

Densité 12G-SDI Modules

This lineup offers advanced tools for embedding, switching, and distributing high-quality signals across 12G/3G/HD environments.

MDX-3901

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

HCO-3931

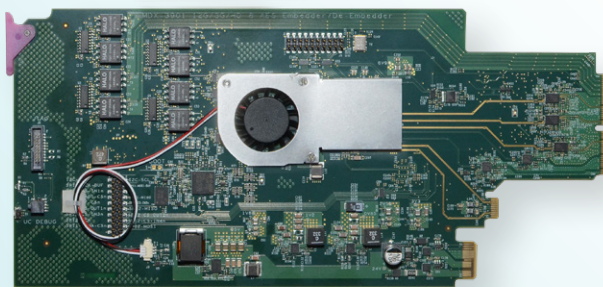
12G/3G/HD Changeover with Clean Switch and Automatic Loudness Control

HDA-3962

Single/Dual 12G/3G/HD/SD-SDI Distribution Amplifier (DA) with Optional Fiber Connectivity and 12G Relay Input Bypass

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.

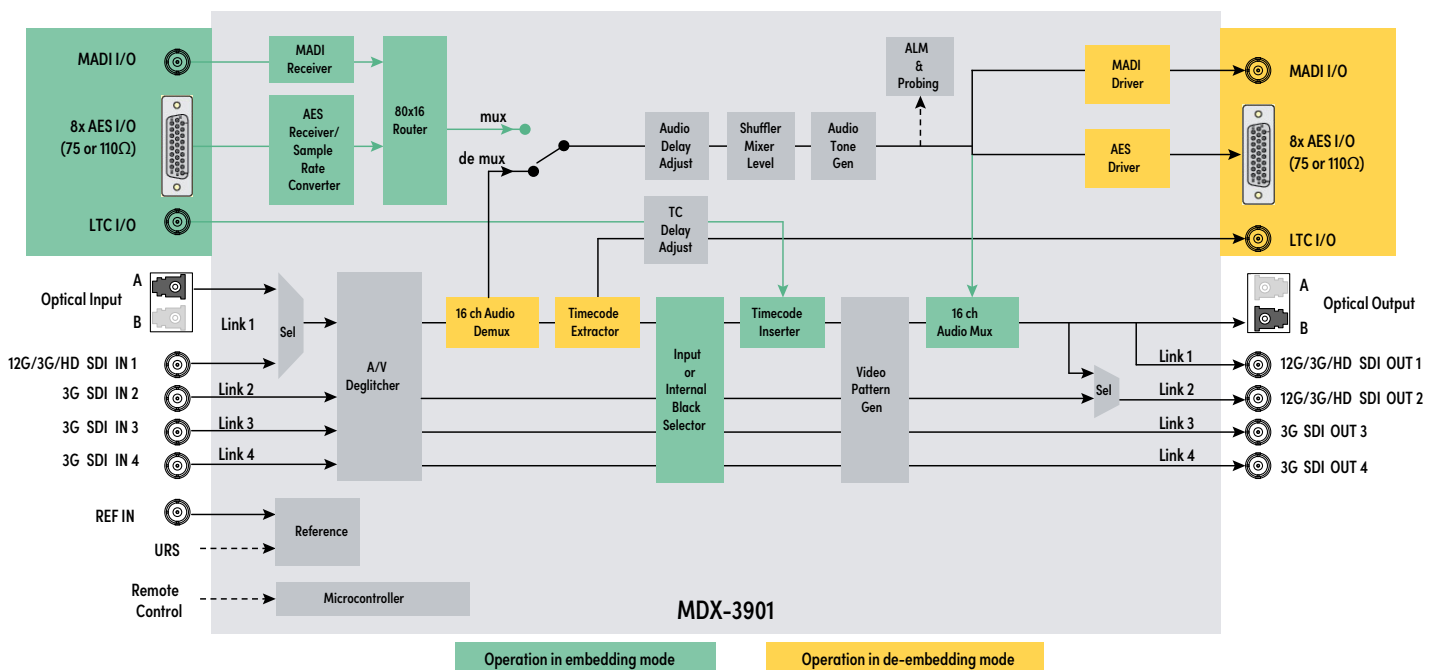
When configured as a de-embedder, the MDX-3901 can simultaneously process up to 16 channels of audio from the embedded SDI input. Functions include channel shuffling, mixing and probing. Each channel can be delayed independently to correct any lip sync issues. All audio channels can be mixed and shuffled 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:

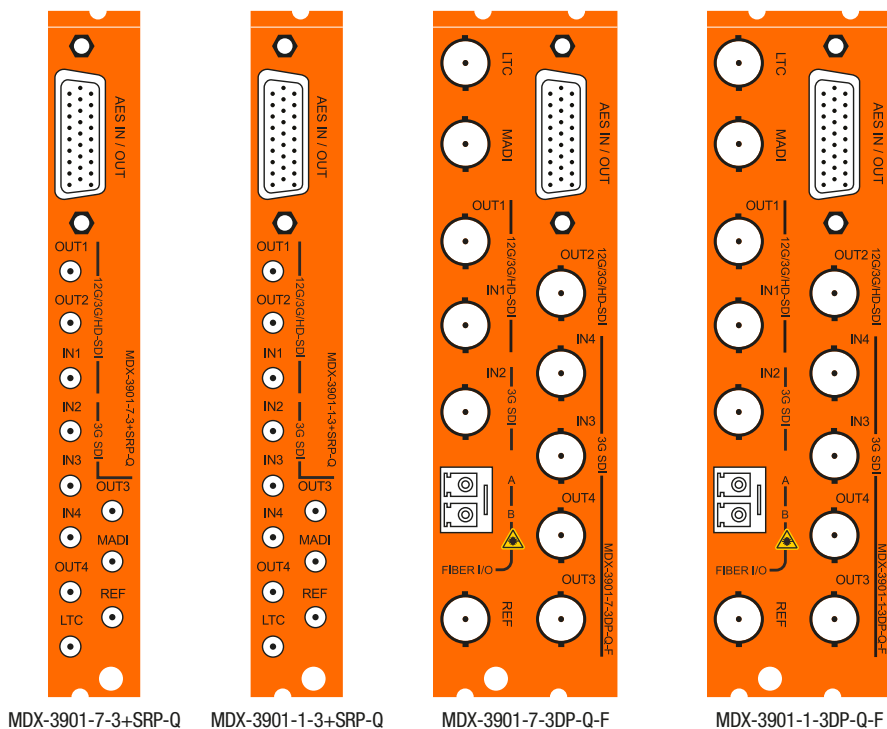
- Embedder: 2.27 ms w/SRC, 1.27 ms SRC off
- De-embedder: 1.83 ms

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

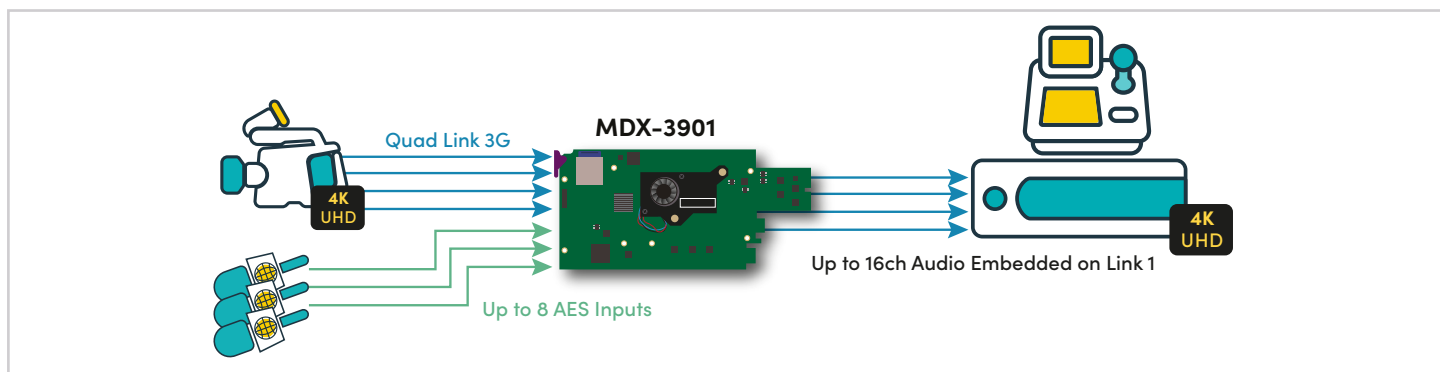
Terminal block adapter for HD-26 connections

Remote Control

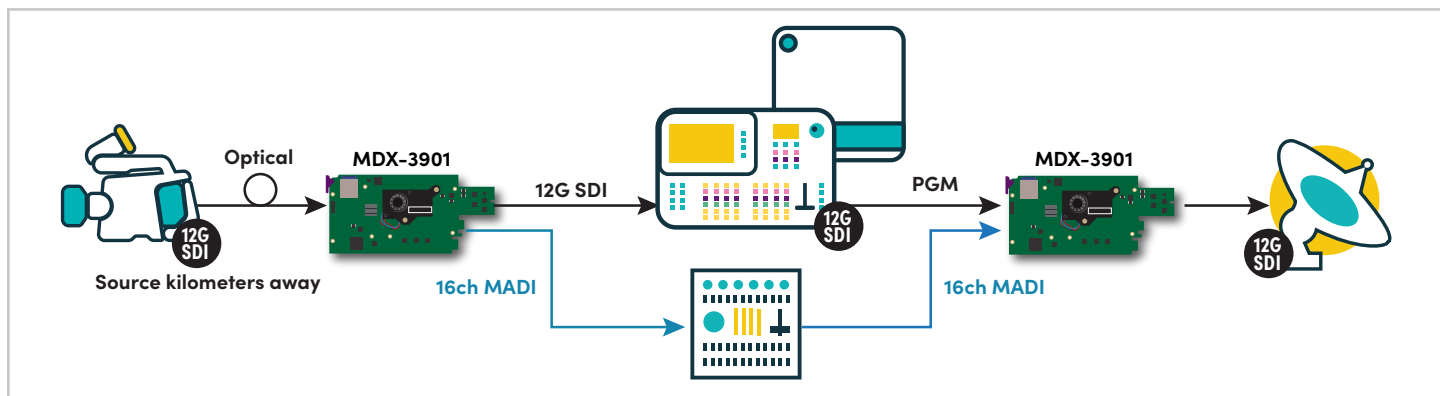
GV Orbit, iControl or iControl Solo (version 7.10 or higher required)

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

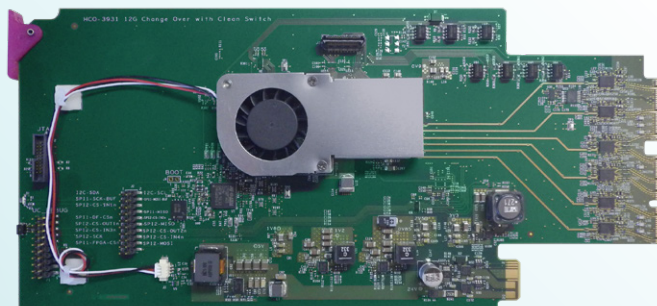
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HCO-3931

12G/3G/HD Change-over with Clean Switch and Automatic Loudness Control



Space-saving, modular platform for advanced signal processing.

The HCO-3931 from Grass Valley® is a 4x1 12G/3G/HD SDI change-over that supports 16 channels of embedded audio and metadata. The module can perform a video and audio “clean and quiet switch” between sources. In the event of a power failure, the PGM signal is protected by a bypass circuit fitted on the rear module, maintaining the integrity of the selected MAIN or BACKUP signals at the output, and it is fully controllable via GPI. Two rear modules are available with different bypass circuits, the HCO-3931-3DRP-H offers an active bypass that retains PGM signals for at least 48 hours while the HCO-3931-3TRP-HR uses 12G SDI rated bypass relays for extended protection.

At the core of the HCO-3931 versatility, a powerful automatic mode rules engine takes the guesswork out of establishing which

input will be routed to the outputs. By simply selecting which signal analysis probes to enable, configuring the severity of each probe’s impact and optionally removing one or both Emergency inputs from the rules engine’s consideration, you effectively instruct the card how to compute the relative health of each input based on its weight and the probes statuses. This in turn enables you to effortlessly create a wide variety of failover mechanisms.

Change-over between inputs selection can also be performed manually, where any four sources can be selected from the Densité® controller, GV Orbit® software, or simply by using a GPI. A GPI can be connected to an automation system or any simple GPI control panel. The GPI outputs give the status of the selected source, allowing tallies to be triggered.

The HCO-3931 provides two 12G/3G/HD outputs: Program (PGM) and Preview (PVW). Each output is available on two connectors (signal copy). The PVW output is user selectable to follow the main PGM output or any of four video inputs.

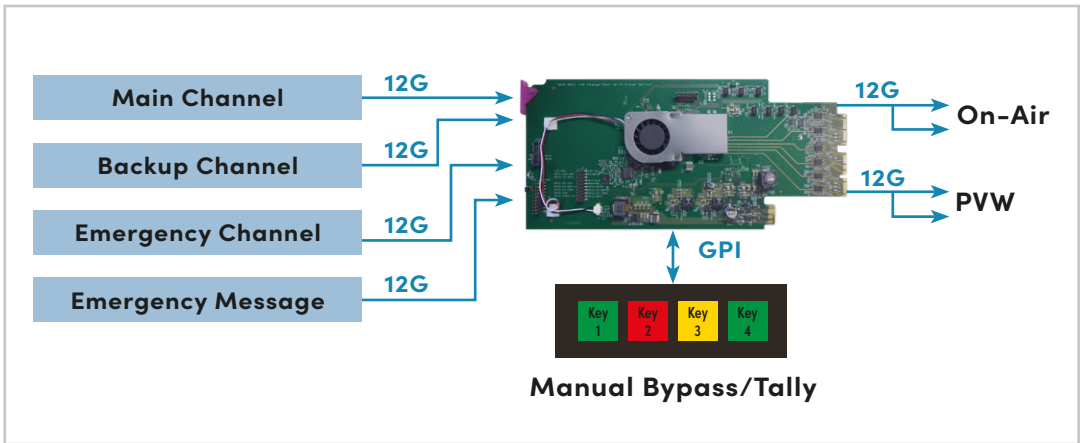
Grass Valley’s next generation 16-channel automatic loudness control (ALC) option, HCO-3931-OPT-ALC, can eliminate objectionable loudness variations between programs and commercials even better than with previous ALC versions, thanks to the addition of an independent dynamic stage consisting of a fully configurable input compressor and a new true peak output limiter with 1 ms buffer protection.

The HCO-3931 targets emerging needs to provide changeover with clean switch and optional Automatic Loudness Control for single-stream 4K UHD signals using 12G SDI. The HCO-3931 is designed for a wide range of applications where bullet-proof mission critical signal distribution is required for OB trucks, production studios and playout facilities as shown here:

Configurable Probes

Video	
No Video	✓
Video Reference Mismatch	✓
Video Format Mismatch	✓
Video Error	✓
Black Detect	✓
Freeze Detect	✓
Audio	
Silence Detect (per channel)	✓
Audio Presence (per group)	✓

Bullet-proof On-air Protection



This new Densité module fully complements our line-up of 12G SDI products such as the HDA-3962 single/dual 12G DA with optional fiber connectivity, MDX-3901 12G 16 audio channel AES/MADI embedder/de-embedder, XIP-3901 SDI/IP agile processing platform and our other Grass Valley products.

Based on the proven Densité modular framework of over 100 cards, the flexible, space-efficient HCO-3931 is a 3 RU card and is available with a two or three slots rear module. With flexibility to configure up to 12 HCO-3931 change-over cards per Densité 3+ FR4 frame with the two-slot rear module, the Densité platform scales to a density of twelve

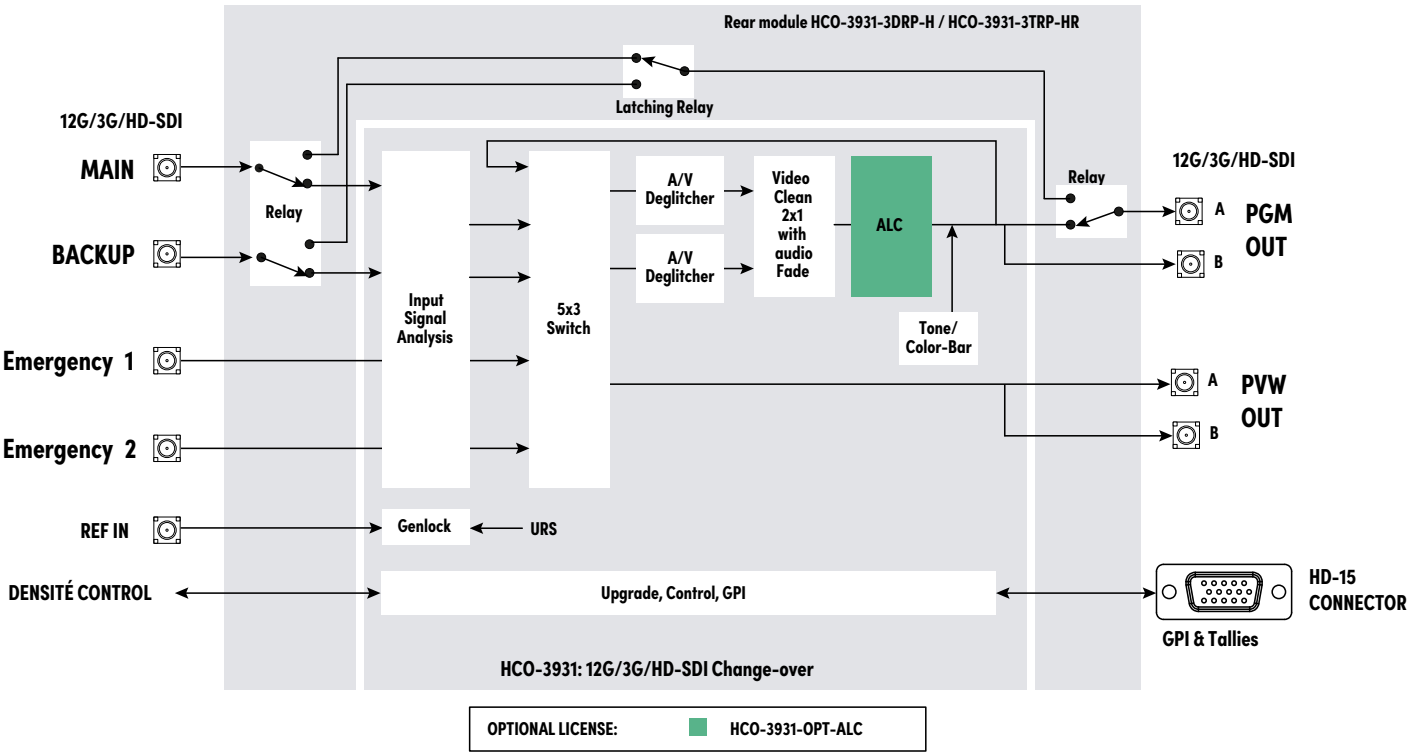
12G SDI change-over modules in a 4 RU frame. This means space- and cost-efficient scaling for today and tomorrow.

The HCO-3931 is configured, controlled and monitored by GV Orbit from Grass Valley. It can also be configured and controlled from iControl™ systems.

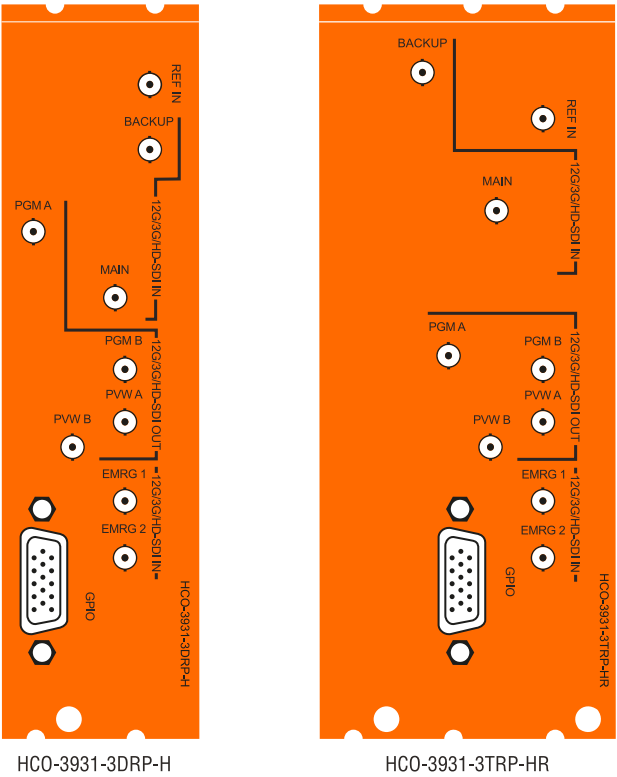
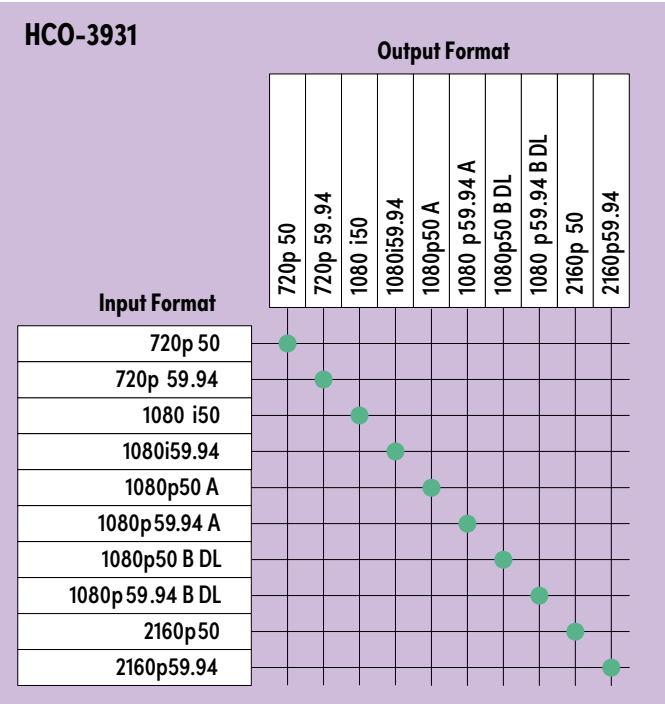
Key Features

- 12G/3G/HD SDI input/output
- Main, Backup and two Emergency inputs
- On-Air Program and Preview outputs with two connectors each (signal copy)
- Choice of external or frame URS reference input
- Audio/video de-glitcher to handle video hot switch on every input
- Clean and quiet switch function of video and 16 channels of audio on Program output
- Optional 16-channel Automatic Loudness Control
- GPI – based inputs selection and tallies
- Electronic switching with two rear panels that maintain selected input upon power loss for Primary Main and Backup inputs:
 - HCO-3931-3TRP-HR triple rear with relay backups
 - HCO-3931-3DRP-H double rear with active bypass for a minimum of 48 hours of protection from a power loss
- Automatic change-over mode using internal signal analysis with configurable probes for all inputs
- Manual change-over by local frame controller, GV Orbit or GPI
- Configuration, control, monitoring and alarm reporting via GV Orbit Network Orchestration solution

HCO-3931 Functional Diagram



Supported Video Resolutions



Specifications

SDI (Inputs/Outputs)

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

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
- 12G: SMPTE ST 2082-10: 2160p59.94, 2160p50

Cable length (Belden 1694A):

- HD: 180m (590 ft.) at 1.485 Gb/s
- 3G: 100m (328 ft) at 2.970 Gb/s

Cable length (Belden 4794R):

- 12G: 30m (98 ft.) at 11.88 Gb/s

Reference Input

Physical: 1 HD-BNC connector

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

Return loss: >35 dB up to 5.75 MHz

GPI (10)

Connector: HD-15, opto-isolated, common ground

GPI IN (5): Contact closure to ground

GPI OUT (5): Contact closure to ground

External pull up voltage: 3.3V to 24V max.

External GPI power: 5V nominal

Video Processing Performance

Signal path: 10 bits

Latency:

- 0.5 lines without Clean Switch and ALC enabled
- Maximum of 2.5 lines with Clean Switch or ALC enabled

Audio Processing Performance

Quantization: 20–24 bits

Sampling: 48 kHz, synchronous

Number of channels: 16, 4 groups

Audio latency:

- 1.8 ms without Clean Switch and ALC enabled
- Add 42 μ s if Clean Switch is enabled
- Add 21 μ s if ALC is enabled

Electrical

Power: 15W maximum

NOTE: Cable length specifications are for worst case scenario when outputs are protected by the active bypass or relay, refer to the manual for more details.

Ordering

HCO-3931

12G/3G/HD Change-over with Clean Switch

HCO-3931-3DRP-H

Double rear panel active bypass HD-BNC. Active bypass offers a minimum of 48 hours of protection from a power loss

HCO-3931-3TRP-HR

Triple rear panel bypass relays HD-BNC. Bypass relay offers persistent passive protection from a power loss

Software Options

HCO-3931-OPT-ALC

16-channel on-board Audio Loudness Control option

Hardware Options

NSH15M

HD-15 to terminal block adapter

Remote Control

GV Orbit version 1.2 or higher, iControl or iControl Solo (version 7.50 or higher required)

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

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DENSITÉ HDA-3962

Single/Dual 12G/3G/HD/SD-SDI Distribution Amplifier (DA) with Optional Fiber Connectivity and 12G Relay Input Bypass

Single and dual channel distribution for 12G/3G/HD/SD-SDI signals.

The HDA-3962 from Grass Valley® provides single and dual channel distribution for 12G/3G/HD/SD-SDI signals with flexible routing of inputs to outputs. Flexible output selection enables the HDA-3962 to be used either as a single channel DA with up to 10 outputs, or in dual channel mode with up to five outputs per input.

The HDA-3962 provides up to ten reclocked outputs with automatic equalization for up to 60 meters (197 feet) of cable using Belden 4794R at 12 Gb/s, and 100m (328 feet) at 3 Gb/s and up to 150 meters (492 feet) at 1.5 Gb/s using Belden 1694A cable.

The HDA-396N-3SRP-HF rear offers fiber connectivity, making it ideal for longer cable lengths. The HDA-3962

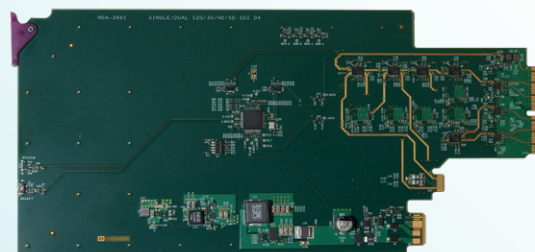
provides a user-configurable fiber optic transceiver for bidirectional conversion of 12G, 3G, HD and SD-SDI signals to 1310 nm optical signals. Ideal for mixed coax and fiber workflows, the HDA-3962 allows users to configure the inputs and outputs to match their infrastructure needs.

The HDA-3962-3DRP-HR rear provides a 12G relay input bypass feature, ideal for signal protection in critical applications.

Based on the proven Densité® modular framework of over 100 functional cards, the HDA-3962 provides a space-efficient signal distribution solution. With the flexibility to configure up to 20 HDA-3962 module per Densité 3 frame,

with each module carrying 12 12G single outputs or six 12G dual outputs, this platform scales to a density of 240 12G signals in a 3 RU frame. The HDA-3962 also support the Densité 3+ FR1 frame with four modules in 1 RU, the Densité 3+ FR4 frame with 24 modules in 4 RU and the Densité 3 mini frame with two modules in 1/2 RU.

The HDA-3962 can be configured and monitored by the proven GV Orbit® Network Orchestration solution.



Key Features

- Single/dual 12G/3G/HD/SD-SDI inputs
- Flexible selection of inputs allows single or dual channel operation on some rear panels
- Supports bitrates up to 11.88 Gb/s
- Automatic format detection and cable equalization
- Up to 10 12G/3G/HD/SD-SDI with one bypass HD-BNC outputs on the HDA-3962-3DRP-HR rear
- Up to 7 12G/3G/HD/SD-SDI BNC outputs on the HDA-396N-3SRP rear
- Up to 6 12G/3G/HD/SD-SDI BNC outputs on the HDA-396N-3SRP-2IN rear
- Up to 10 12G/3G/HD/SD-SDI HD-BNC outputs on the HDA-396N-3SRP-HF rear
- Optional fiber I/O on the HDA-396N-3SRP-HF rear

Specifications

Electrical Inputs and Outputs

Physical:

8 BNC Connectors:

- 1 in, 7 out (HDA-396N-3SRP)
- 2 in, 6 out (HDA-396N-3SRP-2IN)

12 HD-BNC Connectors:

- 2 in, 10 out (HDA-396N-3SRP-HF)
- 1 in, 10 out with relay bypass for in 1 to out 1 (HDA-3962-3DRP-HR)

SDI standards:

- 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)
- SMPTE ST 2082-1:2015 (2.970, 2.970/1.001 Gb/s)

Cable length (Belden 1694A cable):

- 365m (1197 ft.) at 270 Mb/s
- 150m (492 ft.) at 1.485 Gb/s
- 100m (328 ft.) at 2.970 Gb/s

Cable length (Belden 4794R cable):

- 60m (197 ft.) at 11.88 Gb/s

Return loss:

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

Jitter (wideband): <0.2 UI p-p

Rise/fall time:

- <135 ps, 20% to 80%, for HD and 3G
- 400-800 ps, 20% to 80%, for SD

Processing Performance

Processing delay: 7 ns typical

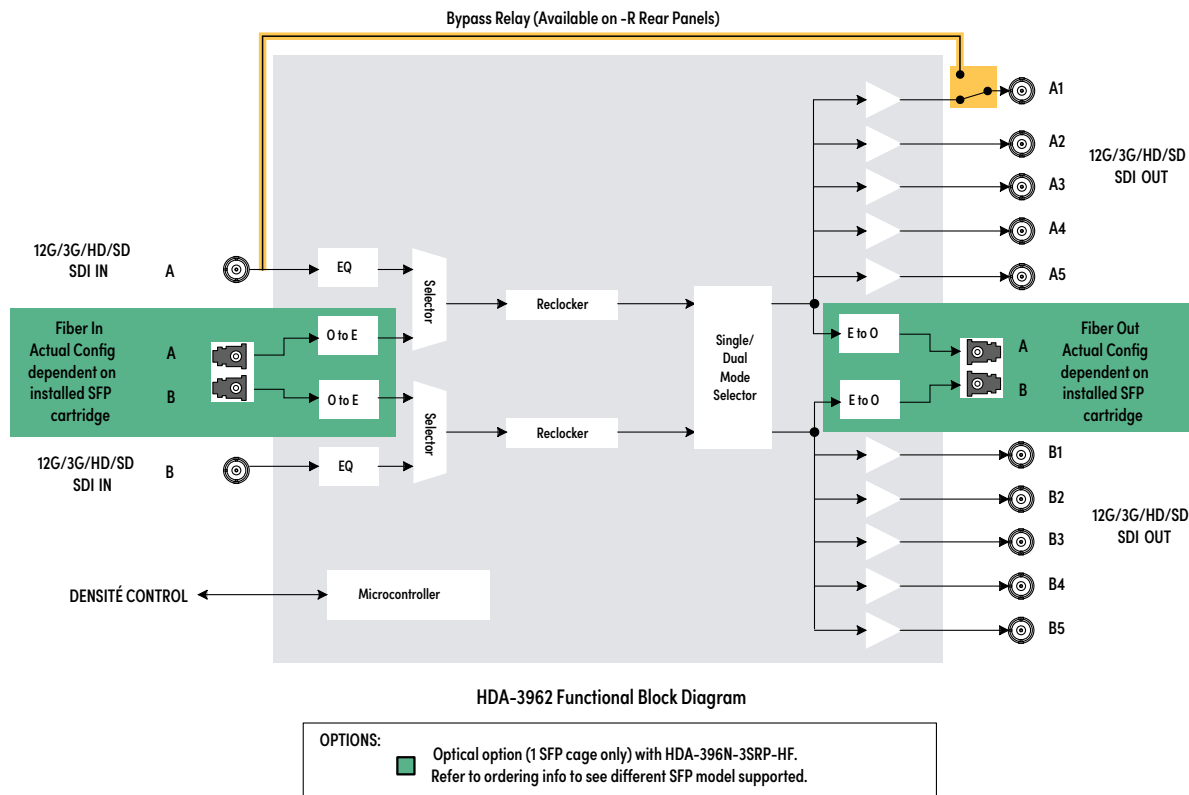
Electrical

Power: less than 12.5W max

NOTE: When using a rear panel that is equipped with a bypass relay (model: HDA-3962-3DRP-HR), performance will be reduced for equipment connected to the output protected by the bypass relay (Output 1).

The total cable length of the bypass relay protected path must not be greater than the maximum input cable length requirement of the receiving equipment. For this, add the cable length of the equipment connected to the card's input to the cable length of the receiving equipment connected to the output protected by the bypass relay.

The return loss specifications of the bypass relay protected path will be reduced as it depends on the return loss of the receiving equipment connected to the output protected by the bypass relay.



Ordering

Densité 3 Frame

HDA-3962

Single/dual 12G SDI distribution amplifier with EQ and reclocking

HDA-396N-3SRP

Single rear panel with single 1x7 BNCs

HDA-396N-3SRP-2IN

Single rear panel with single 1x6 or dual 1x3 BNCs

HDA-396N-3SRP-HF

Single rear panel with single 1x10 or dual 1x5 HD-BNC with fiber option support

HDA-3962-3DRP-HR

Double rear panel with single 1x10 HD-BNC with relay bypass support on output 1

Fiber Options

SFP-U-R-LC

12G Single RX Fiber with LC/PC

SFP-U-RR-LC

12G Dual Rx Fiber with LC/PC

SFP-U-RT-S13-LC

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

SFP-U-T-S13-LC

12G Single Tx Fiber 1310 nm with LC/PC

SFP-U-TT-S13S13-LC

12G Dual Tx Fiber 1310 nm with LC/PC

SFP-R-LC

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

SFP-RR-LC

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

SFP-T-S13-LC

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

SFP-TT-S13S13-LC

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

SFP-RT-S13-LC

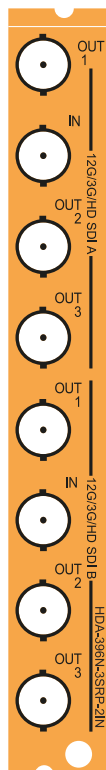
Dual fiber Rx/Tx (input/output) cartridge 1310 nm with LC/PC connector

NOTE: The HDA-3962 can also make use of SFP optical plug-in cartridges from the WDM and CWDM series. Other types of SFP optical plug-in cartridges may be available.

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



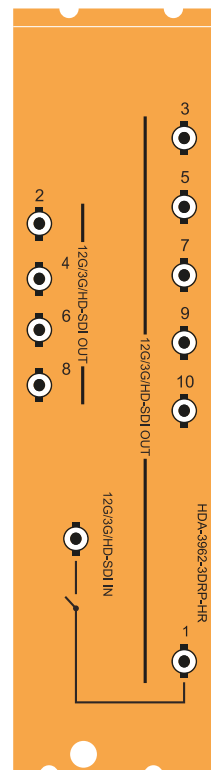
HDA-396N-3SRP



HDA-396N-3SRP-2IN



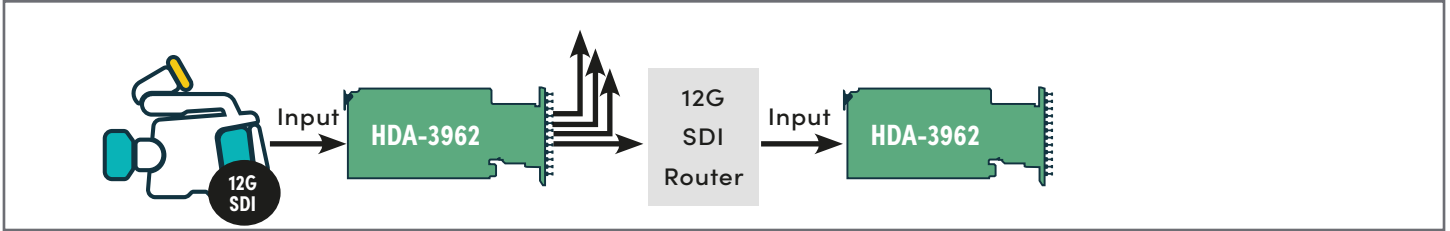
HDA-396N-3SRP-HF



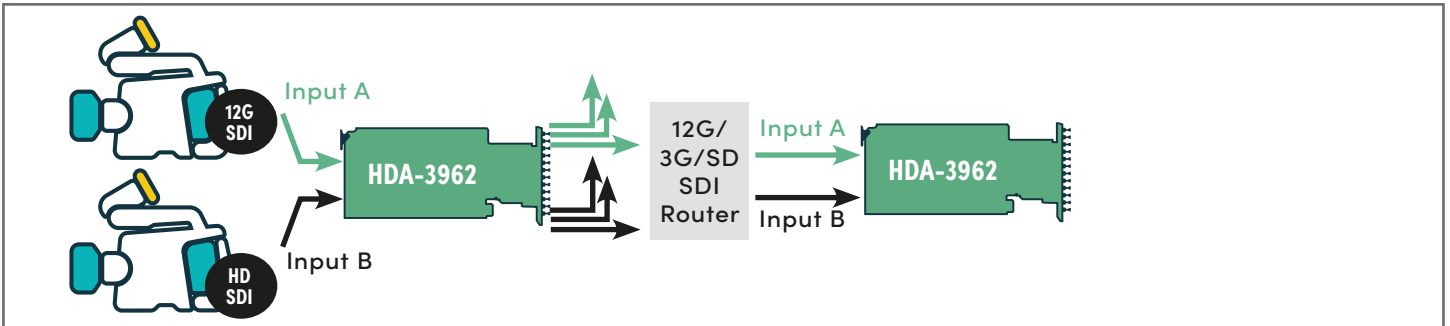
HDA-3962-3DRP-HR

Typical Applications

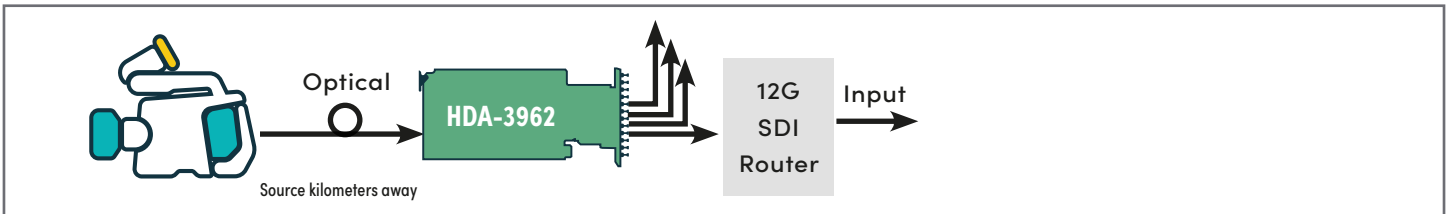
1) Simple router fan-in/fan-out application



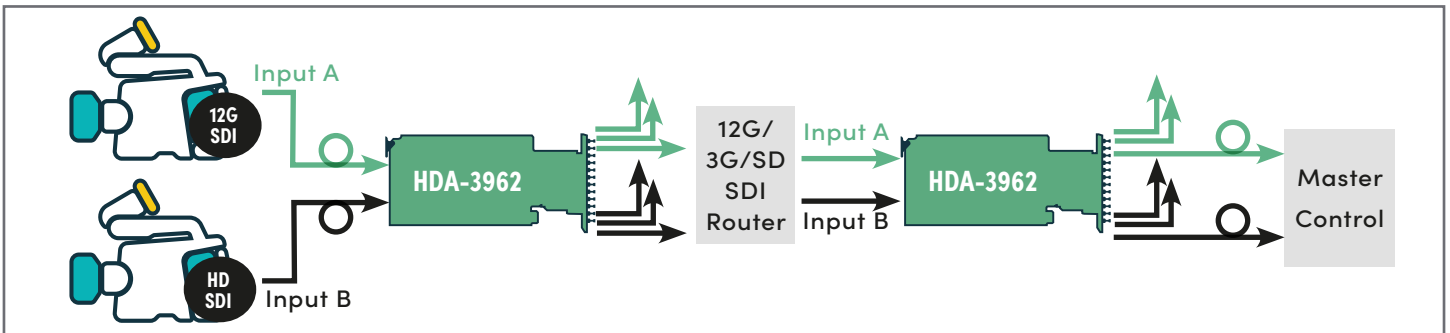
2) Dual channel, dual format multiformat fan-in/fan-out application



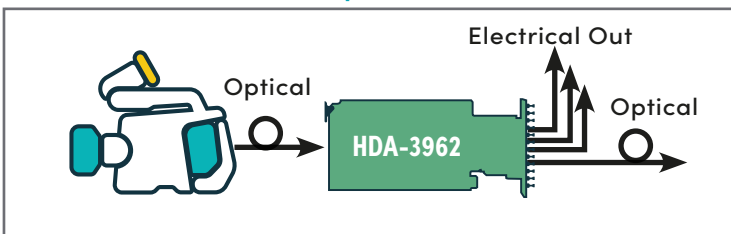
3) Simple channel fiber optic long distance router fan-in/fan-out



4) Dual channel fiber optic long distance router fan-in/fan-out



5) Fiber-to-fiber with electrical drop-down



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

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