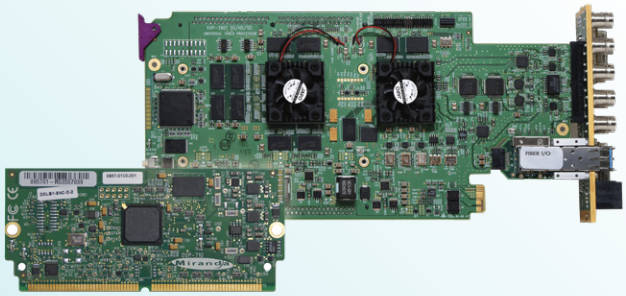
Grass Valley
WE LOVE LIVE

DATASHEET



XVP-3901
Densité Up/Down/ Crossconversion

3G/HD/SD Up/Down/Crossconverter with Optional Audio Processor

The all-in-one processing family that simplifies integration, reduces space, cabling and overall costs.

The award-winning XVP-3901 family from Grass Valley delivers all essential video and audio signal processing functions on a single module. It offers up/down/ crossconversion, with simultaneous 3G, HD and SD outputs. There's also integral fiber I/O, full AFD support and background keying.

The processor performs all the up/ down/crossconversion, color space and aspect ratio conversion needed to maintain the chosen output formatting, irrespective of whether the input is 3G (Level A or B), HD 1080i, HD 720p or SD.

High quality up/down/ crossconversion is performed at both 50 and 59.94 Hz, based on multiple sophisticated processing technologies. These include detail enhancement, pixel-based de-interlacing, and advanced motion adaptive de-interlacing and anti-ringing.

To ensure that the upconverted or downconverted video is delivered in the correct aspect ratio when aired, the XVP-3901 fully supports AFD. This provides automatic aspect ratio and video size control using embedded commands, and it prevents on-air aspect ratio errors such as the postage stamp effect.

Frame accurate Aspect Ratio Conversion (ARC) can be performed automatically, using embedded signaling based on the Active Format Description (AFD) standard. AFD data can be easily embedded in a signal by the Densité XVP processor family, and by the EAP-3901 embedder. With AFD, original image information is maintained throughout the entire conversion process for optimal viewing following 4:3 and 16:9 aspect ratio conversion.

For example, processing three input source formats (16:9 HD, 16:9 SD and 4:3 SD) in a typical HD/SD hybrid plant results in six different output possibilities. However, using automatic aspect ratio control based on AFD prevents any ARC errors that may occur with manual control.

A background keying capability allows side panels (or top and bottom panels) to be filled with graphics to improve on-air presentation.

A fiber input/output plug-in cartridge option significantly simplifies fiber installation and configuration. When the fiber cartridge is fitted, the card can select between fiber and BNC inputs and can output both electrical and optical signals simultaneously. The processor's audio capabilities are equally advanced, with processing of up to 32 channels of audio, with automatic delay to keep lip sync. The processor provides shuffling and downmixing, and options include automatic loudness control (ALC), dynamic processing (limiter, compressor and expander), loudness metering and four AES inputs/outputs for additional flexibility.

The XVP-3901 has two on-board sockets for optional modules, including Dolby E encoding, Dolby Digital (AC-3) encoding, Dolby E/ Dolby Digital (AC-3) decoding, and upmixing using Linear Acoustic upMAX technology. Grass Valley also offers two modules that provide automatic loudness control. These modules feature award-winning technologies such as AEROMAX by Linear Acoustic which is capable of maintaining constant loudness (ALC) across different audio programs.

Key Features

Video

- Up/down/cross/ARC converter with frame sync (50/59.94 Hz)
- Offers a multirate 3G/HD/SD input and simultaneous 3G/HD/ SD outputs (XVP-3901 full version only)
- Options for upconverter only, or downconverter only versions, including all other XVP processing features
- Supports 3G level A (mapping 1) and level B
- Flexible HD/SD/URS reference input
- Advanced video de-interlacing for best image quality
- One frame of processing delay for all conversions
- Automatic ARC using AFD (SMPTE ST 2016), video index (SMPTE RP 186) and WSS
- Custom and fixed ARC presets
- Keyer option for filling black pillars and letter box
- Built-in proc amp with YUV/RGB color correction and legalizer
- Processes and converts ancillary data such as CC (CEA-608/CEA-708), timecode, teletext/OP-47 and SCTE-104 (SMPTE ST 2010)
- Inserts V-Chip and CGMS in XDS of CC (CEA-608)
- Optional SFP optical plug-in cartridges to select between fiber and BNC inputs and output both electrical and optical signals simultaneously
- Serial and GPIO ports for automation control
- Dual fingerprint generation to monitor lip sync on SD and HD outputs

Optional Audio

- 16 channels embedded audio processing (32 channels internal)
- 4 AES inputs, 4 AES outputs
- Automation capabilities based on audio signal type detection
- Audio downmix: 5.1 surround to Lt/Rt or Lo/Ro
- Optional audio dynamic processor (compressor/ limiter/expander)
- Optional automatic loudness control (ALC) with Grass Valley wideband processing (on-board)
- Optional loudness measurement of up to four audio programs and logging with GV Orbit for end-to-end loudness monitoring solutions
- Loudness solution compliant to EBU R128, A/85 ITU-R BS.1770-3 and ARIB TR-B32
- Dolby E compatible
- Audio metadata processing (SMPTE ST 2020-A)
- Perfect audio/video sync plus additional audio user delay of up to 2 seconds
- Compatible with Grass Valley audio processing cards using ABUS
- On-board socket for two optional module expansions:
  - Dolby E and Dolby Digital decoder
  - Dolby Digital and Dolby Digital Plus encoder
  - Dolby E encoder
  - Linear Acoustic upMAX
  - Linear Acoustic AEROMAX automatic loudness control

XVP-3901 is also available with reduced feature set for applications requiring just upconversion or downconversion to provide the ideal cost to features balance. All cut-down versions can be upgraded to full XVP-3901 specification at a later date if required.

There are many benefits to the XVP-3901's high level of feature integration. A lower purchase cost per channel is obviously highly desirable but there are many other dimensions to cost savings that are readily achievable. These include reduced space and cooling costs, less cabling and a reduced spares inventory. By simplifying video and audio synchronization, and reducing the number of vendors, system integration is also simplified significantly.

XVP-3901

Input \ Output		SD		HD				3G	
		525	625	720p50	720p59.94	1080i50	1080i59.94	1080p50	1080p59.94
SD	525	X			X		X		X
	625		X	X		X		X	
HD	720p50		X	X		X		X	
	720p59.94	X			X		X		X
	1080i50		X	X		X		X	
	1080i59.94	X			X		X		X
	1080p23.98	X			X		X		X
	1080pSF23.98	X			X		X		X
	1080p25		X	X		X		X	
	1080p29.97	X			X		X		X
3G	1080p50		X	X		X		X	
	1080p59.94	X			X		X		X

Video Formats Supported.

XVP-3901-UC

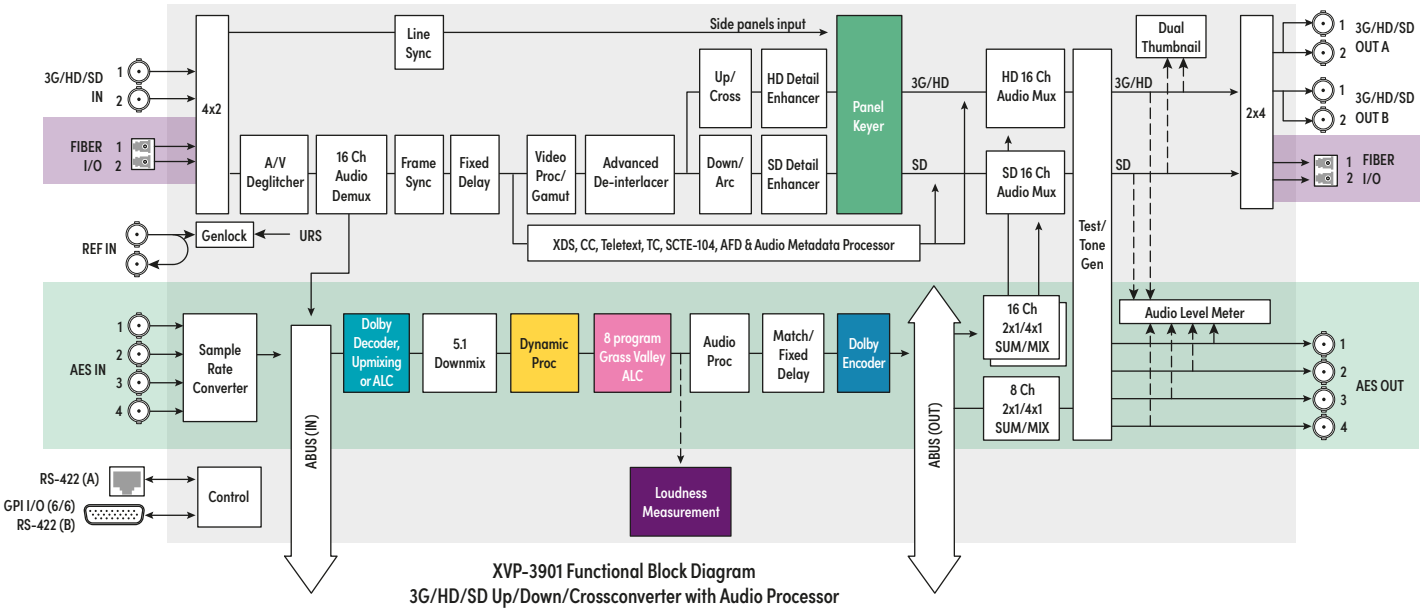
Input \ Output		HD				3G	
		720p50	720p59.94	1080i50	1080i59.94	1080p50	1080p59.94
SD	525		X		X		X
	625	X		X		X	
HD	720p50	X					
	720p59.94		X				
	1080i50			X			
	1080i59.94				X		
	1080p23.98				X		
	1080pSF23.98				X		
	1080p25			X			
	1080p29.97				X		
3G	1080p50					X	
	1080p59.94						X

Video Formats Supported.

XVP-3901-DC

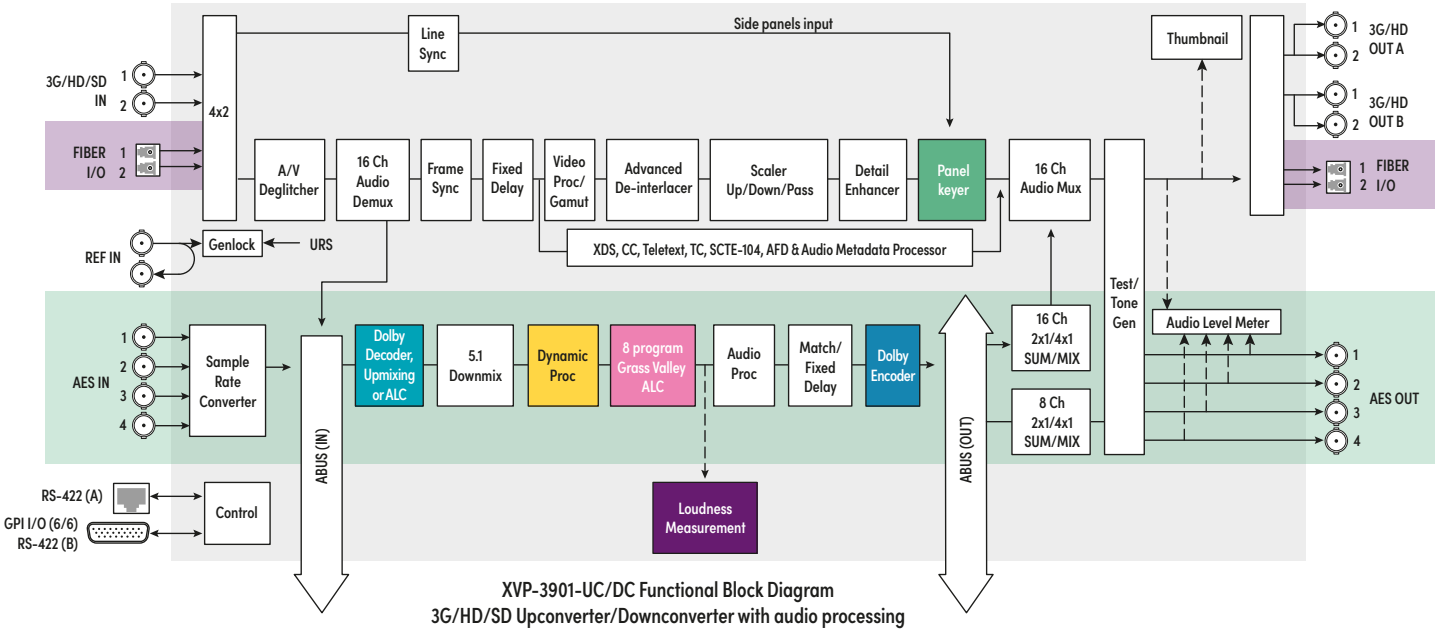
Input \ Output		SD	
		525	625
SD	525	X	
	625		X
HD	720p50		X
	720p59.94	X	
	1080i50		X
	1080i59.94	X	
	1080p23.98	X	
	1080pSF23.98	X	
	1080p25		X
	1080p29.97	X	
3G	1080p50		X
	1080p59.94	X	

Video Formats Supported.



XVP-3901 Functional Block Diagram
3G/HD/SD Up/Down/Crossconverter with Audio Processor

VIDEO OPTIONS	AUDIO OPTIONS			
XVP-3901-110/75-3TRP-F and 3DRP-F (with appropriate fiber cartridge)	XVP-3901-OPT-AUD	XVP-3901-OPT-DP	MOD-DOLBY-DEC-2	MOD-LA-ALC
XVP-3901-OPT-K	XVP-3901-OPT-ALC	XVP-3901-OPT-LM	MOD-LA-DUP-701	MOD-DOLBY-ENC-D-2
			MOD-DOLBY-ENC-E-2	



XVP-3901-UC/DC Functional Block Diagram
3G/HD/SD Upconverter/Downconverter with audio processing

VIDEO OPTIONS	AUDIO OPTIONS			
XVP-3901-110/75-3TRP-F and 3DRP-F (with appropriate fiber cartridge)	XVP-3901-OPT-AUD	XVP-3901-OPT-DP	MOD-DOLBY-DEC-2	MOD-LA-ALC
XVP-3901-OPT-K	XVP-3901-OPT-ALC	XVP-3901-OPT-LM	MOD-LA-DUP-701	MOD-DOLBY-ENC-D-2
			MOD-DOLBY-ENC-E-2	

Specifications

Video Input (2) / Output (2)

Signal:

SMPTE ST 259-C (270 Mb/s)

SMPTE ST 292 (1.485, 1.485/ 1.001 Gb/s)

SMPTE ST 424 (2.970, 2.970/ 1.001 Gb/s)

Supported formats:

SD: 480i59.94, 576i50

HD: SMPTE ST 274: 1080i59.94/50

HD: SMPTE ST 296: 720p59.94/50

3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94/50

Cable length:

300m (984 ft.) Belden 1694A at 270 Mb/s

150m (492 ft.) Belden 1694A at 1.485 Gb/s

120m (393 ft.) Belden 1694A at 2.970 Gb/s

Return loss: >15 dB up to 3 GHz

Jitter:

HD/SD: <0.2 UI (alignment jitter)

3G: <0.3 UI (alignment jitter)

Reference Input

Signal:

SMPTE ST 170/SMPTE ST 318/ITU 624-4 blackburst

SMPTE ST 274/SMPTE ST 296 tri-level sync

Return loss: >35 dB up to 5.75 MHz

Video Processing Performance

Signal path: 10 bits minimum

Latency: 1 frame in all modes

Additional delay: up to 15 frames

Audio Input (4)

Sampling freq.: 32 to 96 kHz

Quantization: up to 24 bits

AES3

Level: 0.2 to 7 Vp-p

Impedance: 110Ω balanced

AES3-id

Level: 0.2 to 2 Vp-p

Impedance: 75Ω

Return loss: 15 dB at 6 MHz

Audio Output (4)

Sampling freq.: 48 kHz

Quantization: 24 bits

AES3

Level: 2.75 Vp-p

Impedance: 110Ω balanced

AES-3id

Level: 1.0 Vp-p

Impedance: 75Ω

Return loss: 15 dB at 6 MHz

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz, synchronous

Number of channels: 16, 8 pairs, 4 groups

Freq. response: ±0.02 dB (20 Hz to 20 kHz)

SNR: 123 dB (A-weighted)

THD-N: -138 dB (20 Hz to 20 kHz)

Miscellaneous

Fixed delay: 0 to 2.0 s

Step: 1 ms (coarse), 1 sample (fine)

GPI

Connector: 26-pin D-Sub, optoisolated

GPI in: Input selection: 1-2

Presets: 1-4

GPI out: Selected input: 1-2

Selected preset: 1-4

RS-422 A (automation)

Connector: RJ-45

Signal: OXTEL series automation protocol

RS-422 B (audio metadata)

Connector: 26-pin D-Sub

Signal: RDD6

ABUS Connector

As per ABUS standard, Grass Valley

Fiber

Full specifications available on SFP optical plug-in cartridges webpage and datasheet.

Test Pattern Generator

Video: Color bars - 100% white bar with 75% color

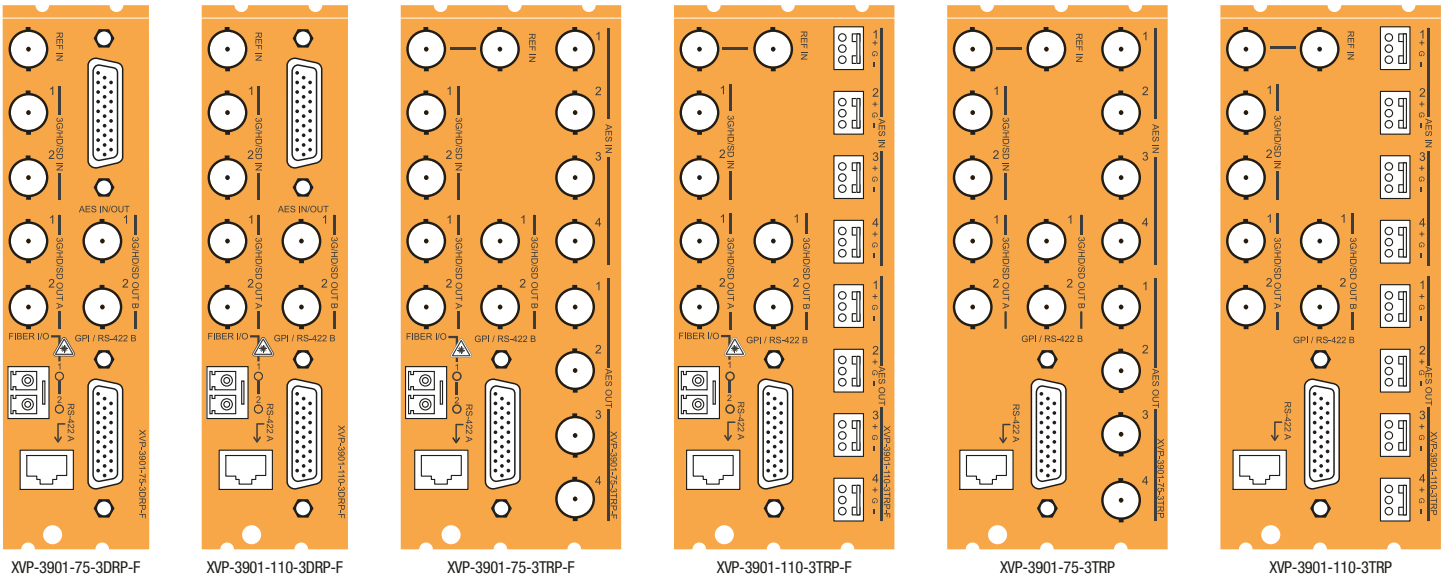
Audio:

Left channel pulsed 1 kHz tone

Right channel steady 1 kHz tone

Electrical

Power: 25W

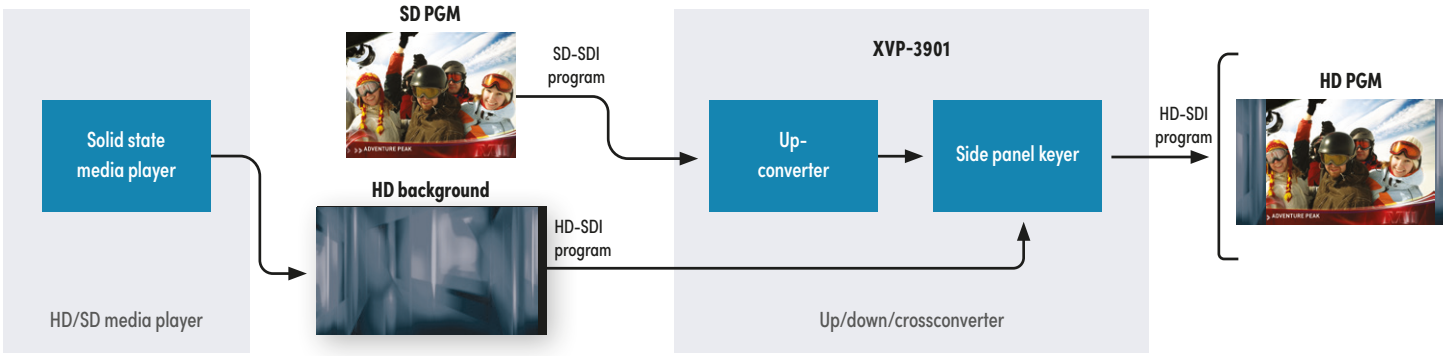


XVP-3901-75-3DRP-F | XVP-3901-110-3DRP-F | XVP-3901-75-3TRP-F | XVP-3901-110-3TRP-F | XVP-3901-75-3TRP | XVP-3901-110-3TRP

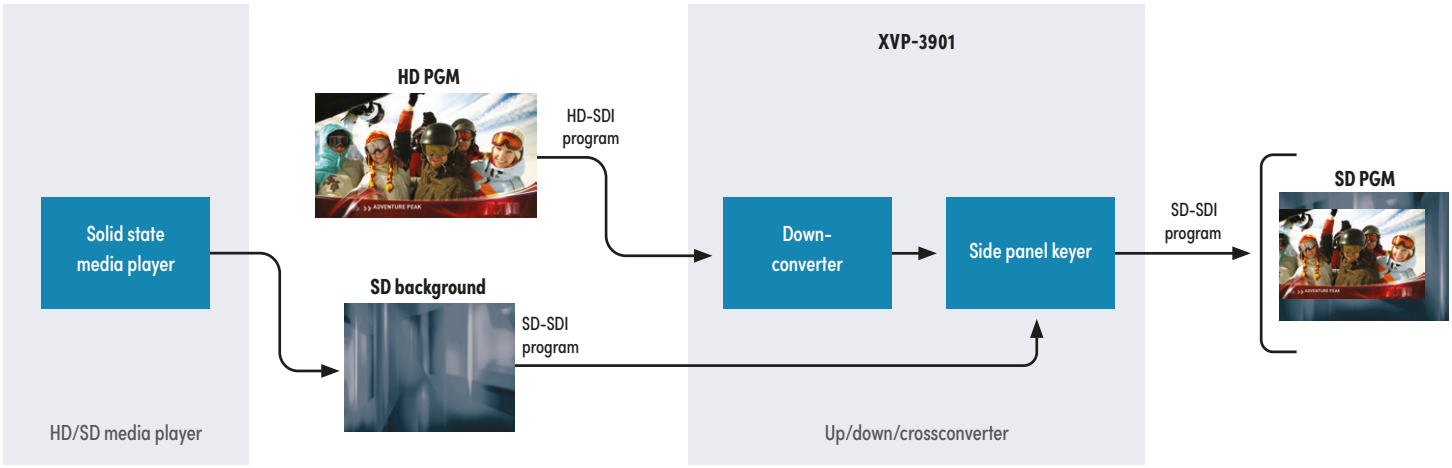
Up/Downconversion with Background Keying

Up/downconversion with background keying using XVP-3901:
The XVP family of interfaces features a background keying capability which allows side panels or letterbox black bars, introduced by upconversion or downconversion, to be filled with video or graphics.

Upconversion with background keying using XVP-3901



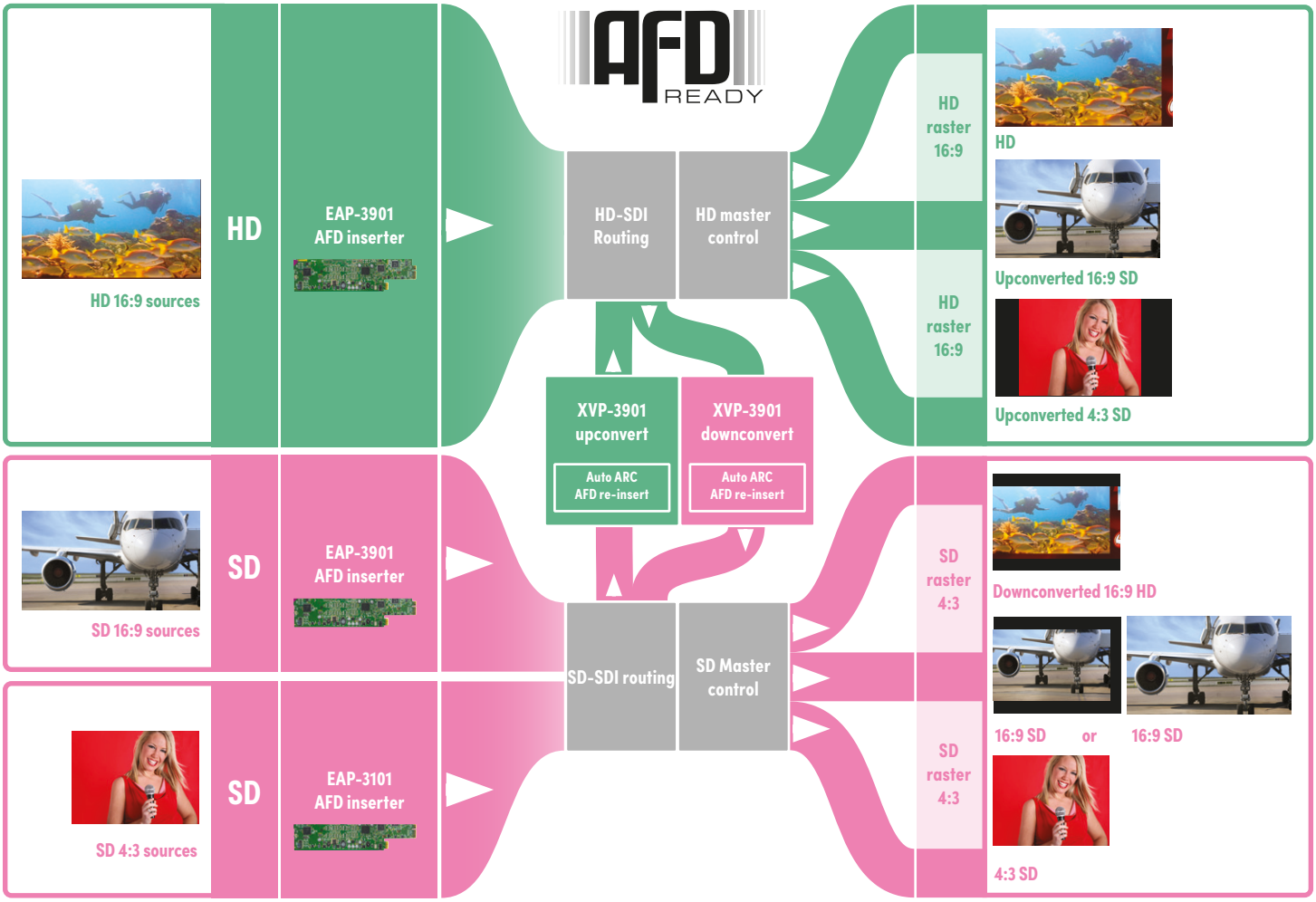
Downconversion with background keying using XVP-3901



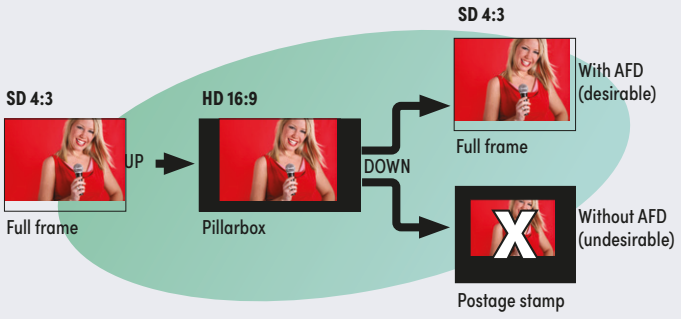
Frame Accurate Aspect Ratio Conversion with AFD

Frame accurate Aspect Ratio Conversion (ARC) can be performed automatically using embedded signaling based on the Active Format Description (AFD) standard. AFD data can be easily embedded in a signal by the Densité XVP processor family, and by the EAP-3901 embedder. With AFD, original image information is maintained throughout the entire conversion process for optimal viewing following 4:3 and 16:9 aspect ratio conversion.

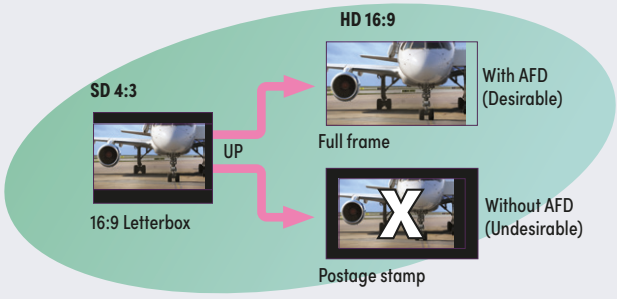
For example, processing three input source formats (16:9 HD, 16:9 SD and 4:3 SD) in a typical HD/SD hybrid plant results in six different output possibilities. However, using automatic aspect ratio control based on AFD will prevent the ARC errors that may occur with manual control.



4:3 aspect ratio conversion with AFD

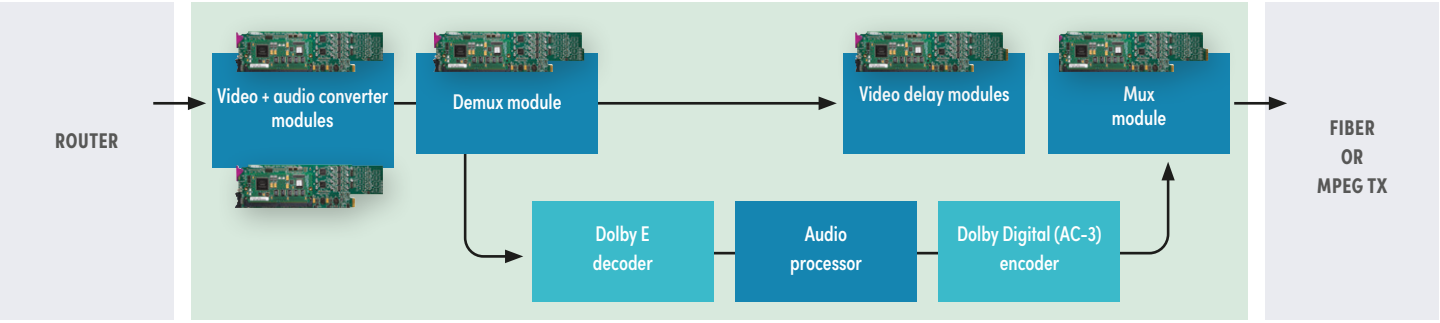


16:9 aspect ratio conversion with AFD

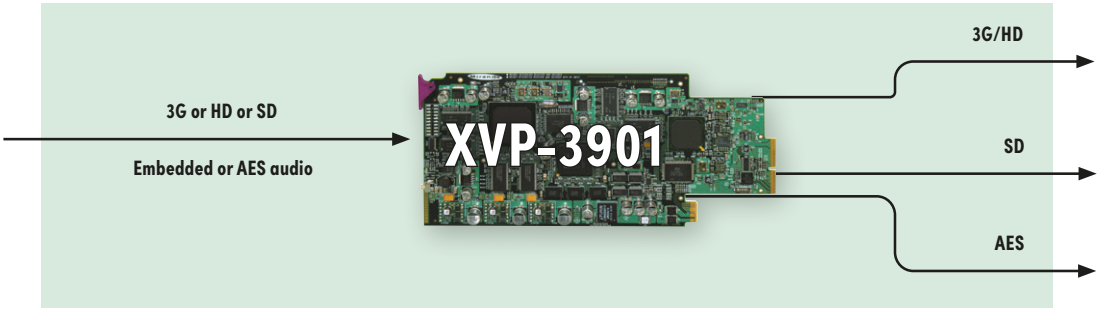


Incoming Feed Processing

Using the XVP-3901 significantly reduces the amount of equipment required for incoming feed processing. A single XVP-3901 replaces multiple single function devices to provide Dolby E decoding, audio processing and Dolby Digital or Dolby Digital Plus encoding.



Traditional approach to Dolby E decoding and Dolby Digital or Dolby Digital Plus encoding using multiple devices.

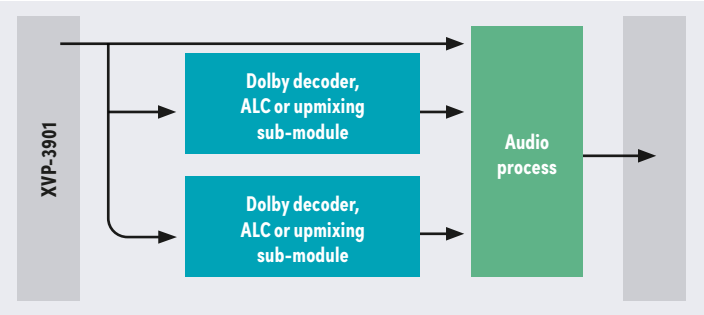


Using a single XVP-3901 3G/HD/SD up, down and cross converter with audio processor for incoming feed processing.

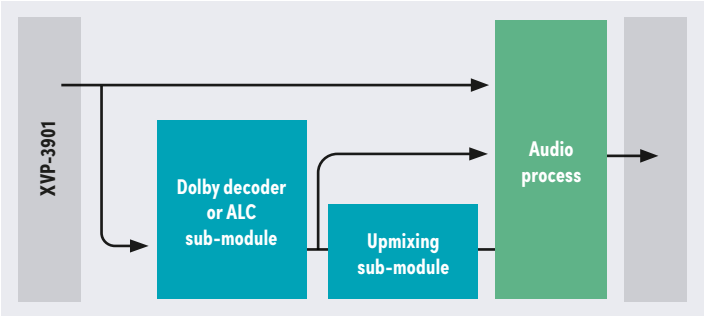
Incoming Feed Problems	XVP-3901 Features
Remote feeds need to be adapted to station infrastructure	Frame synchronization, full proc controls, color correction and legalizer
Multiple audio formats and audio synchronization: • Mixed up audio tracks • Lip sync • Dolby E and Dolby Digital encoded inputs • 5.1 audio • Loudness level	Extraction, processing and re-insertion for up to 4 embedded audio groups Video to audio match delay and fixed delay Audio track mixing and shuffling Discrete audio inputs/outputs handled using complimentary audio modules Dolby Metadata insertion, and will delay Dolby E audio without compromising encoded signal Decode Dolby E or Dolby Digital to discreet PCM channels Audio downmix from 5.1 audio to a Lt Rt or Lo Ro audio 2 channel signal Stereo to 5.1 upmixing using Linear Acoustic technology Automatic loudness control
Receiving SD or HD signals at different times of the day	Built-in up and downconversion automatically converts current input to house format
Receiving 1080i into 720p plant (or vice versa)	Built in 720p to/from 1080i crossconversion eliminates need for costly external converters
Providing 16:9 and 4:3 aspect ratio conversion	Automatic, frame accurate aspect ratio conversion using embedded signaling, based on the Active Format Description (AFD) standard Background keying capability to fill side or top/bottom panels with graphics

Flexible 5.1 Audio Processing

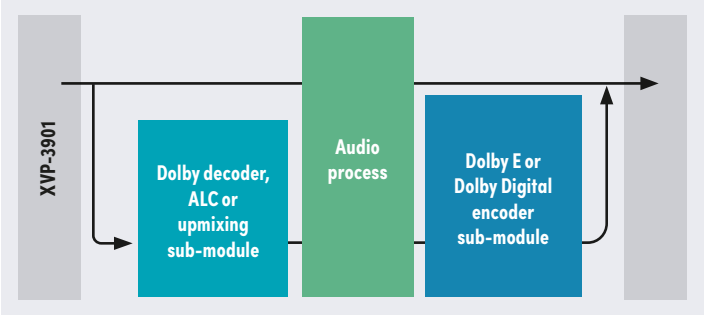
The XVP-3901 can provide very versatile audio processing sequences, due to the flexibility of the optional audio submodules. The submodules include Dolby E decoding, Dolby Digital decoding, Dolby E encoding, Dolby Digital and Dolby Digital Plus encoding, Linear Acoustic upMAX 2.0 to 5.1 upmixing and automatic loudness control (ALC). Two audio submodules can be fitted to an XVP-3901 processor. All audio channels created by the modules are preserved, and can be selected in the output shufflers and mixers for embedding or discrete AES outputs.



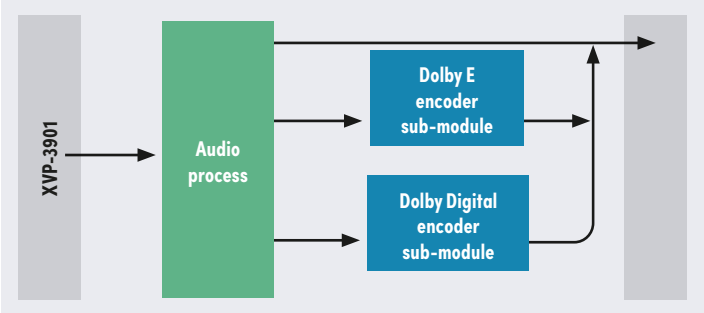
Dolby E / Dolby Digital (AC-3) decoding, automatic loudness control (ALC) or upmixing (or a different combination of these sub-modules) used in parallel ahead of audio processing.



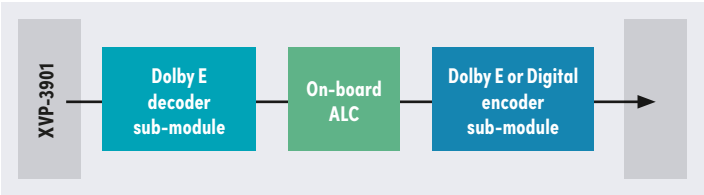
Dolby E / Dolby Digital (AC-3) decoding, ALC or upmixing (or a different combination of these sub-modules) followed by upmixing ahead of audio processing.



Dolby E / Dolby Digital (AC-3) decoding, ALC or upmixing followed by audio processing, and subsequently Dolby E or Dolby Digital (AC-3) encoding.



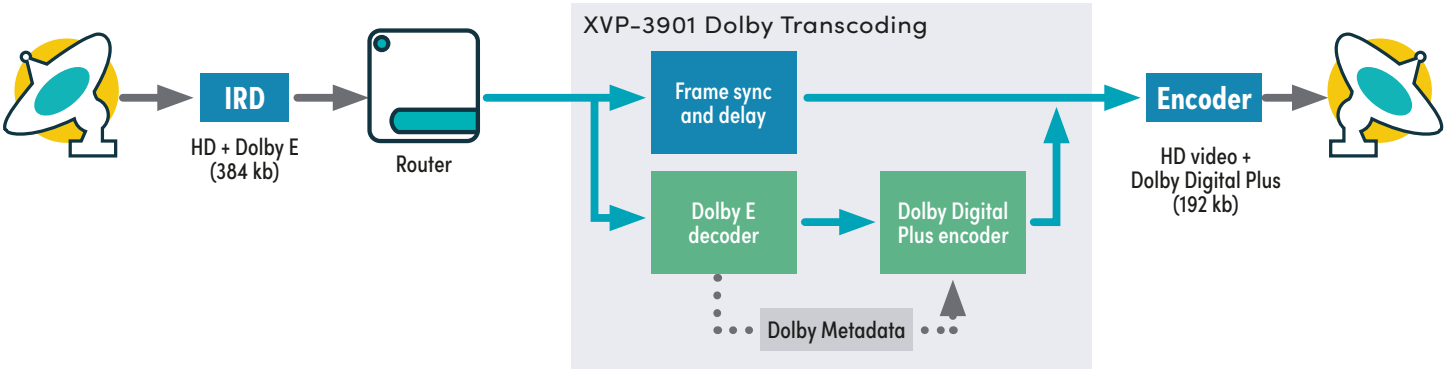
Dolby E and Dolby Digital (AC-3) encoding (or a different combination of these sub-modules) used in parallel after audio processing.



Dolby E decoding, ALC followed by Dolby E or Dolby Digital encoding.

Dolby Digital Plus Transcoding

The addition of Dolby Digital Plus to the Dolby Digital encoder means that Grass Valley's audio processing module will provide the same high-quality audio compression they always have, but at a data rate as much as 50 percent lower than currently required, enabling 5.1 multichannel audio at rates as low as 192 kb/s. When combining Dolby E decoding and Dolby Digital Plus encoding, broadcasters can deliver an efficient multichannel surround sound across multiple platforms and content types.



Ordering

Densité 3 Frame

XVP-3901
3G/HD/SD up, down and cross converter with optional audio processor

XVP-3901-UC
3G/HD/SD upconverter with optional audio processor

XVP-3901-DC
3G/HD/SD downconverter with optional audio processor

XVP-3901-75-3DRP-F
Double rear connector panel, 75Ω and fiber connector

XVP-3901-110-3DRP-F
Double rear connector panel, 110Ω and fiber connector

XVP-3901-75-3TRP-F
Triple rear connector panel, 75Ω and fiber connector

XVP-3901-110-3TRP-F
Triple rear connector panel, 110Ω and fiber connector

XVP-3901-75-3TRP
Triple rear connector panel, 75Ω

XVP-3901-110-3TRP
Triple rear connector panel, 110Ω

Options (software)

XVP-3901-OPT-AUD
AES IO support and 16 channels on-board audio processing option

XVP-3901-OPT-K
Background key input option

XVP-3901-OPT-DP
Dynamic audio processing option

XVP-3901-OPT-LM
Loudness meter option

XVP-3901-UG-UC2XVP
Upgrade from XVP-3901-UC to full XVP

XVP-3901-UG-DC2XVP
Upgrade from XVP-3901-DC to full XVP

XVP-3901-OPT-ALC-2
2-channel on-board ALC option by Grass Valley

XVP-3901-OPT-ALC-6
6-channel on-board ALC option by Grass Valley

XVP-3901-OPT-ALC-8
8-channel on-board ALC option by Grass Valley

XVP-3901-OPT-ALC-16
16-channel on-board ALC option by Grass Valley

Options (hardware)

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-RT-S13-LC
Dual fiber Rx/Tx (input/output) cartridge 1310 nm with LC/PC connector

Other types of SFP Optical Plug-In Cartridges may be available for this product.
Please visit www.grassvalley.com for more information.

NSH26M
HD-26 to terminal block adapter

BOC-DA26-8BNC-1
75Ω digital audio breakout cable

MOD-DOLBY-ENC-E-2
Dolby E encoder

MOD-DOLBY-ENC-D-2
Dolby Digital and Dolby Digital Plus encoder

MOD-DOLBY-DEC-2
Dolby E and Dolby Digital decoder

MOD-LA-DUP-701
Upmixing using Linear Acoustic Technology upMAX

MOD-LA-ALC-2
2-channel ALC licensed by Linear Acoustic

MOD-LA-ALC-6
6-channel ALC licensed by Linear Acoustic

MOD-LA-ALC-8
8-channel ALC licensed by Linear Acoustic

MOD-LA-ALC-2-DUP
2-channel ALC and upmix licensed by Linear Acoustic

MOD-LA-ALC-6-DUP
6-channel ALC and upmix licensed by Linear Acoustic

MOD-LA-ALC-8-DUP
8-channel ALC and upmix licensed by Linear Acoustic

Remote control

GV Orbit, iControl, iControl Solo