

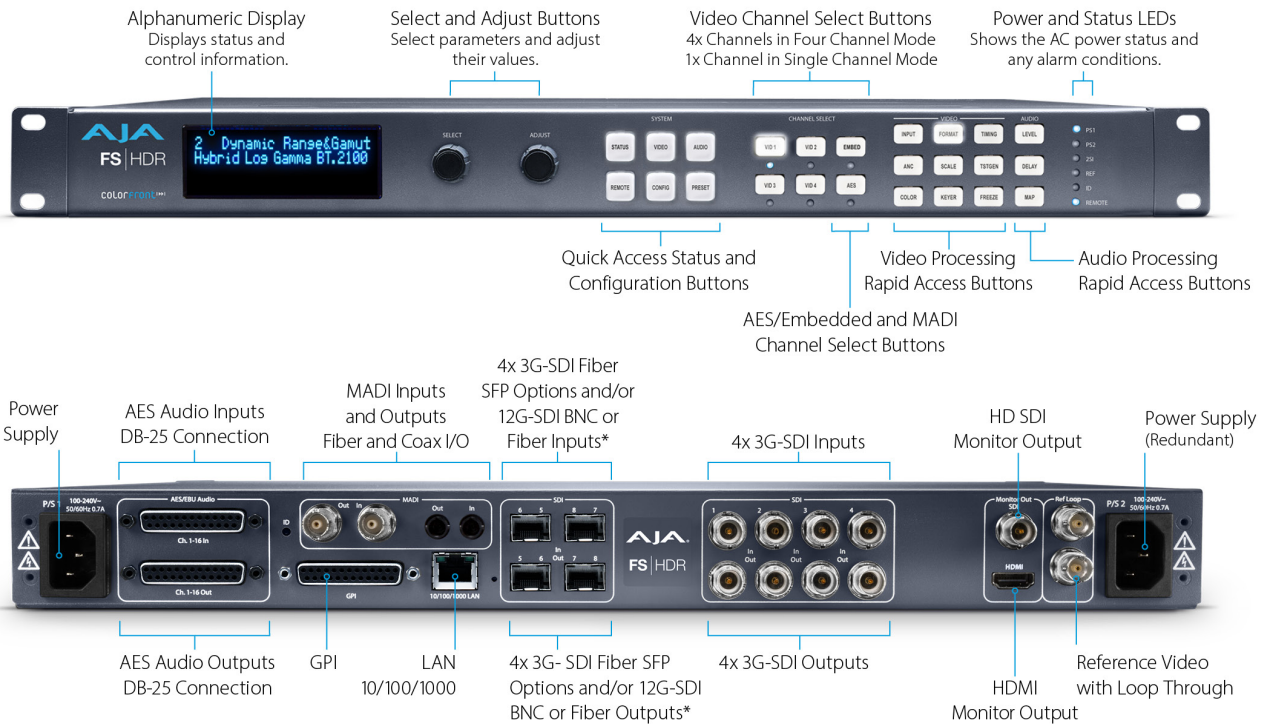


FS-HDR

FS-HDR, a 1RU, rackmount, universal converter/frame synchronizer, is designed specifically to meet the High Dynamic Range (HDR) and Wide Color Gamut (WCG) needs of broadcast, OTT, production, post, and live event AV environments, where real time, low latency processing and color fidelity is required for 4K/UltraHD and 2K/HD workflows. Developed in partnership with Colorfront, the FS-HDR's HDR/WCG functionality is powered by Colorfront Engine proprietary video processing algorithms.

In Single Channel Mode, FS-HDR also serves as a full, 1-channel up, down, cross-converter for 4K/UltraHD/2K/HD HDR transformation. In Four Channel Mode, FS-HDR offers four independent channels of 2K/HD HDR/WCG transformations as well as up, down, and cross conversions.

<https://www.aja.com/products/fs-hdr>



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) 4096 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (4K) 4096 x 2160PsF 23.98, 24, 25, 29.97, 30
- (UltraHD) 3840 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (UltraHD) 3840 x 2160PsF 23.98, 24, 25, 29.97, 30
- (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
- 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 MADI 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 MADI 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 MADI, 2 stereo mixdowns, 3 tone generator
 - Outputs (Four Channel Mode): 16 AES, 128 MADI, 64 embedded
 - Outputs (Single Channel Mode): 16 AES, 128 MADI, 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

- o 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)