Grass Valley®
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DATASHEET

FRS-3901

3G/HD/SD Frame Synchronizer with Embedded Audio Processor

Space-saving, modular platform for advanced signal processing.

The FRS-3901 from Grass Valley® is a highly integrated module which offers frame synchronization and video/audio processing, including color correction and delay, for 3G, HD and SD signals in 3G/HD/SD hybrid plants. The FRS-3901 features an advanced embedded audio processor which can simultaneously process up to 32 channels of audio (16 channels of embedded audio from the video plus others generated internally). Functions include downmixing, proc amp, channel shuffling and 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 legislations around the world.

The FRS-3901 has one on-board socket for optional modules, including Dolby E and Dolby Digital decoding, upmixing using Linear Acoustic upMAX technology, Dolby E encoding, Dolby Digital and Dolby Digital Plus encoding. In addition

to Grass Valley's own automatic loudness control (ALC) solution for up to eight programs, the AMX-3981 offers ALC using the AEROMAX technology module 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 FRS-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.
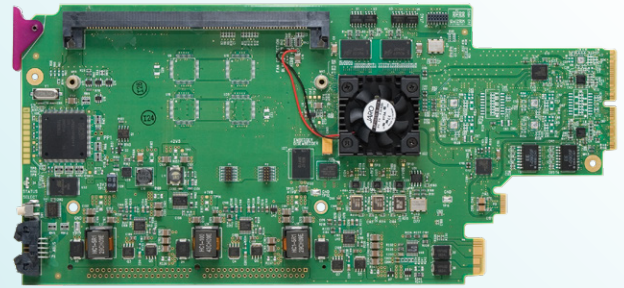
The card has a frame buffer which allows an increase in the video delay of up to 15 frames to compensate for the long audio processing delay required by some modules.

The FRS-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 FRS-3901-3SRP-R rear module has a bypass relay that can be used to bypass the main input directly to the output in the event of card failure, loss of power or card removal.

The FRS‑3901‑3SRP‑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 FRS‑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.

Key Features

Video

- 3G/HD/SD frame synchronizer, delay and line sync
- Supports 3 Gb/s level A (mapping 1) and level B
- Flexible HD/SD/URS reference input
- Video delay up to 15 frames
- 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
- Built-in proc amp with YUV/RGB color correction
- Bypass relay with FRS‑3901‑3SRP‑R rear module
- Optional optical fiber module I/O with FRS‑3901‑3SRP‑F rear

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 inputs and outputs 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
- Audio 5.1 surround downmix to Lt/Rt or Lo/Ro

- 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)
- Automation capabilities based on audio signal type detection
- 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
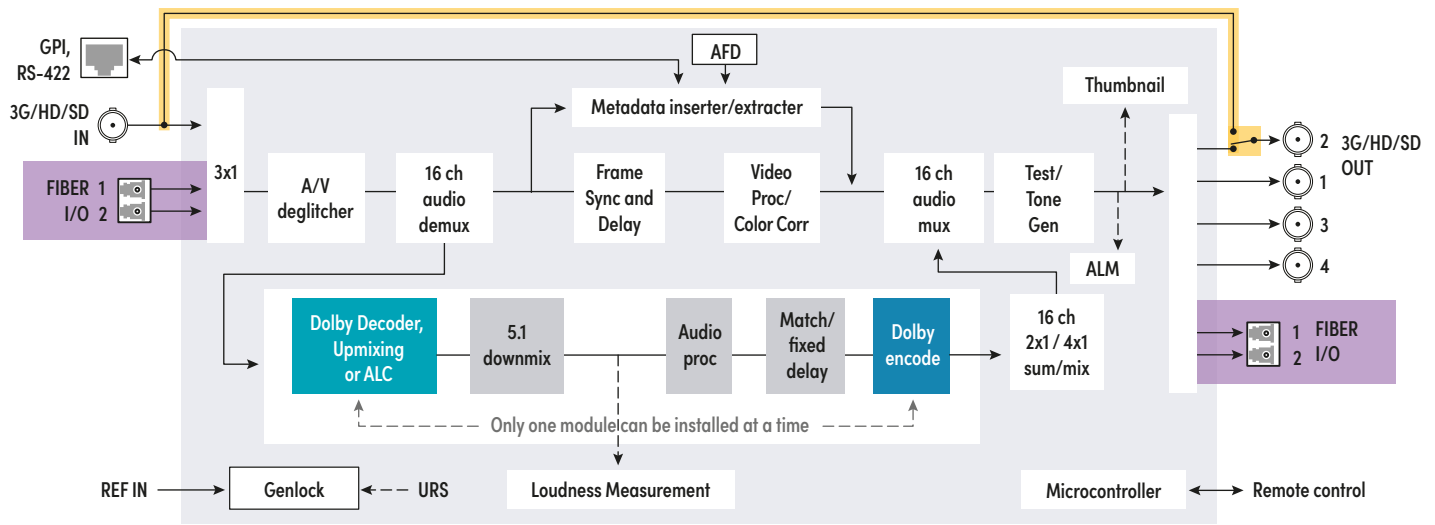
FRS-3901 Functional Block Diagram

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

Optical

Signal: Refer to SFP module specifications

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: 1 frame
Additional delay: Up to 15 frames upon user selection

Audio Processing Performance

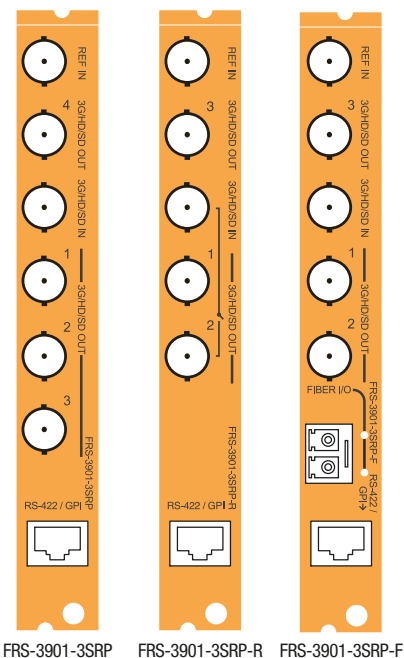**Quantization:** 24 bits
Sampling: 48 kHz, synchronous
Audio delay: Up to 2s (1 ms steps)

Electrical

Power: 12.5W

* Cable length and return loss specifications will be reduced when using the FRS-3901-3SRP-R rear connector. Refer to the manual for more details.

FRS-3901-3SRP   FRS-3901-3SRP-R   FRS-3901-3SRP-F

Ordering

Densité 3 frame	Description
FRS-3901	3G/HD/SD frame synchronizer with embedded audio processor
FRS-3901-3SRP	Single rear connector panel
FRS-3901-3SRP-F	Single rear connector panel with fiber connector
FRS-3901-3SRP-R	Single rear connector panel with bypass relay
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

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
Housing Frame	Densité 3 Frame
Remote Control	GV Orbit, iControl, iControl Solo