



ULC2000

High-quality UHD Dual-channel Linear Frame-rate Converter

ULC2000 is a high-quality dual-channel UHD 12G processing unit using the latest motion adaptive algorithms, including independent HDR support and both format and frame-rate conversion for UHD/3G/HD signals. Providing processing for two independent signal paths allows both UHD and HD workflows to be catered for — ideal for applications that require UHD/HDR processing be performed with simultaneous HD/SDR outputs, for example.

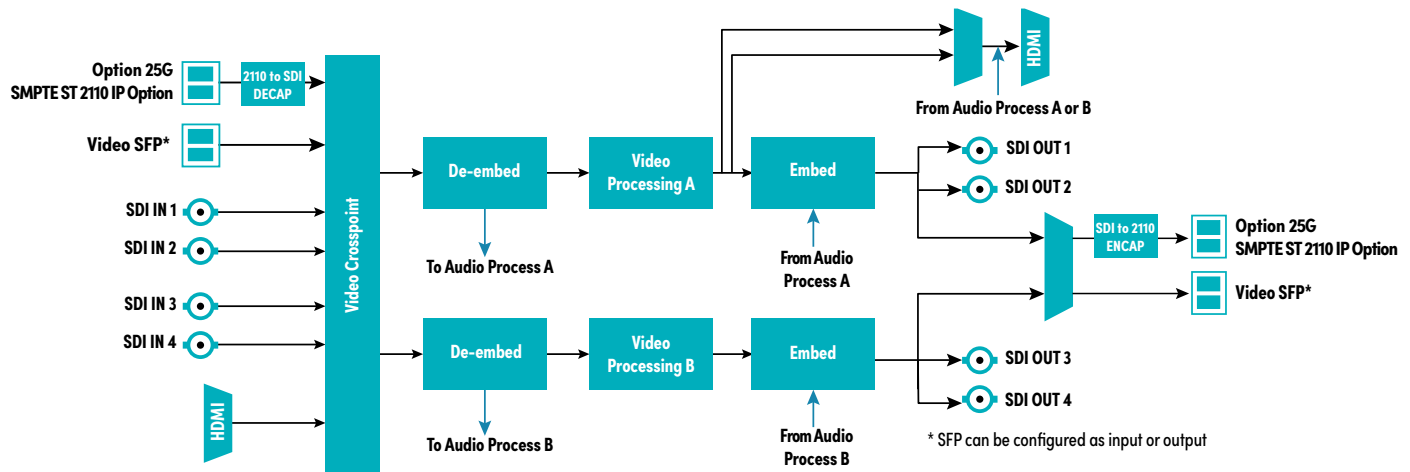
Key Features

- HD/3G/4K UHD up/down/crossconversion with clean cut feature
- Frame synchronization with input main/backup switching and additional video delay including continuous output on input standard changes
- Pre- and post-scaler video proc amp and RGB color correction support allows incoming signals to be fixed, and output artistic adjustments to be made
- RGB Legalizer with Black Level adjustment limits
- HDR (PQ, HLG, S-Log3) scene-referred and display referred conversions with BT709, P3-D65 color space, and BT2020 wide color gamut support
- 3D user LUT loading with full support for BBC type I, II & III 1.7 version LUTs
- Linear motion adaptive frame rate conversion for all supported standards, including UHD-UHD 50/59.94/60p
- Video processing and powerful picture enhancement tools, edge enhancement, noise reduction
- 32-channel embedded audio processing for each video channel with channel-based audio gain, delay compensation and shuffling
- Metadata support including closed caption, WST, timecode, SMPTE ST 2020 handling and an ancillary data bridge to allow transfer of up to seven different ANC packet types around the converter
- Easy to use control options including front panel with video confidence display and control lock, and remote via HTML5 web interface and GV Orbit®
- Balanced and unbalanced AES I/O, and balanced analog audio I/O
- MADI I/O on BNC with processing for 32 channels selectable from channels 1 to 64 of the MADI input
- Support for fiber Tx and Rx via SFP
- Dual PSU as standard
- Option to encapsulate or de-capsulate SDI signals to/from uncompressed SMPTE ST 2110

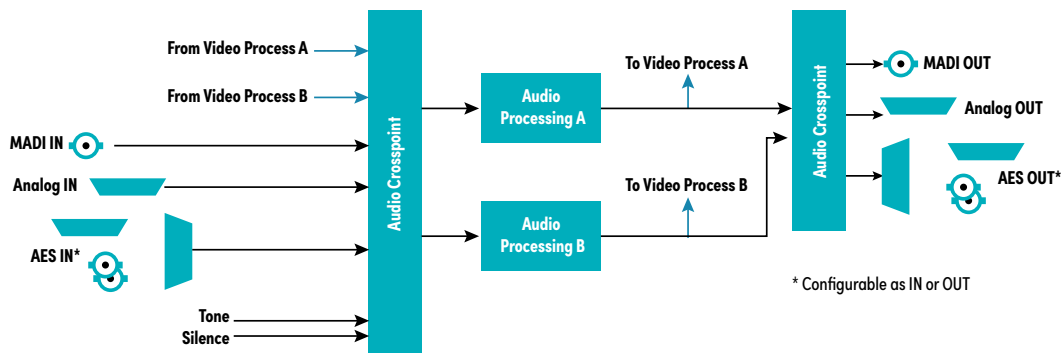
Applications

- Provide simulcast UHD and HD services with independent HDR/SDR mapping and processing
- Integrate HDR (PQ, HLG, S-Log3) signals into SDR workflows, translate between HDR standards, or map SDR signals for use in HDR productions utilizing the built-in feature set or by downloading user 3D LUTs
- Cover color space requirements with BT709, P3-D65 and BT2020 translation features
- 4K UHD signal processing — synchronize, adjust and enhance, or process audio with ULC2000's comprehensive control features

ULC2000 Video Processing



ULC2000 Audio Processing



Specifications

Signal Inputs

Serial digital 4x 75Ω HD/3G/6G/12G serial digital with embedded audio

Input standards:

- 12 Gb/s 4K UHD-1 single link to SMPTE ST 2082-10
- 6 Gb/s 6G-SDI UHD SMPTE ST 2081-10 Mode 1 (Level B-DS)
- 3 Gb/s HD-SDI, SMPTE ST 425 level A, dual-link level B
- 1.5 Gb/s HD-SDI SMPTE ST 292/SMPTE ST 299

Reference: 1x loop-through HDTV Tri-sync/SD Bi-sync (black- burst) SMPTE ST 240/SMPTE ST 274

Audio AES: Up to 8x balanced AES inputs – via 25-way D-type or 8x unbalanced AES inputs via BNC

Note: AES audio connectors may be configured as input or output.

Analog audio: 2x stereo analog inputs via 25-way D-type

MADI serial interface: AES10, 32 channels selectable from channels 1-64

Optical: 12 Gb/s UHD-SDI, 3 Gb/s HD-SDI or 1.485 Gb/s HD-SDI

Signal Outputs

Serial digital 4x 75Ω HD/3G/12G/4K UHD-1 serial digital with embedded audio

Optical: 12 Gb/s UHD-SDI, 3 Gb/s HD-SDI and 1.485 Gb/s HD-SDI

Output standards:

- 12 Gb/s 4K UHD-1 single link to SMPTE ST 2082-10
- 6 Gb/s 6G-SDI UHD SMPTE ST 2081-10 Mode 1 (Level B-DS)
- 3 Gb/s HD-SDI, SMPTE ST 425 level A, dual-link level B
- 1.5 Gb/s HD-SDI SMPTE ST 292/SMPTE ST 299

Audio AES: Up to 8x balanced AES outputs – via 25-way D-type or 8x unbalanced AES outputs via BNC

Note: AES audio connectors may be configured as input or output.

Analog audio: 2x stereo analog outputs via 25-way D-type

MADI serial interface: AES10, channels 1-32

Input Standards

- (auto detect) 720 50/59.94/60p
- 1080 50/59.94/60i
- 1080 50/59.94/60p (Levels A and B) 720/1080/2160 23.98/24/25/29.97/30p
- 1080 23.98/24/25/29.97/30PsF, with film detection and processing 2160 23/24/25/29/30p (6G-SDI single-link, Level B dual stream)
- 2160 50/59.94/60p (12G-SDI single link Level A)

Output Standards

- 720 50/59.94/60p
- 1080 50/59.94/60i
- 1080 50/59.94/60p (Levels A and B) 720/1080/2160 23.98/24/25/29.97/30p
- 1080 23.98/24/25/29.97PsF, with film detection and processing
- 2160 23/24/25/29/30p (6G-SDI single-link, Level B dual stream)
- 2160 50/59.94/60p (12G-SDI single link Level A)

Specifications (cont.)

Video Functions

Up/down conversion with clean cut feature

HD/3G to/from 4K UHD-1 linear standards conversion and 4K UHD-1 to 4K UHD-1 linear standards conversion

Enhancement:

Filter: Vertical and horizontal filters with preset normal, narrow or wide settings

Nonlinear enhancer:

- Frequency band selection: Med, high
- Six preset enhancement modes

Pre- and post-scaler color corrector:

- RGB lift: +200 to -200 mV in 0.8 mV steps
- RGB gain: +6.0 to -6.0 dB in 0.2 mV steps

Noise reducer: Multiband

Edge enhance: Horizontal & vertical

Video delay:

- 8 frames in steps of 1 frame for progressive sources
- 8 fields in steps of 1 field for interlaced sources

HDR Processing:

HDR flags input detection

HDR bypass support

External HDR processing:

- User LUT (33-cube 3D LUTs) loading support (32 entries), with full BBC Type I, II & III LUT support

Internal HDR processing:

- Conversion type: Scene referred/display referred
- SDR/HDR modes: SDR, HLG, PQ, S-Log3
- Colorimetry: Auto, BT709, P3-D65, BT2020
- Clipping: Hard/soft
- White clip level: Manual, Narrow, Full Scale and gamma adjust
- SDR enhancement

Manual ARC controls: Size, aspect, pan, tilt

Metadata:

Closed caption CEA708

Timecode:

- Source: LTC, VITC
- Processing: Follow input, generate
- Timecode loss: Freeze, freerun

SMPTE RDD08/SMPTE ST 2031 conversion SMPTE ST 2020 embed/de-embed

Ancillary data bridge to allow transfer of up to seven different ANC packet types around the converter

Audio Functions

Analog Audio:

- Two pairs of analog inputs are individually available to the processing channel
- Headroom +24 dBu; balanced connection

AES Audio:

- AES audio is accessible via 8 bidirectional ports which can be configured as inputs or outputs
- AES input is auto-detected as PCM (32-96 kHz) or non-PCM (48 kHz locked to relevant video input)

MADI Audio:

- Processing for 32 MADI channels, selected from channels 1 to 64 on the MADI input. Channels 1 to 32 will be available on the MADI output

Embedded Audio:

- 32-channel embedded audio processing
- PCM audio processing includes channel level gain and delay compensation, as well as channel level routing/shuffle with audio phase inversion and tone/mute insertion
- Non-PCM processing features pair level routing and delay compensation

System

Pattern Off, Black, Ramp, Bars Default output: Black, Mute

Pre- and Post-scaler Proc Amp:

- Black Level: +100 to -100 mV (0) in 0.8 mV steps
- Contrast: -6 dB to +6 dB (0) in 0.2 dB steps
- Saturation: -6 dB to +6 dB (0) in 0.2 dB steps
- Y Gamma: 0.4 to 1.7 (1) in 0.1 steps

Genlock: Reference lock, Input lock (same format), Free run

Memories: 8 user memories

Adjustable Legalizer with Black Level adjustment limits included

Front panel lock

Communications

Remote control via HTML5 web interface, GV Orbit and SNMP

Power (Primary and Secondary)

Input voltage range: 100 – 240 VAC, 50/60 Hz 2A (max.) via three-pin IEC power socket

Mechanical

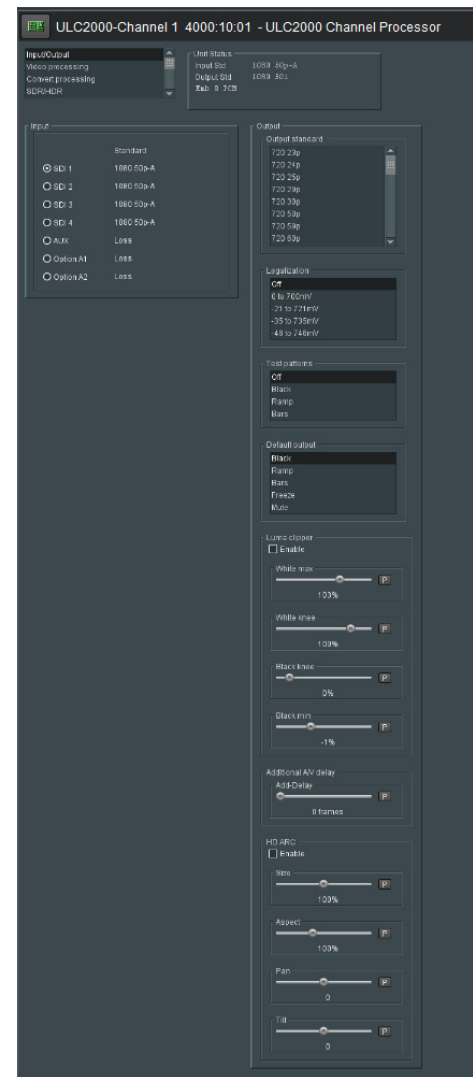
Temperature range: 0 to 45° C (32° to 113° F) operating

Cooling: Internal fan, rear venting

Weight: Approximately 5 kg (11 lbs.)

Case type: 1 RU, rack mounting

Dimensions: 44 x 430 x 410 mm (1.7 x 16.9 x 16.1 in.) (HxWxD)



Specifications (cont.)

SMPTE ST 2110 Option

Offers a flexible IP connectivity through two distinct SFP+ ports for optical or electrical modules:

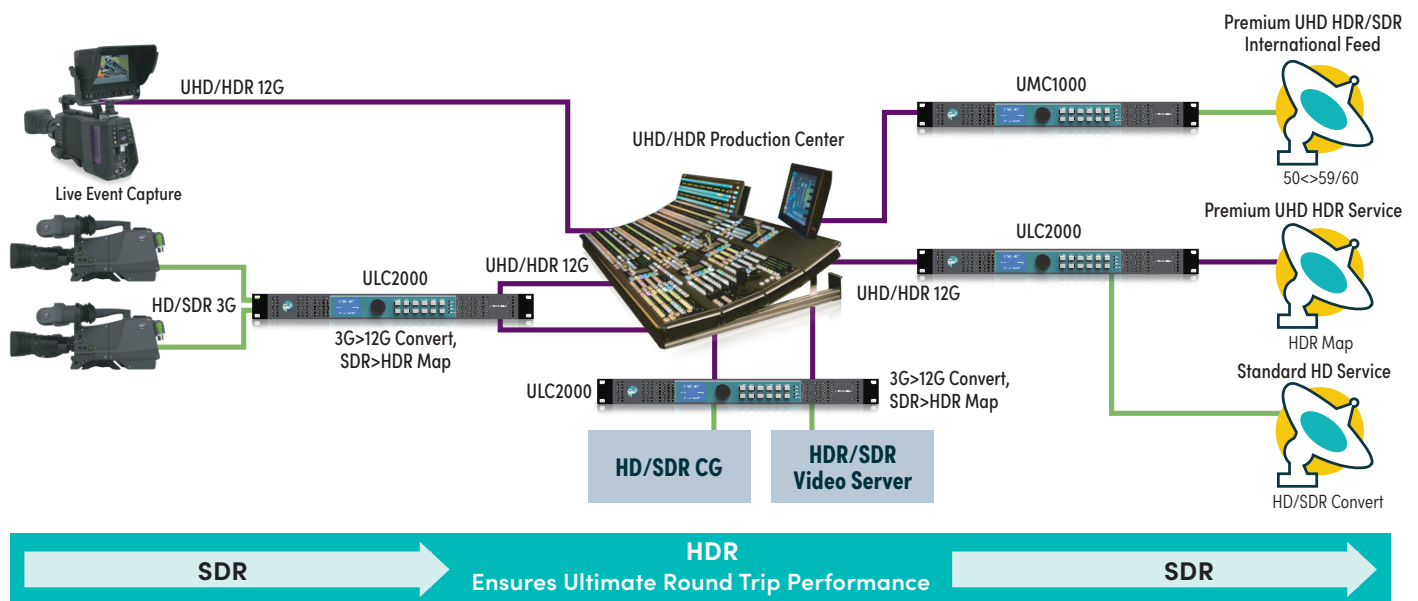
- 25 GbE AOC and Optical SFP
- FEC108 (Reed Solomon IEEE) Forward Error Correction
- SMPTE ST 2022-7 Class A/B/C/D seamless protection switching of IP streams
- Supports IGMPv3 source-specific multicast, allowing transmission in multicast groups
- SMPTE ST 2059-1 & -2 precision time protocol and support of best master clock algorithm
- NMOS IS-04 discovery and registration with group hints tag support
- NMOS IS-05 device connection management
- In-band control of NMOS
- Support of DHCP and DNS-SD for easy IP configuration

- SMPTE ST 2110-20 video including UHD Single stream
- SMPTE ST 2110-21 Wide/Narrow profile receivers and Narrow linear profile senders
- SMPTE ST 2110-31 AES3 transparent transport
- SMPTE ST 2110-30/31 (PCM/AES) Audio – 4x flows, each flow capable of 16 audio pairs
- SMPTE ST 2110-40 metadata associated with SMPTE ST 2110-20 video stream

SMPTE ST 2110 Option Video Formats

- 2160 50p, 59p, 60p (3840 x 2160 4:2:2 YCbCr 10-bit)
- 1080 23p, 24p, 25p, 29p, 30p, 50p, 59p, 60p (1920 x 1080 4:2:2 YCbCr 10-bit)
- 1080 50i, 59i, 60i (1920 x 1080 4:2:2 YCbCr 10-bit)
- 1080 23psf, 24psf, 25psf, 29psf, 30psf (1920 x 1080 4:2:2 YCbCr 10-bit)
- 720 23p, 24p, 25p, 29p, 30p, 50p, 59p, 60p (1280 x 720 4:2:2 YCbCr 10-bit)

Applications



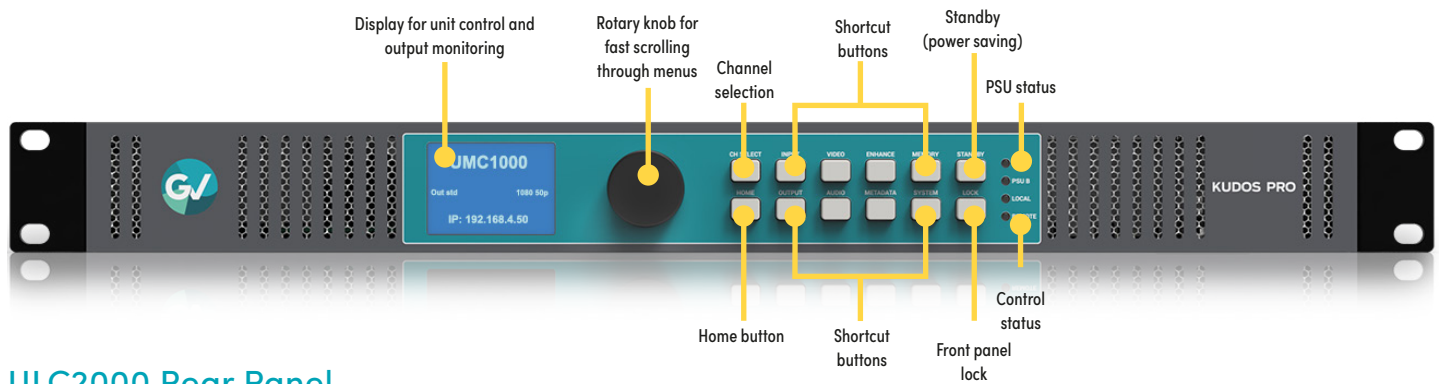
Compact Solution for Mixed UHD/HDR and HD/SDR Applications

HDR/SDR re-mapping enables all signals to be compatible with the required production color space with support for user LUT loading compatible with BBC type I, II and III LUTs for scene or display referred and wide or narrow formats.

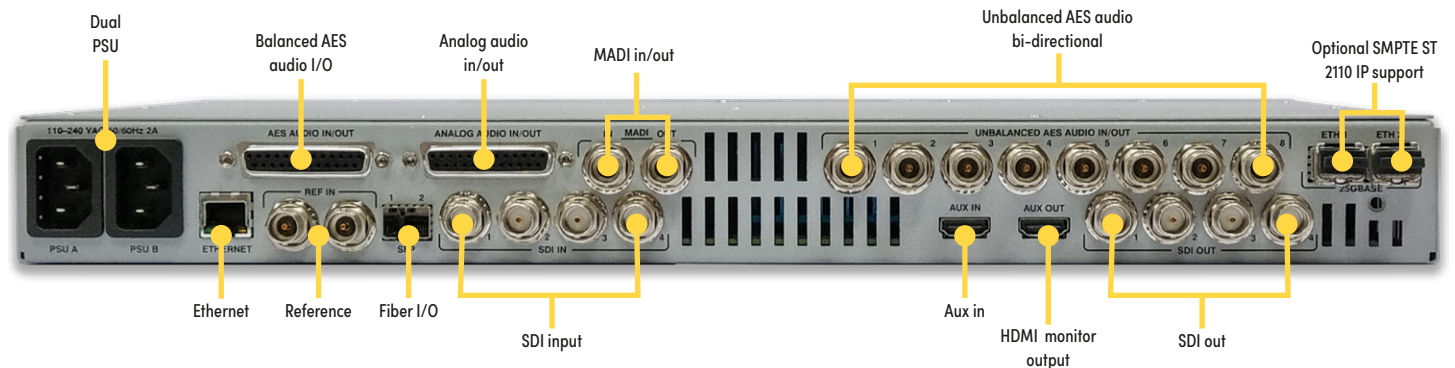
Multiple adjustments are available for color correction and gain, both pre-scaling to "fix" any input issues and post scaling to accommodate any artistic output requirements.

Further HDR/SDR features include hard and soft clipping to balance roll-off and round-tripping requirements, tone mapping for viewing HDR material on an SDR monitor, and SDR enhancement to selectively boost SDR content when mapping to any HDR mode.

ULC2000 Front Panel



ULC2000 Rear Panel



Ordering

KPULC-2000

Dual channel 1 RU video & audio processing unit for HD/3G/12G 4K UHD signals, including format conversion, linear frame rate conversion, HDR to HDR and SDR conversion for S-Log3, HLG and PQ mappings plus BT709, P3-D65 and SMPTE ST 2020 wide color gamut translation. Other features available including frame synchronization, CC, WST and timecode handling, picture enhancement tools, 32-channel audio processing incl. gain, delay & shuffling. 12G-SDI I/O, MADI, balanced AES and analog audio I/O. HDMI I/O, GPI & dual PSUs.

SMPTE ST 2110 Option

KPULC-OPT-25G

Hardware option to add 2x 25 GbE ports to KPULC-2000

SFP-25G-SR

SFP for short range multimode optical connectors

SFP-25G-LR

SFP for long range single mode optical connectors

Video SFP Options

SFP-U-R-LC

12G Single RX Fiber with LC/PC

SFP-U-RR-LC

12G Dual Rx Fiber with LC/PC

SFP-U-RT-S13-LC

12G Dual Rx/Tx Fiber 1310 nm with LC/PC

SFP-U-T-S13-LC

12G Single Tx Fiber 1310 nm with LC/PC

SFP-U-TT-S13S13-LC

12G Dual Tx Fiber 1310 nm with LC/PC

SFP-R-LC

Single fiber RX (input) cartridge with LC/PC connector

SFP-RR-LC

Dual fiber Rx (input) cartridge with LC/PC connector

SFP-T-S13-LC

Single fiber TX (output) cartridge at 1310 nm with LC/PC connector

SFP-TT-S13S13-LC

Dual fiber Tx (output) cartridge at 1310 nm with LC/PC connector

SFP-RT-S13-LC

Dual fiber Rx/Tx (input/output) cartridge 1310 nm with LC/PC connector

This product may be protected by one or more patents. For further information, please visit: www.grassvalley.com/patents

DS-PUB-3-1010E-EN

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