

Densité Signal Change-Over

The Densité series offers robust signal change-over tools designed for seamless switching and routing in demanding broadcast environments, these solutions deliver reliability, flexibility, and high performance for smooth signal management in live and critical workflows.

HCO-3931

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

HCO-3901 & HCO-3901-4K

3G/HD/SD/ASI and 4K UHD Change-Over with Clean Switch and ALC

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.

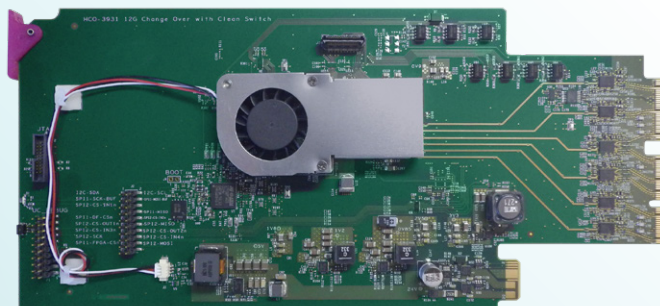
At the core of the HCO-3931 versatility, a powerful automatic mode rules engine takes the guesswork out of establishing which

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.

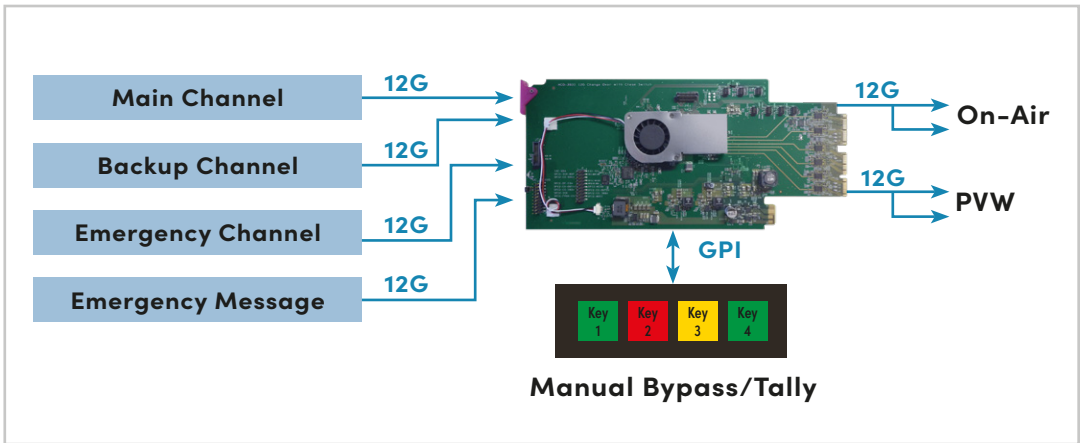


The HCO-3931 targets emerging needs to provide changeover with clean switch and optional Automatic Loudness Control for single-stream 4K UHD signals using 12G SDI. The HCO-3931 is designed for a wide range of applications where bullet-proof mission critical signal distribution is required for OB trucks,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

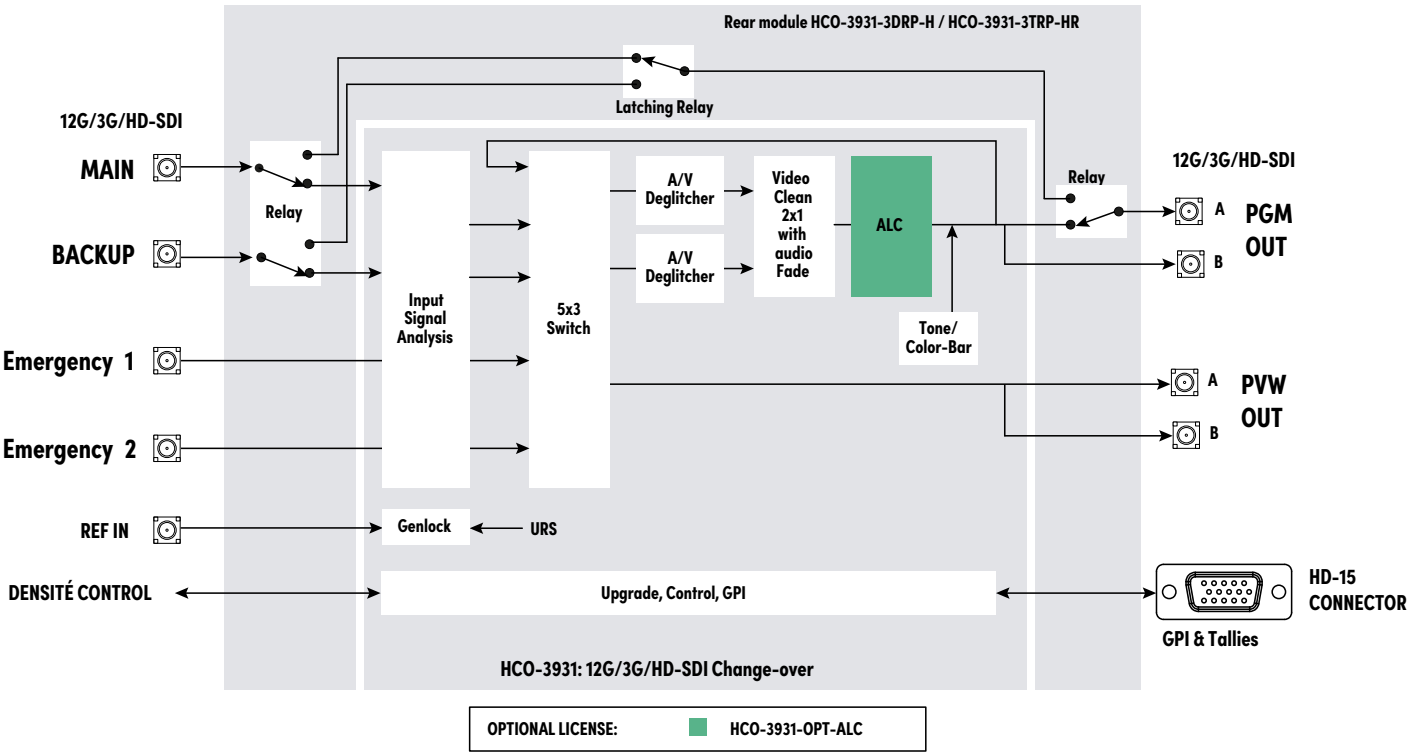
12G SDI change-over modules in a 4 RU frame. This means space- and cost-efficient scaling for today and tomorrow.

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

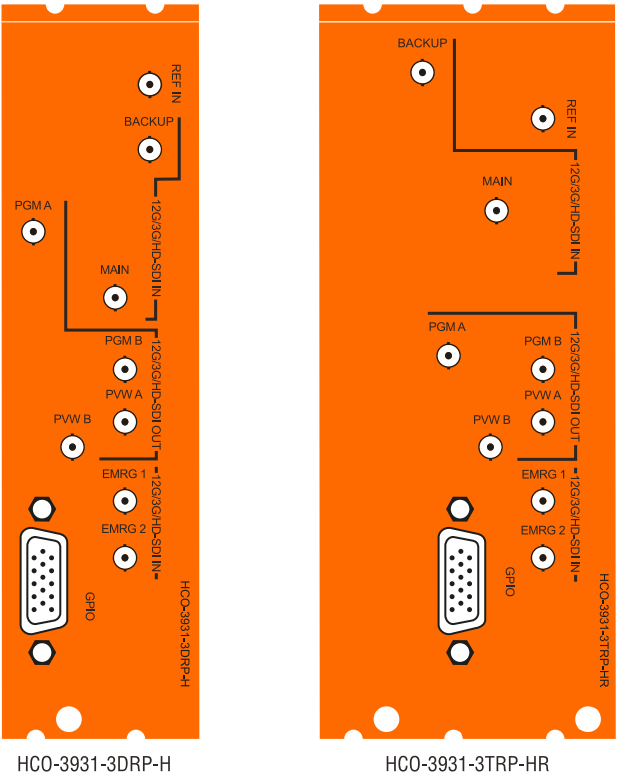
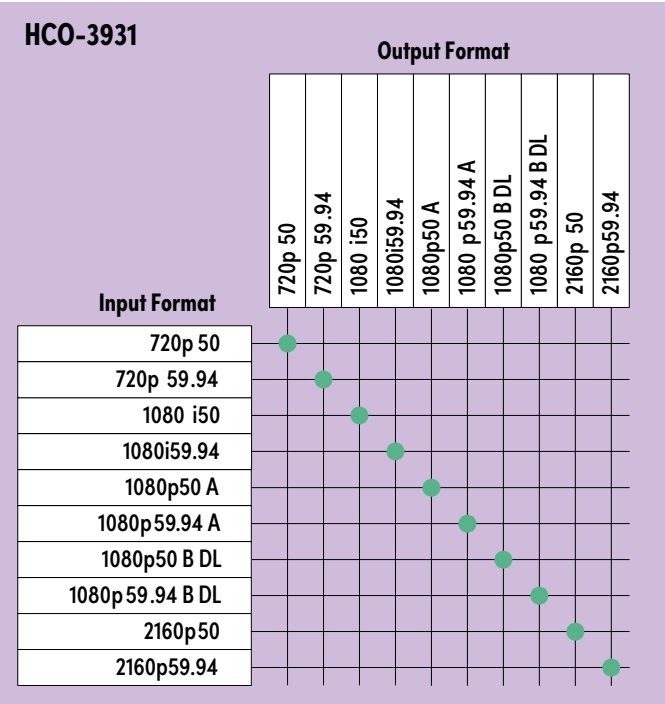
Key Features

- 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

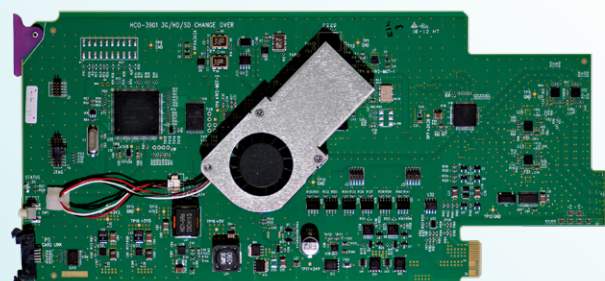
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HCO-3901 & HCO-3901-4K

3G/HD/SD/ASI and 4K UHD Change-Over with Clean Switch and ALC



Space-saving, modular platform for advanced signal processing.

The HCO-3901 from Grass Valley® is a 3x1 3G/HD/SD/ASI change-over which supports 16 channels of embedded audio and metadata. The module can perform a video and audio “Clean and Silent Switch” between sources using the CS option (not available with ASI signals). In the event of a power failure, the PGM signal is protected by relays fitted on the rear module, maintaining the integrity of the selected signal at the output. Relays are fully controllable via GPI. With the addition of the HCO-3901-3DRP-R-EX rear panel, the HCO-3901 now supports paired outputs for 3G/HD/SD SDI (single outputs only for ASI).

Input selection can be performed automatically or manually. In automatic mode, the card will perform input selection between IN 1 and IN 2 based on internal signal analysis with alarm parameters, and the status of the inputs. In manual

mode, any three sources can be selected from the Densité® controller, the GV Orbit® or iControl™ software, or simply by using a GPI (3DRP rear only). A GPI can be connected to an automation system or any simple GPI control panel. The GPI outputs give status of the selected source allowing tallies to be triggered.

The HCO-3901 provides up to eight 3G/HD/SD SDI video outputs (depending on the rear panel in use). The preview outputs are user selectable to follow the main program output, video inputs IN 1, IN 2 or IN 3.

The latest addition, HCO-3901-4K, supports 4K UHD Quad-Link SDI change-over with support for embedded audio and metadata. The additional HCO-3901-X4RP remote control connector supports glitch-free switching of four synchronized 3G-SDI signals or Quad Link 3G-SDI signals.

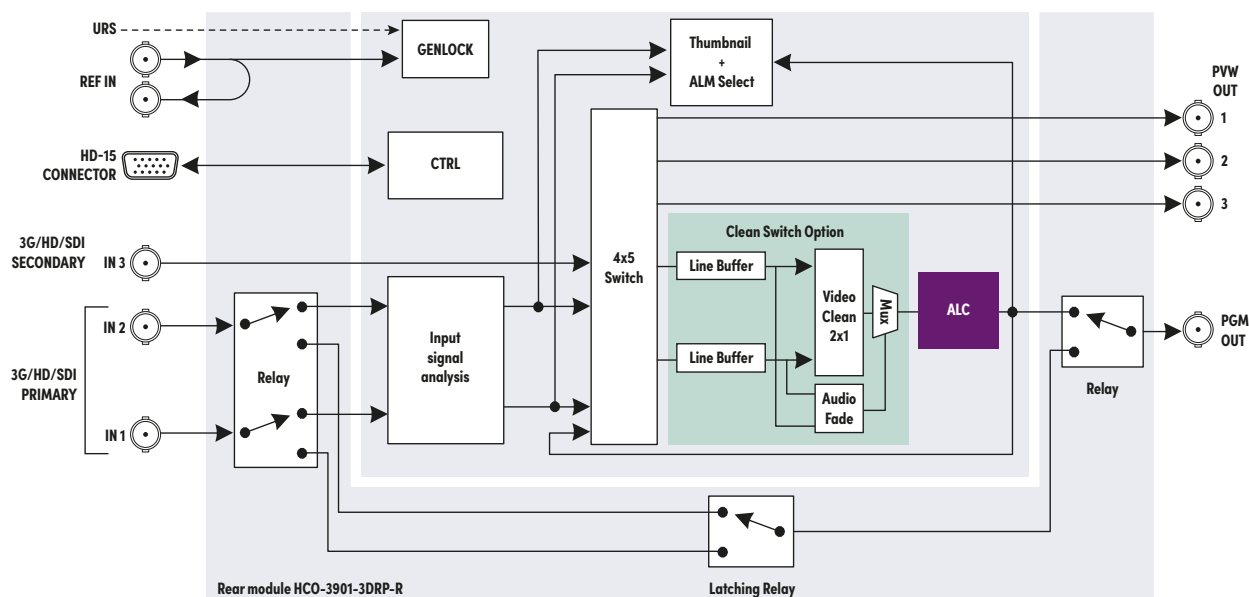
Grass Valley’s automatic loudness control (ALC) option can eliminate objectionable loudness variations between programs and commercials (not available with ASI signals).

The module provides streaming video and audio level metering so an operator can remotely and effectively monitor the signal path using Grass Valley’s GV Orbit facility monitoring and control system.

The HCO-3901 is a 3 RU card and is available with a one or two slot rear module. Up to 20 modules can fit in a 3 RU Densité frame with a 1-slot rear module (or 19 with REF-1801). The HCO-3901-4K kit fits in a 3 RU Densité 3 and Densité 3+ FR4 frame and requires eight slots for an installation.

Key Features

- Two primary inputs: IN 1 and IN 2 plus one secondary: IN 3
- Four outputs: main program and three previews
- Eight outputs (with EX rear): paired outputs for main program and each of the three previews (single outputs only for ASI)
- Supports 3G, HD (1080i50/59.94, 720p50/59.94) and SD (525, 625) or ASI input and output
- Supports 4K UHD Quad-Link 3G-SDI with optional HCO-3901-X4RP remote control panel
- Electronic switching with relay backup (on rear module) maintains selected input with power loss for Primary inputs IN 1 and IN 2
- Automatic mode using internal signal analysis with alarm parameters for IN 1 and IN 2
- Manual change-over by local frame controller, GV Orbit, iControl, iControl Solo or GPI (3DRP rear) for 3 inputs
- Alarm reporting to GV Orbit facility monitoring and control system
- GPI in and out (IN 1, IN 2, IN 3, auto, bypass)
- Optional clean switch function (video and 16 channels of audio) for IN 1 and IN 2 (not available with ASI signals)
- Optional on-board automatic loudness control by Grass Valley (not available with ASI signals)
- Reference input with passive loop through (3DRP rear only)
- Two line timing window with CS option (not available with ASI signals)
- Thumbnail and audio level meter streaming for IN 1, IN 2 and PGM OUT (not available with ASI signals)
- Loudness compliant to EBU R128-2014, ATSC A/85:2013 (FCC CALM compliant) and ARIB TR-B32 (ITU-R BS.1770-3)

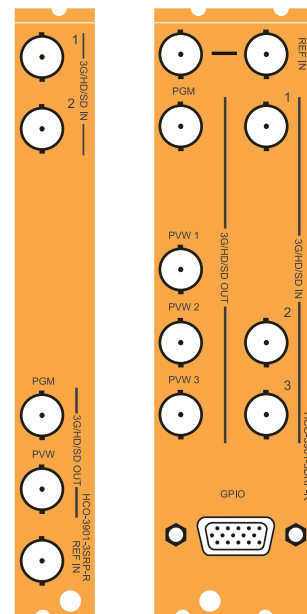


HCO-3901 Functional Block Diagram

OPTIONS	Clean switch
	Grass Valley ALC

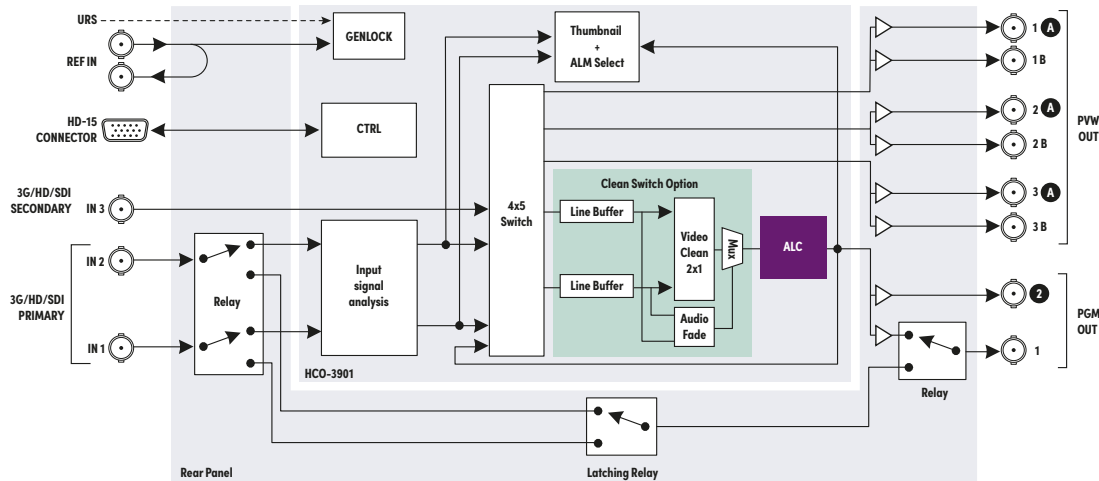
Alarm Parameters

Video	3G	HD	SD	ASI
Loss of video	X	X	X	X
Video error	X	X	X	
Black detect	X	X	X	
Freeze detect	X	X	X	
Video format	X	X	X	
Audio				
Audio presence (per group)	X	X	X	
Silence detect (per channel)	X	X	X	



HCO-3901-3SRP-R

HCO-3901-3DRP-R



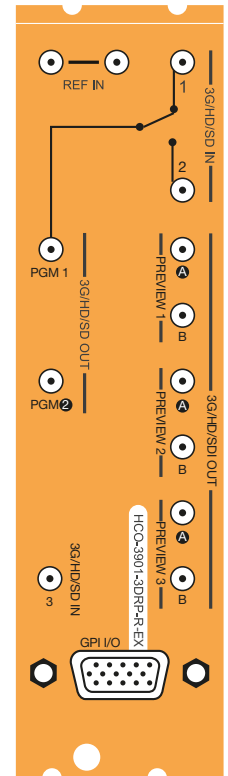
HCO-3901 and the HCO-3901-3DRP-R-EX Rear Panel Functional Block Diagram

OPTIONS

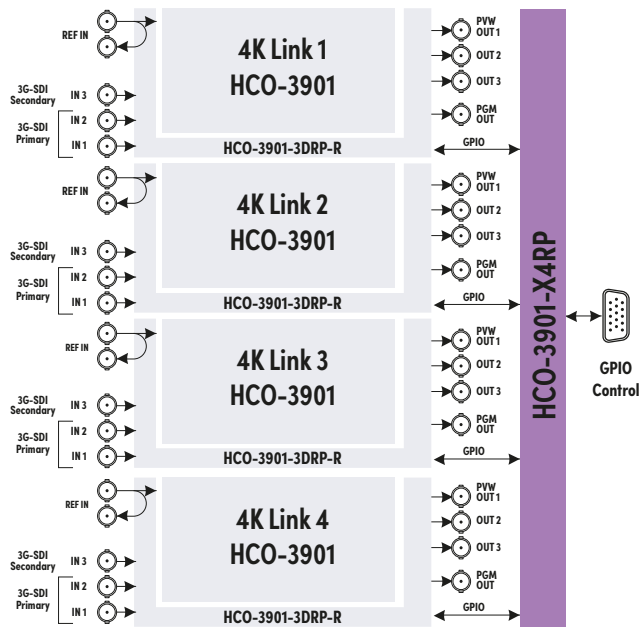
Clean switch

Grass Valley ALC

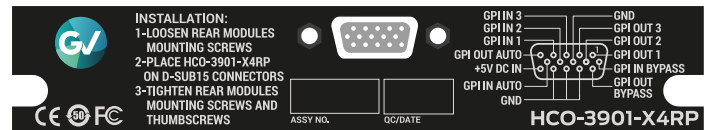
Note: Numbered outputs marked with black circles are not suitable for DVB-ASI distribution.



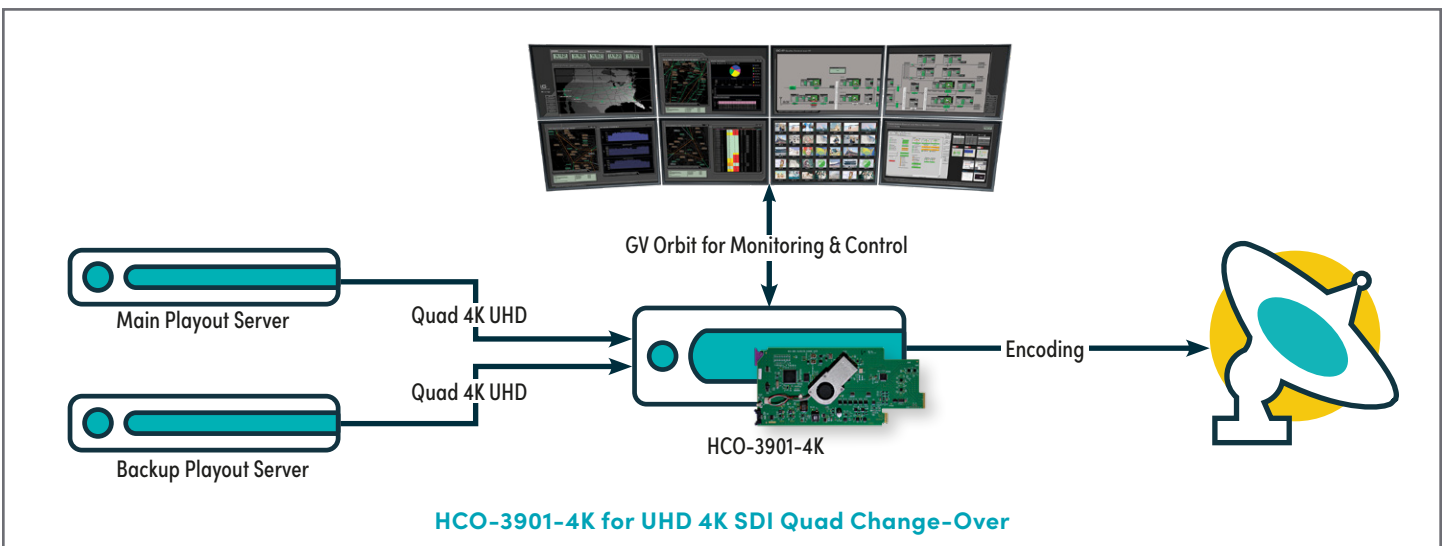
HCO-3901-3DRP-R-EX



HCO-3901-4K Functional Block Diagram



HCO-3901-X4RP



HCO-3901-4K for UHD 4K SDI Quad Change-Over

Specifications

SDI (Inputs/Outputs)

SDI Standards:

- SD: SMPTE ST 259-C (270 Mb/s)
- HD: SMPTE ST 292 (1.485, 1.485/1.001 Gb/s)
- 3G: SMPTE ST 425 (2.970, 2.970/1.001 Gb/s)
- DVB-ASI: EN 50083-9

Supported Formats:

- SD: SMPTE ST 125: 480i59.94, 576i50
- HD: SMPTE ST 274: 1080i59.94, 1080i50
- HD: SMPTE ST 296: 720p59.94, 720p50
- 3G: SMPTE 425 level A (mapping 1): 1080p59.94, 1080p50
- 4K UHD: Quad Link 3 Gb/s SMPTE ST 425-5 (3G-SDI Link 1, Link 2, Link 3 and Link 4): 1080p59.94, 1080p50

Cable Length¹:

- 350m (1,148 ft.) Belden 8281 at 270 Mb/s
- 130m (426 ft.) Belden 1694A at 1.485 Gb/s
- 90m (295 ft.) Belden 1694A at 2.970 Gb/s

Return Loss:

- >15 dB up to 270 MHz (PGM out)³
- >15 dB up to 1.5 GHz (IN 3, PVW out)³
- >12 dB up to 1.5 GHz (PGM out)³
- >10 dB up to 1.5 GHz (IN 1, IN 2)²
- >10 dB up to 3 GHz (IN3, PVW out)³
- >8 dB up to 3 GHz (IN 1, IN 2)²
- >7 dB up to 3 GHz (PGM out)³

Jitter:

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

Reference Input (1)

Signal:

- SMPTE ST 170/SMPTE ST 318/ITU 624-4/ BUT 470-6 or composite sync
- SMPTE ST 274/SMPTE ST 296 tri-level sync

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:

- 0.4 ns without CS option and ALC option
- Maximum of 2 lines with CS or ALC option

Audio Processing Performance

Quantization: 20-24 bits

Sampling: 48 kHz, synchronous

Number of channels: 16, 4 groups

Audio latency:

- 0.4 ns without CS option and without ALC option
- Add 1 ms if CS option is enabled
- Add 1 ms if ALC option is enabled

Electrical

Power: 10W

Note 1: Cable length and return loss specifications will be reduced when using the output protected by the bypass relay, refer to the manual for more details.

Note 2: Input protected by relay.

Note 3: PGM output protected by relay.



Ordering

Densité 3 Frame

Description	
HCO-3901	3G/HD/SD change-over with optional clean switch and ALC
HCO-3901-3SRP-R	Single rear connector with bypass relay
HCO-3901-3DRP-R	Double rear connector panel with bypass relay
HCO-3901-3DRP-R-EX	Double rear connector panel with bypass relays and paired output

Densité 3 and Densité 3+ FR4 Frame

Description	
HCO-3901-4K	4K UHD change-over with optional clean switch and ALC <i>HCO-3901-4K consists of: 4x HCO-3901, 4x HCO-3901-3DRP-R, 1x HCO-3901-X4RP</i>
HCO-3901-X4RP	Remote control connector panel for Quad Link 4K UHD

Options (Software)

Description (Note that all of the following options are not functional with ASI signals)	
HCO-3901-OPT-CS	Clean switch option
HCO-3901-OPT-ALC-2	2-channel on-board ALC option
HCO-3901-OPT-ALC-6	6-channel on-board ALC option
HCO-3901-OPT-ALC-8	8-channel on-board ALC option
HCO-3901-OPT-ALC-16	16-channel on-board ALC option

Options (Hardware)

Description	
NSH15M	HD-15 to terminal block adapter

Options for HCO-3901-4K Only

Description	
HCO-3901-OPT-CS	Clean switch option (4 licenses required for HCO-3901-4K)

ALC: Any software option from above is allowed, but only one is required and applies to the first HCO-3901 (Q1) card in the HCO-3901-4K KIT

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

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