

Densité Audio Processing

This versatile lineup provides advanced tools for embedding, de-embedding, conversion, and processing of audio and metadata. This portfolio delivers reliable and scalable solutions for audio management, ensuring high-quality sound and seamless integration into media production and distribution workflows.

MDX-3901

12G/3G/HD 16 Audio Channel AES/MADI Embedder/De-embedder

MAP-3901

3G/HD/SD Metadata and Embedded Audio Processor

EAP-3901

3G/HD/SD Embedded Audio and Metadata Processor

AMX-3981

3G/HD/SD 8 AES Audio and Metadata Embedder

ADX-3981

8 AES Audio and Metadata De-Embedder

AMX-1901

3G/HD/SD 8 Channel Analog Audio Embedder

ADX-1901

3G/HD/SD 8 Channel Analog Audio De-embedder

AMX-1842

HD/SD 4 AES Embedder

ADX-1842

HD/SD 4 AES De-Embedder

ADC-1722

Dual Analog Audio to AES Converter

DAC-1721

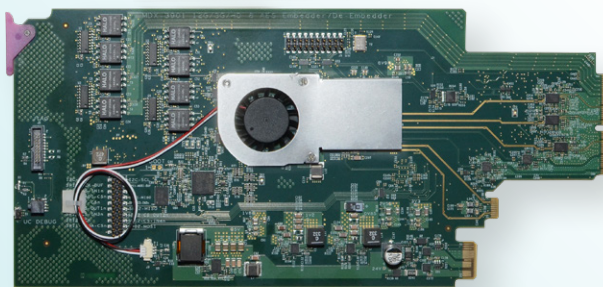
Dual AES to Analog Audio Converter

Automatic Loudness Control (ALC)

Advanced Loudness Control Solutions Which Prevent Excessive Audio Jumps

DENSITÉ MDX-3901

12G/3G/HD 16 Audio Channel AES/MADI Embedder/De-embedder



Audio embedding or de-embedding for 12G/Quad Link 3G/3G/HD SDI signals.

The MDX-3901 from Grass Valley® is an advanced, high-quality audio processor, which can embed up to 16 audio channels from a selection between eight discrete AES and/or one MADI signal into 12G/Quad Link 3G/3G/HD SDI signals or de-embed up to 16 audio channels into eight AES and one MADI signal from a 12G/Quad Link 3G/3G/HD SDI signals.

When configured as an embedder, each AES input can accept different sample rates, or even asynchronous audio, and will be resampled at 48 kHz by a sample rate converter, which can be manually or automatically disabled in the presence of non-PCM audio. The MADI input supports a 64-channel payload at the industry standard 48 kHz sampling rate synchronized to the SDI signal. The MDX-3901 embedder can simultaneously

process up to 16 channels of audio selected from 80 channels inputs — 16 from AES and 64 from MADI. Functions include channel shuffling, mixing and probing. Each channel can be delayed independently to correct any lip sync issues. All 16 audio channels can be mixed and shuffled to provide 16 channels for embedding in the SDI video output. A single-link video input will be distributed to outputs 1 & 2. When genlocked to the external reference input or through the frame reference using the internal URS signal, the MDX-3901 can handle video hot switches at the input without losing sync at the output. In the absence of a video input, the card can still output synchronous video and embed the discrete AES/MADI audio. The MDX-3901 can also embed linear timecode (LTC) as ancillary timecode (ATC) in 12G/Quad Link 3G/3G/HD.

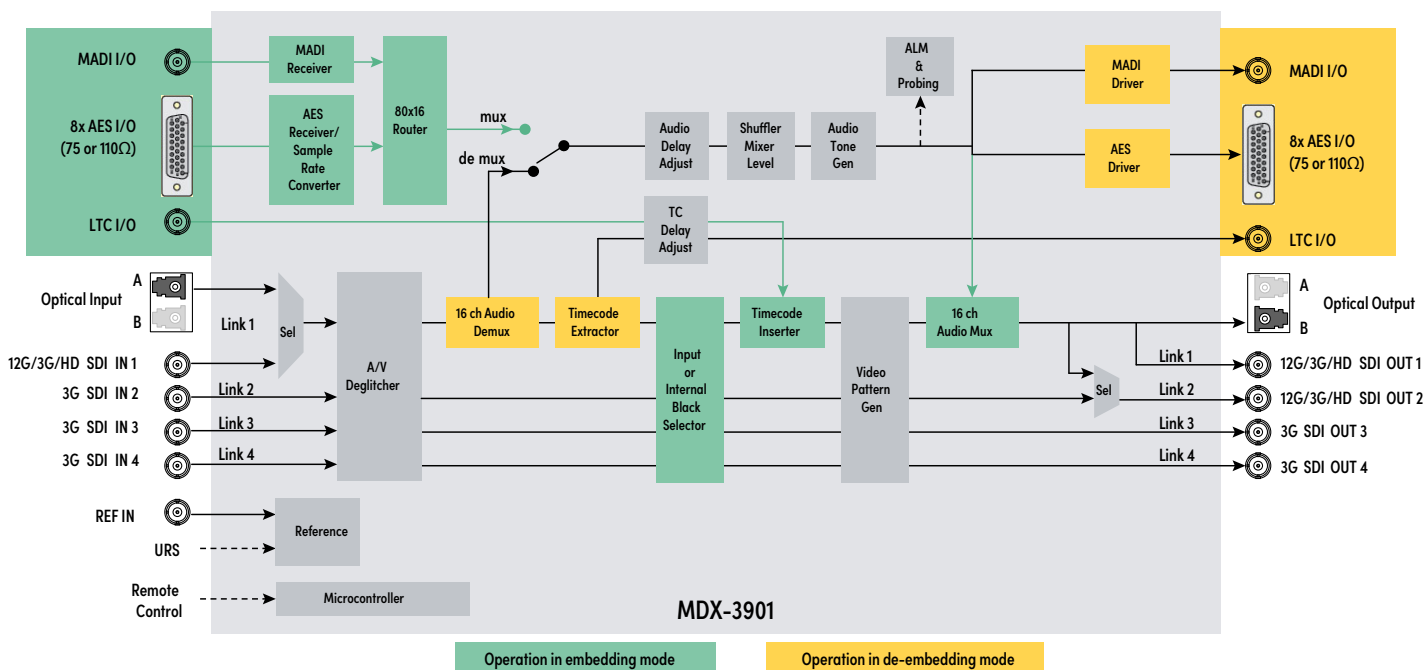
When configured as a de-embedder, the MDX-3901 can simultaneously process up to 16 channels of audio from the embedded SDI input. Functions include channel shuffling, mixing and probing. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels on the discrete AES outputs and on the first 16 channels of the MADI output. A single link video input will be distributed to outputs 1 & 2. When genlocked to the external reference input or through the frame reference using the internal URS signal, the MDX-3901 can handle video hot switches at the input without losing sync at the output. The MDX-3901 can de-embed ancillary timecode (ATC) in 12G/Quad Link 3G/3G/HD and provides a linear timecode output (LTC).

Key Features

- 12G/Quad Link 3G/3G/HD SDI inputs/outputs
- Supports 3 Gb/s level A (mapping 1) and level B
- Audio/video de-glitcher to handle video hot switch at the input
- Automatic detection of input video loss and switchover to local black or color bar for continuous audio/video output synchronization in embedder mode only
- Flexible HD/SD reference using the internal URS frame reference or a dedicated reference input
- Support of one SFP+ cage for SDI fiber I/O on selected rears:
 - 12G SFP and 3G SFP R, T, RT and TT models available
- LTC I/O embedding/de-embedding into/from ATC
- 8 AES3-id 75Ω, or AES3 110Ω, I/Os
- MADI I/O using dedicated connector
- 16 audio channels embedder/de-embedder
- 16 channels internal audio processing
- Full audio shuffling and mixing on a channel basis.
- Two slots rear (BNC connectors) in Densité 3 or 3+ frames
- One slot rear (HD-BNC connectors) available in Densité 3+ frames

Fiber connectivity is offered with certain rear modules, making it ideal for longer cable lengths. The MDX-3901 provides user configurable fiber optic transceiver for bidirectional conversion of 12G, 3G and HD-SDI signals to 1310 nm optical signals. Ideal for mixed coax and fiber workflows, the MDX-3901 allows users to configure the inputs and outputs to match their infrastructure needs.

Based on the proven Densité® modular framework of over 100 functional cards, the MDX-3901 provides a space-efficient audio embedding/de-embedding solution for 4K UHD production with the flexibility to configure up to 24 MDX-3901 modules per Densité 3+ FR4 frame. The MDX-3901 can be configured and monitored by the proven GV Orbit® Network Orchestration system.



Specifications

SDI (Inputs/Outputs)

Physical: 8 BNC or HD-BNC connectors: 4 in, 4 out

SDI Standard:

- SMPTE ST 292 (1.485, 1.485/1.001 Gb/s)
- SMPTE ST 424 (2.970, 2.970/1.001 Gb/s)
- SMPTE ST 2082-1:2015 (on in 1 and outs 1 & 2)

Supported Formats:

- HD: SMPTE ST 274: 1080i59.94, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE ST 425 level A (mapping 1), level B dual link: 1080p59.94, 1080p50
- 4K UHD: Quad Link 3 Gb/s SMPTE ST 425-5: 1080p59.94, 1080p50
- 12G: SMPTE ST 2082-10: 2160p59.94, 2160p50

Cable length (Belden 1694A):

- HD: 250m (820 ft.) at 1.485 Gb/s
- 3G: 145m (475 ft.) at 2.970 Gb/s

Cable length (Belden 4794R cable):

- 12G: 50m (164 ft.) at 11.88 Gb/s

Return loss:

- >15 dB up to 1.5 GHz
- >10 dB from 1.5 GHz to 3 GHz
- >4 dB up to 11.88 Gb/s

Jitter:

- HD/SD: <0.2 UI (alignment jitter)
- 3G: <0.3 UI (alignment jitter)
- 12G: <0.3 UI (alignment jitter)

Audio Input or Output (8)

Sampling freq.:

- Input: 32 to 53 kHz
- Output: 48 kHz

Quantization:

- Input: up to 24 bits
- Output: 24 bits

AES3:

- Input Level: 0.3 to 7 Vp-p
- Output Level: 3.5 Vp-p
- Impedance: 110Ω balanced

AES3-id:

- Input Level: 0.3 to 2 Vp-p
- Output Level: 1.0 Vp-p
- Impedance: 75Ω

Return loss: 15 dB at 6 MHz

MADI (Input or Output)

Signal (1): AES10

Connector: BNC or HD-BNC

Impedance: 75Ω

Level: 0.6V

LTC (Input or Output)

Signal (1): SMPTE ST 12

Connector: BNC or HD-BNC

Impedance: <10 kΩ unbalanced

Input Level: 0.3 to 5 Vp-p

Output Level: 3 Vp-p

Reference Input

Signal (1): SMPTE ST 170/SMPTE ST 318/ITU 624-4 blackburst

Optical

Signal: Refer to SFP module specifications.

Video Processing Performance

Signal path: 10 bits

Processing delay:

- Deglitcher OFF: <1.1 line or all format except 3G Level B
- Deglitcher ON: <1.6 line or all format except 3G Level B

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz, synchronous

Audio latency:

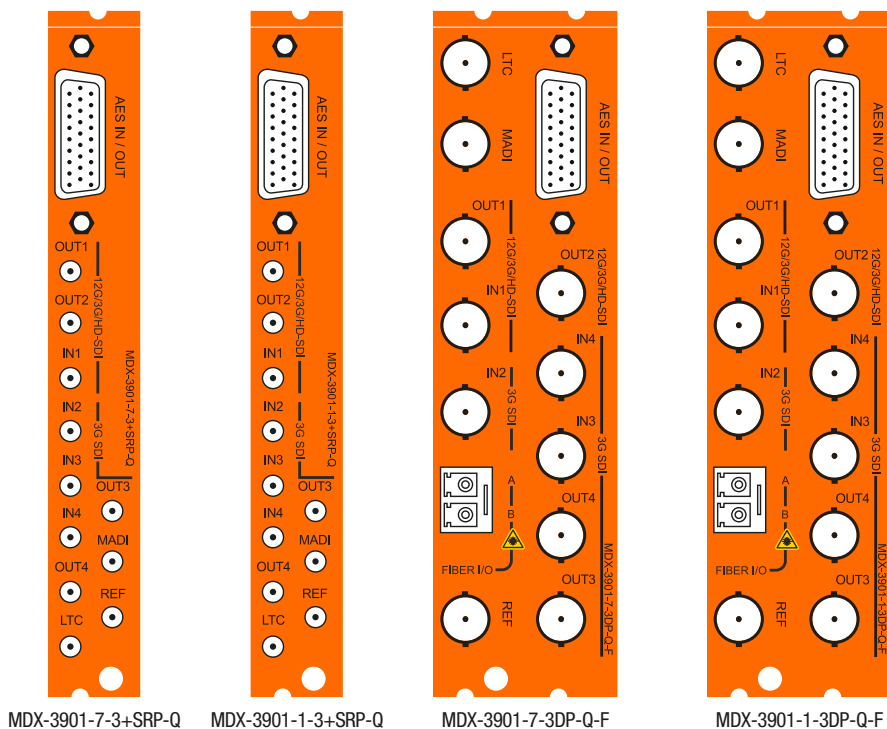
- Embedder: 2.27 ms w/SRC, 1.27 ms SRC off
- De-embedder: 1.83 ms

Audio delay: Up to 2.7s (1 ms steps + 0 to 47 samples)

Tone generator: -18 dBFS 1 kHz sine wave interrupted on left channel (250 ms) per EBU R49

Electrical

Power: 13W max



Ordering

Densité 3, or Densité 3+ Frame

MDX-3901

12G/3G/HD 16-channel AES/MADI Embedder/De-Embedder

MDX-3901-7-3DP-Q-F

Double rear panel, 75Ω, BNC and fiber option

MDX-3901-1-3DP-Q-F

Double rear panel, 110Ω, BNC and fiber option

MDX-3901-7-3+SRP-Q

Single rear panel for Densité 3+ frames, 75Ω, HD-BNC

MDX-3901-1-3+SRP-Q

Single rear panel for Densité 3+ frames, 110Ω, HD-BNC

Fiber Options

SFP-U-R-LC

12G Single 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

3G Single Rx Fiber with LC/PC

SFP-RT-S13-LC

3G Dual Rx/Tx Fiber 1310 nm with LC/PC

SFP-T-S13-LC

3G Single Tx Fiber cartridge at 1310 nm with LC/PC

SFP-TT-S13S13-LC

3G Dual Tx Fiber 1310 nm with LC/PC

Hardware Options

BOC-DA26-8BNC-1

75Ω digital audio breakout cable

NSH26M

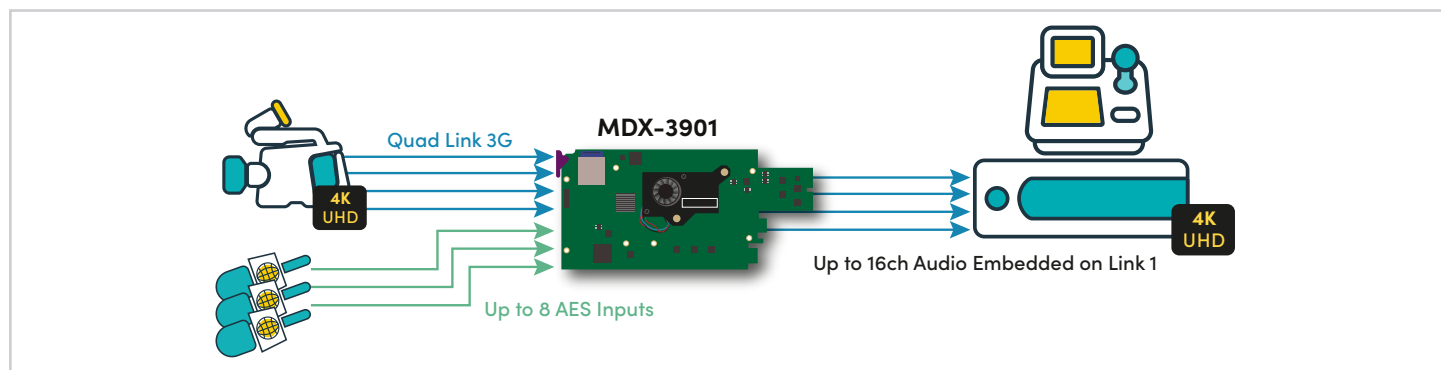
Terminal block adapter for HD-26 connections

Remote Control

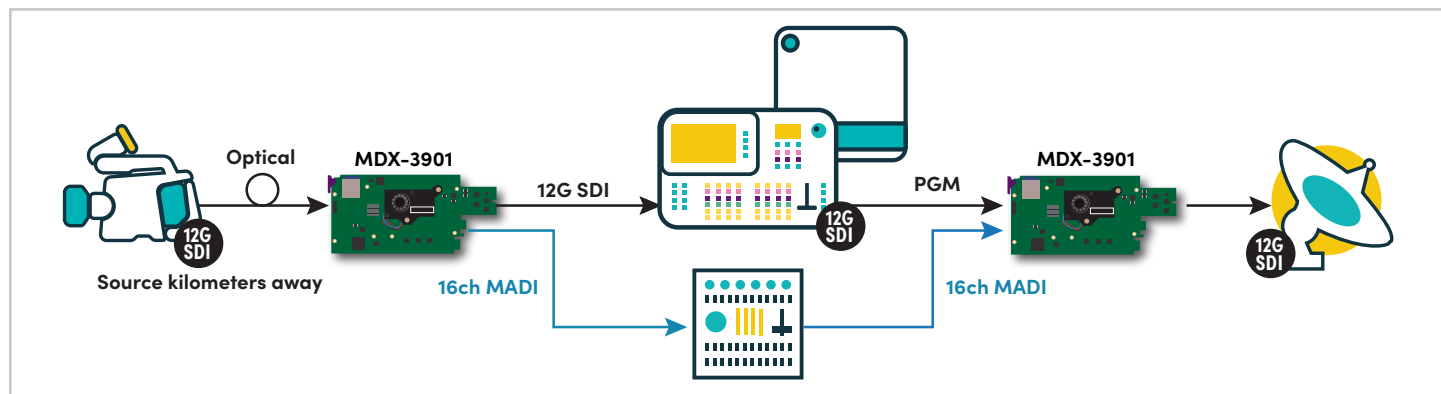
GV Orbit, iControl or iControl Solo (version 7.10 or higher required)

Typical Applications

AES embedding application in a Quad Link 4K UHD SDI production:



MADI De-Embedding & Embedding application in a 12G SDI production environment:



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

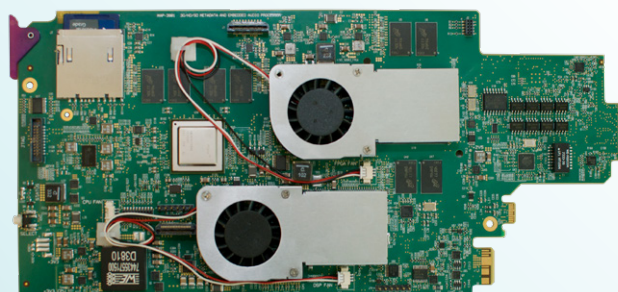
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MAP-3901

3G/HD/SD Metadata and Embedded Audio Processor



Sophisticated audio signal processing on a compact Densité 3 module.

The MAP-3901 from Grass Valley® is the latest generation metadata and audio processor in the Densité® family, offering sophisticated audio signal processing on a single 3 RU module. The powerful and versatile processing platform delivers significant value by simultaneously processing up to 56 channels of audio (16 channels of embedded audio from the video, plus others generated internally). Functions include dual downmixing, level control, channel shuffling/mixing and an on-board DSP engine that can run simultaneously with up to two optional Dolby-E decoders, four optional Dolby Digital & Digital Plus encoders, and two optional upmixers (2.0 to 5.1).

The card will pass and delay automatically all 56 internal audio channels to preserve lip sync between audio and video. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels for embedding in the video output.

The card can be genlocked to an external reference or to the frame reference using the internal URS signal.

The card has a frame buffer (not a frame sync) which allows an increase in the video delay of up to 4.1 seconds in HD to compensate for the long audio processing delay required by some audio processing functions or for effective processing of incoming feeds — especially where there is a mix of short and long delay feeds, as is often the case when managing large live events.

Four audio metadata insertions in the VANC are possible from multiple sources, such as Dolby E decoders, embedded VANC streams or from the integrated metadata generators. All parameters in the metadata streams can be probed and monitored. Audio metadata (SMPTE 2020 method A or B) can be used to steer the behavior of the audio downmixers and the Dolby encoders.

The MAP-3901 has eight GPIOs that can be used as input or output for loading user presets.

The MAP-3901-3DRP-R and MAP-3901-3+SRP-R-D rear modules have a bypass relay that can be used to bypass the main input to the output if the card fails, loses power or if the card is removed.

Up to 10 MAP-3901 processors can be housed in the Densité 3 (3 RU) frame, and up to four MAP-3901 processors can be housed in the Densité 3+ FR1 (1 RU) for even greater space efficiency.

To broadcasters, the MAP-3901 means that the new generation of audio processing requirements can be achieved on a single module, while minimizing a facility's environmental footprint and improving scalability, flexibility and reliability.

Key Features

Video

- 3G/HD/SD support including 3 Gb/s level A (mapping 1) and level B
- Flexible SD/URS reference input
- Programmable audio/video delay of up to 4.1 seconds (124 frames) in HD
- Bypass relay with MAP-3901-3DRP-R and MAP-3901-3+SRP-R-D rear modules

Metadata

- Four audio metadata insertion and extraction (SMPTE ST 2020 Method A or B)

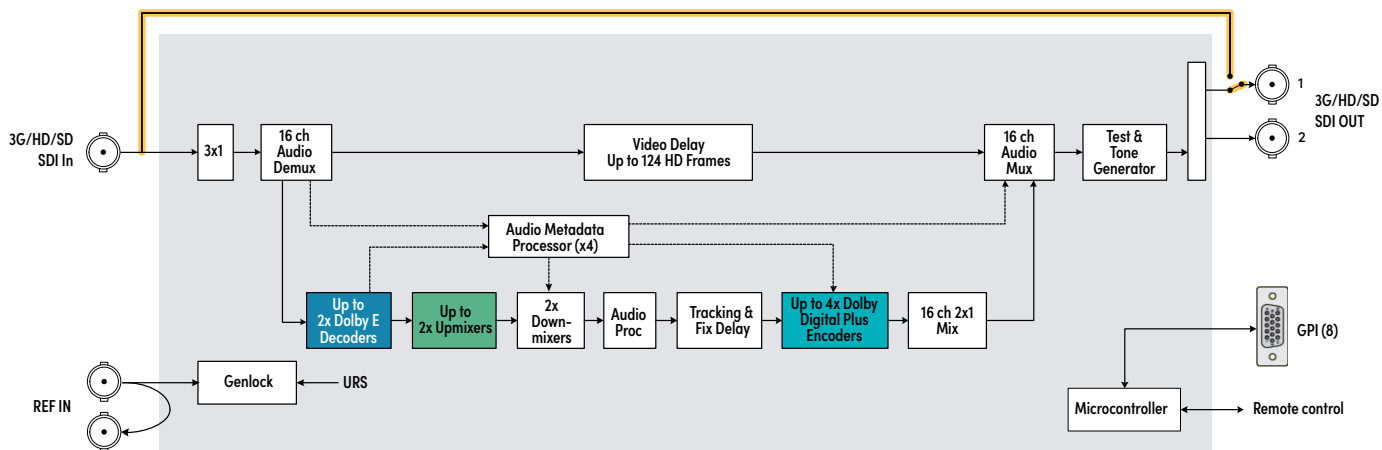
Audio

- Full audio shuffling and mixing per channel basis
- 56 channels internal audio processing
- 2 audio 5.1 surround downmix to Lt/Rt or Lo/Ro

Audio

- Full audio shuffling and mixing per channel basis
- 56 channels internal audio processing
- 2 audio 5.1 surround downmix to Lt/Rt or Lo/Ro

- Audio delay adjustments of up to 2 seconds to compensate for lip sync
- Up to 2 optional Dolby E decoders
- Up to 2 optional stereo to 5.1 upmixers
- Up to 4 optional Dolby Digital and Digital Plus Encoders

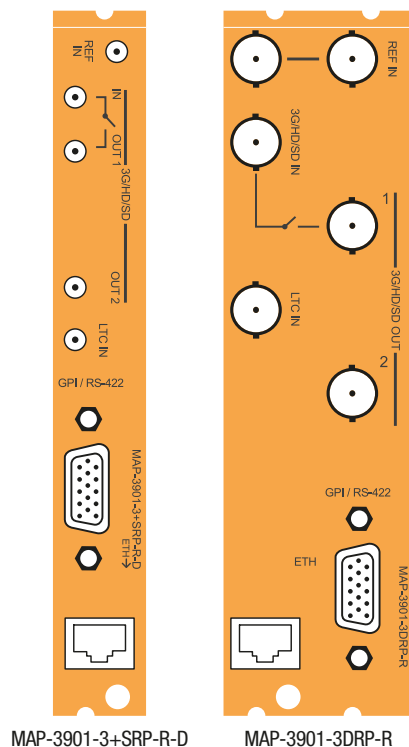


MAP-3901 Functional Block Diagram

Options (hardware and software)

 With -R Rear Modules	 MAP-3901-OPT-UPMIX	 MAP-3901-OPT-DED
		 MAP-3901-OPT-DDE

- MAP-3901-OPT-DDE



Specifications

Video Input/Output

Signal (1):

- 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, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94, 1080p50 (dual link)

Cable length*:

- 325m (1,066 ft.) Belden 1694A at 270 Mb/s
- 180m (590 ft.) Belden 1694A at 1.485 Gb/s
- 90m (295 ft.) Belden 1694A at 2.970 Gb/s

Return loss:

- OUT 1: > 8 dB up to 3 GHz
- OUT 2: > 15 dB up to 1.5 GHz
> 10 dB at 3 GHz

Jitter:

- HD/SD: <0.2 UI (alignment jitter)
- 3G: <0.4 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: >27 dB up to 5.75 MHz

LTC

Not used

GPIO

Signal (8): Opto-isolated, common ground

Direction: Bidirectional

Connector: DE15

RS-422/ETH

Not used

Video Processing Performance

Signal path: 10 bits minimum

Processing delay: 1 interlaced frame (33 ms @59.94 Hz or 40 ms @50 Hz)

Additional delay: (HD) Up to 4.1 seconds frames upon user selection

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz, synchronous

Number of channels: 56

Frequency response: ±0.02 dB (20 Hz to 20 kHz)

SNR: 123 dB (A weighted)

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

Audio latency: Delay depending on processing options

Audio delay: Up to 2s (1 ms steps) in addition to programmed video delay

Electrical

Power: 25W max.

* Cable length will be reduced when using the output protected by the bypass relay on rears MAP-3901-3DRP-R and MAP-3901-3+SRP-R-D.

Ordering

Densité 3 frame

MAP-3901

MAP-3901-3DRP-R

MAP-3901-3+SRP-R-D

Description

3G/HD/SD metadata and embedded audio processor

Double Rear panel with BNC and bypass relay

Single Rear panel with Din and bypass relay for Densité 3+ frame

Options (Software)

MAP-3901-OPT-DED-1

MAP-3901-OPT-DED-2

MAP-3901-OPT-DDE-1

MAP-3901-OPT-DDE-2

MAP-3901-OPT-DDE-3

MAP-3901-OPT-DDE-4

MAP-3901-OPT-UPMIX-1

MAP-3901-OPT-UPMIX-2

Description

Single Dolby E decoding option

Dual Dolby E decoding option

Single Dolby Digital Plus encoding option

Dual Dolby Digital Plus encoding option

Triple Dolby Digital Plus encoding option

Quadruple Dolby Digital Plus encoding option

Single Stereo to 5.1 Surround upmix option

Dual Stereo to 5.1 Surround upmix option

Remote control

GV Orbit, iControl, iControl Solo

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

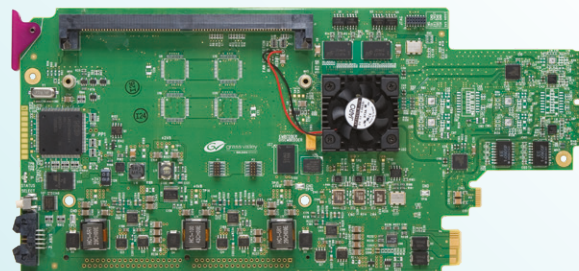
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EAP-3901

3G/HD/SD Embedded Audio and Metadata Processor



Space-saving, modular platform for advanced signal processing.

The EAP-3901 from Grass Valley® is an advanced embedded audio processor that can simultaneously process up to 32 channels of audio (16 channels of embedded audio from the video, plus others generated internally). Functions include down-mixing, proc amp, channel shuffling, mixing and loudness measurement. Options include automatic loudness control (ALC) and dynamic processing (limiter, compressor and expander).

The loudness measurement function allows the measurement and logging of up to four audio programs with iControl™ loudness monitoring software to analyze and report compliance with respect to various loudness regulations around the world.

It has one on-board socket for optional modules, which can offer Dolby decoding, Dolby encoding and stereo upmixing using Linear Acoustic upMAX technology. One other module provides ALC using AEROMAX technology by Linear Acoustic, capable of maintaining

constant loudness across different audio programs.

The card will pass and delay automatically all 32 internal audio channels to preserve lip sync between the channels. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels for embedding in the video output.

An automatic preset recall feature provides basic automation to select user preset based on the status of the incoming audio.

When genlocked to an external reference or to the frame reference using the internal URS signal, the EAP-3901 can handle video hot switches at the input without losing sync at the output. In absence of the video input, the card can freeze the output to the last good frame, field or black.

The card has a frame buffer (not a frame sync), which allows an increase in the video delay of up to 15 frames to compensate for the long

audio processing delay required by some modules. For applications that require a small processing delay, the frame buffer can be bypassed to reduce the delay to a few microseconds.

The EAP-3901 has three GPIOs that can be used as input or output to embed or extract GPI events to/from the timecode user bits in transport applications, or they can be used simultaneously to trigger the card's user presets.

Dolby metadata insertion in the VANC is possible from multiple sources, such as a Dolby E decoder module, an embedded VANC stream, an external RS-422 link or from the integrated metadata generator. All parameters in the metadata stream can be probed and monitored. Dolby metadata can be used to steer the behavior of the audio downmix and upmix modules.

The EAP-3901-3SRP-R rear module has a bypass relay that can be used to bypass the main input to the output if the card fails, loses power or if the card is removed.

Key Features

Video

- 3G/HD/SD input
- Supports 3 Gb/s level A (mapping 1) and level B
- Audio/video de-glitcher to handle video hot switch at the input
- Automatic detection of input video loss and switchover to local grey for continuity of embedded audio
- Flexible HD/SD/URS reference input
- Minimum processing delay of 8 μ s, but additional delay can be added up to 15 frames
- Bypass relay with EAP-3N01-3SRP-R rear module
- Optional optical fiber IO module with EAP-3N01-3SRP-F rear module

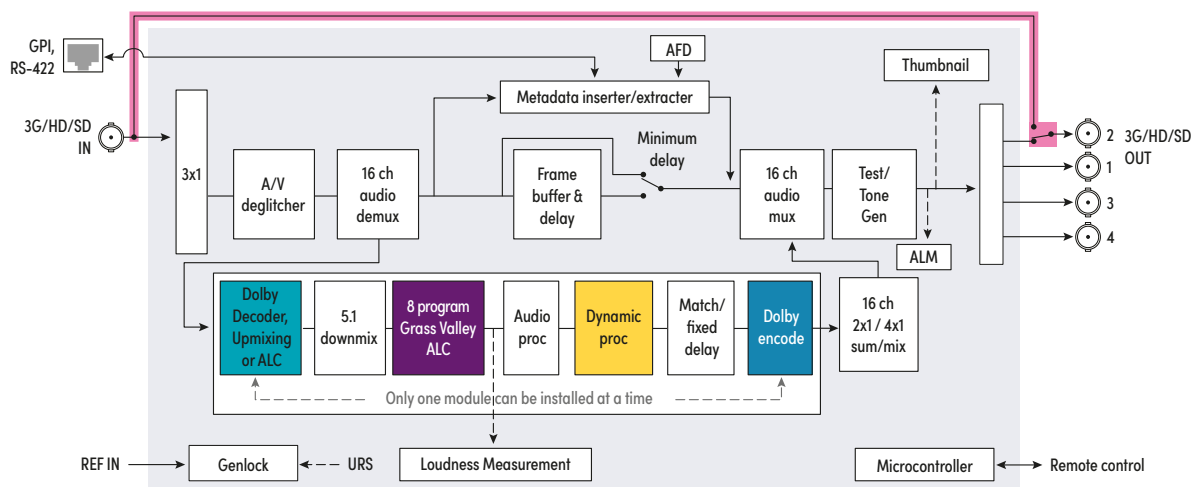
Metadata

- AFD (SMPTE ST 2016), VLI (RP-186) and WSS insertion
- Audio metadata insertion and extraction (SMPTE ST 2020-A)
- RS-422 serial data input and output to carry audio metadata
- 3 GPI I/O that can be inserted or extracted in the timecode user bits, they can also be used for automation, user preset recall and loudness reset

Audio

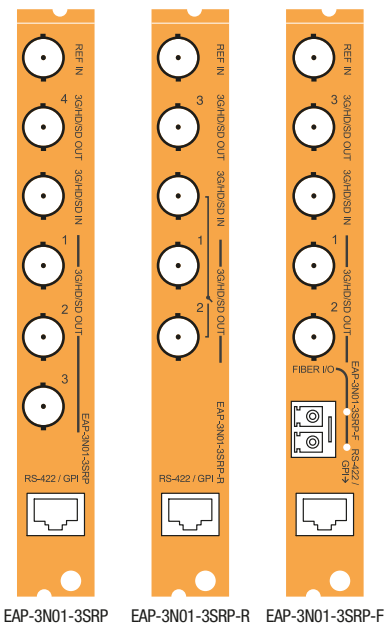
- Full audio shuffling and mixing on a channel basis
- 32 channels internal audio processing
- Automation capabilities based on audio signal type detection
- Audio 5.1 surround downmix to Lt/Rt or Lo/Ro
- Audio dynamic processor option (compressor/limiter/expander)

- Optional on-board automatic loudness control with Grass Valley Wideband processing
- Loudness measurement of up to four audio programs and logging with iControl™ loudness monitoring option
- Loudness compliant to EBU R128-2014, ATSC A/85:2013 (FCC CALM compliant) and ARIB TR-B32 (ITU-R BS.1770-3)
- Audio delay adjustments of up to 2 seconds to compensate for lip sync issues
- On-board socket for one optional module expansion:
 - 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



EAP-3901 Functional Block Diagram

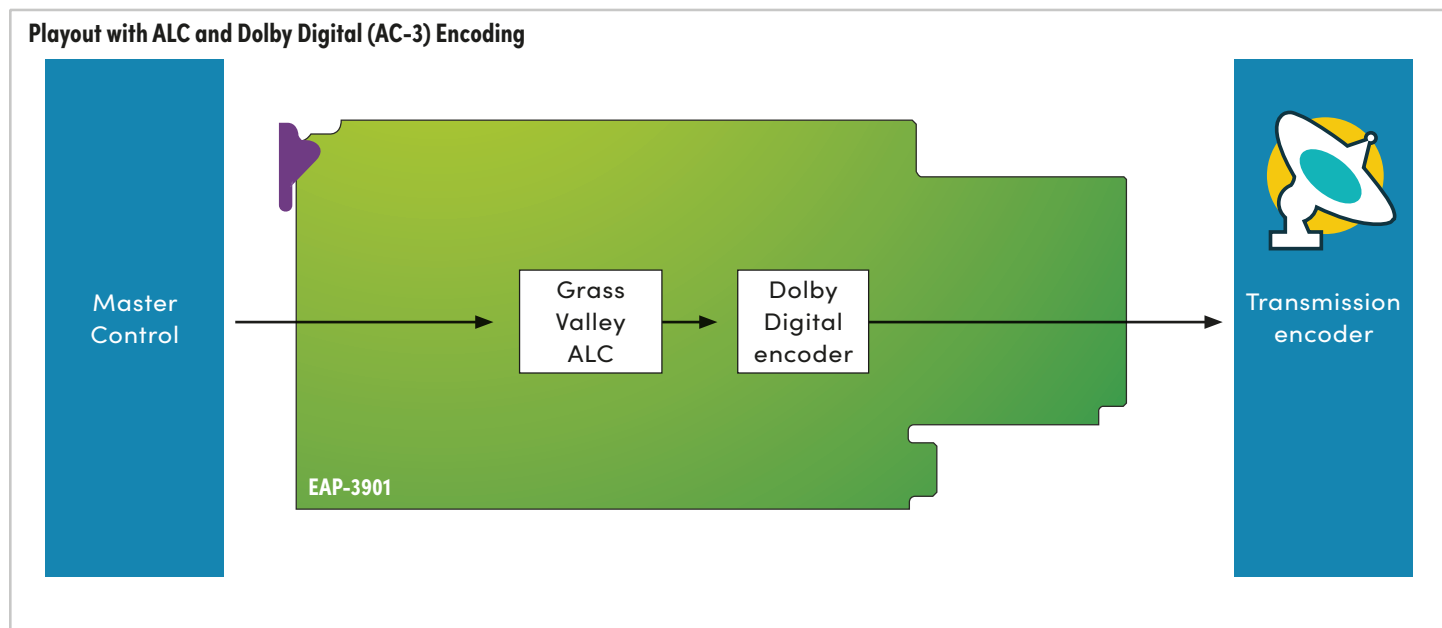
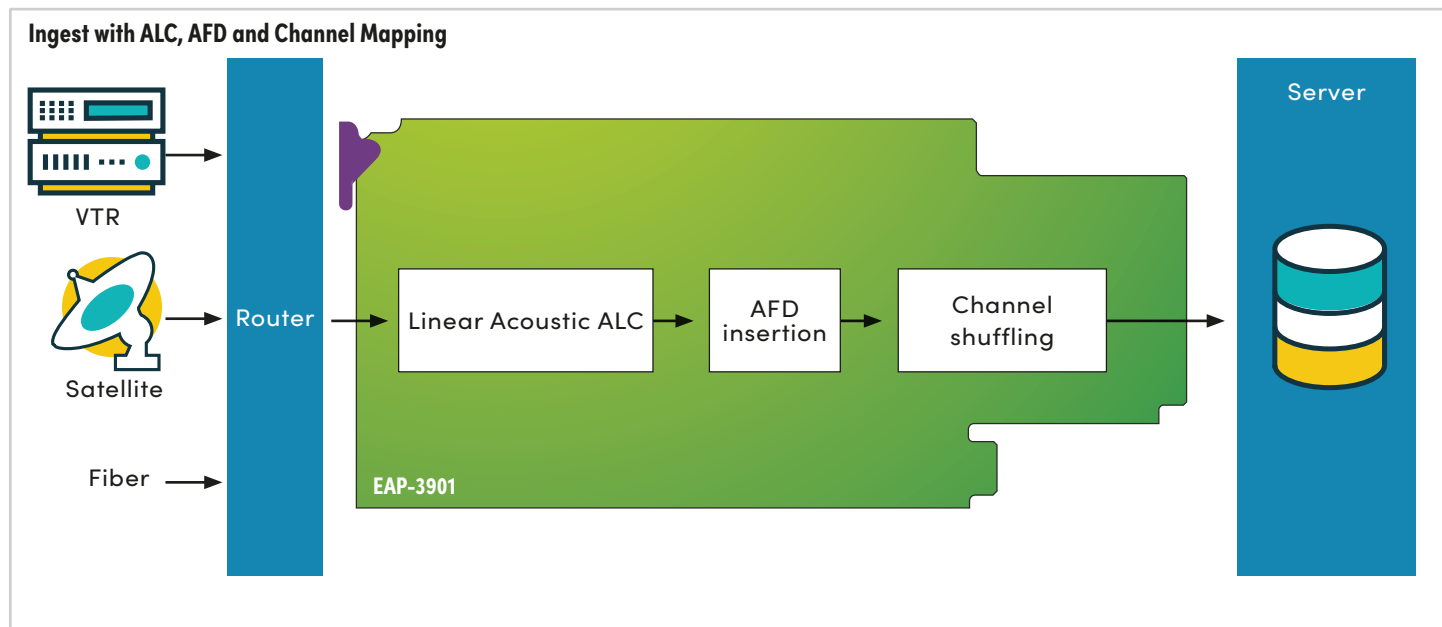
Options (hardware & software)			
	EAP-3901-OPT-DP		MOD-DOLBY-ENC-E-2
	EAP-3901-OPT-ALC		MOD-DOLBY-ENC-D-2
			MOD-LA-ALC
			MOD-LA-DUP-701
			MOD-DOLBY-DEC-2



The EAP-3N01-3SPR-F rear module has a fiber input/output cartridge. Once the cartridge is installed, the inputs or outputs are selectable through the control interface. The input of the card allows you to select between fiber and copper inputs. The outputs are via copper and fiber simultaneously (with appropriate fiber cartridge).

There are many benefits to the EAP-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, the system integration is also simplified significantly.

Typical Audio Processing Applications



Specifications

Video Input/Output

Signal (1):

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, 1080i50
HD: SMPTE ST 296: 720p59.94, 720p50
3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94, 1080p50

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
3G: <0.3 UI

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

GPIO

Signal (3): Contact closure to ground

Connector: RJ45

Direction: Bidirectional (application specific)

RS-422

Signal (2): RS-422

Input level: 300 mVp-p (min)

Output level: 3 Vp-p (min)

Rate: 115,200 Bd

Video Processing Performance

Signal path: 10 bits

Processing delay (HD): 8 µs (in minimum delay mode)

Additional delay: Up to 15 frames upon user selection

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz, synchronous

Audio latency: 2 to 6 ms in minimum processing delay depending on processing options

Audio delay: Up to 2s (1 ms steps)

Electrical

Power: 12.5W

* Cable length and return loss specifications will be reduced when using the output protected by the bypass relay on EAP-3901-3SRP-R rear. Refer to the manual for more details.



Ordering

Densité 3 frame

EAP-3901

EAP-3N01-3SRP

EAP-3N01-3SRP-R

EAP-3N01-3SRP-F

Options (Software)

EAP-3901-OPT-DP

EAP-3901-OPT-ALC-2

EAP-3901-OPT-ALC-6

EAP-3901-OPT-ALC-8

EAP-3901-OPT-ALC-16

Options (Hardware)

SFP-RR-LC

SFP-TT-S13S13-LC

SFP-R-LC

SFP-T-S13-LC

SFP-RT-S13-LC

Description

3G/HD/SD embedded audio and metadata processor

Single rear connector panel

Single rear connector panel with bypass relay

Single rear connector panel with fiber connector

Description

Dynamic audio processing option

2-channel on-board ALC option by Grass Valley

6-channel on-board ALC option by Grass Valley

8-channel on-board ALC option by Grass Valley

16-channel on-board ALC option by Grass Valley

Description

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

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

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

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

Single fiber Rx (input) and Tx (output) cartridge at 1310 nm with LC/PC connector

Other types of SFP Optical Plug-In Cartridges may be available for this product.

MOD-DOLBY-ENC-E-2

MOD-DOLBY-ENC-D-2

MOD-DOLBY-DEC-2

MOD-LA-DUP-701

MOD-LA-ALC-2

MOD-LA-ALC-6

MOD-LA-ALC-8

MOD-LA-ALC-2-DUP

MOD-LA-ALC-6-DUP

MOD-LA-ALC-8-DUP

Remote control

Dolby E encoder

Dolby digital (AC-3) encoder

Dolby E and digital (AC-3) decoder

Upmixing using Linear Acoustic Technology upMAX

2-channel ALC licensed by Linear Acoustic

6-channel ALC licensed by Linear Acoustic

8-channel ALC licensed by Linear Acoustic

2-channel ALC and upmix licensed by Linear Acoustic

6-channel ALC and upmix licensed by Linear Acoustic

8-channel ALC and upmix licensed by Linear Acoustic

GV Orbit®, iControl, iControl Solo

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

DS-PUB-3-0365A-EN

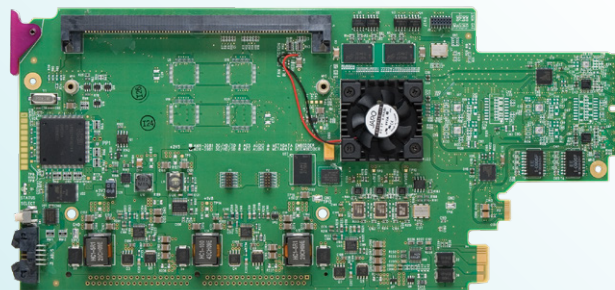
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AMX-3981

3G/HD/SD 8 AES

Audio and Metadata Embedder



Space-saving, modular platform for advanced signal processing.

The AMX-3981 from Grass Valley® is an advanced, high-quality audio processor which embeds up to eight (8) AES signals into a 3G/HD/SD video signal. Each AES input can accept different sample rates, or even asynchronous audio, and will be resampled at 48 kHz by a sample rate converter, which can be manually or automatically disabled in the presence of non-PCM audio.

The AMX-3981 can simultaneously process up to 32 channels of audio (16 channels from the discrete AES inputs, and 16 channels of embedded audio). Functions include downmixing, proc amp, channel shuffling, mixing and loudness measurement..

The loudness measurement function allows the measurement and logging of up to four audio programs with iControl™ loudness monitoring software to analyze and report compliance with respect to various loudness regulations around the world.

The AMX-3981 has one on-board socket for optional modules, which can offer Dolby decoding, Dolby

encoding and stereo upmixing using Linear Acoustic upMAX technology. One other module provides ALC using AEROMAX technology by Linear Acoustic, capable of maintaining constant loudness across different audio programs.

The card will pass and delay automatically all 32 internal audio channels to preserve lip sync between the channels. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels for embedding in the video output.

An automatic preset recall feature provides basic automation to select user preset based on the status of the incoming audio.

When genlocked to the frame reference using the internal URS signal, the AMX-3981 can handle video hot switches at the input without losing sync at the output. In the absence of a video input, the card can still output synchronous video and embed the discrete AES audio.

The card has a frame buffer (not a frame sync) which allows an increase in the video delay of up to 15 frames to compensate for the long audio processing delay required by some modules. For applications which require a small processing delay, the frame buffer can be bypassed to reduce the delay to a few microseconds.

The AMX-3981 can embed linear timecode (LTC) as ancillary timecode (ATC) in 3G/HD and DVITC in SD. Up to three GPIO can be used as input or output to embed or extract GPI events to/from the timecode user bits in transport applications. They can also be used simultaneously to trigger the card's user presets.

Dolby metadata insertion in the VANC is possible from multiple sources, such as a Dolby E decoder module, an embedded VANC stream, an external RS-422 link, or from the integrated metadata generator. All parameters in the metadata stream can be probed and monitored. Dolby metadata can be used to steer the behavior of the audio downmix and upmix modules.

A fiber input/output cartridge is offered as an option on some rear modules. Once the cartridge is installed, the inputs or outputs are selectable through the control interface. The input of the card allows you to select between fiber and copper inputs. The outputs are

via copper and fiber simultaneously (with appropriate fiber cartridge).

There are many benefits to the AMX-3981'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, the system integration is also simplified significantly.

Key Features

Video

- 3G/HD/SD input
- Supports 3 Gb/s level A (mapping 1) and level B
- Audio/video de-glitcher to handle video hot switch at the input
- Automatic detection of input video loss and switchover to local black for continuity of embedded audio
- Flexible HD/SD reference using the internal URS frame reference
- Minimum processing delay of 8 μ s, but additional delay can be added up to 15 frames
- Optional optical fiber module

Metadata

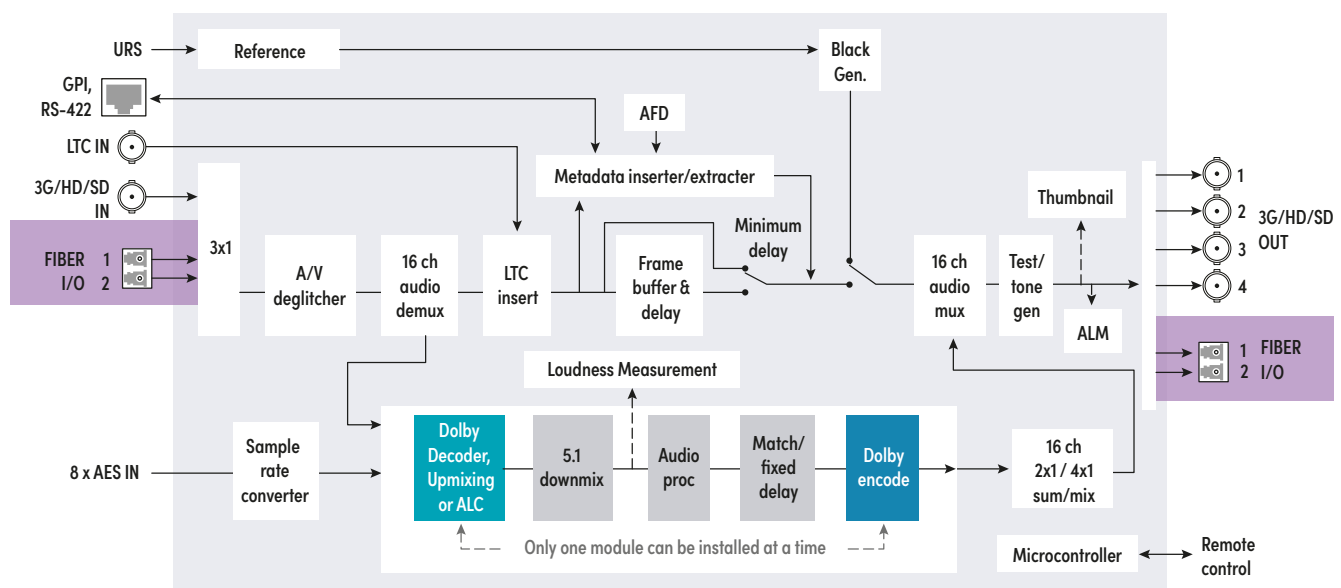
- AFD (SMPTE ST 2016), VLI (RP-186) and WSS insertion
- Linear timecode (LTC) embedding into DVITC (SD) or ATC (3G/HD)

- Audio metadata insertion and extraction (SMPTE ST 2020-A)
- RS-422 serial data input/output to carry audio metadata
- 3 GPI inputs/outputs that can be inserted or extracted in the TC user bits. They can also be used for automation, user preset recall and loudness reset

Audio

- 8 AES inputs
- Sample rate conversion for asynchronous AES inputs
- Full audio shuffling and mixing on a channel basis
- 32 channels internal audio processing
- Automation capabilities based on audio signal type detection
- Audio 5.1 surround downmix to Lt/Rt or Lo/Ro

- Audio delay adjustments of up to ± 2 seconds to compensate for lip sync issues
- Loudness measurement of up to ± 4 audio programs and logging with iControl loudness monitoring option
- Loudness compliant to EBU R128-2014, ATSC A/85:2013 (FCC CALM compliant) and ARIB TR-B32 (ITU-R BS.1770-3)
- On-board socket for 1 optional module expansion:
 - 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



AMX-3981 Functional Block Diagram

Options (hardware & software)		
With appropriate fiber cartridge & -F rear module	MOD-DOLBY-ENC-E-2	MOD-LA-ALC
	MOD-DOLBY-ENC-D-2	MOD-LA-DUP-701
		MOD-DOLBY-DEC-2

Specifications

Video Input/Output

Signal (1):

- 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, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94, 1080p50

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
- 3G: <0.3 UI

Audio Input (8)

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

Reference Input

Signal (1): Through the URS internal frame reference signal

Optical

Signal: Refer to SFP module specifications

LTC

Signal (1): SMPTE ST 12

Connector: RJ45 (-3SRP rear), BNC (-3DRP rear)

Impedance: <10 kΩ (bridging 600Ω) unbalanced

Level: 0.3 to 5 Vp-p

GPIO (-3DRP Rear)

Signal (3): Contact closure to ground

Direction: Bidirectional (application specific)

GPIO (-3SRP Rear)

Signal (2): Contact closure to ground

Direction: Bidirectional (application specific)

RS-422

Signal (2): RS-422

Input level: 300 mVp-p (min)

Output level: 3 Vp-p (min)

Rate: 115, 200 Bd

Video Processing Performance

Signal path: 10 bits

Processing delay (HD): 8 μs (in minimum delay mode)

Additional delay: Up to 15 frames upon user selection

Audio Processing Performance

Quantization: 24 bits

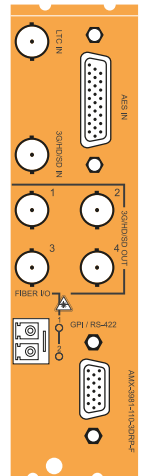
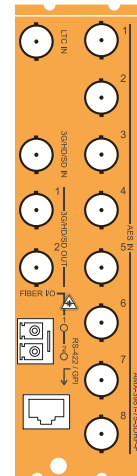
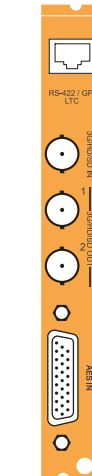
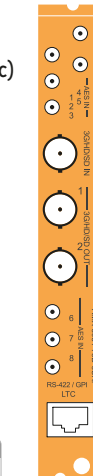
Sampling: 48 kHz, synchronous

Audio latency: 2 to 6 ms in minimum processing delay depending on processing options

Audio delay: Up to 2s (1 ms steps)

Electrical

Power: 12.5W



AMX-3981-75D-3SRP AMX-3981-110-3SRP

AMX-3981-75-3DRP-F

AMX-3981-110-3DRP-F

Ordering

Densité® 3 frame

AMX-3981

3G/HD/SD 8 AES audio and Metadata embedder

AMX-3981-75D-3SRP

Single rear connector panel, 75Ω Din 1.0/2.3

AMX-3981-110-3SRP

Single rear connector panel, 110Ω

AMX-3981-75-3DRP-F

Double rear connector panel, 75Ω and fiber connector

AMX-3981-110-3DRP-F

Double rear connector panel, 110Ω and fiber connector

Options (Hardware)

SFP-RR-LC

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

SFP-TT-S13S13-LC

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

SFP-R-LC

Single 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-RT-S13-LC

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

Other types of SFP Optical Plug-In Cartridges may be available for this product.

Description

NSH15M

NSH26M

MOD-DOLBY-ENC-E-2

MOD-DOLBY-ENC-D-2

MOD-DOLBY-DEC-2

MOD-LA-DUP-701

MOD-LA-ALC-2

MOD-LA-ALC-6

MOD-LA-ALC-8

MOD-LA-ALC-2-DUP

MOD-LA-ALC-6-DUP

MOD-LA-ALC-8-DUP

Remote control

HD-15 to terminal block adapter

HD-26 to terminal block adapter

Dolby E encoder

Dolby Digital (AC-3) encoder

Dolby E and Digital (AC-3) decoder

Upmixing using Linear Acoustic Technology upMAX

2-channel ALC licensed by Linear Acoustic

6-channel ALC licensed by Linear Acoustic

8-channel ALC licensed by Linear Acoustic

2-channel ALC and upmix licensed by Linear Acoustic

6-channel ALC and upmix licensed by Linear Acoustic

8-channel ALC and upmix licensed by Linear Acoustic

GV Orbit, iControl, iControl Solo

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

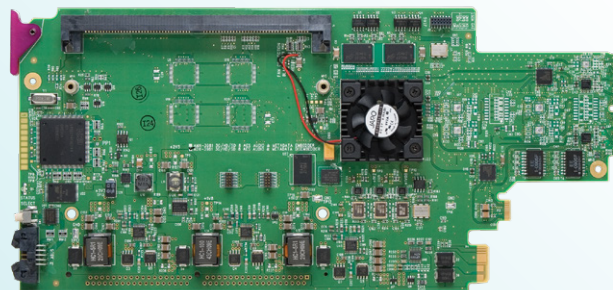
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ADX-3981

8 AES Audio and Metadata De-Embedder



Space-saving, modular platform for advanced signal processing.

The ADX-3981 from Grass Valley® is an advanced, high-quality audio processor which de-embeds up to eight AES signals at 48 kHz from a 3G/HD/SD video signal.

The ADX-3981 can simultaneously process up to 32 channels of audio (16 channels from the embedded audio input plus others generated internally). Functions include downmixing, proc amp, channel shuffling, mixing and loudness measurement.

The loudness measurement function allows the measurement and logging of up to four audio programs with iControl™ loudness monitoring software to analyze and report compliance with respect to various loudness regulations around the world.

The ADX-3981 has one on-board socket for optional modules, which can offer Dolby decoding, Dolby encoding and stereo upmixing using Linear Acoustic upMAX technology. One other module provides ALC using AEROMAX technology by Linear

Acoustic, capable of maintaining constant loudness across different audio programs.

The card will pass and delay automatically all 32 internal audio channels to preserve lip sync between the channels. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled to provide 16 channels for embedding in the video output, and 16 more channels on the discrete AES outputs.

An automatic preset recall feature provides basic automation to select user preset based on the status of the incoming audio.

When genlocked to the frame reference using the internal URS signal, the ADX-3981 can handle video hot switches at the input without losing sync at the output. In the absence of a video input, the card can still output synchronous video and audio silence on the discrete AES outputs.

The card has a frame buffer (not a frame sync) which allows an increase

in the video delay of up to 15 frames to compensate for the long audio processing delay required by some modules. For applications which require a small processing delay, the frame buffer can be bypassed to reduce the delay to a few microseconds.

The ADX-3981 can de-embed ancillary timecode (ATC) in 3G/HD, or DVITC in SD, to generate linear timecode (LTC). Up to three GPIO can be used as input or output to embed or extract GPI events to/from the timecode user bits in transport applications. They can also be used simultaneously to trigger the card's user presets.

Dolby metadata insertion in the VANC is possible from multiple sources, such as a Dolby E decoder module, an embedded VANC stream, an external RS-422 link, or from the integrated metadata generator. All parameters in the metadata stream can be probed and monitored. Dolby metadata can be used to steer the behavior of the audio downmix and upmix modules.

A fiber input/output cartridge is offered as an option on some rear modules. Once the cartridge is installed, the inputs or outputs are selectable through the control interface. The input of the card allows you to select between fiber and copper inputs. The outputs are

via copper and fiber simultaneously (with appropriate fiber cartridge).

There are many benefits to the ADX-3981'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, the system integration is also simplified significantly.

Key Features

Video

- 3G/HD/SD input
- Supports 3 Gb/s level A (mapping 1) and level B
- Audio/video de-glitcher to handle video hot switch at the input
- Automatic detection of input video loss and switchover to local gray for continuous audio/video output synchronization
- Flexible HD/SD reference using the internal URS frame reference
- Minimum processing delay of 8 μ s, but additional delay can be added up to 15 frames
- Optional optical fiber module

Metadata

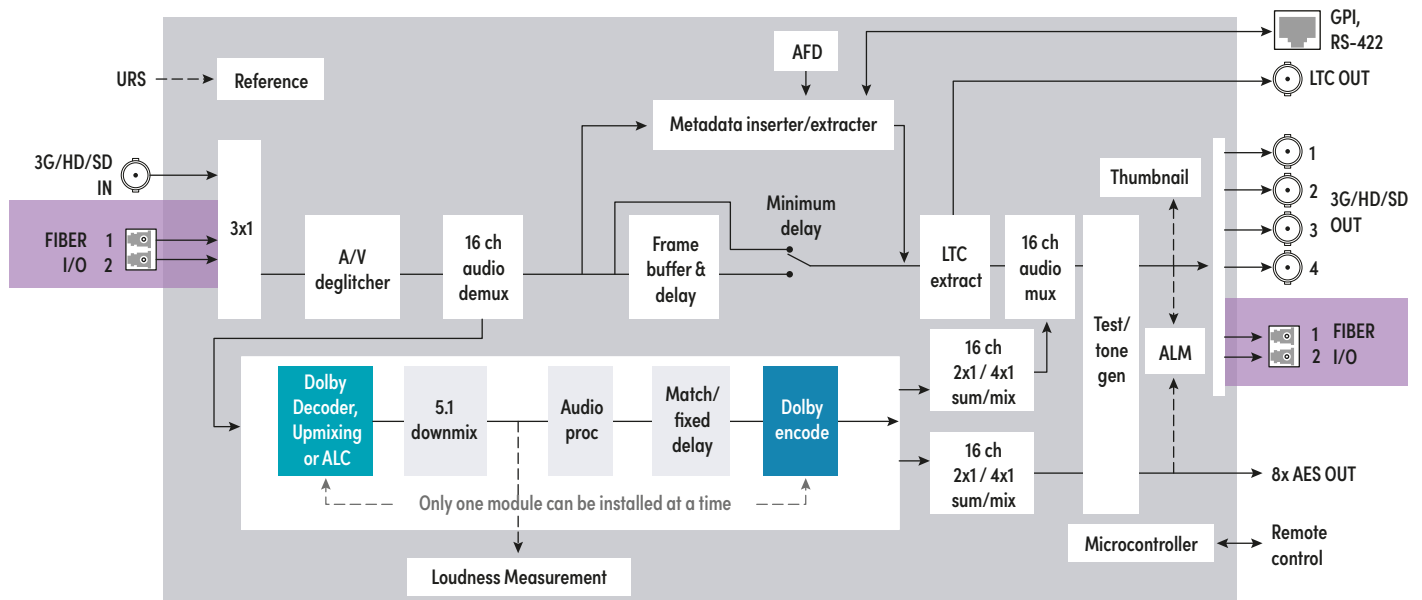
- AFD (SMPTE ST 2016), VLI (RP-186) and WSS insertion

- Linear timecode (LTC) embedding into DVITC (SD) or ATC (HD)
- Audio metadata insertion and extraction (SMPTE ST 2020-A)
- RS-422 serial data input and output to carry audio metadata
- 3 GPI I/O that can be inserted or extracted in the TC user bits. They can also be used for automation, user preset recall and loudness reset

Audio

- 8 AES outputs
- Full audio shuffling and mixing on a channel basis
- 32 channels internal audio processing
- Automation capabilities based on audio signal type detection
- Audio 5.1 surround downmix to Lt/Rt or Lo/Ro

- Audio dynamic processor option (compressor/limiter/expander)
- Audio delay adjustments of up to ± 2 seconds to compensate for lip sync issues
- Loudness measurement of up to ± 4 audio programs and logging with iControl loudness monitoring option
- Loudness compliant to EBU R128-2014, ATSC A/85:2013 (FCC CALM compliant) and ARIB TR-B32 (ITU-R BS.1770-3)
- On-board socket for 1 optional module expansion:
 - 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



ADX-3981 Functional Block Diagram

Options (hardware & software)		MOD-DOLBY-ENC-D-2	MOD-LA-ALC
With appropriate fiber cartridge & -F rear module		MOD-DOLBY-ENC-E-2	MOD-LA-DUP-701
			MOD-DOLBY-DEC-2

Specifications

Video Input/Output

Signal (1):

- 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, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94, 1080p50

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
- 3G: <0.3 UI

Audio Output (8)

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 unbalanced

Return loss: 15 dB at 6 MHz

Reference Input

Signal (1): Through the URS internal frame reference signal

Optical

Signal: Refer to SFP module specifications

LTC

Signal (1): SMPTE ST 12

Connectors:

- RJ45 (-3SRP rear)
- BNC (-3DRP rear)

Impedance: <10 kΩ (bridging 600Ω) unbalanced

Level: 0.3 to 5 Vp-p

GPIO (-3DRP Rear)

Signal (3): Contact closure to ground

Direction: Bidirectional (application specific)

GPIO (-3SRP Rear)

Signal (2): Contact closure to ground

Direction: Bidirectional (application specific)

RS-422

Signal (2): RS-422

Input level: 300 mVp-p (min)

Output level: 3 Vp-p (min)

Rate: 115,200 Bd

Video Processing Performance

Signal path: 10 bits

Processing delay (HD): 8 μs (in minimum delay mode)

Additional delay: Up to 15 frames upon user selection

Audio Processing Performance

Quantization: 24 bits

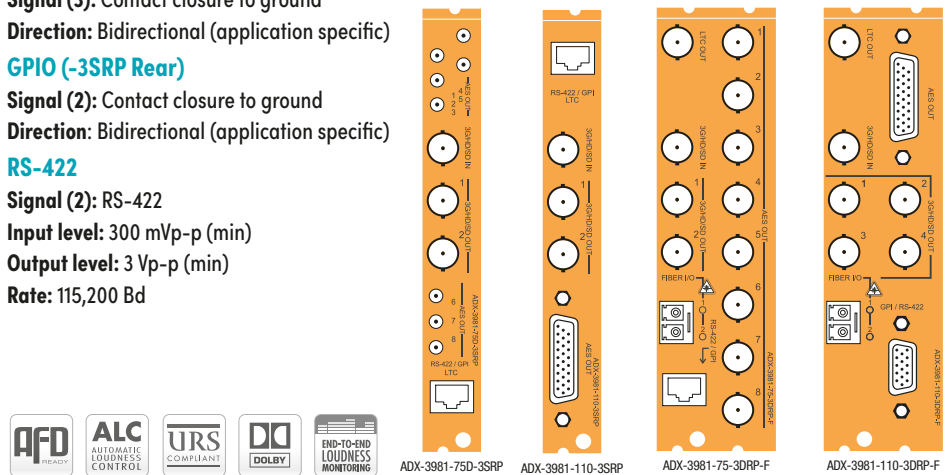
Sampling: 48 kHz, synchronous

Audio latency: 2 to 6 ms max in minimum delay depending on processing options

Audio delay: Up to 2s (1 ms steps)

Electrical

Power: 12.5W



Ordering

Densité® 3 frame

Model	Description
ADX-3981	3G/HD/SD 8 AES audio and metadata de-embedder
ADX-3981-75D-3SRP	Single rear connector panel, 75Ω Din 1.0/2.3
ADX-3981-110-3SRP	Single rear connector panel, 110Ω
ADX-3981-75-3DRP-F	Double rear connector panel, 75Ω and fiber connector
ADX-3981-110-3DRP-F	Double rear connector panel, 110Ω and fiber connector

Options (Hardware)

SFP-RR-LC	Dual fiber RX (input) cartridge with LC/PC connector
SFP-TT-S13S13-LC	Dual fiber TX (output) cartridge at 1310 nm with LC/PC connector
SFP-R-LC	Single 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-RT-S13-LC	Single fiber RX (input) and TX (output) cartridge at 1310 nm with LC/PC connector

Other types of SFP Optical Plug-In Cartridges may be available for this product.

NSH15M	HD-15 to terminal block adapter
NSH26M	HD-26 to terminal block adapter
MOD-DOLBY-ENC-E-2	Dolby E encoder
MOD-DOLBY-ENC-D-2	Dolby Digital (AC-3) encoder
MOD-DOLBY-DEC-2	Dolby E and Digital (AC-3) 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

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

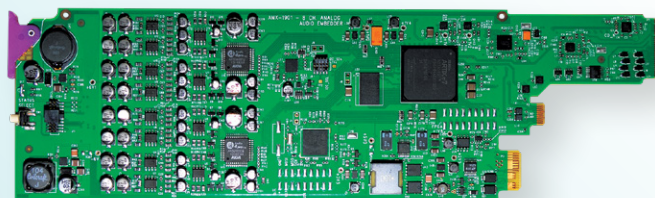
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AMX-1901

3G/HD/SD 8 Channel Analog Audio Embedder



Space-saving, modular platform for advanced signal processing.

The AMX-1901 is an advanced, high quality 24-bit 48 kHz analog audio embedder designed to insert up to eight analog audio signals into a 3G/HD/SD video signal. The AMX-1901 can process the eight audio input channels with functions including level, channel shuffling and mixing.

Options include Automatic Loudness Control and dynamic processing (limiter, compressor and expander). The loudness measurement features allows the measurement and logging of up to eight audio programs with iControl™ Loudness

Monitoring software to analyze and report compliance with respect to various loudness legislation around the world. Furthermore, a delay of up to 2.7s can be programmed independently per audio input channel.

In the absence of an input video signal, an internally generated black or color bar signal is used, thus sustaining audio embedding even with a loss of input.

The AMX-1901 can embed longitudinal timecode (LTC) as ancillary timecode (ATC) in 3G/HD

and DVITC in SD. Up to two GPIO can be used as input to embed GPI events to the timecode user bits in transport applications. Audio metadata insertion in the VANC is possible from an embedded VANC stream or an external RS-422 link.

A fiber input/output SFP cartridge is offered as an option on some rear modules. Once the cartridge is installed, the inputs or outputs are selectable through the control interface.

Key Features

Audio

- 8 analog audio inputs with inputs shuffling
- Individually adjustable input level
- Audio delay adjustments of up to 2.7s to compensate for lip sync issues
- Audio dynamic processor option (compressor/limiter/expander)
- Optional 8 programs/8 channels Automatic Loudness Control with Wideband processing
- Loudness measurement of up to 8 audio programs and logging with iControl Loudness Monitoring software

- Loudness compliant to EBU R128-2014, ATSC A/85:2013 (FCC CALM compliant) and ARIB TR-B32 (ITU-R BS.1770-3)
- Built-in test generator (audio + video)
- Monitoring and reporting of audio input Overload, Max/Min Level, Silence and Phase

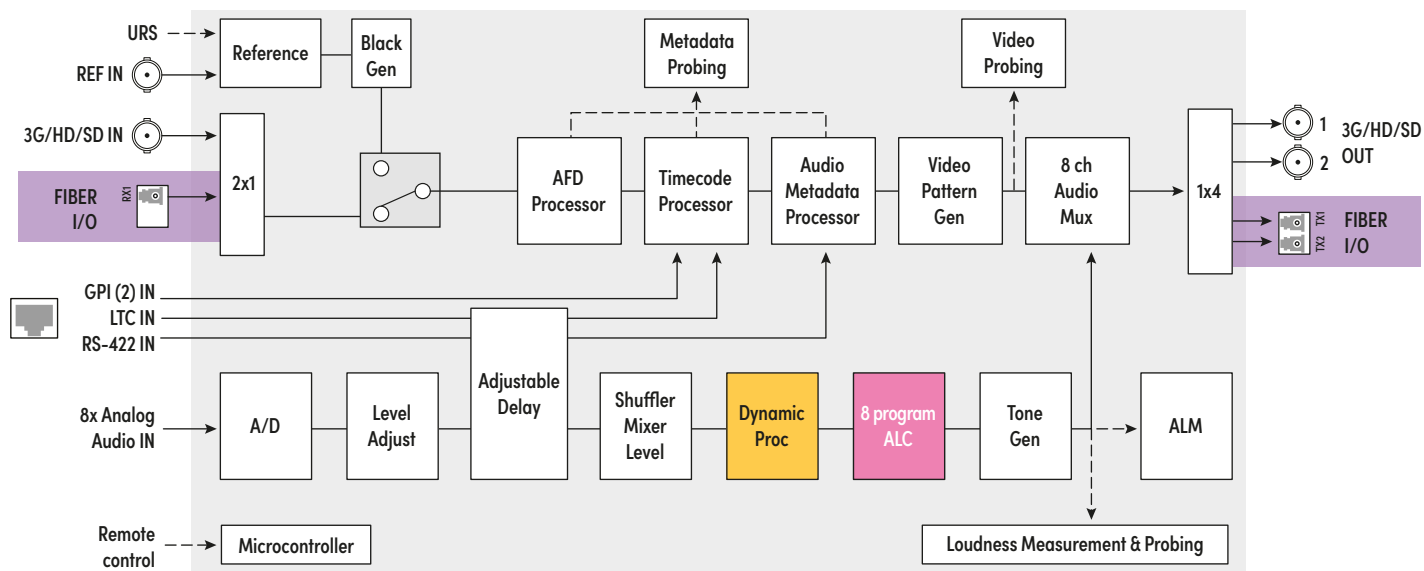
Video

- 3G/HD/SD input
- Supports 3G level A (mapping 1) and level B
- Internal black or color bar generator in case of input signal absence or loss

- Flexible HD/SD/URS reference input, used only with an input signal absence
- Optional optical fiber SFP cartridge
- Black Detection monitoring

Metadata

- AFD (SMPTE ST 2016), VLI (SMPTE RP 186) and WSS insertion
- Longitudinal timecode (LTC input) embedding into DVITC (SD) or ATC (3G/HD)
- Audio metadata insertion (SMPTE ST 2020-A) from RS-422 serial data input
- 2 GPI inputs that can be inserted in the timecode user bits



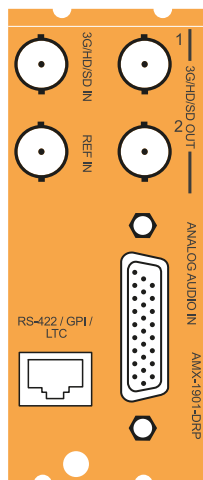
AMX-1901 Functional Block Diagram

Options (hardware & software)

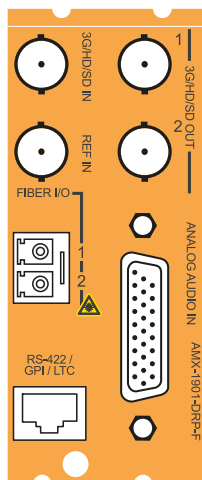
With appropriate fiber cartridge & -F rear module

AMX-1901-OPT-DP

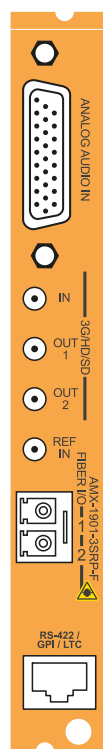
AMX-1901-OPT-ALC



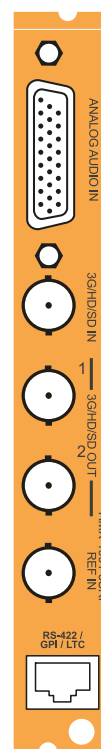
AMX-1901-DRP



AMX-1901-DRP-F



AMX-1901-3SRP-F



AMX-1901-3SRP

Specifications

Analog Audio Inputs (8)

Signal: balanced analog audio

Input impedance: > 12 kΩ

Max. level: +24 dBu

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz

SNR: >117 dB A weighted

0 dBFS: 0 to +24 dBu (1 dB steps)

Distortion: -90 dB (20 Hz to 5 kHz)

Crosstalk: -100 dB (20 Hz to 20 kHz)

Freq. response: ± 0.05 dB (20 Hz to 20 kHz)

Processing delay: 400 µs to 3 ms depending video resolution and processing options

Tone generator: -18 dBFS 1 kHz sine wave interrupted on left channel (250 ms) per EBU R49

Video Input (1) / Output (2)

Signal:

- SMPTE ST 259 (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:

- 480i59.94, 576i50
- SMPTE ST 274: 1080/59.94, 1080p23.98/24sF/25/29.97
- SMPTE ST 296: 720p24, 720p23.98, 24/50/59.94
- SMPTE ST 425 Level A (mapping 1), Level B: 1080p59.94, 1080/50

Embedded audio:

- SMPTE ST 272 (SD)
- SMPTE ST 299 (HD)

Embedded ATC: SMPTE RP 188

Embedded ANC: SMPTE ST 291

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

Input impedance: 75Ω

Return Loss:

- >15 dB up to 1.5 GHz
- >10 dB from 1.5 GHz to 3 GHz

Jitter:

- SD/HD: < 0.2 UI
- 3G : < 0.3 UI

External Reference Input (1)

Signal:

- SMPTE ST 170/SMPTE ST 318/ITU 624-4 Black Burst
- SMPTE ST 274/SMPTE ST 296 Tri-level sync

Input impedance: 75Ω

Return loss: >35 dB up to 5.75 MHz

Frame Reference

Signal: URS from REF-1801 card installed in the frame

LTC Input (1)

Signal: SMPTE ST 12

Connector: RJ45

Impedance: 10 kΩ unbalanced

Level: 0.2 to 5 Vp-p

GPI Input (2)

Signal: Contact closure to ground

Connector: RJ45

RS-422 Metadata Input (1)

Signal: RS-422

Connector: RJ45

Level: 300 mVp-p min.

Rate: 115200 bauds

Optical Video Input (0 or 1)

Refer to SFP module specifications:

- SFP-R-S13-LC
- SFP-RT-S13-LC

Optical Video Output (0, 1 or 2)

Refer to SFP module specifications:

- SFP-T-S13-LC
- SFP-TT-S13-LC

Video Processing

Signal Path: 10 bits

I/O Processing delay:

- Normal: < 1.1 line for all format except 3G Level B
- Minimum: < 0.25 line for all format except 3G Level B

Electrical

Power: <7W with dual SFP cartridge



Ordering

Densité® 2 Frame	Densité 3 Frame	Description	Options (Hardware)	Description
AMX-1901	AMX-1901-3RU	3G/HD/SD 8 channel analog audio embedder	NSH26M	HD-26 to terminal block adapter
AMX-1901-DRP		Double rear connector panel	SFP-TT-S13S13-LC	Dual fiber TX (output) cartridge at 1310 nm with LC/PC connector
AMX-1901-DRP-F		Double rear connector panel with fiber cage	SFP-R-LC	Single fiber RX (input) cartridge with LC/PC connector
	AMX-1901-3SRP	Single rear connector panel	SFP-T-S13-LC	Single fiber TX (output) cartridge at 1310 nm with LC/PC connector
	AMX-1901-3SRP-F	Single rear connector panel with fiber cage	SFP-RT-S13-LC	Dual fiber RX/TX (input/output) cartridge at 1310 nm with LC/PC connector
Options (Software)	Description		Other types of SFP Optical Plug-In Cartridges may be available for this product. Please visit www.grassvalley.com for more information.	
AMX -1901-OPT-DP	Dynamic Processing Option (Compressor/Limiter/Expander)		Remote Control	GV Orbit, iControl, iControl Solo
AMX -1901-OPT-ALC	8-channel Automatic Loudness Control option			

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

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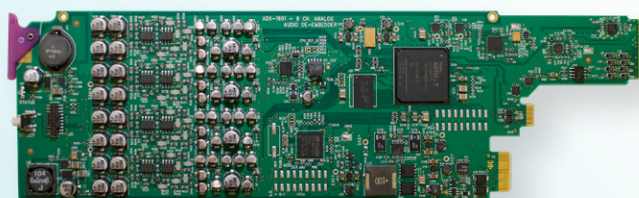
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ADX-1901

3G/HD/SD 8 Channel Analog Audio De-embedder

Space-saving, modular platform for advanced signal processing.



The ADX-1901 from Grass Valley® is an advanced, high-quality 24-bit 48 kHz analog audio de-embedder designed to extract eight analog audio signals from a 3G/HD/SD video signal. The ADX-1901 can process the eight audio de-embedded channels with functions including level, channel shuffling and mixing.

The loudness measurement features provide for the measurement and logging of up to eight audio programs with iControl Loudness Monitoring software to analyze and report compliance with respect to

various loudness legislation around the world. Furthermore, a delay of up to 2.7 seconds can be programmed independently per de-embedded audio channel to provide lip sync correction.

The ADX-1901 can de-embed ancillary timecode (ATC) in 3G/HD, or DVITC in SD, to generate linear timecode (LTC). Up to two GPIO can be generated by extracting GPI events from the timecode user bits in transport applications. Audio metadata extraction from the VANC can be streamed to an external RS-422 output.

The ADX-1901 is designed for the Densité® 2 frame, but will be compatible with the Densité 3 frame with the metal extender. Multiple rear connector panels are available according to application needs and the chassis type used.

A fiber input/output cartridge is offered as an option on some rear modules. Once the cartridge is installed, the inputs or outputs are selectable through the control interface.

Key Features

Audio

- 8 analog audio outputs
- Audio silence output on loss of video input
- Full audio shuffling and mixing on a channel output basis
- Individually adjustable audio output level
- Audio 5.1 surround downmix to Lo/Ro
- Audio delay adjustments of up to 2.7 seconds to compensate for lip sync issues
- Built in test generator (audio)

- Monitoring and reporting of audio output max/min level, silence and phase
- Loudness measurement of up to 8 audio programs and logging with iControl Loudness Monitoring software
- Loudness compliant to EBU R128-2014, ATSC A/85:2013 and ARIB TR-B32 (ITU-R BS.1770-3)

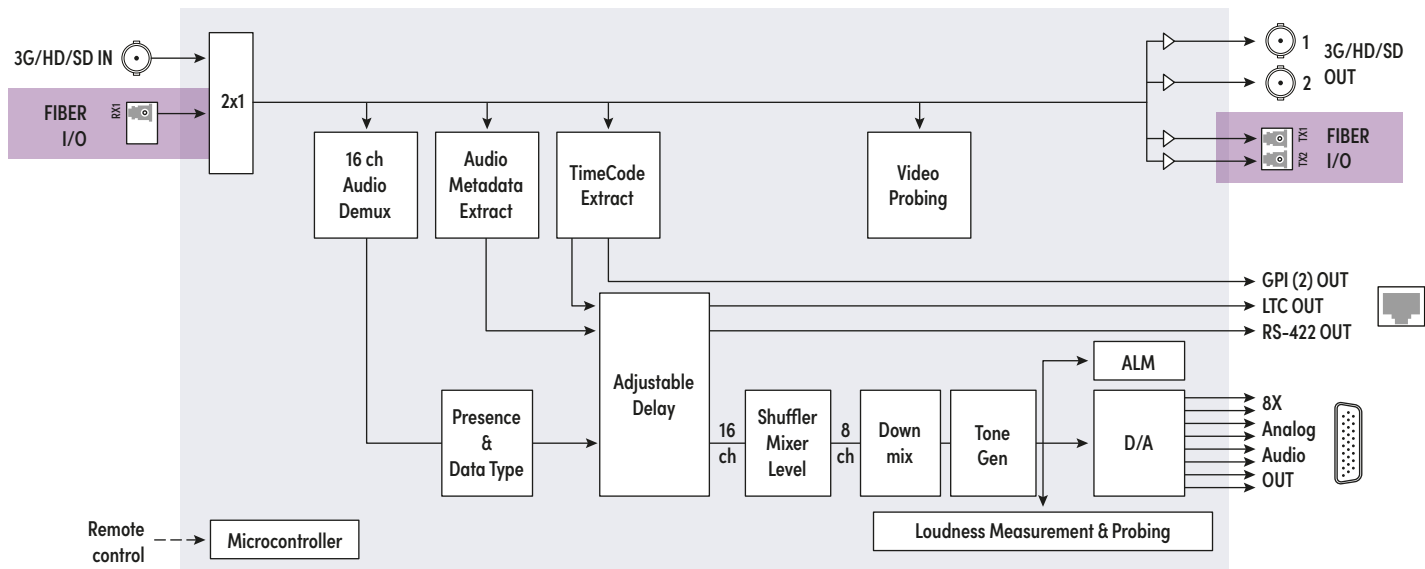
Video

- 3G/HD/SD input with automatic equalization
- Supports 3G level A (mapping 1) and level B
- Automatic detection of video input format

- Optional optical fiber SFP cartridge
- Black detection monitoring

Metadata

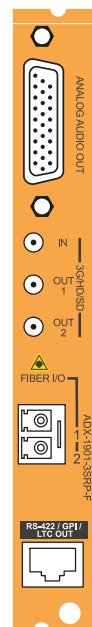
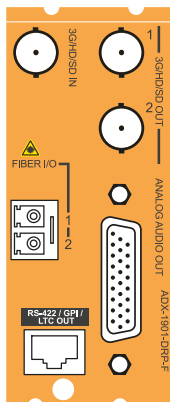
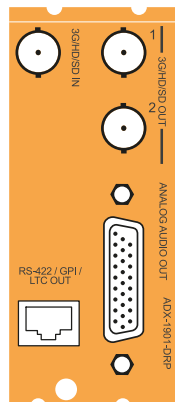
- Linear timecode (LTC) output translated from DVITC (SD) or ATC (3G/HD)
- 2 GPI data output signals reconstructed from ANC TC user bits
- RS-422 serial data output to carry audio metadata (SMPTE ST 2020-A) from the VANC



ADX-1901 Functional Block Diagram

Options (hardware & software)

With appropriate fiber cartridge & -F rear module



Specifications

Analog Audio Output (8)

Signal: Balanced analog audio

Impedance: <50Ω

Max. level: +24 dBu / 2 kΩ

Audio Processing Performance

Quantization: 24 bits

Sampling: 48 kHz

Audio latency: 0.967 ms at 48 kHz

Audio delay: Up to 2.7s (1 ms steps)

SNR: >117 dB A weighted

0 dBFS: 0 to +24 dBu (1 dB steps)

Distortion: <-90 dB (20 Hz to 5 kHz)

Crosstalk: <-110 dB (20 Hz to 20 kHz)

Freq. response: ±0.05 dB (20 Hz to 20 kHz)

Tone generator: -18 dBFS 1 kHz sine wave interrupted on left channel (250 ms) per EBU R49

Video Input/Output

Signal (1):

- 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, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE ST 425 level A (mapping 1), level B: 1080p59.94, 1080p50

Embedded audio: SMPTE ST 272 (SD), SMPTE ST 299 (HD)

Embedded ATC: SMPTE RP 188

Embedded ANC: SMPTE ST 291

Cable length (Belden 1694A):

- SD: 400m (1,312 ft.) at 270 Mb/s
- HD: 200m (656 ft.) at 1.5 Gb/s
- 3G: 100m (328 ft.) at 3 Gb/s

Return loss: >15 dB up to 3 GHz

Jitter: 3G/HD/SD: < 0.2 UI

Optical Video Input (0 or 1)

Refer to SFP module specifications:

SFP-R-S13-LC, SFP-RT-S13-LC

Optical Video Output (0, 1 OR 2)

Refer to SFP module specifications:

SFP-T-S13-LC, SFP-TT-S13-LC

LTC Output (1)

Signal: SMPTE ST 12

Connectors: RJ45

Level: 2 Vp-p

GPI Signal Output (2)

Signal: Contact closure to ground

RS-422 Metadata Output (1)

Signal: RS-422

Connector: RJ45

Output level: 3 Vp-p (min.)

Rate: 115,200 Bd

Electrical

Power: <7W with dual SFP cartridge



Ordering

Densité 2 Frame	Densité 3 Frame	Description	Options (Hardware)	Description
ADX-1901	ADX-1901-3RU	3G/HD/SD 8-channel analog audio de-embedder	NSH26M	HD-26 to terminal block adapter
ADX-1901-DRP		Double rear connector panel	SFP-R-LC	Single fiber RX (input) cartridge with LC/PC connector
ADX-1901-DRP-F		Double rear connector panel with fiber cage	SFP-T-S13-LC	Single fiber TX (output) cartridge at 1310 nm with LC/PC connector
	ADX-1901-3SRP	Single rear connector panel	Other types of SFP Optical Plug-In Cartridges may be available for this product. Please visit www.grassvalley.com for more information.	
	ADX-1901-3SRP-F	Single rear connector panel with fiber cage	Remote Control	GV Orbit, iControl, iControl Solo

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

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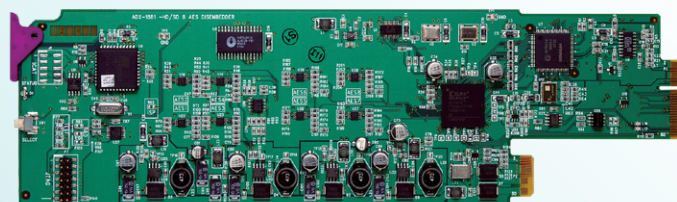
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AMX-1842

HD/SD 4 AES

Embedder



Space-saving, modular platform for advanced signal processing.

The AMX-1842 from Grass Valley® is a high-quality embedder which embeds up to four AES 24-bit 48 kHz digital audio signals into a single HD/SD serial digital video signal. It includes audio and video signal presence detection and reporting, and local or remote configuration and control.

A unique feature is its ability to embed timecode, a serial RS-422 data signal and two GPI status signals into the video signal.

The card has built-in audio tone, timecode and video color bar test signals.

Key Features

- HD-SDI or SDI input
- Automatic EQ for up to 110/250m (360/820 ft.)
- Automatic detection of video input format
- Continuity of embedded audio on loss of video input
- 110Ω balanced or 75Ω unbalanced input
- Input SRC to handle asynchronous audio
- Audio channel gain selectable
- Audio group insertion/bypass/delete
- Selectable audio delay of up to 3 frames
- Automatic mute on AES error
- Selectable routing of AES signals
- Left/right channels swappable
- Dolby-E compatible
- 24-bit digital audio embedding
- Linear timecode (LTC) embedding
- RS-422 input for embedding as ANC data
- GPI inputs for embedding as ANC data

Resolutions	Formats
HD-SDI formats	
1920 x 1080	59.94i, 50i, 29.97p, 25p, 24p, 23.98p, 29.97psf, 25psf, 24psf, 23.98psf
1280 x 720	59.94p, 50p
SD-SDI formats	
525	59.94i
625	50i

Specifications

Video Input

Video signal: HD/SD-SDI SMPTE ST 292/SMPTE ST 259-C

Cable length: Up to 110/250m (360/820 ft.) of Belden 1694A

Return loss: >15 dB, 5 MHz to 1.485 GHz

Audio AES-3id Input

Signal: AES-3id (SMPTE ST 276)

Level: 0.2 to 2.0 Vp-p

Impedance: 75Ω unbalanced

Cable length: >400m (1,312 ft.)

Audio AES3 Input

Signal: AES3

Level: 0.2 to 7.0 Vp-p

Impedance: 110Ω balanced

Cable length: >200m (656 ft.)

Audio AES Signals

Sampling rate: 48 kHz synchronous or asynchronous

Dolby-E rate: 48 kHz synchronous

Bits: 24-bit

LTC Signal

Signal: LTC per SMPTE ST 12

Impedance: <10kΩ (bridging 600Ω) unbalanced

Level: 0.2 to 5 Vp-p

Video Output

Video signal:

- HD/SD-SDI (SMPTE ST 292/SMPTE ST 259-C)
- Audio embedded per SMPTE ST 299/SMPTE ST 272
- LTC embedded as ATC/DVITC (SMPTE RP188/SMPTE ST 266)
- RS-422 and two GPIs embedded as ANC data per SMPTE ST 291 (Proprietary type 1 DID)

Return loss: >15 dB up to 1.485 GHz

Wideband jitter: as per SMPTE ST 259-C and SMPTE ST 292

ANC Serial Data Input

Signal: RS-422

Level: 200 mVp-p (min)

Rate: 38,400 or 115,200 Bd

ANC General Purpose Interface (GPI) Input

Signal (2): Contact closure (opto-isolated), common ground

Level:

- True = 0 to 0.8V (max.)
- Maximum input voltage = ±5.5V

Rate: DC to 250 Hz

Processing Performance

Signal path: 10-bit video / 24-bit audio

Audio latency: 875 μs (combined embedding and extraction*)

Audio delay: Up to 3 video frames (1/2 frame steps)

ATC/DVITC delay: None, 1, 2 or 3 frames before translation to LTC

RS-422 latency: 500 μs max. (combined embedding and extraction*)

GPI latency: 4 video lines (combined embedding and extraction*)

Test signals: Audio: 1 kHz tone (R steady, L pulsed) -18 dBFS (EBU R49, R68)

LTC: 10s loop starting at 23:59:00:00

RS-422

Latency: max 500 μs*

GPI

Latency: 4 video lines*

Test signals: Video – color bars 100%

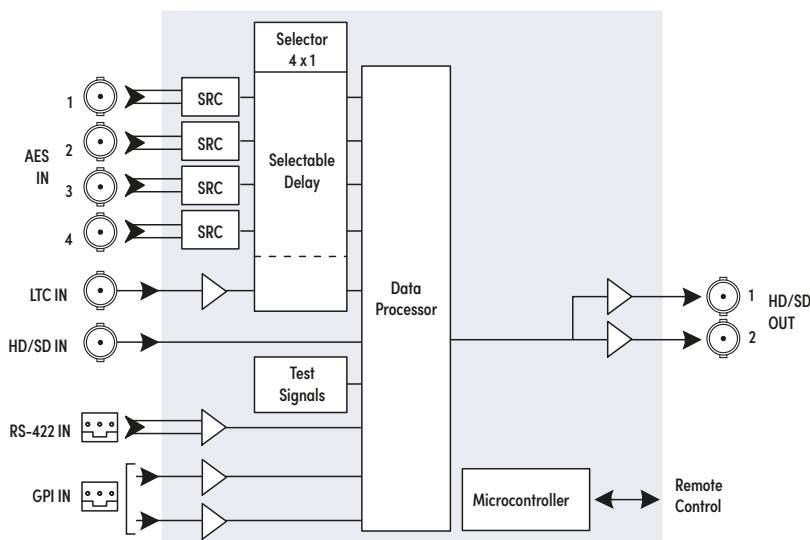
Audio: 1 kHz tone (R steady, L pulsed) -18 dBFS (EBU R49, R68)

LTC: 10s loop starting at 23:59:00:00

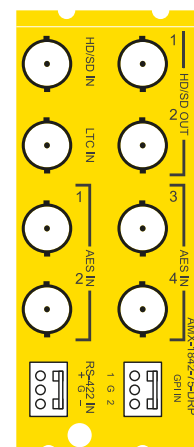
Electrical

Power: 6W

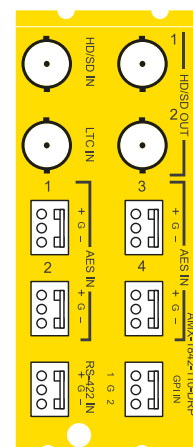
* Applicable to combinations of this card and ADX-1842/1852.



AMX-1842 Functional Block Diagram



AMX-1842-75-DRP



AMX-1842-110-DRP

Ordering

Densité® 2 frame

AMX-1842

AMX-1842-75-DRP

AMX-1842-110-DRP

Remote control

Densité 3 frame

AMX-1842-3RU

AMX-1842-75-DRP-3RU

AMX-1842-110-DRP-3RU

Description

HD/SD 4 AES Embedder

Double rear connector panel, 75Ω

Double rear connector panel, 110Ω

GV Orbit, iControl, iControl Solo

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

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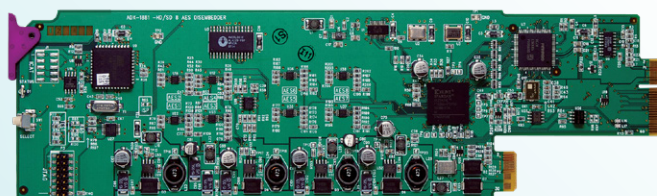
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ADX-1842

HD/SD 4 AES

De-Embedder



Space-saving, modular platform for advanced signal processing.

The ADX-1842 from Grass Valley® is a high-quality de-embedder designed to extract up to four AES 24-bit 48 kHz digital audio signals from a single HD/SD serial digital video signal.

A unique feature is its ability to extract timecode, a serial RS-422 data signal and two GPI status signals from the video signal. The module supports signal presence detection, remote reporting, and local or remote configuration and control, and features a built-in audio tone test signal.

ADX-1842

Resolutions	Formats
HD-SDI formats	
1920 x 1080	59.94i, 50i, 29.97p, 25p, 24p, 23.98p, 29.97psf, 25psf, 24psf, 23.98psf
1280 x 720	59.94p, 50p
SD-SDI formats	
525	59.94i
625	50i

Key Features

- HD-SDI or SDI input
- Auto EQ for up to 110/250m (360/820 ft.)
- Automatic detection of video input format
- Two pass-through HD-SDI/SDI video outputs
- 110Ω balanced or 75Ω unbalanced outputs
- Selectable audio delay of up to three frames
- 24-bit digital audio de-embedding
- Audio silence output on loss of video input
- Left/right channels swappable
- Selectable routing of AES
- Co-phased audio outputs
- Dolby-E compatible
- LTC output translated from ATC data or DVITC
- RS-422 serial data output
- Two opto-isolated GPI outputs

Specifications

Video Input

Video signal:

- HD/SD-SDI SMPTE ST 292/SMPTE ST 259-C (see list of supported formats in Key Features section)

Embedded audio as per SMPTE ST 299/SMPTE ST 272

Embedded ATC/DVITC as per SMPTE RP 188/SMPTE ST 266

Embedded RS-422 and GPI as per SMPTE ST 291 (with proprietary Type-1 DID)

Cable length: up to 110/250m (360/820 ft.) of Belden 1694A

Return loss: >15 dB up to 1.5 GHz

Audio AES-3id Output

Signal: AES-3id (SMPTE ST 276)

Level: 1.0 Vp-p $\pm 10\%$

Impedance: 75 Ω unbalanced

Audio AES3 Output

Signal: AES3

Level: 3.0 Vp-p $\pm 10\%$

Impedance: 110 Ω balanced

Audio AES Signal

Sampling rate: 48 kHz synchronous

LTC Signal Output

Signal: Reconstructed LTC from ATC/DVITC

Impedance: <55 Ω source, unbalanced 1 k Ω load

Level: 1.0 Vp-p

RS-422 Signal Output

Signal: RS-422

Rate: Reconstruction of signal input to embedder (38,400 or 115,200 Bd)

GPI Signal Output (2)

Signal: Opto-isolated, common emitter

Forward voltage: 30V max

Reverse voltage: 5V max

Rate: DC to 250 KHz

Video Output (Input Active Loop-through)

Video signal: HD/SD-SDI SMPTE ST 292/SMPTE ST 259-C

Return loss: >15 dB up to 1.5 GHz

Wideband jitter: As per SMPTE ST 259-C and SMPTE ST 292

Processing Performance

Signal path: 10-bit video / 24-bit audio

Audio latency: 875 μ s (combined embedding and extraction*)

Audio delay: Up to 3 video frames (1/2 frame steps)

ATC/DVITC delay: None, 1, 2 or 3 frames before translation to LTC

RS-422 latency: 500 μ s max. (combined embedding and extraction*)

GPI latency: 4 video lines (combined embedding and extraction*)

Test signals: Audio: 1 kHz tone (R steady, L pulsed) -18 dBFS (EBU R49, R68)

LTC: 10s loop starting at 23:59:00:00

Electrical

Power: 9.5W

*Applicable to combinations of this card.

Ordering

Densité 2 frame

ADX-1842

ADX-1842-75-DRP

ADX-1842-110-DRP

Densité 3 frame

ADX-1842-3RU

ADX-1842-75-DRP-3RU

ADX-1842-110-DRP-3RU

Description

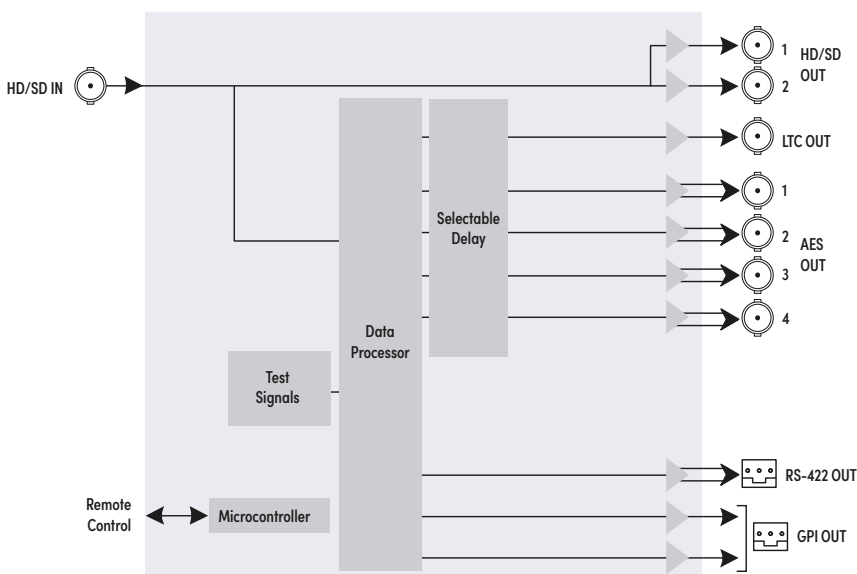
HD/SD 4 AES de-embedder

Double rear connector panel, 75 Ω

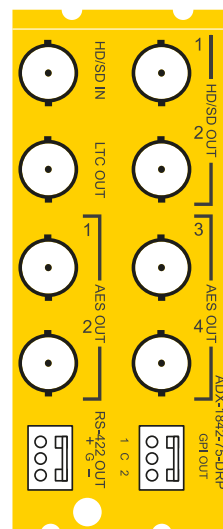
Double rear connector panel, 110 Ω

Remote control

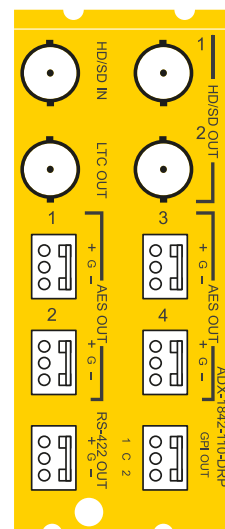
GV Orbit, iControl, iControl Solo



ADX-1842 Functional Block Diagram



ADX-1842-75-DRP



ADX-1842-110-DRP

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

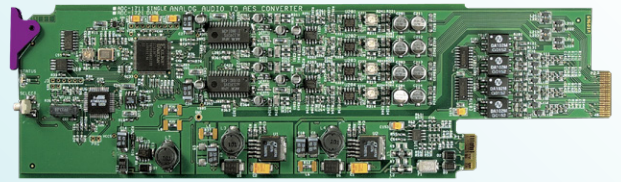
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ADC-1722

Dual Analog Audio to AES Converter



Space-saving, modular platform for advanced signal processing.

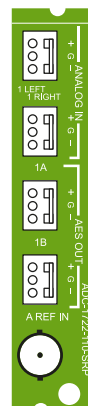
The ADC-1722 from Grass Valley® is a high-quality, 24-bit, analog to digital audio converter which allows conversion of two stereo analog audio channel into two AES type digital signals.

Sampling rates can be set to 32, 48 or 96 kHz by an internal clock or an external reference signal. An internal digital EBU tone generator facilitates alignment of audio levels.

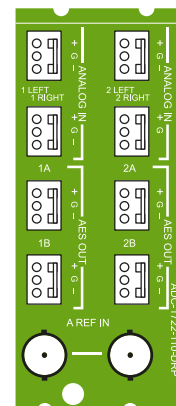
User-defined channel identification data may be encoded in the AES status bits. An input audio signal status is also available indicating input signal silence or overload. The ADC-1722 is compatible with both AES3 and AES3-id digital audio standards.

Key Features

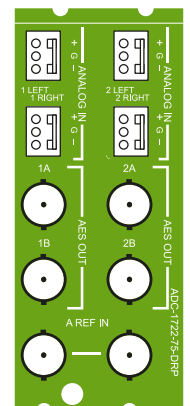
- Single or dual stereo channel use (select proper rear)
- 1 external reference input (Word Clock or AES3-id DARS)
- 2 AES outputs per stereo channel
- Balanced AES3 or unbalanced AES3-id outputs
- 24-bit A to D conversion (16, 20 or 24 bits output word length)
- 32, 48 and 96 kHz sampling rates
- -96 to +12 dB of gain adjustment (by 0.5 dB steps)
- 0 dBFS programmable analog (0 to +28 dBu, 1 dB steps) level mapping
- Internal EBU tone generator
- Adjustable silence detection threshold
- Overload detection and reporting



ADC-1722-110-SRP ADC-1722-75-SRP



ADC-1722-110-DRP



ADC-1722-75-DRP

Specifications

Inputs

Signal: Balanced analog stereo audio

Impedance: >12k Ω

Reference: Word Clock or AES-3id

Impedance: 75 Ω

Outputs

AES3:

- Level: 4 Vp-p
- Impedance: 110 Ω balanced
- Jitter: 0.011 UI peak (50 Hz to 100 kHz)

AES-3id (SMPTE 276M):

- Level: 1.0 Vp-p
- Impedance: 75 Ω unbalanced
- Jitter: 0.011 UI peak (50 Hz to 100 kHz)

Processing Performance

Quantization: 24 bits

Sampling: 3 2, 48, 96 kHz

SNR: >113 dB (a weighted)

0 dBFS: 0 to +28 dBu (1 dB step)

Distortion: < -100 dB (0.001 %)

Crosstalk: < -100 dB (20 Hz to 20 kHz)

Freq. response: ± 0.1 dB (20 Hz to 20 kHz)

Latency: 810 μ s at 48 kHz

Tone generator: -18 dBFS 1 kHz sine wave interrupted on left channel (250 ms/3s) EBU R49

Miscellaneous

Signal presence threshold: From -72 to -54 dBFS (6 dB steps)

Silence detect delay: From 0 to 255s (1s steps)

Electrical

Power: 5W



Ordering

Densité 2 Frame

ADC-1722

ADC-1722-75-SRP

ADC-1722-110-SRP

ADC-1722-75-DRP

ADC-1722-110-DRP

Densité 3 Frame

ADC-1722-3RU

ADC-1722-75-SRP-3RU

ADC-1722-110-SRP-3RU

ADC-1722-75-DRP-3RU

ADC-1722-110-DRP-3RU

Description

Dual analog audio to AES converter

Single rear connector panel, 75 Ω

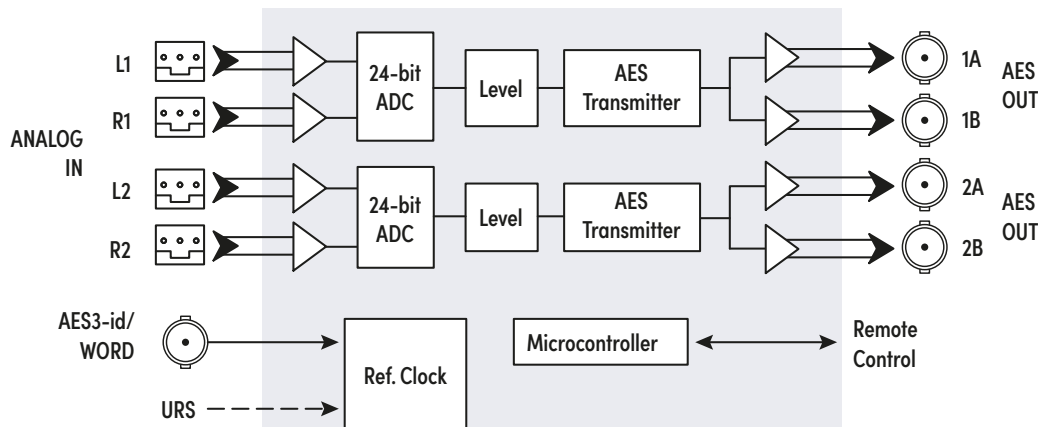
Single rear connector panel, 110 Ω

Double rear connector panel, 75 Ω

Double rear connector panel, 110 Ω

Remote Control

GV Orbit, iControl, iControl Solo



ADC-1722 Functional Block Diagram

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

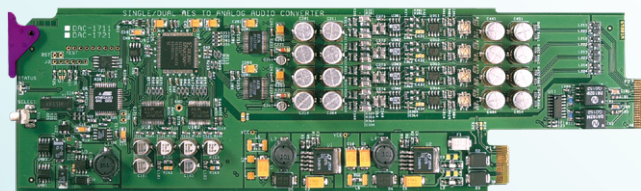
DS-PUB-3-0334A-EN

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DAC-1721

Dual AES to Analog Audio Converter



Space-saving, modular platform for advanced signal processing.

The DAC-1721 from Grass Valley® is high-quality, 24-bit, digital to analog audio converter which allows conversion of two AES digital signal into two stereo analog audio signals.

The DAC-1721 is a dual input converter card. The input sampling

rates can be up to 100 kHz, including 32 kHz, 44.1 kHz, 48 kHz and 96 kHz. An internal digital EBU tone generator facilitates alignment of audio levels. All analog audio output levels may be set individually. A digital 50/15 μ s de-emphasis stage may be selected manually

or automatically according to the channel status. Input status is also available indicating input audio signal presence or overload.

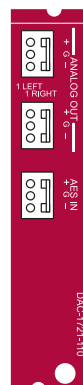
The DAC-1721 is compatible with both AES3 and AES-3id digital audio standards.

Key Features

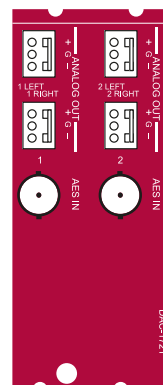
- Single or dual AES3, AES-3id or S/PDIF digital input(s)
- Single or dual stereo analog audio outputs
- 0 dBFS programmable analog (+15, 16, 18, 20, 21, 22, 24 and 28 dBu) level mapping
- 24-bit D/A conversion
- 32 to 96 kHz sampling rates
- -96 to +12 dB level adjustment (by 0.5 dB steps) per channel
- Adjustable presence and overload threshold
- Internal EBU tone generator
- Digital 50/15 μ s de-emphasis selectable



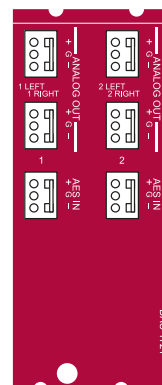
DAC-1721-75-SRP



DAC-1721-110-SRP



DAC-1721-75-DRP



DAC-1721-110-DRP

Specifications

Input

Signal: AES3

Level: 0.2 to 7 V_{p-p}

Termination: 110Ω balanced

Return loss: >15 dB up to 12 MHz

AES-3id (S/PDIF compatible)

Signal: AES-3id (SMPTE ST 276)

Level: 0.2 to 5.0 V_{p-p}

Termination: 75Ω unbalanced

Return loss: >15 dB up to 12 MHz

Outputs (2)

Signal: Balanced analog audio

Impedance: <50Ω

Maximum level: 24 dBu / 600Ω

Processing Performance

Quantization: 24 bits

Sampling:

– 20 to 50 kHz (128X over-sampling)

– 50 to 100 kHz (64X over-sampling)

0 dBfs: +15, 16, 18, 20, 21, 22, 24 and 28 dBu

SNR: >116 dB (A weighted)

Distortion: <-96 dB

Crosstalk: <-100 dB (20 Hz to 20 kHz)

Freq. response: ±0.2 dB (20 Hz to 20 kHz)

De-emphasis: ±0.3 dB (50/15 μs)

Latency: 32/FS (670 μs at 48 kHz)

Tone generator: 1 kHz sine wave interrupted on left channel (250 ms / 3s)

Electrical

Power: 4.3W

Ordering

Densité 2 frame

DAC-1721

DAC-1721-75-SRP

DAC-1721-110-SRP

DAC-1721-75-DRP

DAC-1721-110-DRP

Remote control

Densité 3 frame

DAC-1721-3RU

DAC-1721-75-SRP-3RU

DAC-1721-110-SRP-3RU

DAC-1721-75-DRP-3RU

DAC-1721-110-DRP-3RU

GV Orbit, iControl, iControl Solo

Description

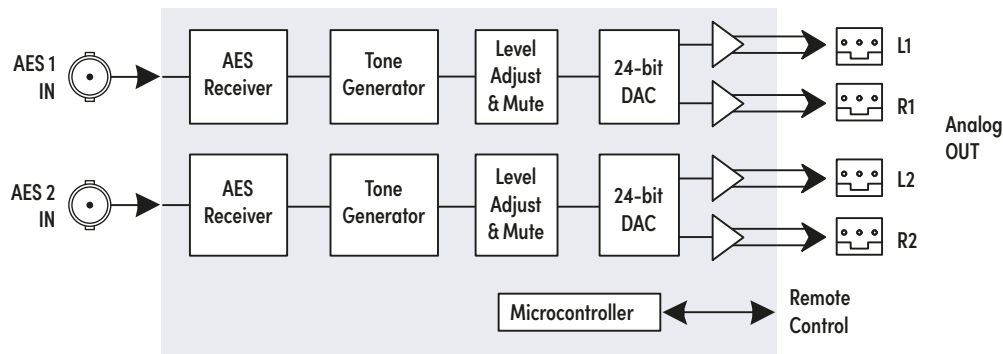
Dual AES to analog audio converter

Single rear connector panel, 75Ω

Single rear connector panel, 110Ω

Double rear connector panel, 75Ω

Double rear connector panel, 110Ω



DAC-1721 Functional Block Diagram

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

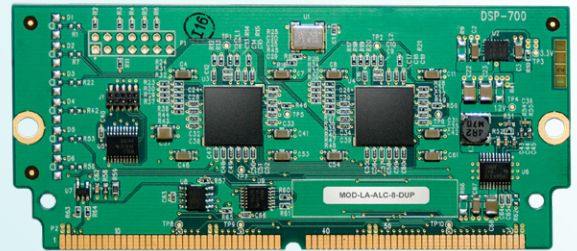
DS-PUB-3-0352A-EN

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AUTOMATIC LOUDNESS CONTROL (ALC)

Advanced Loudness Control Solutions Which Prevent Excessive Audio Jumps



Space-saving, modular platform for advanced signal processing.

Excessive loudness variation is probably the most common viewer complaint, and it's now something you can eliminate entirely. Our automatic loudness control solutions for our Densité® interfaces are designed to address all typical loudness problems, including audio jumps between programs and commercials, without adversely impacting the program content.

Uniquely, Grass Valley® offers two distinct automatic loudness control solutions which bring together the very best loudness technology:

- ALC with Linear Acoustic AEROMAX processing
- ALC with Grass Valley wideband audio processing

Both solutions can be used effectively to address loudness problems across multiple applications, such as broadcast playout, server ingest, production and post-production. However, the best fit solution will depend on an individual facility's particular channel mix and program dynamics, as well as the associated playout workflow and equipment.

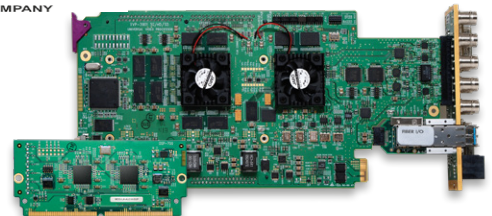
ALC Solutions Overview

ALC with Linear Acoustic Aeromax Processing

- Advanced loudness control, using proven Linear Acoustic AEROMAX multiband audio processing
- Highly flexible processing, with excellent performance with vocal tracks
- Up to 8 channels of loudness processing per submodule
- Audio processing for up to 2 programs per submodule (mono, stereo, 5.1 audio)
- Optional 2.0 to 5.1 upmixing using Linear Acoustic technology



This ALC option uses a submodule mounted on a Densité card



ALC with Grass Valley Wideband Audio Processing

- Lower cost, high-performance wideband audio processing
- Designed for easy configuration and control
- Up to 16 channels of on-board loudness processing
- Audio processing for up to 8 programs (mono, stereo, 5.1 or 7.1 audio)
- Firmware based solution leaves the submodule sockets on the host card free for other advanced processing functions
- Now supporting loudness measurements and true-peak limiter according to ITU-R BS.1770-3



This ALC option uses a firmware upgrade for a Densité card



Key Features

- Automatic loudness control option for Densité interfaces smooths out irritating loudness level differences between program segments and between different channels
- High-quality processing prevents adverse effects to program content
- Three different processing variants allow selection to best match a facility's content and workflow
- Multiband or wideband processing
- Up to 16 audio channels processing capacity
- Multiprogram support using mono, stereo, 5.1 or 7.1 audio
- "Set and forget" mode with setting of output target loudness per program
- Actively managed processing modes, with playout automation driving a bypass mode or different profiles
- Loudness monitoring according to ITU-R BS.1770
- Upmixing can be combined with ALC for optimal integration (Linear Acoustic)
- Manual remote control by GV Orbit®, iControl™ or iControl Solo PC GUI
- Now supporting loudness measurement and true-peak limiter according to ITU-R BS.1770-3

Automatic Loudness Control Using Linear Acoustic AEROMAX

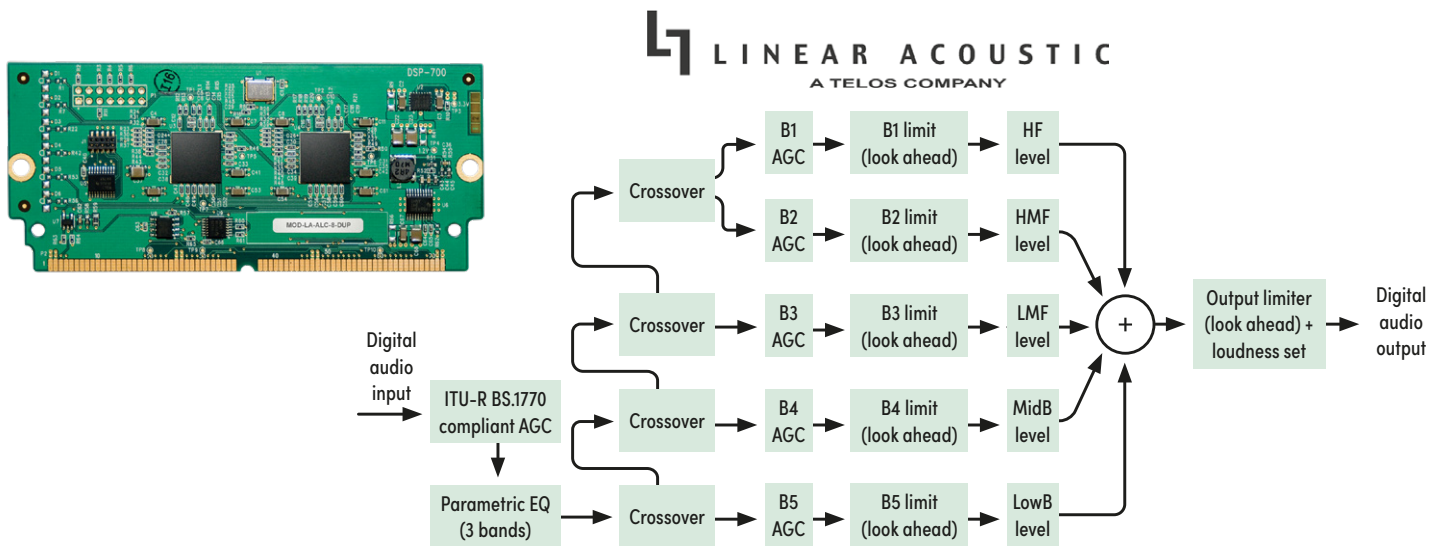
Advanced loudness control is offered by ALC with Linear Acoustic AEROMAX audio processing. It uses a third-generation audio processor to provide a simple and cost-effective solution for guarding against loudness shifts.

Multiband Architecture

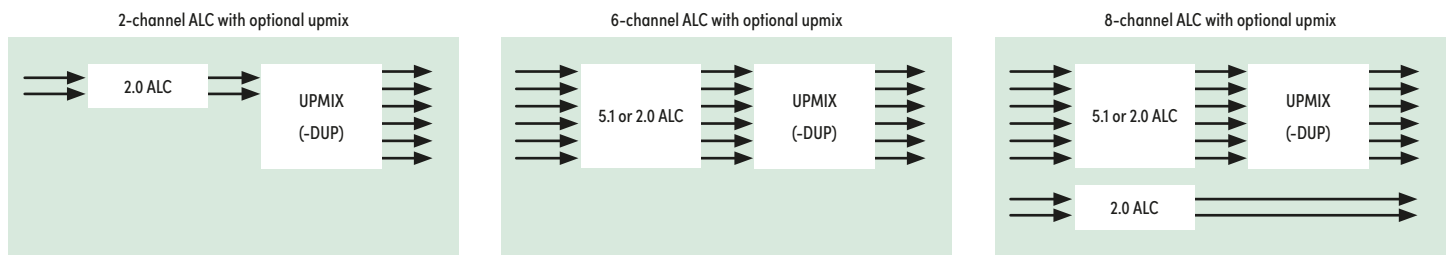
The AEROMAX algorithms use a multiband approach to loudness control. These algorithms can apply multiband,

multistage loudness control to the audio, resulting in audio free from abrupt loudness or image shifts, while preserving more of the original content than previously possible.

This version of ALC can be packaged with, or without, the Linear Acoustic upMAX upmixer on the same submodule for optimal integration.



Typical program configurations using AEROMAX



Upmixing is only available with the -DUP ordering codes.

Other channel configurations are also supported.
Please visit www.grassvalley.com for more information.

Specifications

Architecture: 8 channel multiband (5) processing
Number of programs: 1 or 2
Program configuration: 2 and/or 6 audio channels

Loudness measurement: ITU-R BS.1770
Sampling: Up to 24 bits at 48 kHz
Processing profiles: 6

Limiter set range: -6 to 0 dBFS or ± 6 dB
AGC pulling range: ± 36 dB

Ordering

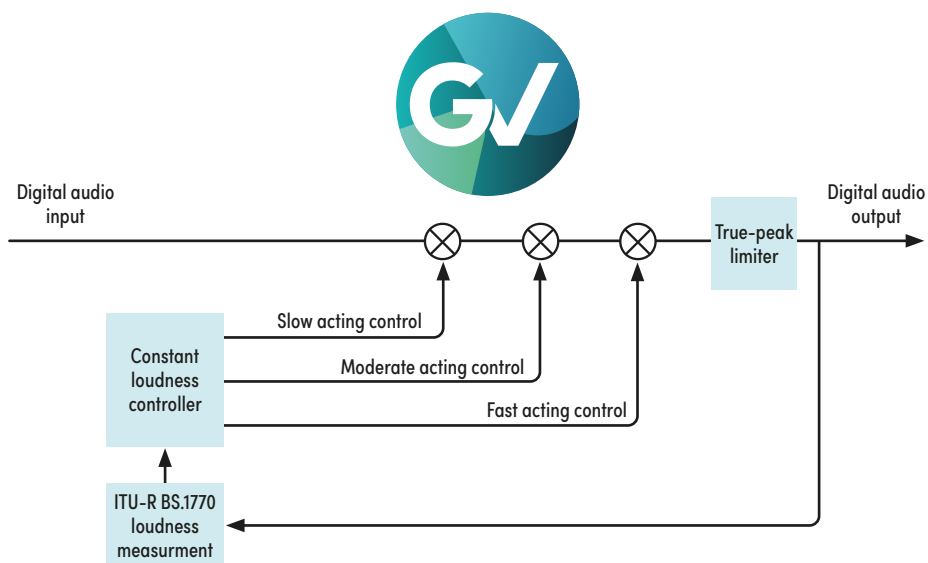
MOD-LA-ALC-2	2-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-6	6-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-8	8-channel ALC licensed by Linear Acoustic
MOD-LA-ALC-2-DUP	2-channel ALC and up mix licensed by Linear Acoustic
MOD-LA-ALC-6-DUP	6-channel ALC and up mix licensed by Linear Acoustic
MOD-LA-ALC-8-DUP	8-channel ALC and up mix licensed by Linear Acoustic

ALC with Grass Valley Wideband Audio Processing

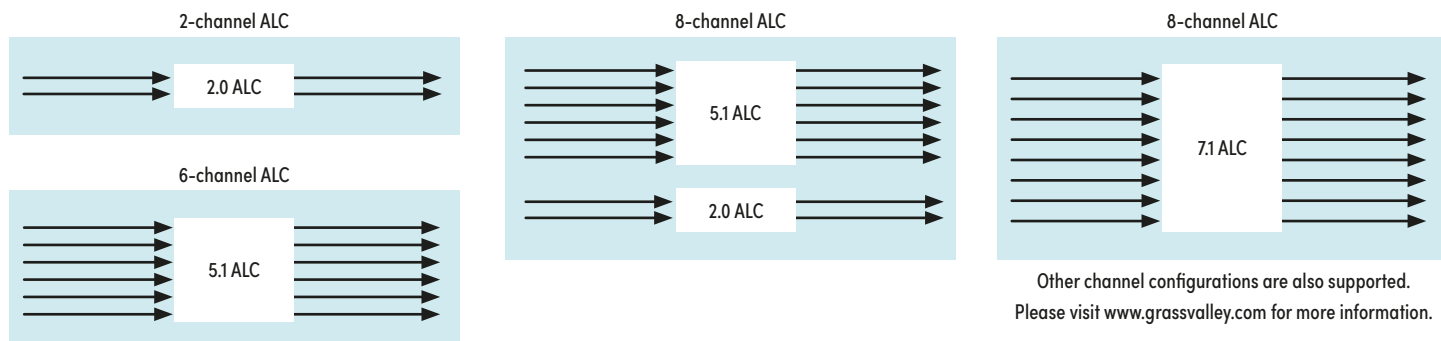
Lower cost, high-performance loudness control is provided by ALC using Grass Valley's proprietary wideband audio processing algorithms. This variant of ALC offers versatile, easily configured loudness processing, which does not adversely affect the program content.

Wideband Architecture

This ALC option uses a firmware upgrade to the hosting card. Up to eight different programs and up to 16 channels can be processed simultaneously, with independent controls and loudness meters on each program. This ALC variant leaves the submodule sockets on the host card free for other advanced processing functions.



Typical configurations



Specifications

Architecture: 16 channel wideband processing

Number of programs: Up to 8

Program configuration: 1, 2, 3, 4, 6 or 8 audio channels

Loudness measurement: ITU-R BS.1770-3

Sampling: Up to 24 bits at 48 kHz

Processing profiles: 3/5

Target loudness range: -31 to -10 LKFS

Limiter set range: -20 to dBFS true-peak

AGC pulling range: -31 to +18 dB

Pre-gain stage range: -20 to 20 dB

Segment-to-Segment: Active Loudness Control

Grass Valley’s ALC solutions can be operated in a “set-and forget” mode, with the setting of an output Target Loudness per program. This mode can achieve excellent results, and the performance can be optimized by selecting a loudness processing profile that best matches the content of the facility.

An alternative approach to loudness processing involves using playout automation to actively control

the loudness processing profile, according to the type of content. This can yield improved results when the facility uses a significant amount of programming with a controlled loudness level or a reliable Dialnorm value.

In the example below, a facility controls three different profiles by playout automation to create an optimal loudness processing result, with minimal impact to the original

program dynamics. The three different profiles provide aggressive loudness control for commercials, light processing for a movie with an uncontrolled loudness level, and a complete bypass of the ALC processing for a program with the correct loudness level or a reliable Dialnorm value. Traditionally, the most problematic content from a loudness control perspective has been commercial and promo insertions.

	Program	Promo	Movie
			
Program Segments	Program with correct loudness level or reliable Dialnorm value	Loud promo	Movie with uncontrolled loudness level
Automation Decisions	ALC is bypassed	ALC is engaged with an aggressive profile	ALC is engaged with a light profile
Effects on Original Audio	Audio remains intact with its original dynamics while the program meets station’s target loudness	Audio level matches target loudness but compression will likely affect original dynamics	Audio level matches target loudness with a slight impact on the original film audio dynamics

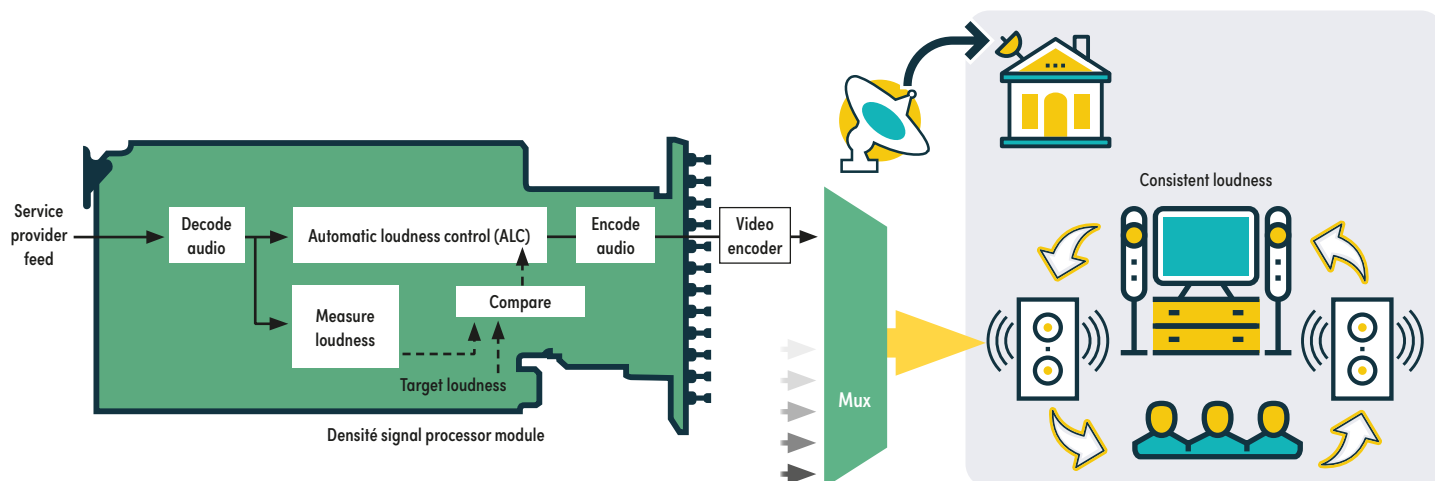
Active Control of ALC by Playout Automation

Headend Uses Decoding, ALC Audio Processing, and Re-encoding

Can fix both channel-to-channel and segment-to-segment loudness problems.

Note: This configuration is possible if the audio compression algorithm and the bit rate in use allow for an extra

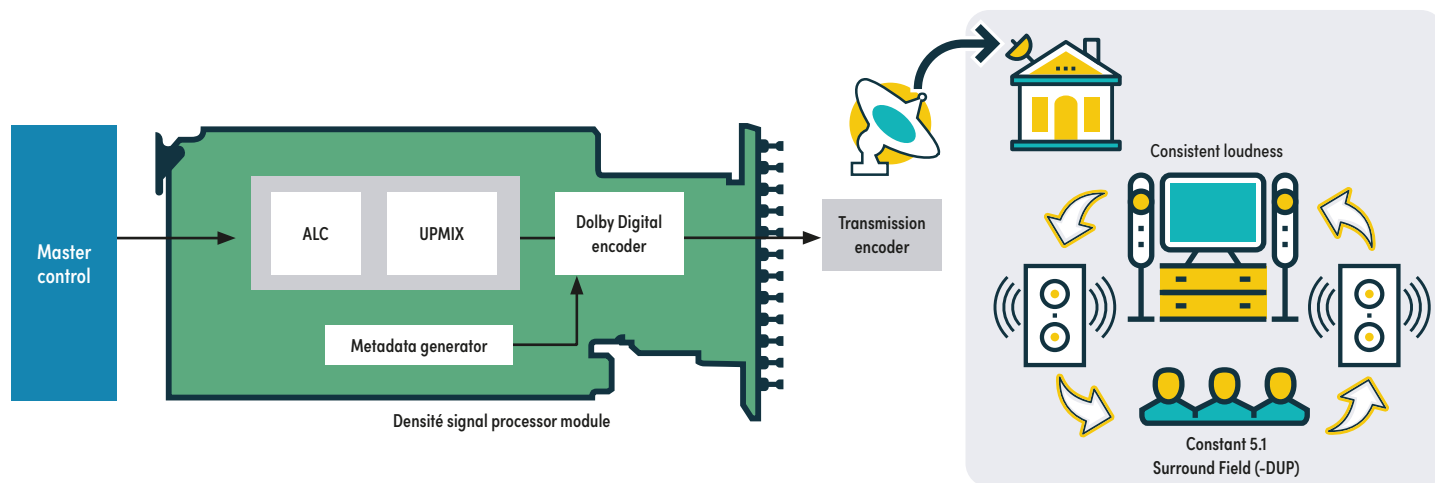
generation of encoding without creating audible artifacts when decoded at final destination.



Note: This configuration is possible if the audio compression algorithm and the bit rate in use allow for an extra generation of encoding without creating audible artifacts when decoded at final destination.

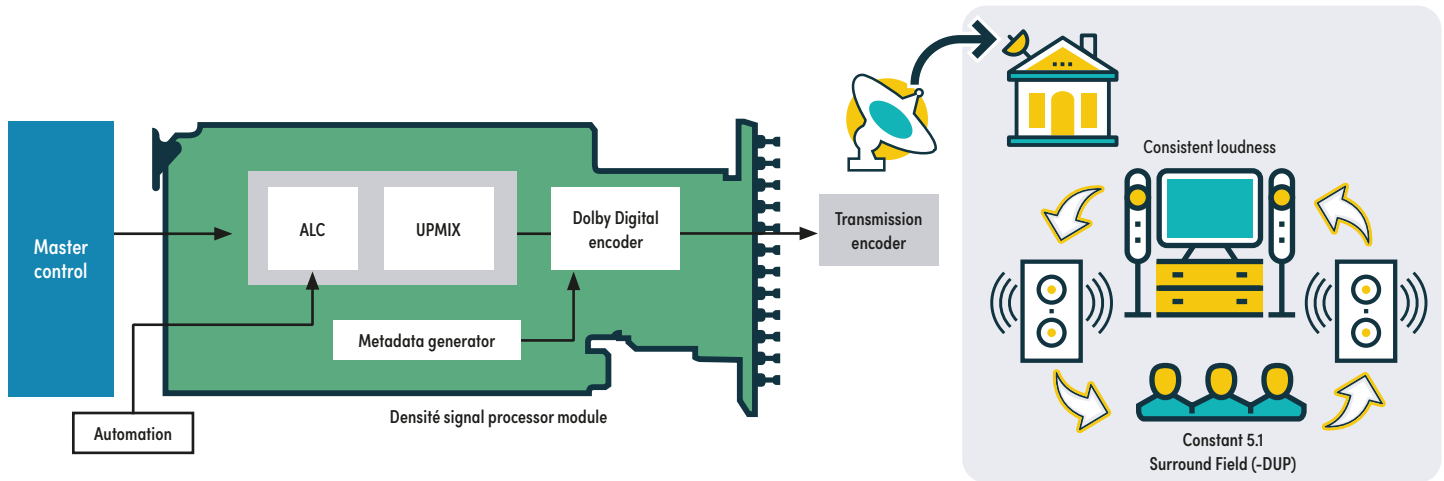
Playout using “set and forget” mode with ALC

- Output target loudness is maintained by ALC
- Loudness control can be optimized by choosing an ALC profile that best matches the facility’s content

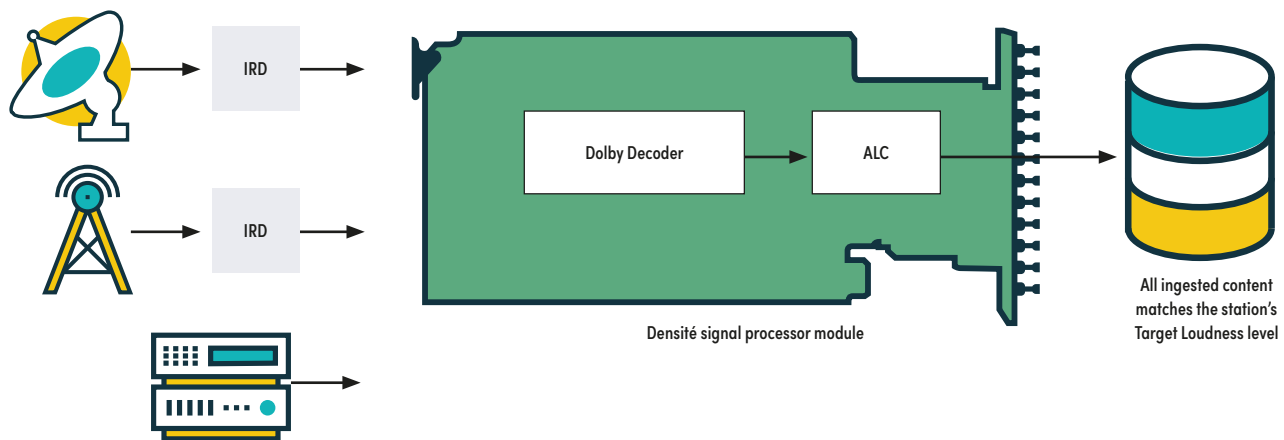


Playback using active control of ALC by automation system

- Automation triggers different ALC profiles according to the program content, driven by content tagging performed by the traffic team
- By adapting the ALC profiles to the content, there is minimal impact to original program dynamics



Dolby Decode/ALC at ingest

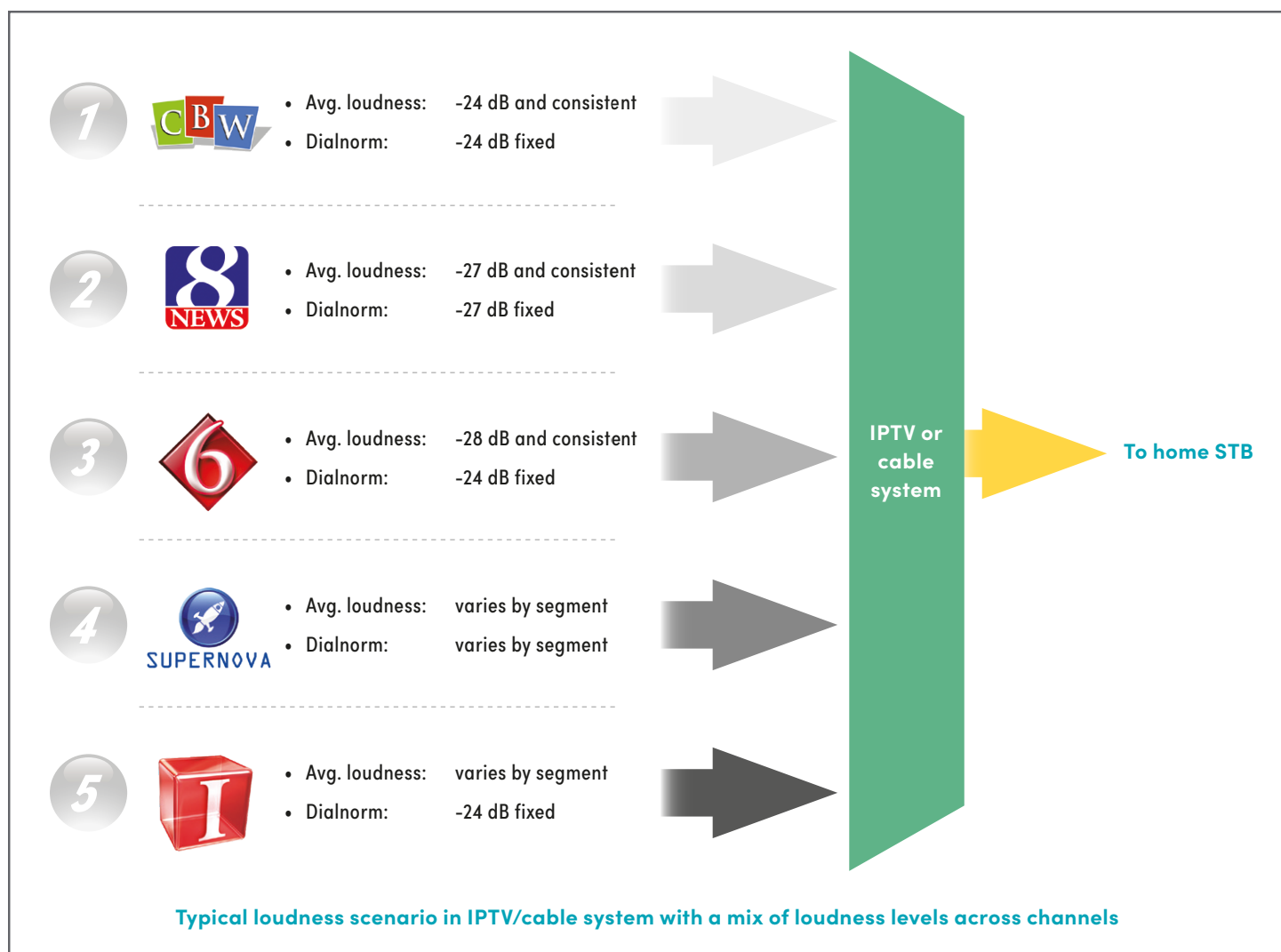


Channel-to-Channel Loudness Control: ALC at Head-ends

Channel-to-channel loudness inconsistencies are another key issue, especially for cable and IPTV service providers. It's common for viewers to experience different loudness levels as they switch between channels, and this is because the channels will have different average loudness and inconsistent Dialnorm values.

Often, the cause of this channel-to-channel loudness variation is the broadcaster's use of a default -27 dB Dialnorm value for the Dolby Digital encoder when there is significant variation in the average loudness of the program segments.

Fortunately, Grass Valley's automatic loudness control solutions can be used to address the problem by decoding and processing the audio with ALC, and then re-encoding. The Densité signal processor card can re-stamp a consistent Dialnorm value to match the target loudness value used by the ALC processor.



Specifications

Quick ALC Comparison Table



	ALC with Linear Acoustic Processing	ALC with Grass Valley Proprietary Processing
Max number of programs	2	8
Max number of channels	8	16
Number of channels/pgm	1, 2 or 6	1, 2, 3, 4, 6 or 8
Audio formats	PCM in / PCM out up to 24 bits at 48 kHz	PCM in / PCM out up to 24 bits at 48 kHz
Technology	AeroMAX, multiband	Wideband
Pulling range	±36 dB	-31 to 18 dB
Limiter range	-6 to 0 dBFS	-20 to dBFS true-peak
Embedded Upmixing option	Yes	No
Loudness Measurement methods	ITU-R BS.1770	ITU-R BS.1770-3
Profile switching (including ALC bypass) via automation/GPI	Yes	Yes
Form factor	Submodule	Software option

Ordering

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 up mix licensed by Linear Acoustic

MOD-LA-ALC-6-DUP

6-channel ALC and up mix licensed by Linear Acoustic

MOD-LA-ALC-8-DUP

8-channel ALC and up mix licensed by Linear Acoustic

ALC options for XVP-3901 up/down/crosscon- verter host module*

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

ALC options for EAP-3901 embedded audio processor*

EAP-3901-OPT-ALC-2

2-channel on-board ALC option by Grass Valley

EAP-3901-OPT-ALC-6

6-channel on-board ALC option by Grass Valley

EAP-3901-OPT-ALC-8

8-channel on-board ALC option by Grass Valley

EAP-3901-OPT-ALC-16

16-channel on-board ALC option by Grass Valley

ALC options for HCO-3901 change-over

HCO-3901-OPT-ALC-2

2-channel on-board ALC option by Grass Valley

HCO-3901-OPT-ALC-6

6-channel on-board ALC option by Grass Valley

HCO-3901-OPT-ALC-8

8-channel on-board ALC option by Grass Valley

HCO-3901-OPT-ALC-16

16-channel on-board ALC option by Grass Valley

MOD-LA-DUP-701

Upmixing using Linear Acoustic Technology upMAX

* If upmixing is required, it can be done on separate sub-module.

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