc 2 Background format Alarm
- Video Proc 3 Background format Alarm
- Video Proc 4 Background format Alarm
- Video Proc 1 Background Timing Alarm
- Video Proc 2 Background Timing Alarm
- Video Proc 3 Background Timing Alarm
- Video Proc 4 Background Timing Alarm
- Over Temp Range Alarm

SNMP Configuration

AJA MIBs

AJA provides two FS related MIB files for use with your NMS. One identifies AJA product types, and the other defines the trap messages for a specific AJA product. These MIB .txt files are included with the AJA software download package.

Front Panel SNMP Configuration

FS-HDR SNMP configuration can be accomplished using the front panel or with the web browser computer interface (if Remote Control is enabled).

The FS-HDR front panel screens for SNMP are accessible through the CONFIG button. The direct SNMP configuration screens are:

- 4.0 SNMP Enable
- 4.1 SNMP Trap Destination 1
- 4.2 SNMP Trap Port 1
- 4.3 SNMP Trap Destination 2
- 4.4 SNMP Trap Port 2

These SNMP direct configuration parameters are described later in this chapter.

Front Panel Octet Value Entry Procedure

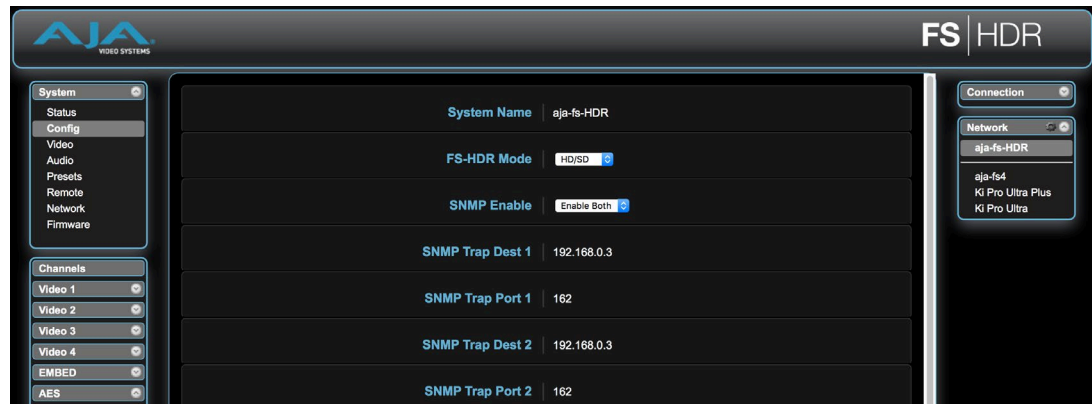
Set the octets (numbers between periods) values as follows:

1. Push ADJUST momentarily to enter edit mode.
2. Turn SELECT to select the octet you want to edit, indicated by blinking.
3. Turn ADJUST to enter the new value.
 - If you need to revert to the previous setting (undo changes), push SELECT.
4. Push ADJUST momentarily to save and activate the new setting.
 - If you want to revert to the default value, hold down ADJUST for 4 seconds.

Web Browser SNMP Configuration

SNMP direct configuration settings are available on the Config screen of the web browser interface.

Figure 56. Web Browser Config Screen SNMP Parameters



SNMP Configuration Parameters

4.0 SNMP Enable

The SNMP Enable parameter Enables or Disables SNMP messaging between the FS-HDR and an external client.

Disabled (default)	When set to Disabled, the FS-HDR will not issue SNMP trap messages.
Enable 1	When set to Enable 1, the FS-HDR issues SNMP trap messages to Trap Destination 1 (parameter 4.1) and as defined in the MIB.
Enable Both	When set to Enable Both, the FS-HDR issues SNMP trap messages to Trap Destination 1 and 2 (parameters 4.1 and 4.3) and as defined in the MIB.

When Enabled, menus described below are available for configuration.

4.1 SNMP Trap Destination 1

Determines the SNMP Trap Destination IP address where trap messages issued by the FS-HDR will be sent.

IP Address	Set the desired IP address where traps will be sent (usually a client on your LAN). <i>Default: 192.168.0.3</i>
------------	---

4.2 SNMP Trap Port 1

Determines the SNMP Trap Port 1 used for sending destination #1 trap messages. UDP Port 162 is the default used for SNMP trap messages. However, if this port is being used by another protocol or service, you can change the setting by modifying this parameter.

Variable	Select a UDP port for sending FS-HDR trap messages. <i>Default: 162</i>
----------	---

NOTE: The SNMP Trap Port number does not blink when changed (as does the Trap Destination IP address); if you change the port number and exit the parameter, the port changes immediately to the new value.

4.3 SNMP Trap Destination 2

Determines the secondary SNMP Trap Destination IP address where trap messages issued by the FS-HDR will be sent (if desired). This parameter is similar to above. The default is 192.168.0.3.

4.4 SNMP Trap Port 2

Determines the SNMP Trap Port used for sending destination #2 trap messages, similar to ["4.2 SNMP Trap Port 1"](#) above. Default is 162.

Appendix A – Specifications

FS-HDR Tech Specs

HDR/WCG Real Time Processor

- HDR Conversions
 - HDR to HDR
 - HDR to SDR
 - SDR to HDR
- Colorimetry
 - BT.709 and BT.2020

Video Processing Transforms

- Each processing channel can independently select from:
 - Colorfront Engine - TV Mode
 - Colorfront Engine - Live Mode
 - Colorfront Engine - Film Mode
 - BBC HLG 3-D LUTs
 - NBCU 3-D LUTs
 - User 3-D LUTs
 - Dynamic 3-D LUTs

Colorfront Engine (CFE) Advanced HDR Conversions

- Processing Based on Human Perception Model
- Perceptually optimized color volume remapping
- Preserves the original creative intent
- Parametric controls including HDR functions and color corrector
- TV Mode for applications such as television broadcast
- Live Mode for applications such as broadcast, OTT, A/V
- Film Mode for applications such as on-set camera preview and look creation
- Input Video Dynamic Range/Color Gamut
 - SDR BT.709 100 Nits
 - SDR Extended BT.709
 - PQ BT.2020 1000 Nits
 - PQ P3D65 1000 Nits
 - Hybrid Log Gamma BT.2100
 - HLG Extended BT.709
 - HLG Extended BT.2100
 - Sony S-Log3 S-Gamut3
 - Sony S-Log3 S-Gamut3 Cine
 - Sony S-Log3 BT.2020
 - ARRI Log C Wide Gamut
 - Panasonic V-log
 - RED Log3G10 Wide Gamut
 - Canon Log 2
 - Canon Log 3

- ACEScct (Film mode only)
- Output Video Dynamic Range/Color Gamut
 - SDR BT.709 100 Nits
 - SDR Extended BT.709
 - PQ BT.2020 1000 Nits
 - PQ P3D65 1000 Nits
 - Hybrid Log Gamma BT.2100
 - HLG Extended BT.709
 - HLG Extended BT.2100
 - Sony S-Log3 S-Gamut3
 - Sony S-Log3 BT.2020
 - ARRI Log C Wide Gamut
 - ACEScct (Film mode only)
- SDR Preview mode
- Ambient Light Compensation control
- PQ Output Nit level: 48-4000 Nit
- PQ Output P3 Colorspace Clamp
- Exposure, Color Temp, Tint controls
- TV Mode controls
 - Highlight management: Knee Point, Knee Slope
 - Color Correction: Lift, Gamma, Gain, Saturation
 - Camera Correction: Exposure, Color Temp, Tint
- Live Mode controls
 - Grading: Lift, Gamma, Gain,
 - SDR Softness control
 - ITU-R BT.2408 control
- Film Mode controls
 - Grading space: LogC, ACEScct, or S-Log3
 - ACES CDL: Offset, Power, Slope, Saturation
 - A/B Look Selection
 - A/B Look Mix
 - MasterLook
 - MasterBroadcast
 - MasterLookBright
 - MasterLookCool
 - MasterLookLowCon
 - MasterLookSoftColor
 - MasterLookVivid
 - MasterLookWarm
 - MasterPastelD60
 - MasterPastelD65
 - Agfa
 - ARRI K1S1
 - Bleach
 - ClassicFilm
 - Ektachrome
 - FilmBlended
 - FilmBlendedLoCon
 - FujiDI
 - FujiXD

- GenericFilm
- Kodachrome
- ReversalClassic

BBC HLG 3-D LUT HDR Conversions

- Mathematical dynamic range mapping per ITU-R BT.2408
- SDR/BT.709 Scene Referred to HLG/BT.2100 v1.5
- SDR/BT.709 Scene Referred to HLG/BT.2100 Strict v1.5
- SDR/BT.709 Scene Referred UpMap to HLG/BT.2100 v1.5
- SDR/BT.709 Scene Referred UpMap to HLG/BT.2100 Strict v1.5
- SDR/BT.709 Display Referred to HLG/BT.2100 v1.5
- SDR/BT.709 Display Referred UpMap to HLG/BT.2100 v1.5
- SDR/BT.2020 Display Referred to HLG/BT.2100 v1.5
- SDR/BT.2020 Display Referred UpMap to HLG/BT.2100 v1.5
- PQ 1000 Nits Display Referred to HLG/BT.2100 v1.5
- PQ 4000 Nits Display Referred to HLG/BT.2100 v1.5
- S-Log3/BT.2020 100% Scene Referred to HLG/BT.2100 v1.5
- S-Log3/BT.2020 200% Scene Referred(SR-Live) to HLG/BT.2100 v1.5
- HLG/BT.2100 to SDR/BT.709 Scene Referred v1.5
- HLG/BT.2100 to SDR/BT.709 Scene Referred Strict v1.5
- HLG/BT.2100 to SDR/BT.709 Display Referred v1.5
- HLG/BT.2100 to SDR/BT.709 Display Referred Super White v1.5
- HLG/BT.2100 to PQ 1000 Nits Display Referred v1.5

NBCU 3-D LUT Processing

- NBCU LUTs developed by NBCUniversal Media, LLC
- 1-NBCU_SDR2HLG_DL_v1, SDR UpMap to HLG using Display Light v1.0
- 2-NBCU_SDR2HLG_SL_v1, SDR to HLG using Scene Light v1.0
- 3-NBCU_HLG2SDR_DL_v1.1, HLG to SDR using Display Light v1.1
- 4-NBCU_SDR2PQ_DL_v1, SDR UpMap to PQ using Display Light v1.0
- 5-NBCU_PQ2SDR_DL_v1, PQ to SDR using Display Light v1.0
- 7-NBCU_HLG10002PQ_v1, HLG 1000 Nits to PQ v1.0

User 3-D LUT Processing

- Supports custom 33 point .cube format 3-D LUTs
- Tetrahedral LUT interpolation
- Configurable Colorspace, Scale, and HDR Transfer Characteristic
- Nonvolatile storage of 10 fixed LUTs

Dynamic 3-D LUT Processing

- Supports third party apps for automatic loading and display of 3-D LUTs
- Reflects dynamic changes in real time from source software
- Supported by Pomfort Livegrade Pro
- Supported by TV Logic WonderLookPro

Modes of Operation

- Four Channel Mode - Four Independent 2K, HD, or SD Video Processors
- Single Channel Mode - One 4K, UltraHD, 2K, HD, or SD Video Processor
- Enhanced Single Channel Mode - One 4K, UltraHD Video Processor with simultaneous 4K/UltraHD and 2K/HD/SD outputs

Video Formats

- (4K) 4096x2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (4K) 4096x2160PsF 23.98, 24, 25, 29.97, 30
- (UltraHD) 3840x2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (UltraHD) 3840x2160PsF 23.98, 24, 25, 29.97, 30
- (2K) 2048x1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1920x1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1920x1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1920x1080i 50, 59.94, 60
- (HD) 1280x720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94
- YCbCr, 4:2:2, 10-bit

Video Input Digital

- 4x 3G-SDI inputs, 4x BNC
- 4x 12G-SDI inputs, 4x Fiber or HD-BNC (optional SFP modules)
 - SFP coax module, 12G/6G-SDI, dual HD-BNC
 - SFP fiber module, 12G/6G-SDI, Single Mode, dual LC or single LC, SMPTE-297
 - SFP fiber module, 3G-SDI, Single Mode, dual LC, single LC, or single SC, SMPTE-297
 - SFP fiber module, 3G-SDI, Multi-Mode, dual LC or single LC, SMPTE-297
- 12G/6G/3G/HD/SD, SMPTE-259/292/424/2081/2082
 - Single Link 12G/6G-SDI (with optional SFP module)
 - Quad Link 3G-SDI Level A or B-DL (4x 3G), SMPTE-425-5
 - Dual Link 3G-SDI Level B-DS (2x 3G), SMPTE-425-3
 - Single Link 3G-SDI Level A, B-DL, or B-DS, SMPTE-425
 - Quad Link HD-SDI (4x 1.5G)
 - Dual Link HD-SDI (2x 1.5G), SMPTE-372
 - Single Link HD/SD
- Quadrant (Square Division) or 2SI (Two Sample Interleave) 4K/UltraHD input pixel mapping
- 8x 1 selector feeds video processor(s)

Video Output Digital

- 4x 3G-SDI outputs, 4x BNC
- 4x 12G-SDI outputs, 4x fiber or HD-BNC (optional SFP modules)
 - SFP coax module, 12G/6G-SDI, dual HD-BNC
 - SFP fiber module, 12G/6G-SDI, Single Mode, dual LC or single LC, SMPTE-297
 - SFP fiber module, 3G-SDI, Single Mode, dual LC, single LC, or single SC, SMPTE-297
 - SFP fiber module, 3G-SDI, Single Mode, dual LC, SMPTE-297
 - SFP fiber module, 3G-SDI, Multi-Mode, dual LC or single LC, SMPTE-297

- 12G/6G/3G/HD/SD, SMPTE-259/292/424/2081/2082
 - Single Link 12G/6G-SDI (with optional SFP module)
 - Quad Link 3G-SDI Level A or B-DL (4x 3G), SMPTE-425-5
 - Dual Link 3G-SDI Level B-DS (2x 3G), SMPTE-425-3
 - Single Link 3G-SDI Level A, B-DL, or B-DS, SMPTE-425
 - Quad Link HD-SDI (4x 1.5G)
 - Dual Link HD-SDI (2x 1.5G), SMPTE-372
 - Single Link HD/SD
- Quadrant (Square Division) or 2SI (Two Sample Interleave) 4K/UltraHD output pixel mapping

Monitor Output Digital

- Monitor Output is a copy of the Main Output
- 1x BNC, 1x 3G-SDI output
 - 3G-SDI/HD/SD, SMPTE-259/292/424, 10-bits
 - 4K/UltraHD automatically down-converted to 2K/HD
 - SDI Monitor Output is configurable when FS-HDR is operating in Enhanced Single Channel Mode
 - Video Formats
 - (2K) 2048x1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
 - (HD) 1920x1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
 - (HD) 1920x1080PsF 23.98, 24, 25, 29.97, 30
 - (HD) 1920x1080i 50, 59.94, 60
 - (HD) 1280x720p 50, 59.94, 60
 - (SD) 625i 50
 - (SD) 525i 59.94
 - Transforms
 - Colorfront Engine - TV Mode, select from 9 Conversions
 - Colorfront Engine - Live Mode, select from 10 Dynamic Range & Gamut settings
 - Colorfront Engine - Film Mode, select from 11 Dynamic Range & Gamut settings
 - BBC HLG LUTs, select from 17 LUTs
 - NBCU LUTs, select from 6 LUTs
 - USER LUTs, select from 10 LUTs
- 1x HDMI, 1x HD output
 - 2K/HD/SD, HDMI v1.4a
 - 4K/UltraHD automatically down-converted to 2K/HD
 - HDR Infoframe generation to support HDR displays per HDMI v2.0b and CTA-861-G
 - Crop control

Video Processing

- Motion adaptive deinterlacer
- Proc amp controls
- Color corrector
- Legalizer
- Frame rate conversion/film cadence removal/insertion (3:2, 1:2, 2:1, 2:3)
- Adjustable delay 0-20 frames with H and V timing controls in lines and pixels
- Freeze (manual or on input signal loss) to black or last good frame
- Matte generator for background fill
- Video test generator with SDR and HDR patterns
- Nominal video delay HD/SD, 2 frames (LFR), 4 frames (HFR)

Ancillary Data

- All embedded ANC packets pass-through when output format equals input format
- Ancillary Timecode (LTC, VITC1, VITC2) translation and pass-through for wide range of conversions
- SCTE-104 and Closed Captioning pass-through for wide range of conversions
- Closed Captioning conversion (CEA-608/CEA-708)
- AFD input detection, down-convert control, and output pass-through or overwrite
- Configurable SDI output VPID for Colorimetry and Transfer Characteristic

Format Conversion

- Convert any supported input format to any supported output format, within the same frame rate family. These three families are:
 - 59.94, 29.97, 23.98
 - 50, 25
 - 60, 30, 24

Scaling

- Supported in 2K/HD/SD formats
 - Zoom in and out
 - Reposition
 - Region of Interest (ROI)

Up-Conversion

- Hardware 10-bit
- Zoom 14:9: results in a 4:3 image zoomed slightly to fill a 14:9 image with black side bars
- Zoom Letterbox: results in image zoomed to fill fullscreen
- Zoom Wide: results in a combination of zoom and horizontal stretch to fill a 16:9 screen; this setting will introduce a small aspect ratio change

Down-Conversion

- Hardware 10-bit
- Anamorphic: fullscreen
- Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved
- Crop: image is cropped to fit video output format

Aspect Ratio Conversion for SD to SD

- Letterbox: Transforms SD anamorphic material to a letterboxed image
- H Crop: Produces a horizontally stretched effect on the image; transforms anamorphic SD to full frame
- SD Pillarbox: Produces an image in the center of the screen with black borders on the left and right sides and an anamorphized image in the center
- V Crop: Transforms SD letterbox material to an anamorphic image

Audio Input Digital

- 48 kHz sample rate
- 8x SDI embedded inputs (16-Channels each)
 - 128-channels, 24-bit (20-bit SD), SMPTE-272/299
- 8x balanced AES inputs (16-Channels), 1x DB-25
 - 16-channels, 24-bit, AES-3
- 2x MAD I inputs, 1 BNC, 1x ST Fiber
 - 128-Channels, 24-bit, AES-10

Audio Output Digital

- 48 kHz sample rate
- 1x SDI embedded output per Video Processor (16-Channels each)
 - 16-channels (in single Video Processor mode), 24-bit (20-bit SD), SMPTE-272/299
 - 64-channels (in four Video Processor mode), 24-bit (20-bit SD), SMPTE-272/299
- 8x balanced AES outputs (16-Channels), 1x DB-25
 - 16-channels, 24-bit, AES-3
- 2x MAD I outputs, 1x BNC, 1x ST Fiber
 - 128-channels, 24-bit, AES-10

Audio Processing

- 277 x 208 mono audio matrix, route 1 to 1, 1 to many
 - Inputs: 128 embedded, 16 AES, 128 MAD I, 2 stereo mixdowns, 3 tone generator
 - Outputs (Four Channel Mode): 16 AES, 128 MAD I, 64 embedded
 - Outputs (Single Channel Mode): 16 AES, 128 MAD I, 16 embedded
- Input adjustment controls for each channel
 - Gain +18 to -18 dB in 0.5 dB steps
 - Phase invert
- Input adjustment controls for each channel pair
 - Delay -16ms to +1sec in 20.8 us steps
- Audio delay can automatically follow video timing delay adjustments
- Two independent 5.1 or 7.1 to stereo mixdown processors with gain adjust
- High quality Sample Rate Conversion supported on all audio inputs
- SRC bypass for non-PCM audio (e.g. Dolby E, AC-3, etc)
- Audio tone generator (mute, 400 Hz, 1 kHz)

Reference Input

- External, 2x BNC
 - Looping, nonterminating
 - Blackburst or tri-level sync

Genlock

- Lock to External Reference
- Lock to SDI input 1 thru 8
- Free run based on Temperature Compensated Crystal Oscillator

Network Interface

- 1x RJ-45, 10/100/1000 Ethernet
- Embedded web server for remote control
- REST Interface
- SNMP

User Interface

- Display
- Keypad with status LEDs
- Two rotary/push knobs
- Comprehensive alarm indicators

FS-HDR Control Link Application

- Real time remote control of Colorfront Engine Parameters (Live Mode only)
- Supports Tangent Kb USB 12 knob panel
- Ganging feature provides simultaneous control of multiple FS-HDRs in Single Channel Mode
- Enables 8K HDR transform pipelines when controlling 4x FS-HDR simultaneously

Presets

- Four Channel and Single Channel Mode each support 40 system level Presets

GPI

- 1x 25-pin D-Connector
 - Four optically isolated GPI inputs
 - Four optically isolated GPO outputs

Size (w x d x h)

- 17.5" x 16.0" x 1.75" (1RU) (444.5 x 406.4 x 44.45 mm)

Weight

- 7.9 lb (3.6 kg)

Power

- 100-240 VAC 50/60 Hz (Dual, redundant power supplies), 55W typical; 70W max.

Environment

- Safe Operating Temperature: 0 to 40 C (32 to 104 F)
- Safe Storage Temperature (Power OFF): -40 to 60 C (-40 to 140 F)
- Operating Relative Humidity: 10-90% noncondensing
- Operating Altitude: <3,000 meters (<10,000 feet)

Appendix B – FS-HDR Pinouts

GPI Pinouts

General Purpose Interface Inputs and Outputs are available on the FS-HDR back panel to provide contact closure control. GPI Inputs can control FS-HDR functions, while GPI outputs can control external equipment (i.e. alarms).

Figure 57. DB-25F GPI Input and Output Pinout

Pin	Function	Pin	Function
1	NC	14	NC
2	NC	15	NC
3	NC	16	NC
4	NC	17	NC
5	NC	18	NC
6	NC	19	NC
7	GPI GND 4	20	GPI Out 4
8	GPI In 4	21	GPI GND 3
9	GPI Out 3	22	GPI In 3
10	GPI GND 2	23	GPI Out 2
11	GPI In 2	24	GPI GND 1
12	GPI Out 1	25	GPI In 1
13	Ground		

The GPI inputs and outputs are electrically isolated from power and ground on the FS-HDR frame. There are four inputs and four outputs. Electrical isolation is provided for up to four pieces of external equipment.

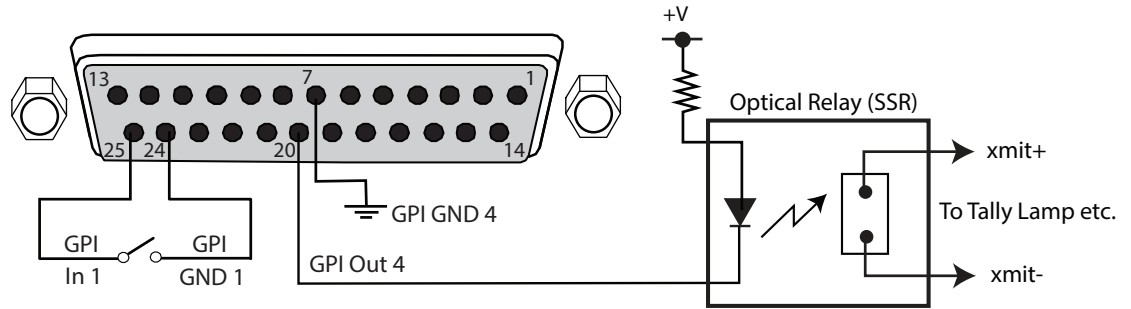
The following guidelines apply to the four GPI inputs and outputs:

- GPI In 1 and GPI Out 1 share a common isolated ground on pin 24 (GPI GND 1),
- GPI In 2 and GPI Out 2 share a common isolated ground on pin 10 (GPI GND 2),
- GPI In 3 and GPI Out 3 share a common isolated ground on pin 21 (GPI GND 3),
- GPI In 4 and GPI Out 4 share a common isolated ground on pin 7 (GPI GND 4),
- Pin 13, local chassis ground, may only be used as references when isolation is not required.
- All four GPI inputs are internally pulled high through a 10K ohm resistor to an isolated +5V supply, so that a relay contact closure or any device sinking at least 0.4 mA to ground will register a logic low.
- All four GPI outputs are +5V TTL compatible, sourcing up to 6mA and sinking up to 4mA each.

The following illustration shows typical external wiring to the GPI connector. The GPI inputs require some kind of contact closure between the input pin and the input ground pin to register the logic low that triggers the GPI input.

You can connect the outputs to TTL buffers that communicate the GPI output logic levels to other devices. For example, you could use an opto-isolator controlling a relay to activate other equipment as shown below.

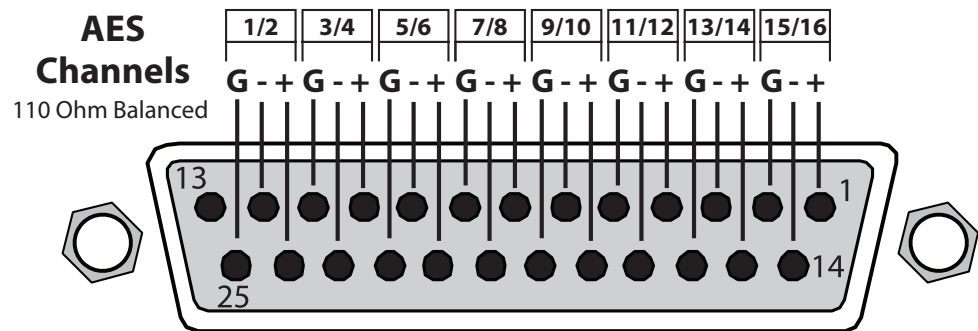
Figure 58. Typical GPI Input and Output Connections



Audio Connection Pinouts

Digital Audio

Figure 59. Digital Audio Connector Pinout



G = Ground

To MUX into unbalanced AES BNC connections, use Balun 75 ohm adapter.

The pinout scheme above is used for the AES/EBU digital audio connections. Each channel handles a pair of digital audio signals (16 total per connector). The top connector is for digital audio input channels 1-16, and the bottom connector is for digital audio output channels 1-16.

Appendix C – Safety & Compliance

Federal Communications Commission (FCC) Compliance Notices

Class A Interference Statement

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

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian ICES Statement

Canadian Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Règlement sur le brouillage radioélectrique du ministère des Communications

Cet appareil numérique respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

European Union and European Free Trade Association (EFTA) Regulatory Compliance

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, ICELAND, LICHTENSTEIN, NORWAY, SWITZERLAND

Declaration of Conformity

Marking by this symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU.



This equipment meets the following conformance standards:

Safety

EN 62368-1: 2014 + A11 (T-Mark License),
IEC 62368-1: 2014 (CB Scheme Report/Certificates)

Additional licenses issued for specific countries available on request.

Emissions

EN 55032: 2012 + AC: 2013, CISPR 32: 2015,
EN 61000-3-2: 2014, EN 61000-3-3: 2013

Immunity

EN 55103-2: 2009, EN 61000-4-2:2009, EN 61000-4-3: 2006 + A1:2008 + A2:2010,
EN 61000-4-4: 2004 + A1:2010, EN 61000-4-5:2006, EN 61000-4-6:2009,
EN 61000-4-11:2004

Environments: E2, E3 and E4

The product is also licensed for additional country specific standards as required for the International Marketplace.

Laser

EN 60825-1: 2014 and EN 60825-2: 2004 + A1 + A2,
CDRH Compliant Class 1 (TUV Cert No.'s R 50392421 and R 50488852)
Also Licensed for Standards: FDA 21 CFR 1040.10 and 1040.11



Warning! This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Attention! Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées..

Recycling Notice



This symbol on the product or its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

Korea KCC Compliance Statement

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

Taiwan Compliance Statement

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Japan Compliance Statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016). If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

China Compliance Statement

This product has been tested to the following Chinese standards:

GB/T13837-2012, GB8898-2011, and GB17625.1-2012

This product meets the requirements of implementation rules for compulsory certification (REF NO. CNCA-C08-01:2014) under certificate number 2016010805915614.

Translated Warning and Caution Messages

The following caution statements, warning conventions, and warning messages apply to this product and manual.



Warning Symbol



Hazard Symbol



Caution Symbol

Before Operation Please Read These Instructions



Warning! Read and follow all warning notices and instructions marked on the product or included in the documentation.

Avertissement! Lisez et conformez-vous à tous les avis et instructions d'avertissement indiqués sur le produit ou dans la documentation.

Warnung! Lesen und befolgen Sie die Warnhinweise und Anweisungen, die auf dem Produkt angebracht oder in der Dokumentation enthalten sind.

¡Advertencia! Lea y siga todas las instrucciones y advertencias marcadas en el producto o incluidas en la documentación.

Aviso! Leia e siga todos os avisos e instruções assinalados no produto ou incluídos na documentação.

Avviso! Leggere e seguire tutti gli avvisi e le istruzioni presenti sul prodotto o inclusi nella documentazione.



Warning! Do not use this device near water and clean only with a dry cloth.

Avertissement! N'utilisez pas cet appareil près de l'eau et nettoyez-le seulement avec un tissu sec.

Warnung! Das Gerät nicht in der Nähe von Wasser verwenden und nur mit einem trockenen Tuch säubern.

¡Advertencia! No utilice este dispositivo cerca del agua y límpielo solamente con un paño seco.

Aviso! Não utilize este dispositivo perto da água e limpe-o somente com um pano seco.

Avviso! Non utilizzare questo dispositivo vicino all'acqua e pulirlo soltanto con un panno asciutto.



Warning! Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

Avertissement! Ne bloquez aucune ouverture de ventilation. Suivez les instructions du fabricant lors de l'installation.

Warnung! Die Lüftungsöffnungen dürfen nicht blockiert werden. Nur gemäß den Anweisungen des Herstellers installieren.

¡Advertencia! No bloquee ninguna de las aberturas de la ventilación. Instale de acuerdo con las instrucciones del fabricante.

Aviso! Não obstrua nenhuma das aberturas de ventilação. Instale de acordo com as instruções do fabricante.

Avviso! Non ostruire le aperture di ventilazione. Installare in conformità con le istruzioni del fornitore.



Warning! Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

Avertissement! N'installez pas l'appareil près d'une source de chaleur telle que des radiateurs, des bouches d'air de chauffage, des fourneaux ou d'autres appareils (amplificateurs compris) qui produisent de la chaleur.

Warnung! Nicht in der Nähe von Wärmequellen wie Heizkörpern, Heizregistern, Öfen oder anderen Wärme erzeugenden Geräten (einschließlich Verstärkern) aufstellen.

¡Advertencia! No instale cerca de fuentes de calor tales como radiadores, registros de calor, estufas u otros aparatos (incluidos amplificadores) que generan calor.

Aviso! Não instale perto de nenhuma fonte de calor tal como radiadores, saídas de calor, fogões ou outros aparelhos (incluindo amplificadores) que produzam calor.

Avviso! Non installare vicino a fonti di calore come termosifoni, diffusori di aria calda, stufe o altri apparecchi (amplificatori compresi) che emettono calore



Warning! Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the device, the device has been exposed to rain or moisture, does not operate normally, or has been dropped.

Avertissement! Référez-vous au personnel de service qualifié pour tout entretien. L'entretien est exigé quand l'appareil a été endommagé de quelque manière que ce soit, par exemple lorsque le cordon d'alimentation ou la prise sont endommagés, que du liquide a été versé ou des objets sont tombés dans l'appareil, que l'appareil a été exposé à la pluie ou à l'humidité, ne fonctionne pas normalement ou est tombé.

Warnung! Das Gerät sollte nur von qualifizierten Fachkräften gewartet werden. Eine Wartung ist fällig, wenn das Gerät in irgendeiner Weise beschädigt wurde, wie bei beschädigtem Netzkabel oder Netzstecker, falls Flüssigkeiten oder Objekte in das Gerät gelangen, das Gerät Regen oder Feuchtigkeit ausgesetzt wurde, nicht ordnungsgemäß funktioniert oder fallen gelassen wurde.

¡Advertencia! Consulte al personal calificado por cuestiones de reparación. El servicio de reparación se requiere cuando el dispositivo ha recibido cualquier tipo de daño, por ejemplo cable o espigas dañadas, se ha derramado líquido o se han caído objetos dentro del dispositivo, el dispositivo ha sido expuesto a la lluvia o humedad, o no funciona de modo normal, o se ha caído.

Aviso! Remeta todos os serviços de manutenção para o pessoal de assistência qualificado. A prestação de serviços de manutenção é exigida quando o dispositivo foi danificado mediante qualquer forma, como um cabo de alimentação ou ficha que se encontra danificado/a, quando foi derramado líquido ou caíram objectos sobre o dispositivo, quando o dispositivo foi exposto à chuva ou à humidade, quando não funciona normalmente ou quando foi deixado cair.

Avviso! Fare riferimento al personale qualificato per tutti gli interventi di assistenza. L'assistenza è necessaria quando il dispositivo è stato danneggiato in qualche modo, ad esempio se il cavo di alimentazione o la spina sono danneggiati, è stato rovesciato del liquido è stato rovesciato o qualche oggetto è caduto nel dispositivo, il dispositivo è stato esposto a pioggia o umidità, non funziona correttamente o è caduto



Warning! Disconnect the external AC power supply line cord(s) from the mains power before moving the unit.

Avertissement! Retirez le ou les cordons d'alimentation en CA de la source d'alimentation principale lorsque vous déplacez l'appareil.

Warnung! Trennen Sie die Wechselstrom-Versorgungskabel vom Netzstrom, bevor Sie das Gerät verschieben.

¡Advertencia! Cuando mueva la unidad desenchufe de la red eléctrica el/los cable(s) de la fuente de alimentación CA tipo brick.

Advertência! Remova os cabos CA de alimentação brick da rede elétrica ao mover a unidade.

Avvertenza! Scollegare il cavo dell'alimentatore quando si sposta l'unità.



Hazard! High Voltage. This situation or condition can cause injury due to electric shock.

Avertissement! Tension élevée. Cette situation ou condition peut causer des blessures dues à un choc électrique.

Warnung! Hochspannung. Diese Situation oder Bedingung kann zu Verletzungen durch Stromschlag führen.

¡Advertencia! Alto voltaje . Esta situación o condición puede causar lesiones debidas a una descarga eléctrica.

Aviso! Alta Tensão . Esta situação ou condição pode causar danos devido a choques elétricos.

Avviso! Alta tensione. Questa situazione o condizione può causare lesioni a causa di scosse elettriche.



Warning! Only use attachments and accessories specified and/or sold by the manufacturer.

Avertissement! Utilisez seulement les attaches et accessoires spécifiés et/ou vendus par le fabricant.

Warnung! Verwenden Sie nur Zusatzgeräte und Zubehör angegeben und / oder verkauft wurde durch den Hersteller.

¡Advertencia! Utilice solamente los accesorios y conexiones especificados y/o vendidos por el fabricante.

Aviso! Utilize apenas equipamentos/acessórios especificados e/ou vendidos pelo fabricante.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore.



Warning! Unplug this device during lightning storms or when unused for long periods of time.

Avertissement! Débranchez cet appareil pendant les orages avec éclairsoù s'il est inutilisé pendant de longues périodes.

Warnung! Das Gerät ist bei Gewitterstürmen oder wenn es über lange Zeiträume ungenutzt bleibt vom Netz zu trennen.

¡Advertencia! Desenchufe este dispositivo durante tormentas eléctricas o cuando no se lo utilice por largos periodos del tiempo.

Aviso! Desconecte este dispositivo da tomada durante trovoadas ou quando não é utilizado durante longos períodos de tempo.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore, quali il treppiedi e l'esoscheletro.



Warning! Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

Avertissement! La sécurité de la prise polarisée ou de la prise de type mise à la terre ne doit en aucun cas être empêchée de fonctionner. Une prise polarisée a deux broches, l'une étant plus large que l'autre. Une prise de type mise à la terre a deux broches et une troisième broche pour la mise à la terre. La broche large ou la troisième broche sont fournies pour votre sécurité. Si la prise fournie ne s'insère pas dans votre prise femelle, consultez un électricien pour le remplacement de la prise femelle obsolète.

Warnung! Der Sicherheitszweck des gepolten bzw. Schukosteckers ist zu berücksichtigen. Ein gepolter Stecker verfügt über zwei Pole, von denen einer breiter als der andere ist. Ein Schukostecker verfügt neben den zwei Polen noch über einen dritten Pol zur Erdung. Der breite Pol bzw. der Erdungspol dienen der Sicherheit. Wenn der zur Verfügung gestellte Stecker nicht in Ihren Anschluss passt, konsultieren Sie einen Elektriker, um den veralteten Anschluss zu ersetzen.

¡Advertencia! No eche por tierra la finalidad del tipo de enchufe polarizado con conexión a tierra. Un enchufe polarizado tiene dos espigas, una más ancha que la otra. Un enchufe con conexión a tierra tiene dos espigas iguales y una tercera espiga que sirve para la conexión a tierra. La espiga ancha, o la tercera espiga, sirven para su seguridad. Si el enchufe suministrado no encaja en el tomacorriente, consulte con un electricista para reemplazar el tomacorriente obsoleto.

Aviso! Não anule a finalidade da segurança da ficha polarizada ou do tipo ligação terra. Uma ficha polarizada tem duas lâminas sendo uma mais larga do que a outra. Uma ficha do tipo de ligação à terra tem duas lâminas e um terceiro terminal de ligação à terra. A lâmina larga ou o terceiro terminal são fornecidos para sua segurança. Se a ficha fornecida não couber na sua tomada, consulte um electricista para a substituição da tomada obsoleta.

Avviso! Non compromettere la sicurezza della spina polarizzata o con messa a terra. Una spina polarizzata ha due spinotti, di cui uno più largo. Una spina con messa a terra ha due spinotti e un terzo polo per la messa a terra. Lo spinotto largo o il terzo polo sono forniti per motivi di sicurezza. Se la spina fornita non si inserisce nella presa di corrente, contattare un elettricista per la sostituzione della presa obsoleta.



Warning! Since the Mains plug is used as the disconnection for the device, it must remain readily accessible and operable.

Avertissement! Puisque la prise principale est utilisée pour débrancher l'appareil, elle doit rester aisément accessible et fonctionnelle.

Warnung! Da der Netzstecker als Trennvorrichtung dient, muss er stets zugänglich und funktionsfähig sein.

¡Advertencia! Puesto que el enchufe de la red eléctrica se utiliza como dispositivo de desconexión, debe seguir siendo fácilmente accesible y operable.

Aviso! Dado que a ficha principal é utilizada como a desconexão para o dispositivo, esta deve manter-se prontamente acessível e funcional.

Avviso! Poiché il cavo di alimentazione viene usato come dispositivo di sconnessione, deve rimanere prontamente accessibile e operabile.



Warning! Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the device.

Avertissement! Protégez le cordon d'alimentation pour que l'on ne marche pas dessus ou qu'on le pince, en particulier au niveau des prises mâles, des réceptacles de convenance, et à l'endroit où il sort de l'appareil.

Warnung! Vermeiden Sie, dass auf das Netzkabel getreten oder das Kabel geknickt wird, insbesondere an den Steckern, den Steckdosen und am Kabelausgang am Gerät.

¡Advertencia! Proteja el cable de energía para que no se le pise ni apriete, en especial cerca del enchufe, los receptáculos de conveniencia y el punto del que salen del equipo.

Aviso! Proteja o cabo de alimentação de ser pisado ou de ser comprimido particularmente nas fichas, em tomadas de parede de conveniência e no ponto de onde sai do dispositivo.

Avviso! Proteggere il cavo di alimentazione in modo che nessuno ci cammini sopra e che non venga schiacciato soprattutto in corrispondenza delle spine e del punto in cui esce dal dispositivo.



Warning! Do not open the chassis. There are no user-serviceable parts inside. Opening the chassis will void the warranty unless performed by an AJA service center or licensed facility.

Avertissement! Ne pas ouvrir le châssis. Aucun élément à l'intérieur du châssis ne peut être réparé par l'utilisateur. La garantie sera annulée si le châssis est ouvert par toute autre personne qu'un technicien d'un centre de service ou d'un établissement agréé AJA.

Warnung! Öffnen Sie das Gehäuse nicht. Keine der Geräteteile können vom Benutzer gewartet werden. Durch das Öffnen des Gehäuses wird die Garantie hinfällig, es sei denn, solche Wartungsarbeiten werden in einem AJA-Service-Center oder einem lizenzierten Betrieb vorgenommen.

¡Advertencia! No abra el chasis. El interior no contiene piezas reparables por el usuario. El abrir el chasis anulará la garantía a menos que se lo haga en un centro de servicio AJA o en un local autorizado.

Advertência! Não abra o chassi. Não há internamente nenhuma peça que permita manutenção pelo usuário. Abrir o chassi anula a garantia, a menos que a abertura seja realizada por uma central de serviços da AJA ou por um local autorizado.

Avvertenza! Non aprire lo chassis. All'interno non ci sono parti riparabili dall'utente. L'apertura dello chassis invaliderà la garanzia se non viene effettuata da un centro ufficiale o autorizzato AJA.



Warning! To meet safety regulations for leakage current, connect the dual power supplies to separate branch circuits.

¡Advertencia! Para cumplir con las normas de seguridad para la corriente de fuga, conecte las dos fuentes de alimentación para circuitos derivados diferentes.

Attention! Pour répondre aux mesures de sécurité concernant le courant de fuite, raccorder les sources d'alimentation doubles à des circuits de dérivation distincts.

Warnung! Zur Erfüllung der Sicherheitsbestimmungen bezüglich Reststrom schließen Sie bitte die zwei Netzteile an unterschiedlichen Abzweigleitungen an.

Cuidado! Para atender aos regulamentos de segurança para correntes de fuga, conecte as fontes duplas a circuitos elétricos separados.

Attenzione! Per soddisfare le norme di sicurezza sulla corrente di perdita, collegare i doppi alimentatori a circuiti derivati separati.



CLASS 1
LASER
PRODUCT

Warning! Active fiber-optic cables emit radiation invisible to the human eye. Do not look directly at the end of an active fiber-optic cable or the fiber connector on a FS1-X, FS2, FS3, FS4 or FS-HDR; these models are Class 1 Laser Products.

Avertissement! Les câbles fibre optique émettent des radiations invisibles à l'oeil humain. Ne regardez pas directement l'extrémité d'un câble fibre optique ou d'un connecteur de fibre d'un FS1-X, FS2, FS3, FS4 ou FS-HDR ces modèles sont des produits laser de Classe 1.

Warnung! Glasfaserkabel emittieren im Betrieb Strahlung, die für das menschliche Auge unsichtbar ist. Nicht direkt in das Ende eines im Betrieb befindlichen Glasfaserkabels bzw. den Glasfaserkabelanschluss am FS1-X, FS2, FS3, FS4 oder FS-HDR schauen; diese Modelle sind Lasergeräte der Klasse 1.

¡Advertencia! Los cables de fibra óptica activos emiten radiación invisible al ojo humano. No mire directamente hacia el extremo de un cable de fibra óptica activo o hacia el conector de fibra óptica del FS1-X, FS2, FS3, FS4 o FS-HDR estos modelos están clasificados como Productos Láser Clase 1.

Advertência! Os cabos de fibra óptica emitem radiação invisível para o olho humano. Não olhe diretamente para a extremidade de um cabo de fibra óptica ativo ou para o conector da fibra em um FS1-X, FS2, FS3, FS4 ou FS-HDR esses modelos são Produtos de Laser Classe 1.

Avvertenza! I cavi a fibre ottiche emettono radiazioni invisibili all'occhio umano. Non guardare direttamente l'estremità di un cavo in fibra ottica attivo o il connettore in fibra su un FS1-X, FS2, FS3, FS4 o FS-HDR questi modelli sono prodotti laser di classe 1.

Warranty and Liability Information

Limited Warranty on Hardware

AJA Video Systems, Inc. (AJA Video) warrants that the hardware product, not including software components, will be free from defects in materials and workmanship for a period of five years from the date of purchase. AJA Video provides a separate software warranty as part of the license agreement applicable to software components.

If the Customer brings a valid claim under this limited warranty for a hardware product (hereafter, a “product”) during the applicable warranty period, AJA Video will, at its sole option and as the Customer’s sole remedy for breach of the above warranty, provide one of the following remedies:

- Repair or facilitate the repair the product within a reasonable period of time, free of charge for parts and labor.
- Replace the product with a direct replacement or with a product that performs substantially the same function as the original product.
- Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

To obtain service under this warranty, the Customer must notify AJA Video of the defect before expiration of the warranty period and make suitable arrangements for the performance of service by contacting AJA Video support through the channels set forth on the support contacts web page at <https://www.aja.com/support>. Except as stated, the Customer shall bear all shipping, packing, insurance and other costs, excluding parts and labor, to effectuate repair. Customer shall pack and ship the defective product to a service center designated by AJA Video, with shipping charges prepaid. AJA Video shall pay to return the product to Customer, but only if to a location within the country in which the AJA Video service center is located. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS ON APPLICABLE STATUTORY RIGHTS OF A CONSUMER, SO SOME OR ALL OF THE TERMS OF THIS PARAGRAPH MAY NOT APPLY TO YOU.

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