



— 2022-2023  
**PRODUCT CATALOG**

**COBALT**

ENGINEERING  
BEYOND  
THE SIGNAL

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Engineering beyond  
the signal starts  
with Innovation.

Cobalt Digital has proudly provided engineering solutions to meet customers' needs since 1997. By speaking and listening closely to end users, Cobalt has developed equipment offering the answer for specific challenges. Our innovative products feature 24/7 service and support and many come with a five-year warranty, vital in today's broadcast industry. Our products are used extensively worldwide in production trucks, and by terrestrial, satellite and cable broadcasters, as well as many government facilities. As we enter our third decade of innovation and service, we reflect on how far the industry has come, and look forward to engineering products for tomorrow's broadcast and beyond.

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**DETECTION/FORWARDING (OPENGEAR® CARDS AND STANDALONEMODELS)**

**9978-ANC-MON** 3G/HD/SD-SDI Ancillary Data Monitoring Probe with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding . . . . . 381

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**MOTION PATTERNS, AND OPTIONAL TROUBLE SLATE INSERTERS**

**(OPENGEAR® CARDS AND STANDALONEMODELS)**

**9960-TG2-REF1** 3G/HD/SD-SDI Dual Test Signal Generator with Moving Box Active Signal Indication, Bi-Level Sync Out, and Embedded ANC Data Signal Generator . . . . . 386

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The latest openGear™ card-based and standalone BBG-1000 Cobalt products offer broad or highly specific functionality and features. Many features can be added as software-based Options, further leveraging your choice. Use the table below to match our products to your specific processing needs.



	9902-UDX	9902-2UDX	9903-UDX-ADDA	9922-FS	9922-2FS	9950-EMDE-ANC	9121	9980-CSC-3G	9980-2CSC-3G	9933-EMDE-ADDA	9933-EMDE-75/110	9433-EMDE-ADDA	9433-EMDE-75/110	9940-ACO	9940-4X1-CS	9978-ANC-MON
3G/HD/SD Format Conversion	S	S	S													
Frame Sync	S	S	S	S	S											
AES Audio Embed / De-Embed	S	S	S	S	S					S	S	S	S			
Analog Audio Embed / De-Embed	S	S	S	S	S											
CVBS I/O	S	S	S	S	S											
HD/SD Component Video I/O			S													
Fiber I/O and EO / OE Conversion												S	S			
Color Correction	0	0	0	0	0			S	S							
Text-to-Speech 21CVAA	0			0	0											
Dual-Path Program Video Processing		S		0	S				S							
Wings Insertion	S	S		S	S											
Trouble Slate/Logo Insertion	0	0		0	0									S		
Keying	0			0	0											
Advanced Audio Proc (per-channel and bulk advance/delay, AES SRC, downmix, flexmix)	S	S		S	S											
Audio DSP Features (Loudness Proc, Upmix, Dolby encode/decode)	0	0		0	0											
ANC Embed / De-Embed	0	0	0	0	0	S										
AFD	0	0														
Video-Audio-ANC Quality / Presence Check	0	0		0	0											S
Multi-Input Failover / Relay Bypass	0	0	0	0	0		S							S	S	
MADI Embed / De-Embed																
Also available in BBG-1000 Series Standalone / Desktop Form Factor. These models are identified with "-SA" PN suffix, or by (where applicable) substituting "BBG-10" for "99" in the part number (example: BBG-1002-UDX is BBG equivalent of openGear card version 9902-UDX).	S	S	S	S	S	S		S	S					S	S	S

S Standard  
0 Optional

BlueBox™ Compact Throwdowns offer not only excellent performance, but also excel to a new level of ease of use and installation practicality. Designed to power from associated equipment using USB, BlueBox provides for a neater, more physically secure and dependable installation than with other interface boxes. Many BlueBox models also include USB remote control/configure using our free BBGConfig. Use the table below to match our products to your specific processing needs.



	BBG-DE-AA	BBG-EM-AA	BBG-EMDE-AES75	BBG-EMDE-AES110	BBG-A-TO-S	BBG-S-TO-A	BBG-S-TO-H	BBG-H-TO-S	BBG-F-TO-H	BBG-H-TO-F	BBG-2EO-MK2, 2OE-MK2, EO-MK2, OE-MK2, EOOE-MK2, SFP-SXH	BBG-IP-TO-SDI-10GE, BBG-SDI-TO-IP-10GE	BBG-DA-12G-1x6
AES Audio Embed / De-Embed			S	S									
Analog Audio Embed / De-Embed	S	S			S	S	S	S	S	S			
CVBS I/O					S	S							
HD/SD Component Video I/O					S	S							
Fiber I/O and EO / OE Conversion									S	S	S		
HDMI / SDI / Fiber Conversion							S	S	S	S			
IP/SDI Conversion												S	
3G/HD/SD-SDI Distribution													
12G/3G/HD/SD-SDI Distribution													S

S Standard  
 0 Optional

## VIDEO OPTIONS »



Options allow economical expanded functionality, combining the functions of multiple devices in one unit. Options include audio options such as loudness processing/metering, I/O options, video processing options, and many other features. Using options is like having multiple cards in one card. Adding options adds processing versatility without the expense, complexity, space usage, or accumulated processing latency of multiple cards.

Most options are available as software upgrade uploads which can be ordered on new cards or field-installed on existing cards without removing the card from its frame. To help you readily ascertain availability of options when looking at a product's block diagram, options are shown in block diagrams as light blue. For complete information about any option listed and its applicability for specific products models, please see the model's specific web page. Some cards or models may have options unique to the card model that may not be listed here.

**VIDEO OPTIONS****+COLOR – Color Correction Software Option**

Provides independent RGB channel controls for luma, black, and gamma. Ultra-fast response time. The color correction feature is perfectly suited for use with Cobalt OGCP-9000/CC Remote Control Panel.

*See card/model pages for availability.*

**+FRC – Frame Rate Conversion Software Option**

Provides comprehensive high-quality standards conversion utilizing Cobalt's linear frame rate conversion to convert between virtually any SD/HD/3G format – 25/50, 29.97/30/59.94/60, and 23.98/24 (both film and PsF) from 525/625i to 1080p and anything in-between – with conversion to and from NTSC and PAL available for all input and output formats.

*See card/model pages for availability.*

**+KEYER – Keying Option**

Provides keying using independent SDI inputs for key and fill signals. A separate preview SDI output is provided for observing key results before applying to program video output. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input.

*See card/model pages for availability.*

**+LOGO / +T-SLATE – GRAPHIC INSERTION OPTIONS**

Option +LOGO allows uploading of up a user graphics file (such as an ID bug) to the card or device. When loaded, the graphic can be loaded using automated insertion controlled by GPI or other events (such as a GPI insertion signal for periodic station ID).

Option +T-SLATE allows uploading of up to three different user trouble slate graphic file to the card or device. When loaded, any of the graphics can be loaded using automated insertion controlled by GPI or other user-definable events (such as loss of closed captioning, frozen video or other detectable events). Option +T-SLATE offers fully automated insertion for numerous conditions when used in conjunction with +QC Quality Check Option.

*See card/model pages for availability.*



## QUALITY CHECK/SIGNAL INTEGRITY ASSURANCE AND DEVICE UPGRADE OPTIONS »

**QUALITY CHECK/SIGNAL INTEGRITY ASSURANCE OPTIONS****+QC - Quality Check Option**

+QC allows failover to alternate inputs based on user-definable criteria such as black/frozen frame or audio silence. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS marker. Closed captioning absence/presence detection allows CEA 608/708 and line 21 SD CC absence or presence to be detected, with event actions consisting of GPO, automated alert email actions, or go-to card user presets or other actions. Intelligent Event Actions automatic monitoring allows any number of prioritized actions to be carried out when screened signal or programming errors are detected. Please see the respective card pages for more information about these options where available.

*See card/model pages for availability.*

**DEVICE UPGRADE OPTIONS****+3G - Upgrade Software Option**

On card purchased as alternate HD/SD model (for example "9901-UDX-HD"), allows upgrade to full 3G/HD/SD-SDI I/O and processing.

*See card/model pages for availability.*

**+FS - Add Frame Sync Software Option**

Adds frame sync to device, offering unsurpassed accuracy in audio-video delay (lip sync) management, with glitch-free per-channel audio delay adjustment.

*See card/model pages for availability.*

**+2FS - Add Dual-Channel Frame Sync Software Option**

Adds a second independent processing channel. (Makes 9922-FS functionally equivalent to 9922-2FS.)

*See card/model pages for availability.*

*Cobalt Options add processing versatility without the expense, complexity, space usage, or accumulated processing latency of multiple cards.*

## ANCILLARY DATA SUPPORT OPTIONS »

**ANCILLARY DATA SUPPORT OPTIONS****+SCTE104 / +SCTE104-FAST Software Options**

SCTE 104 provides a flexible and easily incorporated segment/interstitial insertion automation solution which can be propagated across the plant via baseband SDI (using the ANC space). Option **+SCTE104 provides generation and insertion of SCTE 104 messages** into baseband SDI. Message send can be triggered from automation GPI or other event action modes.

Option +SCTE104-FAST (frame-accurate SCTE trigger) provides functionality available only from Cobalt in the openGear form factor. This software option meets the need to frame-accurately mark the start and stop points of content. Cobalt engineers worked closely with key customers to develop +SCTE104-FAST, providing the unique ability to tie time-stamped information from automation systems to the timecode information contained in the baseband SDI. +SCTE104-FAST provides frame-accurate insertion for deterministic results when the program signal is used in sophisticated downstream video-on-demand (VOD) and commercial insertion systems.

*See card/model pages for availability.*

**+DT – User COM Data Insert/Extract Software Option**

Available for certain 9433-series Fiber Optic Transport Embedder / De-Embedders, option +DT offers user serial data insertion and extraction from SDI streams using user accessible DID/SDID locations. This allows serial data handled by the card to be embedded or de-embedded on an unused DID/SDID.

This offers a very convenient self-contained transport within the program stream physical media, greatly simplifying this data transfer workflow.

*The software can be ordered with card purchase, or activated later using a downloadable feature key via free DashBoard™ remote control/monitoring software (no need to remove or replace card.)*

**+ANC – Ancillary Data Processing Option**

Option +ANC offers full VANC/HANC ancillary data packet de-embedding and embedding for 3G/HD/SD-SDI streams. The easy to use interface allows direct access to DID and SDID locations to extract or insert user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads. Data can be extracted and inserted within the card, bypassing the scaler (Bridge mode) and allowing scaling while preserving ANC packets, or inserted and/or extracted to and from external interface via serial or IP interfaces. This allows the card to directly embed ANC packets from external sources such as closed-captioning generators.

*See card/model pages for availability.*

**+LTC – Audio/RS-485 LTC Software Option**

Allows bidirectional transfer and conversion between video timecode formats and audio/RS-485 LTC. Audio LTC can be received or sent over various card audio channels. RS-485 LTC can be received or sent via a rear module RS-485 port.

*See card/model pages for availability.*

## TEXT-TO-SPEECH / EAS AUTOMATION »

**TEXT-TO-SPEECH / EAS AUTOMATION OPTIONS****+TTS – Text-To-Speech Option**

Cobalt Digital +TTS is a complete 21CVAA text-to-speech generation / audio insertion solution for embedded or discrete audio systems. +TTS is a software option available for many Cobalt card models using the 20-slot openGear® frame architecture (and available for BBG-1000 Series standalone units). Platforms utilizing existing openGear® infrastructure can be 21CVAA-ready with only an easily incorporated option feature upload to the card. For platforms not utilizing an existing openGear® infrastructure, most of our BBG-1000 Series standalone units are available with option +TTS, offering a compact rack-mounted 1RU solution easily integrated into the broadcast workflow.

+TTS interfaces with industry standard Windows Share folder systems to receive non-proprietary text, XML, or similar plain text files, and converts and inserts realistic human-voice audio into user-configured audio channels (typically an SAP channel pair intended for this payout). +TTS allows for prioritization based on the organization's discretion (for example, severe weather alerts out-prioritizing school closings). Alert tones are ducked in on the main program channel to alert the visually impaired that emergency content is to occur on the SAP channel. Alerts can be played a configurable number of times, and alerts with higher priority can interrupt current lists for breaking news. Once the interrupt message is broadcast, +TTS automatically reverts to normal audio programming.

Compatible Cobalt cards and modulars offer the synergy of also providing keyed text scrolls when used in conjunction with option +KEYER."

*See card/model pages for availability.*

**+EAS – Emergency Alert System Text Crawl Generation Option**

Option +EAS is the ideal solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos.

Serial crawl data from an EAS generator (such as Sage™ or Dasdec™) is transmitted to a Cobalt Digital openGear® card or BBG-1000 series stand-alone unit. The crawl data is held until a GPI is sent from the EAS generator, signaling the creation of the text graphics. The GPI also routes digital or analog emergency audio to the embedded video output. Once the GPI goes back to the resting state, the program audio is routed back to the embedded output. Crawl data is played according to the user-selectable loop counter. User-configurable fill background color and text size control can be correlated to event context severity.

*See card/model pages for availability.*

## AUDIO DSP OPTIONS »



Our latest +DSP suite of DSP-based audio processing features represents our greatest single-device audio processing capacity. The DSP-based platform supports multiple audio DSP options using a processing core (which supports numerous simultaneous processing engines) that uses license “credits” which allows flexible tailoring of multiple processing function instances.

**AUDIO DSP OPTIONS****Dolby® Digital/Digital Plus™ Encoding (ENCD-5.1 / ENCD-2.0)**

Provides Dolby® Digital/Digital Plus™ encoding from any combination of audio sources supported by the card (including upmixed and loudness-processed signals). Full metadata support using internally generated or external metadata via SMPTE 2020, or from a same-card decoder. Available in 5.1 or 2.0 versions.

*See card/model pages for availability.*

**Dolby® Decoding**

Provides Dolby® Digital/Digital Plus™/E decode from any card digital audio channel pair, with Digital/Digital Plus dynamic range control and full bitstream summary displays.

**Dolby® Real-Time Loudness Leveling Loudness Processing (RTL-5.1 / RTL-2.0)**

Provides full-featured loudness processing, including peak limit, aggressiveness, and dialog intelligence modes. Available in 5.1 or 2.0 versions.

*See card/model pages for availability.*

**Linear Acoustic® UPMAX™ Upmixing (UPMIX-LA)**

Featuring Linear Acoustic UPMAX™ technology, the 5.1 upmixer uses any stereo pair accommodated by the card and generates a six-channel 5.1 complement (L, R, C, LFE, Ls, Rs) from the stereo source, thereby allowing legacy stereo programming to adapt to and fully utilize 5.1-channel audio capabilities.

*See card/model pages for availability.*

*For complete information about any option listed and its applicability for specific products models, please see the model’s specific web page at [CobaltDigital.com](http://CobaltDigital.com).*

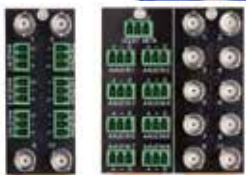
**HPF-9000 » HIGH-POWER 20-SLOT FRAME**

The HPF-9000 is a 2RU high-density modular frame offering 360 Watts of net (user) available power in a high-capacity 20-slot format. (Maximum card capacity is determined by card model(s) installed and other factors. See 20-Slot Frame Card Capacity and Rear Modules on next page.) High power-density power supplies (single standard, redundant second optional) and engineered cooling/ventilation design allow

10 high-power cards in a frame (10 x 36 W = 360 W), or 20 medium-power cards in a frame (20 x 18 W = 360W). Separate forced-air cooling paths are provided for the card area and the power supply areas. An intelligent fan controller adjusts fan speed with changes in power supply loading and temperature.

The HPF-9000 uses the same rear modules as our other 20-slot frames, allowing a seamless transition from current frames to the HPF-9000. These rear modules offer a broad selection for a flexible and wide array of interfaces such as BNC, twisted-pair audio, and fiber.

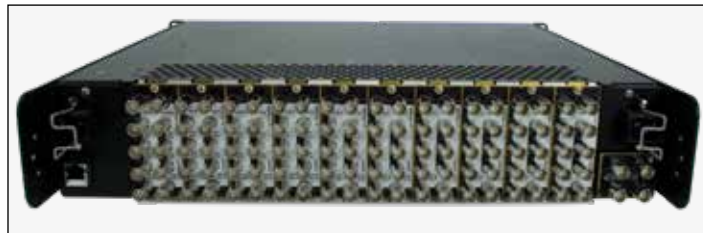
The HPF-9000 can accommodate two front-loaded PSU-9000 power supply modules. Adding a second (optional) supply gives the frame full power redundancy. The PSU-9000 power supply unit is interchangeable as a primary or redundant power supply module, with supplies in either position being hot-swappable. Each power supply contains an independent cooling fan, status LED, and a front-mounted power switch. The HPF-FC Network Controller Card (furnished as standard on the HPF-9000 frame) allows Ethernet connectivity to any number of connections for full multi-point control and monitoring via free DashBoard™ software. Optional SNMP support, for large scale monitoring implementation, is also available.



Modular Rear I/O



**Hot-swappable power supply** (with optional redundant supply) is easily replaced from front of frame



Individual **removable Rear I/O Modules** allow selecting the right connections for each card



**Numerous Rear I/O Module choices** provide input/output combinations that most suit your needs, including mixed interfaces (such as BNC and balanced analog audio)

» **FEATURES**

Highest available power for an openGear-compatible frame (360 Watts net) – 3x the available power of our previous 20-slot frame

Two independent looping references internally routed to all user card slots

Power supply is hot-swappable for 24/7 operation

Power switch/supplies accessible from the front of the frame

Separate power cords to each power supply for power redundancy

Network Controller Card (HPF-FC) enables multiple copies of DashBoard™ for seamless remote setup, monitoring, and control. SNMP option can further be added.

Fan status and error indicator LEDs on front of the frame

Hinged, pull-away front door panel lowers to allow quick, easy card insertion

Remote control/monitoring via Ethernet using free DashBoard™ software, or optional OGCP-9000 remote control panel

Five-year warranty

» **ORDERING INFORMATION**

**HPF-9000-N** High-Power 20-Slot Frame - 2RU with fans, cover plates for unused slots.

Includes one PSU-9000 Power Supply Module and MFC-8320-N Network Controller Card. (Network Controller Card allows multiple connection network control through DashBoard™ software or Cobalt OGCP-9000 Remote Control Panel.)

Note: Please see “20-Slot Frame Card Capacity and Rear Modules” on pages 12-13 for helpful information about practical card capacity, descriptions of available rear module types, and other important considerations.

**PS-9000** Extra (redundant) HPF-9000 frame power supply

**SNMP-HPF9000** Software option for MFC-8320-N card. Provides SNMP (v1 and v2) control and monitoring.

**HPF9000-FSB** Frame support bracket kit.

Note: Maximum cooling performance is obtained when a 1RU space is provided above the frame. Optional high-ventilation rear modules are available to increase airflow where above-frame cooling space is compromised (see “High Ventilation Rear Module” in the following pages for more information). Please contact Cobalt Sales for more information regarding frame build-out where ventilation is less than optimal.

## BBG-1300-FR » 1RU ENCLOSURE FOR OPENGear® CARDS



The Cobalt® **BBG-1300-FR** is a 1/3 rack-width 1RU openGear® compatible enclosure frame capable of housing up to 2 cards\* as a basic standalone desktop unit, or up to 3 units racked together as a 1RU group for rack mounting. BBG-1300-FR allows openGear® cards to be supported where a full-size 2RU 20-slot openGear® frame is not feasible or required. Just like a full frame, BBG-1300-FR built-in network interface allows DashBoard™ control/monitoring of any openGear® capable card. Looping reference on the BBG-1300-FR unit itself provides card reference support without using reference connections that consume card rear module connector count.

Most cards within the Cobalt product lineup can be housed in the BBG-1300-FR, with a total available power of 60 W. Up to three BBG-1300-FR units can fit onto a single 1RU tray for maximum density where a 2RU frame is not feasible.

A front control panel makes status monitoring and network setup connectivity simple with an LCD display screen. The front rotary knob makes navigation simple and easy to use. SNMP control available.

\* 2-card usage requires the use of 2-card split rear I/O module. Split rear I/O modules are not available for all card models.

### FEATURES

Provides openGear® card support in a compact package where a full-size 2RU 20-slot openGear® frame is not feasible or required

High power for latest 4K and IP card solutions

Full openGear® compatibility supporting openGear-compatible cards as well as latest and legacy 20-slot frame openGear rear modules

Looping reference internally routed to all user card slots

Dual power supplies for power redundancy

Network Controller function enables multiple copies of DashBoard™ for seamless remote setup, monitoring, and control. Network Controller “smart” functionality provides Gigabit Ethernet to both user card slots.

Front display with rotary knob and buttons for simple and quick control

Pull-away front door panel allows quick, easy card insertion

Optional Frame Support Bracket kit provides frame rear support for mobile applications

Remote control/monitoring via DashBoard™ or SNMP

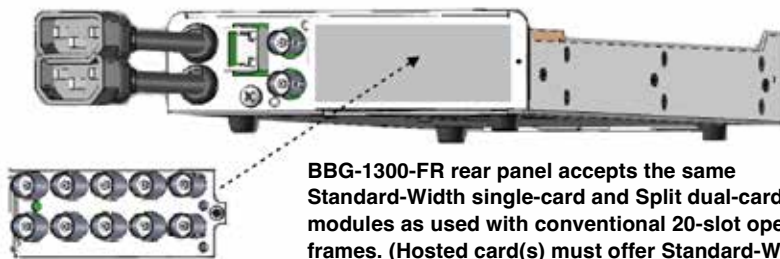
Five year warranty

### OPTIONS

**BBG-1300-TRAY** 1-RU Mounting Tray (supports 3 units)

**BBG-TRAY-RSB** Support Bracket/Rail Kits (see Ordering Info for details)

Front bezel opens to access card slots. Where Split Rear I/O Module can be used, up to 2 openGear® cards can be installed.



BBG-1300-FR rear panel accepts the same Standard-Width single-card and Split dual-card rear modules as used with conventional 20-slot openGear® frames. (Hosted card(s) must offer Standard-Width or Split rear module to be used with BBG-1300-FR.)

## BBG-1300-FR » 1RU ENCLOSURE FOR OPENGear® CARDS

### SPECIFICATIONS

**Note:** All specifications are preliminary and subject to change.

#### AC Line Input

(2) AC IEC inputs. 100-240 VAC, 50/60 Hz, 50 W typical (140 W max)

**Note:** AC power is largely dependent on whether 2 cards are fitted, as well as the power consumption of the hosted card(s).

#### Available User Card Slots

Two (2) maximum

**Note:** 2-card loading only possible with compatible Split rear module. Some card models are not available with Split rear modules. See card page for availability.

#### Available User (Net) Power

60 W (sufficient for latest-generation high-power cards such as 9992 or 9904). Built-in fan cooling for card area and power supplies.

#### Frame Communication

100/1000 Mbps Ethernet with Auto-MDIX

#### Frame Reference Input

Single looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

#### Dimensions (WxHxD)

5.7 x 1.4 x 14.7 in (14.5 x 3.6 x 37.4 cm)

#### Weight

6 lb (2.7 kg)

**Note:** Empty weight; does not include card(s) or rear module.

### ORDERING INFORMATION

**BBG-1300-FR** 1RU Enclosure Frame with redundant power and network controller included.

#### Options and Accessories:

**BBG-1300-TRAY** 1RU Mounting Tray (supports 3 units)

**BBG-TRAY-RSB-L** 24-30 Long-Length (24-30 in (61-76 cm)) Support Bracket & Rail Kit For BBG-1300-TRAY

**BBG-TRAY-RSB-M** 20-24 Medium-Length (20-24 in (51-61 cm)) Support Bracket & Rail Kit For BBG-1300-TRAY

**BBG-TRAY-RSB-S** 18-20 Short-Length (18-20 in (46-51 cm)) Support Bracket & Rail Kit For BBG-1300-TRAY

**oGx » 20-SLOT OPENGear® FRAME**



The **oGx** is a 2RU high-density openGear® modular frame offering 600 Watts of total power in a high-capacity 20-slot format. It uses the same form factor and DashBoard™ remote control as our other 20-slot frames and supports all openGear compatible cards and rear I/O modules, but offers significantly more available user power. The oGx is designed to meet the demands of today's most complex IP and hybrid infrastructures, supporting evolving IP and UHD applications.

A new high-power mode allows 23 Watts per slot at full 20-card capacity (460 W user net max). An intelligent fan controller adjusts fan speed with changes in power supply loading and temperature. The single (standard) 600 Watt power supply can fully power a loaded frame, and the addition of a second (optional) supply gives the frame full power redundancy. oGx accommodates 2 front-loaded, hot-swappable power supplies. The split outside location of the power supplies makes installation easy. Each power supply contains an independent cooling fan, status LED, and a front mounted power switch.

In addition to an integrated LCD display that provides frame name, IP address and reports any alarms, the FrameGlow highly-visible programmable RGB LED bar provides “across-the-room” visibility of any customizable status or frame ID functions, allowing personnel to see frame status/info literally anywhere in the room.

The openGear® 3.0 frame offers optional gigabit Ethernet to every slot within the frame chassis, enhancing communication speed, and connection options to all openGear® cards. The openGear® 3.0 frame provides more communication options and flexibility to openGear® card manufacturers. The 21-port Ethernet switch, built in to the frame's network control card, virtually future-proofs the openGear® 3.0 platform. (Gigabit Ethernet is only available with the Advanced Network Control option.) SNMP (optionally available) is loaded direct to the frame eliminating the need for any external gateways and runs on a separate software port allowing for simultaneous control from both DashBoard and SNMP clients. This is useful in applications where system wide monitoring is performed using SNMP and real-time control is performed using DashBoard.

The oGx uses the same rear I/O modules as our current 20-slot frames, allowing a seamless transition from a current 20-slot frame to the oGx. These rear modules offer a broad selection for a flexible and wide array of interfaces such as coaxial, twisted-pair audio, GPIO, comm, and fiber. Special high-density/high-ventilation rear I/O modules offer even greater packaging density when used with compatible Cobalt® cards.

**FEATURES**

600 Watt power supply with redundancy option. New high-power mode allows 23 W per slot at full 20-card capacity (460 W user net max).

Full openGear® 3.0 compatibility supporting openGear-compatible cards as well as latest and legacy 20-slot frame openGear rear modules

Gigabit Ethernet to every slot within the frame (available on frames with Advanced Networking)

Optional DataSafe network-card stored backup and restore allows swapping of hosted cards with all settings automatically uploaded to the new card - no hassles trying to remember card settings. Settings are restored only when a DataSafe detects same-model card as replacement. (Available with the advanced networking control option.)

Power supply is hot-swappable for 24/7 operation

Front LCD display and FrameGlow customizable multi-color, flexible-function lightbar. Wide high-visibility design provides “across-the-room” visibility of any customizable status or frame ID functions.

Two independent looping references internally routed to all user card slots

Separate power cords to each power supply for power redundancy

Network Controller Card enables multiple copies of DashBoard™ for seamless remote setup, monitoring, and control. SNMP option can further be added.

Fan status and error indicator LEDs on front of the frame

Hinged, pull-away front door panel lowers to allow quick, easy card insertion

Remote control/monitoring via Ethernet using free DashBoard™ software, or optional OGCP-9000 remote control panel

Five year warranty

**ORDERING INFORMATION**

**OGX-FR-C-P** openGear® Frame with Cooling

**OGX-FR-CN-P** openGear® Frame with Cooling and Advanced Networking

**OGX-FR-CNS-P** openGear® Frame with Cooling, Advanced Networking, and SNMP

**PS-OGX** Redundant Power Supply

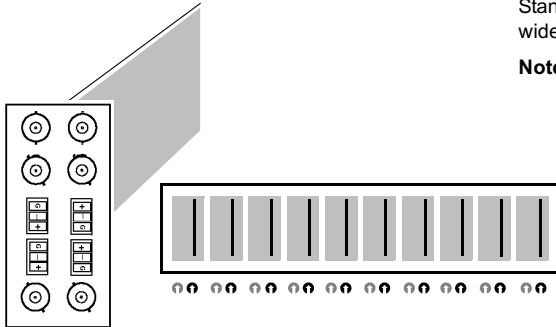


## 20-SLOT FRAME CARD CAPACITY AND REAR MODULES

Frame card capacity is largely determined by the rear modules that mate a card with its rear panel user connections.

For example, when using “split” rear modules, the card capacity in the 20-slot openGear®-compliant 2RU frame is greater than previously possible. 20-slot frames can be fitted with any mix of the rear module types described here, offering connection break-out that suits your requirements while maximizing frame capacity.

### Standard-Width Rear Module



1 card per rear module  
2 card slots used → 10 cards per frame (max)  
10 rear modules per frame (max)

**Standard-Width Rear Module** occupies 2 card slots and can accommodate BNC and wired connections such as balanced audio and GPIO connections. Standard-width rear modules are available for all Cobalt cards, and offer a wide variety of signals accommodation choices in the smallest space.

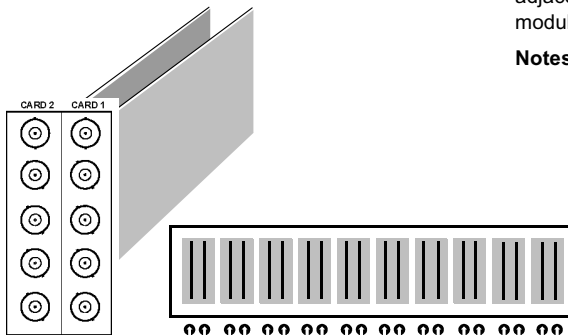
**Notes:**

- Not all slots can be fitted with cards when using a standard-width rear module (for example, when a standard-width module is fitted in the right-most frame position (viewed from rear), first available slot is slot 2, with slot 1 not being available).

- In all cases, maximum frame power budget for user slot total must be considered when planning frame build-out:
  - HPF-9000 Frame: 360W user budget
  - OG3-FR Frame: 300W user budget
  - 8321 Frame: 120W user budget

If necessary, consult Cobalt Sales for assistance in power planning.

### Split Rear Module



2 cards per rear module  
2 card slots used → 20 cards per frame (max)  
10 rear modules per frame (max)

**Split Rear Module** occupies 2 card slots, but also accommodates 2 card in adjacent slots. In this manner, for a frame fitted entirely with split rear modules, the maximum 20-card frame capacity can be achieved.

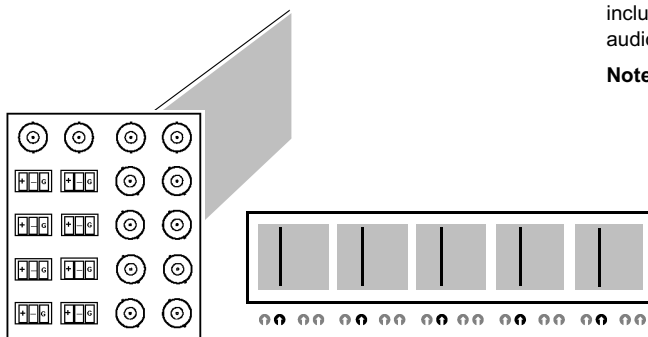
**Notes:**

- Split rear modules are available only for certain Cobalt cards. Consult our catalog, card Product Manual, or our website for availability of rear modules for particular cards.

- Split rear modules may not in all cases support the maximum number of connections offered by a card. (For example, a 9323 card fitted with a split rear module offers two AES ports vs. four available when using a standard rear module. Some cards are available with split rear modules using high-density HD-BNC or DIN 1.0/2.3 connectors which allow more connections than with BNC connectors.)
- In all cases, maximum frame power budget for user slot total must be considered when planning frame build-out:
  - HPF-9000 Frame: 360W user budget
  - OG3-FR Frame: 300W user budget
  - 8321 Frame: 120W user budget

If necessary, consult Cobalt Sales for assistance in power planning.

### Double-Width Rear Module



1 card per rear module  
4 card slots used → 5 cards per frame (max)  
5 rear modules per frame (max)

**Double-Width Rear Module** occupies 4 card slots and can accommodate a very high degree of signal count and types, including multiple BNC and wired connections such as balanced audio and GPIO connections.

**Notes:**

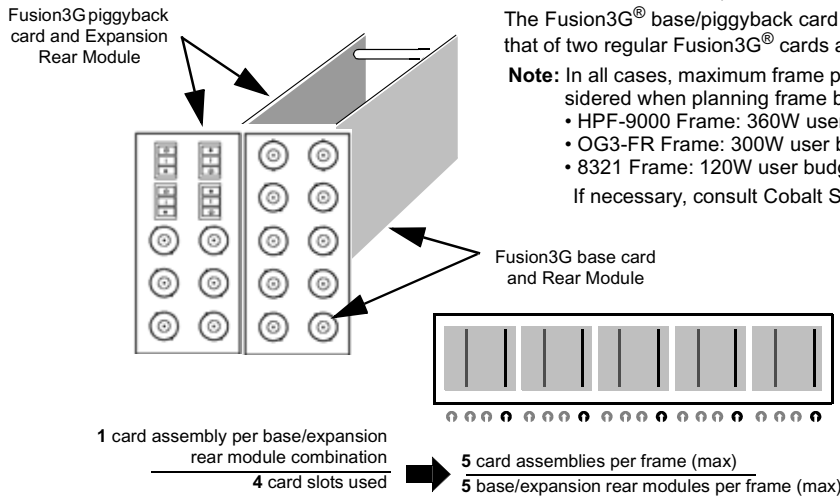
- Not all slots can be fitted with cards when using a double-width rear module (for example, when a double-width rear module is fitted in the right-most frame position (viewed from rear), first available slot is slot 2, with slot 1 not being available).

- In all cases, maximum frame power budget for user slot total must be considered when planning frame build-out:
  - HPF-9000 Frame: 360W user budget
  - OG3-FR Frame: 300W user budget
  - 8321 Frame: 120W user budget

If necessary, consult Cobalt Sales for assistance in power planning.

## 20-SLOT FRAME CARD CAPACITY AND REAR MODULES

### Expansion Rear Module (Fusion3G® only)



An **Expansion Rear Module** is used in conjunction with a Fusion3G® card equipped to provide optional features such as analog audio I/O (which is in turn provided by an Expansion piggyback card factory-installed on the base card when this option is ordered). Expansion Rear Modules are identified with "X" in the part number and **must be used in conjunction with a Base Rear Module**.

The expansion rear module installs directly to the **left** of the base Rear Module (as shown viewed from rear), and interfaces with the piggyback card.

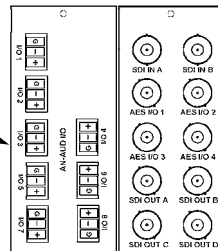
The Fusion3G® base/piggyback card assembly occupies the space identical to that of two regular Fusion3G® cards and two standard-width rear modules.

**Note:** In all cases, maximum frame power budget for user slot total must be considered when planning frame build-out:

- HPF-9000 Frame: 360W user budget
- OG3-FR Frame: 300W user budget
- 8321 Frame: 120W user budget

If necessary, consult Cobalt Sales for assistance in power planning.

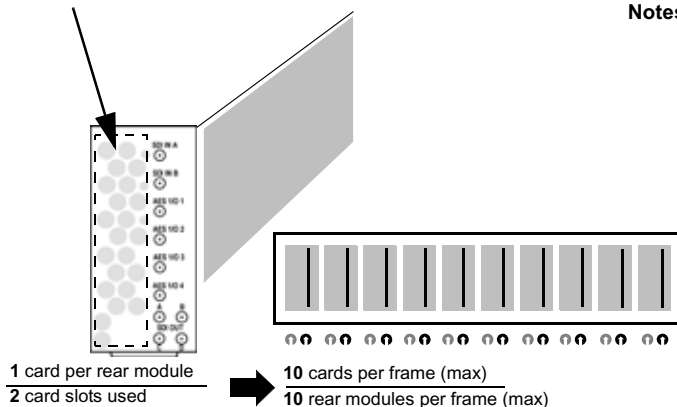
Expansion Rear Module installs directly to the **left** of base Rear Module, and interfaces with the piggyback card. In this example, an RM20-9901-XC expansion rear module breaks out analog audio connections provided by Option +ANA (analog audio option).



RM20-9901-B Rear Module provides connection break-out for base card functions.

### High-Ventilation Rear Module

Ventilation openings allow increased ventilation in installations where normal above-frame ventilation clearance is reduced



**High Ventilation (HV) Rear Module** occupies 2 card slots and offers coaxial connections using miniaturized connectors (HDBNC or DIN 1.0/2.3). These rear modules have openings to increase ventilation where the normal recommended above-frame ventilation space (1 RU) cannot be accommodated.

**Notes:**

- HV (high-ventilation) rear modules are available only for certain Cobalt cards. Consult our catalog, card Product Manual, or our website for availability of high-ventilation rear modules for particular cards.

- (Fusion3G® only) Where a base HV rear module is to be used in conjunction with an expansion rear module, a **companion HV expansion rear module must also be used**. Both base and expansion HV rear modules use card positioning that optimizes air flow across the component surface of the card PCB. Also note that when using an expansion rear module, frame capacity then follows the form as specified in "Expansion Rear Module" above.

- In all cases, maximum frame power budget for user slot total must be considered when planning frame build-out:
  - HPF-9000 Frame: 360W user budget
  - OG3-FR Frame: 300W user budget
  - 8321 Frame: 120W user budget

If necessary, consult Cobalt Sales for assistance in power planning.

DASHBOARD™ » CONTROL AND MONITORING APPLICATION for openGear

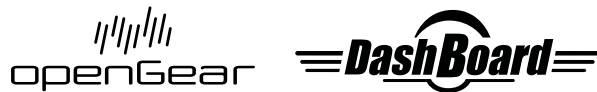
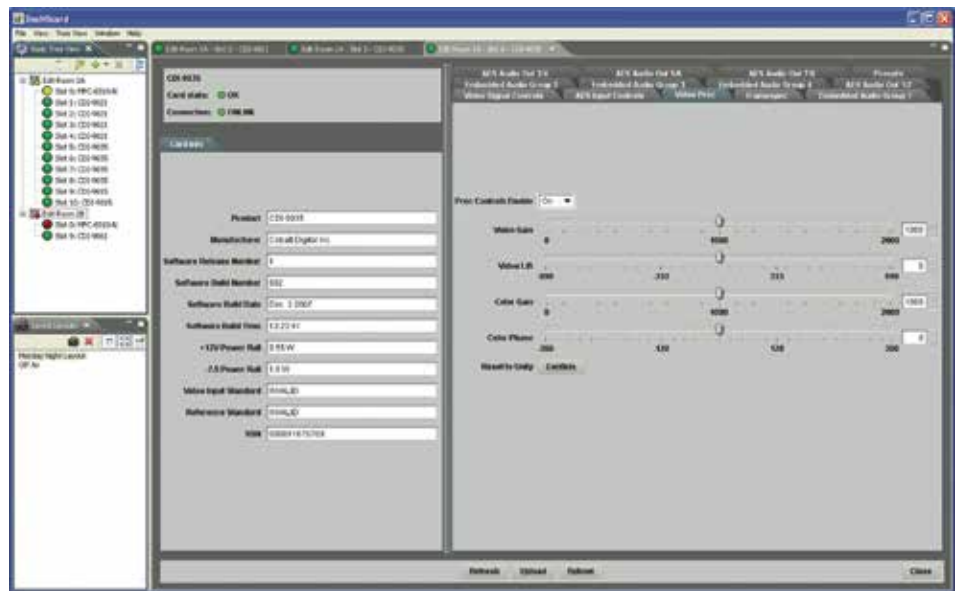
# DashBoard™

DashBoard™ is a control / monitoring application for the openGear® platform. It is available at no cost, and works with Windows®, Mac® and Linux®.

DashBoard™ provides a centralized user interface for all populated frame slots, allowing users to view and control all frames and cards on a network with a consistent, easy-to-use graphical interface. Cards define their controllable parameters to DashBoard™, so the control interface is always up to date.

In addition to extensive control and monitoring capabilities with its intuitive GUI, DashBoard™ allows for easily performed card software updates. Software update files can be downloaded from the Cobalt Digital website and then uploaded through DashBoard™.

To communicate with DashBoard™, an openGear® frame must be equipped with the HPF-FC (HPF-9000) or the MFC-8322-S (OG3-FR) frame controller module.



» FEATURES

Free application can be downloaded at [www.cobaltdigital.com/dashboard](http://www.cobaltdigital.com/dashboard)

Java based and runs in Windows®, Mac® and Linux®

Multiple frames can be connected to multiple control and monitoring stations

Automatic discovery of cards

Software and firmware updates via ethernet

openGear® is a registered trademark of Ross Video Limited. DashBoard™ is a trademark of Ross Video Limited.

**OG-PC-x86-A » INTEGRAL FRAME-INSTALLED PC** for openGear® Frames

The **OG-PC-x86-A Integral Frame-Installed PC for openGear® Frames** is a compact PC which is installed directly in the frame in the form of an openGear-style card with a double-width rear I/O module. The OG-PC-x86-A gets its power from the frame midplane with no external patches or sources. The full-featured PC is the perfect solution for a headless computer where rack space is limited – the OG-PC-x86-A frees-up the installation from wasting space on a separate 1RU server (especially useful for flypack setups). Using the OG-PC-x86-A, special applications of your choice can be conveniently collocated directly in the frame.

The OG-PC-x86-A installs just like other openGear® device. The OG-PC-x86-A is equipped with a rear panel that provides dual GigE, USB 2.0 and 3.0, HDMI, serial, as well as a DisplayPort.

**Basic Processing Details**

- Intel® Pentium® N3710      • 4-Core
- 1.6 GHz (2.56 GHz burst)      • 8GB DDR3



**FEATURES**

Self-contained compact integrated PC solution – eliminates the need for separate 1RU server in rack

Full-function high-speed PC with optional high-capacity SSD and dual HDD RAID backup availability

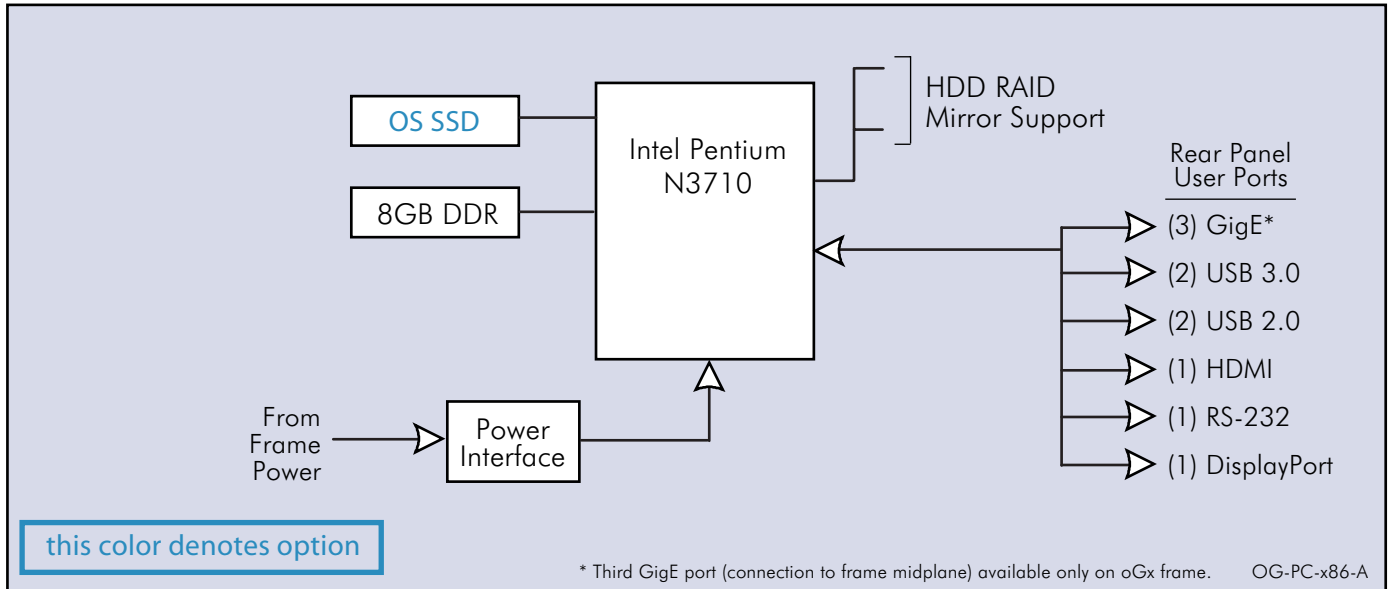
Obtains operating power from frame – no added or external power connections needed

Ruggedized openGear-compliant design. Plugs directly into frame with user ports exposed on rear of unit.

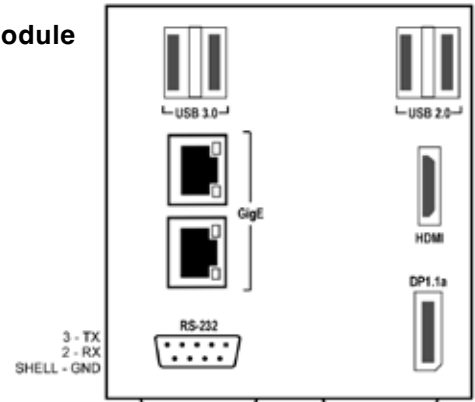
Hardware control features such as power on/off, reset, and sleep are accessible via DashBoard remote control – no need for physical collocation to invoke hard reset or similar actions

Full complement of user ports, including dual GigE and USB, as well as HDMI and DisplayPort

Low power consumption with minimal effect on overall frame power budget



**Rear I/O Module**



**OG-PC-x86-A » INTEGRAL FRAME-INSTALLED PC** for openGear® Frames

**SPECIFICATIONS**

**Processor System**

CPU: Intel® Pentium® N3710  
 Base Frequency: 1.6 GHz (burst to 2.56 GHz)  
 Core Number: 4  
 BIOS: AMI UEFI 64 Mbit  
 Instruction Set: 64 bit  
 For detailed information on the Intel® N3710 Processor used in this product, please see **Intel Pentium Processor N3710**

**Memory**

Technology: DDR3L 1600 MHz  
 Max. Capacity: 8GB

**Storage**

1x M.2 M-Key SATA (OS SSD specification defined by order option)  
 2x HDD 2.5in SATA

**Display**

Intel® HD Graphics 505  
 HDMI: 1.4b up to 3840 x 2160 at 30 Hz  
 DisplayPort: 1.1a up to 3840 x 2160 at 30 Hz

**Ethernet**

Speed: 10/100/1000 Mbps  
 Connectors: (2) RJ45 on rear I/O panel

**Power**

**Note:** Power figures below represent worse-case (all USB ports fully loaded; HDDs (if equipped) spinning). Current draw is distributed across multiple slots using supplied rear I/O module. As such, per-slot power consumption is not exceeded for supported 20-slot frames HPF-9000 and oGx models.  
 Power Consumption (no RAID HDD options): 48.6 W  
 Power Consumption (RAID; 1 HDD; typ): 53.6 W  
 Power Consumption (RAID; 2 HDD; typ): 58.6 W  
 Power Management: ACPI  
 Battery: Lithium 3 V / 210 mAh

**Environmental**

Operational Temperature: 0° to 45° C (32° to 113° F)  
 Operational Humidity: 40° C (104° F) @ 95% RH Non-Condensing  
 Non-Operational Temperature: -40° C to 85° C (-40° F to 185° F)

**ORDERING INFORMATION**

**OG-PC-x86-A** Integral Frame-Installed PC for openGear® Frames supporting up to two HDDs and one M.2 socket (includes rear I/O module)  
 (Above base model is base PC for which SSD and OS choices can be added, and a 1TB HDD can be added as described and specified below.)

**Options:**

- OG-PC-x86-HDD-1TB** 1TB Hard Disk Drive for the OG-PC-x86-A openGear® PC. (Two (2) max per OG-PC-x86-A card)
- OG-PC-x86-SSD-128GB** 128GB M.2 Solid State Drive without Operating System
- OG-PC-x86-SSD-128GB-WIN10IoT** 128GB M.2 SSD with Windows 10 IoT Operating System
- OG-PC-x86-SSD-128GB-WIN7** 128GB M.2 SSD with Windows 7 Embedded Operating System

**Note:** Options or ordering line items denoted as “-” are hardware orderable items (such as drives pre-loaded or unloaded with OS choices).  
**Note:** OG-PC-x86-A can be equipped to support user-added HDDs (up to two). Please contact your sales representative for more information and ordering details.

**OGCP-9000 » REMOTE CONTROL PANEL FOR OPENGear® CARDS**



The award-winning OGCP-9000 offers instantly available, simplified card control using individual control knobs that act just like level controls or selector switches. Each control setting is displayed on the adjacent display. The OGCP-9000 works with all Fusion3G® 9900 and COMPASS® 9000 series signal processing cards.

Communication with the openGear® frame occurs over an optimized high-speed openGear® Ethernet control protocol, allowing lightning-fast access. The OGCP-9000 offers instantaneous, real-time adjustments, so operators can manipulate on-air signals with confidence and precision.

An easy to use keypad enables intuitive access with minimal submenus. For any card, only one level of submenus is needed to access all of its functions. Station engineers can configure the panel to restrict availability of specific cards and parameters for operation. Configuration is done through a simple web interface, where configurations can be exported, backed up, and re-imported easily. The OGCP-9000 works seamlessly with DashBoard™ control software--any changes made with either system are instantly reflected on the other.

The control panel is optimized for both bright and low light environments. Two large format, super-bright, wide-angle color LCD screens show sharp and clear text; operators can select either a white or black background. Other features include a fully backlit keypad and user-adjustable LED back light.

**Options**  
Loudness Metering (+LM-P)

» FEATURES

Simultaneous display and update of 8 parameters	Save and restore panel configuration with web interface and USB drive	Seamless integration with DashBoard™ remote control software
Real time adjustments, excellent for on-air manipulation	10/100 Mbpts Ethernet TCP/IP connection	Rugged 2RU rack mounted chassis
No deep submenus, all parameters can be accessed quickly	Optimized for bright and low light environments	Five-year warranty
Completely configurable with password protected web interface		

» SPECIFICATIONS

<p><b>Power</b> 9 watts</p> <hr/> <p><b>AC Input</b> IEC C14 Chassis Plug accepting 90-264 VAC @ 47-63 Hz</p> <hr/> <p><b>DC Input</b> 12 VDC 1.0 A</p>	<p><b>Ethernet</b> 10/100 Mbps with Auto-MDIX on RJ45 socket with DC isolation</p> <hr/> <p><b>LCD</b> 500 cd/m2 (nits) of brightness, 300:1 contrast ratio, 120 degree viewing angle</p> <hr/> <p><b>Size</b> Standard 2RU; 5" depth</p>	<p>To allow you to provision loudness metering on a card-by-card and panel-by-panel basis suiting your needs, host cards and control panels use individual co-licenses. <b>Co-licenses are required on both the host card(s) and Control Panel(s)</b>, with card +LM-C co-licenses and panel +LM-P co-licenses comprising the overall option.</p> <div style="text-align: center;"> <p><b>Example</b> 2 cards each with a +LM-C co-license      1 Control Panel with a +LM-P co-license</p> </div>
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» ORDERING INFORMATION

**OGCP-9000** 2RU Remote Control Panel for Fusion3G®/COMPASS® Cards  
(Specify country of destination for power cord)

**+LM-P** Audio Loudness Metering software co-license for OGCP-9000.  
(Each card to be used with loudness metering also requires an individual card co-license (+LM-C). See respective card Ordering Information for availability.)

9970-QS » 3G/HD/SD-SDI/CVBS EXPANDABLE MULTIVIEWER with Advanced On-Screen Graphics



The Cobalt® 9970-QS 3G/HD/SD-SDI/CVBS Expandable Multiviewer integrates five discrete 3G/HD/SD-SDI or CVBS inputs onto a single 3G/HD/SD-SDI quint-split output, with each image being flexibly inserted into the output image area.

While the 9970-QS offers unprecedented flexibility, it also offers an unprecedented ease of use. Fully-flexible layouts using one-button template presets or fully customizable layouts using easy to use sizing/positioning custom controls. Custom layouts can be saved to user presets. Any template layout or custom layout changes can be done "on-the-fly" in real time, without tedious setup compiler or layout programs like many other split/multiviewer products.

Multiple 9970-QS cards can be cascaded to provide splits greater than the base quint-split. The 9970-QS PIP5 input can be used in a cascaded chain of 9970-QS cards that provides multiviewer layouts of up to 8x8 (64:1). The QuickSet grid definer precisely and easily sets up a multiviewer grid where columns and rows of each of the cards PIPs are arranged to work together in a cascaded aggregate arrangement. Low-latency processing allows multiple 9970-QS cards to be cascaded without significant accumulated delays within the chain.

Advanced graphics such as user identify text, PIP input video format, audio meter bars, tally/UMD, reticules, and timecode can be burned into any PiP with full user attributes control. CEA 608 Ch1 text strings can serve as user text overlays, allowing direct closed captioning presence/quality compliance checks for up to 5 simultaneous video streams per card. User-configurable Quality Check allows subjective criteria such as black/frozen frame or audio silence events to propagate an on-screen alarm/alert to the output image (such as alert text burn-in or border alert highlighting).

A master output up-down-cross convert scaler provides scale-to HD or 3G SDI formats for the combined multiviewer output, which also includes an HDMI output (with audio embedding) to directly feed a wall monitor. The openGear® card-based form factor of the 9970-QS provides scalable, easily integrated multi-image functions for the 20-slot frame

form factor with easy to use DashBoard™ remote control. Each PiP input is provided its own independent timing alignment controls with lock to reference, allowing asynchronous inputs to be directly accommodated. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. Tally can be communicated by GPI, Ethernet, or serial interfaces.

Independent per-PiP audio meters

Two user identify text fields per PiP. Each can be set as as user text, or to display the input video format

Independent sizing control for each PiP using one-button templates or easy to use custom slider controls with full control of size, position, H/V scaling, and border attributes. Burn-in insertions are independently configurable for insertion enable/disable, insertion size/position, color, background, and opacity.

User-configurable reticules

Independent per-PiP timecode insertion

Per PiP User UMD text and tally indicators

User-configurable alert annunciation with special borders and text

Clock insertion can be sized and positioned anywhere in merged view, or inserted as per-PIP user text. Time can be locally user set, or sourced from network NTP with timezone localization.



9970-QS » 3G/HD/SD-SDI/CVBS EXPANDABLE MULTIVIEWER with Advanced On-Screen Graphics

FEATURES

Scalable openGear® PiP solution. Card-based form factor provides high density, space-saving economical integration.

Easy, real-time “on the fly” custom layout changes without needing setup compiler or layout programs

Easy to configure PiP sizing and borders. Advanced graphics include audio meters, character burn, and reticules. PiP sizing/splits using one-button templates or easy-to-use, intuitive DashBoard controls. Custom settings can be saved to user presets.

GPI, Ethernet, and serial tally inputs provide dual, per-PiP tally indicators

Closed captioning overlays provide direct closed captioning presence/quality compliance checks for up to 5 simultaneous video streams per card

Cascading Mode and QuickSet grid definer offers easy to set up scalable multiviewer functions (up to 64:1) using multiple cascaded (daisy-chained) 9970-QS cards. Two cards can provide an 8:1 multiviewer, with up to 16 cards providing a 64:1 multiviewer. Single card provides up to 5:1 split, with up to ten 5:1 splits per frame.

Cascade Config provides access to PiP controls for all PiPs from one card. Controls for all PiPs appear universally on each card in the chain. PiP numbers are correlated to your actual PiPs instead of fixed card-based port definers. Cascade Config consolidated control can span card chains within a frame or across multiple frames.

DashBoard Output Preview function provides display of regularly-sampled screen captures in the card DashBoard page. Provides remote-access program video content/presence and multiviewer layout confidence monitoring via the card’s DashBoard display without needing collocation with the card or its input or output video signals.

Audio routing directs selected PiP audio to combined-stream outputs. Audio downmixing also provided.

3G/HD/SD-SDI 2x DA and HDMI with audio embed outputs

Wall-clock time burn-in on merged output or within PiPs. NTP sync via IP connection with timezone localization.

Per-PiP audio meter, tally, user text, and timecode overlays

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Fully flexible input compatibility – mixed formats on inputs can be automatically sized and outputted in a combined output scaled to desired broadcast SD/HD/3G output format. Each input automatically detects and sets up for SDI or CVBS input. Supports asynchronous inputs using per-PiP ref lock. Per-PiP independent ARC settings and controls.

User quality criteria (such as frozen/black frame) alert/alarms can be propagated to output image with alarm text and border highlighting

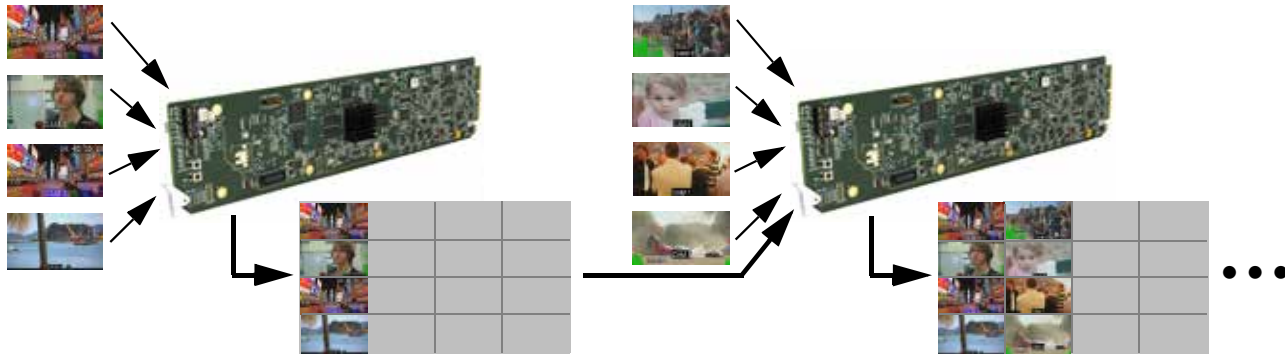
Low-power/high-density design – less than 18 Watts per card

DashBoard™ remote control status monitoring and setup/control

Hot-swappable

Five year warranty

Multiple 9970-QS cards can operate in a **cascading** mode, where four PiP inputs serve as program video inputs, and the PiP 5 input receives the cascading combined layout of a preceding 9970-QS card in a daisy-chain arrangement.



The cascade output (consisting of the four PiP images and a full-size underlay) can be sent to another 9970-QS as a **cascade** input, serving as an underlay which can accept more PiP insertions.

A Quickset grid definer precisely sets up a multiviewer grid where columns and rows of each of the cards PiPs are arranged to work together in a cascaded aggregate arrangement. Simply set for the number of rows and columns desired – the Quickset definer does the rest!

More downstream 9970-QS cards can be added and have its PiPs added next to those furnished from the upstream card cascade. Here, PiP insertions are arranged in columns, although almost any desired grid and arrangement scheme is possible.

Even more cards and PiPs can be added using open adjacent cells in the grid. Grids of up to 8x8 are supported, providing for a 64:1 multiviewer using only 16 cards all within the compact 2RU openGear-standard frame form.



Pressing the Identify PiP button in DashBoard™ instantly correlates each image to its PiP card channel.

The identities are clearly shown for a few seconds, after which the identity overlays automatically cancel.

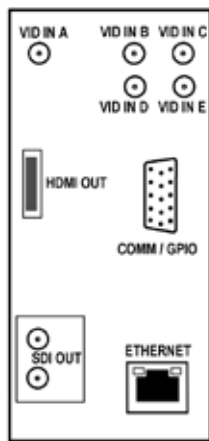
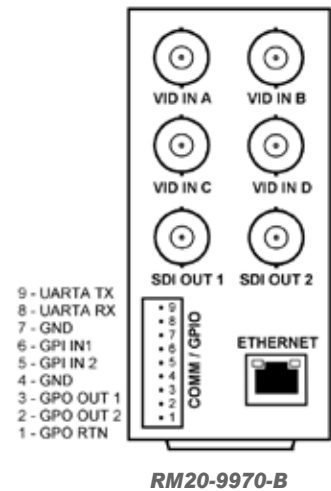


3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

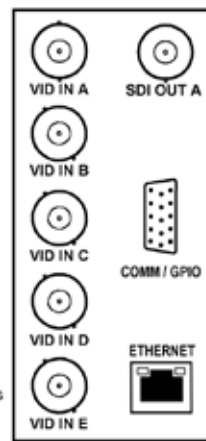
9970-QS » 3G/HD/SD-SDI/CVBS EXPANDABLE MULTIVIEWER with Advanced On-Screen Graphics

Each of the up to five multi-image displays offer per-PIP independent, real-time closed captioning text overlays

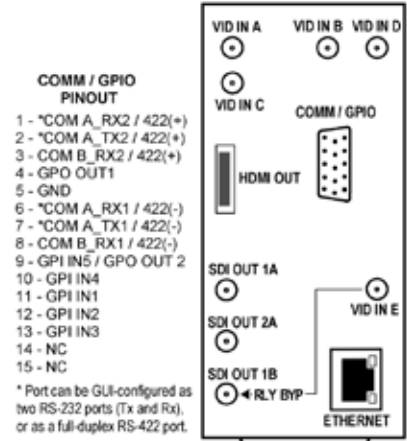
Any or all of the five PIP images can insert closed captioning overlays, providing an easy to use, intuitive, and very practical source for closed captioning presence and quality check. The CC overlay function interprets CEA 608 data for text formatting (roll-up, line breaks, etc). Caption overlay can accept CEA 608 formatting or CEA 608 packaged into CEA 708.



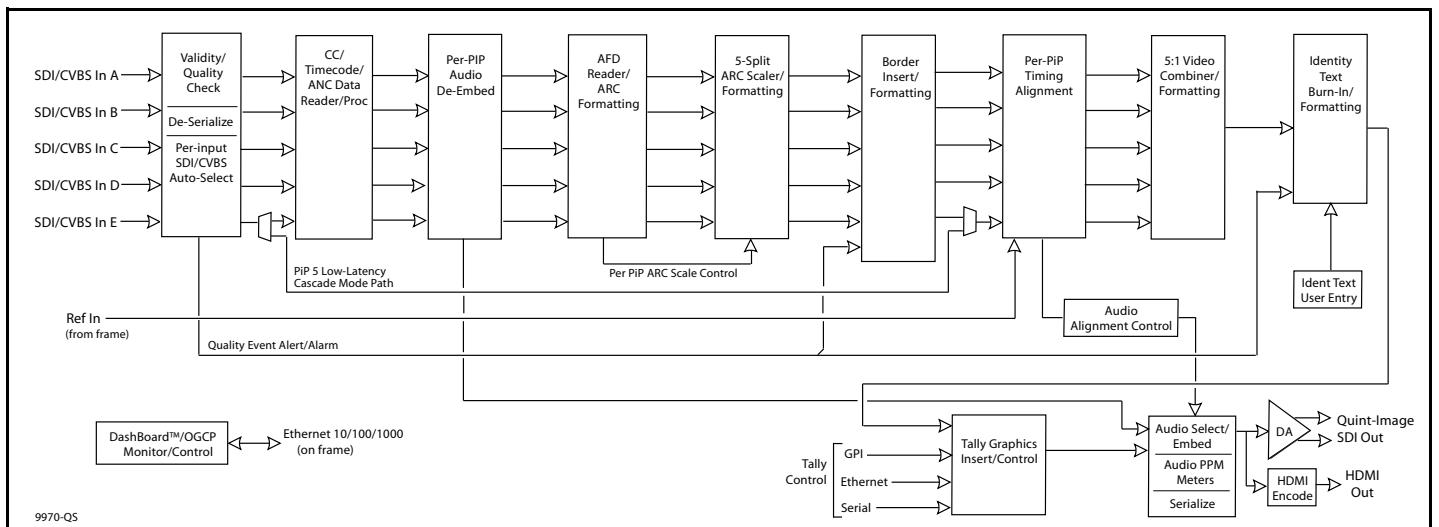
**RM20-9970-C-DIN**  
**RM20-9970-C-HDBNC**



**RM20-9970-D**



**RM20-9970-E-DIN**  
**RM20-9970-E-HDBNC**



**9970-QS » 3G/HD/SD-SDI/CVBS EXPANDABLE MULTIVIEWER** with Advanced On-Screen Graphics

**SPECIFICATIONS**

**Power**

< 18 Watts

**Video Input/Outputs**

Video Inputs: (5) 75Ω BNC; auto-detect/setup for 3G/HD/SD-SDI or CVBS  
 SDI Outputs: (2) 75Ω BNC (2x DA); user-selectable as 720p, 1080i, or 1080p (3G)  
 HDMI Output: (1) HDMI output with audio embedding  
 Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 I/O Latency: Basic PiP Input/Output < 1.5 frames (max). Cascade latency consists of basic PiP I/O latency plus < 2 line added delay.  
 Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

**Timecode Burn-In**

Independent per-PIP burn-in via user controls from input video SMPTE embedded timecode. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size, color, and H/V position.

**Text Burn-In**

Per-PiP UMD and two user identity text strings (as alternate, automatic PiP input video format can be inserted). Independent insertions controls for enable/disable. User controls for text size, color, and H/V position.

**Audio Output**

16-ch embedded. Per-PIP select allows routing of PIP input 16-ch embedded audio to combined SDI output. HDMI output tracks with group 1/2 audio as selected for SDI embedded audio output.

**Tally Indicators/Inputs**

Per-PIP dual tally indicators. GPI, Ethernet, serial per-PiP control. Per-PiP tally lamp position and sizing controls.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9970-QS** 3G/HD/SD-SDI/CVBS Expandable Multiviewer with Advanced On-Screen Graphics

**RM20-9970-B** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI/CVBS Input BNCs, (2) 3G/HD/SD-SDI Output BNCs (2xDA), COMM/GPIO Port, Ethernet Port

**RM20-9970-C-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI DA Outputs, COMM/GPIO Port (Combined D-connector), HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9970-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI DA Outputs, COMM/GPIO Port (Combined D-connector), HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

**RM20-9970-D** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Input BNCs, (1) 3G/HD/SD-SDI Output BNC, COMM/GPIO Port (Combined D-connector), Ethernet Port

**RM20-9970-E-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) SDI x2 Outputs (1 with relay bypass protect), COMM/GPIO Port (Combined HD-15 connector), HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9970-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) SDI x2 Outputs (1 with relay bypass protect), COMM/GPIO Port (Combined HD-15 connector), HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

**BBG-1070-QS » 3G/HD/SD-SDI/CVBS STANDALONE EXPANDABLE MULTIVIEWER**

with Advanced On-Screen Graphics



The Cobalt® **BBG-1070-QS 3G/HD/SD-SDI/CVBS Standalone Expandable Multiviewer with Advanced On-Screen Graphics** integrates five discrete 3G/HD/SD-SDI or CVBS inputs onto a single 3G/HD/SD-SDI quint-split output, with each input image being flexibly inserted into the output image area.

While the BBG-1070-QS offers unprecedented flexibility, it also offers an unprecedented ease of use. Fully-flexible layouts using any of several one-button template presets or fully customizable layouts using easy to use sizing/positioning custom controls. Custom layouts can be saved to user presets. Any template layout or custom layout changes can be done "on-the-fly" in real time, without tedious setup compiler or layout programs like many other split/multiviewer products.

Multiple BBG-1070-QS units can be cascaded to provide splits greater than the base quint-split. The PiP5 input can be used in a cascaded chain of BBG-1070-QS units that provides multiviewer layouts of up to 8x8 (64:1). The QuickSet grid definer precisely and easily sets up a multiviewer grid where columns and rows of each of the PiPs are arranged to work together in a cascaded aggregate arrangement. Low-latency processing allows multiple BBG-1070-QS units to be cascaded without significant accumulated delays within the chain.

Advanced graphics such as user identify text, PiP input video format, audio meter bars, tally/UMD, reticules, and timecode can be burned into any PiP with full user attributes control. CEA 608 Ch1 text strings can serve as user text overlays, allowing direct closed captioning presence/quality compliance checks for up to 5 simultaneous video streams per unit. User-configurable Quality Check allows subjective criteria such as black/frozen frame or audio silence events to propagate an on-screen alarm/alert to the output image (such as alert text burn-in or border alert highlighting). Each PiP input is provided its own independent timing alignment controls with lock to reference, allowing asynchronous inputs to

be directly accommodated. An HDMI output (with audio embedding) allows direct feed to a monitor.

The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1070-QS allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

Independent per-PiP audio meters

Two user identity text fields per PiP. Each can be set as user text, or to display the input video format

Independent sizing control for each PiP using one-button templates or easy to use custom slider controls with full control of size, position, H/V scaling, and border attributes. Burn-in insertions are independently configurable for insertion enable/disable, insertion size/position, color, background, and opacity.

User-configurable reticules

Independent per-PiP timecode insertion

Per PiP User UMD text and tally indicators

User-configurable alert annunciation with special borders and text

Clock insertion can be sized and positioned anywhere in merged view, or inserted as per-PiP user text. Time can be locally user set, or sourced from network NTP with timezone localization.



3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

**BBG-1070-QS » 3G/HD/SD-SDI/CVBS STANDALONE EXPANDABLE MULTIVIEWER**

with Advanced On-Screen Graphics

**FEATURES**

Scalable PiP solution. Single unit provides up to 5:1 split, with up to ten 5:1 splits per frame

Allows easy, real-time “on the fly” custom layout changes without needing setup compiler or layout programs

Easy to configure PiP sizing and borders. Advanced graphics include audio meters, character burn, and reticules. PiP sizing/splits using one-button templates or easy-to-use, intuitive DashBoard™ GUI controls. Custom settings can be saved to user presets.

GPI, Ethernet, and serial tally inputs provide dual, per-PiP tally indicators

Closed captioning overlays provide direct closed captioning presence/quality compliance checks for up to 5 simultaneous video streams per unit

Cascading Mode and QuickSet grid definer offers easy to set up scalable multiviewer functions (up to 64:1) using multiple cascaded (daisy-chained) BBG-1070-QS units. Two units can provide an 8:1 multiviewer.

Cascade Config provides access to PiP controls for all PiPs from one DashBoard device view. Controls for all PiPs appear universally on each BBG-1070-QS in the chain. PiP numbers are correlated to your actual PiPs instead of fixed device-based port definers.

DashBoard Output Preview function provides display of regularly-sampled screen captures in the device DashBoard page. Provides remote-access program video content/presence and multiviewer layout confidence monitoring via the device’s DashBoard display without needing collocation with the card or its input or output video signals.

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

3G/HD/SD-SDI and HDMI outputs with audio embed outputs

Per-PIP audio meter, tally, user text, and timecode overlays

Audio routing directs selected PiP audio to combined-stream outputs. Audio downmixing also provided.

Wall-clock time burn-in on merged output or within PiPs. NTP sync via IP connection with timezone localization.

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Fully flexible input compatibility – mixed formats on inputs can be automatically sized and outputted in a combined output scaled to desired broadcast SD/HD/3G output format. Each input automatically detects and sets up for SDI or CVBS input. Supports asynchronous inputs using per-PiP ref lock. Per-PiP independent ARC settings and controls.

User quality criteria (such as frozen/black frame) alert/alarms can be propagated to output image with alarm text and border highlighting

Redundant power supply option

Five year warranty

Multiple BBG-1070-QS units can operate in a **cascading** mode, where four PiP inputs serve as program video inputs, and the PiP 5 input receives the cascading combined layout of a preceding BBG-1070-QS unit in a daisy-chain arrangement.



The cascade output (consisting of the four PiP images and a full-size underlay) can be sent to another BBG-1070-QS as a **cascade** input, serving as an underlay which can accept more PiP insertions.

A Quickset grid definer precisely sets up a multiviewer grid where columns and rows of each of the cards PiPs are arranged to work together in a cascaded aggregate arrangement. Simply set for the number of rows and columns desired – the Quickset definer does the rest!

More downstream BBG-1070-QS units can be added and have its PiPs added next to those furnished from the upstream card cascade. Here, PiP insertions are arranged in columns, although almost any desired grid and arrangement scheme is possible.

Even more units and PiPs can be added using open adjacent cells in the grid. Grids of up to 8x8 are supported.



Pressing the Identify PiP button instantly correlates each image to its PiP channel.

The identities are clearly shown for a few seconds, after which the identity overlays automatically cancel.

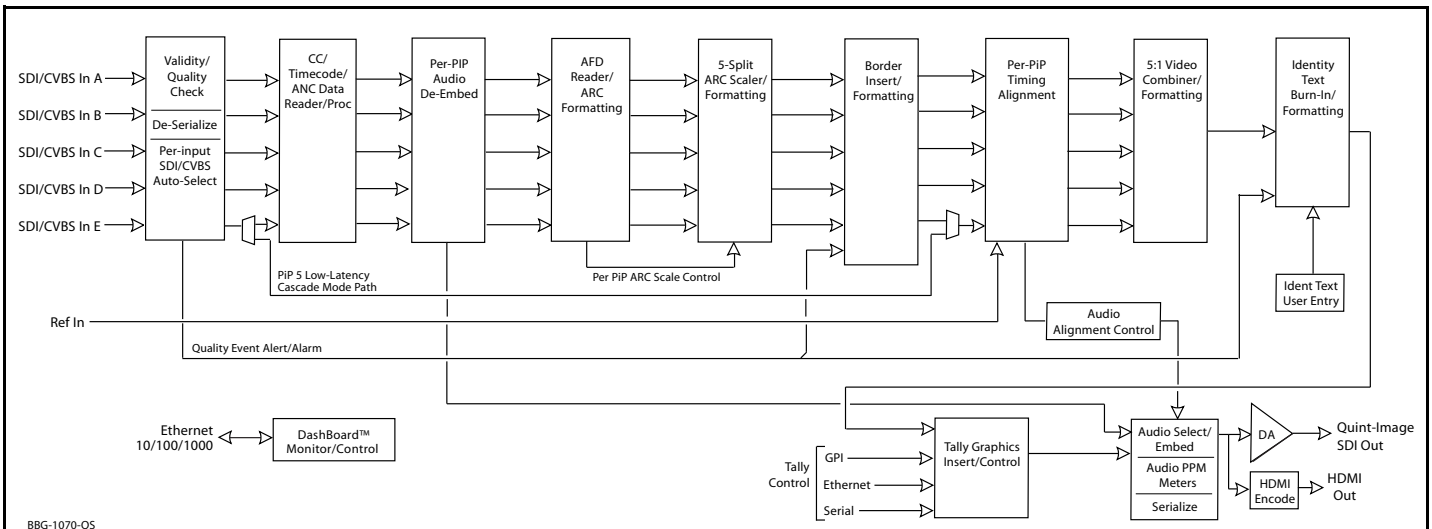
3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

**BBG-1070-QS » 3G/HD/SD-SDI/CVBS STANDALONE EXPANDABLE MULTIVIEWER**

with Advanced On-Screen Graphics

Each of the up to five multi-image displays offer per-PIP independent, real-time closed captioning text overlays

Any or all of the five PIP images can insert closed captioning overlays, providing an easy to use, intuitive, and very practical source for closed captioning presence and quality check. The CC overlay function interprets CEA 608 data for text formatting (roll-up, line breaks, etc). Caption overlay can accept CEA 608 formatting or CEA 608 packaged into CEA 708.



**BBG-1070-QS Rear Panel**

**COMM / GPIO**

- 1 - \*COM A\_RX2 / 422(+)
- 2 - \*COM A\_TX2 / 422(+)
- 3 - COM B\_RX2 / 422(+)
- 4 - GPO OUT1
- 5 - GND
- 6 - \*COM A\_RX1 / 422(-)
- 7 - \*COM A\_TX1 / 422(-)
- 8 - COM B\_RX1 / 422(-)
- 9 - GPI IN5
- 10 - GPI IN4
- 11 - GPI IN1
- 12 - GPI IN2
- 13 - GPI IN3
- 14 - NC
- 15 - NC

\* Port can be GUI-configured as two RS-232 ports (Tx and Rx), or as a full-duplex RS-422 port.

**3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS****BBG-1070-QS » 3G/HD/SD-SDI/CVBS STANDALONE EXPANDABLE MULTIVIEWER**

with Advanced On-Screen Graphics

**SPECIFICATIONS****Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (supplied).

**Video Input/Outputs**

Video Inputs: (5) 75Ω BNC; auto-detect/setup for 3G/HD/SD-SDI or CVBS

SDI Outputs: (1) 75Ω BNC; user-selectable as 720p, 1080i, or 1080p (3G)

HDMI Output: (1) HDMI output with audio embedding

Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

I/O Latency: Basic PIP Input/Output < 1.5 frames (max). Cascade latency consists of basic PIP I/O latency plus < 2 line added delay.

Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

**Timecode Burn-In**

Independent per-PIP burn-in via user controls from input video SMPTE embedded timecode. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size, color, and H/V position.

**Text Burn-In**

Per-PIP UMD and two user identity text strings (as alternate, automatic PIP input video format can be inserted). Independent insertions controls for enable/disable. User controls for text size, color, and H/V position.

**Audio Output**

16-ch embedded. Per-PIP select allows routing of PIP input 16-ch embedded audio to combined SDI output. HDMI output tracks with group 1/2 audio as selected for SDI embedded audio output.

**Tally Indicators/Inputs**

Per-PIP dual tally indicators. GPI, Ethernet, serial per-PIP tally control. Per-PIP tally lamp position and sizing controls.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping reference input. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**BBG-1070-QS** 3G/HD/SD-SDI/CVBS Standalone Expandable Multiviewer with Advanced On-Screen Graphics (includes one BBG-1000-PS Power Supply)

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

**9970-QS-MC » 3G/HD/SD-SDI/CVBS EXPANDABLE MASTER CONTROL MULTIEWER**  
with Advanced On-Screen Graphics



The Cobalt® **9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer** integrates five discrete 3G/HD/SD-SDI or CVBS inputs onto a single 3G/HD/SD-SDI quint-split output, with each image being flexibly inserted into the output image area.

Based on our award-winning 9970-QS, the 9970-QS-MC is specifically designed for master control applications by providing layout optimization that saves space, and easily implemented QC screening of master control ingest.

The 9970-QS-MC provides the ability to orient and arrange PIPs in columns arranged for a 9x16 "portrait" layout. This allows consumer or professional monitors to be oriented "on-end", thereby saving wall-width in any area (especially in space-conscious mobile environments). The 9970-QS-MC provides individual per-PIP detection of missing video, black/frozen frame or audio silence events. This detection can propagate an alert to individual QC GPO signals for instant notification of video/audio errors. While the 9970-QS-MC offers unprecedented flexibility, it also offers an unprecedented ease of use. Fully-flexible layouts using one-button template presets or fully customizable layouts using easy to use sizing/positioning custom controls. Custom layouts can be saved to user presets. Any template layout or custom layout changes can be done "on-the-fly" in real time, without tedious setup compiler or layout programs like many other split/multiviewer products.

Multiple 9970-QS-MC cards can be cascaded to provide splits greater than the base quint-split. The 9970-QS-MC PIP5 input can be used in a cascaded chain of 9970-QS-MC cards that provides multiviewer layouts of up to 8x8 (64:1). The QuickSet grid definer precisely and easily sets up a multiviewer grid where columns and rows of each of the cards PIPs are arranged to work together in a cascaded aggregate arrangement. Low-latency processing allows multiple 9970-QS-MC cards to be cascaded without significant accumulated delays within the chain.

A master output up-down-cross convert scaler provides scale-to HD or 3G SDI formats for the combined multiviewer output, which also includes an HDMI output (with audio embedding) to directly feed a consumer wall monitor. The openGear® card-based form factor of the 9970-QS-MC provides scalable, easily integrated multi-image functions for the 20-slot frame form factor with easy to use DashBoard™ remote control. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Scalable openGear® multiviewer master control solution. Card-based form factor provides high density, space-saving economical integration.

9x16 "portrait" layout mode allows monitor "on-end" orientation to save wall-width space in master control environments

Easy, real-time "on the fly" custom layout changes without needing setup compiler or layout programs

Quality events (such as missing video, frozen/black frame, or audio silence) alert/alerts can be propagated to individual per-PIP GPO (Input A only)

Easy to configure PIP sizing and borders. Custom settings can be saved to user presets.

Cascading Mode and QuickSet grid definer offers easy to set up scalable multiviewer functions (up to 64:1) using multiple cascaded (daisy-chained) 9970-QS-MC cards. Two cards can provide an 8:1 multiviewer, with up to 16 cards providing a 64:1 multiviewer. Single card provides up to 5:1 split, with up to ten 5:1 splits per frame.

3G/HD/SD-SDI 2x DA and HDMI with audio embed outputs

DashBoard Output Preview function provides display of regularly-sampled screen captures in the card DashBoard page. Provides remote-access program video content/presence and multiviewer layout confidence monitoring via the card's DashBoard display without needing collocation with the card or its input or output video signals.

Audio routing directs selected PIP audio to combined-stream outputs. Audio downmixing also provided.

Fully flexible input compatibility - mixed formats on inputs can be automatically sized and outputted in a combined output scaled to desired broadcast SD/HD/3G output format. Each input automatically detects and sets up for SDI or CVBS input. Supports asynchronous inputs using per-PIP ref lock. Per-PIP independent ARC settings and controls.

Low-power/high-density design - less than 18 Watts per card

DashBoard™ remote control status monitoring and setup/control

Hot-swappable

Five year warranty



9x16 Portrait output mode provides space efficiency allowing consumer-size monitors to be positioned on-end. The 9970-QS-MC allows the same cascading as the 9970-QS model, allowing large-scale multiviewer setups using less wall space.

Per-PIP detection of missing video, black/frozen frame, or audio silence events can propagate an alert to individual QC GPO signals for instant detection of video/audio errors.

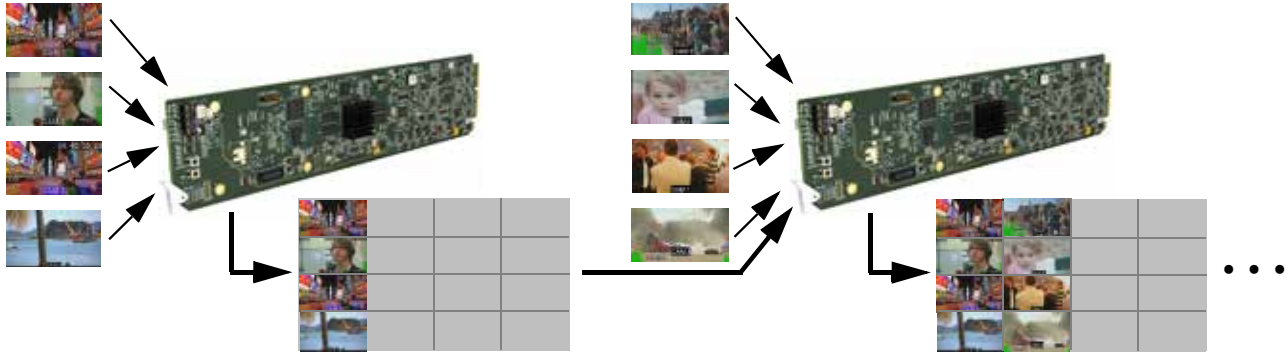


3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

9970-QS-MC » 3G/HD/SD-SDI/CVBS EXPANDABLE MASTER CONTROL MULTIVIEWER

with Advanced On-Screen Graphics

Multiple 9970-QS-MC cards can operate in a **cascading** mode, where four PiP inputs serve as program video inputs, and the PIP5 input receives the cascading combined layout of a preceding 9970 card in a daisy-chain arrangement.

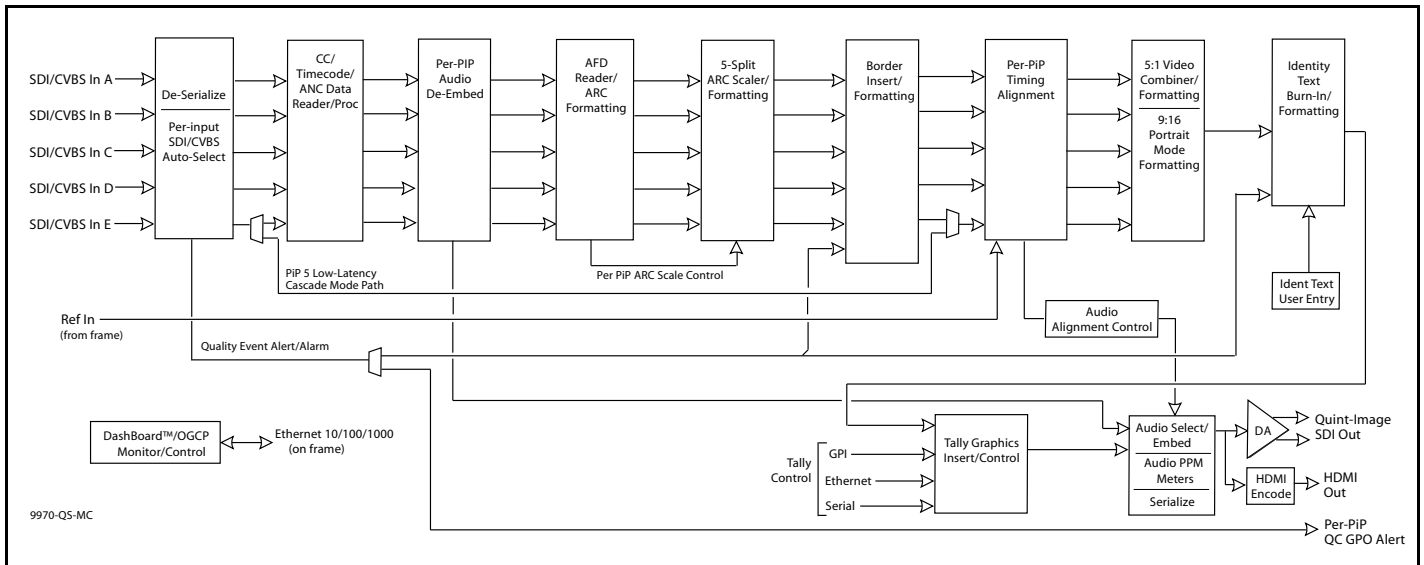


The cascade output (consisting of the four PiP images and a full-size underlay) can be sent to another 9970-QS as a **cascade** input, serving as an underlay which can accept more PiP insertions.

A Quickset grid definer precisely sets up a multiviewer grid where columns and rows of each of the cards PiPs are arranged to work together in a cascaded aggregate arrangement. Simply set for the number of rows and columns desired – the Quickset definer does the rest!

More downstream 9970-QS cards can be added and have its PiPs added next to those furnished from the upstream card cascade. Here, PiP insertions are arranged in columns, although almost any desired grid and arrangement scheme is possible.

Even more cards and PiPs can be added using open adjacent cells in the grid. Grids of up to 8x8 are supported, providing for a 64:1 multiviewer using only 16 cards all within the compact 2RU openGear-standard frame form.

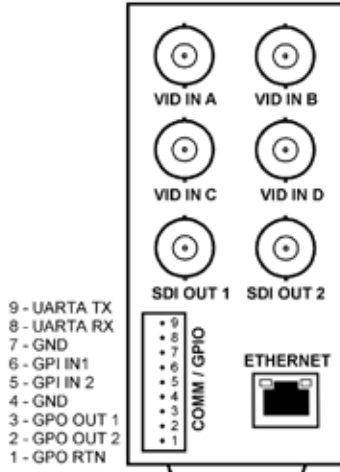




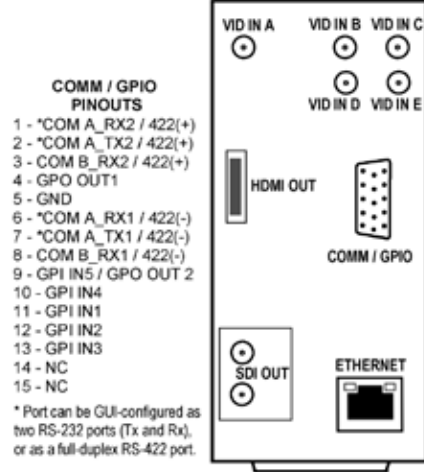
3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

9970-QS-MC » 3G/HD/SD-SDI/CVBS EXPANDABLE MASTER CONTROL MULTIEWER

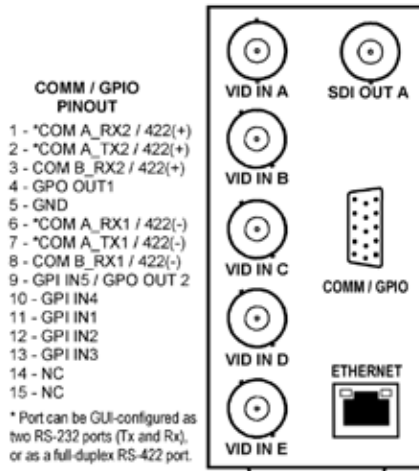
with Advanced On-Screen Graphics



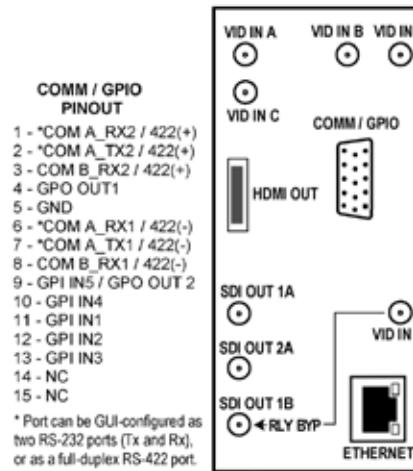
RM20-9970-B



RM20-9970-C-DIN  
RM20-9970-C-HDBN



RM20-9970-D



RM20-9970-E-DIN  
RM20-9970-E-HDBNC

3G/HD/SD-SDI EXPANDABLE MULTIVIEWERS

**9970-QS-MC » 3G/HD/SD-SDI/CVBS EXPANDABLE MASTER CONTROL MULTIVIEWER**

with Advanced On-Screen Graphics

**SPECIFICATIONS**

**Power**

< 18 Watts

**Video Input/Outputs**

Video Inputs: (5) 75Ω BNC; auto-detect/setup for 3G/HD/SD-SDI or CVBS. (3G support for Level A only.)  
 SDI Outputs: (2) 75Ω BNC (2x DA); user-selectable as 720p, 1080i, or 1080p (3G). (9x16 portrait output mode available only for 1080p (3G) output raster.)  
 HDMI Output: (1) HDMI output with audio embedding  
 Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M (level A)  
 I/O Latency: Basic PIP Input/Output < 1.5 frames (max). Cascade latency consists of basic PIP I/O latency plus < 2 line added delay.  
 Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

**Timecode Burn-In**

Independent per-PIP burn-in via user controls from input video SMPTE embedded timecode. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size, color, and H/V position.

**Text Burn-In**

Per-PIP UMD and two user identity text strings (as alternate, automatic PIP input video format can be inserted). Independent insertions controls for enable/disable. User controls for text size, color, and H/V position.

**Audio Output**

16-ch embedded. Per-PIP select allows routing of PIP input 16-ch embedded audio to combined SDI output. HDMI output tracks with group 1/2 audio as selected for SDI embedded audio output.

**Tally Indicators/Inputs**

Per-PIP dual tally indicators. GPI, Ethernet, serial per-PIP control. Per-PIP tally lamp position and sizing controls.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9970-QS-MC** 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics

**RM20-9970-B** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI/CVBS Input BNCs, (2) 3G/HD/SD-SDI Output BNCs (2xDA), COMM/GPIO Port, Ethernet Port

**RM20-9970-C-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI DA Outputs, COMM/GPIO Port (Combined D-connector), HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9970-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI DA Outputs, COMM/GPIO Port (Combined D-connector), HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

**RM20-9970-D** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Input BNCs, (1) 3G/HD/SD-SDI Output BNC, COMM/GPIO Port (Combined D-connector), Ethernet Port

**RM20-9970-E-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) SDI x2 Outputs (1 with relay bypass protect), COMM/GPIO Port (Combined HD-15 connector), HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9970-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) SDI x2 Outputs (1 with relay bypass protect), COMM/GPIO Port (Combined HD-15 connector), HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

9971-MV6-4K » 12G/6G/3G/HD/SD UHD MULTIVIEWERS



The Cobalt® 9971-MV6-4K 12G/6G/3G/HD/SD UHD Multiviewers suite is Cobalt's next generation of advanced UHD high-capacity channel multiviewers for the openGear® platform. Full-flexibility design accommodates 12G/6G/3G/HD/SD-SDI and UHD1 3840x2160 Square Division (SDQS) or Two-Sample Interleave (2SI) quad 3G-SDI based formats as I/O, and can output ST 2082 12G-SDI for single-wire 4K transport. Using 12G-SDI "single-wire" inputs, up to 6 discrete PIP images can be supported. With both 12G-SDI and quad 3G-SDI inputs, the 9971-MV6-4K can downconvert 12G and quad UHD. The 9971-MV6-4H-4K model directly works with commercial/consumer HDMI signals as both inputs and outputs without any video converter boxes being required. All 9971-MV6-4K models provide up to two HDMI 2.0 outputs for economical 4K video monitoring.

The 9971-MV6-4K suite offers unprecedented ease of setup and also offers an unprecedented ease of use. Fully-flexible layouts using any of several one-button template presets or fully customizable layouts using easy to use sizing/positioning custom controls. Any template layout or custom layout changes can be done "on-the-fly" in real time, without

tedious setup or layout programs like many other multiviewer products. Graphical overlay features include user text "burn-in" insertions that can correlate the images displayed with contextual information. Numerous one-button preset layout formats are available, as well as custom layouts as desired. Custom layout and configuration settings can be saved to user presets, allowing the custom settings to be recalled with one click.

The high-density openGear® design allows for up to five 9971-MV6-4K cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via DashBoard user interface or Cobalt's RESTful-based Reflex protocol.

9971-MV6-4K Models:

9971-MV6-4K 12G/6G/3G/HD/SD UHD Multiviewer with Six SDI Inputs

9971-MV6-4H-4K 12G/6G/3G/HD/SD UHD Multiviewer with Six SDI Inputs and Four HDMI 2.0 Inputs

FEATURES

High-density openGear comprehensive UHD multiviewer solution

Allows easy, real-time "on the fly" custom layout changes without needing setup or layout programs

Supports Square Division (SDQS) and Two-Sample Interleave (2SI) quad UHD formats

UHD 3840x2160 output raster support

Easy to configure PIP sizing and borders

PIP Identity Text, Video Format, Closed Captioning, Clock burn-ins. LTC burn-in from discrete external RS-485 or per-PIP VBI-based ATC\_LTC or ATC\_VITC timecode. User graphic overlay import.

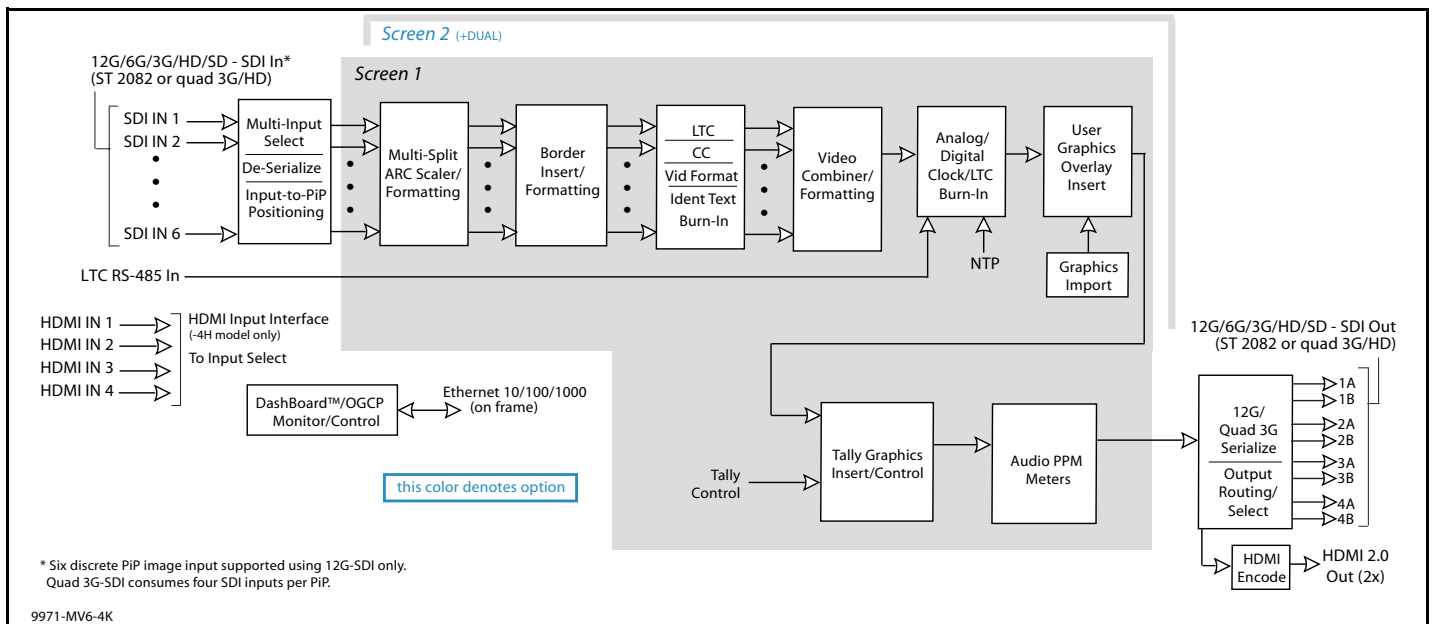
Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol

Five year warranty

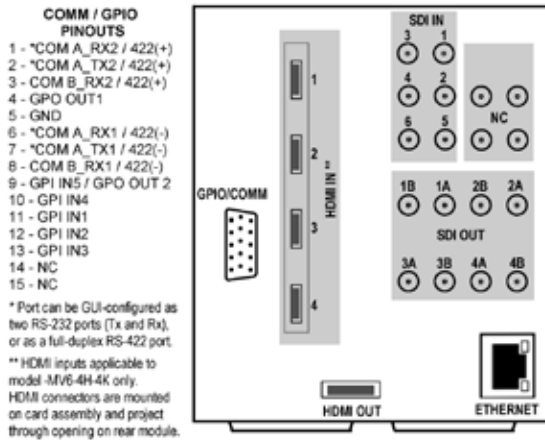
OPTIONS

Dual Screen Option (+DUAL) - Enables dual head output to drive multiple monitors with different layouts. The input and output crosspoints are shared with the two independent screen processors. All functions and layout choices are independently available for both screen processors.

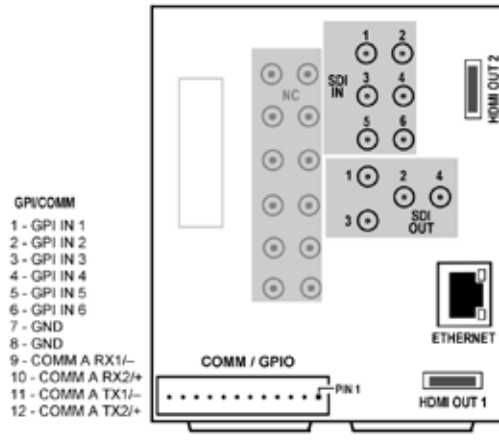
Quality Check (+QC) - Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence. This alert can additionally be a user automation trigger via device GPO. Per-card license; provides +QC function for all 6 input channels.



9971-MV6-4K » 12G/6G/3G/HD/SD EXPANDABLE UHD MULTIVIEWERS



RM20-9971-B-HDBNC



RM20-9971-C-HDBNC

SPECIFICATIONS

12G/6G/3G/HD/SD-SDI Inputs/Outputs

- (6) 75Ω inputs (max)
- (8) 75Ω outputs (max)
- SDI Formats Supported: SMPTE ST2082-1, ST2082-10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.
- Return Loss:
  - > 15 dB up to 1.485 GHz
  - > 10 dB up to 3 GHz
  - > 7 dB up to 6 GHz
  - > 5 dB up to 12 GHz
- Input Cable Length:
  - 60m Belden 1694A cable at 11.88 Gbps
  - 120m Belden 1694A cable at 2.97 Gbps
  - 240m Belden 1694A cable at 1.485 Gbps
  - 400m Belden 1694A cable at 270 Mbps
- Output Signal Level: 800 mV ± 10%
- DC Offset: 0 V ± 50 mV
- Rise and Fall Time @ 11.88 Gbps: < 45 ps
- Alignment Jitter (12G/3G/HD/SD): < 0.3/0.3/0.2/0.2 UI

HDMI Inputs (model 9971-MV6-4H-4K only)

- (4) HDMI 2.0; type C-mini connector

HDMI Output

- (2, max) HDMI 2.0 Output; type A standard connector

On-Screen Graphics Burn-In

Tally, PiP Identity Text (entered via UI), per-PiP video format, CC, Clock, LTC burn-in from discrete external RS-485 or per-PiP VBI-based ATC\_LTC or ATC\_VITC timecode. User graphic overlay import.

ORDERING INFORMATION

9971-MV6-4K 12G/6G/3G/HD/SD UHD Multiviewer with Six SDI Inputs

9971-MV6-4H-4K 12G/6G/3G/HD/SD UHD Multiviewer with Six SDI Inputs and Four HDMI 2.0 Inputs

+DUAL Dual Screen Option

+QC Quality Check Option. (Per-card license; provides +QC function for all 6 input channels.)

RM20-9971-B-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (8) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPIO/COMM (HD-15 connector), HDMI 2.0 Output (type A standard), 10/100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**Note:** RM20-9971-B rear module, when fitted to model 9971-MV6-4H-4K has four (4) HDMI inputs (type C mini). These inputs reside on the card assembly and project through a cutout on the rear module. The connectors are **not** part of the rear module assembly.

RM20-9971-C-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPIO/COMM, (2) HDMI 2.0 Output (type A standard), 10/100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

9971-MV18-4K » 12G/6G/3G/HD/SD 18-INPUT UHD MULTIVIEWER



The Cobalt® 9971-MV18-4K 12G/6G/3G/HD/SD 18-Input UHD Multiviewer is part of Cobalt's next generation of advanced UHD high-capacity channel multiviewers for the openGear® platform. Full-flexibility design accommodates 12G/6G/3G/HD/SD-SDI and UHD1 3840x2160 Square Division (SDQS) or Two-Sample Interleave (2SI) quad 3G-SDI based formats as I/O, and can output ST 2082 12G-SDI for single-wire 4K transport. Using 12G-SDI "single-wire" inputs, up to 18 discrete PIP images can be supported. With both 12G-SDI and quad 3G-SDI inputs, the 9971-MV18-4K can downconvert 12G and quad UHD. The 9971-MV18-4K provides up to two HDMI 2.0 outputs for economical 4K video monitoring.

The 9971-MV18-4K suite offers unprecedented ease of setup and also offers an unprecedented ease of use. Fully-flexible layouts using any of several one-button template presets or fully customizable layouts using easy to use sizing/positioning custom controls. Any template layout or custom layout changes can be done "on-the-fly" in real time, without tedious setup or layout programs like many other multiviewer products. Graphical overlay features include user

text "burn-in" insertions that can correlate the images displayed with contextual information. Numerous preset layout formats are available, as well as custom layouts as desired. The high-density openGear® design allows for up to five 9971-MV18-4K cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via DashBoard user interface, or Cobalt's RESTful-based Reflex protocol.

FEATURES

High-density openGear comprehensive UHD multiviewer solution

Allows easy, real-time "on the fly" custom layout changes without needing setup or layout programs

Supports Square Division (SDQS) and Two-Sample Interleave (2SI) quad UHD formats

Easy to configure PIP sizing and borders

PIP Identity Text, Video Format, Closed Captioning, Clock burn-ins. LTC burn-in from discrete external RS-485 or per-PIP VBI-based ATC\_LTC or ATC\_VITC timecode. User graphic overlay import.

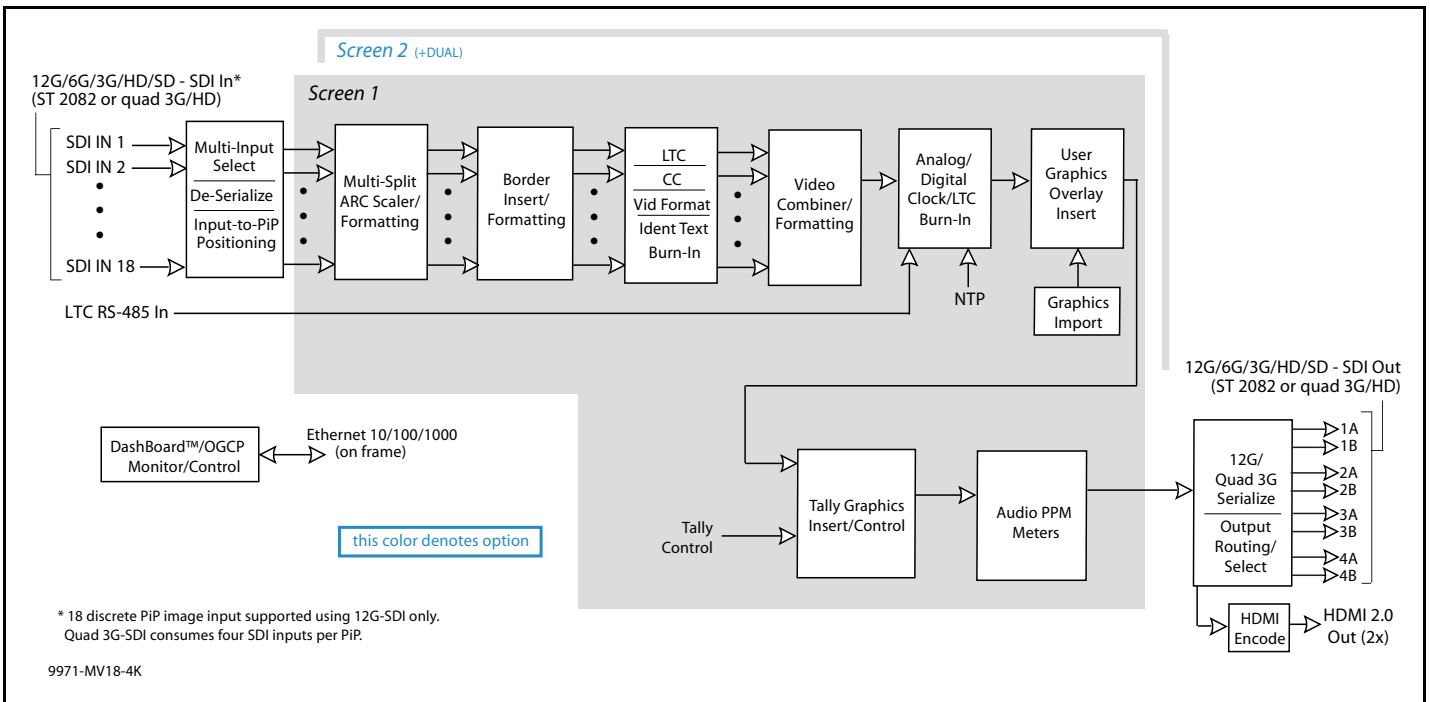
UHD 3840x2160 output raster support

Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol

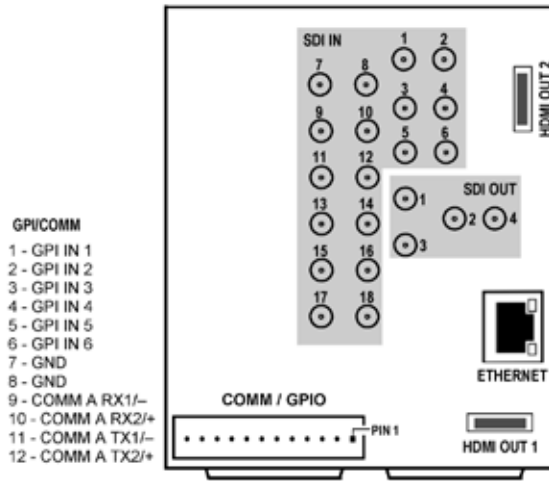
Five year warranty

OPTIONS

Dual Screen Option (+DUAL) – Enables dual head output to drive multiple monitors with different layouts. The input and output crosspoints are shared with the two independent screen processors. All functions and layout choices are independently available for both screen processors.



**9971-MV18-4K » 12G/6G/3G/HD/SD 18-INPUT UHD MULTIVIEWER**



*RM20-9971-D-HDBNC*

**SPECIFICATIONS**

**12G/6G/3G/HD/SD-SDI Inputs/Outputs**

- (18) 75Ω inputs (max)
- (4) 75Ω outputs (max)
- SDI Formats Supported: SMPTE ST2082-1, ST2082-10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.
- Return Loss:
  - > 15 dB up to 1.485 GHz
  - > 10 dB up to 3 GHz
  - > 7 dB up to 6 GHz
  - > 5 dB up to 12 GHz
- Input Cable Length:
  - 60m Belden 1694A cable at 11.88 Gbps
  - 120m Belden 1694A cable at 2.97 Gbps
  - 240m Belden 1694A cable at 1.485 Gbps
  - 400m Belden 1694A cable at 270 Mbps
- Output Signal Level: 800 mV ± 10%
- DC Offset: 0 V ± 50 mV
- Rise and Fall Time @ 11.88 Gbps: < 45 ps
- Alignment Jitter (12G/3G/HD/SD): < 0.3/0.3/0.2/0.2 UI

**HDMI Output**

(2, max) HDMI 2.0 Output; type A standard connector

**On-Screen Graphics Burn-In**

Tally, PiP Identity Text (entered via UI), per-PiP video format, CC, Clock, LTC burn-in from discrete external RS-485 or per-PiP VBI-based ATC\_LTC or ATC\_VITC timecode. User graphic overlay import.

**ORDERING INFORMATION**

**9971-MV18-4K** 12G/6G/3G/HD/SD 18-Input UHD Multiviewer

+**DUAL** Dual Screen Option

**RM20-9971-D-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (18) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPIO/COMM, (2) HDMI 2.0 Output (type A standard), 10/100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/  
AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover**



The Cobalt® 9902-UDX 3G/HD/SD Up-Down-Cross Converter/Frame Sync/Audio Embed/De-Embed with Multi-Input Auto-Changeover provides a high-density card-based solution that offers unprecedented multi-input support and flexibility.

Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. It interfaces with industry standard Windows Share folder systems to receive non-proprietary text, XML, or similar plain text files, and converts and inserts realistic human-voice audio. Option +EAS provides EAS crawl burn-ins directly from industry standard EAS devices such as Sage™.

Quality Check option +QC allows failover to alternate inputs based on user-configurable criteria such as black/frozen frame or audio silence. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option +T-SLATE, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static.

The up/down/cross convert scaler is specifically designed for broadcast video progressive and interlaced formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. 3:2 pulldown optimization allows A-frame to use alignment correlated to received timecode or 6 Hz external input over GPI. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. Linear Frame Rate Conversion option +FRC allows conversion between virtually any SD/HD/3G format – from 525/625i to 1080p and anything in-between – with conversion to and from NTSC and PAL available for all input and output formats. The 9902-UDX also provides analog CVBS video inputs and outputs, and AES/analog audio embedding and de-embedding.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Multi-input, with manual selection or intelligent Auto-Changeover failover

Closed-captioning absence detection and flagging, with GPO, automated alert email, go-to user preset, or other actions

Auto-Changeover can be set to invoke failover for basic input loss.

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Frame Sync with full H/V offset and manual/LOS video pattern generator

3:2 pulldown optimization allows A-frame alignment correlated to received timecode or 6 Hz external input over GPI

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed available

Video options include color correction, and keying Supports import of user trouble slate graphic file for LOS failover insertion

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Five year warranty

**OPTIONS**

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Clean and Quiet Switching Option (+CQS) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

Key/Fill Keyer (+KEYER) – Provides keying using independent SDI inputs for key and fill signals. A separate preview SDI output is provided for observing key results before applying to program video output. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input.

Text-To-Speech (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Trouble Slate Import (+T-SLATE) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events.

Logo Insertion (+LOGO) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.

SCTE 104 Insertion (+SCTE104) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

Linear Frame Rate Conversion (+FRC) – Provides comprehensive high-quality standards conversion utilizing Cobalt's linear frame rate conversion to convert between virtually any SD/HD/3G format.

Audio LTC (+LTC)

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) - Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip.

Emergency Alert System Text Crawl Generation (+EAS) – Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

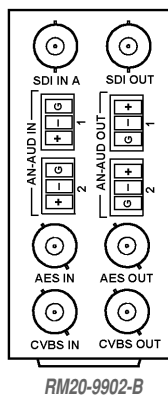
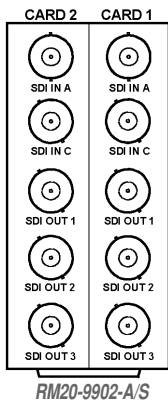
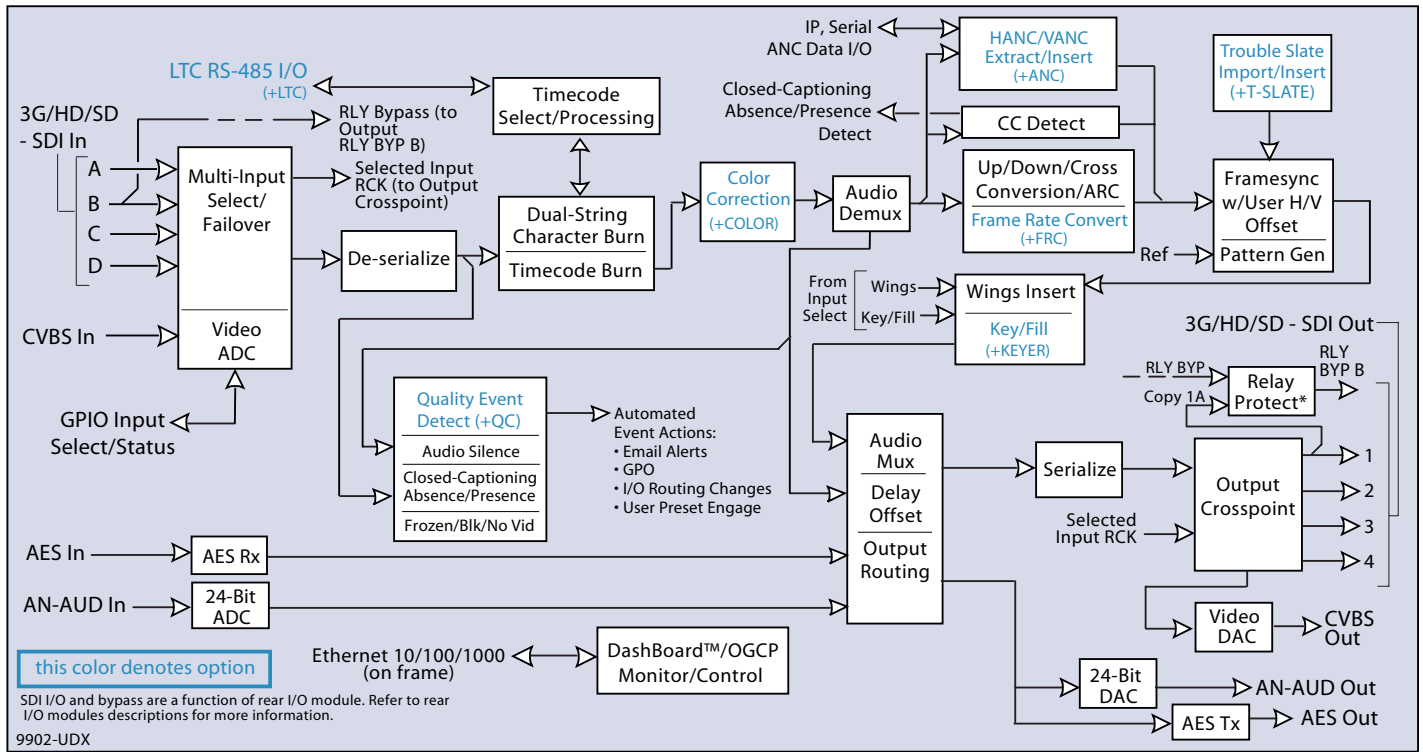
Extended Frame Sync Delay (+DLY)

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP, RS-232/RS-422 serial, and GPIO external interfaces. Bridge mode can be set to preserve special/custom ANC packages when card scaler is enabled.



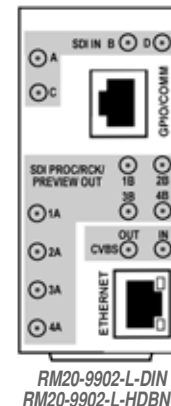
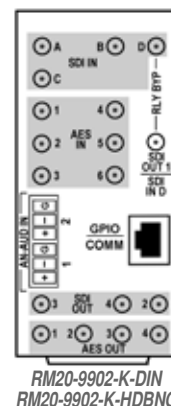
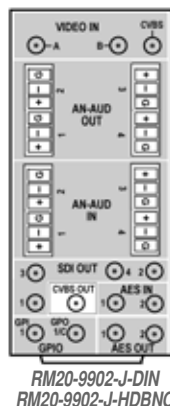
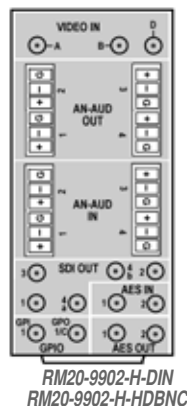
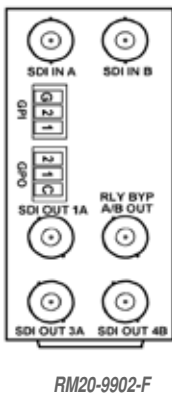
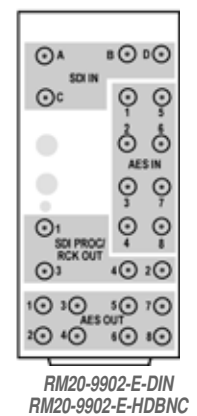
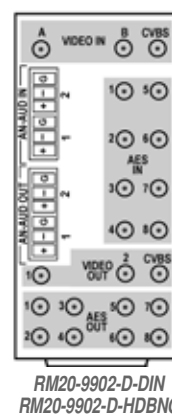
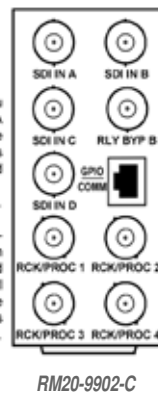
ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/  
AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover



Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



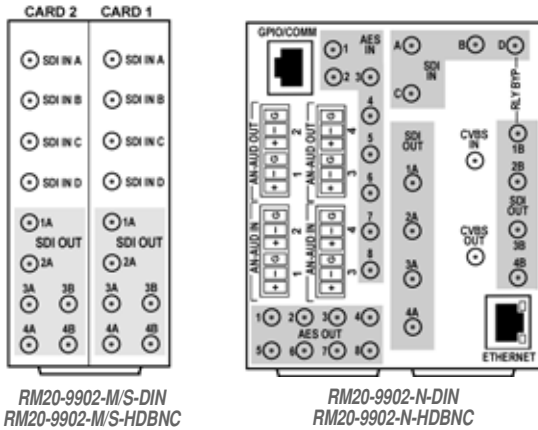
8 - GND  
7 - COM A, RX  
6 - COM A, TX  
5 - GPO OUT 2  
4 - GPO OUT 1  
3 - GPO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.



ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/  
AUDIO EMBED/DE-EMBED** with Multi-Input Auto-Changeover



**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
< 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync and scaler disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)  
Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
(1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all formats can be downconverted to CVBS.  
ADC resolution/sampling: 10-bit; 4x oversampling  
DAC resolution/sampling: 10-bit; 16x oversampling  
Y/C separation: 4 line Adaptive Comb Filter  
Freq. Response: ± 0.25 dB to 5.5 MHz  
SNR: > 50 dB to 5.5 MHz (unweighted)  
Differential Phase: < 1 degree  
Differential Gain: < 1%  
Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
AES-3id 75Ω outputs (8 pair (16-Ch) max)  
Input AES SRC Range: 32 to 96 kHz  
Balanced analog audio inputs (4-Ch max)  
Balanced analog audio outputs (4-Ch max)  
(I/O conforms to 0 dBFS = +24 dBu)  
Analog Output Impedance: < 50 Ω  
Analog Reference Level: -20 dBFS  
Analog Nominal Level: +4 dBu  
Analog Max Output Level: +24 dBu (0 dBFS)  
Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
Analog SNR: 115 dB (A weighted)  
Analog Analog THD+N: -96 dB (20 Hz to 10 kHz)  
Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/  
AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover**

**SPECIFICATIONS (cont.)**

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**Embedded Audio Output**

16-ch embedded. User crosspoint allows routing of any embedded channel to any embedded channel output. Multi-frequency tone generator for each audio output. Master delay control; range of -33 msec to +3000 msec.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9902-UDX** 3G/HD/SD Up-Down-Cross Converter/Frame Sync/Audio Embed/De-Embed with Multi-Input Auto-Changeover

**RM20-9902-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9902-B** 20-Slot Frame Rear I/O Module (Standard-Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Processed Out BNC, (2) Balanced Analog Audio Outputs, (1) AES Output BNC

**RM20-9902-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), GPIO/COMM RJ-45 connector

**RM20-9902-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

**RM20-9902-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC.)

**RM20-9902-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as processed or reclocked of selected input, (2) GPI, (2) GPO

**RM20-9902-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9902-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/  
AUDIO EMBED/DE-EMBED** with Multi-Input Auto-Changeover

**ORDERING INFORMATION (cont.)**

**RM20-9902-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9902-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

**RM20-9902-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9902-M/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9902-M/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9902-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect) , (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect) , (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**Options:**

+**ANC** Ancillary Data Processor Option

+**COLOR** Color Correction Option

+**KEYER** Key/Fill Keyer Option

+**QC** Quality Check Option

+**CQS** Clean and Quiet Switching Option

+**FRC** Linear Frame Rate Conversion Option

+**LTC** Audio LTC I/O Option

+**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

+**DLY** Extended Frame Sync Delay Option

+**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

+**EAS** Emergency Alert System Text Crawl Generation Option

+**T-SLATE** User Trouble Slate Graphic Import Option

+**LOGO** Logo Insertion Option

+**SCTE104** SCTE 104 Insertion Option

+**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/FRAME SYNC/AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover**



The Cobalt® **BBG-1002-UDX 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with Multi-Input Auto-Changeover** provides a high-density standalone unit that offers unprecedented multi-input support and flexibility.

Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. It interfaces with industry standard Windows Share folder systems to receive non-proprietary text, XML, or similar plain text files, and converts and inserts realistic human-voice audio into user-configured audio channels. Option **+EAS** provides EAS crawl burn-ins directly from industry standard EAS devices such as Sage™.

Quality Check option **+QC** allows failover to alternate inputs based on user-configurable subjective criteria such as black/frozen frame. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option **+T-SLATE**, import of user trouble slate graphics is also supported

in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can be enabled to serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning.

The up/down/cross convert scaler is specifically designed for broadcast video progressive and interlaced formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. 3:2 pulldown optimization allows A-frame to use alignment correlated to received timecode or 6 Hz external input over GPI. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. Linear Frame Rate Conversion option **+FRC** allows conversion between virtually any SD/HD/3G format – from 525/625i to 1080p and anything in-between – with conversion to and from NTSC and PAL available for all input and output formats. The BBG-1002-UDX also provides analog CVBS video inputs and outputs, and AES/analog audio embedding and de-embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1002-UDX can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-UDX allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input, with manual selection or intelligent Auto-Changeover failover

Closed-captioning absence detection and flagging, with GPO, automated alert email, go-to user preset, or other actions

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option (**+QC**) provides failover on subjective criteria such as black/frozen frame or audio silence. Threshold and hold-off are user configurable.

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Frame Sync with full H/V offset and manual/LOS video pattern generator

3:2 pulldown optimization allows A-frame alignment correlated to received timecode or 6 Hz external input over GPI

Option **+TTS** provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Supports import of user trouble slate graphic file for LOS failover insertion

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed available

Video options include CGMS support, color correction, and keying

Option **+ANC** adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, and other specialized user payloads. Multi-mode setup includes Bridge mode (device internal path with scaler bypass bridging) or Insert/Extract modes for insert/extract to or from IP/serial external interfaces. SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Supports import of user trouble slate graphic file for LOS failover insertion

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty



ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/FRAME SYNC/AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover**

OPTIONS

**Quality Check (+QC)** – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

**Key/Fill Keyer (+KEYER)** – Provides keying using independent SDI inputs for key and fill signals. A separate preview SDI output is provided for observing key results before applying to program video output. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input.

**Extended Frame Sync Delay (+DLY)** – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

**Trouble Slate Import (+T-SLATE)** – Allows uploading of up to three different user trouble slate graphic file to the BBG unit, with automated insertion controlled by GPI or other events.

**SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST)** – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

**Linear Frame Rate Conversion (+FRC)** – Provides comprehensive high-quality standards conversion utilizing Cobalt's linear frame rate conversion to convert between virtually any SD/HD/3G format.

**Color Correction (+COLOR)** – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.

**SCTE 104 Insertion (+SCTE104)** – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

**Ancillary Data Processor (+ANC)**. Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP, RS-232/RS-422 serial, and GPIO external interfaces. Bridge mode can be set to preserve special/custom ANC packages when scaler is enabled. SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

**Logo Insertion Option (+LOGO)** – Allows uploading of user logo graphic file to BBG unit, with automated insertion controlled by GPI or other events.

**Text-To-Speech (+TTS)** – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

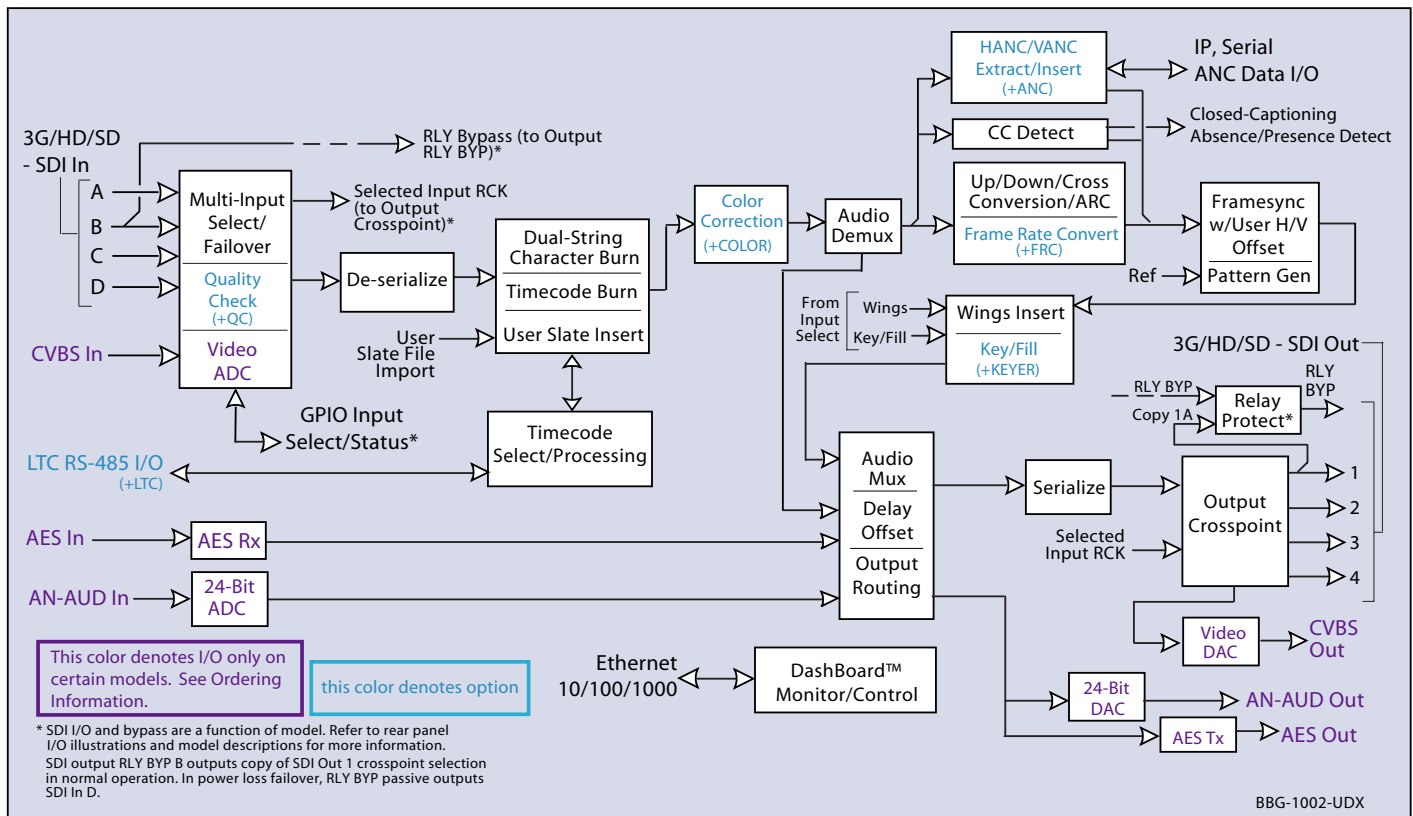
**Emergency Alert System Text Crawl Generation (+EAS)** – Provides a single-device solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

**Clean and Quiet Switching Option (+CQS)** – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

**Audio LTC I/O (+LTC)**

**1RU Mounting Tray (supports 3 units) (BBG-1000-TRAY)**

**Redundant Power Supply Module (BBG-1000-PS)**



## ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/FRAME SYNC/AUDIO EMBED/DE-EMBED** with Multi-Input Auto-Changeover**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of model. See rear panel illustrations for I/O complements offered.

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Minimum Latency (scaler and frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
 (1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all formats can be downconverted to CVBS.  
 ADC resolution/sampling: 10-bit; 4x oversampling  
 DAC resolution/sampling: 10-bit; 16x oversampling  
 Y/C separation: 4 line Adaptive Comb Filter  
 Freq. Response: ± 0.25 dB to 5.5 MHz  
 SNR: > 50 dB to 5.5 MHz (unweighted)  
 Differential Phase: < 1 degree  
 Differential Gain: < 1%  
 Nonlinearity < 1%

**Discrete Audio Input/Outputs**

(1) AES-3id 75Ω BNC input  
 (1) AES-3id 75Ω BNC output  
 (2) Balanced analog audio inputs  
 (2) Balanced analog audio outputs  
 I/O conforms to 0 dBFS = +24 dBu

**Input Select/Auto-Changeover Failover**

Manual selection (forced) of any input.  
 · Failover to alternate input on loss of target input. Failover invoked upon LOS and/or (with option +QC) user configurable parametric criteria such as black/frozen frame or audio silence.  
 - Black frame trigger configurable for black intensity threshold and persistence time.  
 - Frozen frame trigger configurable for frozen percentage difference and persistence time.  
 - Audio silence trigger configurable for dBFS floor threshold and persistence time.  
 · Relay bypass SDI IN B to RLY BYP B upon loss of power.

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level". Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections. Weight: 6 lb (2.8 kg)

**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS**

**BBG-1002-UDX » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/FRAME SYNC/AUDIO EMBED/DE-EMBED with Multi-Input Auto-Changeover**

**ORDERING INFORMATION**

**BBG-1002-UDX** 3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Embedded Audio Proc with (4) 3G/HD/SD-SDI Input BNCs w/ (1) Relay Protect, (4) 3G/HD/SDI Output BNCs, GPIO/COMM (RJ-45 connector), (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-B** 3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Audio Embedder/De-Embedder with (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (1) AES Input BNC, (2) Balanced Analog Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC, (2) Balanced Analog Audio Outputs, (1) Gigabit Ethernet, Looping Reference I/O and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-C** 3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Audio Embedder/De-Embedder with (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video In BNC, (2) AES In BNCs, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Video Out BNC, (2) AES Out BNCs, (2) Balanced Analog Audio Outputs, (1) Gigabit Ethernet, Looping Reference I/O and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-D-DIN** 3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Audio Embedder/De-Embedder with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector) (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply; All coaxial connectors DIN 1.0/2.3)

**BBG-1002-UDX-D-HDBNC** 3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Audio Embedder/De-Embedder with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector) (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply; all coaxial connectors HDBNC)

**Options and Accessories:**

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+KEYER** Key/Fill Keyer Option

**+FRC** Linear Frame Rate Conversion Option

**+LTC** Audio LTC I/O Option

**+QC** Quality Check Option

**+CQS** Clean and Quiet Switching Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+DLY** Extended Frame Sync Delay Option

**+SCTE104** SCTE 104 Insertion Option

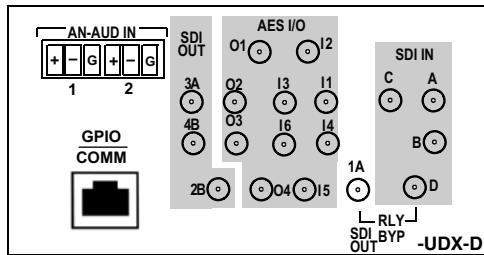
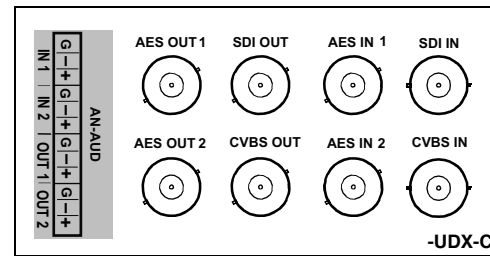
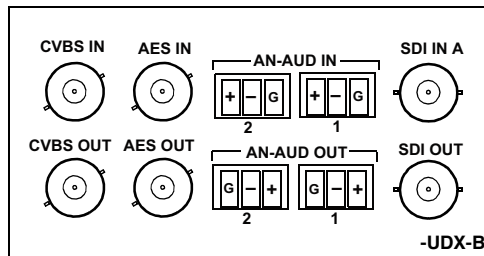
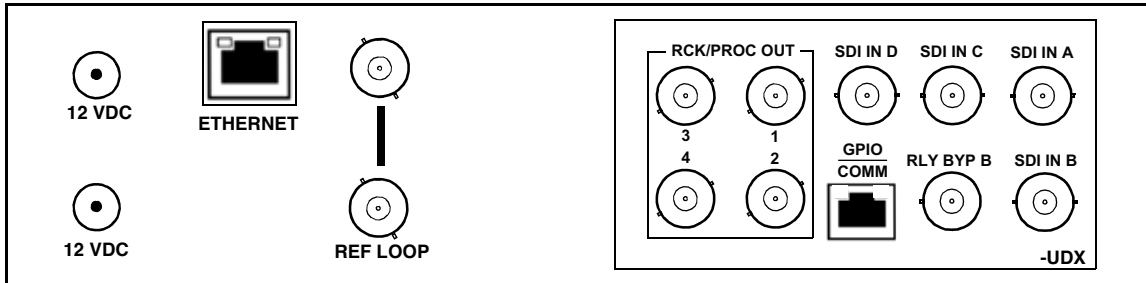
**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

**BBG-1002-UDX » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/FRAME SYNC/AUDIO EMBED/DE-EMBED** with Multi-Input Auto-Changeover

**Rear Panel**





ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-2UDX » 3G/HD/SD-SDI DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED**



The Cobalt® **9902-2UDX 3G/HD/SD-SDI Dual-Channel Up-Down-Cross Converter/Frame Sync/Audio Embed/De-Embed** offers **two independent signal paths** of up/down/cross conversion, frame sync, and audio embedding / de-embedding in a single openGear® card. Using our HPF-9000 20-slot frame, this provides up to 40 channels of processing in a single frame. The 9902-2UDX represents a new level of openGear packaging density!

The 9902-2UDX provides high-density that offers unprecedented multi-input support and flexibility. Dual independent up/down/cross convert scalars are specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. AFD processing can detect an incoming AFD code and correspondingly set scaling and ARC to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Analog video (CVBS) input, with AES and analog audio audio embedding and de-embedding is also supported.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues. Quality Check option +QC allows failover to alternate inputs based on user-configurable criteria such as black/frozen frame. Included standard is closed captioning absence/presence detection that allows CEA 608/708 and line 21 SD CC absence or presence to be detected, with event actions consisting of GPO, automated alert email actions, or go-to card user presets or other actions.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. With option +ANC, the 9902-2UDX offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection. Path inputs can also be sourced from opposite path output with no external patching.

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option (+QC) provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Frame Sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Video options include color correction

CVBS analog video input and analog/AES embed / de-embed with 4-line Adaptive Comb Filter

Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel

Five year warranty

**OPTIONS**

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Clean and Quiet Switching Option (+CQS) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

Expanded Delay (+DLY) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

SCTE 104 Insertion (+SCTE104) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

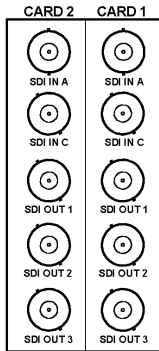
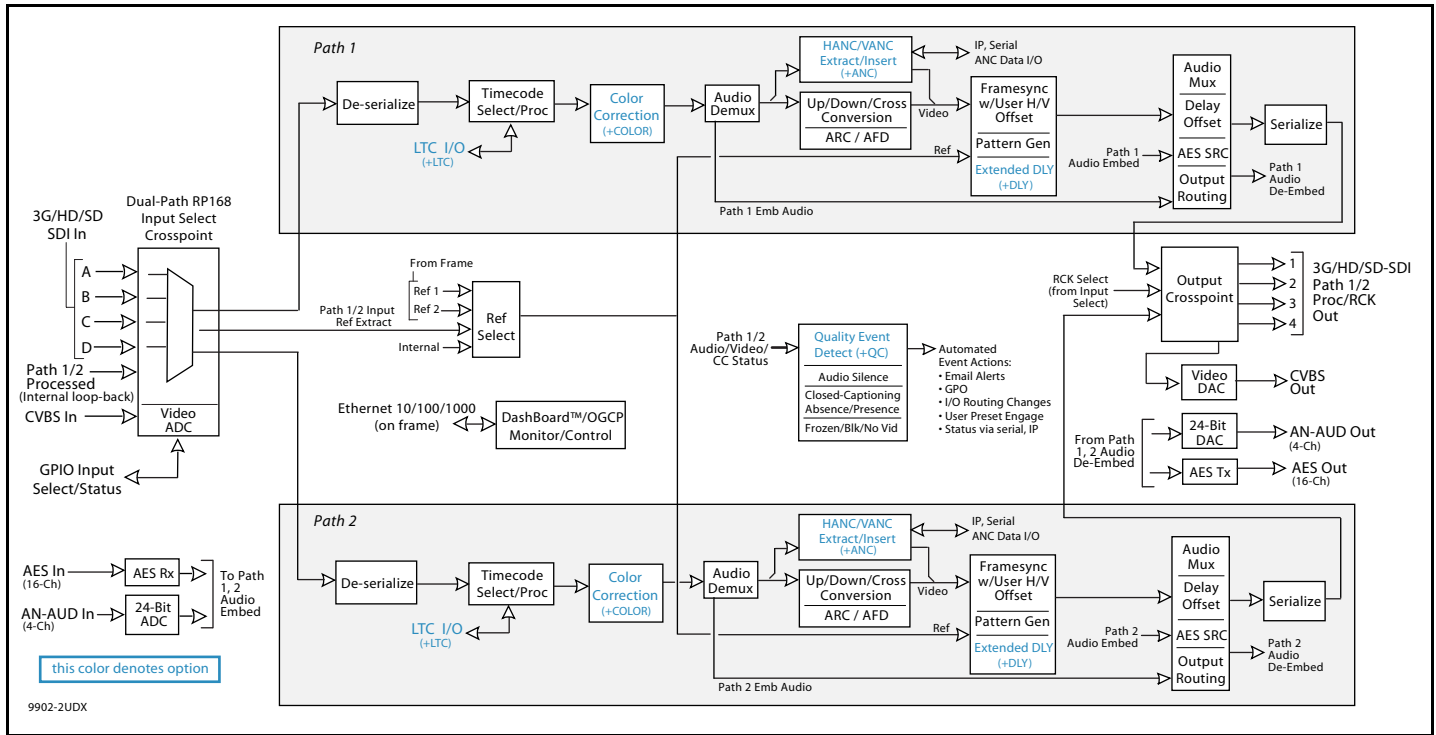
SCTE104 Frame-Accurate SCTE Trigger Insertion (+SCTE104-FAST) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Audio LTC I/O (+LTC)

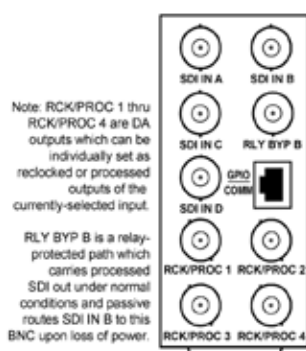


ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

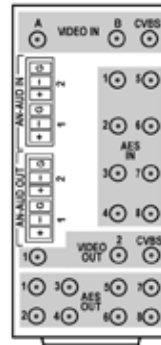
9902-2UDX » 3G/HD/SD-SDI DUAL-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED



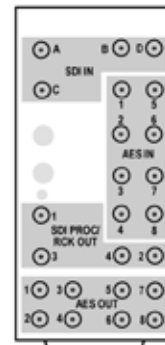
RM20-9902-2UDX-AIS



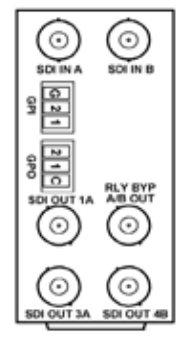
RM20-9902-2UDX-C



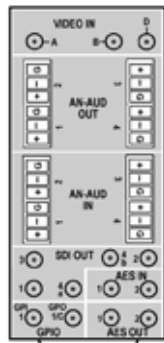
RM20-9902-2UDX-D (DIN | HDBNC)



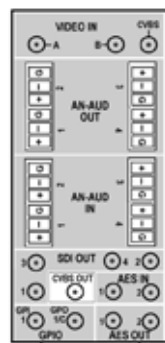
RM20-9902-2UDX-E (DIN HDBNC)



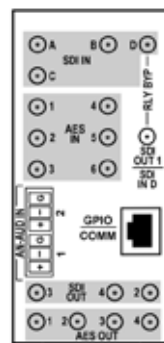
RM20-9902-2UDX-F



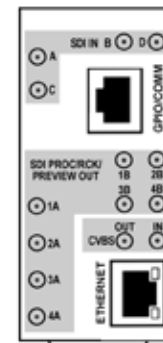
RM20-9902-2UDX-H (DIN | HDBNC)



RM20-9902-2UDX-J (DIN | HDBNC)



RM20-9902-2UDX-K (DIN | HDBNC)

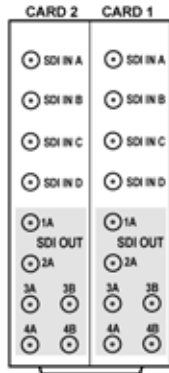


RM20-9902-2UDX-L (DIN | HDBNC)

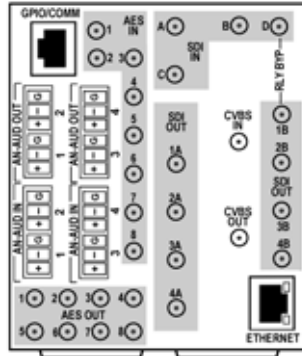
B - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPIO OUT 2  
4 - GPIO OUT 1  
3 - GPIO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.

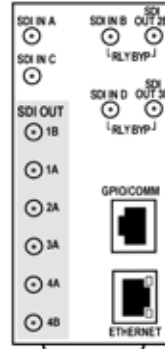
**9902-2UDX » 3G/HD/SD-SDI DUAL-CHANNEL UP-DOWN-CROSS CONVERTER /  
FRAME SYNC / AUDIO EMBED/DE-EMBED**



**RM20-9902-2UDX-MIS-**  
**(DIN | HDBNC)**



**RM20-9902-2UDX-N-**  
**(DIN | HDBNC)**



**RM20-9902-2UDX-P-**  
**(DIN | HDBNC)**

8 - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPO OUT 2  
4 - GPO OUT 1  
3 - GPO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
< 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input reclocked)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)  
Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
(1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.  
ADC resolution: 9-bit  
Sampling frequency: 27 MHz (2x over-sampling)  
Y/C separation: 4 line Adaptive Comb Filter  
Freq. Response: ± 0.25 dB to 5.5 MHz  
SNR: > 50 dB to 5.5 MHz (unweighted)  
Differential Phase: < 1 degree  
Differential Gain: < 1%  
Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
AES-3id 75Ω outputs (8 pair (16-Ch) max)  
Input AES SRC Range: 32 to 96 kHz  
Balanced analog audio inputs (4-Ch max)  
Balanced analog audio outputs (4-Ch max)  
(I/O conforms to 0 dBFS = +24 dBu)  
Analog Output Impedance: < 50 Ω  
Analog Reference Level: -20 dBFS  
Analog Nominal Level: +4 dBu  
Analog Max Output Level: +24 dBu (0 dBFS)  
Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
Analog SNR: 115 dB (A weighted)  
Analog THD+N: -96 dB (20 Hz to 10 kHz)  
Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-2UDX » 3G/HD/SD-SDI DUAL-CHANNEL UP-DOWN-CROSS CONVERTER /  
FRAME SYNC / AUDIO EMBED/DE-EMBED**

**SPECIFICATIONS (cont.)**

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering. (ARC/AFD settings independent per processing path.)

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus or selected program video ref sources. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
 Return Loss: >35 dB up to 5.75 MHz

**ORDERING INFORMATION**

**9902-2UDX** 3G/HD/SD-SDI Dual-Channel Up-Down-Cross Converter / Frame Sync / Audio Embed/De-Embed

**RM20-9902-2UDX-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9902-2UDX-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9902-2UDX-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9902-2UDX-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)ORD INFO

**RM20-9902-2UDX-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

**RM20-9902-2UDX-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-2UDX-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9902-2UDX-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-2UDX-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9902-2UDX-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-2UDX » 3G/HD/SD-SDI DUAL-CHANNEL UP-DOWN-CROSS CONVERTER /  
FRAME SYNC / AUDIO EMBED/DE-EMBED**

**ORDERING INFORMATION (cont.)**

**RM20-9902-2UDX-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9902-2UDX-M/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-M/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9902-2UDX-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-2UDX-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9902-2UDX-P-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-2UDX-P-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**Options:**

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+CQS** Clean and Quiet Switching Option

**+DLY** Extended Frame Sync Delay Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED**



The Cobalt® **BBG-1002-2UDX 3G/HD/SD-SDI Standalone Dual-Channel Up-Down-Cross Converter/Frame Sync/Audio Embed/De-Embed** offers **two independent signal paths** of up/down/cross conversion, frame sync, and audio embedding /de-embedding in a single unit.

The BBG-1002-2UDX provides a high-density standalone unit that offers unprecedented multi-input support and flexibility. Dual independent up/down/cross convert scalars are specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. 3:2 pulldown optimization allows A-frame to use alignment correlated to received timecode or 6 Hz external input over GPI. AFD processing can detect an incoming AFD code and correspondingly set scaling and ARC to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode, and in turn outputted on the output video (with burn-in also available). Various models additionally provide an analog video (CVBS) input, with AES and analog audio audio embedding and de-embedding.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues. Quality Check option **+QC** allows failover to alternate inputs based on user-configurable criteria such as black/frozen frame. Included standard is closed captioning absence/presence detection that allows CEA 608/708 and line 21 SD CC absence or presence to be detected, with event actions consisting of GPO, automated alert email actions, or go-to card user presets or other actions.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. With option **+ANC**, the BBG-1002-2UDX offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1002-2UDX can be remote-controlled using Dashboard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-2UDX allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Two independent processing paths

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection. Path inputs can also be sourced from opposite path output with no external patching.

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option **+QC** provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Frame Sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

CVBS analog video input and analog/AES embed / de-embed with 4-line Adaptive Comb Filter

Video options include color correction

Low-power/high-density design - less than 18 Watts

Compact footprint - up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via Dashboard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty

**OPTIONS**

Quality Check **(+QC)** - Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Color Correction **(+COLOR)** - Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor **(+ANC)** - Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech **(+TTS)** - Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Clean and Quiet Switching Option **(+CQS)** - Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

Expanded Delay **(+DLY)** - Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

SCTE 104 Insertion **(+SCTE104)** - Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option **(+SCTE104-FAST)** - Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

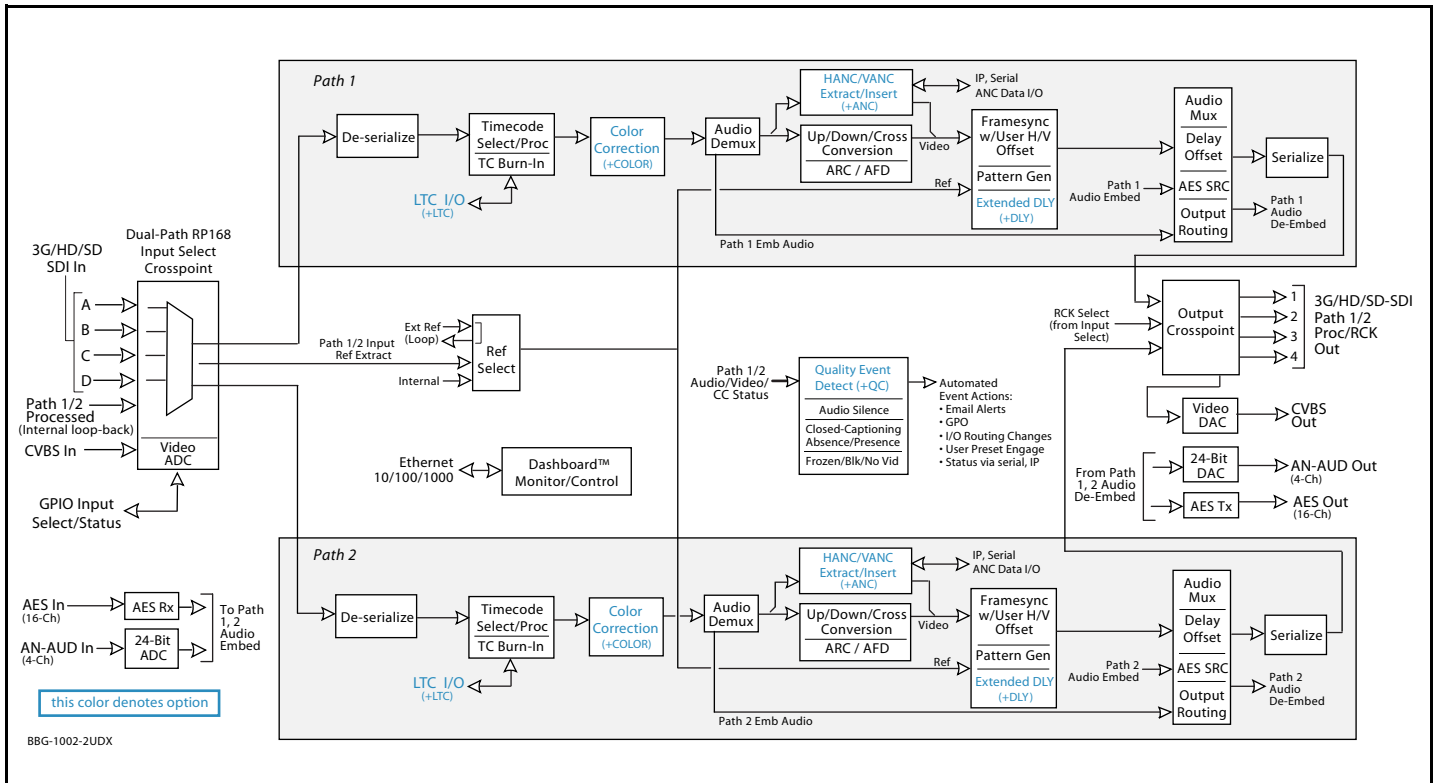
Audio LTC I/O **(+LTC)**

1RU Mounting Tray (supports 3 units) **(BBG-1000-TRAY)**

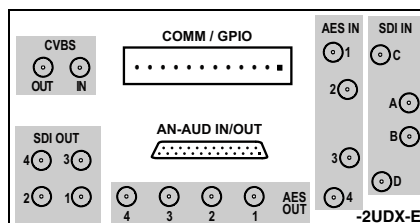
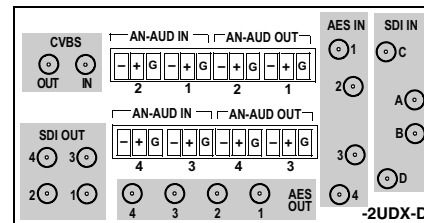
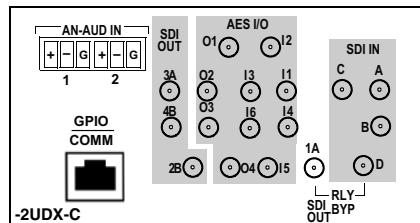
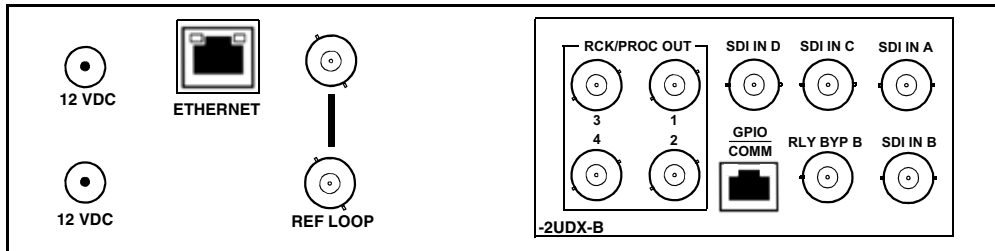


ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED**



**Rear Panel**



## ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED****SPECIFICATIONS**

**Note:** Standard I/O capabilities are limited to those shown in Rear Panel diagrams and listed in Ordering Information. Where specifications below list other I/O types and/or complements, some combinations other than shown for standard models may be available as special order. Inquire with Sales for alternative I/O availability.

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input relocked)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.

ADC resolution: 9-bit

Sampling frequency: 27 MHz (2x over-sampling)

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max) AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering. (ARC/AFD settings independent per processing path.)

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)



ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED**

**ORDERING INFORMATION**

**BBG-1002-2UDX** 3G/HD/SD-SDI Standalone Dual-Channel Up-Down-Cross Converter/Frame Sync/Audio Embed/De-Embed available in the following rear-panel I/O configurations:

**BBG-1002-2UDX-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1002-2UDX-C-DIN** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio Inputs, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1002-2UDX-C-HDBNC** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio Inputs, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors HD-BNC)

**BBG-1002-2UDX-D-DIN** (4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output. (All coaxial connectors DIN 1.0/2.3)

**BBG-1002-2UDX-D-HDBNC** (4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output. (All coaxial connectors HD-BNC)

**BBG-1002-2UDX-E-DIN** (4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output, GPIO/COMM. (All coaxial connectors DIN 1.0/2.3), Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-2UDX-E-HDBNC** (4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output, GPIO/COMM. (All coaxial connectors HD-BNC), Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**Options and Accessories:**

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+CQS** Clean and Quiet Switching Option

**+DLY** Extended Frame Sync Delay Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9903-UDX-ADDA » 3G/HD/SD-SDI UNIVERSAL FORMAT CONVERTER** with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding



The Cobalt® **9903-UDX-ADDA 3G/HD/SD-SDI Universal Format Converter** with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding provides a high-density card-based solution that offers unprecedented multi-input support, flexibility, and ease of use and integration for SDI and analog video and discrete audio. Frame sync provides glitch-free audio upon frame sync events, with video/audio offsets user configurable. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

With option +ANC, the 9903-UDX-ADDA offers full VANC/HANC ancillary data packet de-embedding and embedding for 3G/HD/SD-SDI streams. The easy to use interface allows direct access to DID and SDID locations to extract or insert user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads. Data can be extracted and inserted within the card, bypassing the scaler (Bridge mode), or inserted and/or extracted to and from external interface via serial or IP interfaces.

Multiple SDI input ports allow selection from multiple input sources with failover. Both CVBS and component analog video is supported both as inputs and outputs.

The up/down/cross convert scaler is specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Multi-input, with failover switching

Universal I/O support – analog CVBS and component inputs and outputs, as well as analog and AES audio embed/de-embed. 10-bit processing with 5-line adaptive comb filtered SD Y/C separation.

Frame Sync with full H/V offset and manual/LOS video pattern generator

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Option +ANC adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, and other specialized user payloads. Multi-mode setup includes Bridge mode (card internal path with scaler bypass bridging) or Insert/Extract modes for insert/extract to or from IP/serial external interfaces.

Available color correction option

Low-power/high-density design – less than 13 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Five year warranty

**OPTIONS**

Audio LTC I/O (+LTC)

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP, RS-232/RS-422 serial, and GPIO external interfaces. Bridge mode can be set to preserve special/custom ANC packages when card scaler is enabled.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

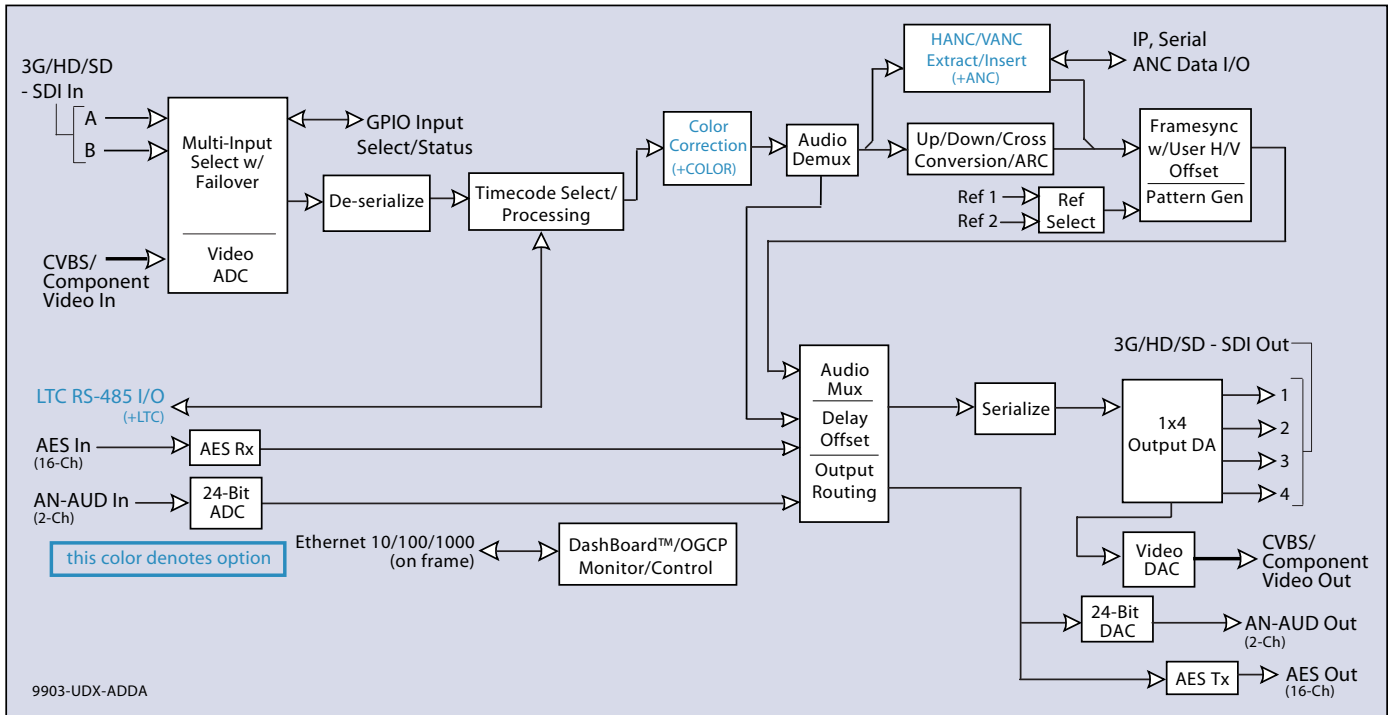
SCTE 104 Insertion Option (+SCTE104) - Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) - Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

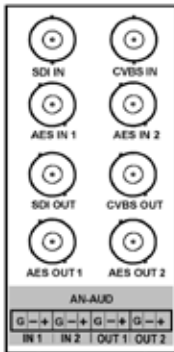


ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

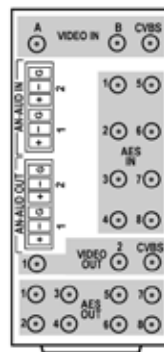
**9903-UDX-ADDA » 3G/HD/SD-SDI UNIVERSAL FORMAT CONVERTER** with CVBS/YPbPr Video I/O,  
Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding



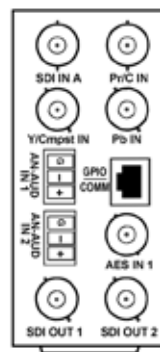
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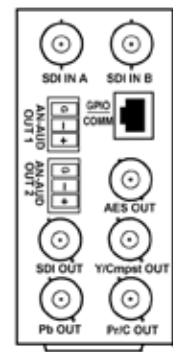
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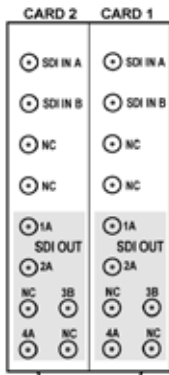
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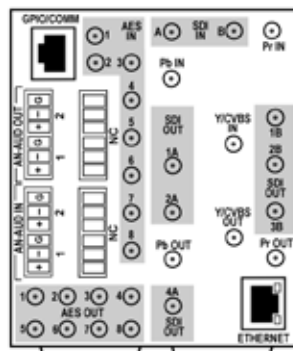
RM20-9903-E



RM20-9903-F



RM20-9903-G/S-DIN  
RM20-9903-G/S-HDBNC



RM20-9903-H-DIN  
RM20-9903-H-HDBNC

**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS**

**9903-UDX-ADDA » 3G/HD/SD-SDI UNIVERSAL FORMAT CONVERTER** with CVBS/YPbPr Video I/O,  
Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 13 Watts

**SDI Input/Outputs**

Up to (2) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**Analog Video Input/Outputs**

(1) 75Ω BNC CVBS input

(1) 75Ω BNC CVBS output. CVBS can be upscaled to any supported SDI format; all SDI formats can be downconverted to CVBS.

(3) 75Ω BNC Component Video inputs (Y, Cb, Cr)

(3) 75Ω BNC Component Video outputs (Y, Cb, Cr)

ADC resolution: 10-bit

Sampling frequency: 54 MHz (4x over-sampling SD)

SD Y/C separation: 5-line Adaptive Comb Filter

SD Freq. Response: ± 0.25 dB to 5.5 MHz

SD SNR: > 55 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

HD Freq. Response: Y 30 MHz., PbPr 15 MHz

HD SNR: > 55 dB to 30 MHz (unweighted)

**Discrete Audio Input/Outputs**

(8) AES-3id 75Ω BNC input

(8) AES-3id 75Ω BNC output

(2) Balanced analog audio inputs

(2) Balanced analog audio outputs

I/O conforms to 0 dBFS = +24 dBu

Analog Input Impedance: >10 kΩ

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Input Clip Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

Return Loss: >35 dB up to 5.75 MHz

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**9903-UDX-ADDA » 3G/HD/SD-SDI UNIVERSAL FORMAT CONVERTER** with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding

**ORDERING INFORMATION**

**9903-UDX-ADDA** 3G/HD/SD-SDI Universal Format Converter with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding

**RM20-9903-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (2) Balanced Analog Audio Inputs, (2) AES Input BNCs, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Video Out BNC, (2) Balanced Analog Audio Outputs, (2) AES Output BNCs

**RM20-9903-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9903-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9903-E** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, Component/CVBS Video In BNCs, (1) AES In BNC, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Output BNCs, (1) GPIO/COMM RJ-45 connector

**RM20-9903-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, Component/CVBS Video Out BNCs, (1) AES Out BNC, (2) Balanced Analog Audio Outputs, (1) 3G/HD/SD-SDI Output BNC, (1) GPIO/COMM RJ-45 connector

**RM20-9903-G/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9903-G/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9903-H-DIN** 20-Slot Frame Rear I/O Module (Double Width) (2) 3G/HD/SD-SDI Inputs, (1) Component/CVBS Video In, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (6) 3G/HD/SD-SDI Outputs, (1) Component/CVBS Video Out, (8) AES Outputs, (2) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9903-H-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (2) 3G/HD/SD-SDI Inputs, (1) Component/CVBS Video In, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (6) 3G/HD/SD-SDI Outputs, (1) Component/CVBS Video Out, (8) AES Outputs, (2) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC)

**+LTC** Audio LTC I/O Option

**+COLOR** Color Correction Option

**+ANC** Ancillary Data Processor

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1003-UDX-ADDA » 3G/HD/SD-SDI STANDALONE UNIVERSAL FORMAT CONVERTER/FRAME SYNC** with CVBS/ YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding



The Cobalt® **BBG-1003-UDX-ADDA 3G/HD/SD-SDI Standalone Universal Format Converter/Frame Sync** with CVBS/ YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding provides a high-density standalone solution that offers unprecedented multi-input support, flexibility, and ease of use and integration for SDI and analog video and discrete audio. Frame sync provides glitch-free audio upon frame sync events, with video/audio offsets user configurable. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

With option **+ANC**, the BBG-1003-UDX-ADDA offers full VANC/HANC ancillary data packet de-embedding and embedding for 3G/HD/SD-SDI streams. The easy to use interface allows direct access to DID and SDID locations to extract or insert user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads. Data can be extracted and inserted within the unit, bypassing the scaler (Bridge mode), or inserted and/or extracted to and from external interface via serial or IP interfaces.

Multiple SDI input ports allow selection from multiple input sources with failover. Both CVBS and component analog video is supported both as inputs and outputs.

The up/down/cross convert scaler is specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1003-UDX-ADDA can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1003-UDX-ADDA allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input, with failover switching

Universal I/O support – analog CVBS and component inputs and outputs, as well as analog and AES audio embed/de-embed. 10-bit processing with 5-line adaptive comb filtered SD Y/C separation.

Frame Sync with full H/V offset and manual/LOS video pattern generator

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Option **+ANC** adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, and other specialized user payloads. Multi-mode setup includes Bridge mode (device internal path with scaler bypass bridging) or Insert/Extract modes for insert/extract to or from IP/serial external interfaces.

Available color correction option

Low-power/high-density design – less than 13 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty

**OPTIONS**

Audio LTC I/O (**+LTC**)

Ancillary Data Processor (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP, RS-232/RS-422 serial, and GPIO external interfaces. Bridge mode can be set to preserve special/custom ANC packages when scaler is enabled.

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

SCTE 104 Insertion Option (**+SCTE104**) - Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

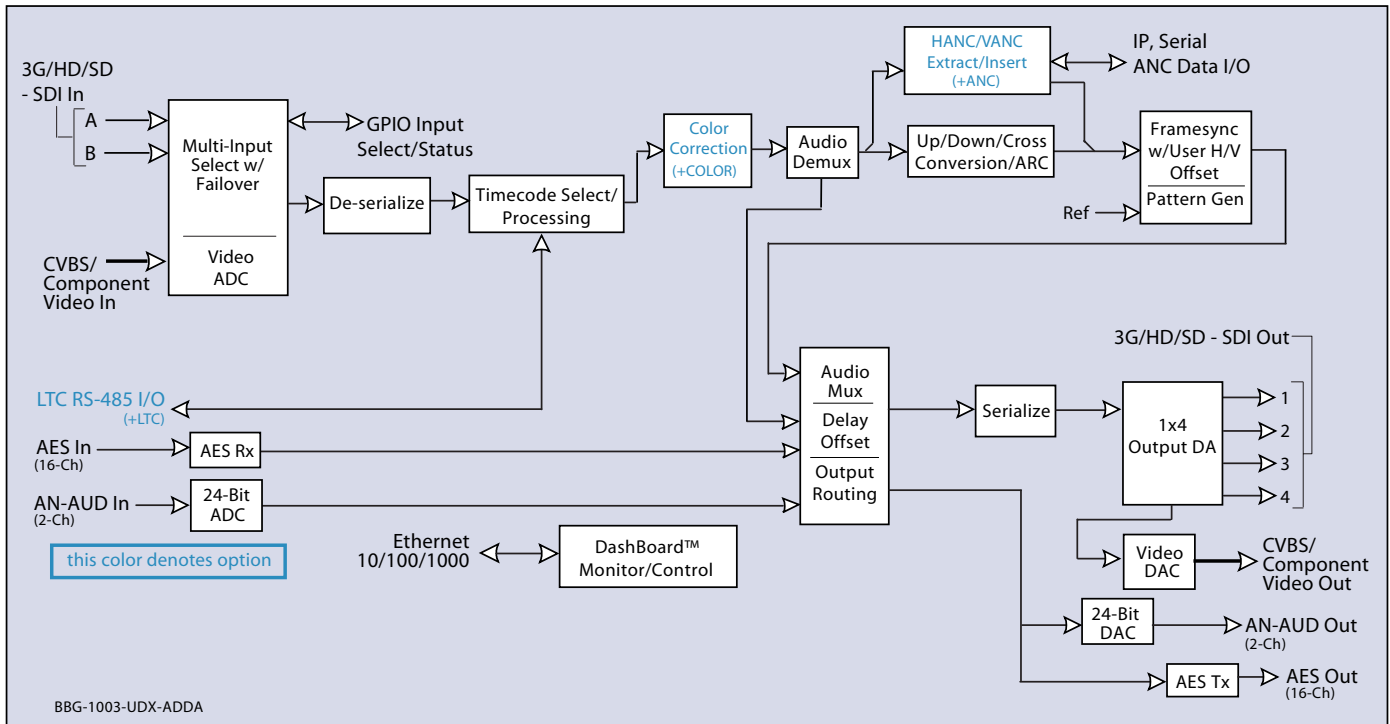
SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) - Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

1RU Mounting Tray (supports 3 units) (**BBG-1000-TRAY**)

Redundant Power Supply Module (**BBG-1000-PS**)

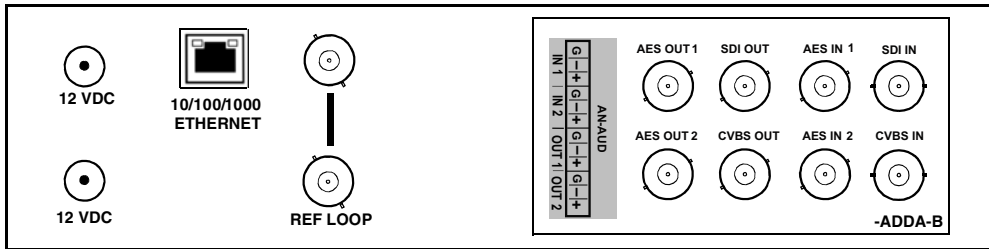


**BBG-1003-UDX-ADDA » 3G/HD/SD-SDI STANDALONE UNIVERSAL FORMAT CONVERTER/FRAME SYNC** with CVBS/ YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding



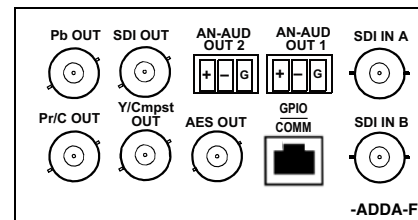
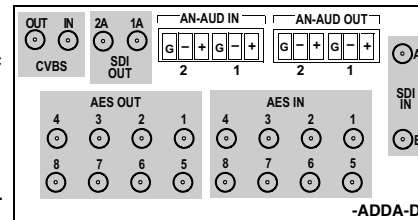
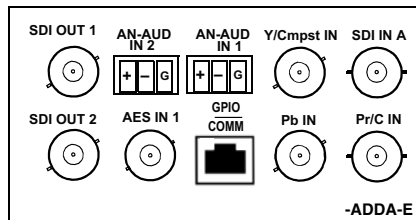
BBG-1003-UDX-ADDA

**Rear Panel**



\* -D model available as -DIN (DIN 1.0/2.3 connectors) or -HDBNC (HD-BNC connectors)

-E model is analog video IN, AN-AUD IN, AES IN model.  
 -F model is analog video OUT, AN-AUD OUT, AES OUT model.  
 See Ordering Info,



## ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1003-UDX-ADDA » 3G/HD/SD-SDI STANDALONE UNIVERSAL FORMAT CONVERTER/FRAME SYNC** with CVBS/  
YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding**SPECIFICATIONS****Power**

< 13 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (2) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**Analog Video Input/Outputs**

(1) 75Ω BNC CVBS input

(1) 75Ω BNC CVBS output. CVBS can be upscaled to any supported SDI format; all SDI formats can be downconverted to CVBS.

75Ω BNC Component Video inputs (Y, Cb, Cr)

75Ω BNC Component Video outputs (Y, Cb, Cr)

ADC resolution: 10-bit

Sampling frequency: 54 MHz (4x over-sampling SD)

SD Y/C separation: 5-line Adaptive Comb Filter

SD Freq. Response: ± 0.25 dB to 5.5 MHz

SD SNR: > 55 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

HD Freq. Response: Y 30 MHz, PbPr 15 MHz

HD SNR: > 55 dB to 30 MHz (unweighted)

**Discrete Audio Input/Outputs**

(8) AES-3id 75Ω BNC input

(8) AES-3id 75Ω BNC output

(2) Balanced analog audio inputs

(2) Balanced analog audio outputs

I/O conforms to 0 dBFS = +24 dBu

Analog Input Impedance: >10 kΩ

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Input Clip Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)



**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS**

**BBG-1003-UDX-ADDA » 3G/HD/SD-SDI STANDALONE UNIVERSAL FORMAT CONVERTER/FRAME SYNC** with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding

**ORDERING INFORMATION**

**BBG-1003-UDX-ADDA** 3G/HD/SD-SDI Standalone Universal Format Converter/Frame Sync with CVBS/YPbPr Video I/O, Up/Down/Cross Conversion, Frame Sync, AES and Analog Audio Embedding / De-Embedding available in the following rear-panel I/O configurations:

**BBG-1003-UDX-ADDA-B** (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (2) Balanced Analog Audio Inputs, (2) AES Input BNCs, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Out BNC, (2) Balanced Analog Audio Outputs, (2) AES Output BNCs

**BBG-1003-UDX-ADDA-D-DIN** (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**BBG-1003-UDX-ADDA-D-HDBNC** (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**BBG-1003-UDX-ADDA-E** (1) 3G/HD/SD-SDI Input BNC, Component/CVBS In BNCs, (1) AES In BNC, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Output BNCs, (1) GPIO/COMM RJ-45 connector

**BBG-1003-UDX-ADDA-F** (2) 3G/HD/SD-SDI Input BNCs, Component/CVBS Out BNCs, (1) AES Out BNC, (2) Balanced Analog Audio Outputs, (1) 3G/HD/SD-SDI Output BNC, (1) GPIO/COMM RJ-45 connector

Options and Accessories:

**+LTC** Audio LTC I/O Option

**+COLOR** Color Correction Option

**+ANC** Ancillary Data Processor Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP » 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED** with DSP Audio Options Support



The Cobalt® 9902-UDX-DSP 3G/HD/SD-SDI Up-Down-Cross Converter / Frame Sync / Audio Embed/De-Embed with DSP Audio Options Support provides a high-density card-based solution that offers unprecedented multi-input support and flexibility. The 9902-UDX-DSP offers a DSP-based platform that supports multiple audio DSP options. When optioned with various audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows flexible tailoring of multiple proc function instances. The 9902-UDX-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

The up/down/cross convert scaler is specifically designed for broadcast video progressive and interlaced formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. 3:2 pulldown optimization allows A-frame 9902-UDX-DSP also provides analog CVBS video inputs and outputs, and AES/analog audio embedding and de-embedding.

to use alignment correlated to received timecode or 6 Hz external input over GPI. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. The 9902-UDX-DSP also provides analog CVBS video inputs and outputs, and AES/analog audio embedding and de-embedding.

Audio proc options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-card purchase, or field-installed as software option upgrades without removing the card from its frame. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio embed/de-embed. Also included standard is bulk and per-channel audio delay controls that easily address lip-sync issues. Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits” – our largest DSP capacity

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available

Full audio crosspoint with 5.1-to-stereo downmix and flex mixing available for all audio outputs

Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay

CVBS analog video I/O and analog/AES embed / de-embed available

High-density design

Moving-box/motion insertion serves as a dynamic raster confidence check even in cases where the input video image is static. Dual-string character/timecode burn-in.

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

**OPTIONS**

Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (+DSP-RTLL) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details)

Dolby® Encoder Options (+DSP-ENCD) – Available as 5.1 and 2.0 Dolby Digital/Digital Plus Encode. (See Ordering Information for full details.)

Dolby® Decoder Options (+DSP-DEC) – Provides Dolby Digital, Digital Plus, and E decode

Linear Acoustic® UPMAX™ Upmixing (+DSP-UPMIX-LA) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing

Linear Acoustic® AEROMAX™ Loudness Processor Options (+DSP-LP) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (+DSP-ITU) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Quality Check Option (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence

Clean & Quiet Switching Option (+CQS) – Provides automatic audio ramp-down and up during input switching events

Text-To-Speech Option (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (+EAS) – Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Add Extended Delay Option (+DLY)

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Trouble Slate Import (+T-SLATE) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events

Logo Insertion (+LOGO) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events

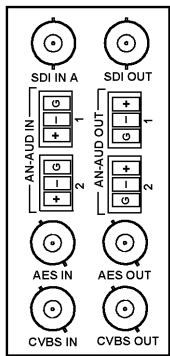
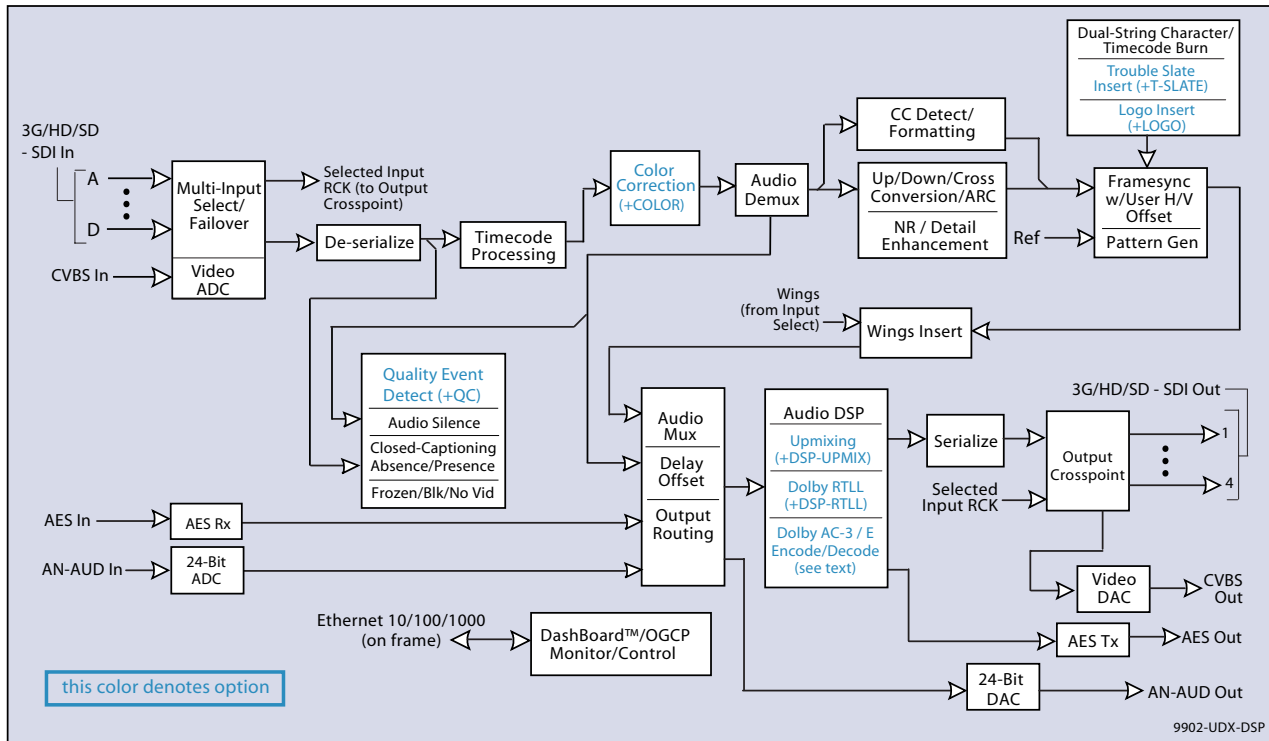
Ancillary Data Processor Option (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP and GPIO external interfaces

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) Provides deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI, optimizing it for automatic dissemination to CDN and VOD systems

Audio LTC I/O Option (+LTC)



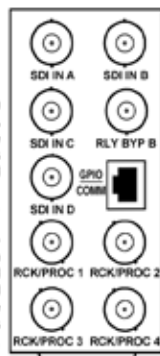
**9902-UDX-DSP » 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED** with DSP Audio Options Support



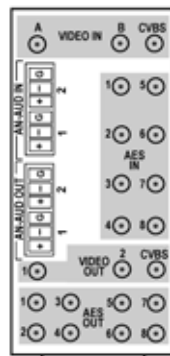
RM20-9902-B

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

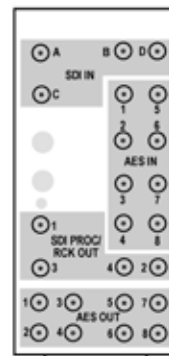
RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



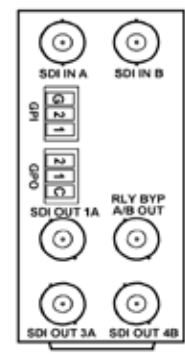
RM20-9902-C



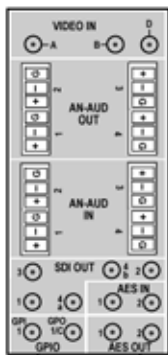
RM20-9902-D-DIN  
RM20-9902-D-HDBNC



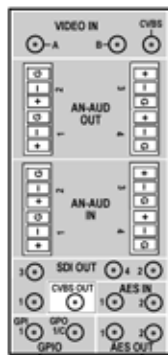
RM20-9902-E-DIN  
RM20-9902-E-HDBNC



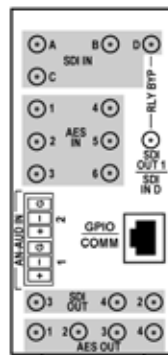
RM20-9902-F



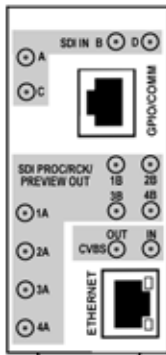
RM20-9902-H-DIN  
RM20-9902-H-HDBNC



RM20-9902-J-DIN  
RM20-9902-J-HDBNC



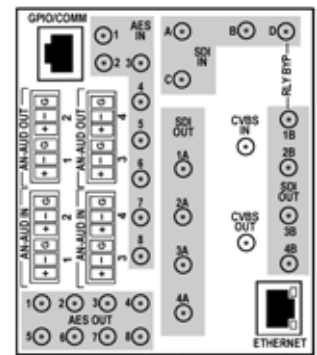
RM20-9902-K-DIN  
RM20-9902-K-HDBNC



RM20-9902-L-DIN  
RM20-9902-L-HDBNC

B - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPIO OUT 2  
4 - GPIO OUT 1  
3 - GPIO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.



RM20-9902-N-DIN  
RM20-9902-N-HDBNC

## ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP » 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED** with DSP Audio Options Support**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

24 Watts (includes +DSP options)

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (frame sync and scaler disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all formats can be downconverted to CVBS.

ADC resolution/sampling: 10-bit; 4x oversampling

DAC resolution/sampling: 10-bit; 16x oversampling

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)

AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP » 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED** with DSP Audio Options Support

**SPECIFICATIONS (cont.)**

**Embedded Audio Output**

16-ch embedded. User crosspoint allows routing of any embedded channel to any embedded channel output. Multi-frequency tone generator for each audio output. Master delay control; range of -33 msec to +3000 msec.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9902-UDX-DSP** 3G/HD/SD-SDI Up-Down-Cross Converter / Frame Sync / Audio Embed/De-Embed with DSP Audio Options Support

**Note:** On this DSP-equipped card, an adjacent card **will not** fit into the immediately adjacent slot to the front-of-frame **right**. (For example, if DSP-equipped card is in slot 8, an adjacent card will not fit in slot 9. This would be the case of an adjacent card that installs into an odd frame slot, or the case where a Split Rear Module serves two cards in the adjacent odd/even slot pairs (in this example slots 9/10)).

**RM20-9902-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC, (2) Balanced Analog Audio Outputs

**RM20-9902-C** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (8) AES I/O BNCs (I/O switch selectable), (1) 3G/HD/SD-SDI Output BNC

**RM20-9902-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9902-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9902-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9902-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)

**RM20-9902-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

**RM20-9902-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9902-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9902-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9902-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9902-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9902-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors HD-BNC)

**RM20-9902-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9902-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP » 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED** with DSP Audio Options Support

**ORDERING INFORMATION (cont.)**

**Options:**

- +**DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option
- +**DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option
- +**DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder
- +**DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder
- +**DSP-DEC** Dolby® Decoder
- +**DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer
- +**DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option
- +**DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option
- +**DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)
- +**DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)
- +**ANC** Ancillary Data Processor Option
- +**COLOR** Color Correction Option
- +**T-SLATE** User Trouble Slate Graphic Import Option
- +**LOGO** Logo Insertion Option
- +**SCTE104** SCTE 104 Insertion Option
- +**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option
- +**DLY** Extended Frame Sync Delay Option
- +**LTC** Audio LTC I/O Option
- +**CQS** Clean & Quiet Switching Option
- +**QC** Quality Check Option
- +**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)
- +**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)
- +**EAS** Emergency Alert System Text Crawl Generation Option

(1) Manufactured under license from Audyne Inc.

**BBG-1002-UDX-DSP » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/  
FRAME SYNC/ AUDIO EMBED-DE-EMBED with DSP Audio Options Support**



The Cobalt® **BBG-1002-UDX-DSP 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support** provides a high-density standalone solution that offers unprecedented multi-input support and flexibility. The BBG-1002-UDX-DSP offers a DSP-based platform that supports multiple **+DSP** audio options. When optioned with various audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows flexible tailoring of multiple proc function instances. The BBG-1002-UDX-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Audio proc **+DSP** options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-card purchase, or field-installed as software option upgrades without disconnecting the unit. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio embed/de-embed. Also included standard is bulk

and per-channel audio delay controls that easily address lip-sync issues. Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. Quality Check option **+QC** checks for and acts upon user-configurable criteria such as black/frozen frame, audio silence or CC absence.

The up/down/cross convert scaler is specifically designed for broadcast video progressive and interlaced formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. 3:2 pulldown optimization allows A-frame to use alignment correlated to received timecode or 6 Hz external input over GPI. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. The BBG-1002-UDX-DSP also provides analog CVBS video inputs and outputs, and AES/analog audio embedding and de-embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1002-UDX-DSP can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-UDX-DSP allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19” frame).

**FEATURES**

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits” – our largest DSP capacity

Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available

Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay

Full audio crosspoint with 5.1-to-stereo downmix (standard) available for all audio outputs

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

CVBS analog video I/O and analog/AES embed / de-embed available

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static. Dual-string character/timecode burn-in.

Advanced audio processing allows routing, gain, smooth delay, and flexible mixing as standard features

Option **+TTS** provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Supports import of user trouble slate graphic file for LOS failover insertion

3:2 pulldown optimization allows A-frame alignment correlated to received timecode or 6 Hz external input over GPI

Option **+ANC** adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, and other specialized user payloads. SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty



ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**BBG-1002-UDX-DSP » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/  
FRAME SYNC/ AUDIO EMBED-DE-EMBED** with DSP Audio Options Support

OPTIONS

Dolby® Real-Time Loudness Levelling Automatic Loudness Processing Options (**+DSP-RTL**) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Dolby® Encoder Options (**+DSP-ENCD**) – Available as 5.1 and 2.0 Dolby Digital and Digital Plus Encode. (See Ordering Information for full details.)

Dolby® Decoder Options (**+DSP-DEC**) – Provides Dolby Digital, Digital Plus, and E Decode.

Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing.

Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (**+DSP-ITU**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Linear Frame Rate Conversion (**+FRC**) – Provides comprehensive high-quality standards conversion utilizing Cobalt's linear frame rate conversion to convert between virtually any SD/HD/3G format.

Quality Check Option (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Clean & Quiet Switching Option (**+CQS**) – Provides automatic audio ramp-down and up during input switching events.

Text-To-Speech Option (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip.

SCTE 104 Insertion (**+SCTE104**) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

Trouble Slate Import (**+T-SLATE**) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events.

Logo Insertion (**+LOGO**) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.

Emergency Alert System Text Crawl Generation (**+EAS**) – Provides a single-device solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Add Extended Delay Option (**+DLY**)

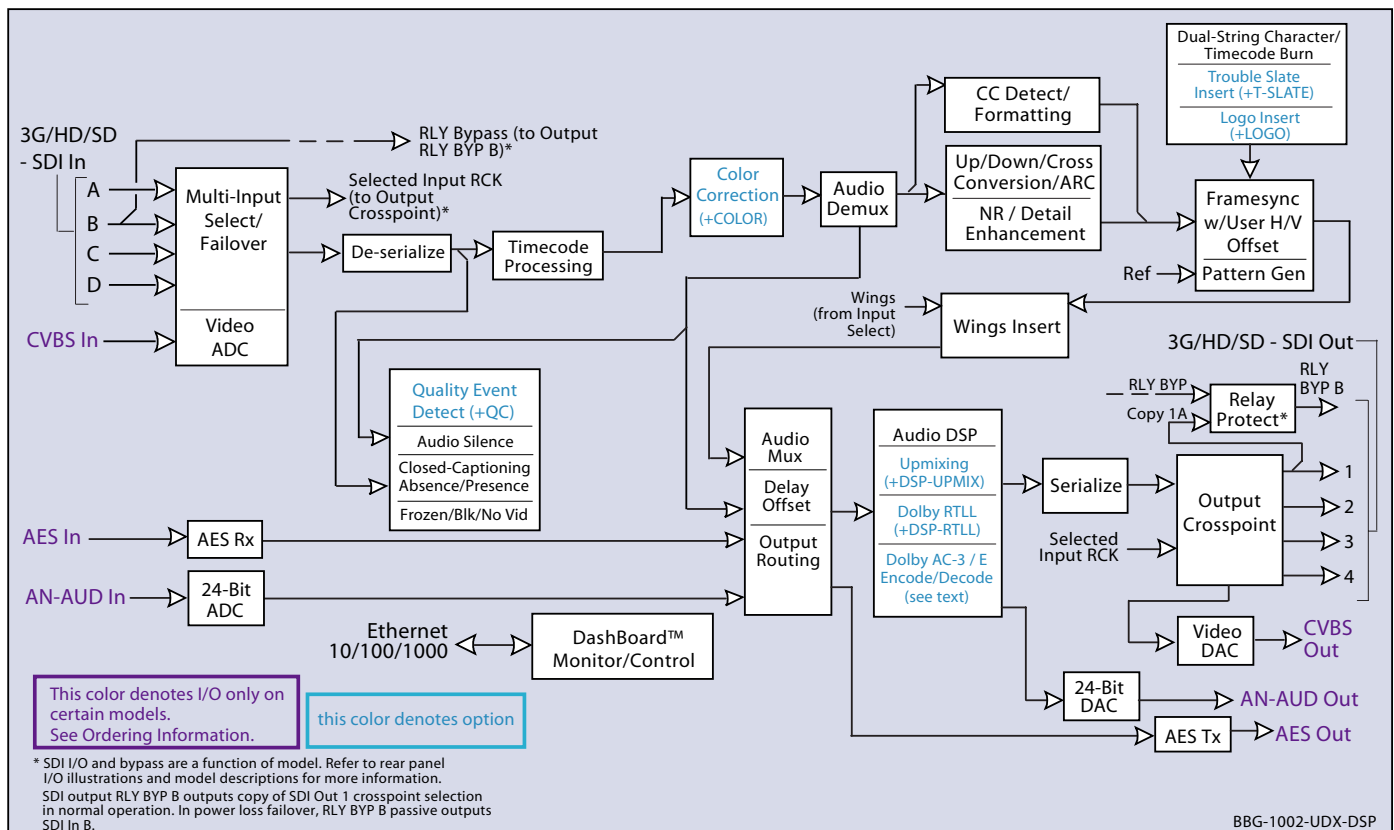
Audio LTC I/O (**+LTC**)

Ancillary Data Processor Option (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP and GPIO external interfaces.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) Provides deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI, optimizing it for automatic dissemination to CDN and VOD systems.

1RU Mounting Tray (supports 3 units) (**BBG-1000-TRAY**)

Redundant Power Supply Module (**BBG-1000-PS**)



BBG-1002-UDX-DSP



**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS**

**BBG-1002-UDX-DSP » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/  
FRAME SYNC/ AUDIO EMBED-DE-EMBED with DSP Audio Options Support**

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of model. See rear panel illustrations for I/O complements offered.

**Power**

24 Watts (includes +DSP options). Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency (frame sync and scaler disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
 (1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all formats can be downconverted to CVBS.  
 ADC resolution/sampling: 10-bit; 4x oversampling  
 DAC resolution/sampling: 10-bit; 16x oversampling  
 Y/C separation: 4 line Adaptive Comb Filter  
 Freq. Response: ± 0.25 dB to 5.5 MHz  
 SNR: > 50 dB to 5.5 MHz (unweighted)  
 Differential Phase: < 1 degree  
 Differential Gain: < 1%  
 Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
 AES-3id 75Ω outputs (8 pair (16-Ch) max)  
 Input AES SRC Range: 32 to 96 kHz  
 Balanced analog audio inputs (4-Ch max)  
 Balanced analog audio outputs (4-Ch max)  
 (I/O conforms to 0 dBFS = +24 dBu)  
 Analog Output Impedance: < 50 Ω  
 Analog Reference Level: -20 dBFS  
 Analog Nominal Level: +4 dBu  
 Analog Max Output Level: +24 dBu (0 dBFS)  
 Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
 Analog SNR: 115 dB (A weighted)  
 Analog THD+N: -96 dB (20 Hz to 10 kHz)  
 Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**Timecode/Text Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position. (2) independent text strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear panel RJ-45 GPIO/COMM jack (where equipped).

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level". Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections. Weight: 6 lb (2.8 kg)

**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS**

**BBG-1002-UDX-DSP » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/  
FRAME SYNC/ AUDIO EMBED-DE-EMBED with DSP Audio Options Support**

**ORDERING INFORMATION**

**BBG-1002-UDX-DSP** 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support with (4) 3G/HD/SD-SDI Input BNCs w/ (1) Relay Protect), (4) 3G/HD/SDI Output BNCs, GPIO/COMM (RJ-45 connector), (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-DSP-B** 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support with (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (1) AES Input BNC, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC, (2) Balanced Analog Audio Outputs, (1) Gigabit Ethernet, Looping Reference I/O and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-DSP-C** 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support with (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video In BNC, (2) AES In BNCs, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Video Out BNC), (2) AES Out BNCs, (2) Balanced Analog Audio Outputs, (1) Gigabit Ethernet, Looping Reference I/O and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-UDX-DSP-D-DIN** 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector) (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply; All coaxial connectors DIN 1.0/2.3)

**BBG-1002-UDX-DSP-D-HDBNC** 3G/HD/SD-SDI Standalone Up-Down-Cross Converter/Frame Sync/Audio Embed-De-Embed with DSP Audio Options Support with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector) (1) Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply; all coaxial connectors HDBNC)

**Options and Accessories:**

**+DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option

**+DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option

**+DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder

**+DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder

**+DSP-DEC** Dolby® Decoder

**+DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer

**+DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option

**+DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option

**+DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)

**+DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+FRC** Linear Frame Rate Conversion Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**+DLY** Extended Frame Sync Delay Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean & Quiet Switching Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

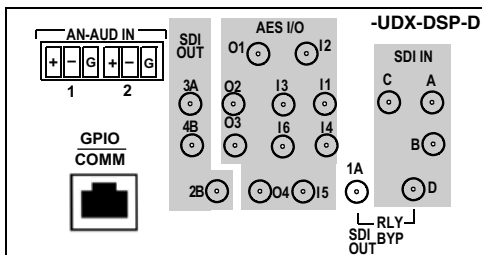
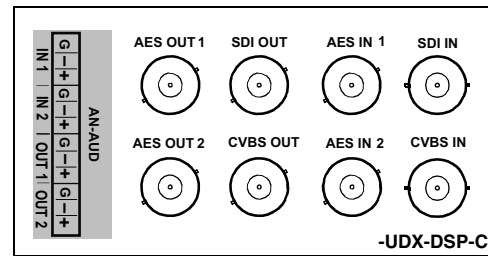
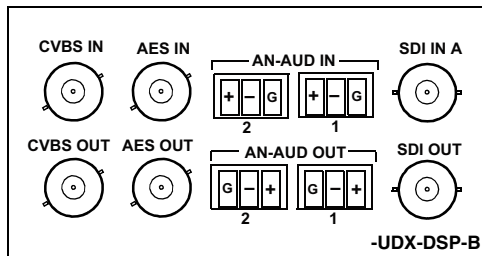
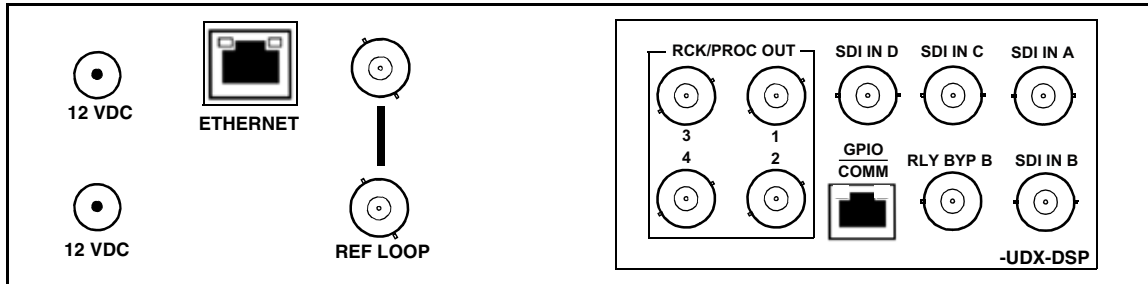
**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

(1) Manufactured under license from Audyne Inc.

**BBG-1002-UDX-DSP » 3G/HD/SD-SDI STANDALONE UP-DOWN-CROSS CONVERTER/  
FRAME SYNC/ AUDIO EMBED-DE-EMBED** with DSP Audio Options Support

**Rear Panel**



# 9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options



The Cobalt® 9902-UDX-DSP-CI Channel Integrator provides a comprehensive signal conversion and processing feature set designed to condition ingest Analog and Digital Audio and Video signals to meet comprehensive output requirements. The 9902-UDX-DSP-CI Channel Integrator provides a powerful, high-density 3G/HD/SD-SDI/CVBS Up/Down/Cross Converter-Frame Sync and Embedder/De-Embedder platform with support for the following optional features:

- Linear Frame Rate Standards Conversion Option
- RGB Color Correction Option
- Trouble Slate Insertion Option
- Logo Generator Option
- External SFP Cage Hardware Option
- HDMI, Fiber, IP ST2110, ST2022-6 SFP Options
- Emergency Alert Crawl Generator Option
- Text-To-Speech Generator Option
- Real-Time Loudness Leveling (RTLL) Loudness Processing Options
- Dolby® Encode/Decode Options
- Stereo to Surround Sound Upmixing Option

Along with the extensive list of features and options, the 9902-UDX-DSP-CI offers comprehensive high-quality standards conversion utilizing Cobalt’s linear frame rate conversion to convert between virtually any SD/HD/3G format – 25/50, 29.97/30/59.94/60, and 23.98/24 (both film and PsF) from 525/625i to 1080p and anything in-between – with conversion to and from NTSC and PAL available for all input and output formats (see next page for full conversion matrix). This broad flexibility makes the 9902-UDX-DSP-CI perfect for international signal aggregators and distributors in the Cable, DBS, and OTT markets.

### I/O Capabilities

In addition to accepting and providing 3G/HD/SD-SDI I/O and CVBS I/O, the 9902-UDX-DSP-CI accommodates a wide array of baseband I/O, including:

- Externally-accessible SFP cage option allows flexible added I/O, including fiber, HDMI, and IP.
- Accepts up to 16 channels (8 pairs) of discrete unbalanced AES (AES-3id) embed/de-embed. Per-pair SRC can be applied to consumer (non-professional) digital audio sources to synchronize to 48 kHz video.
- Full audio crosspoint between embedded channels, balanced analog I/O and AES I/O.

As content delivery platforms evolve, conversion and processing systems need to be as comprehensive and cost effective as possible. Content providers/aggregators are tasked with receiving various signal types and standards and formatting them to the exact video, audio and metadata configuration needed on a per channel basis, and need an easy to deploy means of integrating and optimizing the components that comprise a modern broadcast. Designed to address these evolving needs in the densest foot print possible, the 9902-UDX-DSP-CI Channel Integrator provides the signal conversion and processing tool set needed to conform analog and digital audio and video signals and their associated metadata to meet sophisticated channel delivery requirements.

Flexibility and advanced video processing including broadcast quality Up/Down/Cross conversion with Noise Reduction and Detail Enhancement makes the 9902-UDX-DSP-CI perfect for rentals and international signal aggregators and distributors in all Lmarkets. The Channel Integrator is offered with a wide range of rear I/O options and can be configured with a SFP I/O port option which adds support for either HDMI, fiber optic, or IP (SMPTE 2110 or SMPTE 2022-6).

### FEATURES

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

High-density openGear comprehensive signal integration solution

Optionally accepts SMPTE resolution and frame rate signals via HDMI allowing for computer and consumer A/V sources to be ingested

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits” – our largest DSP capacity

Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay

Frame Sync provides audio/video offsets as desired

Noise Reduction and Detail Enhancement provide image quality optimization

Supports SNMP and Cobalt’s Reflex (JSON) Protocols

Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

### OPTIONS

**Note:** Options or ordering line items denoted as “-” are hardware-based options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

Option **-CI-SFP** provides externally-accessible SFP cage allowing flexibly added I/O, including fiber I/O, and HDMI (See Ordering Information for SFP types available)

Quality Check Option (**+QC**) provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence

Trouble Slate Option (**+T-SLATE**) provides automated insertion controlled by screened user-selectable events (such as LOS or frozen/black frame)

Logo Insertion Option (**+LOGO**) provides insertion for branding local or destination branding requirements

Linear Frame Rate Conversion Option (**+FRC**)

Clean & Quiet Switching Option (**+CQS**) – Provides automatic audio ramp-down and up during input switching events

Key/Fill Keyer Option (**+KEYER**)

Emergency Alert System Text Crawl Generation Option (**+EAS**)

Audio LTC I/O Option (**+LTC**)

Extended Frame Sync Delay Option (**+DLY**)

Color Correction Option (**+COLOR**) provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (**+DSP-ITU**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Text-To-Speech (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons

Upmixing Option (**+DSP-UPMIX-LA**) provides high-quality Linear Acoustic® UPMAX™ 2.0-to-5.1 upmixing

Dolby Options (**+DSP-ENC** and **+DSP-DEC**) provide numerous Dolby encode and decode options (See Ordering Information for more info)

Loudness Processing Options (**+DSP-RTLL**) provide numerous Dolby Real-Time Loudness Leveling loudness processing options (See Ordering Information for more info)

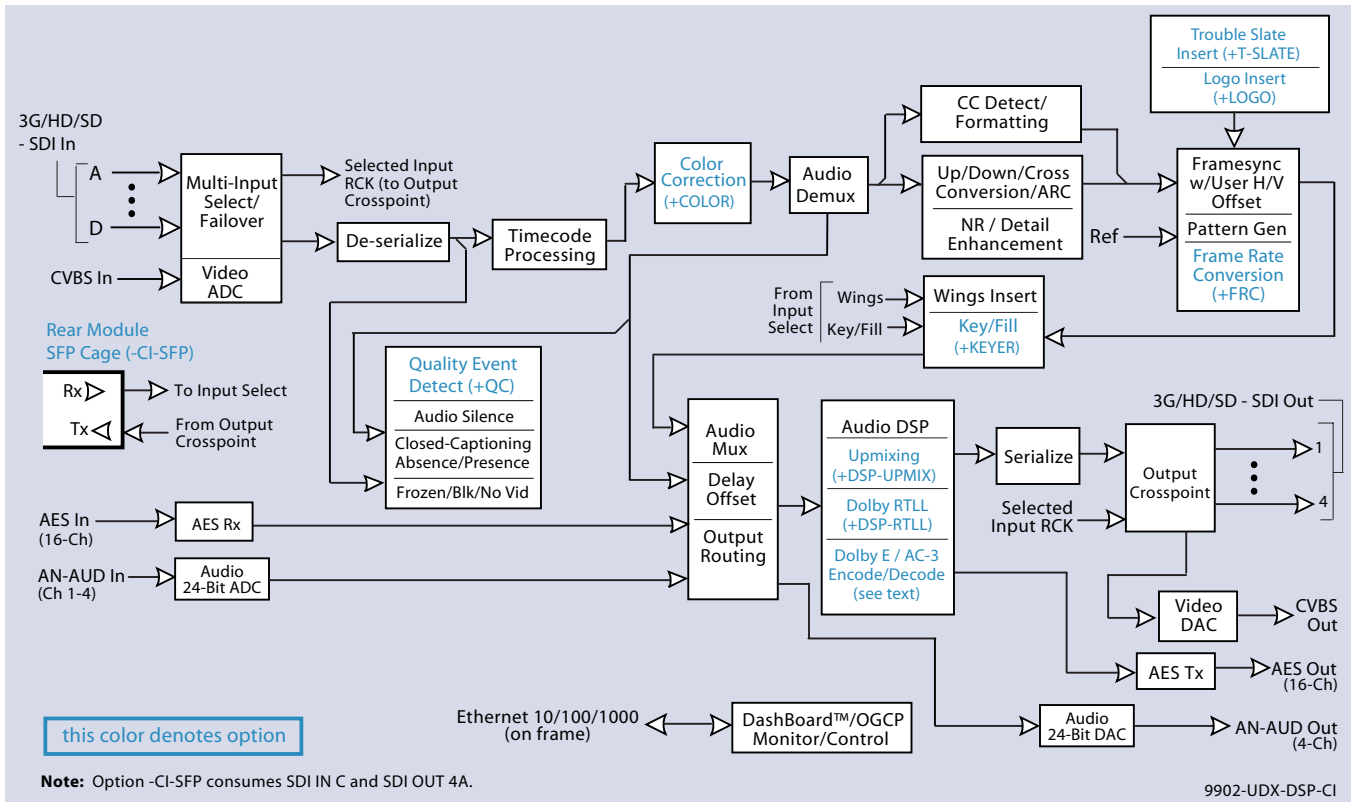
SCTE 104 Insertion (**+SCTE104**) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion (**+SCTE104-FAST**) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI.

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options



Inputs ↓ / Outputs →	525i 59.94	625i 50	720p 23.98	720p 24	720p 25	720p 29.97	720p 30	720p 50	720p 59.94	720p 60	1080i 50	1080i 59.94	1080i 60	1080PsF 23.98	1080PsF 24	1080PsF 25	1080PsF 29.97	1080PsF 30	1080PsF 23.98	1080p 24	1080p 25	1080p 29.97	1080p 30	1080p 50	1080p 59.94	1080p 60	
525i 59.94	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
625i 50	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 23.98	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 24	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 25	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 29.97	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 30	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 50	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 59.94	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
720p 60	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080i 50	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080i 59.94	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080i 60	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080PsF 23.98	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080PsF 24	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080PsF 25	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080PsF 29.97	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080PsF 30	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 23.98	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 24	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 25	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 29.97	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 30	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 50	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 59.94	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1080p 60	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

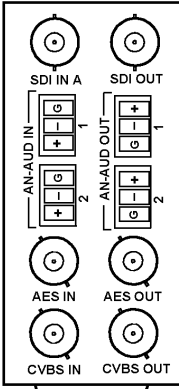
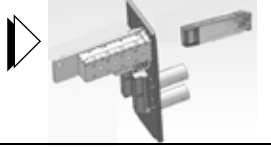
Standards Conversion Table

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

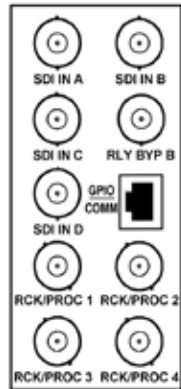
Externally-accessible SFP cage (Option -CI-SFP) on the card Rear Module allows flexible added I/O (including fiber, HDMI, and IP encaps/de-encap) as well as repurposing by simply swapping SFP modules as desired



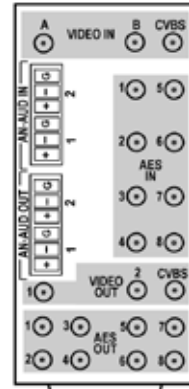
RM20-9902-UDX-DSP-CI-B

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

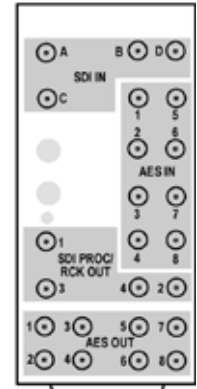
RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



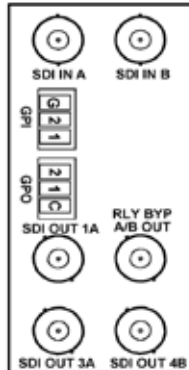
RM20-9902-UDX-DSP-CI-C



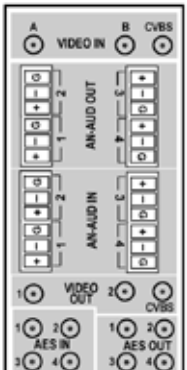
RM20-9902-UDX-DSP-CI-D (DIN / HD-BNC)



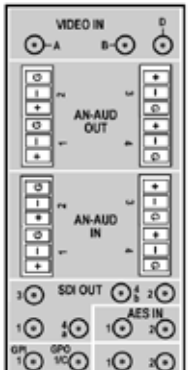
RM20-9902-UDX-DSP-CI-E (DIN / HD-BNC)



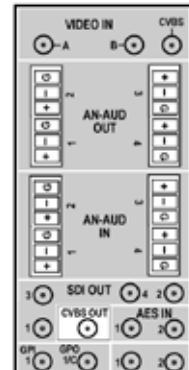
RM20-9902-UDX-DSP-CI-F



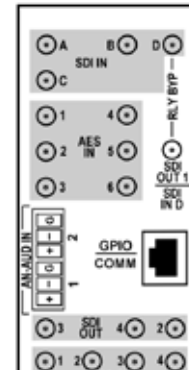
RM20-9902-UDX-DSP-CI-G (DIN / HD-BNC)



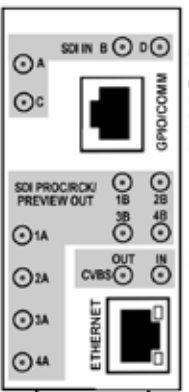
RM20-9902-UDX-DSP-CI-H (DIN / HD-BNC)



RM20-9902-UDX-DSP-CI-J (DIN / HD-BNC)



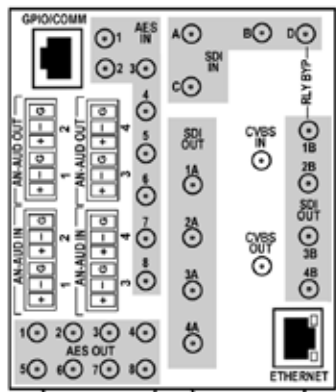
RM20-9902-UDX-DSP-CI-K (DIN / HD-BNC)



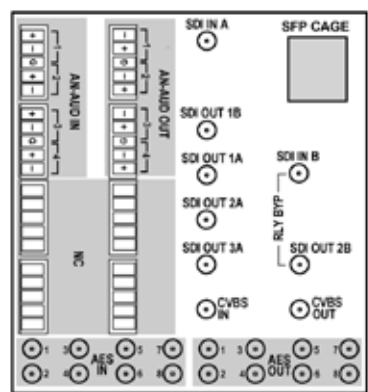
RM20-9902-UDX-DSP-CI-L (DIN / HD-BNC)

8 - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPO OUT 2  
4 - GPO OUT 1  
3 - GPO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.



RM20-9902-UDX-DSP-CI-N (DIN / HD-BNC)



RM20-9902-UDX-DSP-CI-P (DIN / HD-BNC)

**9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC**

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

**SPECIFICATIONS****Power**

24 Watts (including +DSP options)  
Add 3 Watts for option -CI-SFP

**SDI Input/Outputs**

(4) 75Ω inputs (max)  
(5) 75Ω outputs (max) (1 with relay bypass protect)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter 3G/HD/SD: <2.0/1.0/0.2 UI  
Minimum Latency (scaler and frame sync disabled):  
SD: 127 pixels; 9.4 us  
720p: 330 pixels; 4.45 us  
1080i: 271 pixels; 3.65 us  
1080p: 361 pixels; 2.43 us

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
(1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all inputs can be downconverted to CVBS.  
CVBS ADC resolution: 10-bit  
CVBS ADC sampling: 4x over-sampling  
CVBS DAC resolution: 10-bit  
CVBS DAC sampling: 16x over-sampling  
Y/C separation: 4-line Adaptive Comb Filter  
Freq. Response: ± 0.25 dB to 5.5 MHz  
SNR: > 50 dB to 5.5 MHz (unweighted)  
Differential Phase: < 1 degree  
Differential Gain: < 1%  
Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
AES-3id 75Ω outputs (8 pair (16-Ch) max)  
Input AES SRC Range: 32 to 96 kHz  
Balanced analog audio inputs (4-Ch max)  
Balanced analog audio outputs (4-Ch max)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
Latency (min): 1 frame  
Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**Audio Conversion Format**

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs. Analog audio I/O conforms to +24 dBu <=> 0 dBFS.

**Note:** Fiber specifications are typical, and only applicable for card fitted with optional Tx or Rx (as applicable) fiber SFP module. Specifications subject to change.

**Fiber Transmit Output (typ. with fiber Tx SFP)**

LC connector  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

**Fiber Receive Input (typ. with fiber Rx SFP)**

LC connector  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm (with internal power meter status display)

**HDMI Input (typ. with HDMI-to-SDI HDMI SFP)**

(1) HDMI 1.4 Input; type D-micro connector; DVI-D compliant input (limited to SMPTE HD formats).

**ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS**

**9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC**

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

**SPECIFICATIONS (cont.)**

**HDMI Output (typ. with SDI-to-HDMI SFP)**

(1) HDMI 1.4 Output; type D-micro connector; DVI-D compliant input (limited to SMPTE HD formats).

**Analog Audio Specifications**

4-ch inputs; 4-ch outputs  
 Input Impedance: > 10kΩ  
 Reference Level: -20 dBFS  
 Nominal Level: +4 dBu  
 Input Clip Level: +24 dBu (0 dBFS)  
 Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
 SNR: 115 dB (A weighted)  
 THD+N: -96 dB (20 Hz to 10 kHz)  
 Crosstalk: -106 dB (20 Hz to 20 kHz)  
 Output Impedance: < 50Ω  
 Max. Output Level: +24 dBu (0 dBFS)  
 (I/O conforms to 0 dBFS = +24 dBu)

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9902-UDX-DSP-CI** 3G/HD/SD-SDI/CVBS Channel Integrator – UDX/Frame Sync and Embedder/De-Embedder with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

**Options:**

**Note:** Options denoted as "+" are software-based options which are available on new product when ordered or can be customer field-installed as a software upload upgrade. Options or ordering line items denoted as "-" are hardware orderable items (such as SFP and expansion modules). These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

+**COLOR** Color Correction Option

+**QC** Quality Check Option

+**FRC** Linear Frame Rate Conversion Option

+**LTC** Audio LTC I/O Option

+**DLY** Extended Frame Sync Delay Option

+**SCTE104** SCTE 104 Insertion Option

+**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

+**T-SLATE** User Trouble Slate Graphic Import Option

+**LOGO** Logo Insertion Option

+**KEYER** Key/Fill Keyer Option

+**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

+**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

+**EAS** Emergency Alert System Text Crawl Generation Option

+**CQS** Clean & Quiet Switching Option

+**DSP-RTLL-5.1** Dolby® Real-Time Loudness Leveling 5.1-Channel Surround Sound Loudness Processor

+**DSP-RTLL-2.0** Dolby® Real-Time Loudness Leveling 2.0-Channel Stereo Loudness Processor

+**DSP-ENCD-5.1** Dolby® Digital / Digital Plus 5.1 Encoder

+**DSP-ENCD-2.0** Dolby® Digital / Digital Plus 2.0 Encoder

+**DSP-DEC** Dolby® E / Dolby® Digital / Dolby® Digital Plus Decoder

+**DSP-UPMIX-LA** Linear Acoustic UPMAX™ 2.0-to-5.1 Upmixer



ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC**  
with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

**ORDERING INFORMATION (cont.)**

**+DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option

**+DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option

**+DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)

**+DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)

(1) Manufactured under license from Audyne Inc.

**-CI-SFP** Adds daughter card supporting externally-accessible SFP cage; orderable as new option or field upgrade.

**Note:** To support SFP option(s), this option is required in addition to desired specific SFP options below. Option can only be used with rear module RM20-9902-UDX-DSP-CI-P-DIN or RM20-9902-UDX-DSP-CI-P-HDBNC.

**-SFP-E0** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Transmitter, Medium Haul, 1310nm

**-SFP-0E** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Receiver, Medium Haul

**-SFP-E00E** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Transceiver, Medium Haul, 1310nm

**-SFP-E0-CWDM-WX** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Transmitter, Long Haul. Specify CWDM Wavelength in place of -WX (see table below)

**-SFP-E00E-CWDM-WX** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Transceiver, Long Haul. Specify CWDM Wavelength in place of -WX (see table below)

In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

(Example: SFP-E0-CWDM-27 has 1270 nm FIBER OUT CWDM wavelength)

**-SFP-H-TO-S** HDMI/DVI To SDI Video SFP Converter, Single Receiver, Type D with retention clip  
(**Note:** The H-to-S SFP module used here supports **8-bit input only.**)

**-SFP-S-TO-H** SDI To HDMI/DVI Video SFP Converter, Single Transmitter, Type D with retention clip

**-SFP-IP-SWD** Software-Defined EmSFP 2110 or 2022-6 Encap/De-Encap 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type **-SPF-IP-SWD**:

**+ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6

**+ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110

**+ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI

**+ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI

**+ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

**+ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

**+ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

**+ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

**Rear I/O Modules:**

**RM20-9902-UDX-DSP-CI-B** 20-Slot Frame Rear I/O Module (Standard-Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Processed Out BNC, (2) Balanced Analog Audio Outputs, (1) AES Output BNC

**RM20-9902-UDX-DSP-CI-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), GPIO/COMM RJ-45 connector

**RM20-9902-UDX-DSP-CI-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

**RM20-9902-UDX-DSP-CI-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC.)

ADVANCED 3G/HD/SD-SDI FORMAT CONVERTERS WITH DSP AUDIO OPTIONS

**9902-UDX-DSP-CI » 3G/HD/SD-SDI/CVBS CHANNEL INTEGRATOR – UDX/FRAME SYNC**

with Video Optimization, Advanced Audio DSP Features, and SFP I/O Options

**ORDERING INFORMATION (cont.)**

**RM20-9902-UDX-DSP-CI-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as processed or relocked of selected input, (2) GPI, (2) GPO

**RM20-9902-UDX-DSP-CI-G-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) SDI/CVBS Input, (4) AES Inputs, (4) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (4) AES Outputs, (4) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-G-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) SDI/CVBS Input, (4) AES Inputs, (4) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (4) AES Outputs, (4) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

**RM20-9902-UDX-DSP-CI-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9902-UDX-DSP-CI-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9902-UDX-DSP-CI-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9902-UDX-DSP-CI-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

**RM20-9902-UDX-DSP-CI-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-UDX-DSP-CI-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9902-UDX-DSP-CI-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**Note:** Rear module RM20-9902-UDX-DSP-CI-P-DIN or RM20-9902-UDX-DSP-CI-P-HDBNC is required if option -CI-SFP is ordered.

**RM20-9902-UDX-DSP-CI-P-DIN** 20-Slot Frame Rear I/O Module (Double-Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (4) Balanced Analog Audio Inputs, (8) AES-3id AES Inputs, (1) SFP cage receptacle (valid with option -CI-SFP), (5) 3G/HD/SD-SDI Outputs (relay bypass for SDI IN B - SDI OUT 2B path), (1) CVBS Output, (4) Balanced Analog Audio Outputs, (8) AES-3id AES Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-DSP-CI-P-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (4) Balanced Analog Audio Inputs, (8) AES-3id AES Inputs, (1) SFP cage receptacle (valid with option -CI-SFP), (5) 3G/HD/SD-SDI Outputs (relay bypass for SDI IN B - SDI OUT 2B path), (1) CVBS Output, (4) Balanced Analog Audio Outputs, (8) AES-3id AES Outputs (All coaxial connectors HD-BNC.)



DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9902-UDX-FS » 3G/HD/SD-SDI DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC

with Audio Embed/De-Embed



The Cobalt® 9902-UDX-FS 3G/HD/SD-SDI Dual-Channel – Path 1 UDX / Path 2 Frame Sync with Audio Embed/De-Embed offers **two independent signal paths**: one path of full up/down/cross conversion, frame sync, and audio embedding /de-embedding, and the other path economically offering frame sync and audio embedding / de-embedding – all in a single openGear® card. Using our HPF-9000 20-slot frame, this provides up to 40 channels of processing in a single frame. The 9902-UDX-FS is another new Cobalt model representing a new level of openGear packaging density!

The 9902-UDX-FS provides high-density that offers unprecedented multi-input support and flexibility. The up/down/cross convert scaler is specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. AFD processing can detect an incoming AFD code and correspondingly set scaling and ARC to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on

the input. Analog video (CVBS) input, with AES and analog audio audio embedding and de-embedding is also supported and can work with either of the card's two processing channels.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues. Quality Check option +QC allows failover to alternate inputs based on user-configurable criteria such as black/frozen frame. Included standard is closed captioning absence/presence detection that allows CEA 608/708 and line 21 SD CC absence or presence to be detected, with event actions consisting of GPO, automated alert email actions, or go-to card user presets or other actions.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. With option +ANC, the 9902-UDX-FS offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

FEATURES

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection. Path inputs can also be sourced from opposite path output with no external patching.

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option (+QC) provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Up/Down/Cross Conversion (Path 1) with user and AFD, VI, and WSS ARC specifically tailored for broadcast video

Frame sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Video options include color correction

Upgrade option +UDX-FS-to-2UDX converts path 2 to full UDX/Frame Sync

CVBS analog video input and analog/AES embed / de-embed with 4-line Adaptive Comb Filter

Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel

Five year warranty

OPTIONS

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Clean & Quiet Switching Option (+CQS) – Provides automatic audio ramp-down and up during input switching events

Add Path 2 UDX (+UDX-FS-to-2UDX) – Converts path 2 to full UDX/Frame Sync

Expanded Delay (+DLY) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

SCTE 104 Insertion (+SCTE104) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

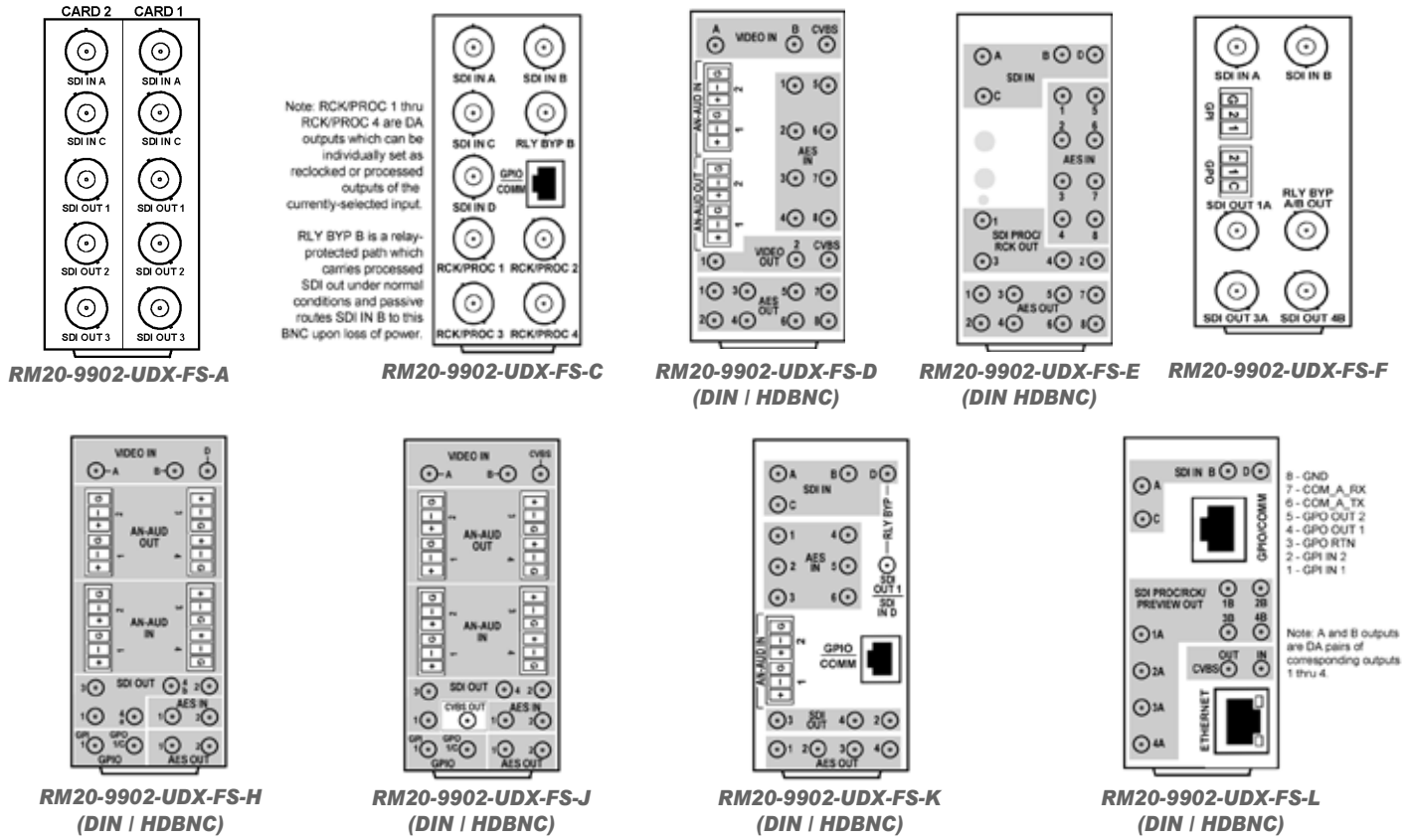
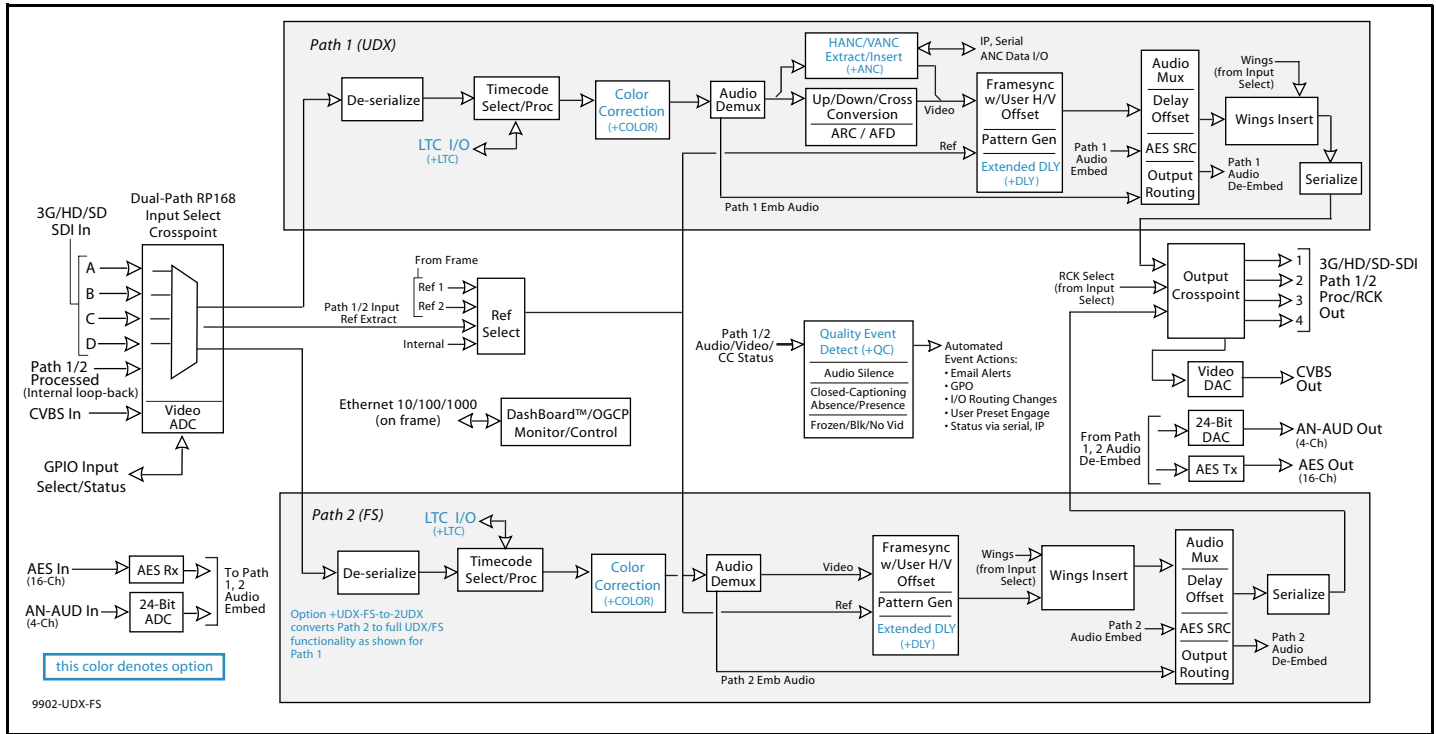
SCTE104 Frame-Accurate SCTE Trigger Insertion (+SCTE104-FAST) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Audio LTC I/O (+LTC)



DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

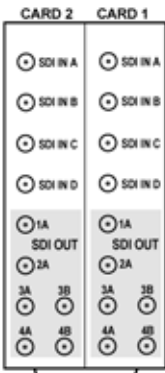
9902-UDX-FS » 3G/HD/SD-SDI DUAL-CHANNEL - PATH 1 UDX / PATH 2 FRAME SYNC  
with Audio Embed/De-Embed



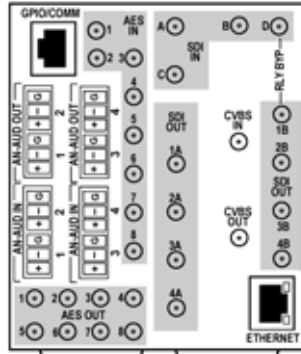
DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9902-UDX-FS » 3G/HD/SD-SDI DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC

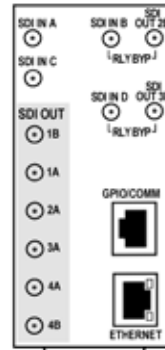
with Audio Embed/De-Embed



**RM20-9902-UDX-FS-MIS**  
(DIN | HDBNC)



**RM20-9902-UDX-FS-N**  
(DIN | HDBNC)



**RM20-9902-UDX-FS-P**  
(DIN | HDBNC)

8 - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPO OUT 2  
4 - GPO OUT 1  
3 - GPO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input/Outputs**

- Up to (4) 75Ω BNC inputs
- Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input relocked)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M
- SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- Minimum Latency (scaler and frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

- (1) 75Ω BNC input
- (1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.
- ADC resolution: 9-bit
- Sampling frequency: 27 MHz (2x over-sampling)
- Y/C separation: 4 line Adaptive Comb Filter
- Freq. Response: ± 0.25 dB to 5.5 MHz
- SNR: > 50 dB to 5.5 MHz (unweighted)
- Differential Phase: < 1 degree
- Differential Gain: < 1%
- Nonlinearity < 1%

**Discrete Audio Input/Outputs**

- AES-3id 75Ω inputs (8 pair (16-Ch) max)
- AES-3id 75Ω outputs (8 pair (16-Ch) max)
- Input AES SRC Range: 32 to 96 kHz
- Balanced analog audio inputs (4-Ch max)
- Balanced analog audio outputs (4-Ch max)
- (I/O conforms to 0 dBFS = +24 dBu)
- Analog Output Impedance: < 50 Ω
- Analog Reference Level: -20 dBFS
- Analog Nominal Level: +4 dBu
- Analog Max Output Level: +24 dBu (0 dBFS)
- Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)
- Analog SNR: 115 dB (A weighted)
- Analog THD+N: -96 dB (20 Hz to 10 kHz)
- Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9902-UDX-FS » 3G/HD/SD-SDI DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC

with Audio Embed/De-Embed

SPECIFICATIONS (cont.)

Frame Sync Audio/Video Delay

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

User Audio Delay Offset from Video

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

ARC

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering. (ARC/AFD settings available only on UDX processing path.)

GPIO/COMM

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

Frame Reference Input

(2) reference from frame bus or selected program video ref sources. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
 Return Loss: >35 dB up to 5.75 MHz

ORDERING INFORMATION

9902-UDX-FS 3G/HD/SD-SDI Dual-Channel – Path 1 UDX / Path 2 Frame Sync with Audio Embed/De-Embed

RM20-9902-UDX-FS-A/S 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

RM20-9902-UDX-FS-C 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

RM20-9902-UDX-FS-D-DIN 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

RM20-9902-UDX-FS-D-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

RM20-9902-UDX-FS-E-DIN 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

RM20-9902-UDX-FS-E-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)ORD INFO

RM20-9902-UDX-FS-F 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/ Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

RM20-9902-UDX-FS-H-DIN 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

RM20-9902-UDX-FS-H-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

RM20-9902-UDX-FS-J-DIN 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

RM20-9902-UDX-FS-J-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

RM20-9902-UDX-FS-K-DIN 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

RM20-9902-UDX-FS-K-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**9902-UDX-FS » 3G/HD/SD-SDI DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC**

with Audio Embed/De-Embed

**ORDERING INFORMATION (cont.)**

**RM20-9902-UDX-FS-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-UDX-FS-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9902-UDX-FS-M/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9902-UDX-FS-M/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9902-UDX-FS-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9902-UDX-FS-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9902-UDX-FS-P-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9902-UDX-FS-P-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**Options:**

+**ANC** Ancillary Data Processor Option

+**COLOR** Color Correction Option

+**LTC** Audio LTC I/O Option

+**QC** Quality Check Option

+**CQS** Clean & Quiet Switching Option

+**UDX-FS-to-2UDX** Add Path 2 UDX Option

+**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Applicable only for Path 2 (frame sync) path. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

+**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

+**DLY** Extended Frame Sync Delay Option

+**SCTE104** SCTE 104 Insertion Option

+**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX-FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC** with Audio Embed/De-Embed



The Cobalt® **BBG-1002-UDX-FS 3G/HD/SD-SDI Standalone Dual-Channel – Path 1 UDX / Path 2 Frame Sync** with Audio Embed/De-Embed offers **two independent signal paths**: one path of full up/down/cross conversion, frame sync, and audio embedding /de-embedding, and the other path economically offering frame sync and audio embedding /de-embedding. The BBG-1002-UDX-FS is another new Cobalt model representing a new level of standalone packaging density!

The BBG-1002-UDX-FS provides high-density that offers unprecedented multi-input support and flexibility. The up/down/cross convert scaler is specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. AFD processing can detect an incoming AFD code and correspondingly set scaling and ARC to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Analog video (CVBS) input, with AES and analog audio embedding and de-embedding is also supported and can work with either of the unit's two processing channels.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input

pair. Bulk and per-channel audio delay controls easily address lip-sync issues. Quality Check option **+QC** allows failover to alternate inputs based on user-configurable criteria such as black/frozen frame. Included standard is closed captioning absence/presence detection that allows CEA 608/708 and line 21 SD CC absence or presence to be detected, with event actions consisting of GPO, automated alert email actions, or go-to device user presets or other actions.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. With option **+ANC**, the BBG-1002-UDX-FS offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-2UDX allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of units to a standard 19" frame).

**FEATURES**

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection. Path inputs can also be sourced from opposite path output with no external patching.

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option **(+QC)** provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Up/Down/Cross Conversion (Path 1) with user and AFD,

Frame sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Upgrade option **+UDX-FS-to-2UDX** converts path 2 to full UDX/Frame Sync

CVBS analog video input and analog/AES embed / de-embed with 4-line Adaptive Comb Filter

Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via Dashboard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty

**OPTIONS**

Quality Check **(+QC)** – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Color Correction **(+COLOR)** – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor **(+ANC)** – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech **(+TTS)** – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Clean and Quiet Switching Option **(+CQS)** – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

Add Path 2 UDX **(+UDX-FS-to-2UDX)** – Converts path 2 to full UDX/Frame Sync

Expanded Delay **(+DLY)** – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

SCTE 104 Insertion **(+SCTE104)** – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion **(+SCTE104-FAST)** – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Audio LTC I/O **(+LTC)**

1RU Mounting Tray (supports 3 units) **(BBG-1000-TRAY)**

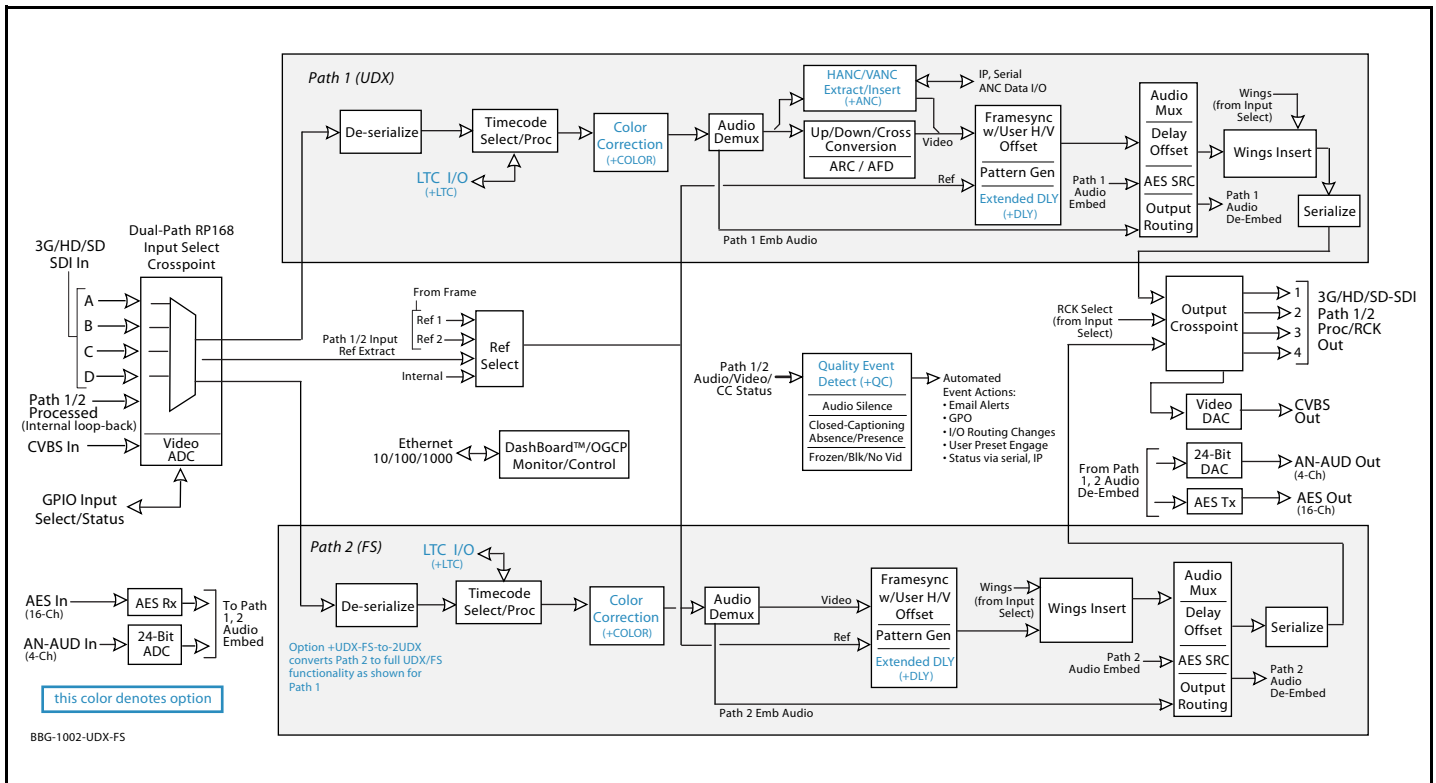
Redundant Power Supply Module **(BBG-1000-PS)**



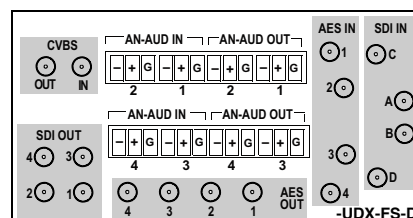
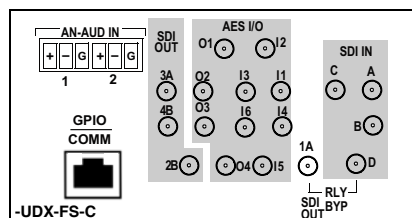
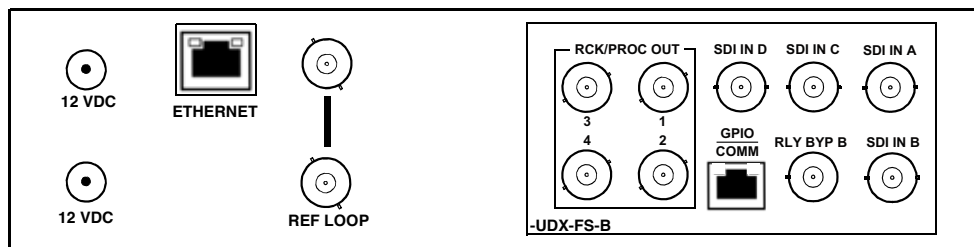


DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX-FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC** with Audio Embed/De-Embed



Rear Panel



## DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX-FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC** with Audio Embed/De-Embed

## SPECIFICATIONS

**Note:** Standard I/O capabilities are limited to those shown in Rear Panel diagrams and listed in Ordering Information. Where specifications below list other I/O types and/or complements, some combinations other than shown for standard models may be available as special order. Inquire with Sales for alternative I/O availability.

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input relocked)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (scaler and frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.

ADC resolution: 9-bit

Sampling frequency: 27 MHz (2x over-sampling)

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max) AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering. (ARC/AFD settings available only on UDX processing path.)

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-UDX-FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC** with Audio Embed/De-Embed

**ORDERING INFORMATION**

**BBG-1002-UDX-FS** 3G/HD/SD-SDI Standalone Dual-Channel - Path 1 UDX / Path 2 Frame Sync available in the following rear-panel I/O configurations:

**BBG-1002-UDX-FS-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1002-UDX-FS-C-DIN** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio Inputs, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1002-UDX-FS-C-HDBNC** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio Inputs, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors HD-BNC)

**BBG-1002-UDX-FS-D-DIN** (4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output. (All coaxial connectors DIN 1.0/2.3)

**BBG-1002-UDX-FS-D-HDBNC** ((4) 3G/HD/SD-SDI Inputs, (4) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, (4) Balanced Analog Audio Outputs, (1) CVBS Input, (1) CVBS Output. (All coaxial connectors HD-BNC)

**Options and Accessories:**

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+CQS** Clean and Quiet Switching Option

**+DLY** Extended Frame Sync Delay Option

**+UDX-FS-to-2UDX** Add Path 2 UDX Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX-DI » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL DE-INTERLACING UP-DOWN-CROSS-CONVERTER / FRAME SYNC**



The Cobalt® **BBG-1002-2UDX-DI 3G/HD/SD-SDI Standalone Dual-Channel De-interlacing Up-Down-Cross-Converter / Frame Sync** offers **two independent signal paths** of up/down/cross conversion (including independent per-path de-interlacing) and frame sync in a single unit.

The BBG-1002-2UDX-DI provides high-density that offers unprecedented multi-input support and flexibility. Dual independent up/down/cross convert scalers are specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. AFD processing can detect an incoming AFD code and correspondingly set scaling and ARC to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Bulk and per-channel audio delay controls easily address lip-sync issues.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. With option **+ANC**, the BBG-1002-2UDX-DI offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1002-2UDX-DI can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-2UDX-DI allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Independent Up/Down/Cross Conversion with independent de-interlacing for each path

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection. Path inputs can also be sourced from opposite path output with no external patching.

Auto-Changeover can be set to invoke failover for basic input loss.

Frame Sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/bum-in timecode using selected format

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Video options include color correction

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty

**OPTIONS**

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Clean and Quiet Switching Option (**+CQS**) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

Expanded Delay (**+DLY**) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

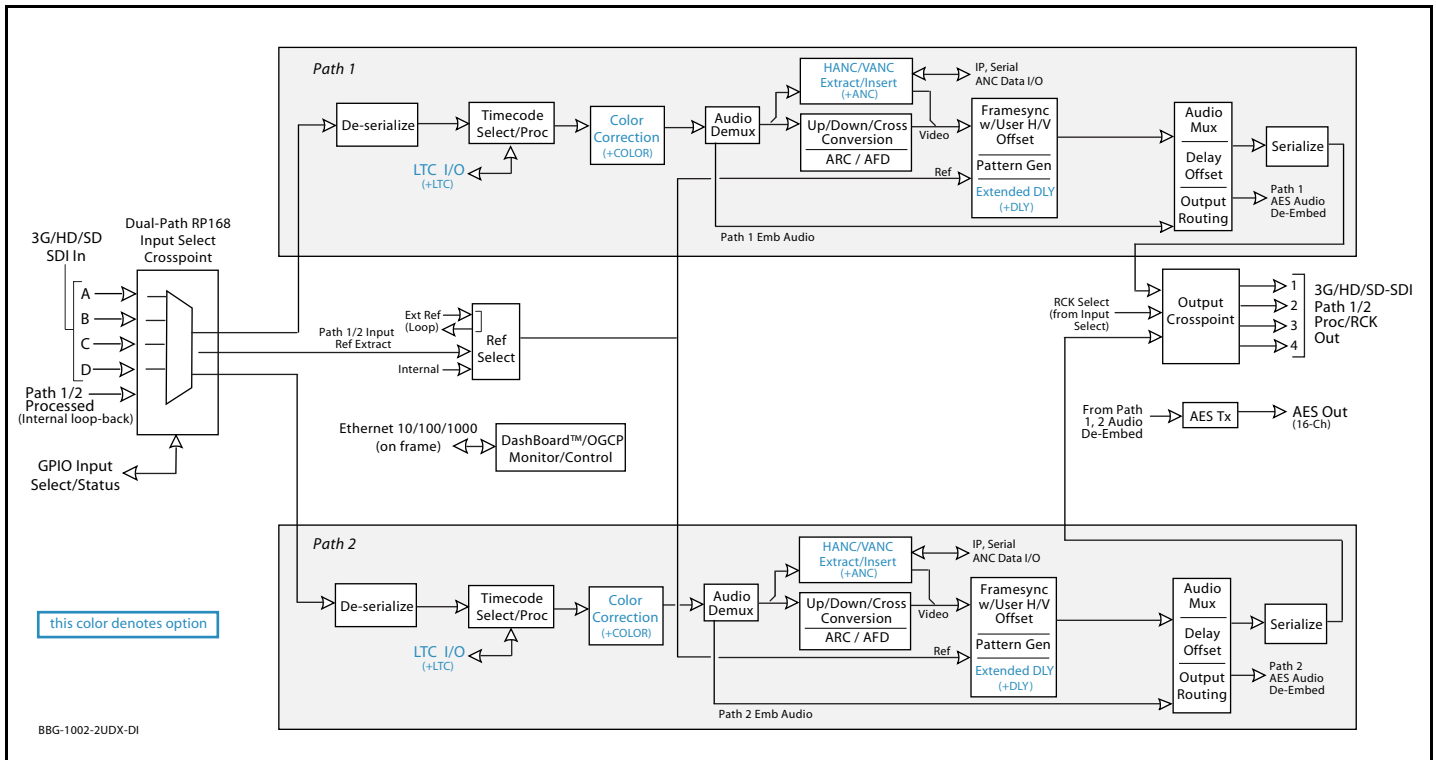
Audio LTC I/O (**+LTC**)

1RU Mounting Tray (supports 3 units) (**BBG-1000-TRAY**)

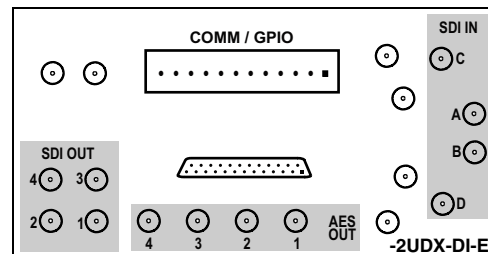
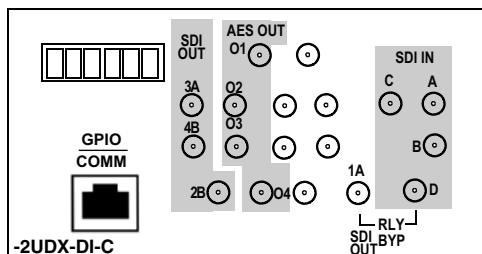
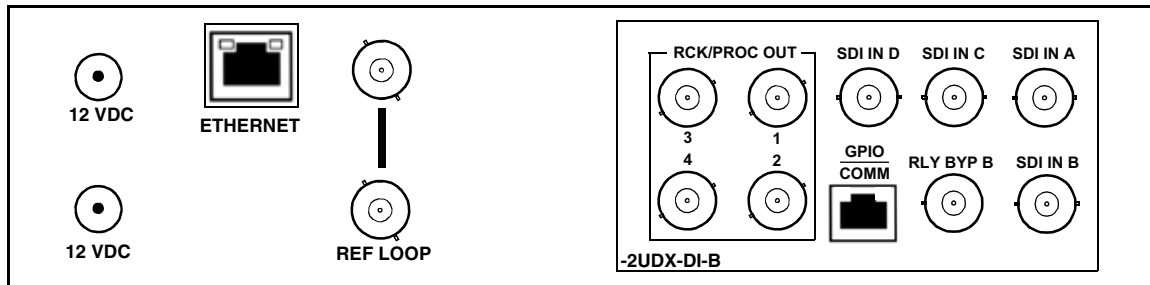


DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX-DI » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL DE-INTERLACING UP-DOWN-CROSS-CONVERTER / FRAME SYNC**



Rear Panel



**Note:** Some rear panels for various models shown here are equipped with connectors for signals not supported by this device (such as multi-wire balanced audio connections, CVBS I/O, and AES IN). These connections (shown unlabeled here) are N/C when used with the respective device.

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX-DI » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL DE-INTERLACING UP-DOWN-CROSS-CONVERTER / FRAME SYNC**

**SPECIFICATIONS**

**Note:** Standard I/O capabilities are limited to those shown in Rear Panel diagrams and listed in Ordering Information. Where specifications below list other I/O types and/or complements, some combinations other than shown for standard models may be available as special order. Inquire with Sales for alternative I/O availability.

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input reclocked)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
 Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
 Weight: 6 lb (2.8 kg)

DUAL-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**BBG-1002-2UDX-DI » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL DE-INTERLACING UP-DOWN-CROSS-CONVERTER / FRAME SYNC**

**ORDERING INFORMATION**

**BBG-1002-2UDX-DI** 3G/HD/SD-SDI Standalone Dual-Channel De-interlacing Up-Down-Cross-Converter / Frame Sync available in the following rear-panel I/O configurations:

**BBG-1002-2UDX-DI-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1002-2UDX-DI-C-DIN** (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1002-2UDX-DI-C-HDBNC** (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector).(All coaxial connectors HD-BNC)

**BBG-1002-2UDX-DI-E-DIN** (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, GPIO/COMM. (All coaxial connectors DIN 1.0/2.3), Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**BBG-1002-2UDX-DI-E-HDBNC** (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SDI Outputs, (4) AES Outputs, GPIO/COMM. (All coaxial connectors HD-BNC), Gigabit Ethernet, Looping Reference and Redundant DC Power Inputs (includes one BBG-1000-PS Power Supply)

**Options and Accessories:**

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean and Quiet Switching Option

**+DLY** Extended Frame Sync Delay Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

**9926-2HtoS » 3G/HD/SD DUAL-CHANNEL HDMI-TO-SDI CONVERTER WITH PER-CHANNEL FRAME SYNC**



The **9926-2HtoS 3G/HD/SD Dual-Channel openGear® HDMI-To-SDI Converter** with Per-Channel Frame Sync provides two independent paths of true 3G and HD conversions from HDMI to SMPTE 424M, 292M, or 259M. Each path is equipped with frame sync as well as full input and output audio crosspoints and optional per-path color correction. Input and output HDMI and SDI crosspoints allow program sourcing and distribution across either of the two HDMI inputs and two SDI outputs.

In existing openGear® installations, the dual-channel capacity of 9926-2HtoS can save space and lend to installation integrity over using throwdown devices. Preset save/load allows saving custom card settings while allowing instant revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080p

Two independent HDMI-to-SDI processing paths on a single openGear® cards neatly integrates high capacity in openGear® environments

Each path equipped with frame sync with configurable manual or LOS-detect insertion of frozen frame or selectable-color flat-field. Optional per-path color correction.

Full input and output audio crosspoints, including independent flex mix, stereo downmixers, and audio delay functions

Remote control/monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel

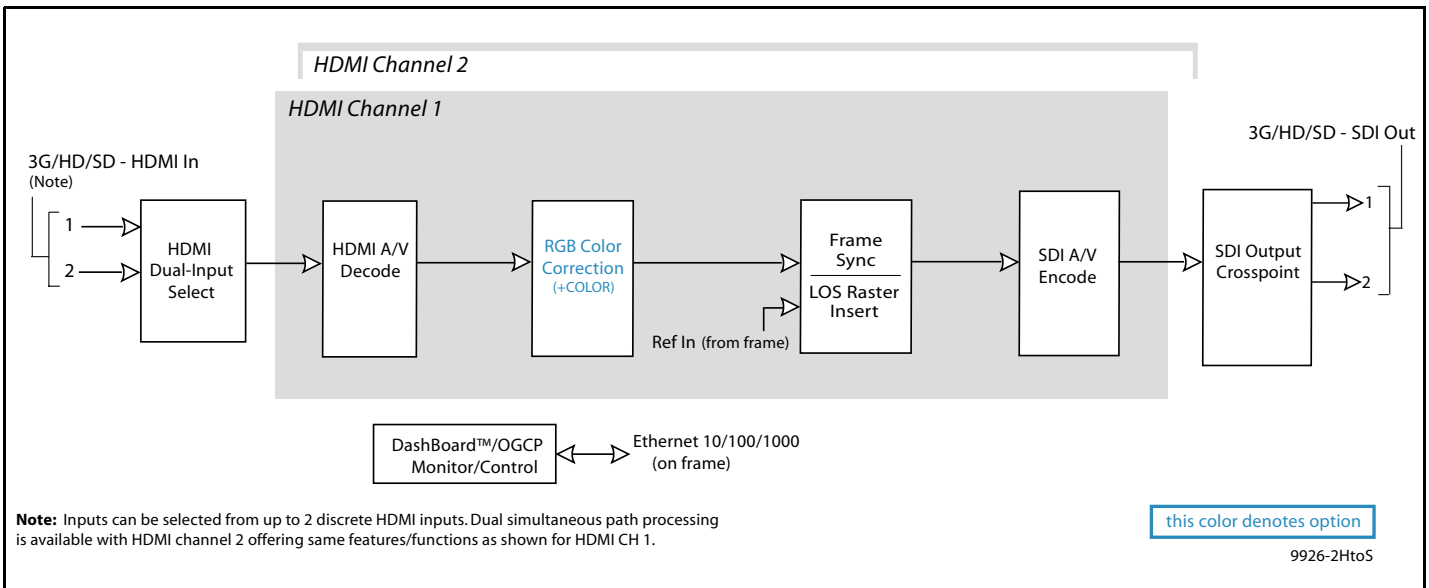
Hot-swappable

Make 9926-2HtoS into a standalone unit by using 9926-2HtoS with our **BBG-1300-FR** 1RU Enclosure for openGear® Cards standalone enclosure

Five year warranty

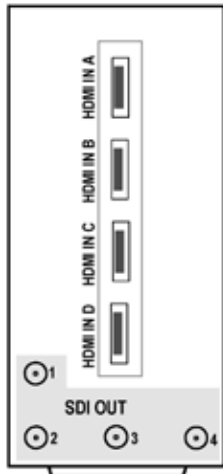
**OPTIONS**

**Color Correction (+COLOR)** – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.





**9926-2HtoS » 3G/HD/SD DUAL-CHANNEL HDMI-TO-SDI CONVERTER WITH PER-CHANNEL FRAME SYNC**



RM20-9926-B-HDBNC

**Note:** HDMI IN 3, HDMI IN 4 and SDI OUT 3, SDI OUT 4 are NC when used with this card.

**Note:** Due to the alignment of the 9926-2HtoS card and this rear module, the combination of the card and rear module will consume the adjacent even frame slot in addition to the odd slot occupied by the card.

**Note:** Mates to card in odd slot.

**SPECIFICATIONS**

**Note:** All specifications are preliminary and subject to change.

<b>Power</b> 49 Watts
<b>Standards Supported</b> SMPTE 259M, 292M, 424M
<b>HDMI Inputs</b> (2) HDMI 2.0; mini connectors
<b>3G/HD/SD-SDI Outputs</b> (2) 75Ω outputs Output Signal Level: 800 mV ±10% DC Offset: 0 V ± 50 mV Alignment Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI
<b>Frame Sync Audio/Video Delay</b> Max offset: 20 frames Latency (min): 1 frame
<b>User Audio Delay Offset from Video</b> Bulk delay control: -33 msec to +3000 msec. Per-channel delay controls: -800 msec to +800 msec
<b>Frame Reference Input</b> (2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level" <b>Note:</b> Per-path frame reference offers independent per-path controls (such as video delay offset). However, all paths must be locked to the same selected reference selection (e.g., frame REF 2 used for each path).

**ORDERING INFORMATION**

**9926-2HtoS** 3G/HD/SD Dual-Channel openGear® HDMI-To-SDI Converter with Per-Channel Frame Sync

**Rear Modules:**

**RM20-9926-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (2) 3G/HD/SD/SD HDMI 2.0 Inputs (mini connectors), (2) 3G/HD/SD/SD-SDI Processed Outputs (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**Options:**

**Note:** Options denoted as "+" are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade. Unless otherwise noted, software options are per-card based. Options which are **per-path** based are identified as such.

**+COLOR** Color Correction Option (**per-path** based)

**9927-2StoH » 3G/HD/SD DUAL-CHANNEL SDI-TO-HDMI CONVERTER WITH PER-CHANNEL FRAME SYNC**



The **9927-2StoH 3G/HD/SD Dual-Channel openGear® SDI-To-HDMI Converter** with Per-Channel Frame Sync provides two independent paths of true 3G and HD conversions from SMPTE 424M, 292M, or 259M SDI to HDMI. Each path is equipped with frame sync as well as full input and output audio crosspoints and optional per-path color correction. Input and output SDI and HDMI crosspoints allow program sourcing and distribution across either of the two SDI inputs and two HDMI outputs.

In existing openGear® installations, the dual-channel capacity of 9927-2StoH can save space and lend to installation integrity over using throwdown devices. Preset save/load allows saving custom card settings while allowing instant revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080p

Two independent SDI-to-HDMI processing paths on a single openGear® cards neatly integrates high capacity in openGear® environments

Each path equipped with frame sync with configurable manual or LOS-detect insertion of frozen frame or selectable-color flat-field. Optional per-path color correction.

Full input and output audio crosspoints, including independent flex mix, stereo downmixers, and audio delay functions

Remote control/monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel

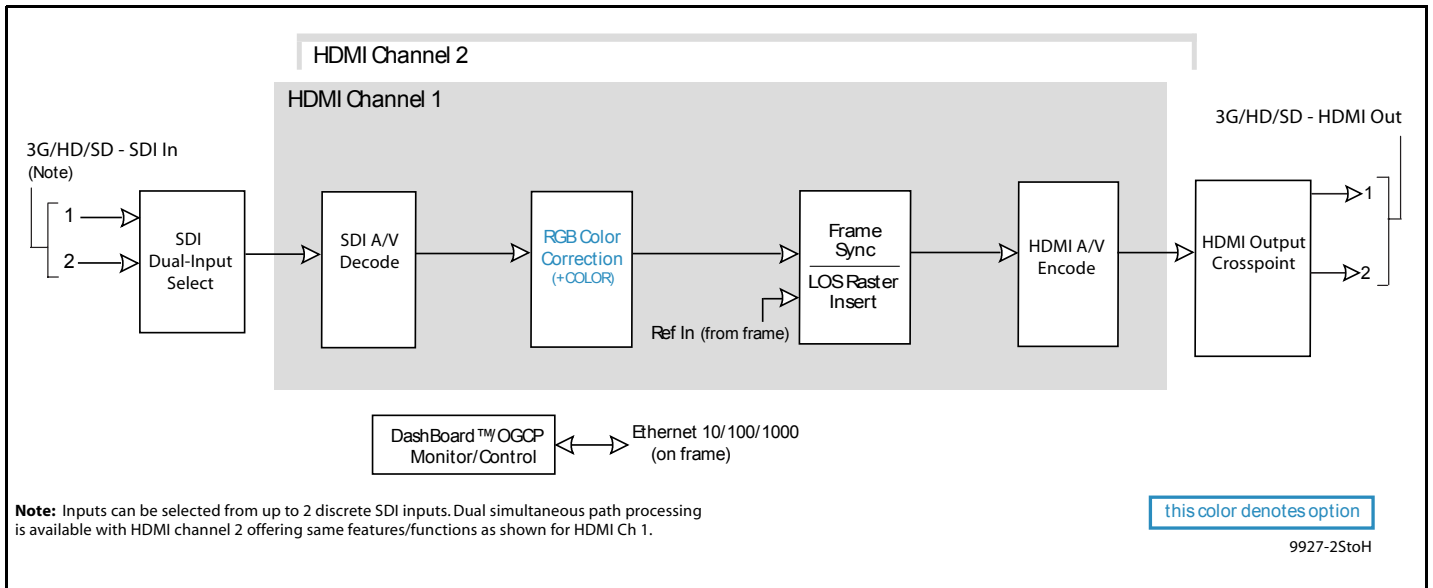
Hot-swappable

Make 9927-2StoH into a standalone unit by using 9927-2StoH with our **BBG-1300-FR** 1RU Enclosure for openGear® Cards standalone enclosure

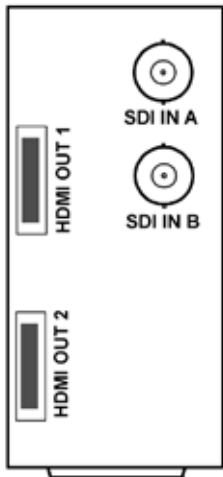
Five year warranty

**OPTIONS**

Color Correction (**+COLOR**) – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.



**9927-2StoH » 3G/HD/SD DUAL-CHANNEL SDI-TO-HDMI CONVERTER WITH PER-CHANNEL FRAME SYNC**



RM20-9927-B-HDBNC

**Note:** Due to the alignment of the 9927-2StoH card and this rear module, the combination of the card and rear module will consume the adjacent even frame slot in addition to the odd slot occupied by the card.

**Note:** Mates to card in **odd** slot.

**SPECIFICATIONS**

**Note:** All specifications are preliminary and subject to change.

<b>Power</b>	37 Watts
<b>Standards Supported</b>	SMPTE 259M, 292M, 424M (10-bit video processing)
<b>3G/HD/SD-SDI Inputs</b>	(2) 75Ω inputs
<b>HDMI Outputs</b>	(2) HDMI 2.0; Type A (standard) connectors
<b>Frame Sync Audio/Video Delay</b>	Max offset: 20 frames Latency (min): 1 frame
<b>User Audio Delay Offset from Video</b>	Bulk delay control: -33 msec to +3000 msec. Per-channel delay controls: -800 msec to +800 msec
<b>Frame Reference Input</b>	(2) reference from frame bus. SMPTE 170M/318M “Black Burst”, SMPTE 274M/296M “Tri-Level” <b>Note:</b> Per-path frame reference offers independent per-path controls (such as video delay offset). However, all paths must be locked to the same selected reference selection (e.g., frame REF 2 used for each path).

**ORDERING INFORMATION**

**9927-2StoH** 3G/HD/SD Dual-Channel openGear® SDI-To-HDMI Converter with Per-Channel Frame Sync

**Rear Modules:**

**RM20-9927-B** 20-Slot Frame Rear I/O Module (Standard-Width) (2) 3G/HD/SD/SD-SDI Inputs, (2) HDMI 2.0 Outputs (Type A (standard) connectors), (All coaxial connectors BNC.) (**Note:** Mates to card in odd frame slot.)

**Options:**

**Note:** Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade. Unless otherwise noted, software options are per-card based. Options which are **per-path** based are identified as such.

**+COLOR** Color Correction Option (**per-path** based)

QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9905-MPx » 3G/HD/SD QUAD-PATH UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR



The Multi-Path **9905-MPx 3G/HD/SD Quad-Path Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor** is a Cobalt® next-generation advanced scaler/frame synchronizer for the openGear® platform. The 9905-MPx provides **four independent signal paths** of UDX / frame sync / audio embedding and de-embedding on a single open-Gear® card. Using our HPF-9000 20-slot frame, this provides up to 24 channels (6 cards) of processing in a single frame. The 9905-MPx represents a new level of openGear packaging density!

The 9905-MPx provides high-density that offers unprecedented multi-input support and flexibility. Independent up/down/cross convert scalars are specifically designed for broadcast video formats, with full ARC control suitable for conversions to or from 4:3 and 16:9 aspect ratios. Discrete AES and MADI audio embedding/routing/mixing/de-embedding to any of four processing paths is supported. Standard 3D LUT feature and available color correction provide accommodation of SDR and HDR processing for downstream HDR systems.

Card control/monitoring is available via DashBoard user interface or Cobalt's RESTful-based Reflex protocol. The 9905-MPx can be software-converted to a 4K Quad-Link Input SDM/2SI 4K UDX/Frame Sync card with an option software license.

FEATURES

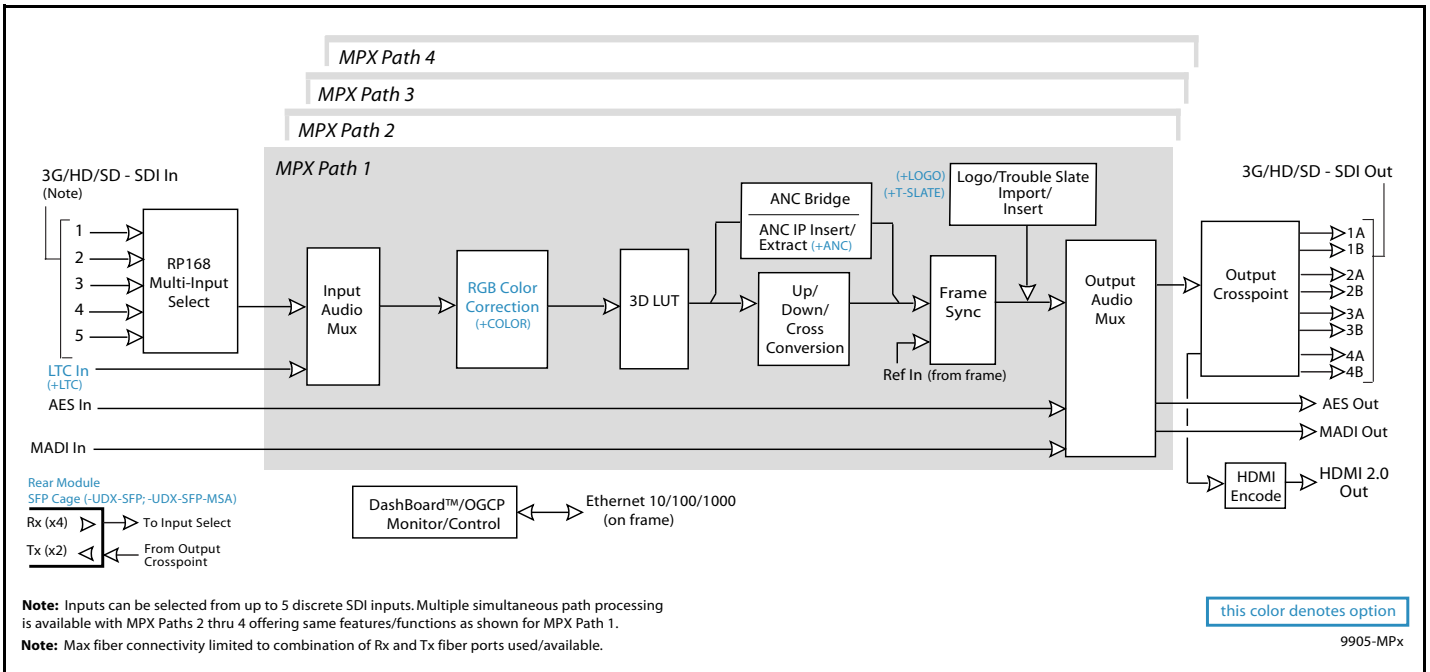
- Multi-Path design offers four independent UDX /frame sync paths (channels) per card
- Flexible AES and MADI embed/de-embed for each path
- Up/Down/Cross Conversion with user ARC control. 3D-LUT is standard feature for all paths.
- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

- Independent four-path ANC bridging, including closed-captioning processing
- Noise Reduction and Detail Enhancement provide image quality optimization
- Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels or Cobalt's RESTful-based Reflex protocol
- Five year warranty

OPTIONS

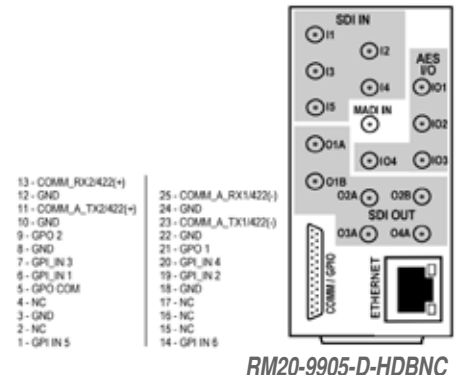
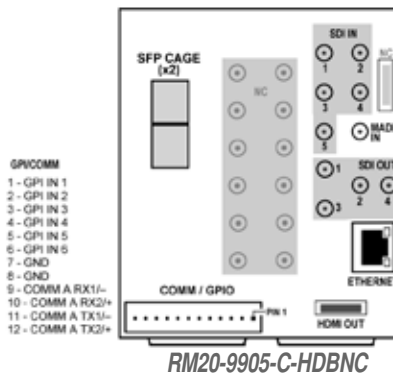
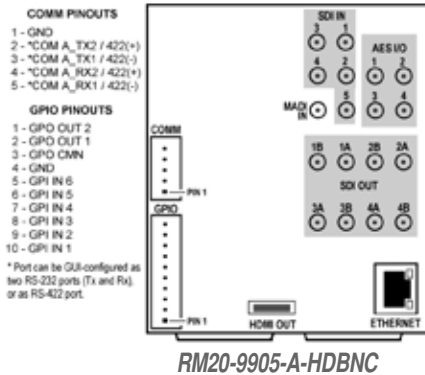
- Color Correction (+COLOR)** - Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.
- Logo Insertion (+LOGO)** - Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events
- Trouble Slate Import (+T-SLATE)** - Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events
- Clean & Quiet Switching (+CQS)** - Provides automatic audio ramp-down and up during input switching events for noise-free audio between input switches

- BBC LUTs (+3D-LUT-BBC)** - Licensed product developed by the BBC, provides BBC 3D LUTs for SDR-to-HDR and HDR-to-SDR
- Serial-To-Embedded Audio LTC In (+LTC)**
- ANC IP Insert/Extract (+ANC)** (Internal ANC Bridge is standard)
- Software-Defined Convert Card to 4K Quad-Link Input SDM/2SI 4K UDX/Frame Sync (+2K-TO-4K-9905)** - Software-defined option license that converts card to Quad-Link Input SDM/2SI 4K UDX/Frame Sync model
- UDX-SFP Options** - Adds daughter card supporting externally-accessible dual SFP cage. (See Ordering Information for SFP types available, descriptions, and further info.)



QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

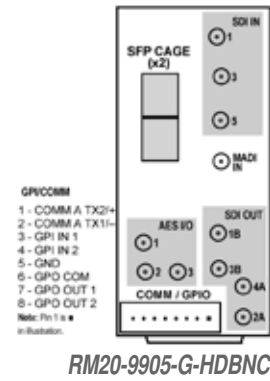
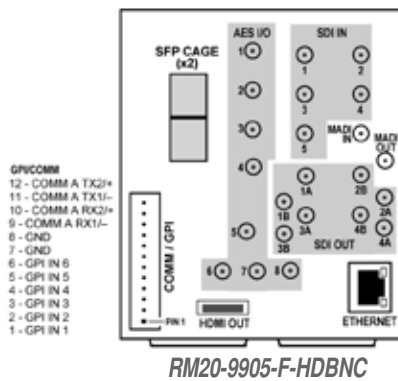
9905-MPx » 3G/HD/SD QUAD-PATH UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR



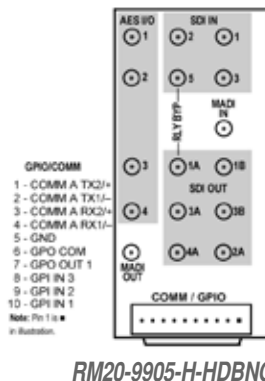
**Note:** Rear modules with SFP access do not come standard with any SFP functionality. Appropriate SFP option must be provisioned for rear module SFP functionality.

**Note:** Due to the alignment of the 9905-MPx card and the -D rear module, the combination of the card and rear module will consume the adjacent odd frame slot in addition to the even slot occupied by the card.

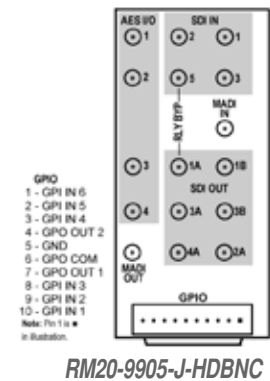
**Note:** This rear module cannot be installed in frame slots 19/20 location. The 9905-MPx card, when installation is attempted, will clash/interfere with the frame network controller card.



**Note:** Mates to card in odd slot.



**Note:** 12G signals over relay bypass path stipulates maximum cable length not to exceed 10m for total of both input and output cable lengths.



QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**9905-MPx » 3G/HD/SD QUAD-PATH UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR**

**SPECIFICATIONS**

**3G/HD/SD-SDI Input/Outputs**

(4) 75Ω inputs (max); (4) inputs can be simultaneously routed to the four UDX/FS paths.  
 (2x4) 75Ω outputs (max)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 Return Loss:  
 > 15 dB up to 1.485 GHz  
 > 10 dB up to 3 GHz  
 Input Cable Length:  
 120m Belden 1694A cable at 2.97 Gbps  
 240m Belden 1694A cable at 1.485 Gbps  
 400m Belden 1694A cable at 270 Mbps  
 Output Signal Level: 800 mV ± 10%  
 DC Offset: 0 V ± 50 mV  
 Alignment Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec  
 Per-channel delay controls: -800 msec to +800 msec

**AES Audio Inputs/Outputs**

(8) AES-3id 75Ω coaxial ports (max); port direction assignable as inputs or outputs in groups of 4 ports.

**MADI Audio Inputs/Outputs**

(2) 75Ω coaxial ports (max)  
**Note:** Not all rear modules support full MADI I/O. MADI I/O is a function of Rear Module used. See Rear Module illustrations for specific information.

**HDMI Output**

HDMI 2.0 Output; type A standard connector. Crosspoint-selectable program source as Path 1, 2, 3, or 4.

**GPIO**

(6) GPI (max); (2) GPO (max)  
**Note:** GPIO max capacity is a function of Rear Module used. See Rear Module illustrations for specific information.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

**Frame Loading (Max. recommended number of 9905 cards supported per Frame Model)**

- OG3 Frame: (5) cards
- HPF-9000 Frame: (5) cards
- oGx Frame: (7) cards

**Note:** In all cases, it is recommended to leave a 1RU gap above the frame and set frame Network Controller Card to run the frame cooling fans at full (max.) speed.

QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

**9905-MPx » 3G/HD/SD QUAD-PATH UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR**

**ORDERING INFORMATION**

**9905-MPx** 3G/HD/SD Quad-Path Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor

**Rear Modules:**

**Note:** Rear modules with SFP access do not come standard with any SFP functionality. Appropriate SFP option must be provisioned for rear module SFP functionality.

• SFP port-type availability depends upon SFP Type, rear IO module, and 9905-UDX host card rev as follows:

• **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs.

• **Option -UDX-SFP (non-MSA); Card Rev F and later with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.

• **Option -UDX-SFP-MSA (no card restrictions):**

- Top SFP port supports 1 Fiber input and 1 Fiber output.
- Bottom SFP port supports 1 Fiber input and 1 Fiber output.

**RM20-9905-A-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (5) 3G/HD/SD/SD-SDI Inputs, (8) 3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O (User Selectable), (1) MADI Input, GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9905-C-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (5) 3G/HD/SD/SD-SDI Inputs, (4) 3G/HD/SD/SD-SDI Processed Outputs, (1) MADI Input, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9905-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 3G/HD/SD/SD-SDI Inputs, (6) 3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, (1) MADI Input, GPIO/COMM, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9905-F-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (5) 3G/HD/SD/SD-SDI Inputs, (8) 3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, (1) MADI Input, (1) MADI Output, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9905-G-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (3) 3G/HD/SD/SD-SDI Inputs, (4) 3G/HD/SD/SD-SDI Processed Outputs, (3) AES I/O, (1) MADI Input, (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), GPIO/COMM (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9905-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD/SD-SDI Inputs, (6) 3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, (1) MADI Input, (1) MADI Output, GPIO/COMM (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9905-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD/SD-SDI Inputs, (6) 3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, (1) MADI Input, (1) MADI Output, GPIO (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**Options:**

**Note:** Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.

Unless otherwise noted, software options are per-card based. Options which are **per-path** based are identified as such.

Options or ordering line items denoted as “-” are **hardware-based** options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**+3D-LUT-BBC** BBC 3D LUTS Option

**+COLOR** Color Correction Option (**per-path** based)

**+LTC** RS-485 Serial-To-Embedded Audio LTC In Option

**+ANC** IP ANC Insert/Extract Option (**per-path** based)

**+LOGO** Logo Insertion Option (**per-path** based)

**+T-SLATE** Trouble Slate Insertion Option (**per-path** based)

**+CQS** Clean & Quiet Switching Option

**+2K-TO-4K-9905** Software-Defined Convert Card to 4K Quad-Link Input SDM/2SI 4K UDX/Frame Sync Option

QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9905-MPx » 3G/HD/SD QUAD-PATH UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR

ORDERING INFORMATION (cont.)

**-UDX-SFP-MSA** Adds daughter card supporting externally-accessible dual MSA SFP cage; orderable as new option. **Note:** To support SFP option(s), this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9905-MPx card when also fitted with SFP option -UDX-SFP-MSA.

• **-UDX-SFP-MSA-2S** is required where **2-slot** ("Standard-Width") rear module (such as RM20-9905-G-HDBNC) is to be fitted with SFP option.

• **-UDX-SFP-MSA-4S** is required where **4-slot** ("Double-Width") rear module (such as RM20-9905-C-HDBNC or RM20-9905-F-HDBNC) is to be fitted with SFP option.

Rear modules RM20-9905-C-HDBNC, RM20-9905-F-HDBNC, or RM20-9905-G-HDBNC and option -UDX-SFP-MSA-2S or -UDX-SFP-MSA-4S are purchased and available separately.

**-SFP-E00E-MSA-12G** 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

**-SFP-E0-MSA-12G** 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

**-SFP-0E-MSA-12G** 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

**-SFP-E00E-MSA** Single-Channel Video Optical Transceiver (LC female connectors)

**-SFP-E0-MSA** Single-Channel Video Optical Transmitter (LC female connector)

**-SFP-0E-MSA** Single-Channel Video Optical Receiver (LC female connector)

**-SFP-IP-SWD-MSA** Software-Defined MSA SFP 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD-MSA (Up to 3 software licenses can be added to the -SFP-IP-SWD-MSA, but only 1 license can be active at a time):

**+ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

**+ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

**+ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

**+ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

**-UDX-SFP** Adds daughter card supporting externally-accessible dual SFP cage; orderable as new option. **Note:** To support SFP option(s), this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9905-MPx card when also fitted with SFP option -UDX-SFP.

• **-UDX-SFP-MSA-4S** daughter card is used with 4-slot ("Double-Width") rear module (such as RM20-9905-C-HDBNC or RM20-9905-F-HDBNC). UDX-SFP-MSA is **only** available for use in conjunction with 4-slot rear modules and daughter card -UDX-SFP-MSA-4S). Rear modules RM20-9905-C-HDBNC, RM20-9905-F-HDBNC and option -UDX-SFP-MSA-4S are available separately.

**-SFP-E00E-12G** 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

**-SFP-E0-12G** 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

**-SFP-0E-12G** 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

**-SFP-2E0-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter (LC female connector)

**-SFP-20E-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Receiver (LC female connector)

**-SFP-E00E** Single-Channel Video Optical Transceiver (LC female connectors)

**-SFP-E0** Single-Channel Video Optical Transmitter (LC female connector)

**-SFP-0E** Single-Channel Video Optical Receiver (LC female connector)

**-SFP-2E0** Dual-Channel Video Optical Transmitter (LC female connector)

**-SFP-20E** Dual-Channel Video Optical Receiver (LC female connector)

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

**+ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6

**+ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110

**+ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI

**+ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI

**+ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

**+ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

**+ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

**+ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110



**9926-4HtoS » 3G/HD/SD QUAD-CHANNEL HDMI-TO-SDI CONVERTER** with Per-Channel Frame Sync



The **9926-4HtoS 3G/HD/SD Quad-Channel openGear® HDMI-To-SDI Converter** with Per-Channel Frame Sync provides four independent paths of true 3G and HD conversions from HDMI to SMPTE 424M, 292M, or 259M. Each path is equipped with frame sync as well as full input and output audio crosspoints and optional per-path color correction. Input and output HDMI and SDI crosspoints allow program sourcing and distribution across any of the four HDMI inputs and four SDI outputs.

In existing openGear® installations, the quad-channel capacity of 9926-4HtoS can save space and lend to installation integrity over using throwdown devices. Preset save/load allows saving custom card settings while allowing instant revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080p

Four independent HDMI-to-SDI processing paths on a single openGear® cards neatly integrates high capacity in openGear® environments

Each path equipped with frame sync with configurable manual or LOS-detect insertion of frozen frame or selectable-color flat-field. Optional per-path color correction.

Full input and output audio crosspoints, including independent flex mix, stereo downmixers, and audio delay functions

Remote control/monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel

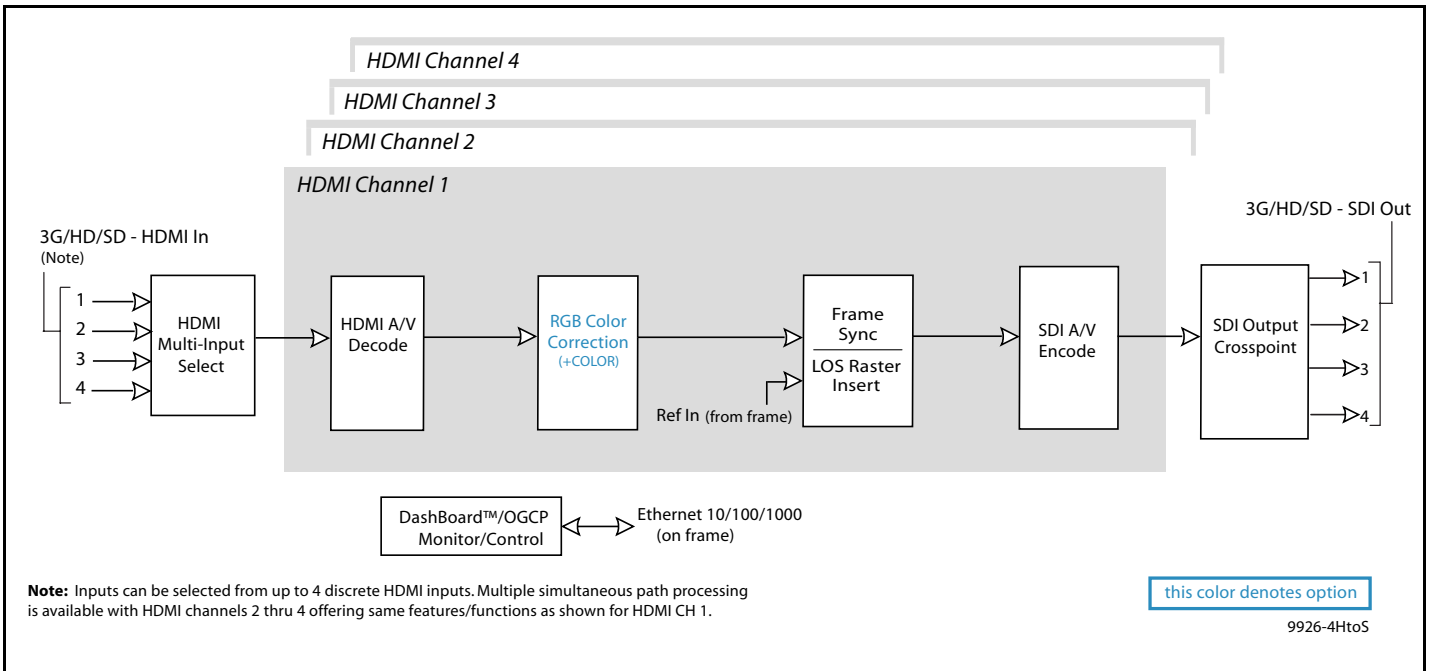
Hot-swappable

Make 9926-4HtoS into a standalone unit by using 9926-4HtoS with our **BBG-1300-FR** 1RU Enclosure for openGear® Cards standalone enclosure

Five year warranty

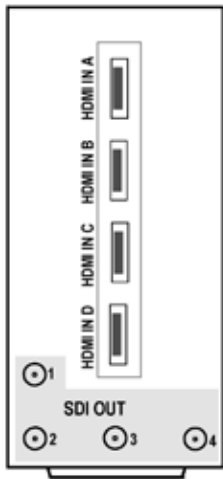
**OPTIONS**

Color Correction (+COLOR) – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.



QUAD-CHANNEL 3G/HD/SD-SDI FORMAT CONVERTERS

9926-4HtoS » 3G/HD/SD QUAD-CHANNEL HDMI-TO-SDI CONVERTER with Per-Channel Frame Sync



RM20-9926-B-HDBNC

**Note:** Due to the alignment of the 9926-4HtoS card and this rear module, the combination of the card and rear module will consume the adjacent even frame slot in addition to the odd slot occupied by the card.

**Note:** Mates to card in **odd** slot.

SPECIFICATIONS

**Note:** All specifications are preliminary and subject to change.

**Power**  
49 Watts

**Standards Supported**  
SMPTE 259M, 292M, 424M

**HDMI Inputs**  
(4) HDMI 2.0; mini connectors

**3G/HD/SD-SDI Outputs**  
(4) 75Ω outputs  
Output Signal Level: 800 mV ±10%  
DC Offset: 0 V ± 50 mV  
Alignment Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI

**Frame Sync Audio/Video Delay**  
Max offset: 20 frames  
Latency (min): 1 frame

**User Audio Delay Offset from Video**  
Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**Frame Reference Input**  
(2) reference from frame bus. SMPTE 170M/318M “Black Burst”, SMPTE 274M/296M “Tri-Level”  
**Note:** Per-path frame reference offers independent per-path controls (such as video delay offset). However, all paths must be locked to the same selected reference selection (e.g., frame REF 2 used for each path).

ORDERING INFORMATION

9926-4HtoS 3G/HD/SD Quad-Channel openGear® HDMI-To-SDI Converter with Per-Channel Frame Sync

Rear Modules:

**RM20-9926-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD/SD HDMI 2.0 Inputs (mini connectors), (4) 3G/HD/SD/SD-SDI Processed Outputs (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

Options:

**Note:** Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade. Unless otherwise noted, software options are per-card based. Options which are **per-path** based are identified as such.

+**COLOR** Color Correction Option (**per-path** based)

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR**



The Cobalt® **9904-UDX-4K 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor** is Cobalt's next generation of advanced scaler/frame synchronizers for the openGear® platform. The 9904-UDX-4K upconverts 12G/6G/3G/HD/SD to either UHD1 3840x2160 Square Division Multiplex (SDM) or Two-Sample Interleave (2SI) quad 3G-SDI based formats, or can output ST 2082 12G-SDI for single-wire 4K transport. With both 12G-SDI and quad 3G-SDI inputs, the 9904-UDX-4K can downconvert 12G and quad UHD. The 9904-UDX-4K provides an HDMI 2.0 output for economical 4K video monitoring. The 9904-UDX-4K offers numerous options, including SDR-to-HDR conversion and color correction.

The 9904-UDX-4K-IP model offers the same functionality as the 9904-UDX-4K SDI-based model, but additionally also provides dual 10GigE ports providing support for the emerging uncompressed video/audio/data over IP standards.

The 9904-UDX-4K-DSP model provides the same functionality as the 9904-UDX-4K SDI-based model, and also offers a DSP-based platform that supports multiple audio DSP options, including Dolby® Real-Time Loudness Leveling

automatic loudness processing, Dolby® E/D/D+ encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. The high-density openGear® design allows for up to five 9904-UDX-4K cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via DashBoard user interface, or Cobalt's RESTful-based Reflex protocol.

**Alternate Models:**

**9904-UDX-4K-IP** 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor with Dual 10GigE IP Ports

**9904-UDX-4K-DSP** 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with DSP Advanced Audio Processing



**FEATURES**

High-density openGear comprehensive UHD UDX solution

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Full up/down conversion between HD/3G, ST 2082 12G-SDI single-wire, and SDQS/2SI quad 3G-SDI based formats, with ST 2082 12G-SDI single-wire and quad 3G UHD available at both input and output

Supports Square Division Multiplex (SDM) and Two-Sample Interleave (2SI) quad UHD

12G-SDI and quad 3G frame sync and user delay

Supports Cobalt's Reflex (JSON) Protocols

Noise Reduction and Detail Enhancement provide image quality optimization

Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol

Hot-swappable

Five year warranty

**OPTIONS**

SDR/HDR Conversion Options (**+HDR-TCHCLR-4K, +HDR-TCHCLR**) – Provides real-time intelligent HDR conversion powered by Technicolor®. Contains SDR-to-HDR, HDR-to-SDR, and HDR-to-HDR conversion with dynamic metadata creation. Technicolor toolkits include SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.

3D LUT Options (**+3DLUT-PRO-4K, +3DLUT-PRO**) – 3D LUT (Look-Up Table) options provide 33 LUT mapping between 10-bit RGB and HDR color spaces.

3D LUT Option (**+3D-LUT-BBC**) – Licensed product developed by the BBC, provides BBC 3D LUTS as optional SDR-to-HDR and HDR-to-SDR profiles.

Audio LTC I/O Option (**+LTC**)

Logo Insertion Option (**+LOGO-4K, +LOGO**) – Provides file-based insertion for branding local or destination branding/ID requirements.

Color Correction Options (**+COLOR-4K, +COLOR**) – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.

Key/Fill Keyer Option (**+KEYER-4K, +KEYER**) – Provides keying using SDI inputs for key and fill signals. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input. (A second +KEYER option license can be added to enable a second independent keyer block.)

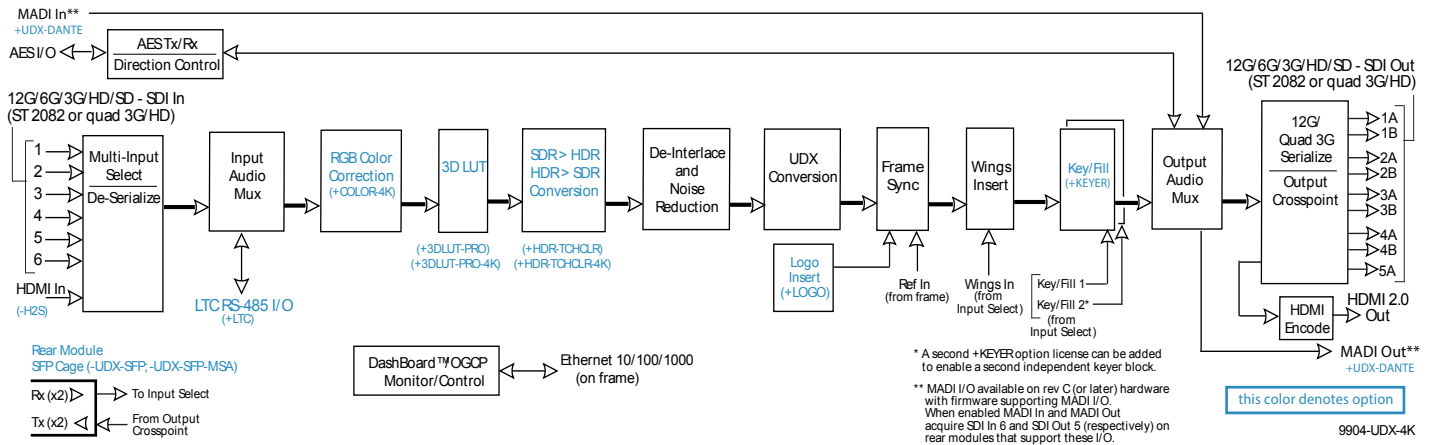
**-UDX-SFP** Options – Adds daughter card supporting externally-accessible dual SFP cage. (See Ordering Information for SFP types available, descriptions, and further info.)

**-H2S** Option – Adds daughter card supporting externally-accessible HDMI input

**+UDX-DANTE-16x16** 16x16 Dante 16 channel input 16 channel output option (Cannot be used simultaneously with +HDR-TCHCLR and +LOGO).

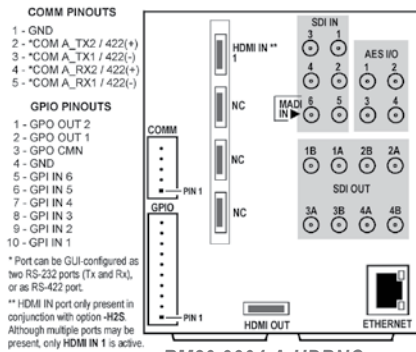
ADVANCED 4K/UHD FORMAT CONVERTERS

9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR

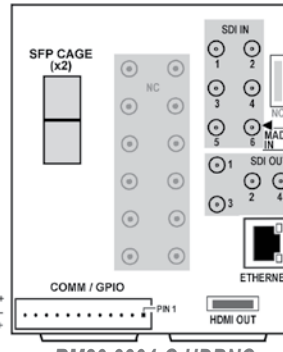


ADVANCED 4K/UHD FORMAT CONVERTERS

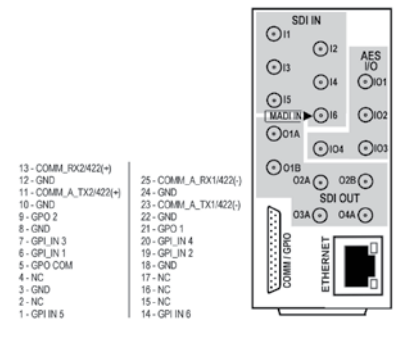
9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR



RM20-9904-A-HDBNC



RM20-9904-C-HDBNC



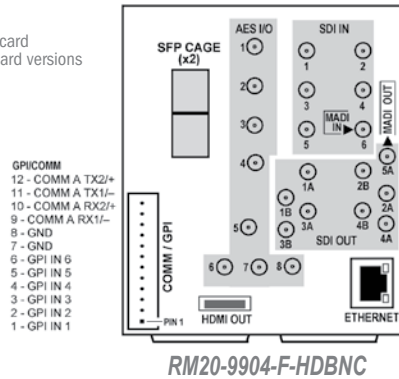
RM20-9904-D-HDBNC

**Note:** MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI In 6 and SDI Out 5 alternatives (as shown in illustrations here).

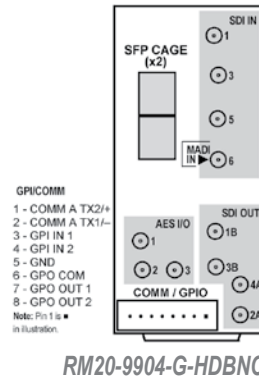
**Note:** Due to the alignment of the 9904 card and the -D rear module, the combination of the card and rear module will consume the adjacent odd frame slot in addition to the even slot occupied by the card.

**Note:** This rear module cannot be installed in frame slots 19/20 location. The 9904-UDX card, when installation is attempted, will clash/interfere with the frame network controller card.

**Note:** (8) AES ports supported on card hardware rev -E and later. Earlier card versions support (4) AES ports (max).

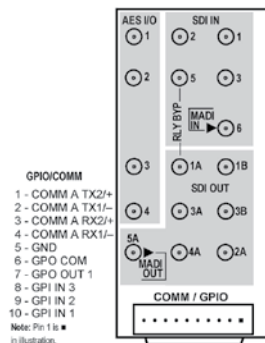


RM20-9904-F-HDBNC

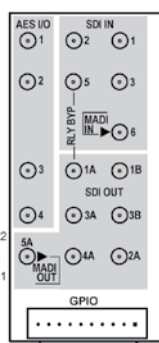


RM20-9904-G-HDBNC

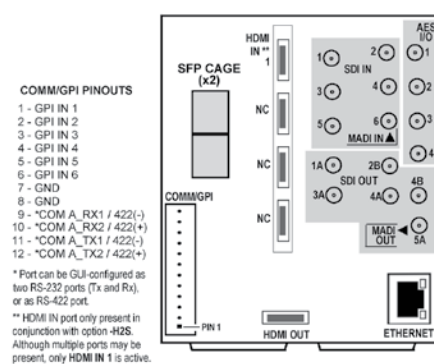
**Note:** Mates to card in odd slot.



RM20-9904-H-HDBNC



RM20-9904-J-HDBNC



RM20-9904-K-HDBNC

**Note:** 12G signals over relay bypass path stipulates maximum cable length not to exceed 10m for total of both input and output cable lengths.

## ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR****SPECIFICATIONS****12G/6G/3G/HD/SD-SDI Input/Outputs**

(6) 75Ω inputs (max)

(8) 75Ω outputs (max)

SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.

Return Loss:

&gt; 15 dB up to 1.485 GHz

&gt; 10 dB up to 3 GHz

&gt; 7 dB up to 6 GHz

&gt; 5 dB up to 12 GHz

Input Cable Length:

45m Belden 1694A cable at 11.88 Gbps / 120m Belden 1694A cable at 2.97 Gbps /

240m Belden 1694A cable at 1.485 Gbps / 400m Belden 1694A cable at 270 Mbps

Output Signal Level: 800 mV ± 10%

DC Offset: 0 V ± 50 mV

Rise and Fall Time @ 11.88 Gbps: &lt; 45 ps

Alignment Jitter (12G/3G/HD/SD): &lt; 0.3/0.3/0.2/0.2 UI

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**AES Audio Inputs/Outputs**

(8) AES-3id 75Ω coaxial ports (max); port direction assignable as inputs or outputs in groups of 4 ports.

**Note:** Hardware rev -E and later has 8 AES ports; earlier versions have 4 port max.**MADI Audio Inputs/Outputs**

(2) 75Ω coaxial ports (max)

**Note:** Not all rear modules support full MADI I/O. MADI I/O is a function of Rear Module used and is available only on card with on rev C (or later) hardware with firmware supporting MADI I/O. See Rear Module illustrations for specific information.**HDMI Output**

HDMI 2.0 Output; type A standard connector

**HDMI Input (Option -H2S only)**

HDMI 2.0 Input; mini connector

**GPIO**

(6) GPI (max); (2) GPO (max)

**Note:** GPIO max capacity is a function of Rear Module used. See Rear Module illustrations for specific information.**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

**Frame Loading (Max. recommended number of 9904 cards supported per Frame Model)**

· OG3 Frame: (5) cards

· HPF-9000 Frame: (5) cards

· oGx Frame: (7) cards

**Note:** In all cases, it is recommended to leave a 1RU gap above the frame and set frame Network Controller Card to run the frame cooling fans at full (max.) speed.

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR**

**ORDERING INFORMATION**

9904-UDX-4K 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor

**Rear Modules:**

**Note:** • MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives. Rear modules that support MADI are identified below as **MADI Compatible**.

• Rear modules with SFP access do not come standard with any SFP functionality. Appropriate SFP option must be provisioned for rear module SFP functionality.

• SFP port-type availability depends upon SFP Type, rear IO module, and 9904-UDX host card rev as follows:

• **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs.

• **Option -UDX-SFP (non-MSA); Card Rev F and later with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.

• **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port is unused (NC).

• **Option -UDX-SFP (non-MSA); Card Rev F and later with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port support up to 2 Fiber outputs.

• **Option -UDX-SFP-MSA (no card restrictions):**

- Top SFP port supports 1 Fiber input and 1 Fiber output.
- Bottom SFP port supports 1 Fiber input and 1 Fiber output.

**RM20-9904-A-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (8) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O (User Selectable), GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port. **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-C-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port. **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, GPIO/COMM, 100/1000 BaseT Ethernet Port. **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-F-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), 100/1000 BaseT Ethernet Port. **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-G-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (3) AES I/O, (2) SFP cage receptacles (when used in conjunction with option -UDX-SFP or -UDX-SFP-MSA), GPIO/COMM **MADI Compatible** (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, GPIO/COMM **MADI Compatible** (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, GPIO **MADI Compatible** (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-K-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, COMM/GPI, HDMI 2.0 Output (type A standard connector), (1) HDMI 2.0 Input (mini connector) (when used in conjunction with option -H2S), (2) SFP cage receptacles (when used in conjunction with SFP option), 100/1000 BaseT Ethernet Port **MADI Compatible** (All coaxial connectors HD-BNC.)

**Options:**

**Note:** • Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.  
• Options or ordering line items denoted as “-” are **hardware-based** options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**+HDR-TCHCLR-4K** 4K SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+HDR-TCHCLR** SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+3DLUT-PRO-4K** 3D LUT 4K Option (compatible with up-mapping to HDR and processing for down-conversions to HD SDR color space)

**+3DLUT-PRO** 3D LUT Option (compatible with processing for down-conversions to HD SDR color space)

**+3D-LUT-BBC** BBC 3DLUT Option (Requires +3D-LUT-PRO or +3D-LUT-PRO-4K option to also be present to support this option)

**+COLOR-4K** 4K Color Correction Option

**+COLOR** Color Correction Option

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR**

**ORDERING INFORMATION (cont.)**

- +KEYER-4K 4K Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

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- +KEYER Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

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- +UDX-DANTE-16x16 16x16 Dante 16 channel input 16 channel output option (Cannot be used simultaneously with +HDR-TCHCLR and +LOGO).

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- +LOGO-4K 4K Logo Insertion Option

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- +LOGO Logo Insertion Option

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- +LTC Audio LTC I/O Option

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- H2S Adds daughter card supporting externally-accessible HDMI input port; orderable as new option. **Note:** To support HDMI input option -H2S, this option is required in addition to card fitted with rear module (such as RM20-9904-B-HDBNC) that allows access to the daughter card-located HDMI input connector.

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- UDX-SFP-MSA Adds daughter card supporting externally-accessible dual MSA SFP cage; orderable as new option. **Note:** To support SFP option(s), this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9904-UDX-4K card when also fitted with SFP option -UDX-SFP-MSA.
  - -UDX-SFP-MSA-2S is required where 2-slot ("Standard-Width") rear module (such as RM20-9904-G-HDBNC) is to be fitted with SFP option.
  - -UDX-SFP-MSA-4S is required where 4-slot ("Double-Width") rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC) is to be fitted with SFP option. Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-G-HDBNC, or RM20-9904-K-HDBNC and option -UDX-SFP-MSA-2S or -UDX-SFP-MSA-4S are purchased and available separately.

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- SFP-E00E-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

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- SFP-E0-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

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- SFP-OE-MSA-12G 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

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- SFP-E00E-MSA Single-Channel Video Optical Transceiver (LC female connectors)

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- SFP-E0-MSA Single-Channel Video Optical Transmitter (LC female connector)

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- SFP-OE-MSA Single-Channel Video Optical Receiver (LC female connector)

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- SFP-IP-SWD-MSA Software-Defined MSA SFP 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD-MSA (Up to 3 software licenses can be added to the -SFP-IP-SWD-MSA, but only 1 license can be active at a time):
  - +ADD-SFP-IP-T0-SDI-2022-6 SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
  - +ADD-SFP-IP-T0-SDI-2110 SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
  - +ADD-SFP-SDI-T0-IP-2022-6 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
  - +ADD-SFP-SDI-T0-IP-2110 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

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- UDX-SFP Adds daughter card supporting externally-accessible dual SFP cage; orderable as new option. **Note:** To support SFP option(s), this option is required in addition to desired specific SFP options below. The SFP modules listed below are available for the 9904-UDX-4K card when also fitted with SFP option -UDX-SFP.
  - -UDX-SFP-MSA-4S daughter card is used with 4-slot ("Double-Width") rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC). UDX-SFP-MSA is **only** available for use in conjunction with 4-slot rear modules and daughter card -UDX-SFP-MSA-4S. Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-K-HDBNC and option -UDX-SFP-MSA-4S are available separately.

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- SFP-E00E-12G 12G/6G/3G/HD/SD-SDI UHD Transceiver (LC female connectors)

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- SFP-E0-12G 12G/6G/3G/HD/SD-SDI UHD Transmitter (LC female connector)

---

- SFP-OE-12G 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

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- SFP-2E0-12G 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter (LC female connector)

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- SFP-2OE-12G 12G/6G/3G/HD/SD-SDI UHD Dual Receiver (LC female connector)

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- SFP-E00E Single-Channel Video Optical Transceiver (LC female connectors)

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- SFP-E0 Single-Channel Video Optical Transmitter (LC female connector)

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- SFP-OE Single-Channel Video Optical Receiver (LC female connector)

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- SFP-2E0 Dual-Channel Video Optical Transmitter (LC female connector)

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- SFP-2OE Dual-Channel Video Optical Receiver (LC female connector)



## ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR****ORDERING INFORMATION (cont.)**

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SPF-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

- +ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6
- +ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110
- +ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI
- +ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI
- +ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
- +ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
- +ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
- +ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC** with DSP Advanced Audio Processing



The Cobalt® **9904-UDX-4K-DSP 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with DSP Advanced Audio Processing** is Cobalt's next generation of advanced scaler/frame sync for the openGear® platform.

The 9904-UDX-4K-DSP upconverts 12G/6G/3G/HD/SD to either UHD1 3840x2160 Square Division Multiplex (SDM) or Two-Sample Interleave (2SI) quad 3G-SDI based formats, or can output ST 2082 12G-SDI for single-wire 4K transport. With both 12G-SDI and quad 3G-SDI inputs, the 9904-UDX-4K can downconvert 12G and quad UHD. The 9904-UDX-4K provides an HDMI 2.0 output for economical 4K video monitoring. The 9904-UDX-4K-DSP offers numerous options, including SDR-to-HDR conversion and color correction.

The 9904-UDX-4K-DSP offers a DSP-based platform that supports multiple advanced audio DSP options, including Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® E/D/D+ encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. Embedded audio and metadata are properly delayed and re-embedded to match any video processing delay, with full adjustment available for audio/video offset.

The high-density openGear® design allows for up to five 9904-UDX-4K-DSP cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via DashBoard user interface or Cobalt's RESTful-based Reflex protocol.

**FEATURES**

- High-density openGear comprehensive UHD UDX solution

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- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

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- Full up/down conversion between HD/3G, ST 2082 12G-SDI single-wire, and SDQS/2SI quad 3G-SDI based formats, with ST 2082 12G-SDI single-wire and quad 3G UHD available at both input and output

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- Supports Square Division Multiplex (SDM) and Two-Sample Interleave (2SI) quad UHD formats

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- 12G-SDI and quad 3G frame sync and user delay

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- DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license "credits"

- Dolby encoding/decoding, Dolby Real-Time Loudness Leveling (RTLL) loudness leveling with full parametric control setup, and Linear Acoustic UPMAX™ upmixing DSP audio options available

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- Supports Cobalt's Reflex (JSON) Protocols

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- Full embedded audio processing with user delay offset and AES I/O

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- Noise Reduction and Detail Enhancement provide image quality optimization

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- Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol

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- Hot-swappable

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- Five year warranty

**OPTIONS**

- SDR/HDR Conversion Options (**+HDR-TCHCLR-4K, +HDR-TCHCLR**) – Provides real-time intelligent HDR conversion powered by Technicolor®. Contains SDR-to-HDR, HDR-to-SDR, and HDR-to-HDR conversion with dynamic metadata creation. Technicolor toolkits include SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.

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- 3D LUT Options (**+3DLUT-PRO-4K, +3DLUT-PRO**) – 3D LUT (Look-Up Table) options provide 33 cube LUT mapping between 10-bit RGB and HDR color spaces.

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- 3D LUTS Option (**+3D-LUT-BBC**)– Licensed product developed by the BBC, provides BBC 3D LUT as optional SDR-to-HDR and HDR-to-SDR profiles.

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- Audio LTC I/O Option (**+LTC**)

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- Logo Insertion Option (**+LOGO-4K, +LOGO**) – Provides file-based insertion for branding local or destination branding/ID requirements.

- Dolby® / Linear Acoustic® DSP Audio Options (**+DSP**) (See Ordering Information for details)

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- Color Correction Options (**+COLOR-4K, +COLOR**) – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.

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- Key/Fill Keyer Option (**+KEYER-4K, +KEYER**) – Provides keying using SDI inputs for key and fill signals. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input. (A second +KEYER option license can be added to enable a second independent keyer block.)

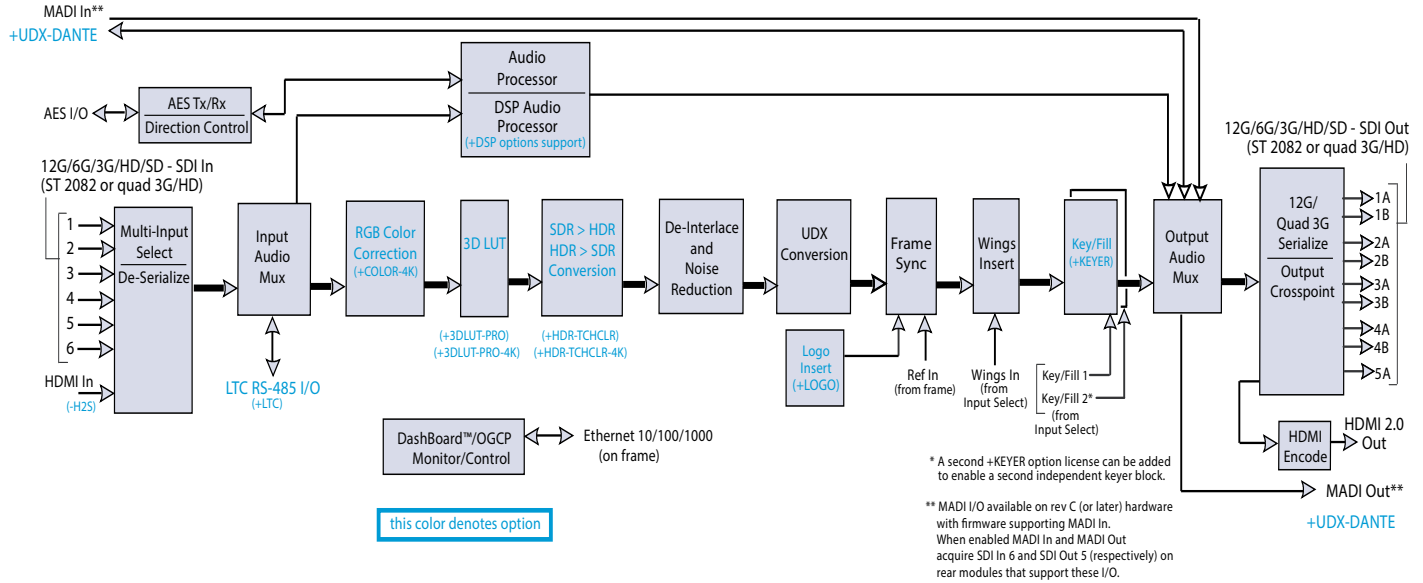
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- Dante Option (**+UDX-DANTE-16x16**) 16x16 Dante 16 channel input 16 channel output option (Cannot be used simultaneously with +HDR-TCHCLR and +LOGO).

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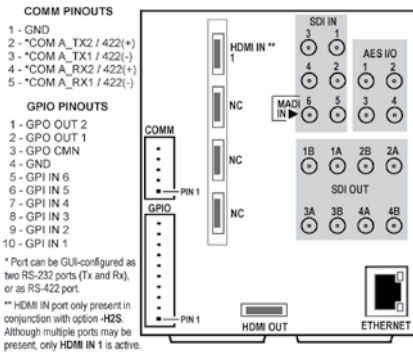
- H2S** Option – Adds daughter card supporting externally-accessible HDMI input

**9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC** with DSP Advanced Audio Processing

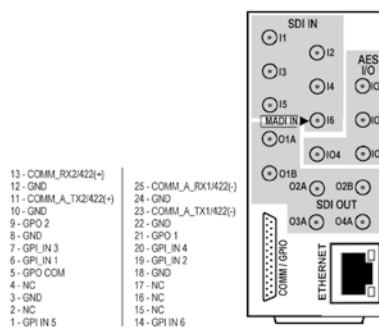


ADVANCED 4K/UHD FORMAT CONVERTERS

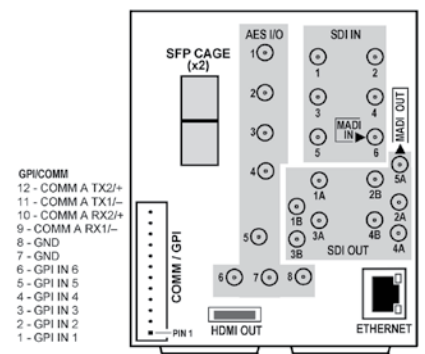
9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC with DSP Advanced Audio Processing



RM20-9904-A-HDBNC

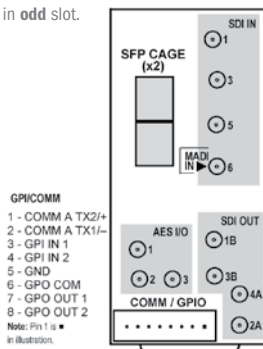


RM20-9904-D-HDBNC



RM20-9904-F-HDBNC

Note: Mates to card in odd slot.



RM20-9904-G-HDBNC

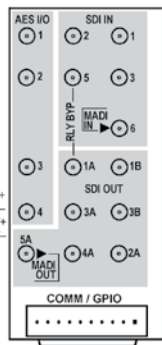
Note: Due to the alignment of the 9904 card and the -D rear module, the combination of the card and rear module will consume the adjacent odd frame slot in addition to the even slot occupied by the card.

Note: This rear module cannot be installed in frame slots 19/20 location. The 9904-UDX card, when installation is attempted, will clash/interfere with the frame network controller card.

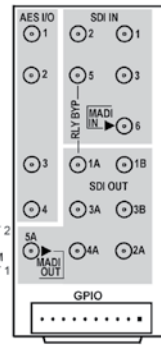
Note: MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternates (as shown in illustrations above).

Note: 9904-UDX-4K-DSP model does not support SFP ports. SFPs are not supported nor present when using rear modules that show SFP presence in rear module illustrations here.

Note: (8) AES ports supported on card hardware rev -E and later. Earlier card versions support (4) AES ports (max).



RM20-9904-H-HDBNC

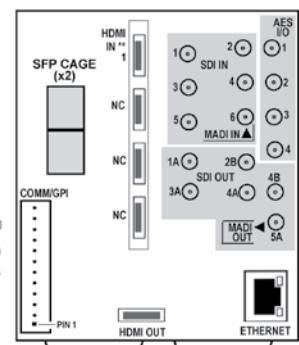


RM20-9904-J-HDBNC

COMM/GPI PINOUTS

- 1 - GPI IN 1
- 2 - GPI IN 2
- 3 - GPI IN 3
- 4 - GPI IN 4
- 5 - GPI IN 5
- 6 - GPI IN 6
- 7 - GND
- 8 - GND
- 9 - \*COM A\_RX1 / 422(-)
- 10 - \*COM A\_RX2 / 422(+)
- 11 - \*COM A\_TX1 / 422(-)
- 12 - \*COM A\_TX2 / 422(+)

\* Port can be GLI-configured as two RS-232 ports (Tx and Rx), or as RS-422 port.  
 \*\* HDMI IN port only present in conjunction with option -H2S. Although multiple ports may be present, only HDMI IN 1 is active.



RM20-9904-K-HDBNC

Note: 12G signals over relay bypass path stipulates maximum cable length not to exceed 10m for total of both input and output cable lengths.



**9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC** with DSP Advanced Audio Processing

**SPECIFICATIONS**

**12G/6G/3G/HD/SD-SDI Input/Outputs**

(6) 75Ω inputs (max)  
 (8) 75Ω outputs (max)  
 SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.  
 Return Loss:  
 > 15 dB up to 1.485 GHz  
 > 10 dB up to 3 GHz  
 > 7 dB up to 6 GHz  
 > 5 dB up to 12 GHz  
 Input Cable Length:  
 45m Belden 1694A cable at 11.88 Gbps  
 120m Belden 1694A cable at 2.97 Gbps  
 240m Belden 1694A cable at 1.485 Gbps  
 400m Belden 1694A cable at 270 Mbps  
 Output Signal Level: 800 mV ± 10%  
 DC Offset: 0 V ± 50 mV  
 Rise and Fall Time @ 11.88 Gbps: < 45 ps  
 Alignment Jitter (12G/3G/HD/SD): < 0.3/0.3/0.2/0.2 UI

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**AES Audio Inputs/Outputs**

(8) AES-3id 75Ω coaxial ports (max); port direction assignable as inputs or outputs in groups of 4 ports.  
**Note:** Hardware rev -E and later has 8 AES ports; earlier versions have 4 port max.

**MADI Audio Inputs/Outputs**

(2) 75Ω coaxial ports (max)  
**Note:** Not all rear modules support full MADI I/O. MADI I/O is a function of Rear Module used and is available only on card with on rev C (or later) hardware with firmware supporting MADI I/O. See Rear Module illustrations for specific information.

**HDMI Output**

HDMI 2.0 Output; type A standard connector

**HDMI Input (Option -H2S only)**

HDMI 2.0 Input; mini connector

**GPIO**

(6) GPI (max); (2) GPO (max)  
**Note:** GPIO max capacity is a function of Rear Module used. See Rear Module illustrations for specific information.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

**Frame Loading (Max. recommended number of 9904 cards supported per Frame Model)**

- OG3 Frame: (5) cards
- HPF-9000 Frame: (5) cards
- oGx Frame: (7) cards

**Note:** In all cases, it is recommended to leave a 1RU gap above the frame and set frame Network Controller Card to run the frame cooling fans at full (max.) speed.

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC** with DSP Advanced Audio Processing

**ORDERING INFORMATION**

**9904-UDX-4K-DSP** 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with DSP Advanced Audio Processing

**Rear Modules:**

**Note:** • MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives. Rear modules that support MADI are identified below as **MADI Compatible**.

• 9904-UDX-4K-DSP model does not support SFP ports. SFPs are not supported nor present when using rear modules that show SFP presence on this card model.

**RM20-9904-A-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (8) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O (User Selectable), GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, GPIO/COMM, 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-F-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, GPI/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-G-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (3) AES I/O, GPIO/COMM **MADI Compatible**. (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, GPIO/COMM **MADI Compatible**. (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (5) 12G/6G/3G/HD/SD/SD-SDI Inputs, (7) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs (one 3G/HD/SDI Output with relay bypass failover), (4) AES I/O, GPIO **MADI Compatible**. (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-K-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, COMM/GPI, HDMI 2.0 Output (type A standard connector), (1) HDMI 2.0 Input (mini connector) (when used in conjunction with option -H2S), 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**Options:**

**Note:** • Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.

• Options or ordering line items denoted as “-” are **hardware-based** options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**+HDR-TCHCLR-4K** 4K SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+HDR-TCHCLR** SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+3DLUT-PRO-4K** 3D LUT 4K Option

**+3DLUT-PRO** 3D LUT Option

**+3D-LUT-BBC** BBC 3DLUT Option (Requires +3D-LUT-PRO or +3D-LUT-PRO-4K option to also be present to support this option)

**+COLOR-4K** 4K Color Correction Option

**+COLOR** Color Correction Option

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-DSP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER /  
FRAME SYNC** with DSP Advanced Audio Processing

**ORDERING INFORMATION (cont.)**

+**KEYER-4K** 4K Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

+**KEYER** Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

+**LOGO-4K** 4K Logo Insertion Option

+**LOGO** Logo Insertion Option

+**LTC** Audio LTC I/O Option

+**UDX-DANTE-16x16** 16x16 Dante 16 channel input 16 channel output option (Cannot be used simultaneously with +HDR-TCHCLR and +LOGO).

+**DSP-RTL-5.1** Dolby® Real-Time Loudness Leveling 5.1-Channel Surround Sound Loudness Processor

+**DSP-RTL-2.0** Dolby® Real-Time Loudness Leveling 2.0-Channel Stereo Loudness Processor

+**DSP-ENCD-5.1** Dolby® Digital / Digital Plus 5.1 Encoder

+**DSP-ENCD-2.0** Dolby® Digital / Digital Plus 2.0 Encoder

+**DSP-DEC** Dolby® E / Dolby® Digital / Dolby® Digital Plus Decoder

+**DSP-UPMIX-LA** Linear Acoustic UPMAX™ 2.0-to-5.1 Upmixer

-**H2S** Adds daughter card supporting externally-accessible HDMI input port; orderable as new option. **Note:** To support HDMI input option -H2S, this option is required in addition to card fitted with rear module (such as RM20-9904-B-HDBNC) that allows access to the daughter card-located HDMI input connector.

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-IP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER/FRAME SYNC**  
with Dual 10GigE IP Ports



The Cobalt® **9904-UDX-4K-IP 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with Dual 10GigE IP Ports** is Cobalt's next generation of advanced scaler/frame synchronizers for the openGear® platform.

The 9904-UDX-4K-IP upconverts 12G/6G/3G/HD/SD to either UHD1 3840x2160 Square Division Multiplex (SDM) or Two-Sample Interleave (2SI) quad 3G-SDI based formats, or can output ST 2082 12G-SDI for single-wire 4K transport. With both 12G-SDI and quad 3G-SDI inputs, the 9904-UDX-4K can downconvert 12G and quad UHD. The 9904-UDX-4K provides an HDMI 2.0 output for economical 4K video monitoring. The 9904-UDX-4K offers numerous options, including SDR-to-HDR conversion and color correction.

The 9904-UDX-4K-IP can provide dual 10GigE ports providing support for the emerging uncompressed video/audio/data over IP standards.

The high-density openGear® design allows for up to five 9904-UDX-4K-IP cards to be installed in one 2RU openGear® frame. Card control/monitoring is available via DashBoard user interface or Cobalt's RESTful-based Reflex protocol.



**FEATURES**

High-density openGear comprehensive UHD UDX solution

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Full up/down conversion between HD/3G, ST 2082 12G-SDI single-wire, and SDQS/2SI quad 3G-SDI based formats, with ST 2082 12G-SDI single-wire and quad 3G UHD available at both input and output

Supports Square Division Multiplex (SDM) and Two-Sample Interleave (2SI) quad UHD formats

12G-SDI and quad 3G frame sync and user delay

Supports Cobalt's Reflex (JSON) Protocols

Noise Reduction and Detail Enhancement provide image quality optimization

Remote control/monitoring via DashBoard™ software, OGCP-9000 remote control panels, or Cobalt's RESTful-based Reflex protocol

Hot-swappable

Five year warranty

**OPTIONS**

**SDR/HDR Conversion Options (+HDR-TCHCLR-4K, +HDR-TCHCLR)** - Provides real-time intelligent HDR conversion powered by Technicolor®. Contains SDR-to-HDR, HDR-to-SDR, and HDR-to-HDR conversion with dynamic metadata creation. Technicolor toolkits include SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.

**3D LUT Options (+3DLUT-PRO-4K, +3DLUT-PRO)** - 3D LUT (Look-Up Table) options provide 33 cube LUT mapping between 10-bit RGB and HDR color spaces.

**3D LUT Option (+3D-LUT-BBC)** - Licensed product developed by the BBC, provides BBC 3D LUTS as optional SDR-to-HDR and HDR-to-SDR profiles.

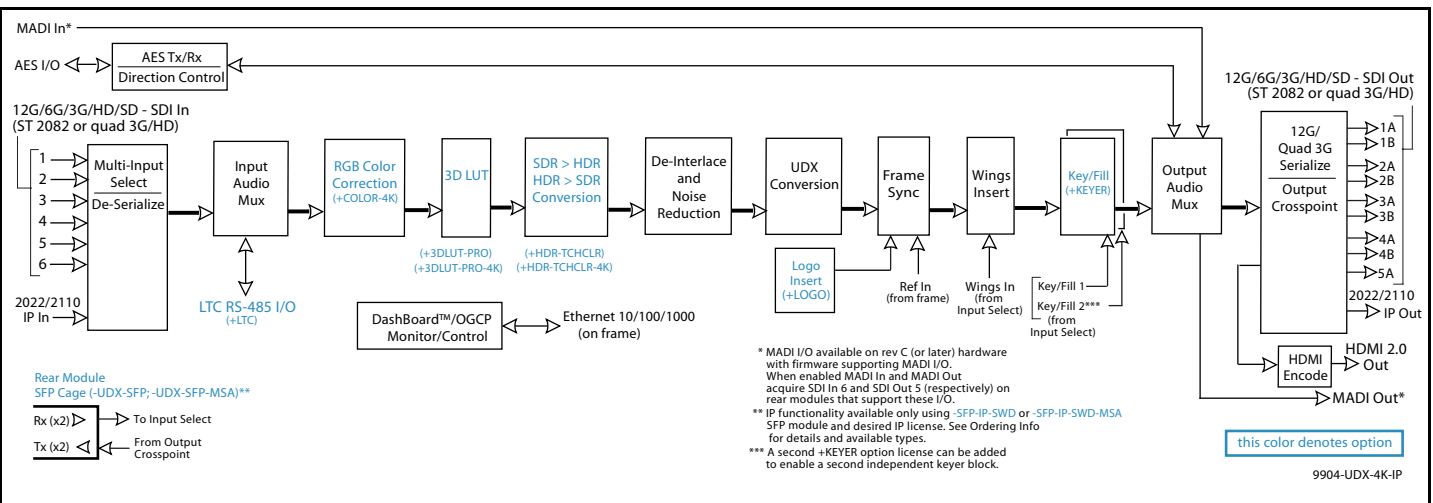
**Logo Insertion Option (+LOGO-4K, +LOGO)** - Provides file-based insertion for branding local or destination branding/ID requirements.

**Audio LTC I/O Option (+LTC)**

**Color Correction Options (+COLOR-4K, +COLOR)** - Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip.

**Key/Fill Keyer Option (+KEYER-4K, +KEYER)** - Provides keying using SDI inputs for key and fill signals. Alpha Threshold mode allows full-color key/fill using low-cost PC-based graphics host where the same signal provides a shared key/fill input. (A second +KEYER option license can be added to enable a second independent keyer block.)

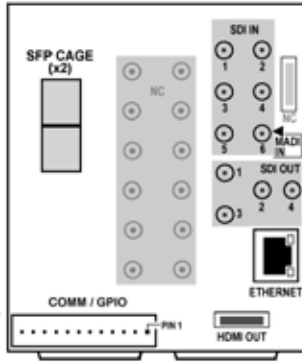
**-UDX-SFP Options** - Adds daughter card supporting externally-accessible dual SFP cage. (See Ordering Information for SFP types available, descriptions, and further info.)





ADVANCED 4K/UHD FORMAT CONVERTERS

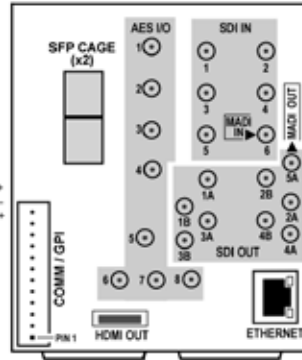
**9904-UDX-4K-IP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER/FRAME SYNC**  
with Dual 10GigE IP Ports



RM20-9904-C-HDBNC

- GPIO/COMM**
- 1 - GPI IN 1
  - 2 - GPI IN 2
  - 3 - GPI IN 3
  - 4 - GPI IN 4
  - 5 - GPI IN 5
  - 6 - GPI IN 6
  - 7 - GND
  - 8 - GND
  - 9 - COMM A RX1/-
  - 10 - COMM A RX2/+
  - 11 - COMM A TX1/-
  - 12 - COMM A TX2/+

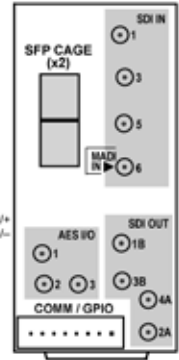
- GPIO/COMM**
- 12 - COMM A TX2/+
  - 11 - COMM A TX1/-
  - 10 - COMM A RX2/+
  - 9 - COMM A RX1/-
  - 8 - GND
  - 7 - GND
  - 6 - GPI IN 6
  - 5 - GPI IN 5
  - 4 - GPI IN 4
  - 3 - GPI IN 3
  - 2 - GPI IN 2
  - 1 - GPI IN 1



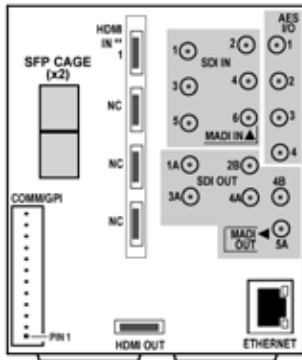
RM20-9904-F-HDBNC

Note: Mates to card in odd slot.

- GPIO/COMM**
- 1 - COMM A TX2/+
  - 2 - COMM A TX1/-
  - 3 - GPI IN 1
  - 4 - GPI IN 2
  - 5 - GND
  - 6 - GPO COM
  - 7 - GPO OUT 1
  - 8 - GPO OUT 2
- Note: Pin 1 is active in illustration.



RM20-9904-G-HDBNC



RM20-9904-K-HDBNC

- COMM/GPI PINOUTS**
- 1 - GPI IN 1
  - 2 - GPI IN 2
  - 3 - GPI IN 3
  - 4 - GPI IN 4
  - 5 - GPI IN 5
  - 6 - GPI IN 6
  - 7 - GND
  - 8 - GND
  - 9 - \*COM A\_RX1 / 422(-)
  - 10 - \*COM A\_RX2 / 422(+)
  - 11 - \*COM A\_TX1 / 422(-)
  - 12 - \*COM A\_TX2 / 422(+)
- \* Port can be GUI-configured as two RS-232 ports (Tx and Rx), or as RS-422 port.
- \*\* HDMI IN port only present in conjunction with option -K2S. Although multiple ports may be present, only HDMI IN 1 is active.

Note: 9904-UDX-4K-IP model does not support HDMI inputs. HDMI inputs are not supported nor present when using rear modules that show HDMI IN presence in rear module illustrations here.

Note: MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives (as shown in illustrations here).

**SPECIFICATIONS**

**12G/6G/3G/HD/SD-SDI Input/Outputs**

- (6) 75Ω inputs (max)
- (8) 75Ω outputs (max)
- SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.
- Return Loss:
  - > 15 dB up to 1.485 GHz
  - > 10 dB up to 3 GHz
  - > 7 dB up to 6 GHz
  - > 5 dB up to 12 GHz
- Input Cable Length:
  - 45m Belden 1694A cable at 11.88 Gbps
  - 120m Belden 1694A cable at 2.97 Gbps
  - 240m Belden 1694A cable at 1.485 Gbps
  - 400m Belden 1694A cable at 270 Mbps
- Output Signal Level: 800 mV ± 10%
- DC Offset: 0 V ± 50 mV
- Rise and Fall Time @ 11.88 Gbps: < 45 ps
- Alignment Jitter (12G/3G/HD/SD): < 0.3/0.3/0.2/0.2 UI

**Frame Sync Audio/Video Delay**

- Max offset: 20 frames
- Latency (min): 1 frame

**User Audio Delay Offset from Video**

- Bulk delay control: -33 msec to +3000 msec.
- Per-channel delay controls: -800 msec to +800 msec

**AES Audio Inputs/Outputs**

- (8) AES-3id 75Ω coaxial ports (max); port direction assignable as inputs or outputs in groups of 4 ports.
- Note: Hardware rev -E and later has 8 AES ports; earlier versions have 4 port max.

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-IP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER/FRAME SYNC**  
with Dual 10GigE IP Ports

**SPECIFICATIONS (cont.)**

**MADI Audio Inputs/Outputs**

(2) 75Ω coaxial ports (max)

**Note:** Not all rear modules support full MADI I/O. MADI I/O is a function of Rear Module used and is available only on card with on rev C (or later) hardware with firmware supporting MADI I/O. See Rear Module illustrations for specific information.

**HDMI Output**

HDMI 2.0 Output; type A standard connector

**IP ST 2022-6 Interface**

(2) 10GigE multi-mode optical Tx/Rx interface; female LC duplex connectors

**GPIO**

(6) GPI (max); (2) GPO (max)

**Note:** GPIO max capacity is a function of Rear Module used. See Rear Module illustrations for specific information.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

**Frame Loading (Max. recommended number of 9904 cards supported per Frame Model)**

- OG3 Frame: (5) cards
- HPF-9000 Frame: (5) cards
- oGx Frame: (7) cards

**Note:** In all cases, it is recommended to leave a 1RU gap above the frame and set frame Network Controller Card to run the frame cooling fans at full (max.) speed.

**ORDERING INFORMATION**

**9904-UDX-4K-IP** 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync with Dual 10GigE IP Ports

**Rear Modules:**

**Note:** · MADI I/O is available on rev C (or later) hardware with firmware supporting MADI I/O. When enabled MADI In and MADI Out acquire SDI In 6 and SDI Out 5 (respectively) on rear modules that support these I/O. Rear modules that support MADI I/O show the MADI port locations that are SDI IN 6 and SDI OUT 5 alternatives. Rear modules that support MADI are identified below as **MADI Compatible**.

· Rear modules with SFP access do not come standard with any SFP functionality. Appropriate SFP option must be provisioned for rear module SFP functionality.

· SFP port-type availability depends upon SFP Type, rear IO module, and 9904-UDX host card rev as follows:

· **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs.

· **Option -UDX-SFP (non-MSA); Card Rev F and later with -C, -F, -G rear IO module:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.

· **Option -UDX-SFP (non-MSA); Card Rev E and earlier with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port is unused (NC).

· **Option -UDX-SFP (non-MSA); Card Rev F and later with -K rear IO:**

- Top SFP port supports up to 2 Fiber inputs and up to 2 Fiber outputs.
- Bottom SFP port support up to 2 Fiber outputs.

· **Option -UDX-SFP-MSA (no card restrictions):**

- Top SFP port supports 1 Fiber input and 1 Fiber output.
- Bottom SFP port supports 1 Fiber input and 1 Fiber output.

**RM20-9904-C-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles, 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-F-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, GPI/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles, 100/1000 BaseT Ethernet Port **MADI Compatible**. (All coaxial connectors HD-BNC.)

**RM20-9904-G-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (3) AES I/O, GPIO/COMM **MADI Compatible**. (All coaxial connectors HD-BNC.) (**Note:** Mates to card in odd frame slot.)

**RM20-9904-K-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (4) AES I/O, COMM/GPI, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles (when used in conjunction with SFP option), 100/1000 BaseT Ethernet Port **MADI Compatible** (All coaxial connectors HD-BNC.)

ADVANCED 4K/UHD FORMAT CONVERTERS

**9904-UDX-4K-IP » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER/FRAME SYNC**  
with Dual 10GigE IP Ports

**ORDERING INFORMATION (cont.)**

**Options:**

**Note:** • Options denoted as “+” are **software-based** options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.  
• Options or ordering line items denoted as “-” are **hardware-based** options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**+HDR-TCHCLR-4K** 4K SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+HDR-TCHCLR** SDR/HDR Conversion Option (This option includes SL-HDR encode, SL-HDR decode, and ITM Intelligent Tone Management.)

**+3DLUT-PRO-4K** 3D LUT 4K Option (compatible with up-mapping to HDR and processing for down-conversions to HD SDR color space)

**+3DLUT-PRO** 3D LUT Option (compatible with processing for down-conversions to HD SDR color space)

**+3D-LUT-BBC** BBC 3DLUT Option (Requires +3D-LUT-PRO or +3D-LUT-PRO-4K option to also be present to support this option)

**+COLOR-4K** 4K Color Correction Option

**+COLOR** Color Correction Option

**+KEYER-4K** 4K Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

**+KEYER** Key/Fill Keyer (Alpha) Option (Additional second option license enables a second independent keyer block.)

**+LOGO-4K** 4K Logo Insertion Option

**+LOGO** Logo Insertion Option

**+LTC** Audio LTC I/O Option

**-UDX-SFP-MSA** Adds daughter card supporting externally-accessible dual SFP cage.

**Note:**  
• To support SFP option(s) below, card must be fitted with rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-G) that supports SFP plug-in modules.  
• This daughter card included standard on 9904-UDX-4K-IP model, but needs to be specified at purchase to support MSA-type SFP below.  
• **-UDX-SFP-MSA-4S** daughter card is used with **4-slot** (“Double-Width”) rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC). UDX-SFP-MSA is **only** available for use in conjunction with **4-slot** rear modules and daughter card -UDX-SFP-MSA-4S). Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-K-HDBNC and option -UDX-SFP-MSA-4S are available separately.

**-SFP-IP-SWD-MSA** Software-Defined MSA SFP 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SFP-IP-SWD-MSA (Up to 3 software licenses can be added to the -SFP-IP-SWD-MSA, but only 1 license can be active at a time):

**+ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

**+ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

**+ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

**+ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

**-UDX-SFP** Adds daughter card supporting externally-accessible dual SFP cage.

**Note:**  
• To support SFP option(s) below, card must be fitted with rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-G) that supports SFP plug-in modules.  
• This daughter card included standard on 9904-UDX-4K-IP model, but needs to be specified at purchase to support SFP below.  
• **-UDX-SFP-2S** is required where **2-slot** (“Standard-Width”) rear module (such as RM20-9904-G-HDBNC) is to be fitted with SFP option.  
• **-UDX-SFP-4S** is required where **4-slot** (“Double-Width”) rear module (such as RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, or RM20-9904-K-HDBNC) is to be fitted with SFP option. Rear modules RM20-9904-C-HDBNC, RM20-9904-F-HDBNC, RM20-9904-G-HDBNC, RM20-9904-K-HDBNC and option -UDX-SFP-2S or -UDX-SFP-4S are available separately.

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SFP-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

**+ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6

**+ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110

**+ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI

**+ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI

**+ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI

**+ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI

**+ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6

**+ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

**Indigo 2110-DC-01 » SMPTE ST-2110 INTEGRATED SUPPORT DAUGHTERCARD OPTION FOR 9904-UDX-4K AND 9905-MPx CARDS**



The **Indigo 2110-DC-01** is a factory add-on option to Cobalt 9904-UDX-4K and 9905-MPx models. This option adds native SMPTE ST-2110 support for this card, with multiple 25G Ethernet interfaces.

The Indigo 2110-DC-01 circumvents the cumbersome, error-prone, and expensive prior solutions of multiple devices in the data path. Adding native ST-2110 interfaces to the audio/video processing elements, Cobalt is providing a cost-effective, easily manageable, integrated solution to this problem. Multiple boxes or processing elements are no longer needed in the data path, going back and forth between IP and SDI. By natively doing all the processing directly over IP, unnecessary complexity and cost is avoided.

With this option, all the advanced processing in these cards is now available with IP inputs and outputs, without the need for an external gateway. Indigo 2110-DC-01 includes support for ST-2022-7 seamless redundancy switching, as well as IS-04/IS-05 NMOS for automatic discovery and configuration. Mated with the host card, this creates a powerful and processing-dense product that is capable of natively processing HD, 3G and 4K IP streams with no quality compromises. No other solution currently in the market can achieve the density provided by the combination of functionality offered by Indigo 2110-DC-01 and the 9904-UDX-4K/9905-MPx.

– Available Q1 2022 –

**FEATURES**

Highly integrated ST-2110 companion for the Cobalt 9904-UDX-4K or 9905-MPx audio/video processors

Offers multiple 25G Ethernet interfaces to support 4K signals without the need for any type of compression and to support ST-2022-7 seamless redundancy switching for improved network reliability

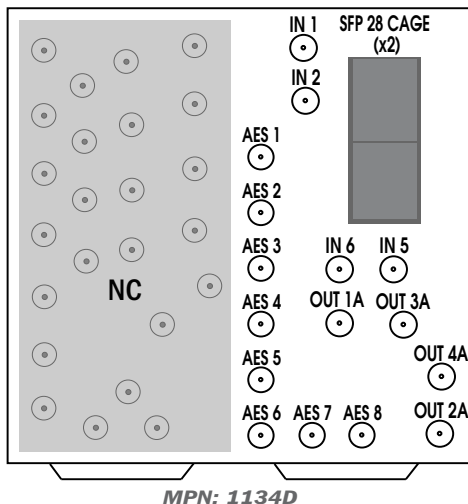
Built-in NMOS support offers straightforward interface to an existing network, with auto-discovery by the network management

Five year warranty

High-density, compact openGear card-based solution, with multiple devices able to be combined into a single frame for multi-channel operation, as well as offering the standard features of redundant hot-swappable power supplies and hot-swappable cards

**ORDERING INFORMATION**

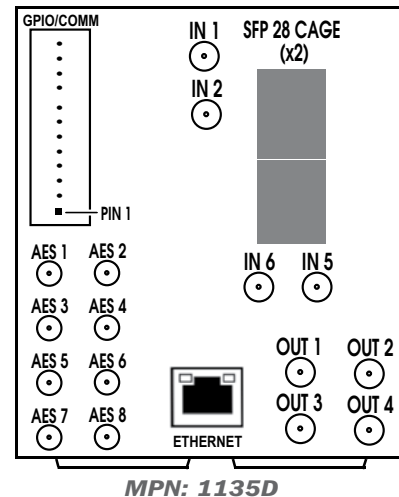
**Indigo 2110-DC-01** SMPTE ST-2110 Integrated Support Daughtercard Option for 9904-UDX-4K and 9905-MPx cards (**Note:** Indigo 2110-DC-01 option is **not compatible** with the 9904-UDX-4K-DSP model.)



**RM20-9904-L-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, (2) 25G SFPs/Receptacles, (All coaxial connectors HD-BNC.)

**GPIO/COMM PINOUTS**

- 1 - GPI IN 1
- 2 - GPI IN 2
- 3 - GPI IN 3
- 4 - GPI IN 4
- 5 - GPI IN 5
- 6 - GPO 1
- 7 - GPO CMN
- 8 - GND
- 9 - COM A RX1 / 422(-)
- 10 - COM A RX2 / 422(+)
- 11 - COM A TX1 / 422(-)
- 12 - COM A RX2 / 422(+)



**RM20-9905-M-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (4) 12G/6G/3G/HD/SD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD/SD-SDI Processed Outputs, (8) AES I/O, (2) 25G SFPs/Receptacles, GPIO/COMM (All coaxial connectors HD-BNC.)

**9501-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs



The **9501-DCDA-3G** provides 3G/HD-to-SD down-conversion with ARC and has versatility in providing up to four SD-SDI and/or analog composite outputs as well as up to four reclocked SDI input copies. The space-saving design of the 9501-DCDA-3G provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard width "split" rear module. Up to 20 of the 9501-DCDA cards can be installed in a 20-slot frame.

The card can pass SD signals with re-aspect, if needed. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Analog audio outputs can be de-embedded from selected embedded audio channels. The 9501-DCDA can rate-convert 23.98 frame video to 59.94 fields, move progressive to interlace and is equipped with extensive user programmable reticule overlays. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS.

The data path is 10-bit with 12-bit analog encoding. Full proc control allows adjustment of luma gain, luma lift, color gain, and color phase. Preset save/load allows saving custom card settings while allowing one-button revert to factory settings.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access over a standard Ethernet network.

**Alternate Base Model**

- **9501-DCDA-HD** Down-Converter/DA with HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

**FEATURES**

Low power/high-density design allows up to 20 cards per frame; less than 18 Watts per card

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Built-in x4 DAs for both reclocked and processed outputs

Dual SDI inputs with manual GUI select and basic failover function

Economical solution for 3G/HD down-conversion to legacy SD monitoring systems. HD version further economizes for environments requiring only HD/SD support (field upgradeable to 3G with software license upload if later desired).

Auto-format detect/down-conversion of SMPTE 424M/292/259M formats

Down-conversion scaling includes user-configurable ARC and AFD-controlled ARC

Full embedded audio control with selectable downmix and analog audio de-embed

Color framing preserved on CVBS outputs for all conversions

User DashBoard output selection flexibly allows SDI or CVBS outputs on four processed-output BNCs

Dual independent text/character burn-in insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover/LOS conditions)

Full timecode and CEA 708 / CEA 608 conversion to SD VITC timecode and closed-captioning. Option **+LTC** allows bidirectional transfer between embedded video timecode formats and audio LTC.

Remote control/monitoring via DashBoard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

**OPTIONS**

3G Software Option Upgrade (**+3G**) – Upgrades 9501-DCDA-HD card to 9501-DCDA-3G functionality/specifications.

Color Correction (**+COLOR**) – Provides independent RGB channel controls for luma, black, and gamma. Ultra-fast response time. The color correction feature is perfectly suited for use with Cobalt OGCP-9000/CC Remote Control Panel.

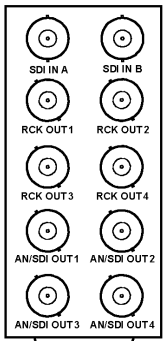
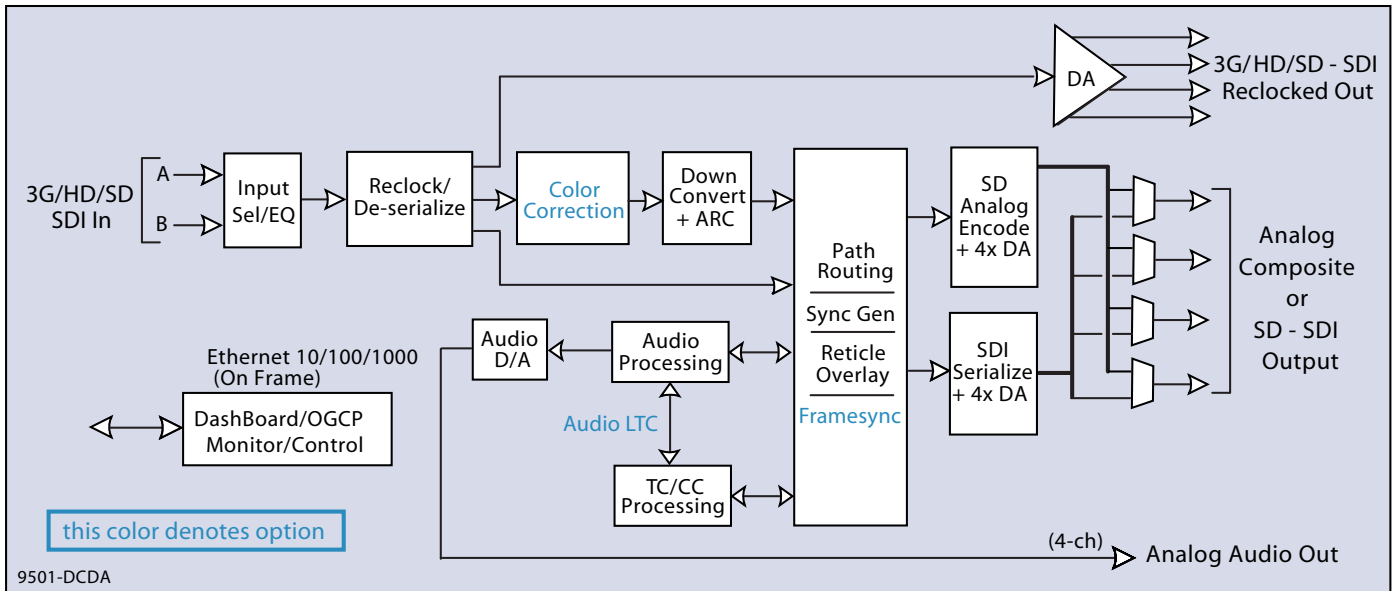
Frame Sync Software Option (**+FS**) – Adds frame sync to 9501-DCDA-3G card. Provides full vertical and horizontal offset and frame delay controls. Glitch-free handling of embedded audio when a frame is dropped or duplicated.

Audio LTC Software Option (**+LTC**) – Offers bidirectional transfer and conversion between video timecode formats and audio LTC. Audio LTC can be received or sent over various card audio channels.

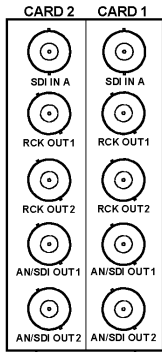
Extended Frame Sync Delay Option (**+DLY**) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video. (Add-on to option +FS; option +FS required)



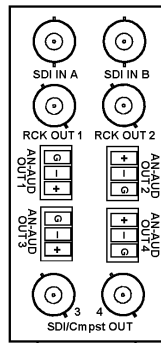
**9501-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs



**RM20-9501-A**

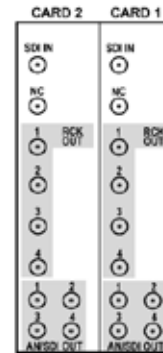


**RM20-9501-A/IS**

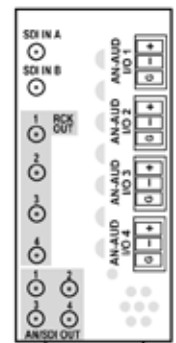


**RM20-9501-B**

Note: Although this rear module offers only two SDI/Compst OUT BNCs, the two outputs on the rear module correlate to card output channels 3 and 4.



**RM20-9501-CIS-DIN**  
**RM20-9501-CIS-HDBNC**



**RM20-9501-F-DIN**  
**RM20-9501-F-HDBNC**

**9501-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input**

Number of Inputs: (2) 3G/HD/SD-SDI BNCs. GUI-selectable.  
 Standards: SMPTE 259M, 292M, 424M (9501-DCDA-3G only)  
 Supported Formats: 1080p59.94,50,29.97, 24, 23.98, 1080i59.94,50, 720p59.94,50,29.97, 24, 23.98, 625i, 525i  
 Cable Length, Minimum, 3G/HD/SD (Belden 1694A): 120m / 180m / 360m  
 Return Loss: 15 dB up to 1.485 GHz, 10 dB up to 2.970 GHz

**Video Outputs**

Number of Outputs: (4) dedicated reclocked output BNCs. Up to 4 processed SD-SDI (or CVBS output) BNCs. GUI-selectable.  
 SDI Signal Level: 800 mV nominal  
 SDI Return Loss: >15 dB up to 1.485 GHz, >10 dB up to 2.970 GHz  
 SDI Jitter: SD: < 0.2 UI  
 SDI Embedded Audio: 16-Ch

**Frame Sync Audio/Video Delay (option +FS)**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**Reference Video Input**

Number of Inputs: (2) looping (openGear® frame)  
 Standard: Tri-level sync (SMPTE 274) and black burst (NTSC and PAL)

**Analog Audio Output**

Number of Outputs: 4-Ch (max) balanced using 3-wire Phoenix connectors  
 Maximum Output Level: +24 dBu @ 0 dBFS  
 DAC Resolution: 24-bit

**ORDERING INFORMATION**

**9501-DCDA-3G** Down-Converter/DA with 3G/HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

**9501-DCDA-HD** Down-Converter/DA with HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

**RM20-9501-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Reclocked Output BNCs, (4) Output BNCs (GUI-selectable as SD-SDI and/or Analog CVBS)

**RM20-9501-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input BNC, (2) HD/SD-SDI Reclocked Output BNCs, (2) Output BNCs (GUI-selectable as SD-SDI and/or Analog CVBS) (connections are per card)

**RM20-9501-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (2) 3G/HD/SD-SDI Reclocked Output BNCs, (2) Output BNCs (GUI-selectable as SD-SDI and/or Analog CVBS), (4) Analog Audio Outputs

**RM20-9501-C/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNCs, (4) HD/SD-SDI Reclocked Outputs, (4) Outputs (GUI-selectable as SD-SDI and/or Analog CVBS) (connections are per card; all connectors DIN1.0/2.3)

**RM20-9501-C/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNCs, (4) HD/SD-SDI Reclocked Outputs, (4) Outputs (GUI-selectable as SD-SDI and/or Analog CVBS) (connections are per card; all connectors HD-BNC)

**RM20-9501-F-DIN** 20-Slot Frame Rear I/O Module (Standard Width, Hi-Density) (2) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Reclocked Outputs, (4) Outputs (GUI-selectable as SD-SDI and/or Analog CVBS), (4) Analog Audio Outputs (all coaxial connectors DIN1.0/2)

**RM20-9501-F-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width, Hi-Density) (2) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Reclocked Outputs, (4) Outputs (GUI-selectable as SD-SDI and/or Analog CVBS), (4) Analog Audio Outputs (all coaxial connectors HD-BNC)

**+3G** Software license upgrade for 9501-DCDA-HD card. Upgrades card to 9501-DCDA-3G functionality/specifications.

**+COLOR** Color Correction Software Option

**+FS** Frame Sync Software Option

**+DLY** Extended Frame Sync Delay Option (add-on to option +FS; option +FS required)

**+LTC** Audio LTC Option

**9502-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking



The **9502-DCDA-3G** provides 3G/HD-to-SD down-conversion with ARC and has versatility in providing up to four HD/SD-SDI processed outputs as well as up to four reclocked SDI input copies selectable from two SDI inputs. The space-saving design of the 9502-DCDA provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard width "split" rear module. Up to 20 of the 9502-DCDA cards can be installed in a 20-slot frame.

The card can pass SD signals with re-aspect, if needed. AFD processing can detect an incoming AFD code and correspondingly set scaling to track with AFD. This processor also allows independent custom ARC to be applied for each incoming AFD code, and set the desired AFD code to be inserted on the output, even if there is no code detected on the input. Using a 10-bit video path, the 9502-DCDA can rate-convert 23.98 frame video to 59.94 fields, move progressive to interlace and is equipped with extensive user programmable reticule overlays. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Full proc control allows adjustment of white level, black level, color gain, and color phase.

Factory presets enable a return to factory settings. The 9502 offers 3G down-conversion to 1080i, 720p, or SD-SDI. AES audio outputs can be de-embedded from selected embedded audio channels.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access over a standard Ethernet network.

**Alternate Base Model**

• **9502-DCDA-HD** Downconverter/DA with HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking

**FEATURES**

Low power/high-density design allows up to 20 cards per frame; less than 18 Watts per card

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Economical solution for 3G/HD downconversion to legacy SD monitoring systems. HD version further economizes for environments requiring only HD/SD support (field upgradeable to 3G with software license upload if later desired).

Full timecode and CEA 708 / CEA 608 conversion to SD VITC timecode and closed-captioning. Option **+LTC** allows bidirectional transfer between embedded video timecode formats and audio LTC.

Down-conversion scaling includes user-configurable ARC and AFD-controlled ARC

Auto-format detect/down-conversion of SMPTE 424M/292/259M formats

Full embedded audio processing with selectable downmix and AES audio de-embed. Dolby passthru on downconversions.

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

**OPTIONS**

3G Software Option Upgrade (**+3G**) - Upgrades 9502-DCDA-HD card to 9502-DCDA-3G functionality/specifications.

Color Correction (**+COLOR**) - Provides independent RGB channel controls for luma, black, and gamma. Ultra-fast response time. The color correction feature is perfectly suited for use with Cobalt OGCP-9000/CC Remote Control Panel.

Frame Sync Software Option (**+FS**) - Adds frame sync to 9502-DCDA-3G card. Provides full vertical and horizontal offset and frame delay controls. Glitch-free handling of embedded audio when a frame is dropped or duplicated.

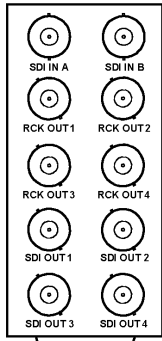
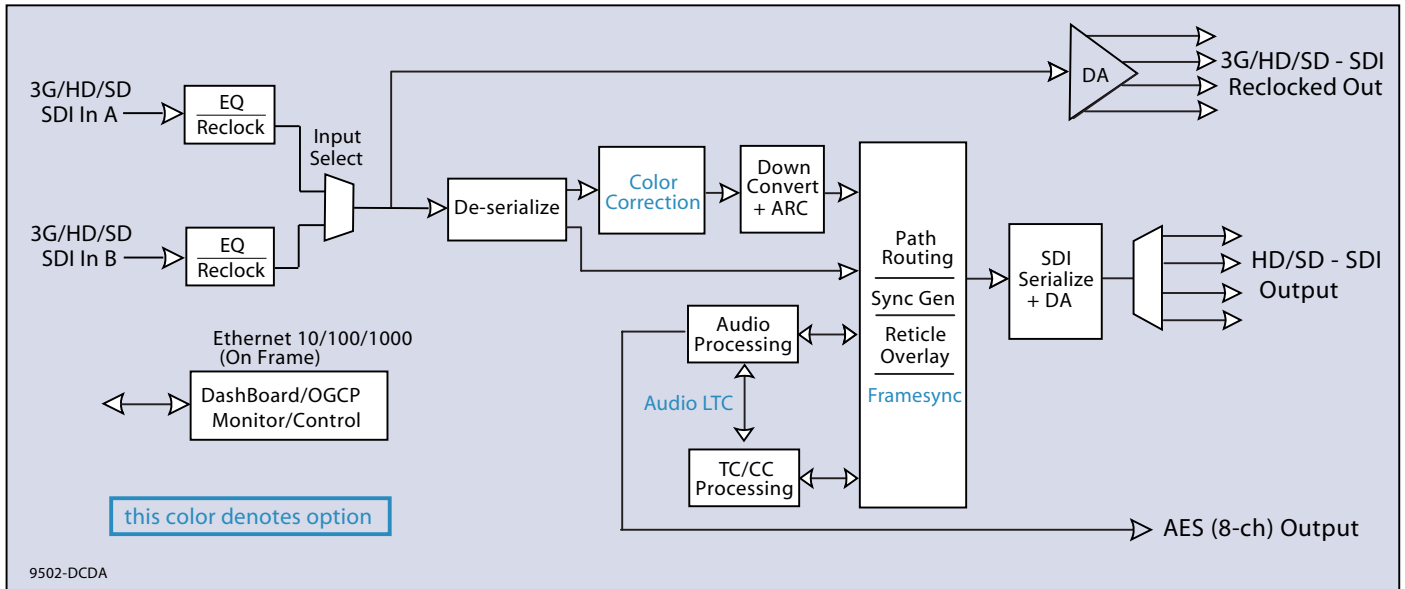
Extended Frame Sync Delay Option (**+DLY**) - Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video. (Add-on to option +FS; option +FS required)

Audio LTC Software Option (**+LTC**) - Offers bidirectional transfer and conversion between video timecode formats and audio LTC. Audio LTC can be received or sent over various card audio channels.

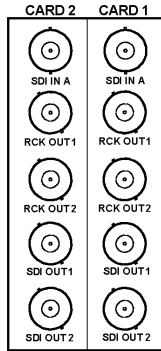




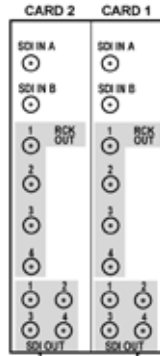
**9502-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking



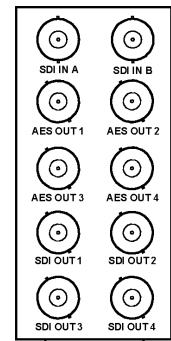
**RM20-9502-A**



**RM20-9502-AIS**



**RM20-9502-CIS-DIN**  
**RM20-9502-CIS-HDBNC**



**RM20-9502-F**

**9502-DCDA-3G » DOWN-CONVERTER/DA** with 3G/HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input**

Number of Inputs: 2  
 Standards: SMPTE 259M, 292M, 424M (9502-DCDA-3G only)  
 Supported Formats:  
 1080p59.94,50,29.97, 25, 24, 23.98  
 1080i59.94,50  
 625i50, 525i59.94  
 Cable Length, Minimum, 3G/HD/SD (Belden 1694A): 120m / 180m / 360m  
 Return Loss: 15 dB up to 1.485 GHz, 10 dB up to 2.970 GHz

**Video Outputs**

Number of Outputs: (4) dedicated reclocked output BNCs Up to 4 processed HD/SD-SDI  
 SDI Signal Level: 800 mV nominal  
 SDI Return Loss: >15 dB up to 1.485 GHz, >10 dB up to 2.970 GHz  
 SDI Jitter: SD: < 0.2 UI  
 SDI Embedded Audio: 16-Ch

**Frame Sync Audio/Video Delay (option +FS)**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**Reference Video Input**

Number of Inputs: (2) looping (openGear® frame)  
 Standard: Tri-level sync (SMPTE 274) and black burst (NTSC and PAL)

**AES Output**

Number of Outputs: 8-Ch (max) unbalanced (AES-3id)  
 Impedance: 75 Ω  
 Sample Rate: 48 kHz  
 Resolution: 24-bit

**ORDERING INFORMATION**

**9502-DCDA-3G** Down-Converter/DA with 3G/HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking

**9502-DCDA-HD** Down-Converter/DA with HD/SD-SDI Input, HD/SD-SDI Processed Outputs, and SDI Input Reclocking

**RM20-9502-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Reclocked Output BNCs, (4) HD/SD-SDI Processed Output BNCs

**RM20-9502-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input BNC, (2) HD/SD-SDI Reclocked Output BNCs, (2) HD/SD-SDI Processed Output BNCs (connections are per card)

**RM20-9502-C/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Inputs, (4) HD/SD-SDI Reclocked Outputs, (4) HD/SD-SDI Processed Outputs (connections are per card; all connectors DIN1.0/2.3)

**RM20-9502-C/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Inputs, (4) HD/SD-SDI Reclocked Outputs, (4) HD/SD-SDI Processed Outputs (connections are per card; all connectors HD-BNC)

**RM20-9502-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (4) Video HD/SD-SDI Processed Output BNCs, (4) AES Audio Output BNCs

**+3G** Software license upgrade for 9502-DCDA-HD card. Upgrades card to 9502-DCDA-3G functionality/specifications.

**+COLOR** Color Correction Software Option

**+FS** Frame Sync Software Option

**+DLY** Extended Frame Sync Delay Option (add-on to option +FS; option +FS required)

**+LTC** Audio LTC Option

**9902-DC-4K » QUAD SDI/2SI-INPUT UHD BROADCAST DOWNCONVERTER** with Optional Frame Sync



The **9902-DC-4K Quad SDI/2SI-Input UHD Broadcast Downconverter with Optional Frame Sync** provides an easily integrated openGear® solution for converting 4K UHD quadrant-division and 2SI (two-sample interleave) content into 3G/HD-SDI. Easy to use DashBoard configuration and monitoring provides for easy setup.

The 9902-DC-4K precisely combines four quadrant-divided or 2SI individual SDI feeds into a combined SDI image directly suitable for broadcast production usage or monitoring purposes. An HDMI output is also furnished which is directly usable by a monitor.

The openGear® card-based form-factor and high-density design allows up to 10, 9902-DC-4K cards to be fitted to a 20-slot frame. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Scalable solution for 4K UHDTV down-conversion/integration to SDI for cinema and sports production

Compatible with 4K Four-Quadrant or 4K Two-Sample Interleaved (2SI) modes

openGear® card-based form factor provides easy, compact, and economical integration

Flexible downconvert output provides 3G/HD/SD-SDI output

Input crosspoint allows quadrant inputs to be easily re-arranged without changing connections

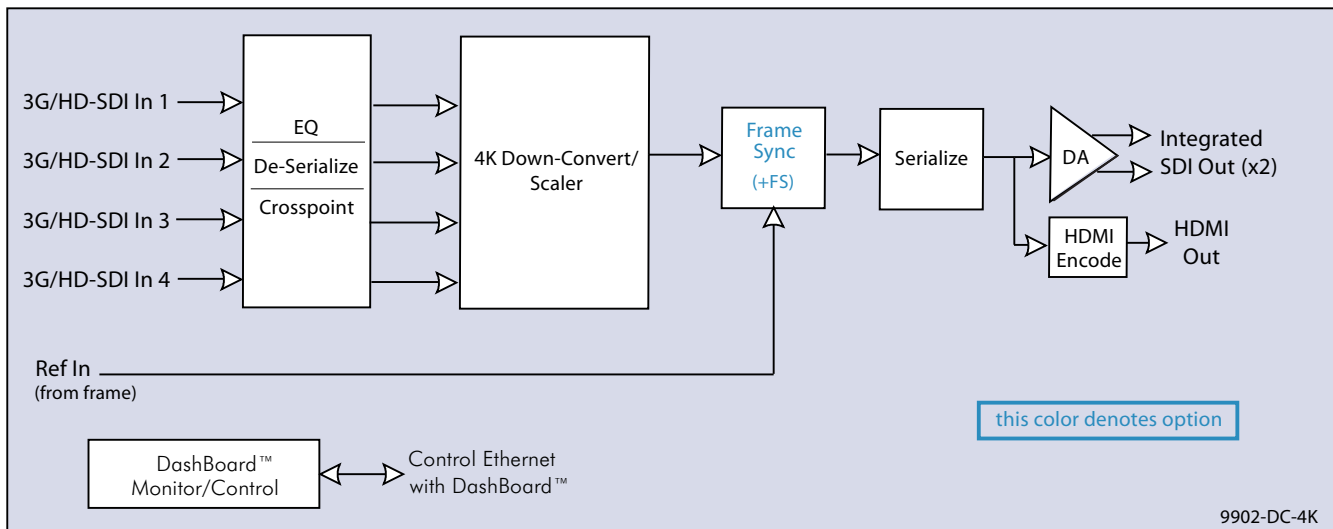
Low-power/high-density design – less than 18 Watts per card

HDMI output allows direct feed to monitors

Option **+FS** adds Frame Sync. Provides full vertical and horizontal offset and frame delay controls.

DashBoard™ remote control status monitoring and setup/control

Five year warranty



**9902-DC-4K » QUAD SDI/2SI-INPUT UHD BROADCAST DOWNCONVERTER** with Optional Frame Sync

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
< 18 Watts

**Video Inputs/Outputs**

Video Inputs: (4) 3G/HD-SDI 75Ω BNC  
 SDI Output: (2) 3G/HD-SDI 75Ω BNCs (2x DA)  
 HDMI Output: (1) HDMI output  
 Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

**ORDERING INFORMATION**

**9902-DC-4K** Quad SDI/2SI-Input UHD Broadcast Downconverter with Optional Frame Sync

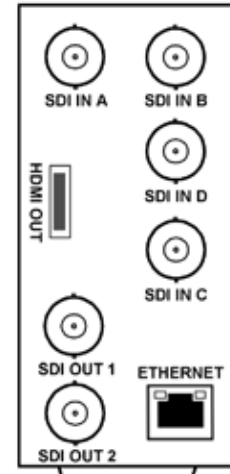
**RM20-9902DC4K-B** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (2) 3G-SDI Output BNCs (2x DA), (1) HDMI Output, (1) 100/1000 BaseT Ethernet Control Port

**RM20-9902DC4K-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (2) 3G-SDI Output BNCs (2x DA), (1) COMM/GPIO Port, (1) 100/1000 BaseT Ethernet Control Port

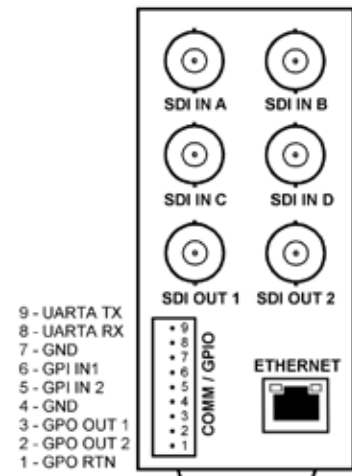
**Options:**

+FS Add Frame Sync Option

+LTC Audio LTC I/O Option



**RM20-9902DC4K-B**



**RM20-9902DC4K-C**

- 9 - UARTA TX
- 8 - UARTA RX
- 7 - GND
- 6 - GPI IN1
- 5 - GPI IN 2
- 4 - GND
- 3 - GPO OUT 1
- 2 - GPO OUT 2
- 1 - GPO RTN

**BBG-1002-DC-4K » STANDALONE QUAD SDI/2SI-INPUT UHD BROADCAST DOWNCONVERTER**  
with Optional Frame Sync



The **BBG-1002-DC-4K Standalone Quad SDI/2SI-Input UHD Broadcast Downconverter with Optional Frame Sync** provides an easily integrated standalone solution for converting 4K UHD quadrant-division and 2SI (two-sample interleave) content into 3G/HD/SD-SDI. Easy to use DashBoard configuration and monitoring provides for easy setup.

The BBG-1002-DC-4K precisely combines four quadrant-divided or 2SI individual SDI feeds into a combined SDI image directly suitable for broadcast production usage or monitoring purposes. The combined SDI output can be scaled to 3G/HD-SDI. An HDMI output allows direct use with monitors. The BBG-1002-DC-4K can be remote-controlled using DashBoard™.

The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1002-DC-4K allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Scalable solution for 4K UHDTV down-conversion/integration to SDI for cinema and sports production

Compatible with 4K Four-Quadrant or 4K Two-Sample Interleaved (2SI) modes

Input crosspoint allows quadrant inputs to be easily re-arranged without changing connections

Redundant power supply option

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

HDMI output allows direct feed to monitors

Remote control/monitoring via DashBoard software or Web Browser User Interface

Low-power/high-density design – less than 13 Watts

Five year warranty

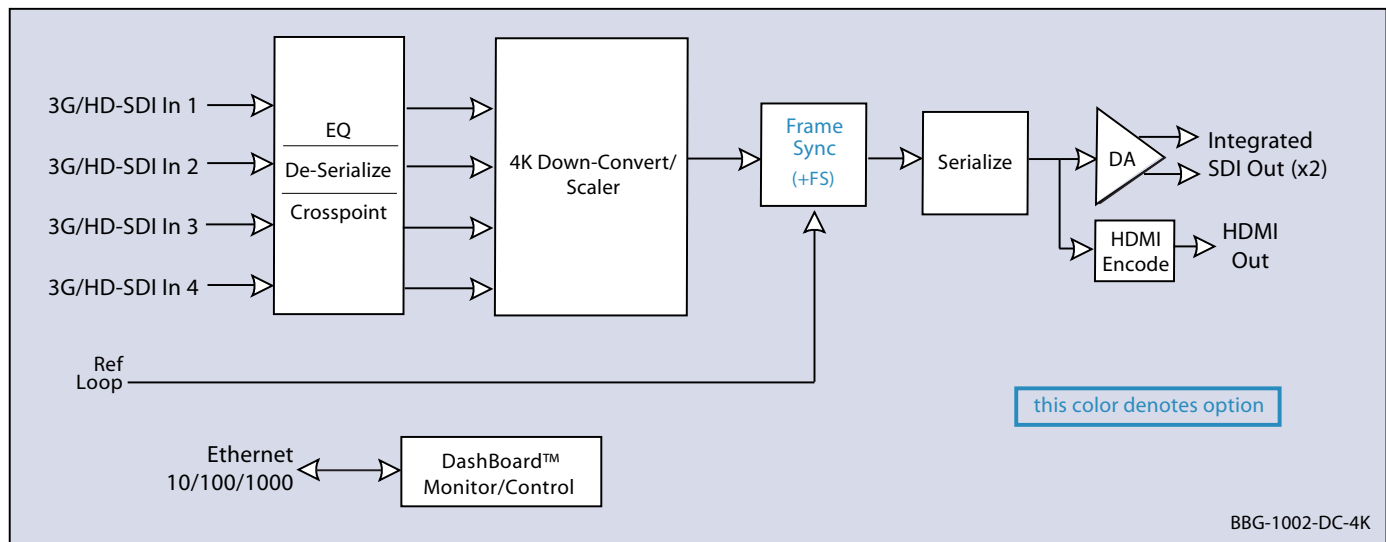
**OPTIONS**

Add Frame Sync. Provides full vertical and horizontal offset and frame delay controls (+FS)

Audio LTC I/O (+LTC)

1RU Mounting Tray (supports 3 units) (BBG-1000-TRAY)

Redundant Power Supply Module (BBG-1000-PS)



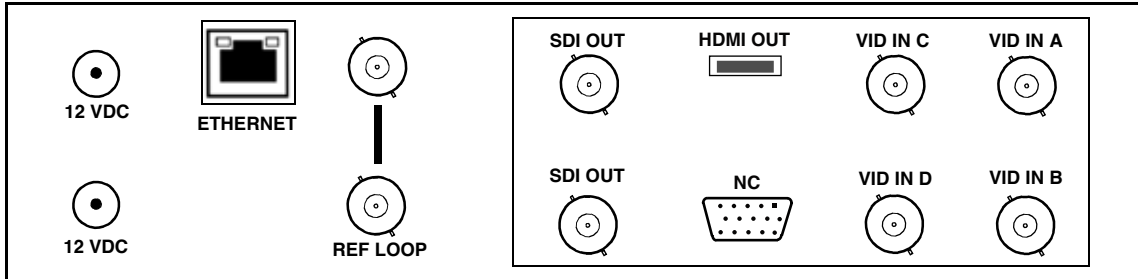
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BBG-1002-DC-4K



**BBG-1002-DC-4K » STANDALONE QUAD SDI/2SI-INPUT UHD BROADCAST DOWNCONVERTER**  
with Optional Frame Sync

**Rear Panel Layout**



**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**Video Input/Outputs**

Video Inputs: (4) 3G/HD-SDI 75Ω BNC  
SDI Output: (2) 3G/HD-SDI 75Ω BNCs (2x DA)  
HDMI Output: (1) HDMI output  
Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1002-DC-4K** Standalone Quad SDI/2SI-Input UHD Broadcast Downconverter with Optional Frame Sync

**+FS** Add Frame Sync Option

**+LTC** Audio LTC I/O Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

**9922-FS » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O



The Cobalt® 9922-FS 3G/HD/SD-SDI Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O offers frame sync, and advanced audio and ancillary data support, plus many other powerful features. Frame sync can select from multiple reference inputs, with failover to alternate selected sources. Full audio support includes per-channel audio delay. Option +2FS adds a second independent processing path, offering two independent signal paths on a single openGear® card, with both paths providing independent frame sync and audio embedding / de-embedding.

Advanced frame sync features include per-channel audio delay and audio/video offset. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues.

Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. Option +EAS provides EAS crawl burn-ins directly from industry standard EAS devices such as Sage™.

Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option +T-SLATE, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input RP168 clean switch, with manual selection or GPI controlled input selection

Closed-captioning absence detection

Auto-Changeover can be set to invoke failover for basic input loss.

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Frame Sync with full H/V offset and manual/LOS video pattern generator

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Option +ANC adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, and other specialized user payloads. SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Video options include color correction and keying

CVBS analog video I/O and analog/AES embed / de-embed available

Option +TTS provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Pattern generator can provide raster/test pattern and patterns for LOS failover insertion

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

**OPTIONS**

Dual-Channel Option (+2FS) – Adds a second independent processing path, offering two independent signal paths of frame sync / audio embedding and de-embedding on a single open-Gear® card. (Upgrades card to full 9922-2FS functionality and specifications.)

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Trouble Slate Import (+T-SLATE) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events.

Logo Insertion (+LOGO) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.

Clean and Quiet Switching Option (+CQS) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (+EAS) – Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Key/Fill Keyer (+KEYER)

Audio LTC I/O (+LTC)

Extended Frame Sync Delay (+DLY) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

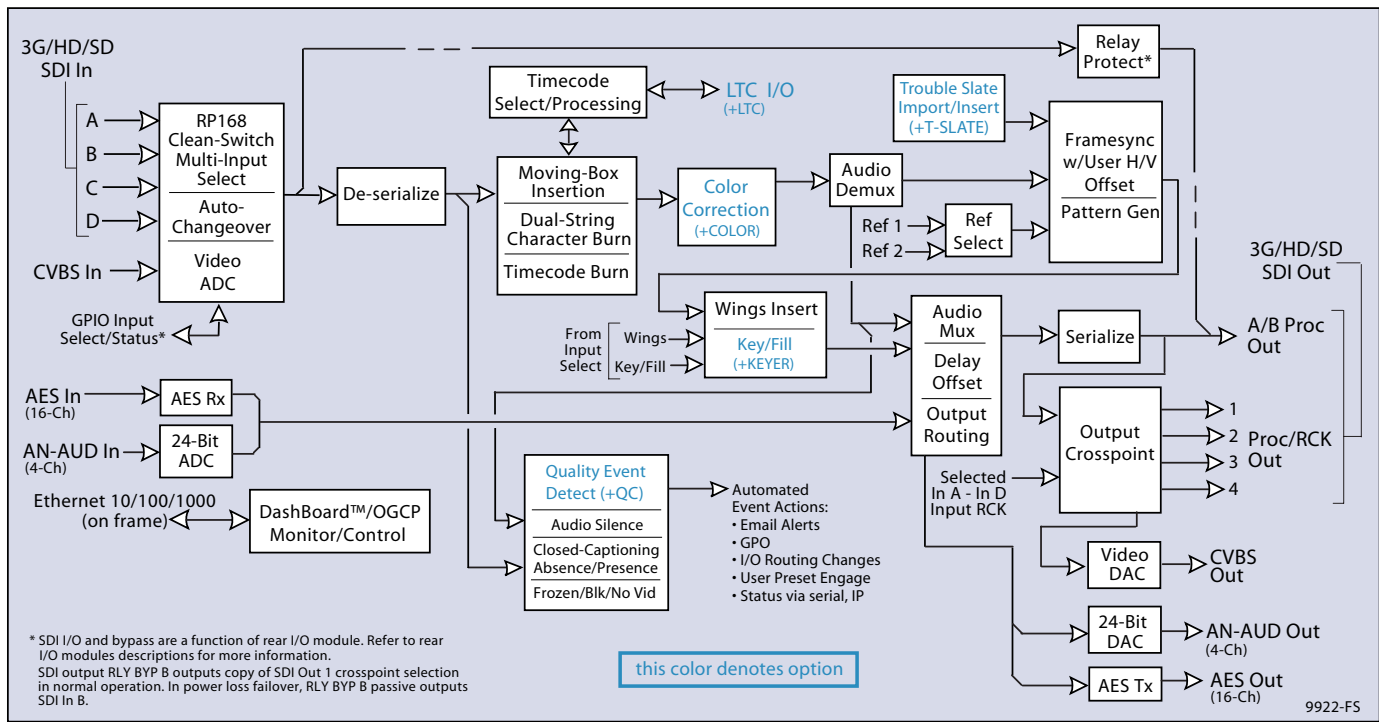
SCTE 104 Insertion (+SCTE104) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI.

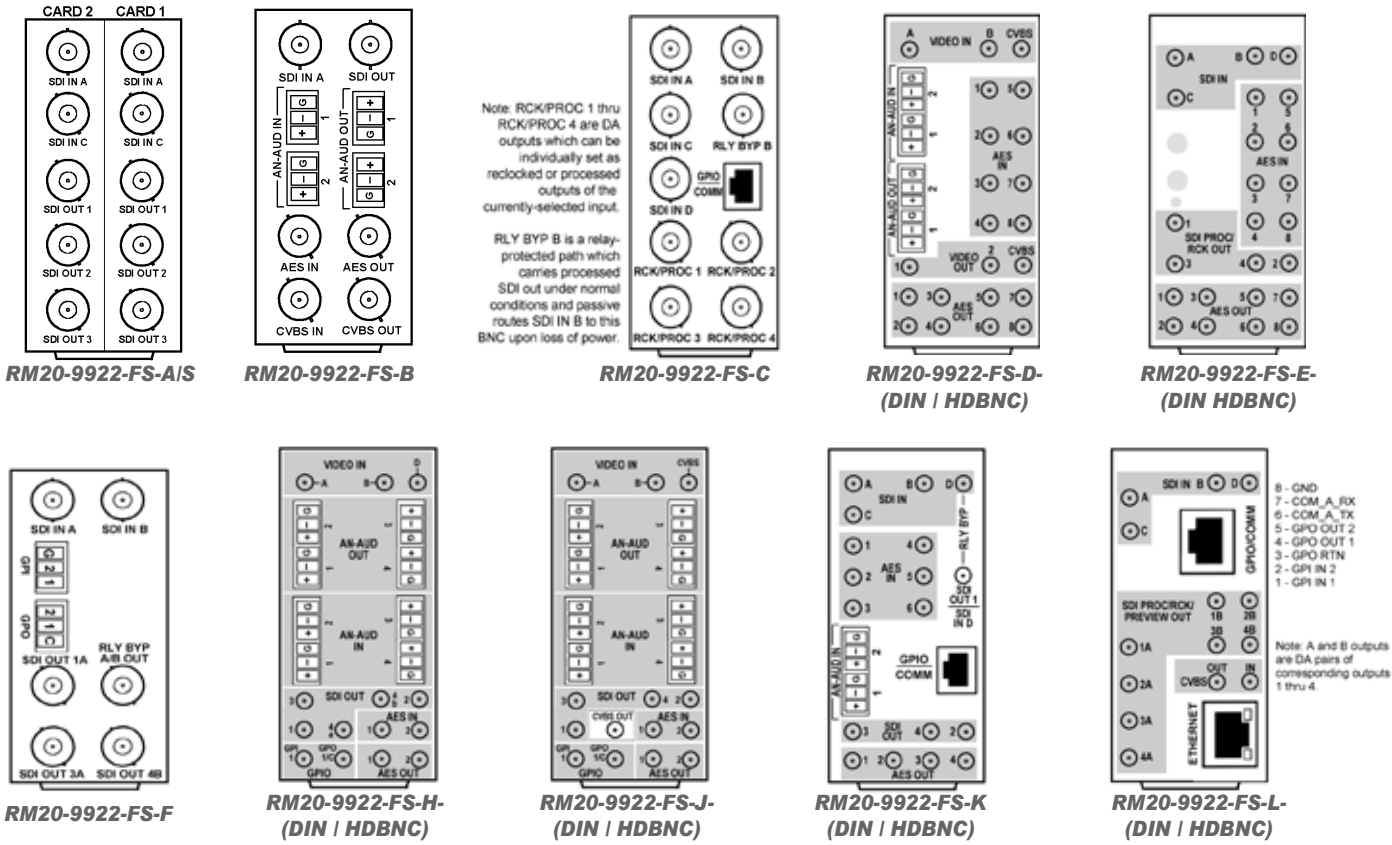


ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGEAR CARDS AND STANDALONE MODELS)

**9922-FS » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

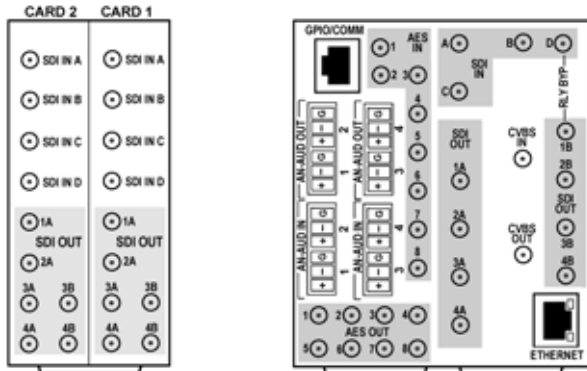


9922-FS





**9922-FS » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O



**RM20-9922-2FS-MIS-**  
(DIN | HDBNC)

**RM20-9922-2FS-N-**  
(DIN | HDBNC)

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)  
 Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
 (1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.  
 ADC resolution: 9-bit  
 Sampling frequency: 27 MHz (2x over-sampling)  
 Y/C separation: 4 line Adaptive Comb Filter  
 Freq. Response: ± 0.25 dB to 5.5 MHz  
 SNR: > 50 dB to 5.5 MHz (unweighted)  
 Differential Phase: < 1 degree  
 Differential Gain: < 1%  
 Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
 AES-3id 75Ω outputs (8 pair (16-Ch) max)  
 Input AES SRC Range: 32 to 96 kHz  
 Balanced analog audio inputs (4-Ch max)  
 Balanced analog audio outputs (4-Ch max)  
 (I/O conforms to 0 dBFS = +24 dBu)  
 Analog Output Impedance: < 50 Ω  
 Analog Reference Level: -20 dBFS  
 Analog Nominal Level: +4 dBu  
 Analog Max Output Level: +24 dBu (0 dBFS)  
 Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
 Analog SNR: 115 dB (A weighted)  
 Analog THD+N: -96 dB (20 Hz to 10 kHz)  
 Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**9922-FS » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

**SPECIFICATIONS (cont.)**

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
 Return Loss: >35 dB up to 5.75 MHz

**ORDERING INFORMATION**

**9922-FS** 3G/HD/SD-SDI Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

**RM20-9922-FS-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9922-FS-B** 20-Slot Frame Rear I/O Module (Standard-Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Processed Out BNC, (2) Balanced Analog Audio Outputs, (1) AES Output BNC

**RM20-9922-FS-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9922-FS-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-FS-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9922-FS-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-FS-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)

**RM20-9922-FS-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input), (2) GPI, (2) GPO

**RM20-9922-FS-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9922-FS-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9922-FS-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9922-FS-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9922-FS-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9922-FS-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

**9922-FS » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

**ORDERING INFORMATION (cont.)**

**RM20-9922-FS-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9922-FS-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9922-FS-M/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9922-FS-M/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9922-FS-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9922-FS-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**Options:**

**+2FS** Add Dual-Channel Option

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+KEYER** Key/Fill Keyer Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean and Quiet Switching Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

**+DLY** Extended Frame Sync Delay Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**9922-FS-DSP » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O



The Cobalt® **9922-FS-DSP 3G/HD/SD-SDI Frame Sync with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O** provides a high-density card-based solution that offers unprecedented multi-input support and flexibility. The 9922-FS-DSP offers a DSP-based platform that supports multiple audio DSP options. When optioned with various audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license "credits" which allows flexible tailoring of multiple proc function instances. The 9922-FS-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows "trading" credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Audio proc options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-card purchase, or field-installed as software option upgrades without removing the card from its frame. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio embed/de-embed. Also included standard is bulk and per-channel audio delay controls that easily address lip-sync issues. Advanced frame sync features include per-channel audio delay, audio/video offset, and output rate conversion to and from 23.98/29.97/59.94 to 24/30/60 frame rates. Frame sync can select from multiple reference inputs, with failover to alternate selected sources.

An input crosspoint with RP168 clean switching can select from up to four SDI inputs. The input crosspoint allows manual selection of input via remote control or GPIO, or failover to alternate inputs on loss of input conditions. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option **+T-SLATE**, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Quality Check option **+QC** checks for and acts upon user-configurable criteria such as black/frozen frame, audio silence or CC absence.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. GPIO allows direct input routing control and status monitoring.

**FEATURES**

- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p
- DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license "credits" – our largest DSP capacity
- Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available
- CVBS analog video I/O and analog/AES embed / de-embed available

- Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay
- Full audio crosspoint with 5.1-to-stereo downmix/flex mix available for all audio outputs
- Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static. Dual-string character/timecode burn-in.

- Advanced audio processing allows routing, gain, smooth delay, and flexible mixing as standard features
- High-density design
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Hot-swappable
- Five year warranty

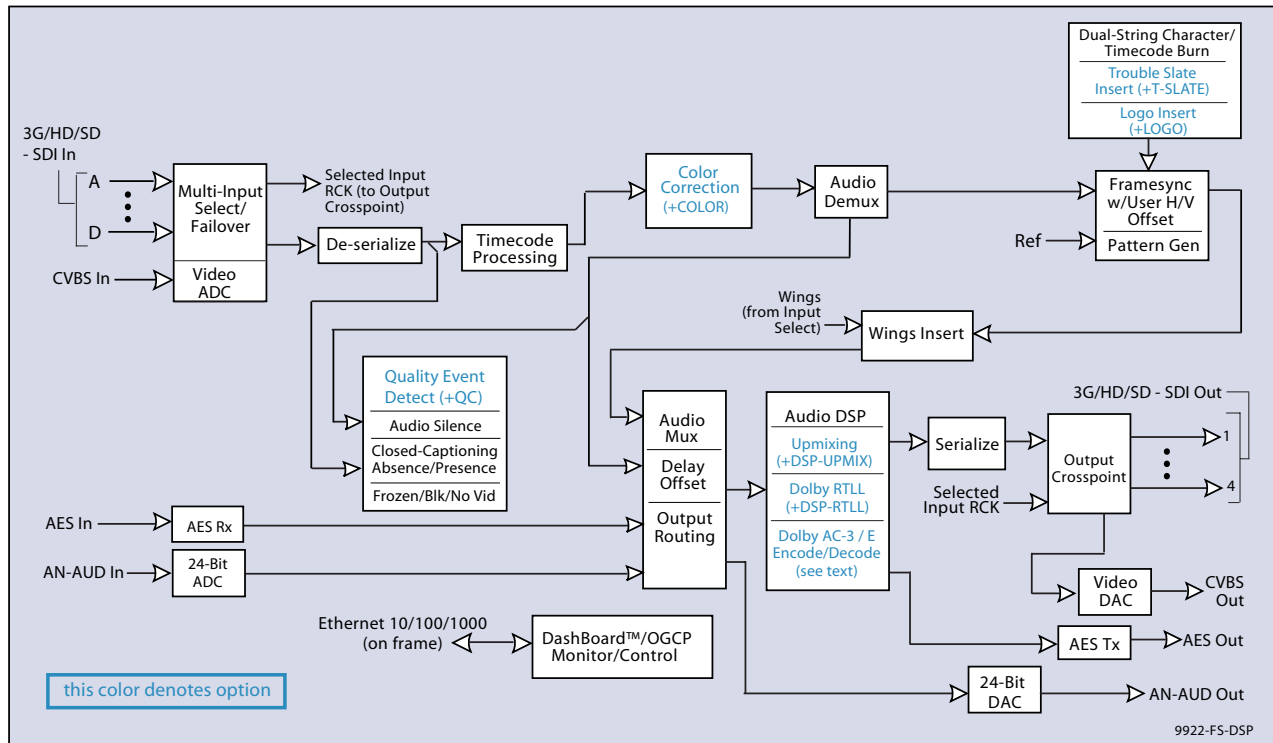
**OPTIONS**

- Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (**+DSP-RTL**) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details)
- Dolby® Encoder Options (**+DSP-ENCD**) – Available as 5.1 and 2.0 Dolby Digital/Digital Plus Encode. (See Ordering Information for full details.)
- Dolby® Decoder Options (**+DSP-DEC**) – Provides Dolby Digital, Digital Plus, and E decode
- Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing
- Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)
- Audyne ITU Loudness Leveler Options (**+DSP-ITU**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)
- Quality Check Option (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence
- Clean & Quiet Switching Option (**+CQS**) – Provides automatic audio ramp-down and up during input switching events
- Text-To-Speech Option (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.
- Add Extended Delay Option (**+DLY**)
- Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip
- Trouble Slate Import (**+T-SLATE**) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events
- Logo Insertion (**+LOGO**) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events
- Ancillary Data Processor Option (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP and GPIO external interfaces
- SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) Provides deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI, optimizing it for automatic dissemination to CDN and VOD systems
- Audio LTC I/O Option (**+LTC**)

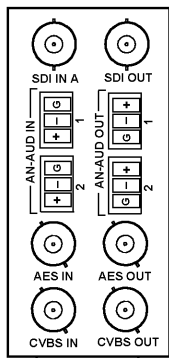


ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGEAR CARDS AND STANDALONE MODELS)

**9922-FS-DSP » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O



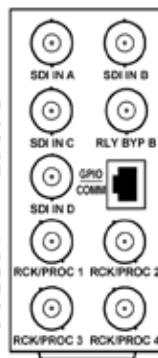
9922-FS-DSP



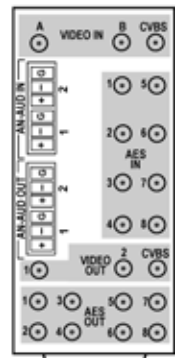
RM20-9922-B

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

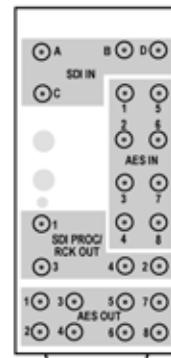
RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



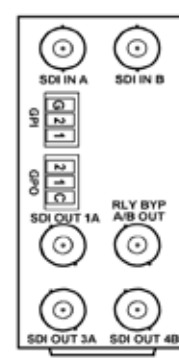
RM20-9922-C



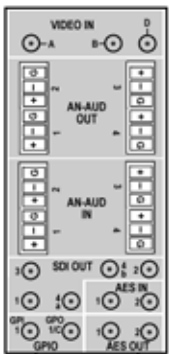
RM20-9922-D-DIN  
RM20-9922-D-HDBNC



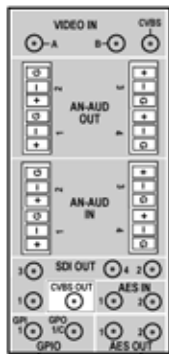
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RM20-9922-E-HDBNC



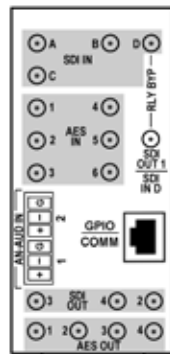
RM20-9922-F



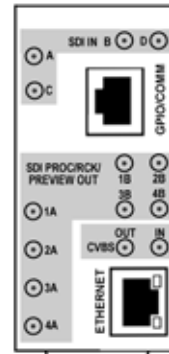
RM20-9922-H-DIN  
RM20-9922-H-HDBNC



RM20-9922-J-DIN  
RM20-9922-J-HDBNC



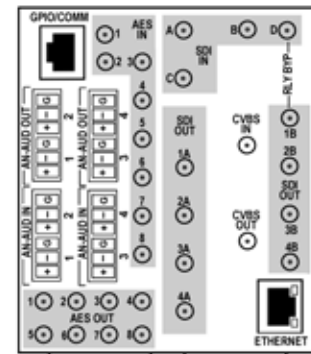
RM20-9922-K-DIN  
RM20-9922-K-HDBNC



RM20-9922-L-DIN  
RM20-9922-L-HDBNC

8 - GND  
7 - COM\_A\_RX  
6 - COM\_A\_TX  
5 - GPO OUT 2  
4 - GPO OUT 1  
3 - GPO RTN  
2 - GPI IN 2  
1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.



RM20-9922-N-DIN  
RM20-9922-N-HDBNC

ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGear CARDS AND STANDALONE MODELS)

**9922-FS-DSP » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

<24 Watts (includes +DSP options)

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output. CVBS can be upconverted to any supported SDI format; all formats can be downconverted to CVBS.

ADC resolution/sampling: 10-bit; 4x oversampling

DAC resolution/sampling: 10-bit; 16x oversampling

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)

AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**ARC**

ARC manually configurable (custom) or automatic triggering in full compliance/conformity with AFD (SMPTE 2016), VI (RP186), and WSS triggering.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**9922-FS-DSP » 3G/HD/SD-SDI FRAME SYNC** with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

**SPECIFICATIONS (cont.)**

**Embedded Audio Output**

16-ch embedded. User crosspoint allows routing of any embedded channel to any embedded channel output. Multi-frequency tone generator for each audio output. Master delay control; range of -33 msec to +3000 msec.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9922-FS-DSP** 3G/HD/SD-SDI Frame Sync with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

**Note:** On this DSP-equipped card, an adjacent card **will not** fit into the immediately adjacent slot to the front-of-frame **right**. (For example, if DSP-equipped card is in slot 8, an adjacent card will not fit in slot 9. This would be the case of an adjacent card that installs into an odd frame slot, or the case where a Split Rear Module serves two cards in the adjacent odd/even slot pairs (in this example slots 9/10)).

**RM20-9922-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC, (2) Balanced Analog Audio Outputs

**RM20-9922-C** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (8) AES I/O BNCs (I/O switch selectable), (1) 3G/HD/SD-SDI Output BNC

**RM20-9922-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9922-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)

**RM20-9922-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input), (2) GPI, (2) GPO

**RM20-9922-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9922-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9922-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9922-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9922-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9922-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors HD-BNC)

**RM20-9922-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9922-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9922-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9922-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD-SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC)

ADVANCED 3G/H/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGear CARDS AND STANDALONE MODELS)

**9922-FS-DSP » 3G/H/SD-SDI FRAME SYNC** with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

**ORDERING INFORMATION (cont.)**

**Options:**

- +**DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option
- +**DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option
- +**DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder
- +**DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder
- +**DSP-DEC** Dolby® Decoder
- +**DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer
- +**DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option
- +**DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option
- +**DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)
- +**DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)
- +**ANC** Ancillary Data Processor Option
- +**COLOR** Color Correction Option
- +**T-SLATE** User Trouble Slate Graphic Import Option
- +**LOGO** Logo Insertion Option
- +**SCTE104** SCTE 104 Insertion Option
- +**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option
- +**DLY** Extended Frame Sync Delay Option
- +**LTC** Audio LTC I/O Option
- +**CQS** Clean & Quiet Switching Option
- +**QC** Quality Check Option
- +**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)
- +**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

(1) Manufactured under license from Audyne Inc.



ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1022-FS » 3G/HD/SD-SDI STANDALONE FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O



The Cobalt® **BBG-1022-FS 3G/HD/SD-SDI Standalone Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O** offers frame sync, and advanced audio and ancillary data support, plus many other powerful features. Full audio support includes per-channel audio delay. Option **+2FS** adds a second independent processing path, offering two signal paths on a single unit, with both paths providing independent frame sync and audio embedding / de-embedding.

Advanced frame sync features include per-channel audio delay and audio/video delay offset. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Bulk and per-channel audio delay controls easily address lip-sync issues.

Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. Option **+EAS** provides EAS crawl burn-ins directly from industry standard EAS devices such as Sage™.

A convenient input crosspoint allows manual selection or failover to alternate inputs on loss of input conditions. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option **+T-SLATE**, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1022-FS can be remote-controlled using Dashboard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1022-FS allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Multi-input RP168 clean switch

Closed-captioning absence detection

Auto-Changeover can be set to invoke failover for basic input loss.

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

CVBS analog video I/O and analog/AES embed / de-embed available

Frame Sync with full H/V offset and manual/LOS video pattern generator

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Option **+TTS** provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Pattern generator can provide raster/test pattern and patterns for LOS failover insertion

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Uses Dashboard remote control (device appears as single-card frame)

Five year warranty

**OPTIONS**

Dual-Channel Option (**+2FS**) – Adds a second independent processing path, offering two independent signal paths of frame sync / audio embedding and de-embedding on a single unit. (Upgrades device to full BBG-1022-2FS functionality and specifications.)

Ancillary Data Processor (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP, RS-232/RS-422 serial, and GPIO external interfaces. SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Trouble Slate Import (**+T-SLATE**) – Allows uploading of up to three different user trouble slate graphic file to the BBG unit, with automated insertion controlled by GPI or other events.

Logo Insertion (**+LOGO**) – Allows uploading of user logo graphic file to BBG unit, with automated insertion controlled by GPI or other events.

Key/Fill Keyer (**+KEYER**)

Text-To-Speech (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (**+EAS**) – Provides a single-device solution for keying Emergency Alert System (EAS) text crawls.

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls, white hard clip, white soft clip, black hard clip, and saturation clip.

Quality Check (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Clean and Quiet Switching Option (**+CQS**) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.

Expanded Delay (**+DLY**) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G.

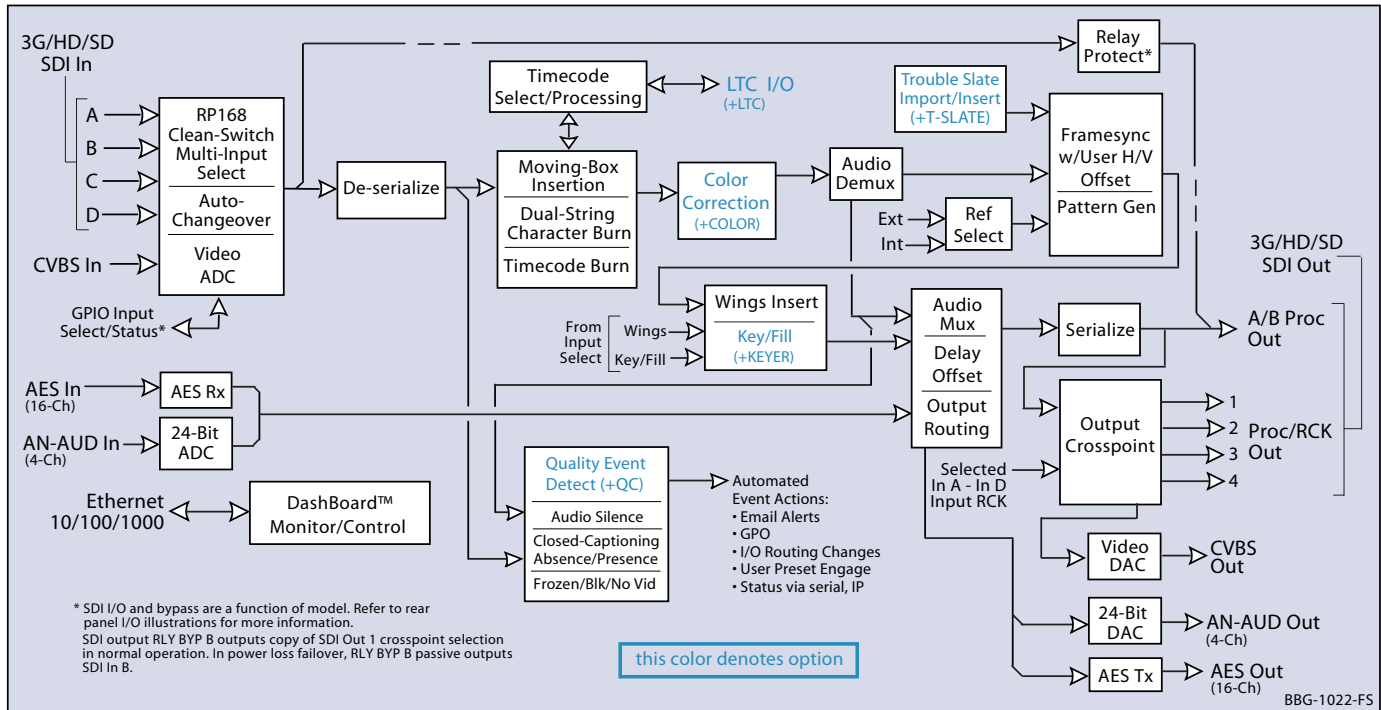
SCTE 104 Insertion (**+SCTE104**) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

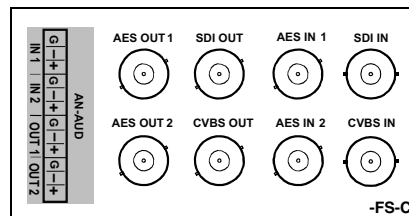
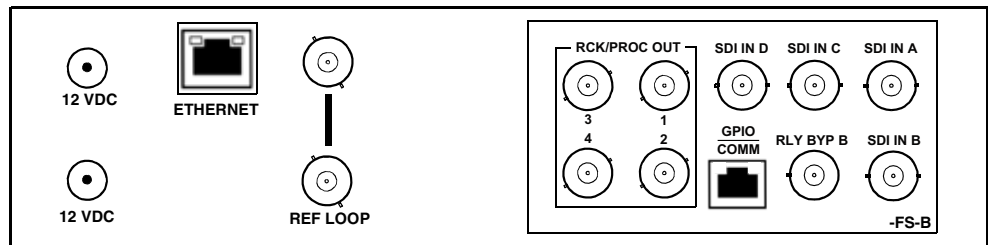
Audio LTC I/O (**+LTC**)

ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGEAR CARDS AND STANDALONE MODELS)

**BBG-1022-FS » 3G/HD/SD-SDI STANDALONE FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O



Rear Panel



ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1022-FS » 3G/HD/SD-SDI STANDALONE FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O**SPECIFICATIONS****Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output. CVBS output functional only when selected path is carrying SD-SDI.

ADC resolution: 9-bit

Sampling frequency: 27 MHz (2x over-sampling)

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max) AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)

ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1022-FS » 3G/HD/SD-SDI STANDALONE FRAME SYNC** with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

**ORDERING INFORMATION**

**BBG-1022-FS** 3G/HD/SD-SDI Standalone Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O available in the following rear-panel I/O configurations:

**BBG-1022-FS-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1022-FS-C** (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video In BNC, (2) AES In BNCs, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Video Out BNC, (2) AES Out BNCs, (2) Balanced Analog Audio Outputs

**BBG-1022-FS-D-DIN** ((4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1022-FS-D-HDBNC** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors HD-BNC)

**Options and Accessories:**

**+2FS** Add Dual-Channel Option

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+KEYER** Key/Fill Keyer Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean and Quiet Switching Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+DLY** Extended Frame Sync Delay Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

## BBG-1022-FS-DSP » 3G/HD/SD-SDI STANDALONE FRAME SYNC

with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O



The Cobalt® **BBG-1022-FS-DSP 3G/HD/SD-SDI Standalone Frame Sync with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O** offers frame sync, and advanced audio and ancillary data support, plus many other powerful features. The 9922-FS-DSP offers a DSP-based platform that supports multiple audio DSP options. When optioned with various audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows flexible tailoring of multiple proc function instances. The 9922-FS-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. Advanced frame sync features include per-channel audio delay, audio/video offset, and output rate conversion to and from 23.98/29.97/59.94 to 24/30/60 frame rates.

A convenient input crosspoint with RP168 clean switching can select from up to four SDI inputs. The input crosspoint allows manual selection of input via remote control or GPIO, or failover to alternate inputs on loss of input conditions. Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option **+T-SLATE**, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Quality Check option **+QC** checks for and acts upon user-configurable criteria such as black/frozen frame, audio silence or CC absence.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1022-FS-DSP can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1022-FS-DSP allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19” frame).

### FEATURES

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits” – our largest DSP capacity

Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available. Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay.

Full audio crosspoint with 5.1-to-stereo downmix (standard) available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed available

Moving-box/ motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static.

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Uses DashBoard remote control (device appears as single-card frame)

### OPTIONS

Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (**+DSP-RTLL**) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details)

Dolby® Encoder Options (**+DSP-ENCD**) – Available as 5.1 and 2.0 Dolby Digital/Digital Plus Encode. (See Ordering Information for full details.)

Dolby® Decoder Options (**+DSP-DEC**) – Provides Dolby Digital, Digital Plus, and E decode

Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing

Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (**+DSP-ITU**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Quality Check Option (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence

Clean & Quiet Switching Option (**+CQS**) – Provides automatic audio ramp-down and up during input switching events

Text-To-Speech Option (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Add Extended Delay Option (**+DLY**)

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Trouble Slate Import (**+T-SLATE**) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events

Logo Insertion (**+LOGO**) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events

Ancillary Data Processor Option (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP and GPI external interfaces

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) Provides deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI, optimizing it for automatic dissemination to CDN and VOD systems

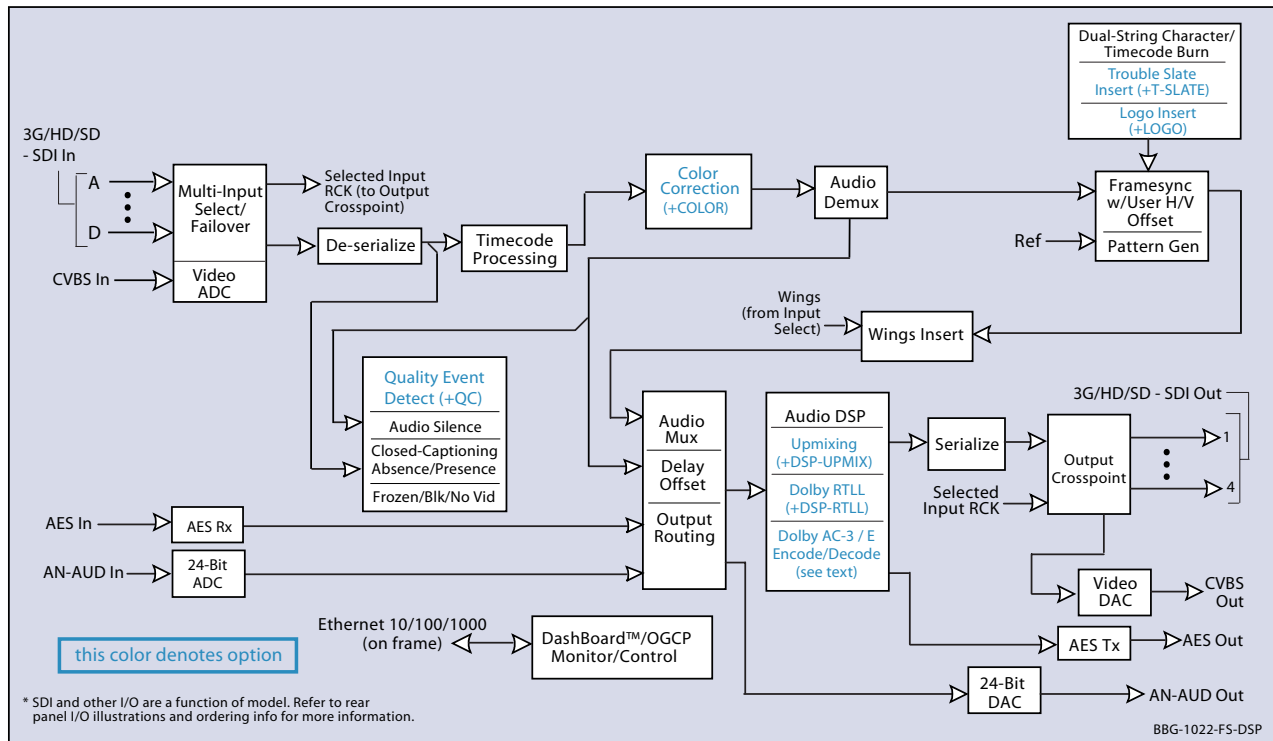
Audio LTC I/O Option (**+LTC**)

1RU Mounting Tray (supports 3 units) (**BBG-1000-TRAY**)

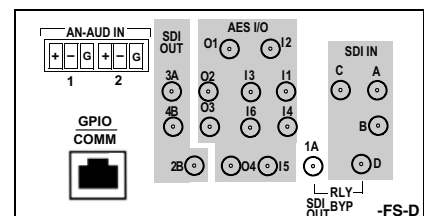
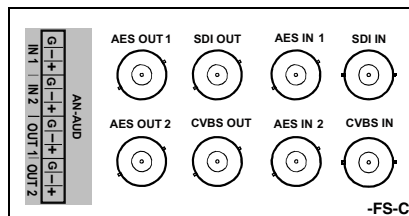
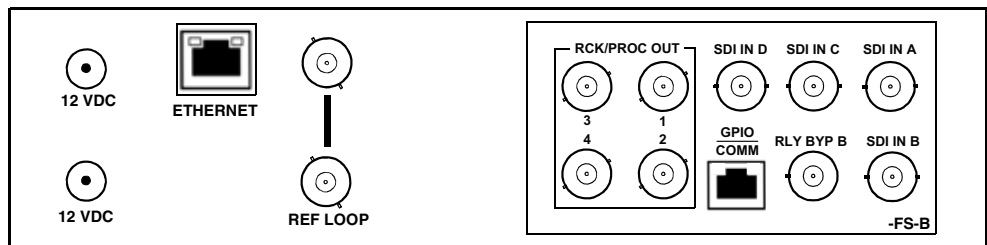
Redundant Power Supply Module (**BBG-1000-PS**)

**BBG-1022-FS-DSP » 3G/HD/SD-SDI STANDALONE FRAME SYNC**

with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O



**Rear Panel**



**BBG-1022-FS-DSP » 3G/HD/SD-SDI STANDALONE FRAME SYNC**

with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

**SPECIFICATIONS****Power**

< 24 Watts (including DSP options). Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output. CVBS output functional only when selected path is carrying SD-SDI.

ADC resolution: 9-bit

Sampling frequency: 27 MHz (2x over-sampling)

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: > 50 dB to 5.5 MHz (unweighted)

Differential Phase: < 1 degree

Differential Gain: < 1%

Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max) AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: < 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)

## BBG-1022-FS-DSP » 3G/HD/SD-SDI STANDALONE FRAME SYNC

with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

### ORDERING INFORMATION

**BBG-1022-FS-DSP** 3G/HD/SD-SDI Standalone Frame Sync with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O available in the following rear-panel I/O configurations:

**BBG-1022-FS-DSP-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1022-FS-DSP-C** (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video In BNC, (2) AES In BNCs, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Video Out BNC, (2) AES Out BNCs, (2) Balanced Analog Audio Outputs

**BBG-1022-FS-DSP-D-DIN** ((4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1022-FS-DSP-D-HDBNC** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors HD-BNC)

#### Options and Accessories:

**+DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option

**+DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option

**+DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder

**+DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder

**+DSP-DEC** Dolby® Decoder

**+DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer

**+DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option

**+DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option

**+DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)

**+DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**+DLY** Extended Frame Sync Delay Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean & Quiet Switching Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

(1) Manufactured under license from Audyne Inc.



## 9922-2FS » 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O



The award-winning Cobalt® 9922-2FS 3G/HD/SD-SDI Dual-Channel Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O offers **two independent signal paths** of frame sync / audio embedding and de-embedding on a single open-Gear® card. Using our HPF-9000 20-slot frame, this provides up to 40 channels of processing in a single frame. The 9922-2FS represents a new level of openGear packaging density!

Advanced frame sync features include per-channel audio delay, audio/video offset, and output rate conversion to and from 23.98/29.97/59.94 to 24/30/60 frame rates. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues.

Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons.

A convenient input crosspoint with RP168 clean switching can select from up to four SDI inputs to be applied to either of the card's two processing paths. The input crosspoint allows manual selection of input via remote control or GPIO, or failover to alternate inputs on loss of input conditions. For each path, two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. With option **+T-SLATE**, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. Moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning.

The space-saving design of the 9922-2FS provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard width "split" rear module. This provides four video paths per each pair of slots, readily providing 20 channels of processing in only 10 slots. Two independent paths with fully independent user delays is perfect for setting up path delays for key/fill video. Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

### FEATURES

Multi-input RP168 clean switch Path inputs can also be sourced from opposite path output with no external patching.

Closed-captioning absence detection

Auto-Changeover can be set to invoke failover for basic input loss.

Moving-box insertion serves as a dynamic raster confidence check even in cases where the input video image is static

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Frame sync with full H/V offset and manual/LOS video pattern generator

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Per-path dual independent burn-in text string insertion allows condition-based insertion

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC

Option **+TTS** provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed with 4-line Adaptive Comb Filter

Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion

Low-power/high-density design – less than 18 Watts per card – hot swappable

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Five year warranty

### OPTIONS

Quality Check (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Text-To-Speech (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (**+EAS**) – Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Trouble Slate Import (**+T-SLATE**) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events.

Logo Insertion (**+LOGO**) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events

Clean and Quiet Switching Option (**+CQS**) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

SCTE 104 Insertion (**+SCTE104**) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Expanded Frame Sync Delay (**+DLY**) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

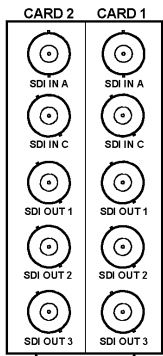
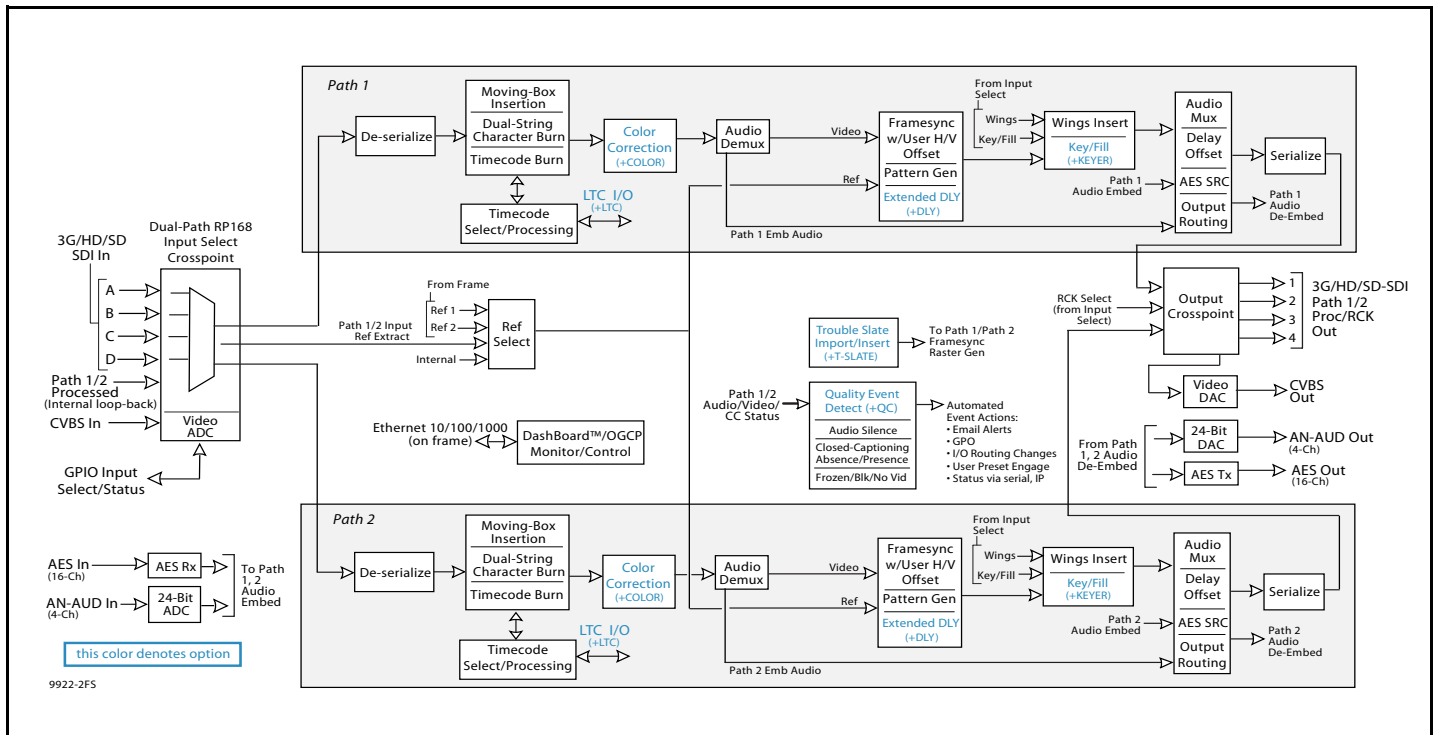
Key/Fill Keyer (**+KEYER**)

Audio LTC I/O (**+LTC**)



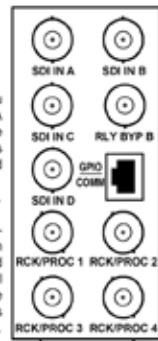
# 9922-2FS » 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

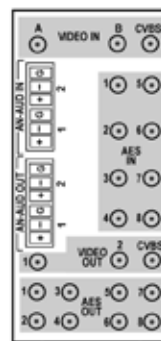


RM20-9922-2FS-AIS

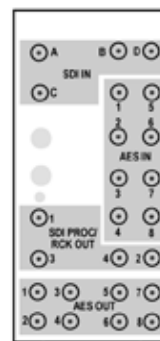
Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.  
 RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



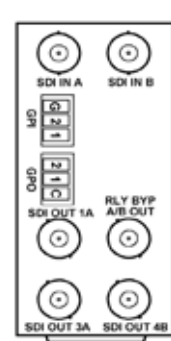
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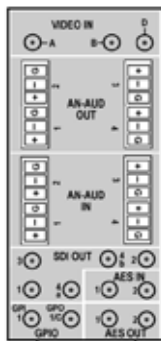
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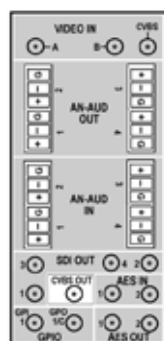
RM20-9922-2FS-E (DIN HDBNC)



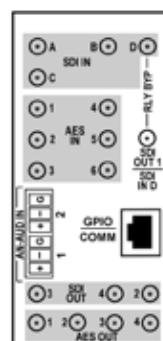
RM20-9922-2FS-F



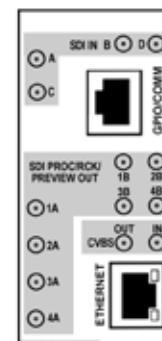
RM20-9922-2FS-H (DIN | HDBNC)



RM20-9922-2FS-J (DIN | HDBNC)



RM20-9922-2FS-K (DIN | HDBNC)



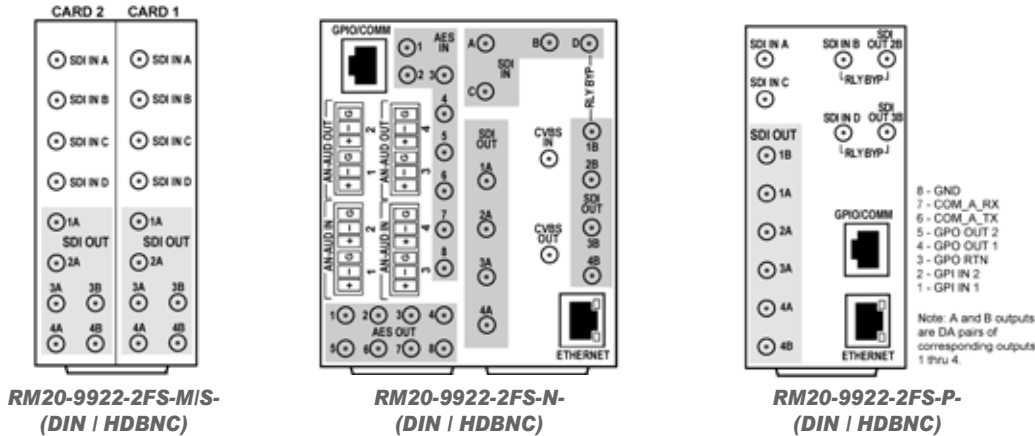
RM20-9922-2FS-L (DIN | HDBNC)

B - GND  
 7 - COM\_A\_RX  
 6 - COM\_A\_TX  
 5 - GPO OUT 2  
 4 - GPO OUT 1  
 3 - GPO RTN  
 2 - GPI IN 2  
 1 - GPI IN 1

Note: A and B outputs are DA pairs of corresponding outputs 1 thru 4.

**9922-2FS » 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC**

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O



**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
 < 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input reclocked)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)  
 Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input  
 (1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.  
 ADC resolution: 9-bit  
 Sampling frequency: 27 MHz (2x over-sampling)  
 Y/C separation: 4 line Adaptive Comb Filter  
 Freq. Response: ± 0.25 dB to 5.5 MHz  
 SNR: > 50 dB to 5.5 MHz (unweighted)  
 Differential Phase: < 1 degree  
 Differential Gain: < 1%  
 Nonlinearity < 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
 AES-3id 75Ω outputs (8 pair (16-Ch) max)  
 Input AES SRC Range: 32 to 96 kHz  
 Balanced analog audio inputs (4-Ch max)  
 Balanced analog audio outputs (4-Ch max)  
 (I/O conforms to 0 dBFS = +24 dBu)  
 Analog Output Impedance: < 50 Ω  
 Analog Reference Level: -20 dBFS  
 Analog Nominal Level: +4 dBu  
 Analog Max Output Level: +24 dBu (0 dBFS)  
 Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
 Analog SNR: 115 dB (A weighted)  
 Analog Analog THD+N: -96 dB (20 Hz to 10 kHz)  
 Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

## 9922-2FS » 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

### SPECIFICATIONS (cont.)

#### Frame Sync Audio/Video Delay

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

#### User Audio Delay Offset from Video

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

#### Timecode Insertion/Burn-In

Per-path burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

#### Text Burn-In

(2) independent strings per path supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

#### GPIO/COMM

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

#### Frame Reference Input

(2) reference from frame bus or selected program video ref sources. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
 Return Loss: >35 dB up to 5.75 MHz

### ORDERING INFORMATION

**9922-2FS** 3G/HD/SD-SDI Dual-Channel Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

**RM20-9922-2FS-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9922-2FS-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9922-2FS-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)

**RM20-9922-2FS-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC)

**RM20-9922-2FS-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

**RM20-9922-2FS-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9922-2FS-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)

**RM20-9922-2FS-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO/COMM RJ-45 connector (All coaxial connectors HD-BNC)

## 9922-2FS » 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

### ORDERING INFORMATION (cont.)

**RM20-9922-2FS-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9922-2FS-M/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-M/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9922-2FS-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect) , (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9922-2FS-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect) , (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO/COMM RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9922-2FS-P-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9922-2FS-P-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

#### Options:

+**ANC** Ancillary Data Processor Option

+**COLOR** Color Correction Option

+**DLY** Extended Delay Option

+**KEYER** Key/Fill Keyer Option

+**LTC** Audio LTC I/O Option

+**CQS** Clean and Quiet Switching Option

+**QC** Quality Check Option

+**TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)

+**2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

+**EAS** Emergency Alert System Text Crawl Generation Option

+**DLY** Extended Frame Sync Delay Option

+**T-SLATE** User Trouble Slate Graphic Import Option

+**LOGO** Logo Insertion Option

+**SCTE104** SCTE 104 Insertion Option

+**SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

## BBG-1022-2FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O



The Cobalt® **BBG-1022-2FS 3G/HD/SD-SDI Standalone Dual-Channel Frame Sync** with Audio/Video Processing, AES/ Analog Audio Embedding/De-Embedding and CVBS I/O offers **two independent signal paths** of frame sync / audio embedding and de-embedding in a single unit.

Advanced frame sync features include per-channel audio delay, audio/video offset, and output rate conversion to and from 23.98/29.97/29.94 to 24/30/60 frame rates. Frame sync can select from multiple reference inputs, with failover to alternate selected sources. Each path can independently use either of two frame references or internal reference.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Bulk and per-channel audio delay controls easily address lip-sync issues.

A convenient input crosspoint can select from up to four SDI inputs to be applied to either of the unit's two processing paths. The input crosspoint allows manual or failover to alternate inputs on loss of input conditions. For each path, two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS.

With option +T-SLATE, import of user trouble slate graphics is also supported in addition to standard test pattern insert as an input LOS/quality event marker. Moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Option +TTS provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. With option +ANC, the BBG-1022-2FS offers full VANC/HANC ancillary data packet de-embedding and embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1022-2FS can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1022-2FS allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

### FEATURES

Two independent processing paths

Multi-input RP168 clean switch. Path inputs can also be sourced from opposite path output with no external patching.

Auto-Changeover can be set to invoke failover for basic input loss

Moving-box insertion serves as a dynamic raster confidence check even in cases where the input video image is static

Frame Sync with full H/V offset and manual/LOS video pattern generator. Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion.

Per-path dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Advanced audio processing allows routing, gain, delay, and flexible mixing as standard features

Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed

Video options include color correction and keying

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Five year warranty

### OPTIONS

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Key/Fill Keyer (+KEYER) – Provides keying using independent SDI inputs for key and fill signals.

Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip

Ancillary Data Processor (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Text-To-Speech (+TTS) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (+EAS) – Provides a single-device solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Trouble Slate Import Option (+T-SLATE) – Allows uploading of up to three different user trouble slate graphic file to the BBG unit, with automated insertion controlled by GPI or other events.

Logo Insertion Option (+LOGO) – Allows uploading of user logo graphic file to BBG unit, with automated insertion controlled by GPI or other events.

Clean and Quiet Switching Option (+CQS) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

Expanded Delay (+DLY) – Increases frame buffer to provide adjustable audio/video delay buffer capacity to over 9 seconds for SD video, 1.5 seconds for HD video, or 0.8 seconds for 3G video.

SCTE 104 Insertion (+SCTE104) – Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Audio LTC I/O (+LTC)

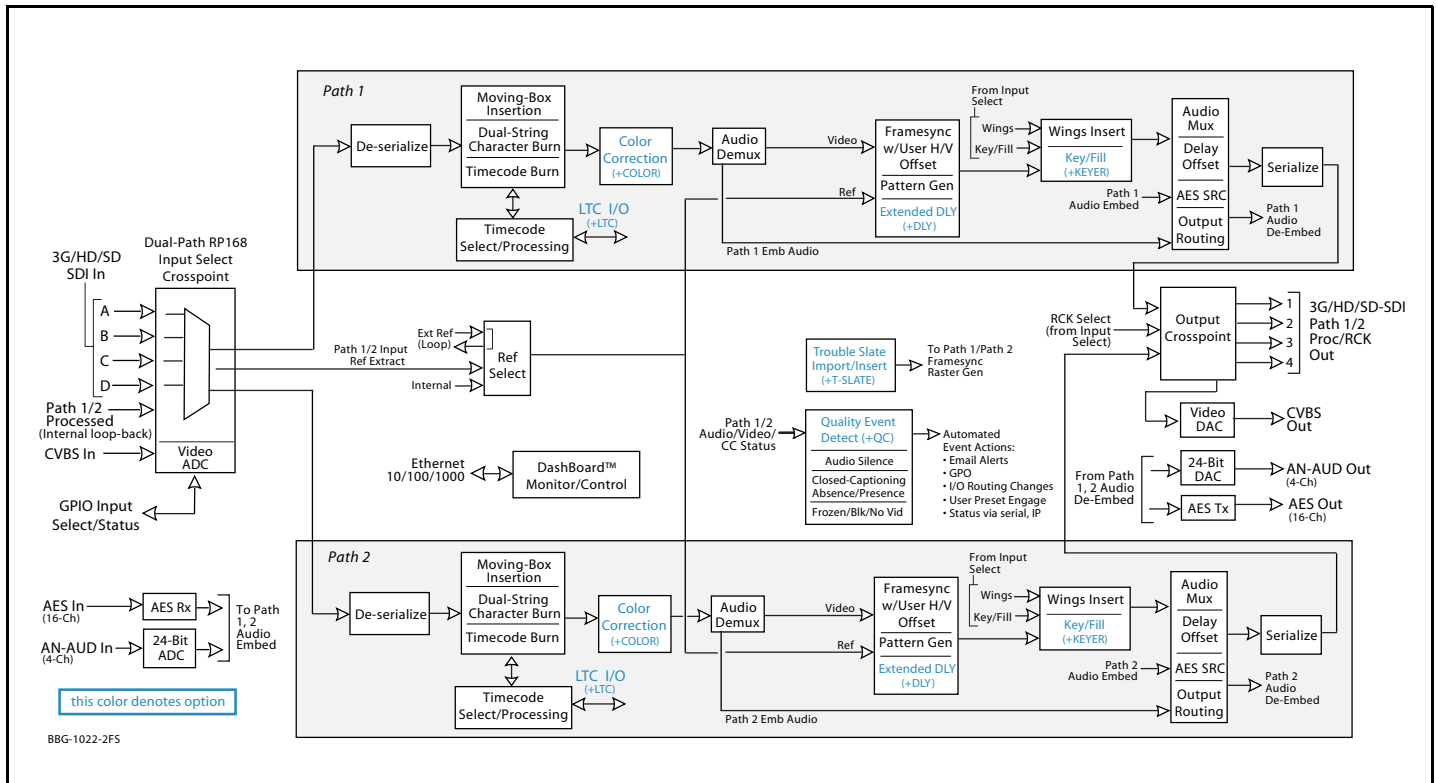
Redundant Power Supply Module (BBG-1000-PS)

1RU Mounting Tray (supports 3 units) (BBG-1000-TRAY)

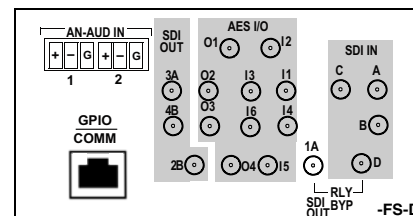
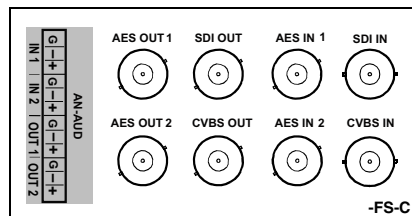
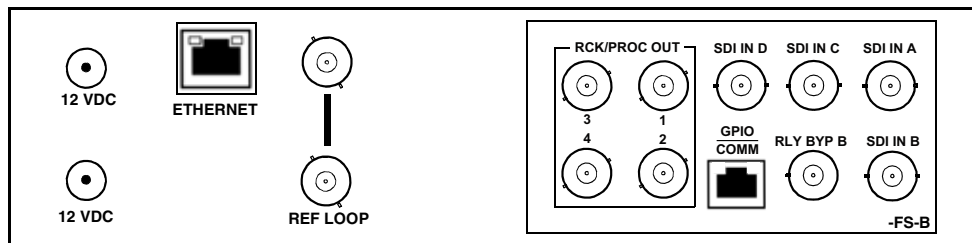


**BBG-1022-2FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL FRAME SYNC**

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O



**Rear Panel**



**BBG-1022-2FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL FRAME SYNC**

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

**SPECIFICATIONS****Power**

&lt; 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI Path 1 or Path 2, or selected input reclocked)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: &gt;15 dB up to 1.485 GHz; &gt;10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: &lt; 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: &lt; 2.0/1.0/0.2 UI

Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output (selectable as Path 1 or Path 2 processed output). CVBS output functional only when selected path is carrying SD-SDI.

ADC resolution: 9-bit

Sampling frequency: 27 MHz (2x over-sampling)

Y/C separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: &gt; 50 dB to 5.5 MHz (unweighted)

Differential Phase: &lt; 1 degree

Differential Gain: &lt; 1%

Nonlinearity &lt; 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max) AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: &lt; 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): &gt;800 msec / &gt;1580 msec / &gt;9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**Text Burn-In**

(2) independent strings per path supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: &gt;35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.

Weight: 6 lb (2.8 kg)



## BBG-1022-2FS » 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL FRAME SYNC

with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O

### ORDERING INFORMATION

**BBG-1022-2FS** 3G/HD/SD-SDI Standalone Dual-Channel Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O available in the following rear-panel I/O configurations:

**BBG-1022-2FS-B** (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**BBG-1022-2FS-C** (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video In BNC, (2) AES In BNCs, (2) Balanced Analog Audio Inputs, (1) 3G/HD/SDI Output BNC, (1) CVBS Video Out BNC, (2) AES Out BNCs, (2) Balanced Analog Audio Outputs

**BBG-1022-2FS-D-DIN** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors DIN 1.0/2.3)

**BBG-1022-2FS-D-HDBNC** (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (6) AES Inputs, (4) 3G/HD/SDI Outputs w/ (1) relay protect, (4) AES Outputs, GPIO/COMM (RJ-45 connector). (All coaxial connectors HD-BNC)

#### Options and Accessories:

**+ANC** Ancillary Data Processor Option

**+COLOR** Color Correction Option

**+KEYER** Key/Fill Keyer Option

**+LTC** Audio LTC I/O Option

**+CQS** Clean and Quiet Switching Option

**+QC** Quality Check Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

**+DLY** Extended Frame Sync Delay Option

**+T-SLATE** User Trouble Slate Graphic Import Option

**+LOGO** Logo Insertion Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

**9934-AUD-PRO-DSP » 3G/HD/SD-SDI ADVANCED AUDIO PROCESSOR**

with DSP Audio Options Support and Full Embed/De-Embed



The Cobalt® **9934-AUD-PRO-DSP 3G/HD/SD-SDI Advanced Audio Processor with DSP Audio Options Support and Full Embed/De-Embed** provides a DSP-based platform that supports multiple audio DSP options. When optioned with various diverse audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows flexible tailoring of multiple proc function instances. In this manner, the 9934-AUD-PRO-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Audio proc options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-card purchase, or

field-installed as software option upgrades without removing the card from its frame. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio embed/de-embed.

Also included standard is bulk and per-channel audio delay controls that easily address lip-sync issues. Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. The 9934-AUD-PRO-DSP is available with numerous options that expand its function well beyond audio DSP and embed/de-embed to maximize frame processing density and system economy. Quality Check option **+QC** allows failover to alternate inputs or other actions based on user-configurable criteria such as black/frozen frame, audio silence or CC absence. The 9934-AUD-PRO-DSP also provides analog CVBS video inputs and outputs, and analog audio embedding and de-embedding.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits”

Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available

Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay

Full audio crosspoint with 5.1-to-stereo downmix / flexmix available for all audio outputs

CVBS analog video I/O and analog/AES embed / de-embed available

High-density design

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

**OPTIONS**

Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (**+DSP-RTL**) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details)

Dolby® Encoder Options (**+DSP-ENC**) – Available as 5.1 and 2.0 Dolby Digital and Digital Plus Encode. (See Ordering Information for full details.)

Dolby® Decoder Options (**+DSP-DEC**) – Provides Dolby Digital, Digital Plus, and E Decode

Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing

Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (**+DSP-ITU**) – Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Quality Check Option (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Logo Insertion Option (**+LOGO**) – Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.

Text-To-Speech Option (**+TTS**) – Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (**+EAS**) – Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Clean and Quiet Switching Option (**+CQS**) – Provides silence between input switches from one SDI input source to another

Add Frame Sync Option (**+FS**)

Add Extended Delay Option (**+DLY**) (Available only in conjunction with option +FS)

Add Up/Down/Cross Converter Option (**+UDX**)

Ancillary Data Processor Option (**+ANC**) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data, with insert/extract to and from IP and GPIO external interfaces.

Audio LTC I/O Option (**+LTC**)

SCTE 104 Insertion Option (**+SCTE104**)

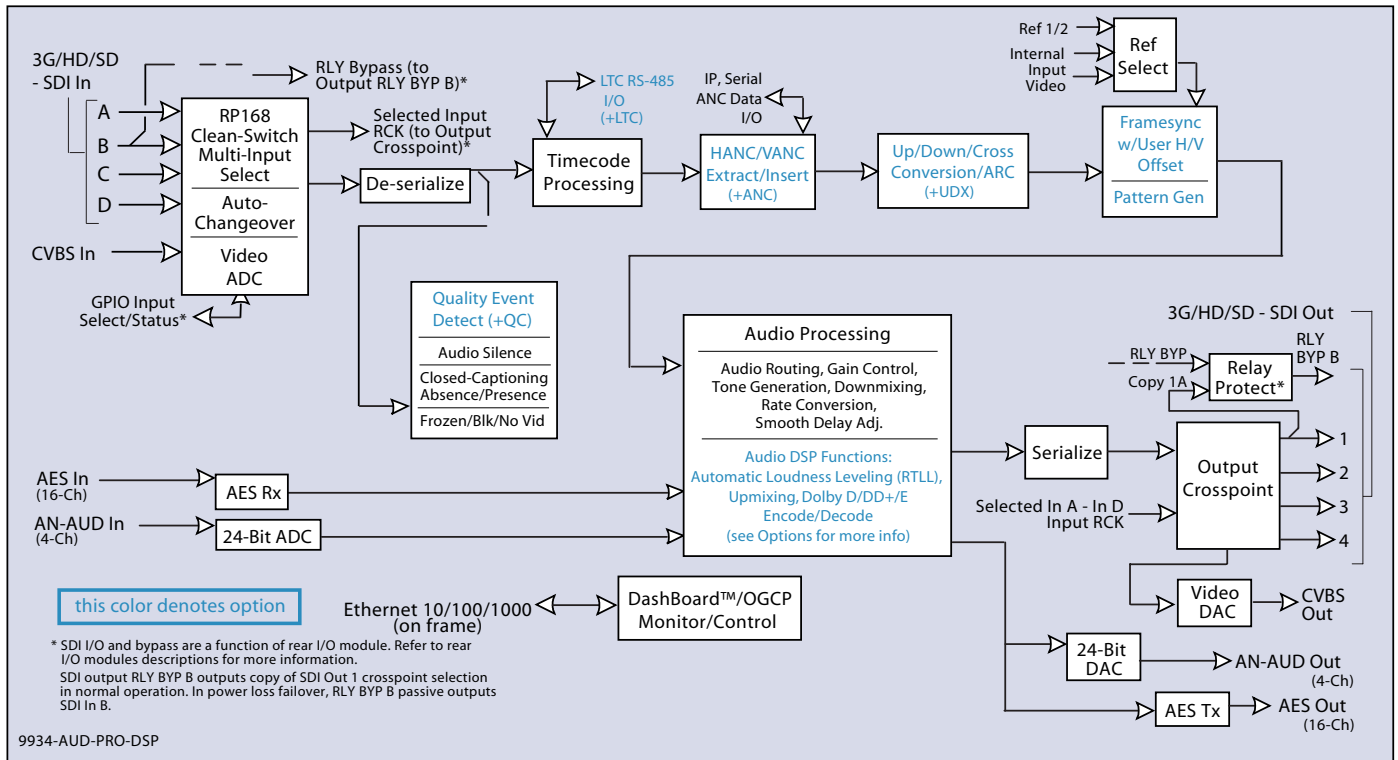
SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**)



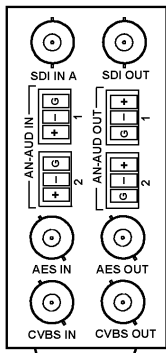
ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

9934-AUD-PRO-DSP » 3G/HD/SD-SDI ADVANCED AUDIO PROCESSOR

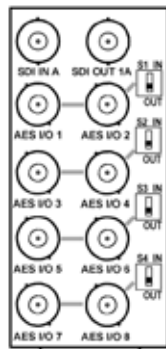
with DSP Audio Options Support and Full Embed/De-Embed



9934-AUD-PRO-DSP

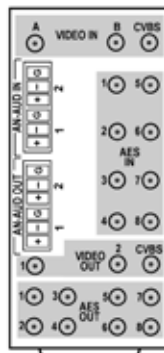


RM20-9934-B

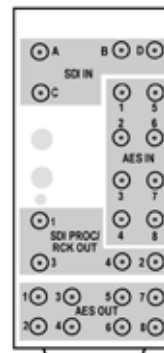


RM20-9934-C

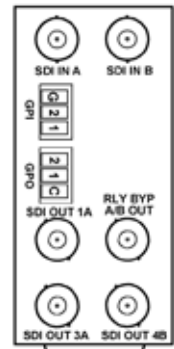
Switches S1 thru S4 set AES BNC pairs (4-ch groups) as Input (embed) or Output (de-embed).  
S1 - AES BNC 1-2  
S2 - AES BNC 3-4  
S3 - AES BNC 5-6  
S4 - AES BNC 7-8



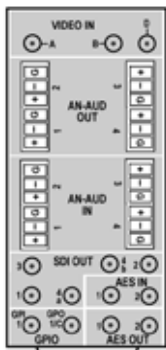
RM20-9934-D-DIN  
RM20-9934-D-HDBNC



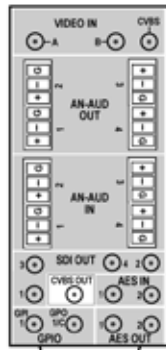
RM20-9934-E-DIN  
RM20-9934-E-HDBNC



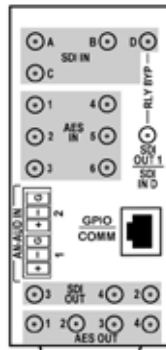
RM20-9934-F



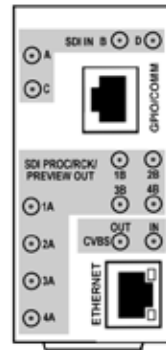
RM20-9934-H-DIN  
RM20-9934-H-HDBNC



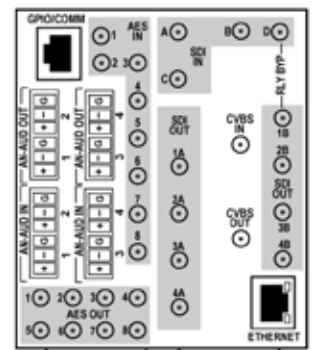
RM20-9934-J-DIN  
RM20-9934-J-HDBNC



RM20-9934-K-DIN  
RM20-9934-K-HDBNC



RM20-9934-L-DIN  
RM20-9934-L-HDBNC



RM20-9934-N-DIN  
RM20-9934-N-HDBNC

**9934-AUD-PRO-DSP » 3G/HD/SD-SDI ADVANCED AUDIO PROCESSOR**

with DSP Audio Options Support and Full Embed/De-Embed

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

24 Watts (includes +DSP options)

**SDI Inputs/Outputs**

Up to (4) 75Ω BNC inputs

Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: &gt;15 dB up to 1.485 GHz; &gt;10 dB up to 2.970 GHz

SDI Alignment Jitter: 3G/HD/SD: &lt; 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: &lt; 2.0/1.0/0.2 UI

Minimum Latency:

SD: 127 pixels; 9.4 us

720p: 330 pixels; 4.45 us

1080i: 271 pixels; 3.65 us

1080p: 361 pixels; 2.43 us

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**CVBS Video Input/Outputs**

(1) 75Ω BNC input

(1) 75Ω BNC output. CVBS output functional only when selected processed signal is carrying SD-SDI.

ADC Resolution: 9-bit

Sampling Frequency: 27 MHz (2x over-sampling)

Y/C Separation: 4 line Adaptive Comb Filter

Freq. Response: ± 0.25 dB to 5.5 MHz

SNR: &gt; 50 dB to 5.5 MHz (unweighted)

Differential Phase: &lt; 1 degree

Differential Gain: &lt; 1%

Nonlinearity &lt; 1%

**Discrete Audio Input/Outputs**

AES-3id 75Ω inputs (8 pair (16-Ch) max)

AES-3id 75Ω outputs (8 pair (16-Ch) max)

Input AES SRC Range: 32 to 96 kHz

Balanced analog audio inputs (4-Ch max)

Balanced analog audio outputs (4-Ch max)

(I/O conforms to 0 dBFS = +24 dBu)

Analog Output Impedance: &lt; 50 Ω

Analog Reference Level: -20 dBFS

Analog Nominal Level: +4 dBu

Analog Max Output Level: +24 dBu (0 dBFS)

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

Analog SNR: 115 dB (A weighted)

Analog THD+N: -96 dB (20 Hz to 10 kHz)

Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Frame Sync Audio/Video Delay (option +FS)**

Max offset: 20 frames

Latency (min): 1 frame

Option +DLY Delay (3G/HD/SD): &gt;800 msec / &gt;1580 msec / &gt;9000 msec

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.

Per-channel delay controls: -800 msec to +800 msec

**GPIO**

(2) GPI; (2) GPO

ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

**9934-AUD-PRO-DSP » 3G/HD/SD-SDI ADVANCED AUDIO PROCESSOR**

with DSP Audio Options Support and Full Embed/De-Embed

**ORDERING INFORMATION**

**9934-AUD-PRO-DSP** 3G/HD/SD-SDI Advanced Audio Processor with DSP Audio Options Support and Full Embed/De-Embed

**Note:** On this DSP-equipped card, an adjacent card **will not** fit into the immediately adjacent slot to the front-of-frame **right**. (For example, if DSP-equipped card is in slot 8, an adjacent card will not fit in slot 9. This would be the case of an adjacent card that installs into an odd frame slot, or the case where a Split Rear Module serves two cards in the adjacent odd/even slot pairs (in this example slots 9/10)).

**RM20-9934-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video Input BNC, (2) Balanced Analog Audio Inputs, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC, (2) Balanced Analog Audio Outputs

**RM20-9934-C** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (8) AES I/O BNCs (I/O switch selectable), (1) 3G/HD/SD-SDI Output BNC

**RM20-9934-D-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9934-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

**RM20-9934-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3.)

**RM20-9934-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs (All coaxial connectors HD-BNC.)

**RM20-9934-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

**RM20-9934-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9934-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (5) 3G/HD/SD-SDI Outputs, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9934-J-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3.)

**RM20-9934-J-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)

**RM20-9934-K-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors DIN1.0/2.3)

**RM20-9934-K-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) 3G/HD/SD-SDI Outputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (2) Balanced Analog Audio Inputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors HD-BNC)

**RM20-9934-L-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9934-L-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs, (1) CVBS Input, (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), (1) CVBS Output, COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**RM20-9934-N-DIN** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)

**RM20-9934-N-HDBNC** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Analog Video In, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs (1 with relay bypass protect), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**9934-AUD-PRO-DSP » 3G/HD/SD-SDI ADVANCED AUDIO PROCESSOR**  
with DSP Audio Options Support and Full Embed/De-Embed

**ORDERING INFORMATION (cont.)**

**Options:**

- +DSP-RTLL-5.1 Dolby® RTLL™ 5.1-Channel Loudness Processor Option
- +DSP-RTLL-2.0 Dolby® RTLL™ Stereo Loudness Processor Option
- +DSP-ENCD-5.1 Dolby® Digital/Digital Plus 5.1 Encoder
- +DSP-ENCD-2.0 Dolby® Digital/Digital Plus 2.0 Encoder
- +DSP-DEC Dolby® Decoder
- +DSP-UPMIX-LA Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer
- +DSP-LP-5.1 Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option
- +DSP-LP-2.0 Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option
- +DSP-ITU-5.1 Audyne ITU 5.1-Channel Loudness Leveler Option (1)
- +DSP-ITU-2.0 Audyne ITU 2.0-Channel Loudness Leveler Option (1)
- +LOGO Logo Insertion Option
- +ANC Ancillary Data Processor Option
- +FS Add Frame Sync Option
- +DLY Extended Frame Sync Delay Option (available only in conjunction with option +FS)
- +UDX Add Up/Down/Cross Converter Option
- +LTC Audio LTC I/O Option
- +QC Quality Check Option
- +CQS Clean and Quiet Switching Option
- +TTS Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Installation requires option upload and installation of speech library SD memory card onto host card. Pre-loaded SD card and instructions provided.)
- +2L-SPAN Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)
- +EAS Emergency Alert System Text Crawl Generation Option
- +SCTE104 SCTE 104 Insertion Option
- +SCTE104-FAST Frame-Accurate SCTE 104 Trigger Insertion Option

(1) Manufactured under license from Audyne Inc.

ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

**BBG-1034-AUD-PRO-DSP » 3G/HD/SD-SDI STANDALONE ADVANCED AUDIO PROCESSOR**

with DSP Audio Options Support and Full Embed/De-Embed



The Cobalt® **BBG-1034-AUD-PRO-DSP Standalone 3G/HD/SD-SDI Advanced Audio Processor with DSP Audio Options Support and Full Embed/De-Embed** provides a DSP-based platform that supports multiple audio DSP options. When optioned with various diverse audio processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows flexible tailoring of multiple proc function instances. In this manner, the BBG-1034-AUD-PRO-DSP provides much more flexibility than other audio processors that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Audio proc options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-device purchase, or field-installed as software option upgrades. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio embed/de-embed.

Also included standard is bulk and per-channel audio delay controls that easily address lip-sync issues. Option **+TTS** provides high-quality Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons.

Quality Check option **+QC** allows failover to alternate inputs or other actions based on user-configurable criteria such as black/frozen frame, audio silence or CC absence. The BBG-1034-AUD-PRO-DSP also provides analog CVBS video inputs and outputs, and analog audio embedding and de-embedding.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1034-AUD-PRO-DSP can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1034-AUD-PRO-DSP allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19” frame).

**FEATURES**

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits”

Dolby encoding/decoding, loudness processing, and upmixing DSP audio options available

Auto Adjust feature helps assure lip sync by assessing and alerting where DSP processing requires matching video delay

Advanced audio processing allows routing, gain, smooth delay, and flexible mixing as standard features

Full audio crosspoint with 5.1-to-stereo downmix (standard) available for all audio outputs

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

CVBS analog video I/O and analog/AES embed / de-embed available

Option **+TTS** provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units

Compact footprint - up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software or Web Browser User Interface

Five year warranty

**OPTIONS**

Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (**+DSP-RTL**) - Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) - Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing

Linear Acoustic® AEROMAX™ Loudness Processor Options (**+DSP-LP**) - Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Audyne ITU Loudness Leveler Options (**+DSP-ITU**) - Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Dolby® Encoder Options (**+DSP-ENC**) - Available as 5.1 and 2.0 Dolby Digital and Digital Plus Encode. (See Ordering Information for full details.)

Dolby® Decoder Options (**+DSP-DEC**) - Provides Dolby Digital, Digital Plus, and E Decode

Logo Insertion Option (**+LOGO**) - Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.

Quality Check Option (**+QC**) - Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Text-To-Speech Option (**+TTS**) - Provides Text-To-Speech synthesis, directly converting EAS text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.

Emergency Alert System Text Crawl Generation Option (**+EAS**) - Provides a single-device solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logos. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.

Clean and Quiet Switching Option (**+CQS**) - Provides silence between input switches from one SDI input source to another

Add Frame Sync Option (**+FS**)

Add Extended Delay Option (**+DLY**) (Available only in conjunction with option +FS)

Add Up/Down/Cross Converter Option (**+UDX**)

Ancillary Data Processor Option (**+ANC**) - Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data

Audio LTC I/O Option (**+LTC**)

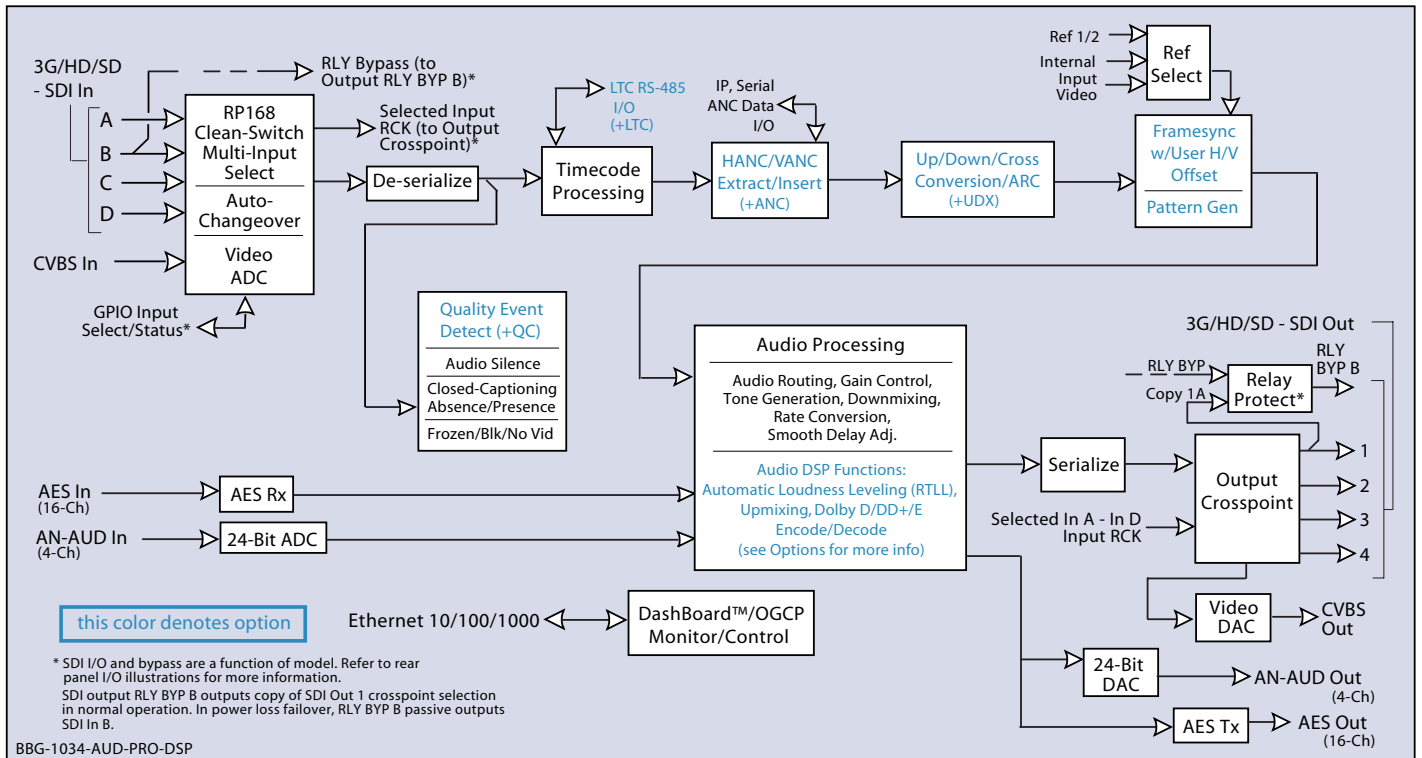
SCTE 104 Insertion Option (**+SCTE104**)

SCTE104 Frame-Accurate SCTE Trigger Insertion Option (**+SCTE104-FAST**)

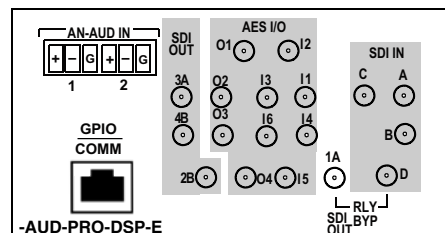
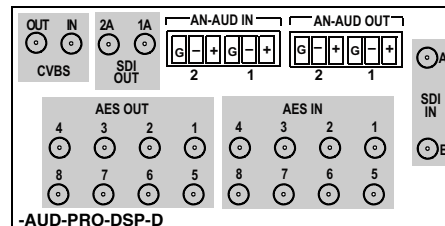
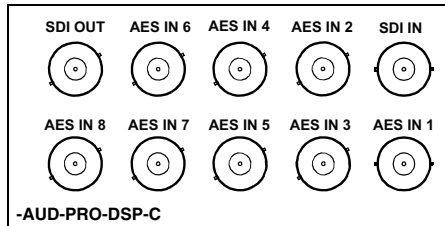
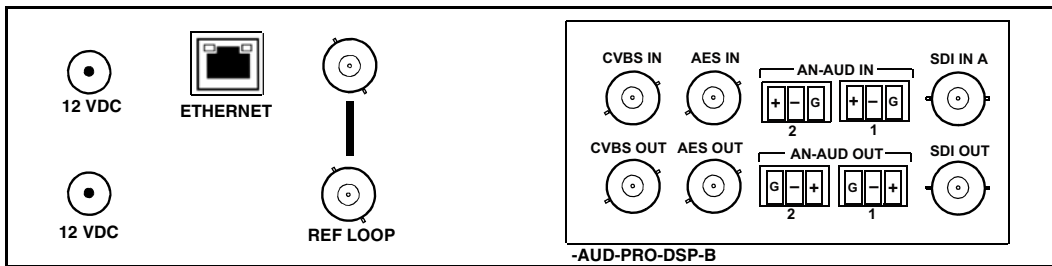
ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

**BBG-1034-AUD-PRO-DSP » 3G/HD/SD-SDI STANDALONE ADVANCED AUDIO PROCESSOR**

with DSP Audio Options Support and Full Embed/De-Embed



**Rear Panel**



-AUD-PRO-DSP-E



## BBG-1034-AUD-PRO-DSP » 3G/HD/SD-SDI STANDALONE ADVANCED AUDIO PROCESSOR

with DSP Audio Options Support and Full Embed/De-Embed

### SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of model. See Ordering Information for details.

#### Power

24 Watts (includes +DSP options). Power supplied by 12VDC AC adapter, universal input (included).

#### SDI Inputs/Outputs

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

Minimum Latency:

SD: 127 pixels; 9.4 us  
 720p: 330 pixels; 4.45 us  
 1080i: 271 pixels; 3.65 us  
 1080p: 361 pixels; 2.43 us

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

#### CVBS Video Input/Outputs

(1) 75Ω BNC input  
 (1) 75Ω BNC output. CVBS output functional only when selected processed signal is carrying SD-SDI.  
 ADC Resolution: 9-bit  
 Sampling Frequency: 27 MHz (2x over-sampling)  
 Y/C Separation: 4 line Adaptive Comb Filter  
 Freq. Response: ± 0.25 dB to 5.5 MHz  
 SNR: > 50 dB to 5.5 MHz (unweighted)  
 Differential Phase: < 1 degree  
 Differential Gain: < 1%  
 Nonlinearity < 1%

#### Discrete Audio Input/Outputs

AES-3id 75Ω inputs (8 pair (16-Ch) max)  
 AES-3id 75Ω outputs (8 pair (16-Ch) max)  
 Input AES SRC Range: 32 to 96 kHz  
 Balanced analog audio inputs (4-Ch max)  
 Balanced analog audio outputs (4-Ch max)  
 (I/O conforms to 0 dBFS = +24 dBu)  
 Analog Output Impedance: < 50 Ω  
 Analog Reference Level: -20 dBFS  
 Analog Nominal Level: +4 dBu  
 Analog Max Output Level: +24 dBu (0 dBFS)  
 Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
 Analog SNR: 115 dB (A weighted)  
 Analog THD+N: -96 dB (20 Hz to 10 kHz)  
 Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

#### Frame Sync Audio/Video Delay (option +FS)

Max offset: 20 frames  
 Latency (min): 1 frame  
 Option +DLY Delay (3G/HD/SD): >800 msec / >1580 msec / >9000 msec

#### User Audio Delay Offset from Video

Bulk delay control: -33 msec to +3000 msec.  
 Per-channel delay controls: -800 msec to +800 msec

#### GPIO

(2) GPI; (2) GPO

#### Control/Monitor Interface

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

#### Physical

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
 Weight: 6 lb (2.8 kg)

**BBG-1034-AUD-PRO-DSP » 3G/HD/SD-SDI STANDALONE ADVANCED AUDIO PROCESSOR**  
with DSP Audio Options Support and Full Embed/De-Embed

**ORDERING INFORMATION**

**BBG-1034-AUD-PRO-DSP** 3G/HD/SD-SDI Standalone Advanced Audio Processor with DSP Audio Options Support and Full Embed/De-Embed, available in the following rear-panel I/O configurations:

**BBG-1034-AUD-PRO-DSP-B** (1) 3G/HD/SD-SDI Input BNC, (1) CVBS Video Input BNC, (1) AES Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) AES Output BNC

**BBG-1034-AUD-PRO-DSP-C** (1) 3G/HD/SD-SDI Input BNC, (8) AES Input BNCs, (1) 3G/HD/SD-SDI Output BNC

**BBG-1034-AUD-PRO-DSP-D-DIN** (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors DIN1.0/2.3.)

**BBG-1034-AUD-PRO-DSP-D-HDBNC** (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

**BBG-1034-AUD-PRO-DSP-E-DIN** (4) 3G/HD/SD-SDI Inputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (4) AES Outputs, (2) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) GPIO RJ-45 connector (All coaxial connectors DIN1.0/2.3.)

**BBG-1034-AUD-PRO-DSP-E-HDBNC** (4) 3G/HD/SD-SDI Inputs (one 3G/HD/SDI Output with relay bypass failover), (6) AES Inputs, (4) AES Outputs, (2) Balanced Analog Audio Inputs, (4) 3G/HD/SD-SDI Outputs, (1) GPIO RJ-45 connector (All coaxial connectors HD-BNC.)

**Options and Accessories:**

**+DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option

**+DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option

**+DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder

**+DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder

**+DSP-DEC** Dolby® Decoder

**+DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer

**+DSP-LP-5.1** Linear Acoustic® AEROMAX™ 5.1-Channel Loudness Processor Option

**+DSP-LP-2.0** Linear Acoustic® AEROMAX™ 2-Channel Loudness Processor Option

**+DSP-ITU-5.1** Audyne ITU 5.1-Channel Loudness Leveler Option (1)

**+DSP-ITU-2.0** Audyne ITU 2.0-Channel Loudness Leveler Option (1)

**+LOGO** Logo Insertion Option

**+ANC** Ancillary Data Processor Option

**+FS** Add Frame Sync Option

**+DLY** Extended Frame Sync Delay Option (available only in conjunction with option +FS)

**+UDX** Add Up/Down/Cross Converter Option

**+QC** Quality Check Option

**+CQS** Clean and Quiet Switching Option

**+TTS** Text-To-Speech Option (Acapela Text-To-Speech from Acapela Group™. Fielded units must be returned to Cobalt for installation of speech library SD memory card onto host unit as well as software upload. Please contact Support for more information.)

**+2L-SPAN** Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)

**+EAS** Emergency Alert System Text Crawl Generation Option

**+LTC** Audio LTC I/O Option

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

(1) Manufactured under license from Audyne Inc.

ADVANCED AUDIO PROCESSOR WITH DSP AUDIO OPTIONS SUPPORT

**+DSP » DSP-BASED DOLBY® ENCODE/DECODE, LOUDNESS PROCESSING, AND UPMIXING AUDIO OPTIONS**

Our latest **+DSP** suite of DSP-based audio processing features represents our greatest single-device audio proc capacity. The DSP-based platform supports multiple audio DSP options using a processing core (which supports numerous simultaneous processing engines) that uses license “credits” which allows flexible tailoring of multiple proc function instances. In this manner, the **+DSP** option provides much more flexibility than other audio processor packages that used fixed processing assets (for example, this flexibility allows “trading” credits for more Dolby encoders while backing out of loudness processors or other engine assets).

Audio proc options include Dolby® Real-Time Loudness Leveling automatic loudness processing, Dolby® encode/decode, and Linear Acoustic® UPMAX™ automatic upmixing. DSP options can be ordered with new-card purchase, or field-installed as software option upgrades.

Multiple instances of Dolby encoding, loudness processing, and upmixing can be supported on the same card.

- **Dolby® Digital/Digital Plus™ Encoding (ENCD-5.1 / ENCD-2.0)** – Provides Dolby® Digital/Digital Plus™ encoding from any combination of audio sources supported by the card (including upmixed and loudness-processed signals). Full metadata support using internally generated or external metadata via SMPTE 2020, or from a same-card decoder. Available in 5.1 or 2.0 versions.
- **Dolby® Decoding** – Provides Dolby® Digital/Digital Plus™/E decode from any card digital audio channel pair, with Digital/Digital Plus dynamic range control and full bitstream summary displays.
- **Dolby® Real-Time Loudness Leveling Loudness Processing (RTLL-5.1 / RTLL-2.0)** – Provides full-featured loudness processing, including peak limit, aggressiveness, and dialog intelligence modes. Available in 5.1 or 2.0 versions.
- **Linear Acoustic® UPMAX™ Upmixing (UPMIX-LA)** – Featuring Linear Acoustic UPMAX™ technology, the 5.1 upmixer uses any stereo pair accommodated by the card and generates a six-channel 5.1 complement (L, R, C, LFE, Ls, Rs) from the stereo source, thereby allowing legacy stereo programming to adapt to and fully utilize 5.1-channel audio capabilities.

**Option**

**+DSP**  
Audio DSP Options

- +DSP-ENCD – Dolby® 5.1/2.0 D/D+ Encode
- +DSP-DEC – Dolby® Decode
- +DSP-RTLL – 5.1/2.0 Loudness Processing
- +DSP-UPMIX-LA – UPMAX™ Upmixing



**FEATURES**

DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits”

Dolby D/D+ encoding and D/D+/E decoding options, with multiple encoders/decoders enabled on the same card/device

Dolby Real-Time Loudness Leveling (RTLL) loudness leveling with full parametric control setup, with multiple loudness processors enabled on the same card/device

Linear Acoustic UPMAX™ DSP audio option available, with multiple upmixers enabled on the same card/device

Provides up to eight processing engines that can be set as Dolby encoders/decoders, loudness processors, or upmixers as desired. Multiple-instance functionality supports multiple-stream audio such as SAP and multi-language.

**OPTIONS**

Dolby® Encoder Options (**+DSP-ENC**) – Available as Dolby Digital/Digital Plus™

Dolby® Decoder Options (**+DSP-DEC**) – Provides Dolby Digital, Digital Plus, and E decode

Dolby® Real-Time Loudness Leveling Automatic Loudness Processing Options (**+DSP-RTLL**) – Provides advanced loudness processing with comprehensive parametric controls. Available as surround 5.1 and stereo 2.0. (See Ordering Information for full details.)

Linear Acoustic® UPMAX™ Upmixing (**+DSP-UPMIX-LA**) – Provides automatic 2.0-to-5.1 Linear Acoustic® UPMAX™ upmixing

**ORDERING INFORMATION**

**Note:** DSP options are supported only on certain latest-revision card and BBG-1000 models that are factory-equipped for DSP support (identified with **-DSP** in their part numbers). Available now are openGear models 9934-AUD-PRO, 9902-UDX-DSP, and 9902-UDX-DSP-CI, as well as standalone models BBG-1034-AUD-PRO and BBG-1002-UDX-DSP which support all options listed here.

**+DSP-RTLL-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option

**+DSP-RTLL-2.0** Dolby® RTLL™ Stereo Loudness Processor Option

**+DSP-ENCD-5.1** Dolby® Digital/Digital Plus 5.1 Encoder

**+DSP-ENCD-2.0** Dolby® Digital/Digital Plus 2.0 Encoder

**+DSP-DEC** Dolby® Decoder

**+DSP-UPMIX-LA** Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer

3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**9980-CSC-3G » 3G/HD/SD-SDI RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



The Cobalt® **9980-CSC-3G 3G/HD/SD-SDI RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support** provides a high-density card-based solution that includes an advanced frame sync/pattern generator in addition to a full-featured SD/HD/3G color corrector. The 9980-CSC-3G offers RGB-space color correction with YCbCr proc features with RGB processing controls providing full offset, gain and gamma adjustments. The YCbCr proc controls provide lift, gain, saturation, phase, white clip (hard and soft), black clip, and color saturation clip.

The built-in pattern generator (which provides calibrated 75% or 100% color bars among other patterns) preceding the color correction block allows setting custom calibration offsets to compensate for on-set monitor/camera colorimetry, with the custom settings saved to a preset, resulting in one-button recall of monitor/camera calibration settings. Any custom settings can be saved to user presets for instant recall via Dashboard or our intuitive OGCP-9000/CC Color Correction Remote Control Panel.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern while not changing any other processing settings or aspects. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Full RGB color corrector (offset, gain, gamma)

Frame Sync with full H/V offset and manual/LOS video pattern generator. Color corrector preceded by pattern generator allows custom offset calibrations for on-set monitor/camera colorimetry characteristics.

Passes entire YCbCr gamut in unity gain configuration

10-bit gamma LUT

Extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Phase preserved when applying saturation clip

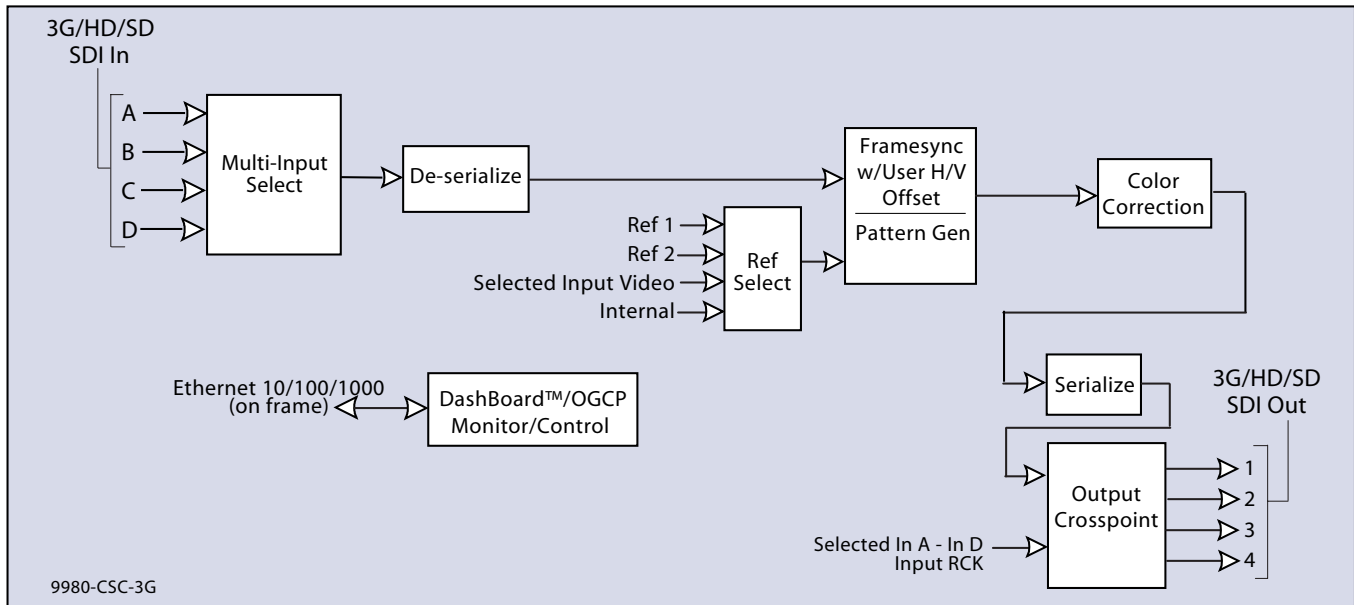
One button bypass of color correction for comparison purposes

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000/CC remote control panel. Award-winning OGCP-9000/CC Remote Control Panel provides fast and intuitive color correction control.

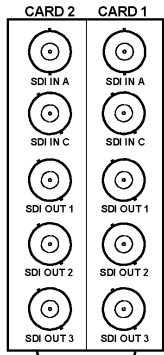
Hot-swappable

Five year warranty

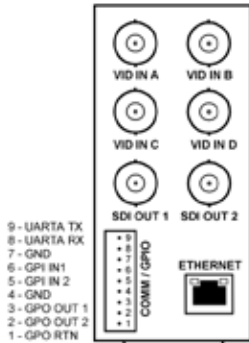


3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**9980-CSC-3G » 3G/HD/SD-SDI RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



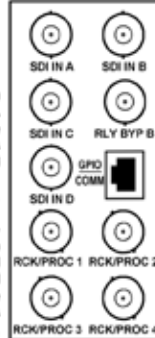
RM20-9980-A/S



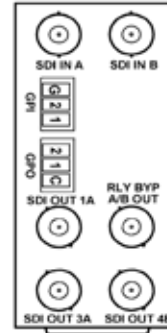
RM20-9980-B

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

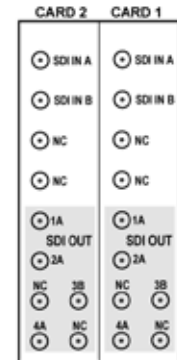
RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



RM20-9980-C



RM20-9980-F



RM20-9980-GIS-DIN  
RM20-9980-GIS-HDBNC

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled):  
SD: 127 pixels; 9.4 us  
720p: 330 pixels; 4.45 us  
1080i: 271 pixels; 3.65 us  
1080p: 361 pixels; 2.43 us  
Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
Latency (min): 1 frame

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
Return Loss: >35 dB up to 5.75 MHz

**RGB Color Correction**

RGB Black Adjust: -100% to 100% in 0.1% steps  
RGB White Adjust: 0% to 200% in 0.1% steps  
RGB Gamma Control: 0.125 to 8.0 in 0.001 steps

**YCbCr Processing Amp**

White Adjust (Gain): 0 to 200% in 0.1% steps  
Black Adjust (Lift): -100% to 100% in 0.1% steps  
C Gain (Saturation): 0% to 200% in 0.1% steps  
Color Phase: -360° to +360° in 0.1 degree steps

**YCbCr Clip**

Y Black hard clip (values limited at or above): -6.8% to 50% in 0.1% steps  
Y White hard clip (values limited at or below): 50% to 109.1% in 0.1% steps  
Y White soft clip (values rolled off at): 50% to 109.1% in 0.1% steps  
CbCr Saturation clip (values limited at or below): 50% to 160% in 0.1% steps

**ORDERING INFORMATION**

**9980-CSC-3G** 3G/HD/SD-SDI RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

**RM20-9980-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Relocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9980-B** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Input BNCs, (2) 3G/HD/SD-SDI Output BNCs, COMM/GPIO Port, Ethernet Port

**RM20-9980-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9980-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Relocked of selected input, (2) GPI, (2) GPO

**RM20-9980-G/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9980-G/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**OGCP-9000/CC** 2RU Remote Control Panel for Color Correction (Specify country of destination for power cord)

3G/HD/SD-SDI COLOR CORRECTORS (OPENGEAR CARDS AND STANDALONE MODELS)

**BBG-1080-CSC-3G » 3G/HD/SD-SDI STANDALONE RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



The Cobalt® **BBG-1080-CSC-3G 3G/HD/SD-SDI Standalone RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support** provides a high-density standalone solution that includes an advanced frame sync/pattern generator in addition to a full-featured SD/HD/3G color corrector. The BBG-1080-CSC-3G offers RGB-space color correction with YCbCr proc features with RGB processing controls providing full offset, gain and gamma adjustments. The YCbCr proc controls provide lift, gain, saturation, phase, white clip (hard and soft), black clip, and color saturation clip.

The built-in pattern generator preceding the color correction block allows patterns (such as 75% or 100% bars) to be pre-emphasized or de-emphasized by the color corrector to match on-set camera colorimetry, with the custom settings saved to a preset, resulting in one-button recall of monitor/camera calibration settings. Any custom settings can be saved to user presets for instant recall via DashBoard or our intuitive OGCP-9000/CC Color Correction Remote Control Panel.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1080-CSC-3G can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1080-CSC allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Full RGB color corrector (offset, gain, gamma)

Frame Sync with full H/V offset and manual/LOS video pattern generator. Pattern generator in front of color corrector provides custom offset calibrations for on-set monitor/camera characteristics calibrated settings

Passes entire YCbCr gamut in unity gain configuration

10-bit gamma LUT

Extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Phase preserved when applying saturation clip

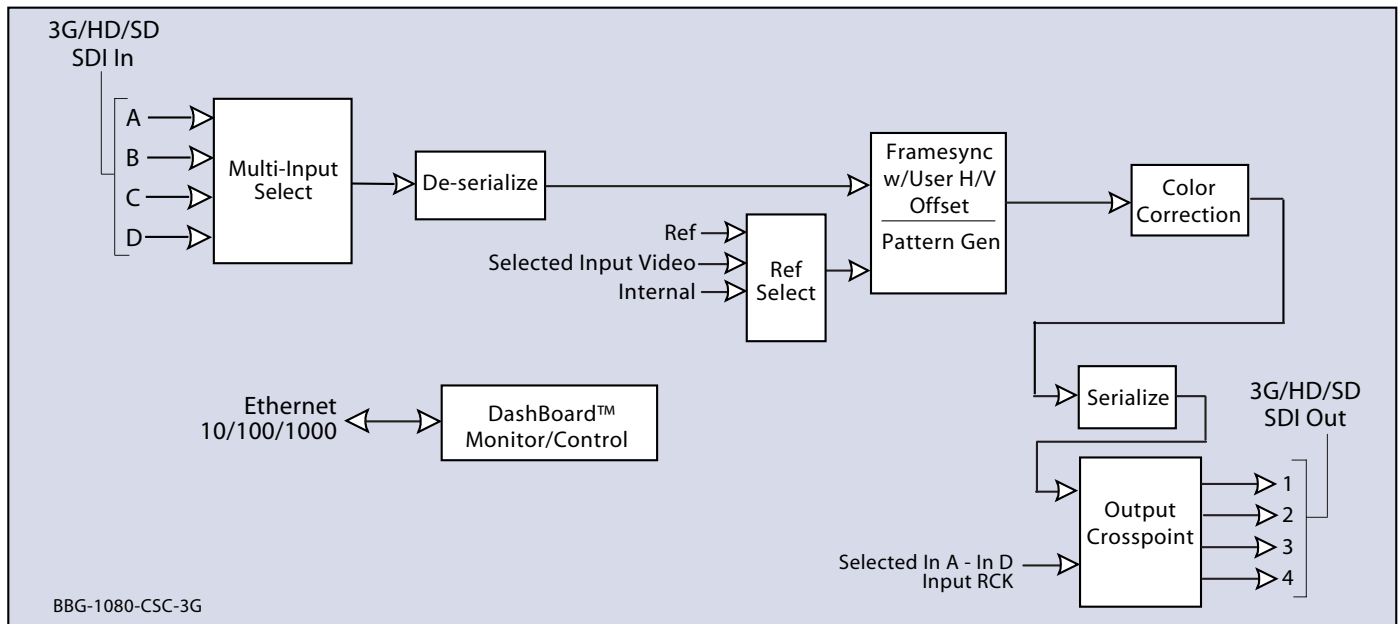
One button bypass of color correction for comparison purposes

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

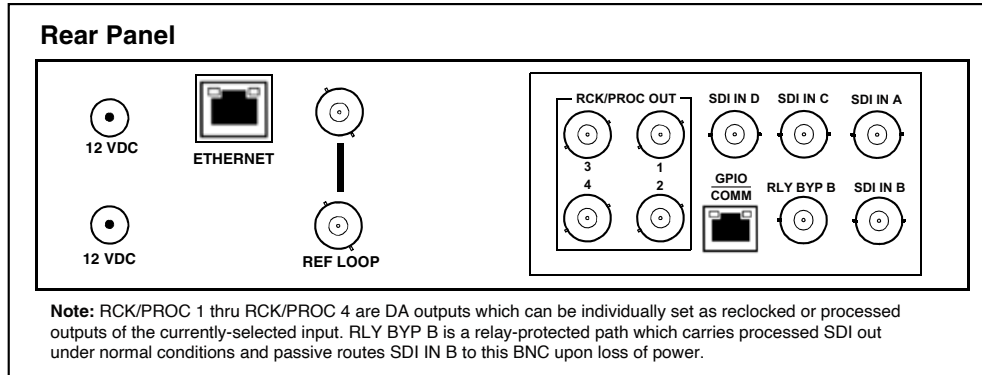
Uses DashBoard remote control (device appears as single-card frame)

Five year warranty



3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1080-CSC-3G » 3G/HD/SD-SDI STANDALONE RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**Frame Sync Delay**

Max offset: 20 frames  
Latency (min): 1 frame

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
Return Loss: >35 dB up to 5.75 MHz

**RGB Color Correction**

RGB Black Adjust (one per primary): -100% to 100% in 0.1% steps  
RGB White Adjust (one per primary): 0% to 200% in 0.1% steps  
RGB Gamma Control (one per primary): 0.125 to 8.0 in 0.001 steps

**YCbCr Processing Amp**

White Adjust (Gain): 0 to 200% in 0.1% steps  
Black Adjust (Lift): -100% to 100% in 0.1% steps  
C Gain (Saturation): 0% to 200% in 0.1% steps  
Color Phase: -360° to + 360° in 0.1 degree steps

**YCbCr Clip**

Y Black hard clip (values limited at or above): -6.8% to 50% in 0.1% steps  
Y White hard clip (values limited at or below): 50% to 109.1% in 0.1% steps  
Y White soft clip (values rolled off at): 50% to 109.1% in 0.1% steps  
CbCr Saturation clip (values limited at or below): 50% to 160% in 0.1% steps

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1080-CSC-3G** 3G/HD/SD-SDI Standalone RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

**OGCP-9000/CC** 2RU Remote Control Panel for Color Correction (Specify country of destination for power cord)

3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**9980-2CSC-3G » 3G/HD/SD-SDI DUAL-CHANNEL RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



The Cobalt® 9980-2CSC-3G 3G/HD/SD-SDI Dual-Channel RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support offers two independent signal paths of color correction/frame sync on a single open-Gear® card. Using our HPF-9000 20-slot frame, this provides up to 40 channels of processing in a single frame. The 9980-2CSC-3G offers dual independent RGB-space color correction channels with YCbCr proc features with RGB processing controls providing full offset, gain and gamma adjustments. The YCbCr proc controls provide lift, gain, saturation, phase, white clip (hard and soft), black clip, and color saturation clip.

Two independent built-in pattern generators (which provide calibrated 75% or 100% color bars among other patterns) preceding the color correction blocks allow setting custom calibration offsets to compensate for on-set monitor/camera colorimetry, with the custom settings saved to a preset, resulting in one-button recall of monitor/camera calibration settings. Any custom settings can be saved to user presets for instant recall via DashBoard or our intuitive OGCP-9000/CC Color Correction Remote Control Panel. The space-saving design of the 9980-2CSC provides for high

density, allowing two cards to be collocated in adjacent slots and served by a single, standard width "split" rear module. This provides four video paths per each pair of slots, readily providing 20 channels of processing in only 10 slots.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Two independent processing paths per card – 20 channels of processing in only 10 slots

Full dual-channel independent RGB color correction (offset, gain, gamma)

Dual Frame Sync with full H/V offset and manual/LOS video pattern generator. Color corrector preceded by pattern generator allows custom offset calibrations for on-set monitor/camera colorimetry characteristics.

Passes entire YCbCr gamut in unity gain configuration

Extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Phase preserved when applying saturation clip

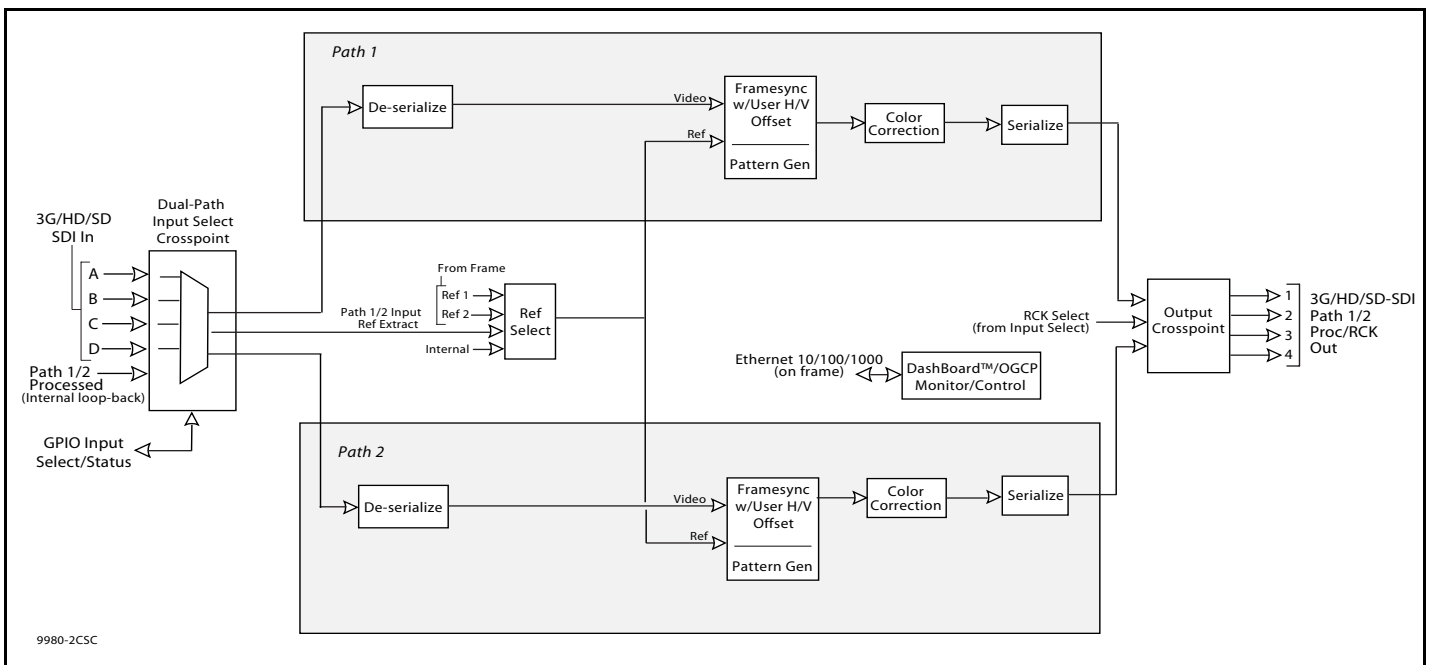
One button bypass of color correction for comparison purposes

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via DashBoard™ software or OGCP-9000/CC remote control panel. Award-winning OGCP-9000/CC Remote Control Panel provides fast and intuitive color correction control.

Hot-swappable

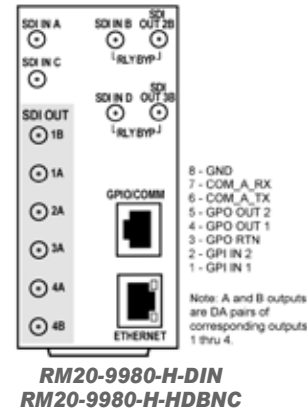
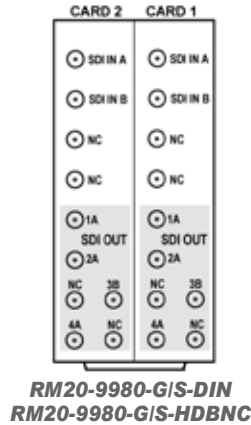
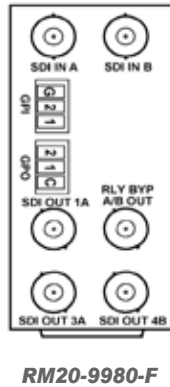
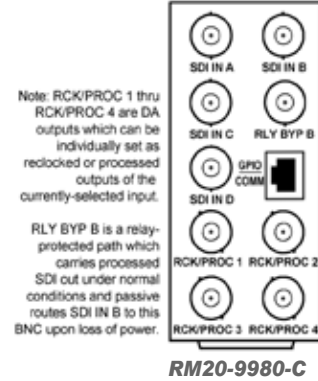
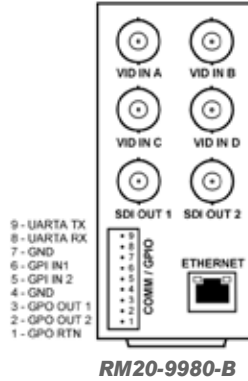
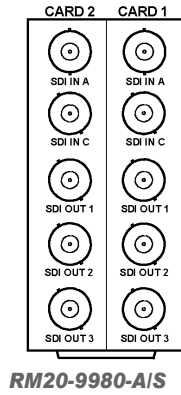
Five year warranty





3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**9980-2CSC-3G » 3G/HD/SD-SDI DUAL-CHANNEL RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled):  
SD: 127 pixels; 9.4 us  
720p: 330 pixels; 4.45 us  
1080i: 271 pixels; 3.65 us  
1080p: 361 pixels; 2.43 us

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
Latency (min): 1 frame

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".  
Return Loss: >35 dB up to 5.75 MHz

**RGB Color Correction (individual controls per proc channel)**

RGB Black Adjust (one per primary): -100% to 100% in 0.1% steps  
RGB White Adjust (one per primary): 0% to 200% in 0.1% steps  
RGB Gamma Control (one per primary): 0.125 to 8.0 in 0.001 steps

**YCbCr Processing Amp**

White Adjust (Gain): 0 to 200% in 0.1% steps  
Black Adjust (Lift): -100% to 100% in 0.1% steps  
C Gain (Saturation): 0% to 200% in 0.1% steps  
Color Phase: -360° to +360° in 0.1 degree steps

**YCbCr Clip**

Y Black hard clip (values limited at or above): -6.8% to 50% in 0.1% steps  
Y White hard clip (values limited at or below): 50% to 109.1% in 0.1% steps  
Y White soft clip (values rolled off at): 50% to 109.1% in 0.1% steps  
CbCr Saturation clip (values limited at or below): 50% to 160% in 0.1% steps

**3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)**

**9980-2CSC-3G » 3G/HD/SD-SDI DUAL-CHANNEL RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

**ORDERING INFORMATION**

**9980-2CSC-3G** 3G/HD/SD-SDI Dual-Channel RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

**RM20-9980-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9980-B** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Input BNCs, (2) 3G/HD/SD-SDI Output BNCs, COMM/GPIO Port, Ethernet Port

**RM20-9980-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9980-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as Processed or Reclocked of selected input, (2) GPI, (2) GPO

**RM20-9980-G/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9980-G/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9980-H-DIN** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors DIN1.0/2.3)

**RM20-9980-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SD-SDI Inputs (2 with independent relay bypass), (8) 3G/HD/SD-SDI Outputs (1x2 DA output of each crosspoint out), COMM/GPIO RJ-45 connector, Ethernet Port (All coaxial connectors HD-BNC)

**OGCP-9000/CC** 2RU Remote Control Panel for Color Correction (Specify country of destination for power cord)

3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1080-2CSC-3G » 3G/HD/SD-SDI DUAL-CHANNEL STANDALONE RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



The Cobalt® **BBG-1080-2CSC-3G 3G/HD/SD-SDI Dual-Channel Standalone RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support** offers **two independent signal paths of color correction/frame sync** in a standalone unit.

The BBG-1080-2CSC-3G offers dual independent RGB-space color correction channels with YCbCr proc features with RGB processing controls providing full offset, gain and gamma adjustments. The YCbCr proc controls provide lift, gain, saturation, phase, white clip (hard and soft), black clip, and color saturation clip. Two independent built-in pattern generators (which provide calibrated 75% or 100% color bars among other patterns) preceding the color correction blocks allow setting custom calibration offsets to compensate for on-set monitor/camera colorimetry, with the custom settings saved to a preset, resulting in one-button recall of monitor/camera calibration settings. Any custom settings can be saved to user presets for instant recall via DashBoard or our intuitive OGCP-9000/CC Color Correction Remote Control Panel.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1080-2CSC-3G can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1080-2CSC allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Two independent processing paths

Full dual-channel independent RGB color correction (offset, gain, gamma)

Dual Frame Sync with full H/V offset and manual/LOS video pattern generator. Color corrector preceded by pattern generator allows custom offset calibrations for on-set monitor/camera colorimetry characteristics.

Passes entire YCbCr gamut in unity gain configuration

10-bit gamma LUT. Extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Phase preserved when applying saturation clip

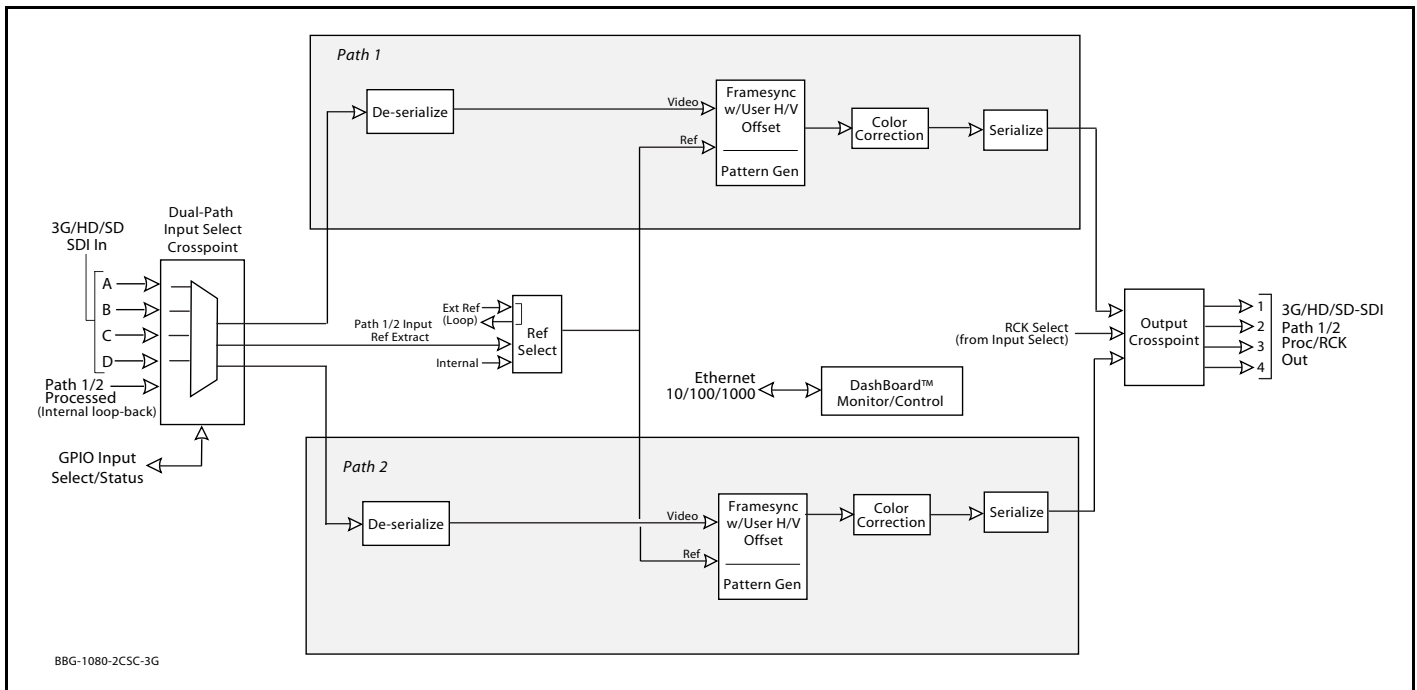
One button bypass of color correction for comparison purposes

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

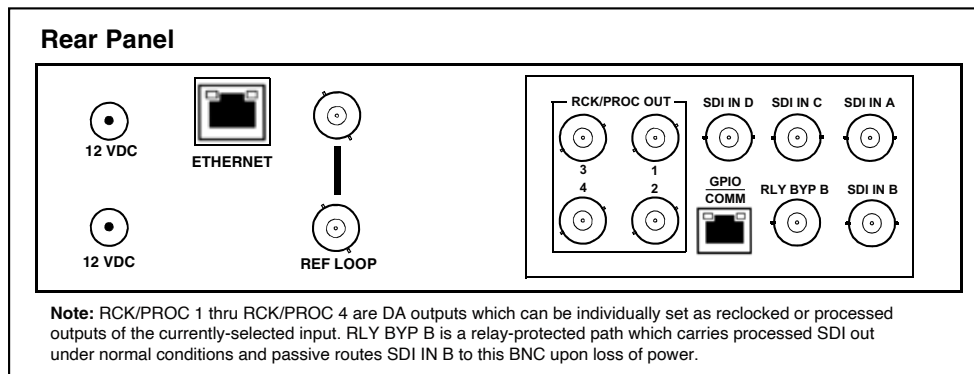
Uses DashBoard remote control (device appears as single-card frame)

Five year warranty



3G/HD/SD-SDI COLOR CORRECTORS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1080-2CSC-3G » 3G/HD/SD-SDI DUAL-CHANNEL STANDALONE RGB COLOR SPACE CORRECTOR / FRAME SYNC**  
with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support



**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**Frame Sync Audio/Video Delay**

Max offset: 20 frames  
Latency (min): 1 frame

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
Return Loss: >35 dB up to 5.75 MHz

**RGB Color Correction**

RGB Black Adjust (one per primary): -100% to 100% in 0.1% steps  
RGB White Adjust (one per primary): 0% to 200% in 0.1% steps  
RGB Gamma Control (one per primary): 0.125 to 8.0 in 0.001 steps

**YCbCr Processing Amp**

White Adjust (Gain): 0 to 200% in 0.1% steps  
Black Adjust (Lift): -100% to 100% in 0.1% steps  
C Gain (Saturation): 0% to 200% in 0.1% steps  
Color Phase: -360° to + 360° in 0.1 degree steps

**YCbCr Clip**

Y Black hard clip (values limited at or above): -6.8% to 50% in 0.1% steps  
Y White hard clip (values limited at or below): 50% to 109.1% in 0.1% steps  
Y White soft clip (values rolled off at): 50% to 109.1% in 0.1% steps  
CbCr Saturation clip (values limited at or below): 50% to 160% in 0.1% steps

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1080-2CSC-3G** 3G/HD/SD-SDI Dual-Channel Standalone RGB Color Space Corrector / Frame Sync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

**OGCP-9000/CC** 2RU Remote Control Panel for Color Correction (Specify country of destination for power cord)

COLOR CORRECTOR REMOTE CONTROL PANEL

OGCP-9000/CC » COLOR CORRECTOR REMOTE CONTROL PANEL FOR OPENGear® CARDS



The **OGCP-9000/CC** is a remote control panel designed with special emphasis for the Color Corrector models, and models equipped with +COLOR option.

Communication with the openGear™ frame occurs over the optimized high-speed Ethernet control protocol, allowing lightning-fast access. The OGCP-9000/CC offers instantaneous, real-time adjustments, so operators can manipulate on-air signals with confidence and precision.

Rotary controls allow direct access to gain, gamma and black for each of the RGB channels, in addition to YCbCr proc controls. An easy to use keypad enables intuitive access with minimal submenus. Cards use only one level of submenus to access all of its functions. The control panel is optimized for both bright and low light environments. A large format, super-bright, wide-angle color LCD screen shows sharp and clear text; operators can select either a white or black background. Other features include a fully backlit keypad and user-adjustable LED back light.

Station engineers can configure the panel to restrict availability of specific cards and parameters for operation. Configuration is done through a simple web interface, where configurations can be exported, backed up, and re-imported easily. The OGCP-9000/CC works seamlessly with DashBoard™ control software. Any changes made with either system are instantly reflected on the other.

**FEATURES**

Real time adjustments, excellent for on-air manipulation	Optimized for bright and low light environments
No deep submenus – all parameters can be accessed quickly	Seamless integration with DashBoard™ control software
10/100 Mbps Ethernet TCP/IP connection	Rugged 2RU rack mounted chassis
Save and restore panel configuration with web interface	Low-power/high-density design – less than 18 Watts per card
Completely configurable with password protected web interface	Five year warranty

**SPECIFICATIONS**

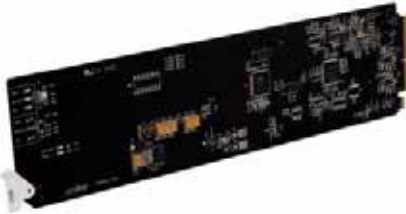
<b>Power</b> 9 Watts	<b>Ethernet</b> 10/100 Mbps with Auto-MDIX on RJ45 socket with DC isolation
<b>AC Power</b> IEC C14 Chassis Plug accepting 90-264 VAC @ 47-63 Hz	<b>LCD</b> 500 cd/m2 (nits) of brightness, 300:1 contrast ratio, 120 degree viewing angle
<b>DC Power</b> 12 VDC 1.0 A	<b>Size</b> Standard 2 RU; 5" depth

**ORDERING INFORMATION**

<b>OGCP-9000/CC</b> 2RU Color Correction Remote Control Panel (Specify country of destination for power cord)
<b>9980-CSC-3G</b> 3G/HD/SD-SDI RGB Color Space Corrector / Framesync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support
<b>9980-2CSC-3G</b> 3G/HD/SD-SDI Dual-Channel RGB Color Space Corrector / Framesync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support
<b>+COLOR</b> Color Correction option software upgrade; software can be ordered with card purchase, or activated later using a downloadable feature key via free DashBoard™ remote control/monitoring software (no need to remove or replace card.) Available for numerous Cobalt openGear® and BBG-1000 products. (See option <b>+COLOR</b> or individual product pages for availability.)

AUDIO CONVERSION

**9930ADC-AES75-RG » 75-OHM (UNBALANCED) 4-CHANNEL ANALOG-TO-2-PAIR AES AUDIO CONVERTER with Remote Gain Control**



The **9930ADC-AES75-RG 75-Ohm (Unbalanced) 4-Channel Analog-To-2-Pair AES Audio Converter with Remote Gain Control** is a broadcast-quality Analog-To-Digital Converter (ADC) that converts four professional-level balanced analog audio inputs to a pair of AES-3id outputs. Each AES output is available over a 2x1 distribution amplifier.

The 9930ADC-AES75-RG supports audio sampling frequencies from 32kHz to 96kHz using AES (DARS) reference, video black reference, or 48kHz internal reference (the AES sampling rate is determined by the reference selected). The 9930ADC-AES75-RG supports full 24 dBu input levels for outputs up to 0 dBFS digital.

A built-in DSP allows mono-mix and L/R-only outputs. Input sensitivity trim for both pairs of analog inputs allows the input ADC to be tailored to professional as well as consumer levels, thereby maximizing ADC performance for any input level.

The space-saving design and very low power consumption of the 9930ADC-AES75-RG provides for high density installation.

**FEATURES**

High-density design accommodates two analog input pairs

2x1 DA outputs provided for each AES output

Full remote control of operating mode and input sensitivity control

Convenient input sensitivity trim optimizes ADC performance for various input levels. Control available via DIP or remote control

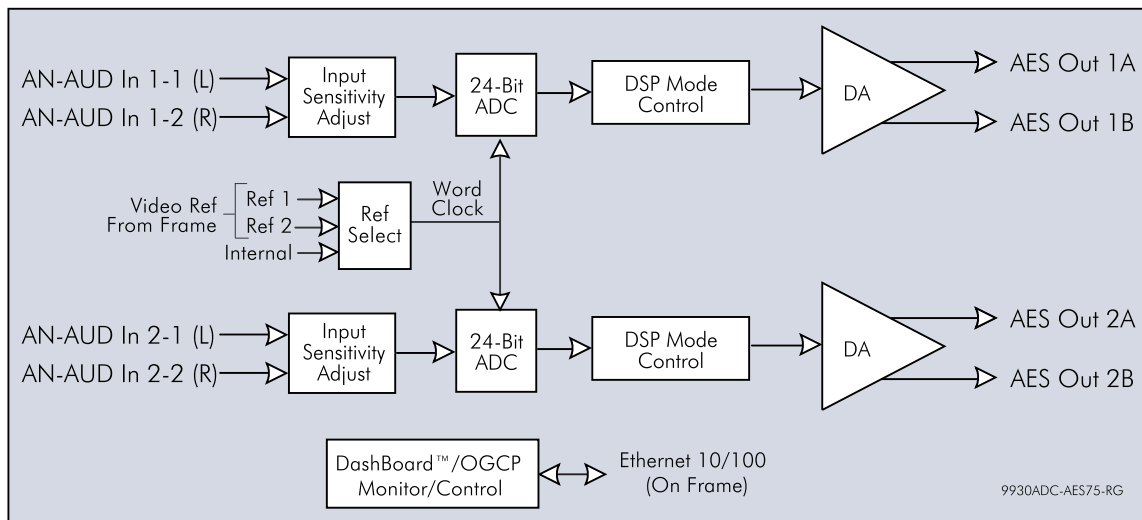
Multiple DSP modes – stereo/pass-thru, mono mix, L/R only outputs

Supports audio sampling frequencies from 32 kHz to 96 kHz

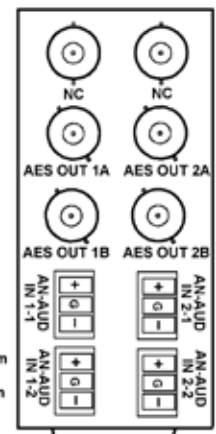
Selectable card switch control or Dashboard™ remote control (usable with Dashboard™ and Cobalt OGCP-9000 remote control panels)

Hot-swappable

Five year warranty



9930ADC-AES75-RG



Note: -1 and -2 analog audio inputs correlate to stereo designations L and R, respectively.  
 • + G - orientation on connectors varies from that on other Cobalt products. Make certain connections are as shown here.

RM20-9930ADC75-B



## AUDIO CONVERSION

**9930ADC-AES75-RG » 75-OHM (UNBALANCED) 4-CHANNEL ANALOG-TO-2-PAIR  
AES AUDIO CONVERTER with Remote Gain Control**

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 3.8 Watts

**Analog Audio Inputs**

Number of Inputs: (4; 2 stereo pairs), balanced

Impedance: >20 k $\Omega$

Nominal Input Level: +4 dB

Connector Type: WECO® 3-pin removable

**Reference Input**

Signal (from frame): REF 1, REF 2 supplying AES3-id, DARS, or Video Black ref

Internal Reference: 48 kHz

**Performance**

Quantization: 24-bit

Frequency Response:  $\pm 0.5$  dB (20 Hz to 20 kHz)

Jitter: <5 ns

S/N: -114 dB unweighted

S/N (at -20 dBFS): -118 dB ("A" weighted)

THD+N: <-110 dB (0.002%)

Separation: >100 dB

**AES Outputs**

Number of Outputs: (4; two 1x2 DA), unbalanced AES-3id BNC (available as stereo, pass-thru, mono-mixed, or L/R only)

Impedance: 75  $\Omega$

Return Loss: -25 dB

Sample Freq. Range: 32 kHz to 69 kHz (per ref received)

Rise/Fall Times: 30 ns

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

## ORDERING INFORMATION

**9930ADC-AES75-RG** 75-Ohm (Unbalanced) 4-Channel Analog-To-2-Pair AES Audio Converter with Remote Gain Control

**RM20-9930ADC75-B** 20-Slot Frame Rear I/O Module (Standard Width) (4) Balanced Analog Audio In, (4) AES Audio Out BNCs (two 2x1 DA)

AUDIO CONVERSION

**9930DAC-AES75-RG » 75-OHM (UNBALANCED) 2-PAIR AES-TO-4-CHANNEL ANALOG AUDIO CONVERTER** with Remote Gain Control



The **9930DAC-AES75-RG 75-Ohm (Unbalanced) 2-Pair AES-To-4-Channel Analog Audio Converter with Remote Gain Control** is a broadcast-quality AES Digital-To-Analog Converter (DAC) that provides four professional-level balanced analog audio outputs. It also provides a 2x1 reclocked distribution amplifier for each AES input channel.

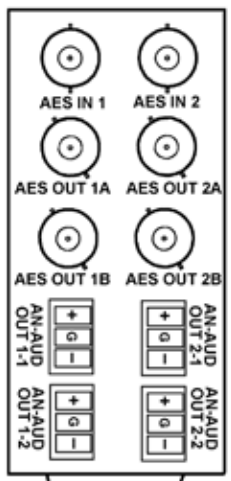
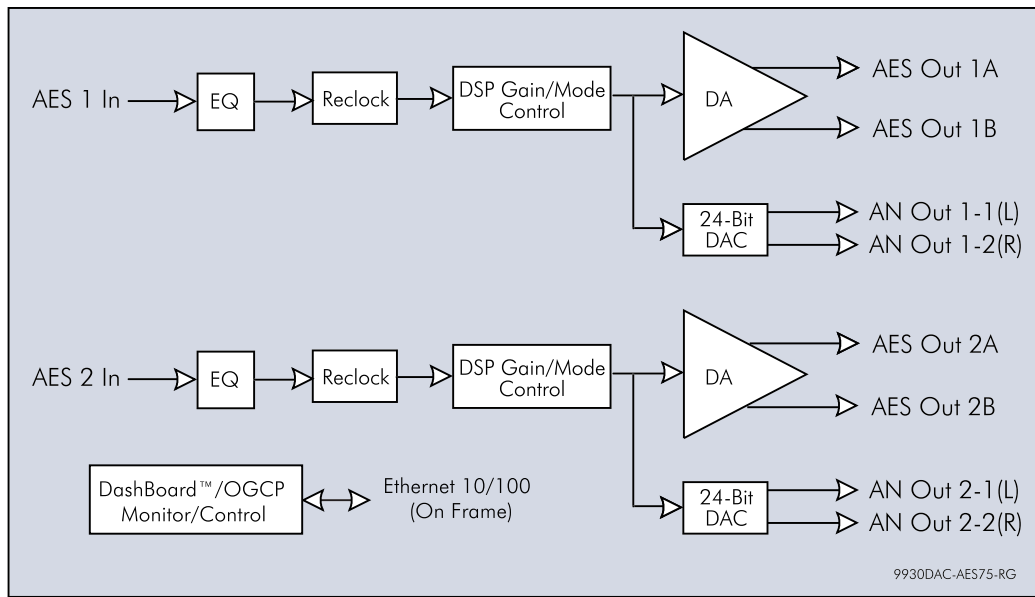
The 9930DAC-AES75-RG supports audio sampling frequencies from 32kHz to 96kHz. Cable equalization and reclocking techniques enable the 9930DAC-AES75-RG to recover the incoming digital audio signal reliably.

A built-in DSP allows mono-mix and L/R-only outputs. The DSP attenuation function allows overall gain (stereo ganged) trim (offset) via DashBoard™ remote control.

The space-saving design and very low power consumption of the 9930DAC-AES75-RG provides for high density installation.

**FEATURES**

- |   |   |
|---|---|
| High-density design accommodates two AES inputs, allowing up to four analog outputs | Supports audio sampling frequencies from 32 kHz to 96 kHz   |
| Also provides 2x1 reclocked DA outputs for each AES input                           | Selectable card switch control or DashBoard™ remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels) |
| Full remote control of operating mode and gain control                              | Hot-swappable   |
| Convenient DSP gain trim via DIP or remote control                                  | Five year warranty  |
| Multiple DSP modes – stereo/pass-thru, mono mix, L/R only outputs                   |   |



Note: • -1 and -2 analog audio outputs correlate to stereo designations L and R, respectively.

• + G - orientation on connectors varies from that on other Cobalt products. Make certain connections are as shown here.

RM20-9930DAC75-B





## AUDIO CONVERSION

**9930DAC-AES75-RG » 75-OHM (UNBALANCED) 2-PAIR AES-TO-4-CHANNEL  
ANALOG AUDIO CONVERTER with Remote Gain Control****SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 7.5 Watts

**AES Input**

Number of Inputs: (2), unbalanced AES-3id BNC

Impedance: 75  $\Omega$

Input Level: 0.2 – 7 V<sub>p-p</sub>

**Performance**

Sampling Rates: 32 kHz to 96 kHz

Resolution: 24-bit

Jitter: < 5 ns

**Analog Output**

Number of Outputs: (4) max (two stereo pairs). Available as stereo, mono-mixed, or L/R only.

Connector Type: WECO® removable 3-pin modular

Impedance: 60  $\Omega$  balanced

Maximum Output Level: +24 dBu

Frequency Response:  $\pm 0.2$ dB, 20 Hz to 20 kHz

Noise (unweighted): -86 dBu, 20 Hz to 20 kHz

THD+N: < 0.02%

Stereo Separation: >90 dB (20 Hz to 20 kHz)

**ORDERING INFORMATION**

**9930DAC-AES75-RG** 75-Ohm (Unbalanced) 2-Pair AES-To-4-Channel Analog Audio Converter with Remote Gain Control

**RM20-9930DAC75-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) AES Audio In BNCs, (4) Reclocked AES Audio Out BNCs, (4) Balanced Analog Audio Out

**BBG-A-TO-S » HD/SD ANALOG COMPONENT/COMPOSITE-TO-HD/SD-SDI with Audio Embedder**



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality.

The Blue Box **BBG-A-TO-S** can power directly via USB to get its power from video monitors or other equipment. Blue Box Analog to SDI offers CVBS SD or component SD/HD conversion to SDI using high-quality 12-bit A/D conversion, with SD line 21 closed-captioning passed onto the converted stream.

Full support of multiple analog standards such as SMPTE, Betacam™, MII, RGB, and S-video (Y/C) is provided. A stereo analog audio pair can be embedded onto embedded audio channels 1/2 with full 24-bit resolution.

**FEATURES**

Compact size and low weight design easily affixes directly to camera or host device chassis

High-quality 12-bit A/D conversion of NTSC/PAL YPbPr, RGB or S-Video/CVBS SD video to SMPTE 259M or SMPTE 292M

Passes line 21 closed-captioning for analog-to-SD-SDI conversions

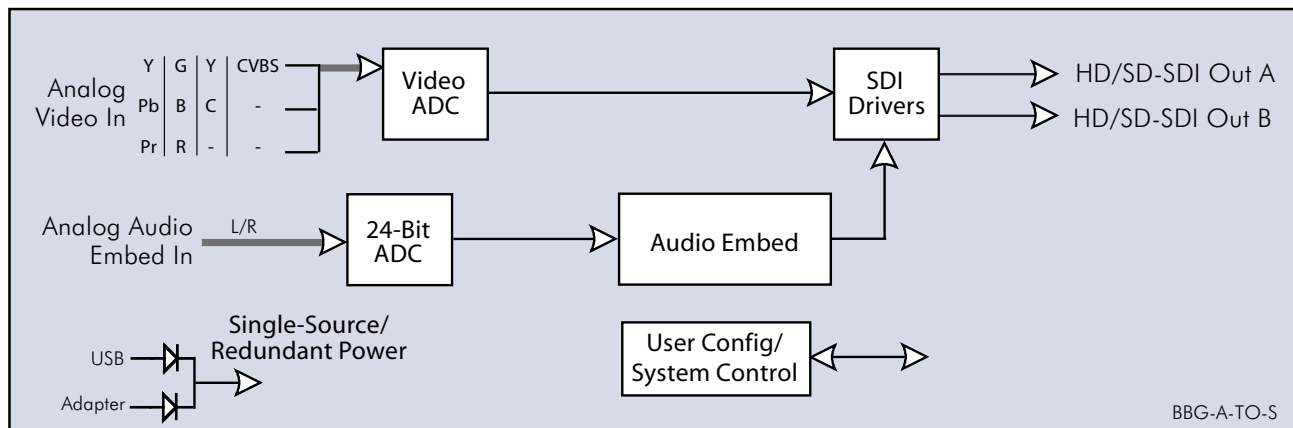
Stereo analog audio input embedding to embedded audio pair on SDI output

Small rugged portable standalone package ideal for portable installations

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

2x SDI DA output

Rugged construction backed with a five-year warranty



**BBG-A-TO-S » HD/SD ANALOG COMPONENT/COMPOSITE-TO-HD/SD-SDI with Audio Embedder****SPECIFICATIONS****Standards Supported**

SMPTE 259M, 292M

**Inputs**

- YPbPr, RGB, Y/C, CVBS analog video (75Ω BNCs)
- (2) analog audio (unbalanced consumer RCA)
- DC power (via USB or adapter)

**Outputs**

(2) SDI (75Ω BNCs)

**Audio Conversion Format**

48 kHz sampling, 24-bit

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 2.4 W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**ORDERING INFORMATION****BBG-A-TO-S** BlueBox™ Analog-to-SDI HD/SD Analog Component/Composite-to-HD/SD-SDI with Audio Embedder Converter Unit**BBG-MB** Mounting Bracket

**BBG-S-TO-A » HD/SD-SDI-TO-HD/SD ANALOG COMPONENT/COMPOSITE** with Audio De-Embedder



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality.

The Blue Box **BBG-S-TO-A** can power directly via USB to get its power from video monitors or other equipment. Blue Box SDI to Analog passes line 21 closed-captioning for SD conversions, and can be set to provide to provide SMPTE, Betacam™, MII, or RGB component outputs using an easy to use DIP switch. S-video or 3x DA CVBS output modes are also provided for SD streams.

Group 1 and 2 stereo pairs can be de-embedded from SDI and outputted via an analog audio output line-level pair.

**FEATURES**

Rugged construction backed with a five-year warranty

Passes line 21 closed-captioning for SD-SDI to analog conversions

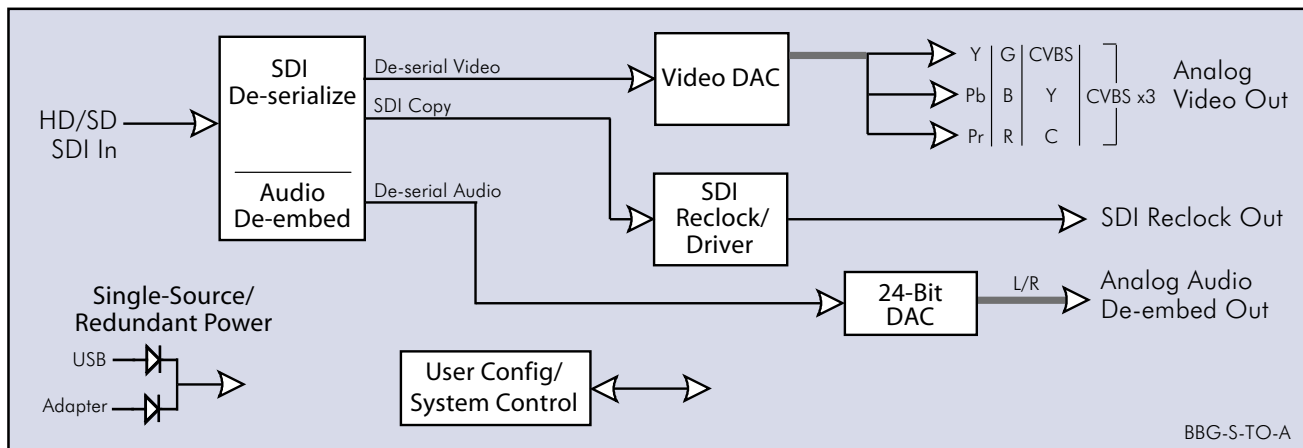
De-embedding from selectable embedded pair to stereo analog audio outputs

Offers conversions to several component and composite standards

SDI input copy output allows converter to provide SDI pass-thru

Compact size and low weight design easily affixes directly to camera or host device chassis

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.



**BBG-S-TO-A » HD/SD-SDI-TO-HD/SD ANALOG COMPONENT/COMPOSITE** with Audio De-Embedder

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M

**Inputs**

SDI (75Ω BNC)  
DC power (via USB or adapter)

**Outputs**

YPbPr, RGB, Y/C, or CVBS analog video (75Ω BNCs)  
SDI reclocked input copy (75Ω BNC)  
(2) analog audio (unbalanced consumer RCA)

**Audio Conversion Format**

48 kHz sampling, 24-bit

**Power**

5-16 VDC, 2.4 W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

-13°F to 149°F  
(-25°C to 65°C)

**ORDERING INFORMATION**

**BBG-S-TO-A** HD/SD-SDI-to-HD/SD Analog Component/Composite with Audio De-Embedder Converter Unit

**BBG-MB** Mounting Bracket

**9915DA-1x16-12G » 12G/6G/3G/HD/SD-SDI 1X16 RECLOCKING DISTRIBUTION AMPLIFIER**



The Cobalt® **9915DA-1x16-12G** 12G/6G/3G/HD/SD-SDI 1x16 Reclocking Distribution Amplifier supports an input channel which is distributed to 16 DA outputs. The 9915DA-1x16-12G also, as an option, can support an SFP-based fiber input and fiber DA outputs.

As demand for 4K continues to rise, distribution of 12G-SDI signals within a rackspace becomes increasingly important. The 9915DA-1x16-12G allows for copper runs of up to 45 meters, reaching most equipment within a rack room or truck.

Up to 10 of the 9915DA-1x16-12G cards can be installed in a frame to provide 10 channels of input, with distribution to up to 160 outputs. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 12G/6G/3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

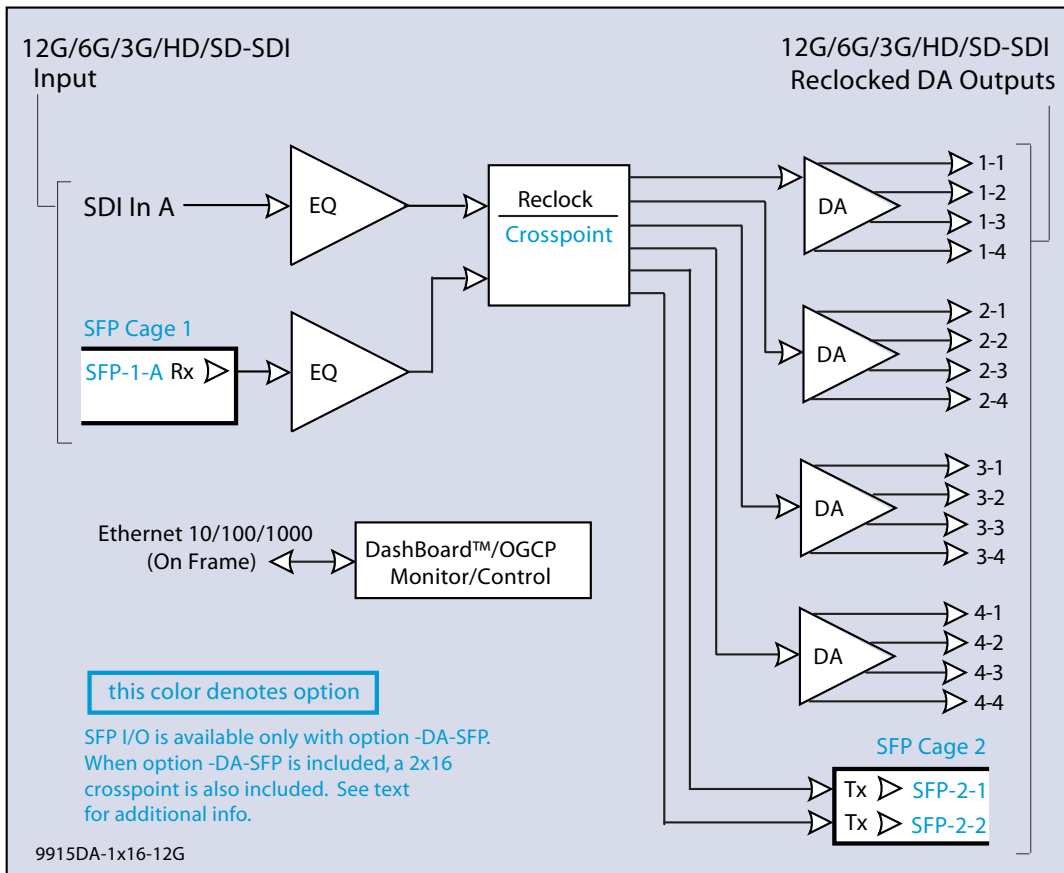
Input data rate auto-detection for all industry-standard data rates

One-card solution for distribution of 8K/4K content over 12G-SDI interfaces

Card display and DashBoard status input lock indicators

Hot-swappable

Five year warranty



## 9915DA-1x16-12G » 12G/6G/3G/HD/SD-SDI 1X16 RECLOCKING DISTRIBUTION AMPLIFIER

### OPTIONS

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-1x16-12G card

**Note:** When option -DA-SFP is included, a second input (fiber OE) is in turn added to the card. As such, this exposes a full 2x16 crosspoint that allows both the coax and fiber inputs to be independently and simultaneously routed to various card outputs.

**-SFP-OE-12G** SFP Optical UHD Single Receiver

**-SFP-2EO** SFP Optical Dual Transmitter

**-SFP-2EO-CWDM** SFP Optical Dual CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-EO-12G** SFP Optical UHD Single Transmitter

**-SFP-H-T0-S** SFP HDMI-to-HD/SD-SDI Receiver

**-SFP-2EO-12G** SFP Optical UHD Dual Transmitter

**-SFP-S-T0-H** SFP HD/SD-SDI-to-HDMI Transmitter

**-SFP-IP-SWD** Software-Defined EmSFP; 2110 or 2022-6 Encapsulator/De-Encapsulator (See Ordering Info for full descriptions and details.)

**-SFP-OE** SFP Optical Single Receiver

**-SFP-EO-CWDM** SFP Optical Single CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-EO** SFP Optical Single Transmitter

### SPECIFICATIONS

**Note:** All specifications are preliminary and subject to change. Inputs/outputs are a function of rear I/O module used.

#### Power

< 10 Watts

#### 12G / 6G / 3G / 1.5G / 270M Serial Digital Interface Input/Output

(1) 75Ω HDBNC Connector Input (max). (16) 75Ω HDBNC Connectors Output (max).

SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.

#### Coaxial Receive Performance (Cable Length; Belden 4694)

50m/70m/150m/180m (12G/6G/3G/HD)

#### Fiber Transmit Output (typ. with optional fiber Tx SFP)

LC connector Fiber Wavelength, Tx: 1310 nm

Tx Power: -5.0 dBm (min)

#### Fiber Receive Input (typ. with optional fiber Rx SFP)

LC connector

Receive Sensitivity: -23 dBm; 1260 to 1620 nm

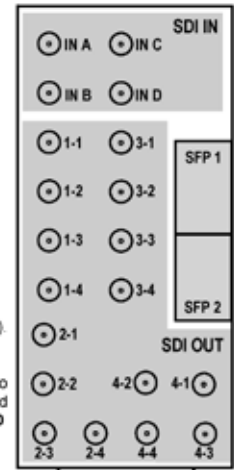
Receive Sensitivity: (-12G SFP models; 12G/6G/3G/HD/SD): -9/-10/-10/-10/-10 dBm

**Note:** On 9915DA-1x16-12G model, SFP cage 1 supports only Rx (OE) type SFPs. SFP cage 2 supports only Tx (EO) type SFPs. (See Ordering Information.)

#### Notes:

1. (Applicable only where -SFP option are offered.) **SFP 1** and **SFP 2** details show SFP receptacle cage locations. SFP receptacle cage is included factory-installed on rear module (Plug-in SFP modules are available with respective options).

2. All four **SDI IN A** thru **SDI IN D** are functional only when mated to quad input card models. Dual and single card models omit **SDI IN D** as NC, and progressively omit **SDI IN C** and **SDI IN B** as NC.



RM20-9915-A-HDBNC

### ORDERING INFORMATION

**9915DA-1x16-12G** 12G/6G/3G/HD/SD-SDI 1x16 Reclocking Distribution Amplifier

#### Rear Modules:

**RM20-9915-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 12G/6G/3G/HD/SD-SDI Input (IN B thru IN D NC), (16) 12G/6G/3G/HD/SD-SDI Outputs (all coaxial connectors HD-BNC)

**Note:** SFP modules, when inserted into rear module SFP receptacles, can dimensionally extend past the right "boundary" of the rear module. In rare cases, this can present interference issues if a rear module to the right of SFP rear module also has adjacent large-footprint connectors that can extend across the rear module boundary. Plan frame buildout accordingly in these cases.

**9915DA-1x16-12G » 12G/6G/3G/HD/SD-SDI 1X16 RECLOCKING DISTRIBUTION AMPLIFIER**

**ORDERING INFORMATION – cont.**

**Options (Hardware-based):**

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-1x16-XPT-12G card

**Note:** When option **-DA-SFP** is included, a second input (fiber OE) is in turn added to the card. As such, this exposes a full 2x16 crosspoint that allows both the coax and fiber inputs to be independently and simultaneously routed to various card outputs.

**-SFP-OE-12G** 12G/6G/3G/HD/SD-SDI UHD Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-EO-12G** 12G/6G/3G/HD/SD-SDI UHD Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2EO-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-OE** 3G/HD/SD-SDI Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-EO** 3G/HD/SD-SDI Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2EO** 3G/HD/SD-SDI Dual Transmitter SFP Module; 1310 nm; type LC connectors

**-SFP-H-TO-S** HDMI-to-HD/SD-SDI Receiver SFP Module

**-SFP-S-TO-H** SFP HD/SD-SDI-to-HDMI Transmitter SFP Module

**-SFP-EO-CWDM-WX** Single CWDM Transmitter SFP Module; type LC connector

**-SFP-2EO-CWDM-WX** Dual CWDM Transmitter SFP Module; type LC connectors

Use fiber wavelength codes below for CWDM SFPs when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610. In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm    -29: 1290nm    -31: 1310nm
- 33: 1330nm    -35: 1350nm    -37: 1370nm
- 39: 1390nm    -41: 1410nm    -43: 1430nm
- 45: 1450nm    -47: 1470nm    -49: 1490nm
- 51: 1510nm    -53: 1530nm    -55: 1550nm
- 57: 1570nm    -59: 1590nm    -61: 1610nm

(Example: -SFP-EO-CWDM-27 has 1270 nm Tx wavelength)

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SFP-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

- +ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6
- +ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110
- +ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
- +ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
- +ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
- +ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110



# 9915DA-2x16-XPT-12G » 12G/6G/3G/HD/SD DUAL-CHANNEL MULTI-RATE RECLOCKING DA with x4 Output Crosspoint



The Cobalt® 9915DA-2x16-XPT-12G 12G/6G/3G/HD/SD Dual-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint supports two input channels which can be crosspoint-routed to up to 16 DA outputs.

As demand for 4K continues to rise, distribution of 12G-SDI signals within a rackspace becomes increasingly important. The 9915DA allows for copper runs of up to 45 meters, reaching most equipment within a rack room or truck. For longer runs, the optional optical inputs and outputs allow the 9915DA to connect distribution from zones of much greater distances.

The extremely flexible crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows dual 1x8, single 1x16 and other routing possibilities. Any of the two input channels can be distributed or duplicated across four groups of 1x4 DAs. The dual-input capacity provides a one-card solution for distribution of 8K quad-link content over 12G-SDI interfaces. A failover function allows going to secondary backup inputs should the primary input lose lock.

Up to 10 of the 9915DA-2x16-XPT-12G cards can be installed in a frame to provide 20 channels of input, with distribution to up to 160 outputs. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

## FEATURES

Flexible output crosspoint allows card to function as dual-channel 1x8, single-channel 1x16, or numerous other routings with reclocking DA

Full support of 12G/6G/3G/HD/SD-SDI and ASI/DVB

Input data rate auto-detection for all industry-standard data rates

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Added fiber inputs/outputs via optional SFPs

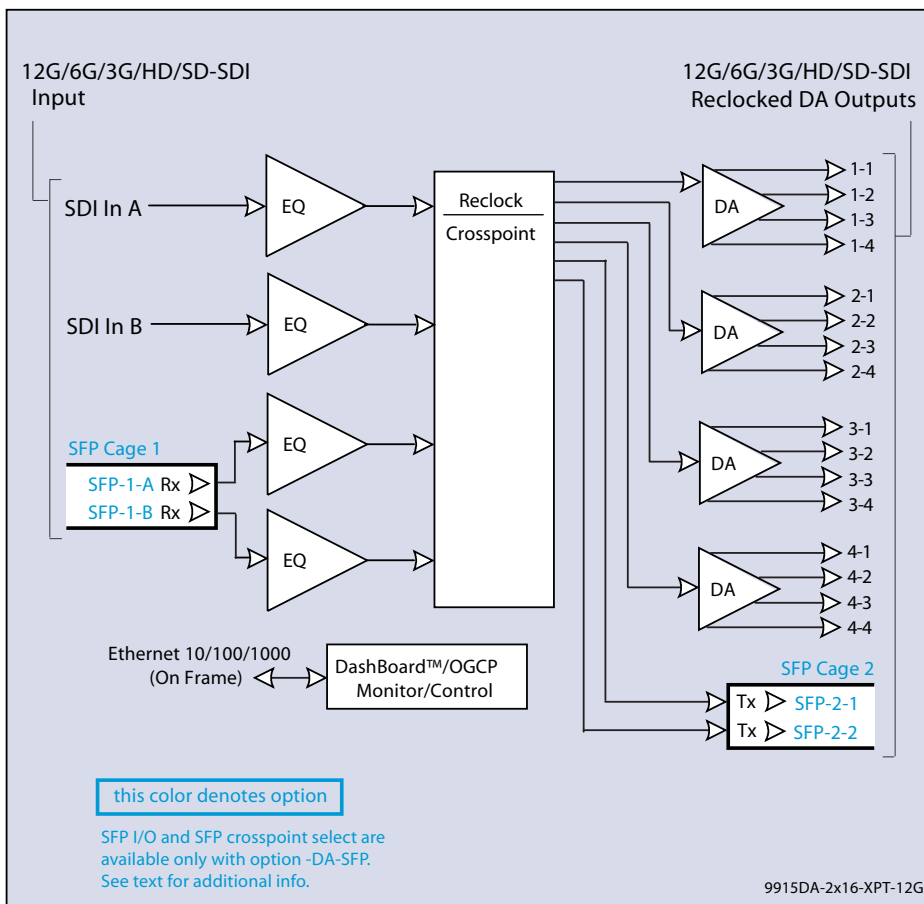
One-card solution for distribution of 4K/8K content over 12G-SDI interfaces

Card display and DashBoard status input lock indicators

Failover provides backup to selected secondary inputs if primary input loses lock, Available for both coax and (optional) fiber inputs.

Hot-swappable

Five year warranty



# 9915DA-2x16-XPT-12G » 12G/6G/3G/HD/SD DUAL-CHANNEL MULTI-RATE RECLOCKING DA with x4 Output Crosspoint

## OPTIONS

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-2x16-12G card

**-SFP-0E-12G** SFP Optical UHD Single Receiver

**-SFP-20E-12G** SFP Optical UHD Dual Receiver

**-SFP-E0-12G** SFP Optical UHD Single Transmitter

**-SFP-2E0-12G** SFP Optical UHD Dual Transmitter

**-SFP-0E** SFP Optical Single Receiver

**-SFP-20E** SFP Optical Dual Receiver

**-SFP-E0** SFP Optical Single Transmitter

**-SFP-2E0** SFP Optical Dual Transmitter

**-SFP-E00E** SFP Optical Transceiver

**-SFP-H-T0-S** SFP HDMI-to-HD/SD-SDI Receiver

**-SFP-S-T0-H** SFP HD/SD-SDI-to-HDMI Transmitter

**-SFP-E0-CWDM** SFP Optical Single CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-2E0-CWDM** SFP Optical Dual CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-IP-SWD** Software-Defined EmSFP; 2110 or 2022-6 Encapsulator/De-Encapsulator (See Ordering Info for full descriptions and details.)

## SPECIFICATIONS

**Note:** All specifications are preliminary and subject to change. Inputs/outputs are a function of rear I/O module used. Fiber specifications are typical, and only applicable for card fitted with optional Tx or Rx (as applicable) fiber SFP module.

### Power

< 10 Watts

### 12G / 6G / 3G / 1.5G / 270M Serial Digital Interface Input/Output

(2) 75Ω HDBNC Connectors Input (max). (16) 75Ω HDBNC Connectors Output (max).  
SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.

### Coaxial Receive Performance (Cable Length; Belden 4694)

50m/70m/150m/180m (12G/6G/3G/HD)

### Fiber Transmit Output (typ. with optional fiber Tx SFP)

LC connector  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

### Fiber Receive Input (typ. with optional fiber Rx SFP)

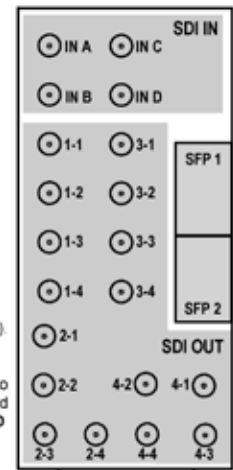
LC connector  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm  
Receive Sensitivity: (-12G SFP models; 12G/6G/3G/HD/SD): -9/-10/-10/-10/-10 dBm

**Note:** On 9915DA-2x16-12G model, SFP cage 1 supports only Rx (OE) type SFPs. SFP cage 2 supports only Tx (EO) type SFPs. (See Ordering Information.)

### Notes:

1. (Applicable only where -SFP option are offered.) **SFP 1** and **SFP 2** details show SFP receptacle cage locations. SFP receptacle cage is included factory-installed on rear module (Plug-in SFP modules are available with respective options).

2. All four **SDI IN A** thru **SDI IN D** are functional only when mated to quad input card models. Dual and single card models omit **SDI IN D** as NC, and progressively omit **SDI IN C** and **SDI IN B** as NC.



RM20-9915-A-HDBNC

## ORDERING INFORMATION

**9915DA-2x16-XPT-12G** 12G/6G/3G/HD/SD-SDI Dual-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

### Rear Modules:

**RM20-9915-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 12G/6G/3G/HD/SD-SDI Inputs, (16) 12G/6G/3G/HD/SD-SDI Outputs (All coaxial connectors HD-BNC)

**Note:** SFP modules, when inserted into rear module SFP receptacles, can dimensionally extend past the right "boundary" of the rear module. In rare cases, this can present interference issues if a rear module to the right of SFP rear module also has adjacent large-footprint connectors that can extend across the rear module boundary. Plan frame buildout accordingly in these cases.

### Options (Hardware-based):

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-2x16-XPT-12G card

**-SFP-0E-12G** 12G/6G/3G/HD/SD-SDI UHD Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-20E-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-E0-12G** 12G/6G/3G/HD/SD-SDI UHD Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2E0-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter SFP Module; 1310 nm; type LC connector

**9915DA-2x16-XPT-12G » 12G/6G/3G/HD/SD DUAL-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint

**ORDERING INFORMATION – cont.**

**-SFP-0E** 3G/HD/SD-SDI Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-20E** 3G/HD/SD-SDI Dual Receiver SFP Module; 1260 nm - 1620 nm; type LC connectors

**-SFP-E0** 3G/HD/SD-SDI Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2E0** 3G/HD/SD-SDI Dual Transmitter SFP Module; 1310 nm; type LC connectors

**-SFP-E00E** 3G/HD/SD-SDI Transceiver SFP Module; 1260 nm - 1620 nm; type LC connectors

**-SFP-H-TO-S** HDMI-to-HD/SD-SDI Receiver SFP Module

**-SFP-S-TO-H** SFP HD/SD-SDI-to-HDMI Transmitter SFP Module

**-SFP-E0-CWDM-WX** Single CWDM Transmitter SFP Module; type LC connector

**-SFP-2E0-CWDM-WX** Dual CWDM Transmitter SFP Module; type LC connectors

Use fiber wavelength codes below for CWDM SFPs when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610. In "WX" places in part number, substitute code for wavelengths in each place as listed below:

-27: 1270nm	-29: 1290nm	-31: 1310nm
-33: 1330nm	-35: 1350nm	-37: 1370nm
-39: 1390nm	-41: 1410nm	-43: 1430nm
-45: 1450nm	-47: 1470nm	-49: 1490nm
-51: 1510nm	-53: 1530nm	-55: 1550nm
-57: 1570nm	-59: 1590nm	-61: 1610nm

(Example: -SFP-E0-CWDM-27 has 1270 nm Tx wavelength)

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SFP-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

- +ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6
- +ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110
- +ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI
- +ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI
- +ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
- +ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
- +ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
- +ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

# 9915DA-4x16-XPT-12G » 12G/6G/3G/HD/SD QUAD-CHANNEL MULTI-RATE RECLOCKING DA with x4 Output Crosspoint



The Cobalt® **9915DA-4x16-XPT-12G** 12G/6G/3G/HD/SD Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint supports four input channels which can be crosspoint-routed to up to 16 DA outputs.

As demand for 4K continues to rise, distribution of 12G-SDI signals within a rackspace becomes increasingly important. The 9915DA allows for copper runs of up to 45 meters, reaching most equipment within a rack room or truck. For longer runs, the optional optical inputs and outputs allow the 9915DA to connect distribution from zones of much greater distances.

The extremely flexible crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows quad 1x4, dual 1x8, single 1x16 and other routing possibilities. Any of the four input channels can be distributed or duplicated across four groups of 1x4 DAs. The quad-input capacity provides a one-card solution for distribution of 8K quad-link content over 12G-SDI interfaces. A failover function allows going to secondary backup inputs should the primary input lose lock.

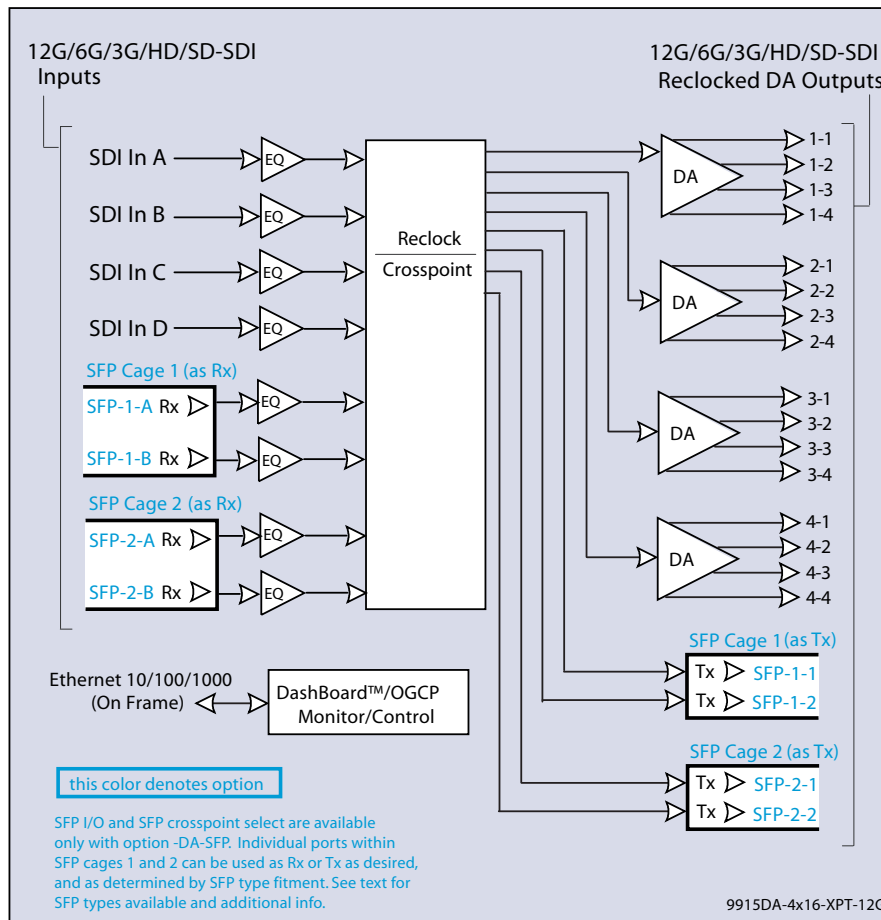
Up to 10 of the 9915DA-4x16-XPT-12G cards can be installed in a frame to provide 40 channels of input, with distribution to up to 160 outputs. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

## FEATURES

- Flexible output crosspoint allows card to function as quad-channel 1x4, dual-channel 1x8, single-channel 1x16, or other numerous routings with reclocking DA
- Input data rate auto-detection for all industry-standard data rates
- Full support of 12G/6G/3G/HD/SD-SDI and ASI/DVB

- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p
- Added fiber inputs/outputs via optional SFPs
- One-card solution for distribution of 4K/8K content over 12G-SDI interfaces
- Card display and DashBoard status input lock indicators

- Failover provides backup to selected secondary inputs if primary input loses lock, Available for both coax and (optional) fiber inputs.
- Hot-swappable
- Five year warranty



# 9915DA-4x16-XPT-12G » 12G/6G/3G/HD/SD QUAD-CHANNEL MULTI-RATE RECLOCKING DA with x4 Output Crosspoint

## OPTIONS

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-2x16-12G card

**-SFP-0E-12G** SFP Optical UHD Single Receiver

**-SFP-20E-12G** SFP Optical UHD Dual Receiver

**-SFP-E0-12G** SFP Optical UHD Single Transmitter

**-SFP-2E0-12G** SFP Optical UHD Dual Transmitter

**-SFP-E00E-12G** SFP Optical UHD Transceiver

**-SFP-0E** SFP Optical Single Receiver

**-SFP-20E** SFP Optical Dual Receiver

**-SFP-E0** SFP Optical Single Transmitter

**-SFP-2E0** SFP Optical Dual Transmitter

**-SFP-E00E** SFP Optical Transceiver

**-SFP-H-T0-S** SFP HDMI-to-HD/SD-SDI Receiver

**-SFP-S-T0-H** SFP HD/SD-SDI-to-HDMI Transmitter

**-SFP-E0-CWDM** SFP Optical Single CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-2E0-CWDM** SFP Optical Dual CWDM Transmitter (see Ordering Info for wavelengths and corresponding ordering codes)

**-SFP-IP-SWD** Software-Defined EmSFP; 2110 or 2022-6 Encapsulator/De-Encapsulator (See Ordering Info for full descriptions and details.)

## SPECIFICATIONS

**Note:** All specifications are preliminary and subject to change. Inputs/outputs are a function of rear I/O module used. Fiber specifications are typical, and only applicable for card fitted with optional Tx or Rx (as applicable) fiber SFP module.

### Power

< 10 Watts

### 12G / 6G / 3G / 1.5G / 270M Serial Digital Interface Input/Output

(4) 75Ω HDBNC Connectors Input (max). (16) 75Ω HDBNC Connectors Output (max).  
SDI Formats Supported: SMPTE ST2082-1,10, 424M, 292M, SMPTE 259M-C. All inputs/outputs 12G compliant and SDQS/2SI quad 3G compliant.

### Coaxial Receive Performance (Cable Length; Belden 4694)

50m/70m/150m/180m (12G/6G/3G/HD)

### Fiber Transmit Output (typ. with optional fiber Tx SFP)

LC connector  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

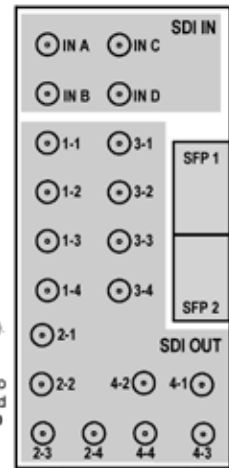
### Fiber Receive Input (typ. with optional fiber Rx SFP)

LC connector  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm  
Receive Sensitivity: (-12G SFP models; 12G/6G/3G/HD/SD): -9/-10/-10/-10/-10 dBm

### Notes:

1. (Applicable only where -SFP option are offered.) **SFP 1** and **SFP 2** details show SFP receptacle cage locations. SFP receptacle cage is included factory-installed on rear module (Plug-in SFP modules are available with respective options).

2. All four **SDI IN A** thru **SDI IN D** are functional only when mated to quad input card models. Dual and single card models omit **SDI IN D** as NC, and progressively omit **SDI IN C** and **SDI IN B** as NC.



RM20-9915-A-HDBNC

## ORDERING INFORMATION

**9915DA-4x16-XPT-12G** 12G/6G/3G/HD/SD-SDI Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

### Rear Modules:

**RM20-9915-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 12G/6G/3G/HD/SD-SDI Inputs, (16) 12G/6G/3G/HD/SD-SDI Outputs (All coaxial connectors HD-BNC)

**Note:** SFP modules, when inserted into rear module SFP receptacles, can dimensionally extend past the right "boundary" of the rear module. In rare cases, this can present interference issues if a rear module to the right of SFP rear module also has adjacent large-footprint connectors that can extend across the rear module boundary. Plan frame buildout accordingly in these cases.

### Options (Hardware-based):

**-DA-SFP** Adds daughter card to support two externally-accessible SFP cages to the 9915DA-4x16-XPT-12G card

**9915DA-4x16-XPT-12G » 12G/6G/3G/HD/SD QUAD-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint

**ORDERING INFORMATION – cont.**

**-SFP-0E-12G** 12G/6G/3G/HD/SD-SDI UHD Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-20E-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-E0-12G** 12G/6G/3G/HD/SD-SDI UHD Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2E0-12G** 12G/6G/3G/HD/SD-SDI UHD Dual Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-E00E-12G** 12G/6G/3G/HD/SD-SDI UHD Transceiver SFP Module; 1310 nm Tx / 1260 nm - 1620 nm Rx; type LC connector

**-SFP-0E** 3G/HD/SD-SDI Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

**-SFP-20E** 3G/HD/SD-SDI Dual Receiver SFP Module; 1260 nm - 1620 nm; type LC connectors

**-SFP-E0** 3G/HD/SD-SDI Single Transmitter SFP Module; 1310 nm; type LC connector

**-SFP-2E0** 3G/HD/SD-SDI Dual Transmitter SFP Module; 1310 nm; type LC connectors

**-SFP-E00E** 3G/HD/SD-SDI Transceiver SFP Module; 1260 nm - 1620 nm; type LC connectors

**-SFP-H-T0-S** HDMI-to-HD/SD-SDI Receiver SFP Module

**-SFP-S-T0-H** SFP HD/SD-SDI-to-HDMI Transmitter SFP Module

**-SFP-E0-CWDM-WX** Single CWDM Transmitter SFP Module; type LC connector

**-SFP-2E0-CWDM-WX** Dual CWDM Transmitter SFP Module; type LC connectors

Use fiber wavelength codes below for CWDM SFPs when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610. In "WX" places in part number, substitute code for wavelengths in each place as listed below:

-27: 1270nm	-29: 1290nm	-31: 1310nm
-33: 1330nm	-35: 1350nm	-37: 1370nm
-39: 1390nm	-41: 1410nm	-43: 1430nm
-45: 1450nm	-47: 1470nm	-49: 1490nm
-51: 1510nm	-53: 1530nm	-55: 1550nm
-57: 1570nm	-59: 1590nm	-61: 1610nm

(Example: -SFP-E0-CWDM-27 has 1270 nm Tx wavelength)

**-SFP-IP-SWD** Software-Defined EmSFP; 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for cards using SFP type -SFP-IP-SWD (Up to 3 software licenses can be added to the -SFP-IP-SWD, but only 1 license can be active at a time):

- +ADD-SFP-2SDI-T0-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6
- +ADD-SFP-2SDI-T0-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110
- +ADD-SFP-IP-T0-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI
- +ADD-SFP-IP-T0-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI
- +ADD-SFP-IP-T0-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
- +ADD-SFP-IP-T0-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
- +ADD-SFP-SDI-T0-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
- +ADD-SFP-SDI-T0-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

9910DA-1Q-3G » 3G/HD/SD/ASI SINGLE-CHANNEL MULTI-RATE DA



The Cobalt® 9910DA-1Q-3G 3G/HD/SD/ASI Single-Channel Multi-Rate DA (Non-Reclocking) supports one input channel which can be distributed to up to 16 DA outputs. The 9910DA-1Q-3G is multi-rate and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock. Up to 10 of the 9910DA-1Q-3G cards can be installed in a frame to provide distribution of up to 160 outputs.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

FEATURES

Full support of 3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

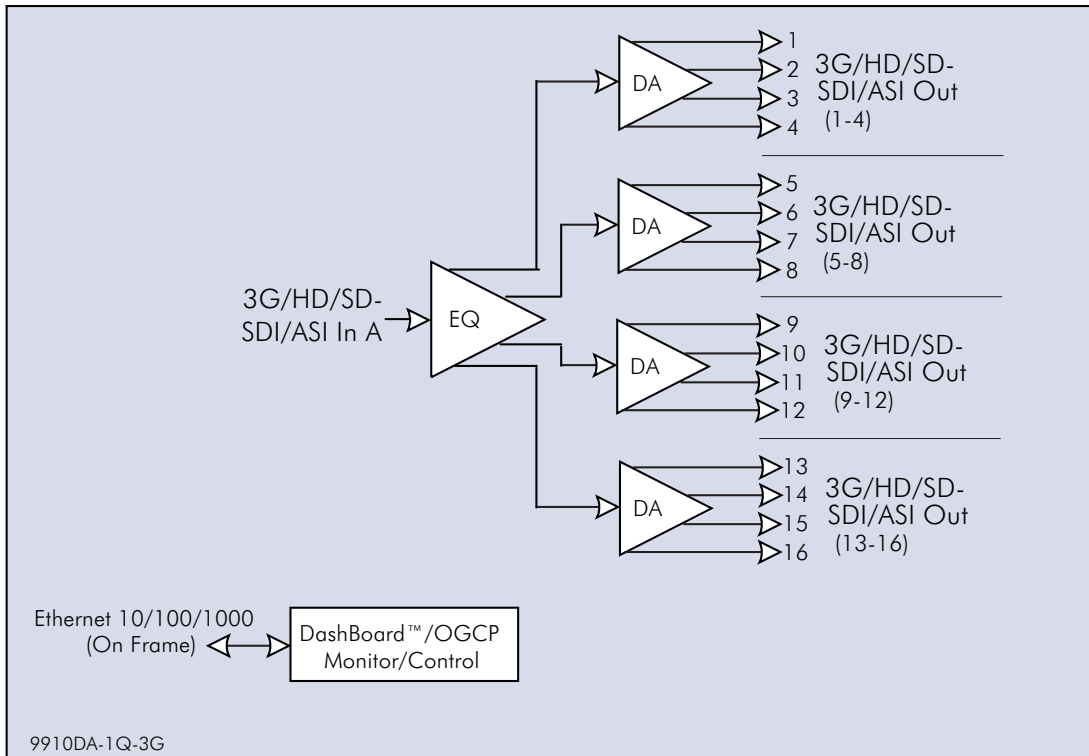
Input data rate auto-detection for all industry-standard data rates

Card edge and DashBoard™ status and individual input lock indicators

All outputs are non-inverting - ASI can be outputted on any output

Hot-swappable

Five year warranty



9910DA-1Q-3G



9910DA-1Q-3G » 3G/HD/SD/ASI SINGLE-CHANNEL MULTI-RATE DA



The Cobalt® **9910DA-1Q-3G 3G/HD/SD/ASI Single-Channel Multi-Rate DA (Non-Reclocking)** supports one input channel which can be distributed to up to 16 DA outputs. The 9910DA-1Q-3G is multi-rate and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock. Up to 10 of the 9910DA-1Q-3G cards can be installed in a frame to provide distribution of up to 160 outputs.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

FEATURES

Full support of 3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

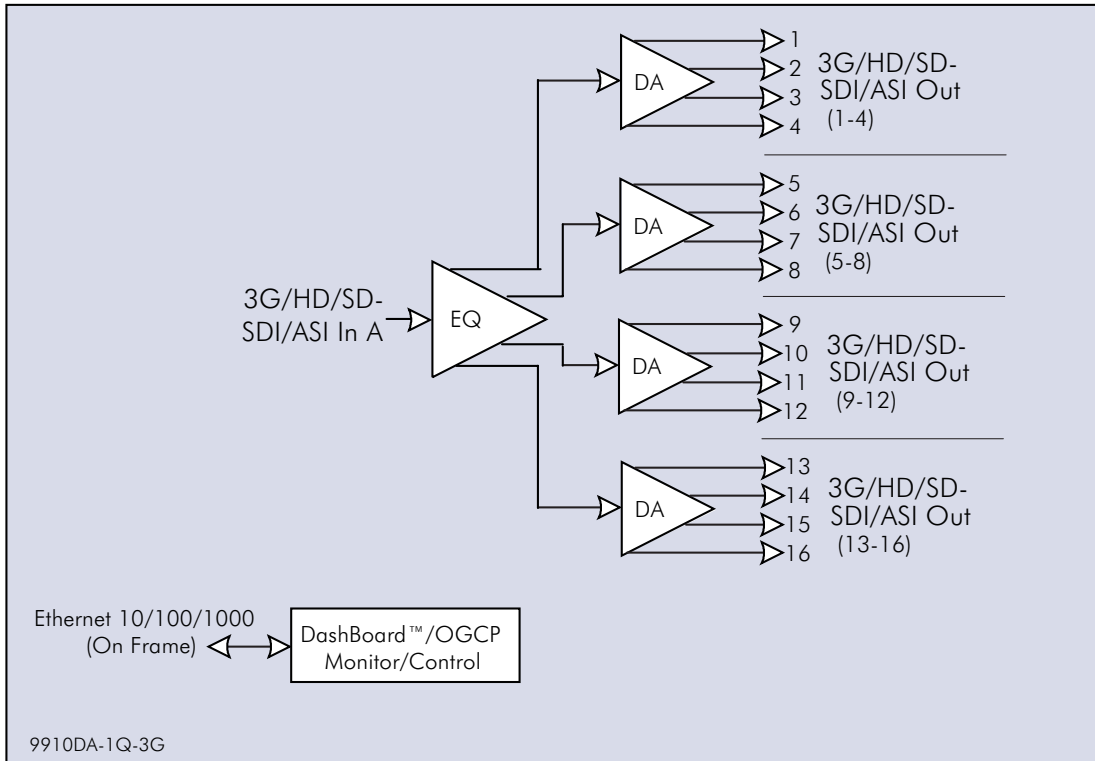
Input data rate auto-detection for all industry-standard data rates

Card edge and DashBoard™ status and individual input lock indicators

All outputs are non-inverting - ASI can be outputted on any output

Hot-swappable

Five year warranty





**9910DA-1Q-3G-RCK » 3G/HD/SD/ASI SINGLE-CHANNEL MULTI-RATE RECLOCKING DA**



The Cobalt® **9910DA-1Q-3G-RCK 3G/HD/SD/ASI Single-Channel Multi-Rate Reclocking DA** supports one input channel which can be distributed to up to 16 DA outputs. The 9910DA-1Q-3G-RCK is multi-rate with user enable/disable reclocking, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock. Up to 10 of the 9910DA-1Q-3G-RCK cards can be installed in a frame to provide distribution of up to 160 outputs.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Excellent receive performance – EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Reclocking can be enabled or disabled for input

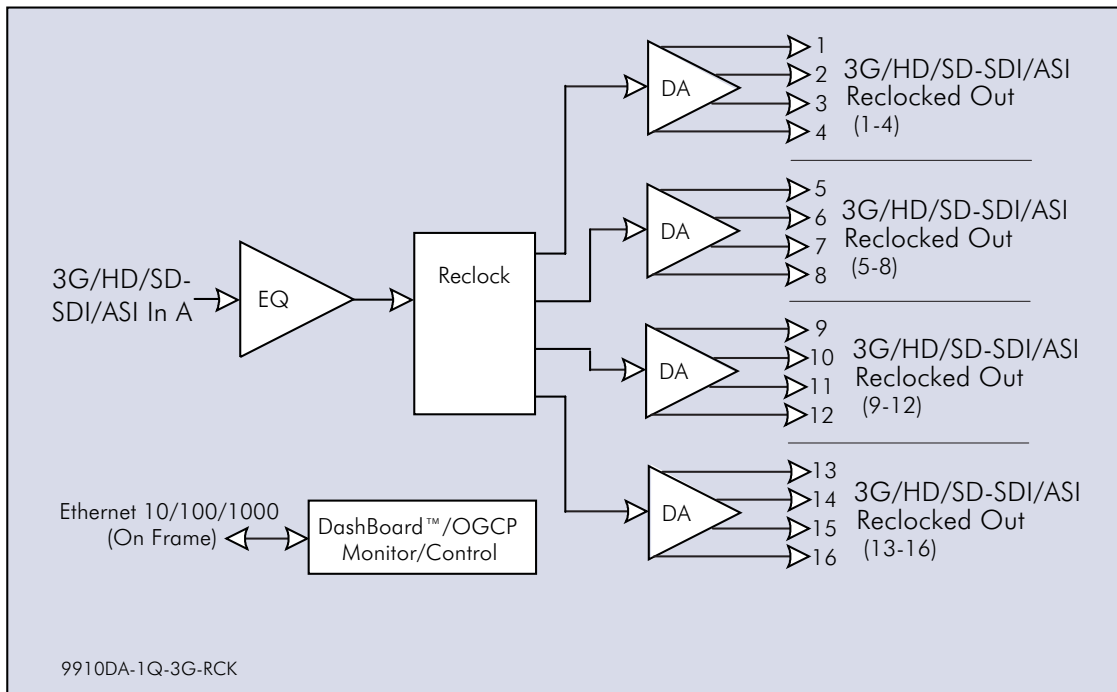
Input data rate auto-detection for all industry-standard data rates

All outputs are non-inverting – ASI can be outputted on any output

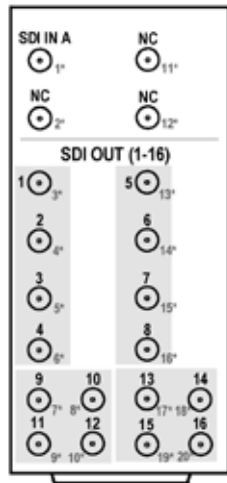
Card edge and DashBoard™ status and individual input lock indicators

Hot-swappable

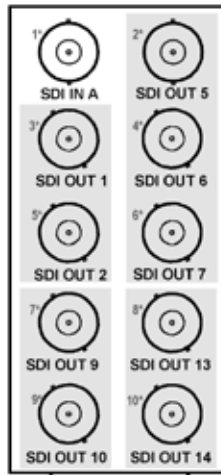
Five year warranty



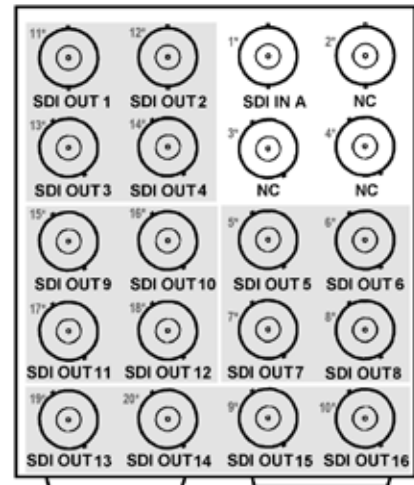
**9910DA-1Q-3G-RCK » 3G/HD/SD/ASI SINGLE-CHANNEL MULTI-RATE RECLOCKING DA**



**RM20-9910-1Q-B-DIN**  
**RM20-9910-1Q-B-HDBNC**



**RM20-9910-1Q-D**



**RM20-9910-1Q-E**

**Note:** Connector numbers with asterisks (\*) here denote the connector generic designation number screened on the rear module PCB.

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 3 Watts

**3G/HD/SD-SDI / ASI Inputs**

(1) 75Ω coaxial inputs (A)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**

3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**

75Ω coaxial outputs (16 total).  
Signal Level: 800 mV nominal  
Return Loss: >15 dB at 5 MHz - 1.485 GHz  
Jitter (wideband): HD < 0.2 UI

**ORDERING INFORMATION**

**9910DA-1Q-3G-RCK** 3G/HD/SD/ASI Single-Channel Multi-Rate Reclocking DA

**RM20-9910-1Q-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (DIN 1.0/2.3) (High Density)

**RM20-9910-1Q-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (HDBNC) (High Density)

**RM20-9910-1Q-D** 20-Slot Frame Rear I/O Module (Double Width) (1) 3G/HD/SD-SDI/ASI Input BNC, (9) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-1Q-E** 20-Slot Frame Rear I/O Module (Double Width) (1) 3G/HD/SD-SDI/ASI Input BNC, (16) 3G/HD/SD-SDI/ASI Output BNCs

**9910DA-2Q-3G » 3G/HD/SD/ASI DUAL-CHANNEL MULTI-RATE DA**  
with x4 Output Crosspoint (Non-Reclocking)



The Cobalt® **9910DA-2Q-3G 3G/HD/SD/ASI Dual-Channel Multi-Rate DA with x4 Output Crosspoint (Non-Reclocking)** supports two input channels which can be crosspoint-routed to any of 16 DA outputs. The 9910DA-2Q-3G is multi-rate and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

The extremely flexible crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows dual 1x8 or single 1x16 routing possibilities. Any of the two input channels can be distributed or duplicated across four groups of 1x4 DAs, and either of the two inputs can be set to use an alternate failover input upon loss of signal.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock for each input channel. Up to 10 of the 9910DA-2Q-3G cards can be installed in a frame to provide 20 channels of input, with distribution to up to 160 outputs.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Flexible output crosspoint allows card to function as dual-channel 1x8 or single-channel 1x16 DA

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Failsafe mode automatically switches to selected secondary input on loss of primary input

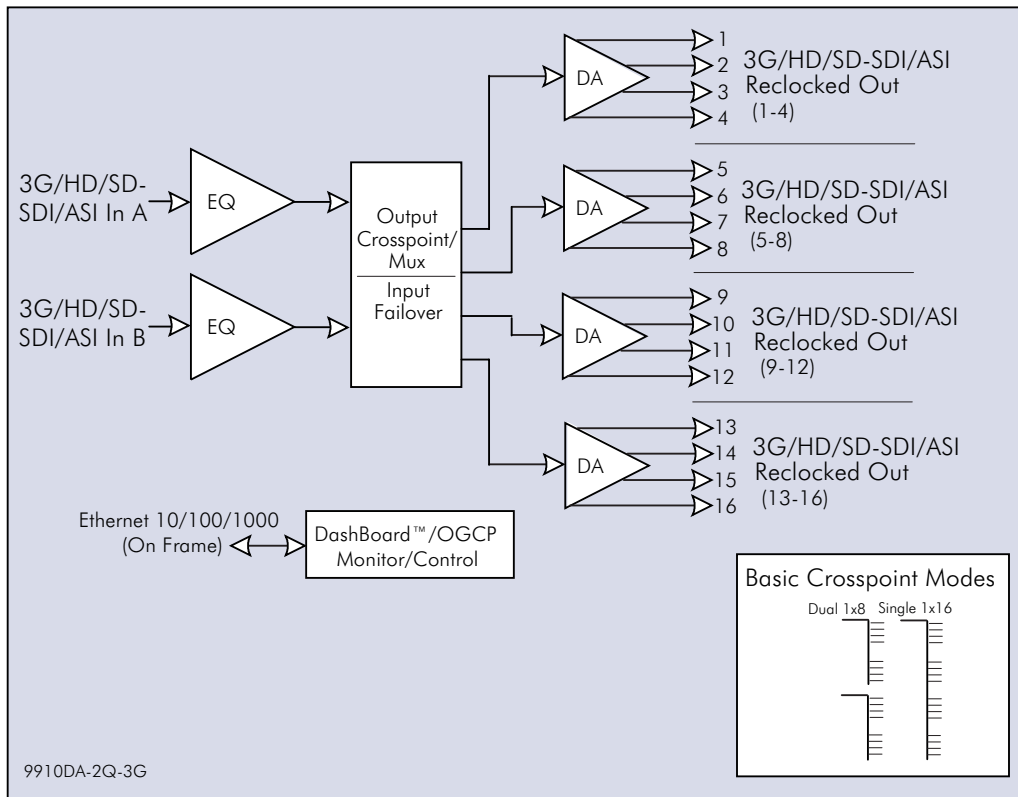
Input data rate auto-detection for all industry-standard data rates

All outputs are non-inverting - ASI can be outputted on any output

Card edge and DashBoard™ status and individual input lock indicators

Hot-swappable

Five year warranty



9910DA-2Q-3G



OPENGear 3G/HD/SD-SDI / ASI DA CARDS

**9910DA-2Q-3G » 3G/HD/SD/ASI DUAL-CHANNEL MULTI-RATE DA**  
with x4 Output Crosspoint (Non-Reclocking)

Rear I/O Module output designations here correlate to output numbers for four DA quadrants as shown in the card block diagram. As such, SDI outputs within a quadrant group can only be sourced from a particular input at one time (for example, if the card is set to feed SDI IN A to quadrant SDI Out (1-4), the rear module outputs 1 thru 4 will all output SDI IN A). Dissimilar inputs cannot be routed within a quadrant group (for example, SDI OUT 1 sourced from SDI IN A and SDI OUT 2 sourced from SDI IN B).

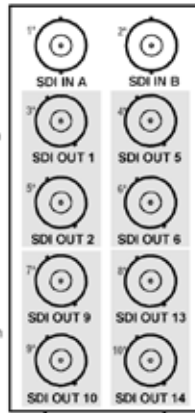
**Note:** Connector numbers with asterisks (\*) here denote the connector generic designation number screened on the rear module PCB.

**Note:** When this rear module is used Dashboard or local control should only be set to use SDI IN A and/or SDI IN B. Either of these inputs can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

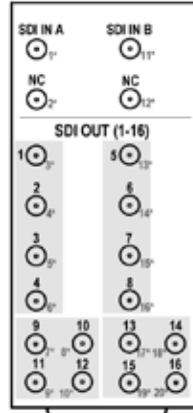
When local control instead of Dashboard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

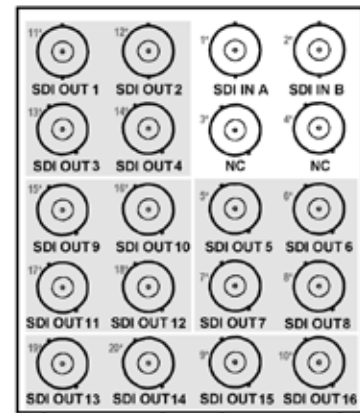
See Product Manual for more information.



RM20-9910-2Q-A



RM20-9910-2Q-B-DIN  
RM20-9910-2Q-B-HDBNC



RM20-9910-2Q-E

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 3 Watts

**3G/HD/SD-SDI / ASI Inputs**

(2) 75Ω coaxial inputs (A and B)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**

3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**

75Ω coaxial outputs (16 total). Each group of 4 outputs can be crosspoint connected to inputs A or B.  
Signal Level: 800 mV nominal  
Return Loss: >15 dB at 5 MHz - 1.485 GHz  
Jitter (wideband): HD < 0.2 UI

**ORDERING INFORMATION**

**9910DA-2Q-3G** 3G/HD/SD/ASI Dual-Channel Multi-Rate DA with x4 Output Crosspoint (Non-Reclocking)

**RM20-9910-2Q-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (8) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-2Q-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (DIN 1.0/2.3) (High Density)

**RM20-9910-2Q-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (HDBNC) (High Density)

**RM20-9910-2Q-E** 20-Slot Frame Rear I/O Module (Double Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (16) 3G/HD/SD-SDI/ASI Output BNCs

**9910DA-2Q-3G-RCK » 3G/HD/SD/ASI DUAL-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint



The Cobalt® **9910DA-2Q-3G-RCK 3G/HD/SD/ASI Dual-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint** supports two input channels which can be crosspoint-routed to any of 16 DA outputs. The 9910DA-2Q-3G-RCK is multi-rate with user enable/disable reclocking, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

The extremely flexible crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows dual 1x8 or single 1x16 and other routing possibilities. Any of the two input channels can be distributed or duplicated across four groups of 1x4 DAs, and either of the two inputs can be set to use an alternate failover input upon loss of signal.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock for each input channel. Up to 10 of the 9910DA-2Q-3G-RCK cards can be installed in a frame to provide 20 channels of input, with distribution to up to 160 outputs.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Reclocking can be enabled or disabled for each input channel

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Flexible output crosspoint allows card to function as dual-channel 1x8 or single-channel 1x16 reclocking DA

Failsafe mode automatically switches to selected secondary input on loss of primary input

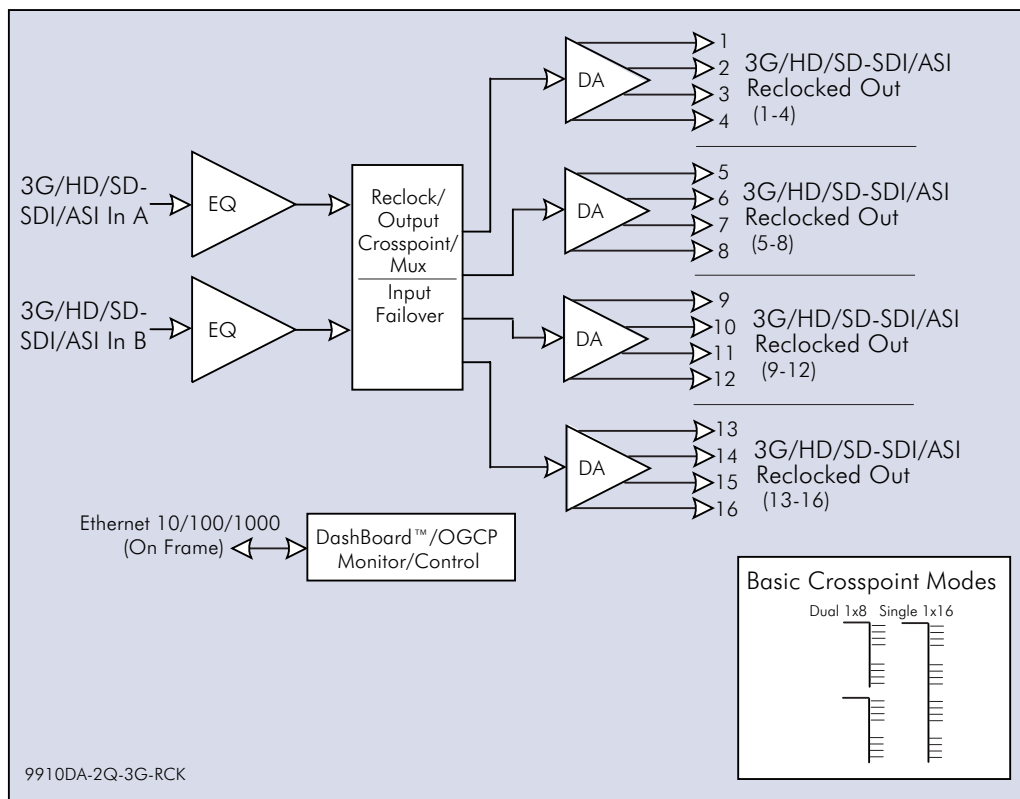
Input data rate auto-detection for all industry-standard data rates

All outputs are non-inverting - ASI can be outputted on any output

Card edge and DashBoard™ status and individual input lock indicators

Hot-swappable

Five year warranty



**9910DA-2Q-3G-RCK » 3G/HD/SD/ASI DUAL-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint

Rear I/O Module output designations here correlate to output numbers for four DA quadrants as shown in the card block diagram. As such, SDI outputs within a quadrant group can only be sourced from a particular input at one time (for example, if the card is set to feed SDI IN A to quadrant SDI Out (1-4), the rear module outputs 1 thru 4 will all output SDI IN A). Dissimilar inputs cannot be routed within a quadrant group (for example, SDI OUT 1 sourced from SDI IN A and SDI OUT 2 sourced from SDI IN B).

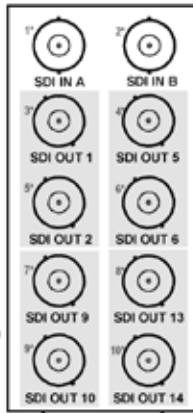
**Note:** Connector numbers with asterisks (\*) here denote the connector generic designation number screened on the rear module PCB.

**Note:** When this rear module is used DashBoard or local control should only be set to use SDI IN A and/or SDI IN B. Either of these inputs can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

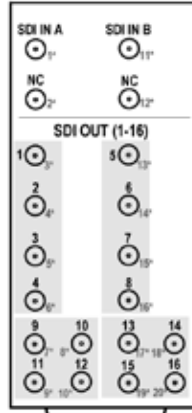
When local control instead of DashBoard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

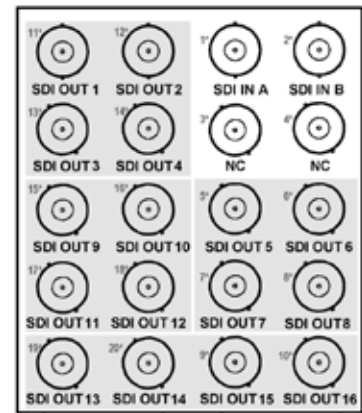
See Product Manual for more information.



**RM20-9910-2Q-A**



**RM20-9910-2Q-B-DIN**  
**RM20-9910-2Q-B-HDBNC**



**RM20-9910-2Q-E**

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
< 3 Watts

**3G/HD/SD-SDI / ASI Inputs**  
(2) 75Ω coaxial inputs (A and B)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**  
3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**  
75Ω coaxial outputs (16 total). Each group of 4 outputs can be crosspoint connected to inputs A or B.  
Signal Level: 800 mV nominal  
Return Loss: >15 dB at 5 MHz - 1.485 GHz  
Jitter (wideband): HD < 0.2 UI

**ORDERING INFORMATION**

**9910DA-2Q-3G-RCK** 3G/HD/SD/ASI Dual-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

**RM20-9910-2Q-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (8) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-2Q-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (DIN 1.0/2.3) (High Density)

**RM20-9910-2Q-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (HDBNC) (High Density)

**RM20-9910-2Q-E** 20-Slot Frame Rear I/O Module (Double Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (16) 3G/HD/SD-SDI/ASI Output BNCs

**9910DA-4Q-3G » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE DA**  
with x4 Output Crosspoint (Non-Reclocking)



The Cobalt® **9910DA-4Q-3G 3G/HD/SD/ASI Quad-Channel Multi-Rate DA with x4 Output Crosspoint (Non-Reclocking)** supports four input channels which can be crosspoint-routed to any of 16 DA outputs. The 9910DA-4Q-3G is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs. The quad-input capacity provides a one-card solution for distribution of 4K quadrant-division content over 3G/HD/SD-SDI interfaces.

The extremely flexible crosspoint (which is user-configurable via Dashboard™ GUI remote control) allows quad 1x4, dual 1x8, single 1x16 and other routing possibilities (such as dual 1x4 plus a single 1x8). Any of the four input channels can be distributed or duplicated across four groups of 1x4 DAs, and any of the four inputs can be set to use an alternate failover input upon loss of signal.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and Dashboard™ remote status monitoring indicates input lock for each input channel. Up to 10 of the 9910DA-4Q-3G cards can be installed in a frame to provide 40 channels of input, with distribution to up to 160 outputs.

Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

One-card solution for distribution of 4K quadrant-division content over 3G/HD/SD-SDI interfaces

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Excellent receive performance – EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Flexible output crosspoint allows card to function as quad-channel 1x4, dual-channel 1x8, or single-channel 1x16 DA

Failsafe mode automatically switches to selected secondary input on loss of primary input

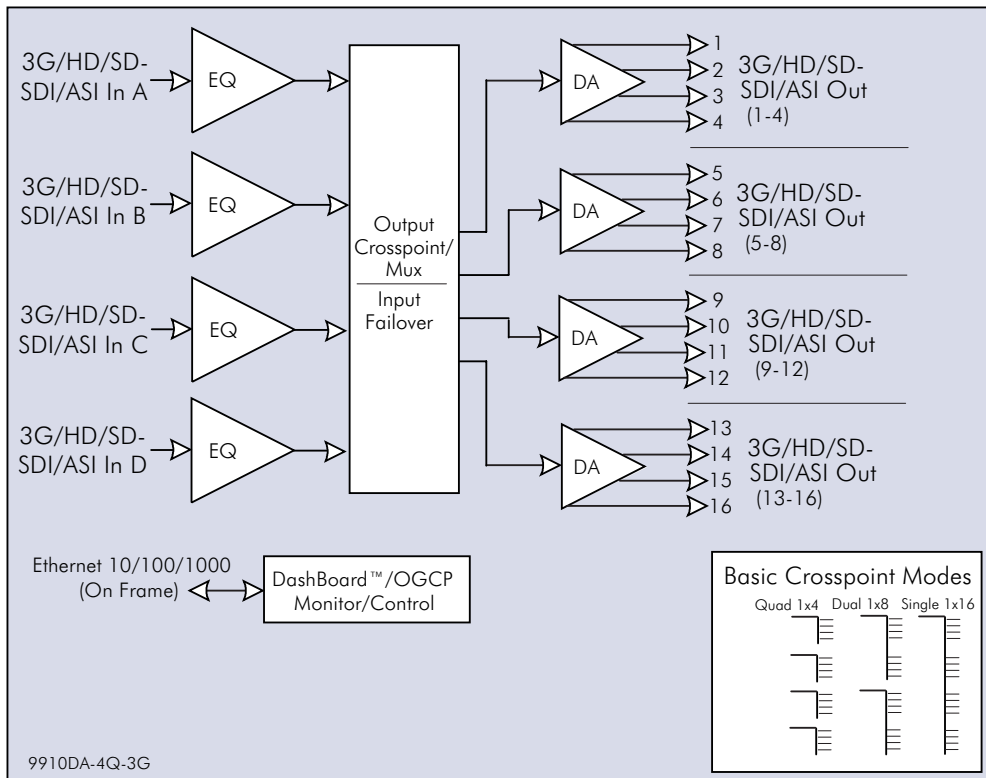
Input data rate auto-detection for all industry-standard data rates

All outputs are non-inverting – ASI can be outputted on any output

Card edge and Dashboard™ status and individual input lock indicators

Hot-swappable

Five year warranty



**9910DA-4Q-3G » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE DA**  
with x4 Output Crosspoint (Non-Reclocking)

Rear I/O Module output designations here correlate to output numbers for four DA quadrants as shown in the card block diagram. As such, SDI outputs within a quadrant group can only be sourced from a particular input at one time (for example, if the card is set to feed SDI IN A to quadrant SDI Out (1-4), the rear module outputs 1 thru 4 will all output SDI IN A). Dissimilar inputs cannot be routed within a quadrant group (for example, SDI OUT 1 sourced from SDI IN A and SDI OUT 2 sourced from SDI IN B).

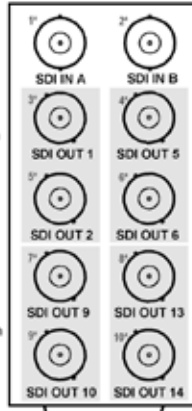
**Note:** Connector numbers with asterisks (\*) here denote the connector generic designation number screened on the rear module PCB.

**Note:** When this rear module is used Dashboard or local control should only be set to use SDI IN A and/or SDI IN B. Either of these inputs can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

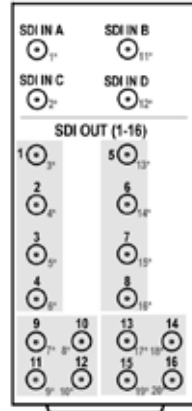
When local control instead of Dashboard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

See Product Manual for more information.



**RM20-9910-4Q-A**



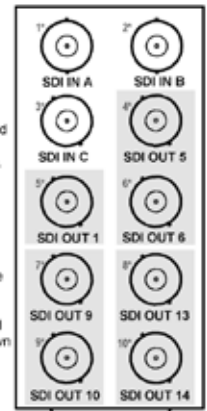
**RM20-9910-4Q-B-DIN**  
**RM20-9910-4Q-B-HDBNC**

**Note:** When this rear module is used Dashboard or local control should only be set to use SDI IN A, SDI IN B and/or SDI IN C. Any of these inputs can be routed to any of the output quadrant groupings shown (groupings shown in shaded areas).

When local control instead of Dashboard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (5-8) (shown in the block diagram) consisting of SDI OUT 5 and SDI OUT 6 only.)

See Product Manual for more information.



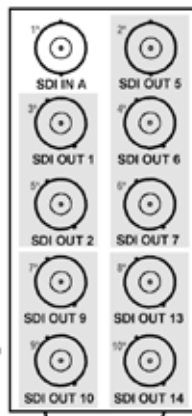
**RM20-9910-4Q-C**

**Note:** When this rear module is used Dashboard or local control should only be set to use SDI IN A. This input can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

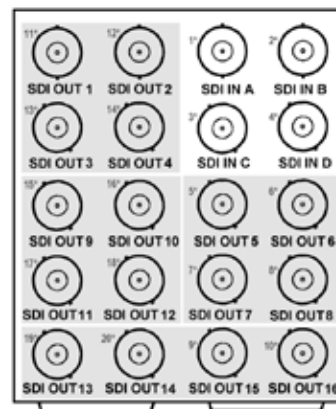
When local control instead of Dashboard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with the outputs being a reduced subset of the maximum available 16 outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

See Product Manual for more information.



**RM20-9910-4Q-D**



**RM20-9910-4Q-E**



**9910DA-4Q-3G » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE DA**  
with x4 Output Crosspoint (Non-Reclocking)

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 3 Watts

**3G/HD/SD-SDI / ASI Inputs**

(4) 75Ω coaxial inputs (A thru D)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**

3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**

(4x4) 75Ω coaxial outputs (16 total). Each group of 4 outputs can be crosspoint connected to inputs A thru D.  
Signal Level: 800 mV nominal  
Return Loss: >15 dB at 5 MHz - 1.485 GHz  
Jitter (wideband): HD < 0.2 UI

**ORDERING INFORMATION**

**9910DA-4Q-3G** 3G/HD/SD/ASI Quad-Channel Multi-Rate DA with x4 Output Crosspoint (Non-Reclocking)

**RM20-9910-4Q-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (8) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (DIN 1.0/2.3)

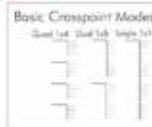
**RM20-9910-4Q-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (HDBNC)

**RM20-9910-4Q-C** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI/ASI Input BNC, (7) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI/ASI Input BNC, (9) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-E** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI/ASI Input BNC, (16) 3G/HD/SD-SDI/ASI Output BNCs

**9910DA-4Q-3G-RCK » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint



The Cobalt® **9910DA-4Q-3G-RCK 3G/HD/SD/ASI Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint** supports four input channels which can be crosspoint-routed to any of 16 DA outputs. The 9910DA-4Q-3G-RCK is multi-rate with user enable/disable reclocking, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs. The quad-input capacity provides a one-card solution for distribution of 4K quadrant-division content over 3G/HD/SD-SDI interfaces.

The extremely flexible crosspoint (which is user-configurable via Dashboard™ GUI remote control) allows quad 1x4, dual 1x8, single 1x16 and other routing possibilities. Any of the four input channels can be distributed or duplicated across four groups of 1x4 DAs, and any of the four inputs can be set to use an alternate failover input upon loss of signal.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and Dashboard™ remote status monitoring indicates input lock for each input channel. Up to 10 of the 9910DA-4Q-3G-RCK cards can be installed in a frame to provide 40 channels of input, with distribution to up to 160 outputs.

Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Reclocking can be enabled or disabled for each input channel

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

One-card solution for distribution of 4K quadrant-division content over 3G/HD/SD-SDI interfaces

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Flexible output crosspoint allows card to function as quad-channel 1x4, dual-channel 1x8, or single-channel 1x16 reclocking DA

Failsafe mode automatically switches to selected secondary input on loss of primary input

Input data rate auto-detection for all industry-standard data rates

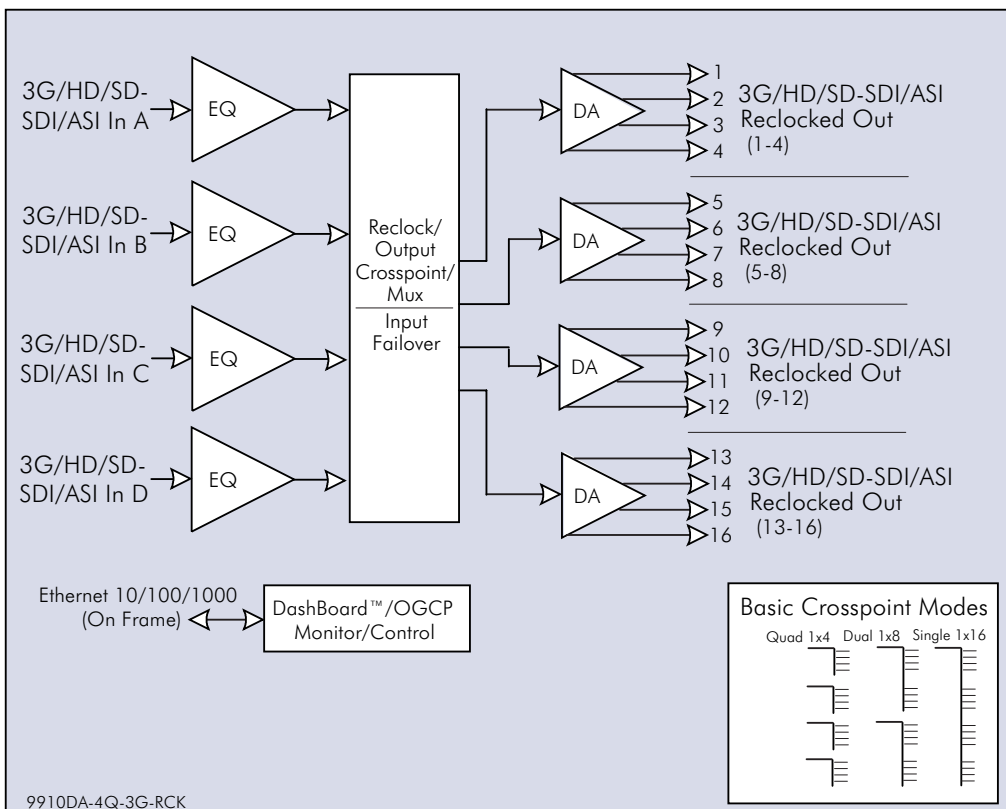
All outputs are non-inverting - ASI can be outputted on any output

All outputs are non-inverting - ASI can be outputted on any output

Card edge and Dashboard™ status and individual input lock indicators

Hot-swappable

Five year warranty



OPENGear 3G/HD/SD-SDI / ASI DA CARDS

**9910DA-4Q-3G-RCK » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint

Rear I/O Module output designations here correlate to output numbers for four DA quadrants as shown in the card block diagram. As such, SDI outputs within a quadrant group can only be sourced from a particular input at one time (for example, if the card is set to feed SDI IN A to quadrant SDI Out (1-4), the rear module outputs 1 thru 4 will all output SDI IN A). Dissimilar inputs cannot be routed within a quadrant group (for example, SDI OUT 1 sourced from SDI IN A and SDI OUT 2 sourced from SDI IN B).

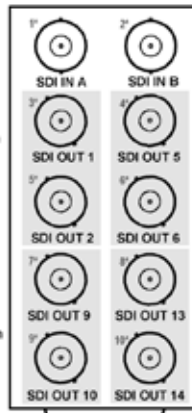
**Note:** Connector numbers with asterisks (\*) here denote the connector generic designation number screened on the rear module PCB.

**Note:** When this rear module is used DashBoard or local control should only be set to use SDI IN A and/or SDI IN B. Either of these inputs can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

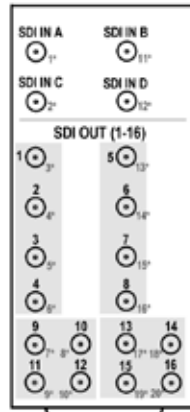
When local control instead of DashBoard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

See Product Manual for more information.



RM20-9910-4Q-A



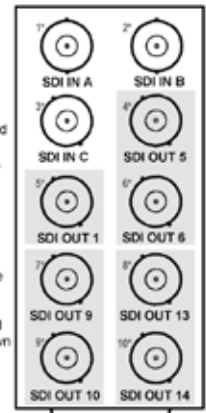
RM20-9910-4Q-B-DIN  
RM20-9910-4Q-B-HDBNC

**Note:** When this rear module is used DashBoard or local control should only be set to use SDI IN A, SDI IN B and/or SDI IN C. Any of these inputs can be routed to any of the output quadrant groupings shown (groupings shown in shaded areas).

When local control instead of DashBoard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with these outputs being a reduced subset of the maximum 16 available outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (5-8) (shown in the block diagram) consisting of SDI OUT 5 and SDI OUT 6 only.)

See Product Manual for more information.



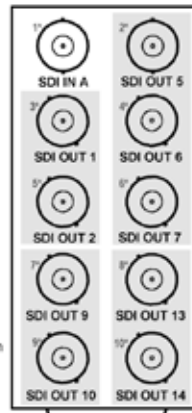
RM20-9910-4Q-C

**Note:** When this rear module is used DashBoard or local control should only be set to use SDI IN A. This input can be routed to any of the output quadrant groupings shown (grouping shown in shaded areas).

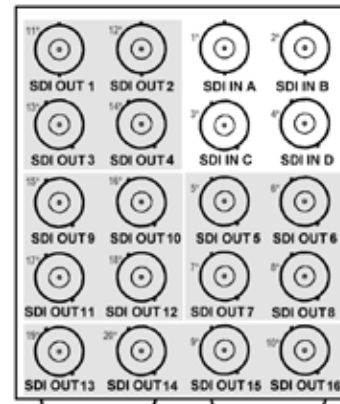
When local control instead of DashBoard is used, input routing to output groups on this rear module is fixed.

The outputs shown here are all that is available using this rear module, with the outputs being a reduced subset of the maximum available 16 outputs. (For example, this rear module offers a reduced subset of DA quadrant SDI Out (1-4) (shown in the block diagram) consisting of SDI OUT 1 and SDI OUT 2 only.)

See Product Manual for more information.



RM20-9910-4Q-D



RM20-9910-4Q-E

**9910DA-4Q-3G-RCK » 3G/HD/SD/ASI QUAD-CHANNEL MULTI-RATE RECLOCKING DA**  
with x4 Output Crosspoint

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 3 Watts

**3G/HD/SD-SDI / ASI Inputs**

(4) 75Ω coaxial inputs (A thru D)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**

3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**

(4x4) 75Ω coaxial outputs (16 total). Each group of 4 outputs can be crosspoint connected to inputs A thru D.  
Signal Level: 800 mV nominal  
Return Loss: >15 dB at 5 MHz - 1.485 GHz  
Jitter (wideband): HD < 0.2 UI

**ORDERING INFORMATION**

**9910DA-4Q-3G-RCK** 3G/HD/SD/ASI Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

**RM20-9910-4Q-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/ASI Input BNC, (8) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (DIN 1.0/2.3) (High Density)

**RM20-9910-4Q-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI/ASI Inputs, (16) 3G/HD/SD-SDI/ASI Outputs (HDBNC) (High Density)

**RM20-9910-4Q-C** 20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI/ASI Input BNC, (7) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI/ASI Input BNC, (9) 3G/HD/SD-SDI/ASI Output BNCs

**RM20-9910-4Q-E** 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI/ASI Input BNC, (16) 3G/HD/SD-SDI/ASI Output BNCs

**9911DA-8-BPX » DUAL-INPUT 3G/HD/SD-SDI / ASI 1X8 DISTRIBUTION AMPLIFIER**  
and Bypass Protection Switch with Passive Relay Protected Output



The Cobalt® **9911DA-8-BPX Dual-Input 3G/HD/SD-SDI / ASI 1x8 Distribution Amplifier and Bypass Protection Switch with Passive Relay Protected Output** provides 1x8 distribution of 3G/HD/SD-SDI and ASI signals with a passive relay path to provide a failover output in case of loss of power. All outputs are non-inverting and usable for ASI. Either of two inputs can be routed to the eight card DA outputs. Inputs are equalized and reclocked.

A Primary input is power-loss relay protected. A Backup secondary input can feed the DA outputs should signal absence be detected on the primary input. SNMP support can propagate notice if secondary input failover has been invoked.

Excellent receive performance allows receive EQ for up to 120m 3G and 160m HD cable length (1694A). Card edge and DashBoard™ remote status monitoring indicates input lock for each input channel. Up to 10 of the 9911DA-8-BPX cards can be installed in a frame.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

3G/HD/SD-SDI and ASI compatible on all inputs and outputs

Simple relay routing signal path maintains full signal integrity. Rear-module located bypass relay maintains signal path even if card/power is lost.

Failsafe mode automatically switches to Backup secondary input on loss of primary input

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

Excellent receive performance - EQ allows 1694A cable lengths up to 120m (3G) / 160m (HD) / 400m (SD)

SNMP support propagates notice if secondary input failover has been invoked.

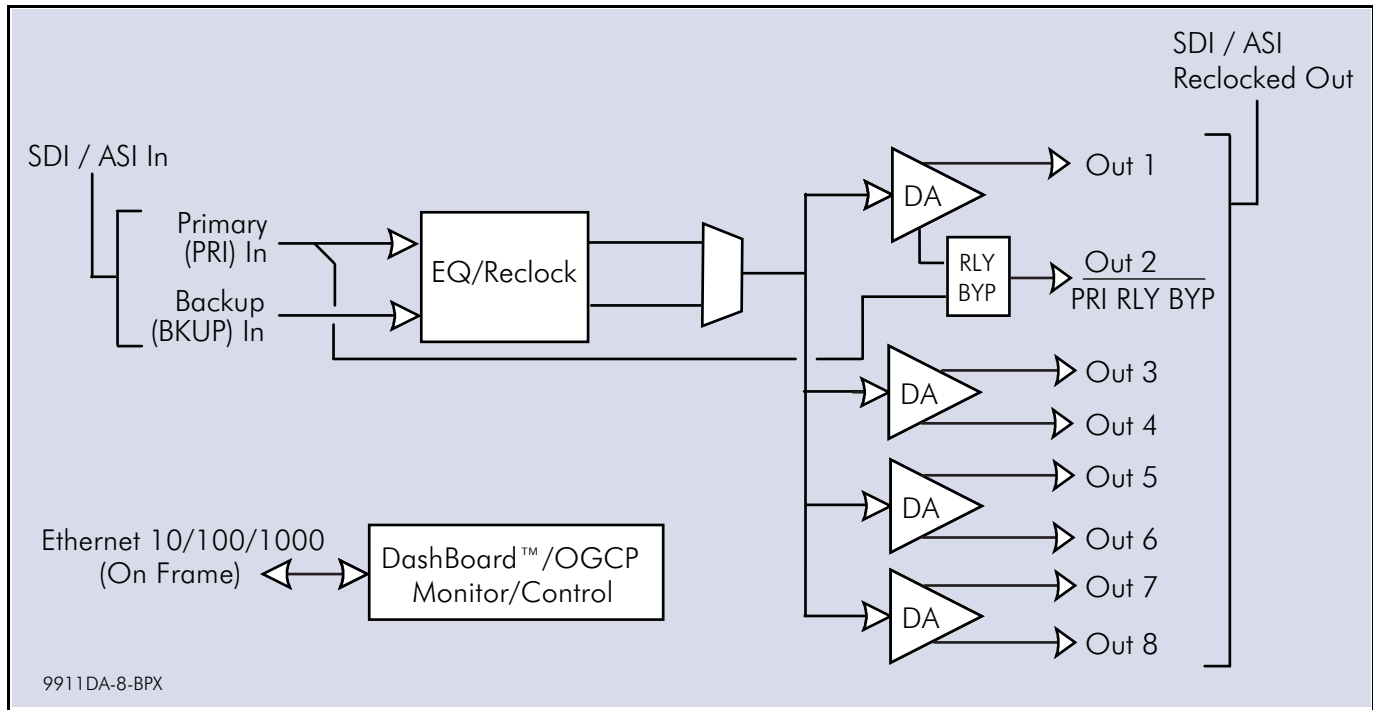
All outputs are non-inverting - ASI can be outputted on any output

Input data rate auto-detection for all industry-standard data rates

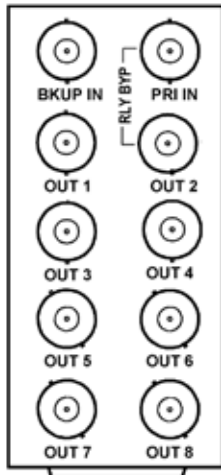
Card edge and DashBoard™ status and individual input lock indicators

Hot-swappable

Five year warranty



**9911DA-8-BPX » DUAL-INPUT 3G/HD/SD-SDI / ASI 1X8 DISTRIBUTION AMPLIFIER**  
and Bypass Protection Switch with Passive Relay Protected Output



**PRI IN** is DA Primary input, and is card loss-of-power relay protected.  
**BKUP IN** is DA Backup (secondary) input, and can be source to DA inputs upon signal loss on PRI IN input.

**RM20-9911DA-A**

**SPECIFICATIONS**

**Power**

<6 Watts

**3G/HD/SD-SDI / ASI Inputs**

Number of inputs: 2  
Impedance: 75Ω  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Receive Performance (Cable Length; Belden 1694A)**

3 Gbps: 120m  
1.485 Gbps: 160m  
143-360 Mbps: 400m

**3G/HD/SD-SDI / ASI Outputs**

Number of DA outputs: 8  
213Mbit/s maximum ASI TS bit-rate per port  
Impedance: 75Ω

**ORDERING INFORMATION**

**9911DA-8-BPX** Dual-Input 3G/HD/SD-SDI / ASI 1x8 Distribution Amplifier and Bypass Protection Switch with Passive Relay Protected Output

**RM20-9911DA-A** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI / ASI Input BNCs, (8) 3G/HD/SD-SDI / ASI Output BNCs.  
Relay bypass for PRI IN – OUT 2 path.

9910DA-AV-EQ » ANALOG VIDEO DISTRIBUTION AMPLIFIER WITH EQ



The Cobalt® 9910DA-AV-EQ Analog Video Distribution Amplifier with EQ provides 1x8 distribution with one analog input and eight 75Ω analog outputs. Card jumpers allow setting the input as differential (floating ground) or single-ended, AC or DC coupled, and Hi-Z looping input or on-card 75Ω terminated. Trim controls located on the front of the card allow EQ adjustment and gain control. The card can be accessed using DashBoard™ remote control for status monitoring. Status monitoring shows the video format of the input signal.

FEATURES

Multi-mode input provides differential or single-ended input and hi-Z looping or card-terminated operation

Signal path can be set as DC or AC coupled

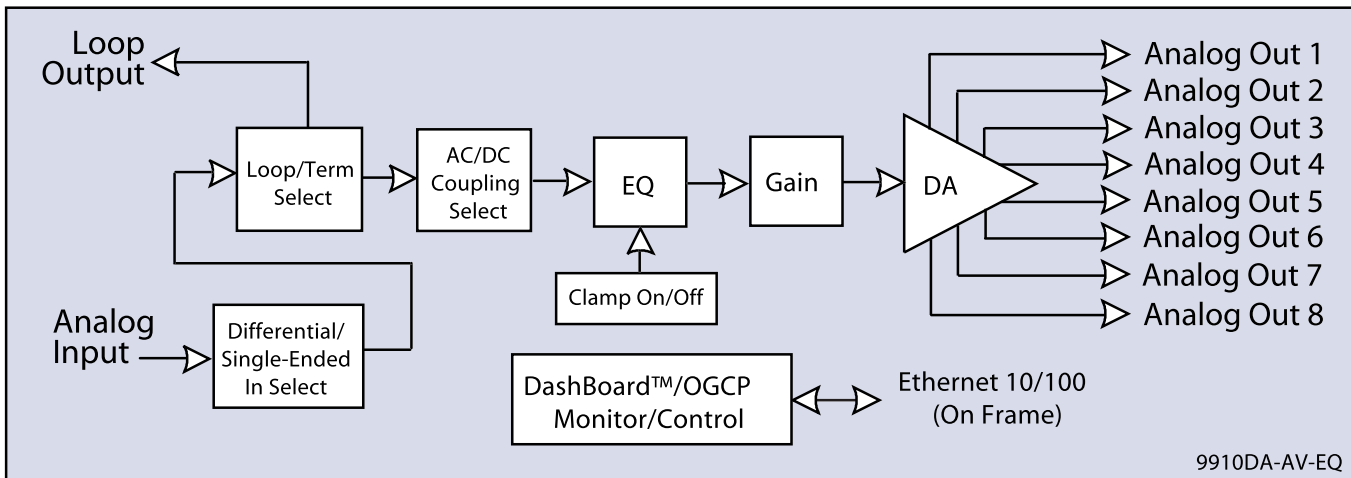
User adjustable EQ and gain with easily accessible controls on front of card edge. EQ optimizes performance for input cable lengths exceeding 1000 ft (300m).

User-selectable input clamping (none, fast, or slow clamping selectable)

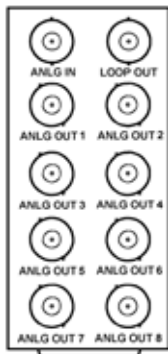
Remote monitoring via DashBoard™ software or OGCP-9000 Remote Control Panel. Card Status display shows presence and video format (e.g., 525i, 720p, 1080i) of input signal.

Hot-swappable

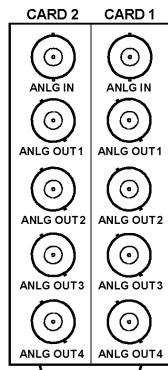
Five year warranty



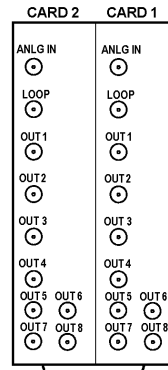
9910DA-AV-EQ



RM20-9910AV-B



RM20-9910AV-A/S



RM20-9910AV-BS-DIN  
RM20-9910AV-BS-DIN



**9910DA-AV-EQ » ANALOG VIDEO DISTRIBUTION AMPLIFIER WITH EQ****SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

2 Watts

**Analog Video Input**

Number of inputs: (1)  
 (Compatible with any NTSC or PAL black-burst or tri-level analog video format.)  
 Impedance: User selectable as hi-Z looping or card-terminated 75Ω  
 Level: 1 Vp-p, nominal  
 Return Loss: 46 dB @ 3.58 MHz  
 Input modes: User selectable as differential/single-ended and AC or DC coupled

**Analog Video Outputs**

Number of DA outputs: up to (8)  
 Impedance: 75Ω  
 Level: 1 Vp-p, nominal  
 Looping Output: (1)

**Performance**

Frequency response: >0.05 dB @ 3.58 MHz  
 Differential Gain: >0.15% @ 3.58 MHz  
 Differential Phase: >0.15° @ 3.58 MHz  
 S/N: >60 dB; 5 MHz BW

**ORDERING INFORMATION**

**9910DA-AV-EQ** Analog Video Distribution Amplifier with EQ

**RM20-9910AV-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) Analog Video Input BNC, (8) Analog DA Output BNCs, (1) Input Loop Output BNC

**RM20-9910AV-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input BNC, (4) Analog DA Output BNCs (connections are per card)

**RM20-9910AV-B/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input, (8) Analog DA Outputs, (1) Input Loop Output (connections are per card; all connectors are DIN 1.0/2.3)

**RM20-9910AV-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input, (8) Analog DA Outputs, (1) Input Loop Output (connections are per card; all connectors are HD-BNC)



9910DA-AV » ANALOG VIDEO DISTRIBUTION AMPLIFIER



The Cobalt® 9910DA-AV Analog Video Distribution Amplifier provides 1x8 distribution with one analog input and eight 75Ω analog outputs. Card jumpers allow setting the input as differential (floating ground) or single-ended, and Hi-Z looping input or on-card 750 terminated. A trim control located on the front of the card allows gain control. The card can be accessed using Dashboard™ remote control for status monitoring. Status monitoring shows the video format of the input signal.

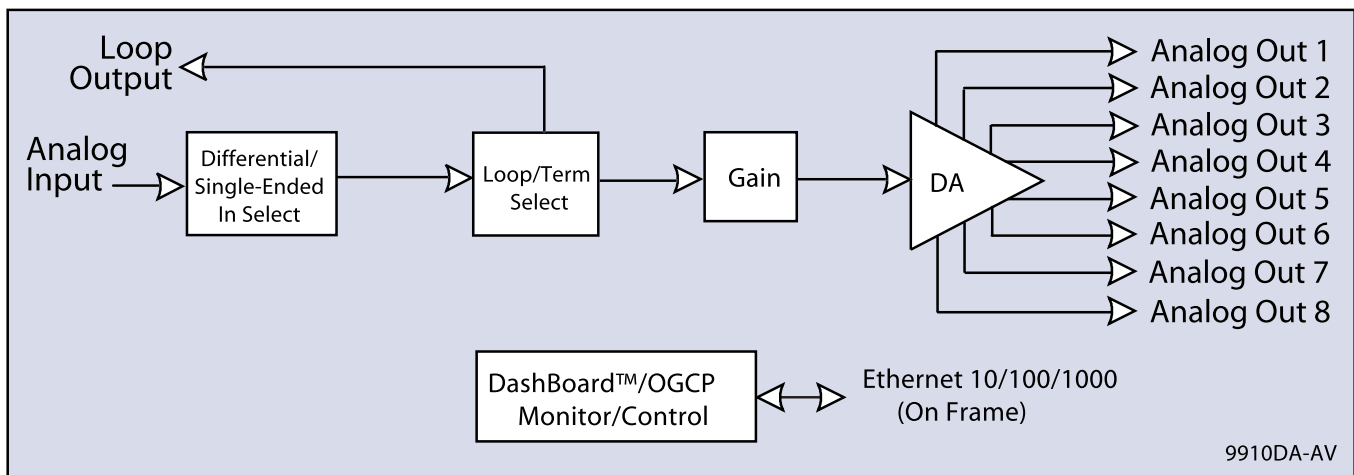
FEATURES

Multi-mode input provides differential or single-ended input and hi-Z looping or card-terminated operation

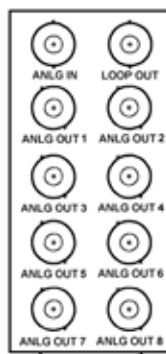
Remote monitoring via Dashboard™ software or OGCP-9000 Remote Control Panel. Card Status display shows presence and video format (e.g., 525i, 720p, 1080i) of input signal.

Hot-swappable

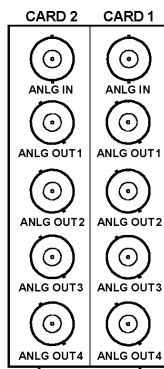
Five year warranty



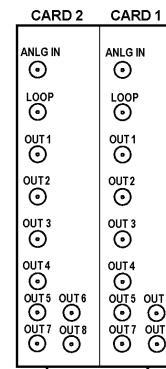
9910DA-AV



RM20-9910AV-B



RM20-9910AV-AIS



RM20-9910AV-BS-DIN  
RM20-9910AV-BS-DIN



**9910DA-AV » ANALOG VIDEO DISTRIBUTION AMPLIFIER****SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

2 Watts

**Analog Video Input**

Number of inputs: (1)

(Compatible with any NTSC or PAL black-burst or tri-level analog video format.)

Impedance: User selectable as hi-Z looping or card-terminated 75Ω

Level: 1 Vp-p, nominal

Return Loss: 46 dB @ 3.58 MHz

Input modes: User selectable as differential/single-ended and AC or DC coupled

**Analog Video Outputs**

Number of DA outputs: up to (8)

Impedance: 75Ω

Level: 1 Vp-p, nominal

Looping Output: (1)

**Performance**

Frequency response: >0.05 dB @ 3.58 MHz

Differential Gain: >0.15% @ 3.58 MHz

Differential Phase: >0.15° @ 3.58 MHz

S/N: >60 dB; 5 MHz BW

**ORDERING INFORMATION**

**9910DA-AV** Analog Video Distribution Amplifier

**RM20-9910AV-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) Analog Video Input BNC, (8) Analog DA Output BNCs, (1) Input Loop Output BNC

**RM20-9910AV-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input BNC, (4) Analog DA Output BNCs (connections are per card)

**RM20-9910AV-B/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input, (8) Analog DA Outputs, (1) Input Loop Output (connections are per card; all connectors are DIN 1.0/2.3)

**RM20-9910AV-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Analog Video Input, (8) Analog DA Outputs, (1) Input Loop Output (connections are per card; all connectors are HD-BNC)

BLUEBOX COMPACT THROWDOWN 3G/HD/SD-SDI / ASI DA UNITS

**BBG-DA-12G-1x6 » 12G/6G/3G/HD/SD-SDI / ASI / MADI RECLOCKING DISTRIBUTION AMPLIFIER** with Input Status LED

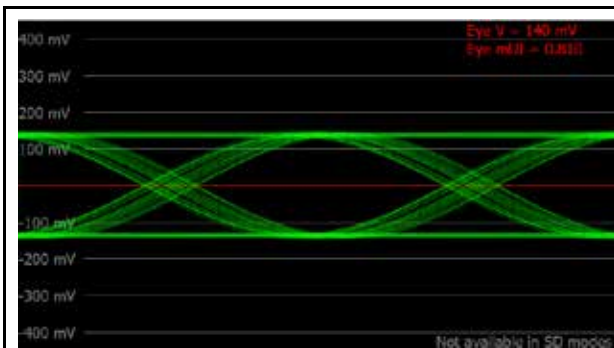
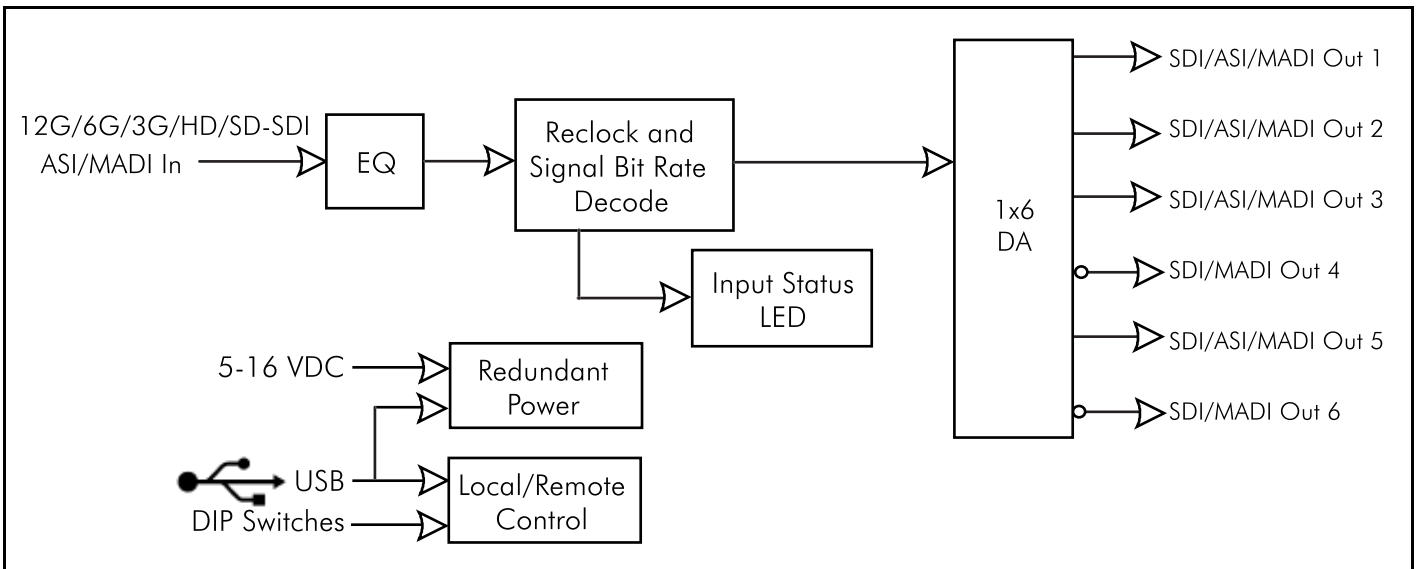


The **BBG-DA-12G-1x6** is a 12G/6G/3G/HD/SD-SDI / ASI / MADI multi-rate distribution amplifier that features an input status LED. The unit is fully automatic and supports SMPTE 2082-1 (12G), 424M (3G), 292M and 259M SDI video signals as well as ASI and MADI, and is equipped with one input and six reclocked SDI outputs. (Reclocking for 12G/6G/3G/HD/SD-SDI and MADI inputs; all other bit rates are non-reclocking.) The unit supports 1x4 ASI distribution using its non-inverting outputs.

Various settings can be configured using the device DIP switches or by using the intuitive **BBGConfig** UI application that communicates with BBG-DA-12G-1x6 over a PC's USB port. When configured using the BBGConfig UI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

- Six 12G/6G/3G/HD/SD equalized and reclocked outputs
- 1x4 ASI distribution capability
- Input status LED indicator
- Configurable using device DIP switches or BBGConfig USB UI remote control
- Auto-reclock for SMPTE 2082-1, 424M, 292M, 259M, and MADI
- BBGConfig USB UI offers eye pattern display, showing real-time input signal condition/timing stability/jitter
- Small rugged portable standalone package ideal for portable installations. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.
- Rugged construction backed with a five-year warranty



**BBGConfig** USB UI provides eye pattern display, showing real-time input signal condition/timing stability/jitter



BLUEBOX COMPACT THROWDOWN 3G/HD/SD-SDI / ASI DA UNITS

**BBG-DA-12G-1x6 » 12G/6G/3G/HD/SD-SDI / ASI / MADI RECLOCKING DISTRIBUTION AMPLIFIER** with Input Status LED

**SPECIFICATIONS**

**Power**

<2 Watts; 5-16 VDC (compatible with Power Supply PS4 (North America) or PS5 (International). (See Ordering Information for details.)

**12G/6G/3G/HD/SD-SDI / ASI / MADI Inputs**

Number of inputs: 1  
 Impedance: 75Ω  
 SDI Formats Supported: SMPTE 2082-1, 424M, 292M, 259M  
 Other Formats Supported: ASI, MADI

**Receive Performance; Equalized (Cable Length; Belden 1694A)**

12 Gbps: 80m  
 3 Gbps: 160m  
 1.485 Gbps: 180m  
 143-360 Mbps: 400m

**12G/6G/3G/HD/SD-SDI / ASI / MADI Outputs**

Number of DA outputs: 6  
 Signal Level: 800 mV +/- 10%  
 DC Offset: 0.0V +/- 0.5V  
**Jitter 12 Gbps:**  
 Alignment (<100 kHz) Jitter: < 0.3 UI  
 Timing (<10 Hz) Jitter: < 8 UI  
**Jitter 6 Gbps:**  
 Alignment (<100 kHz) Jitter: < 0.3 UI  
 Timing (<10 Hz) Jitter: < 4 UI  
**Jitter 3 Gbps:**  
 Alignment (<100 kHz) Jitter: < 0.3 UI  
 Timing (<10 Hz) Jitter: < 2 UI  
**Jitter 1.5 Gbps:**  
 Alignment (<100 kHz) Jitter: < 0.2 UI  
 Timing (<10 Hz) Jitter: < 1 UI  
**Jitter 270 Mbps:**  
 Alignment (<1 kHz) Jitter: < 0.2 UI  
 Timing (<10 Hz) Jitter: < 0.2 UI  
 Impedance: 75Ω

**Dimensions (WxHxD)**

5.8" x 2.9" x 1.1" (including connector projections)  
 (147 x 74 x 28 mm)

**ORDERING INFORMATION**

**BBG-DA-12G-1x6** 12G/6G/3G/HD/SD-SDI / ASI / MADI Reclocking Distribution Amplifier with Input Status LED

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** Device includes one PS4 Power Supply (AC adapter). Power supplies listed below are for replacement or spares purposes:

- **PS4** Universal Power Supply, UL/CSA. Input: 100-240V, 60/50 Hz. Output: 5 VDC @ 12 Watts
- **PS5** Universal Power Supply, IEC Connector, CE/UL/CSA. Input: 100-240V, 60/50 Hz. Output: 5V, 2A (International Power Supply. Specify country of destination.)

## 9241 » ANALOG AUDIO DISTRIBUTION AMPLIFIER



The 9241 is an analog audio distribution amplifier with up to eight low-impedance outputs designed for broadcast use. It can be used as either a mono or two-channel (stereo) audio DA. The 9241 can provide eight copies of a single (mono) input signal or four copies each of a two (stereo) inputs.

The 9241 can also sum two channels for creating a mono mix. It can also detect dead-air silence and set an alarm when no audio is present.

### » FEATURES

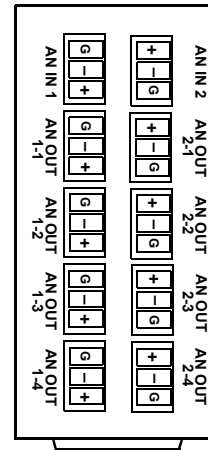
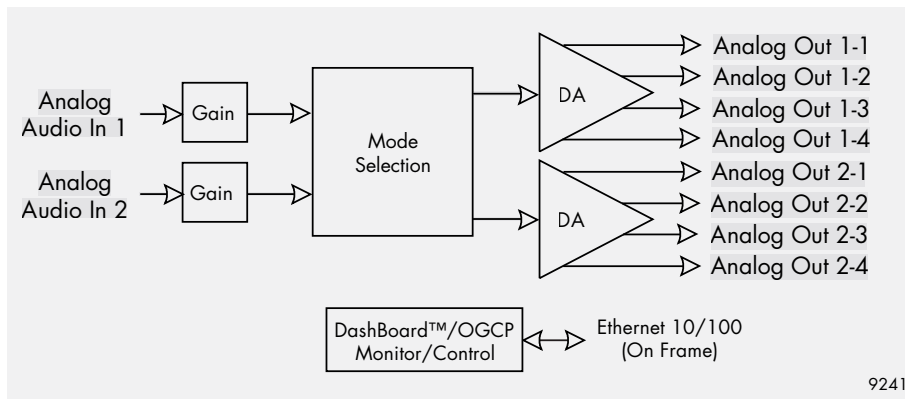
Handles mono or stereo signals

Has summing capability

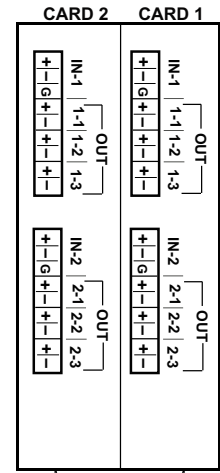
Silence detection

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panel

Five year warranty

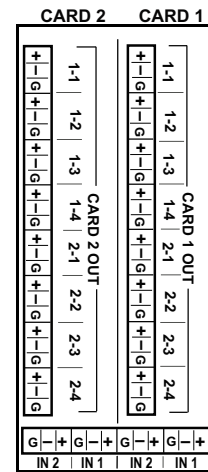


RM20-9241-B



Note: Outputs 2-1 thru 2-3 are outputs 1-4 thru 1-6 when card used in mono DA or mono mix DA mode.

RM20-9241-C/S



Note: Outputs 2-1 thru 2-4 are outputs 1-5 thru 1-8 when card used in mono DA or mono mix DA mode.

RM20-9241-D/S

### » SPECIFICATIONS

#### Electrical

Power: 3 watts

#### Analog Audio Input

Number of inputs: 2 balanced

Impedance: >20 kΩ balanced

Max Level: +27.5 dBu

Common Mode Rejection: >80 dB, 20 Hz to 20 kHz

#### Performance

Freq. Response: >0.1 dB at 20 Hz to 20 kHz

Gain: -14 dB to +18 dB cont. variable

Harmonic Dist: <0.01%

SNR: > 95 dBu

#### Analog Audio Output

Number of Outputs: 8

Impedance: 60 Ω balanced

Max Level: +26 dBu



### » ORDERING INFORMATION

**9241** Analog Audio Distribution Amplifier, 1 X 8 Mono or 1 X 4 Stereo, with Summing Control

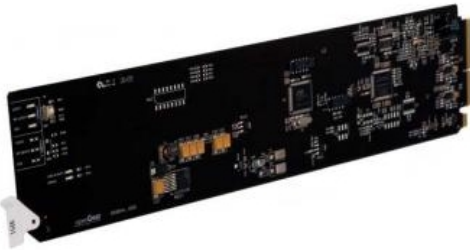
**RM20-9241-B** 20-Slot Frame Rear I/O Module (Standard Width) 2 Differential Analog Audio In, 8 Differential Analog Audio Outs

**RM20-9241-C/S** 20-Slot Frame Rear I/O Module (Split) Dual 1x3 Differential Analog Audio I/O

**RM20-9241-D/S** 20-Slot Frame Rear I/O Module (Split) Dual 1x4 Differential Analog Audio I/O

OPENGear ANALOG AUDIO DA CARDS

9242 » ANALOG AUDIO DISTRIBUTION AMPLIFIER with Remote Gain Control



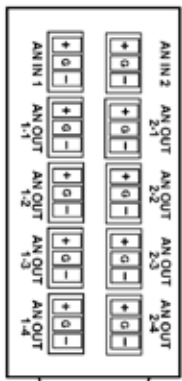
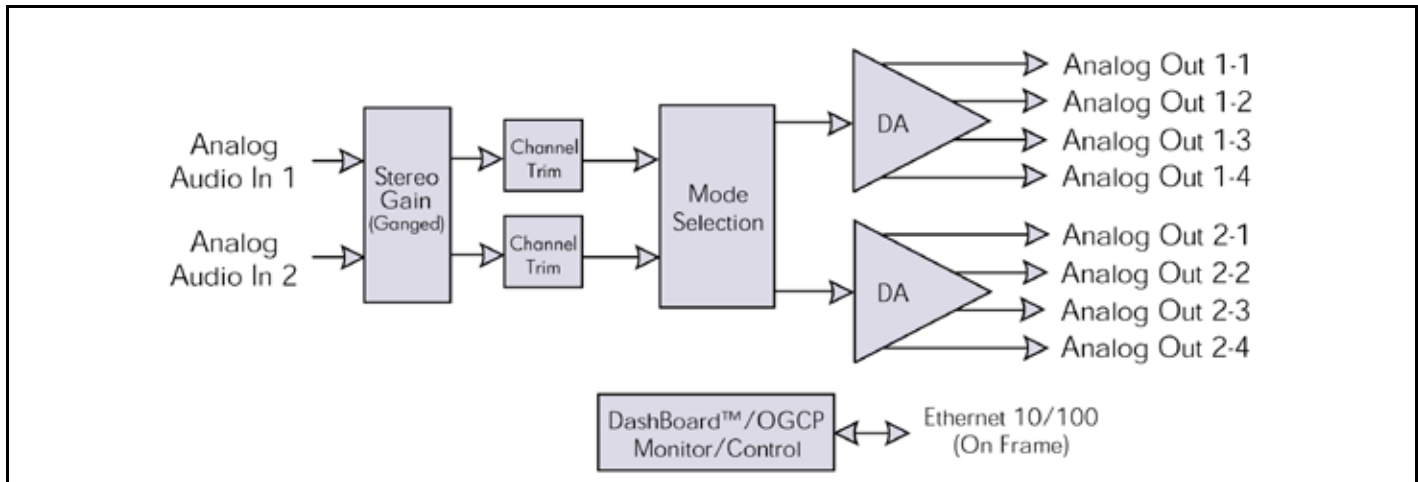
The **9242 Analog Audio Distribution Amplifier with Remote Gain Control** is a broadcast-quality balanced analog audio DA with stereo 2x4, mono 1x8, and stereo sum L+R x 8 selectable output modes. Unlike most analog audio DAs, the 9242 electronic attenuators allow overall gain (stereo ganged) and per-channel trim (offset) via Dashboard™ remote control.

The space-saving design and very low power consumption of the 9242 provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard-width “split” rear module.

FEATURES

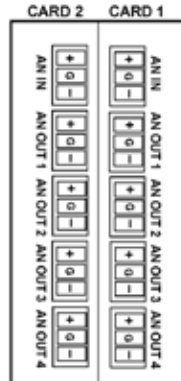
- Full remote control of operating mode and gain control
- Multiple modes – stereo 2x4, mono 1x8, and stereo sum L+R x 8 outputs
- Full broadcast-grade balanced signal capability with 27.5 dBu maximum input level support. Low-impedance outputs.
- Selectable card switch control or Dashboard™ remote control (usable with Dashboard™ and Cobalt OGCP-9000 remote control panels)

- Remote monitoring via Dashboard™ software or OGCP-9000 Remote Control Panel
- Hot-swappable
- Five year warranty



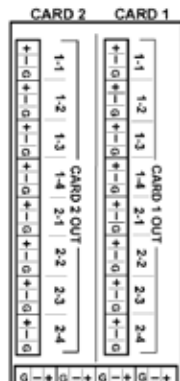
Note: + / G / - orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.

RM20-9242-B



Note: + / G / - orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.

RM20-9242-CIS



Note: Outputs 2-1 thru 2-4 are outputs 1-5 thru 1-8 when card used in mono DA or mono mix DA mode. Screened connection info on PCB may be incorrect. Always use this diagram when making connections.

RM20-9242-DIS



**9242 » ANALOG AUDIO DISTRIBUTION AMPLIFIER** with Remote Gain Control

**SPECIFICATIONS**

**Note:** Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 5 Watts

**Analog Audio Input**

Number of Inputs: (2) balanced  
 Impedance: > 20 kΩ, balanced  
 Maximum Input Level: +27.5 dBu  
 Connector Type: WECO® removable modular

**Performance**

Gain: -15 dB to +15 dB  
 Frequency Response: 20 – 20 kHz ±0.1 dB  
 Noise: < -85 dBu, 10 – 22 kHz at unity gain  
 Harmonic Distortion: < 0.01%

**Analog Audio Outputs**

Number of Outputs: (8) balanced; available as stereo 2x4, mono 1x8, and stereo sum L+R x 8 outputs  
 Impedance: 60 Ω, balanced  
 Output Isolation: > 60 dB  
 Connector Type: WECO® removable modular

**ORDERING INFORMATION**

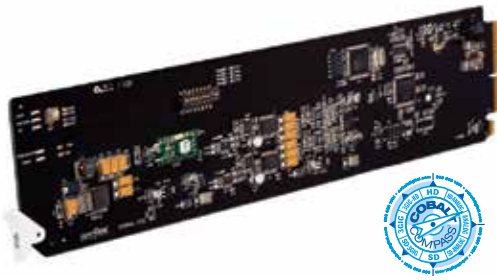
**9910DA-AV-EQ** Analog Audio Distribution Amplifier with Remote Gain Control

**RM20-9242-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) Balanced Analog Audio In, (8) Balanced Analog Audio Out

**RM20-9242-C/S** 20-Slot Frame Rear I/O Module (Split) Dual 1x4 Balanced Analog Audio I/O (connections are per card)

**RM20-9242-D/S** 20-Slot Frame Rear I/O Module (Split) Dual 1x4 Differential Analog Audio I/O (connections are per card)

9262 » STEREO AES TO ANALOG AUDIO D/A CONVERTER



The 9262 features digital-to-analog audio conversion with AES/EBU signal distribution. It supports audio sampling frequencies from 30 kHz to 192 kHz, and converts the incoming AES digital audio signal to a stereo balanced analog audio signal pair using 24-bit conversion. Cable equalization and reclocking techniques enable the 9262 to reliably recover the incoming digital audio signal.

» FEATURES

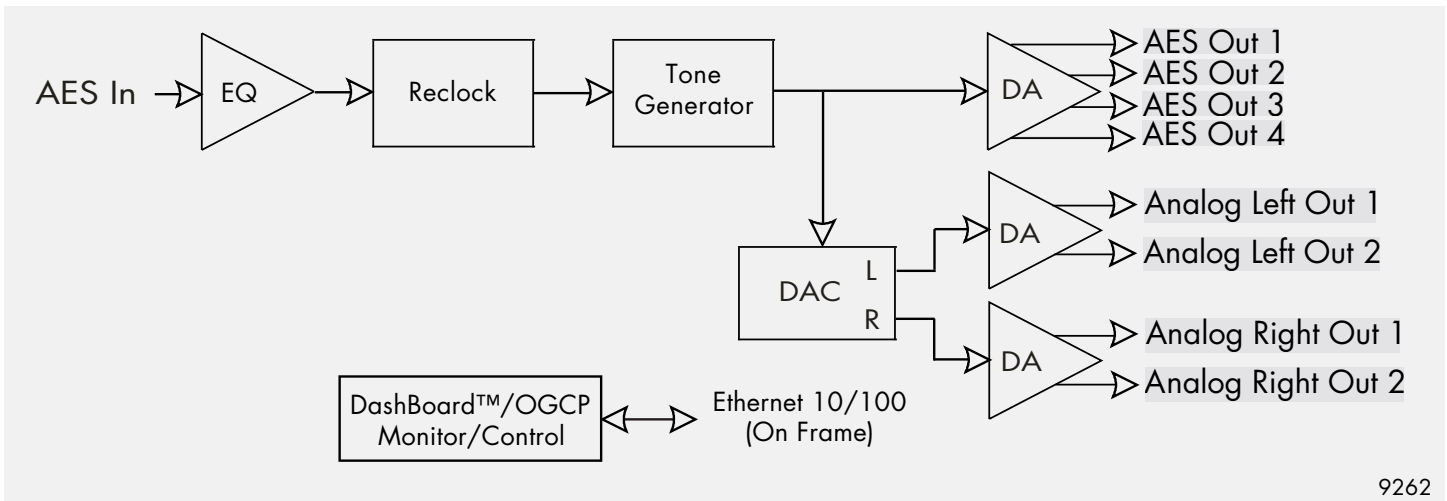
24-bit audio conversion

Supports audio sampling frequencies from 30 kHz to 192 kHz

Cable equalization and data reclocking on incoming AES/EBU signal

Remote control/monitoring via Dashboard™ software

Five year warranty



9262

» SPECIFICATIONS

Electrical

Power: 4 watts

AES Input

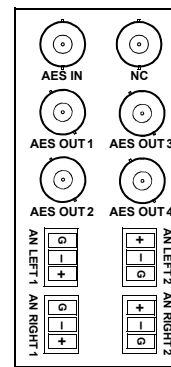
Number of inputs: 1 unbalanced (2 Ch)  
 Impedance: 75 Ω  
 Resolution: 24-bit  
 Level: 0.2 - 7 Vp-p  
 Sample rate: 30 kHz to 192 kHz

AES Output

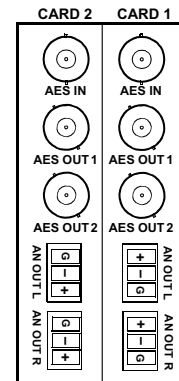
Number of outputs: 4 unbalanced  
 Impedance: 75 Ω  
 Resolution: 24-bit  
 Level: 1 Vp-p  
 Sample rate: 30 kHz to 192 kHz  
 Jitter: <5 ns

Analog Audio Output

Number of Outputs: 4  
 Impedance: 60 Ω balanced  
 Freq. Response: +/-0.2 dB at 20 Hz to 20 kHz  
 Max Level: +24 dBu  
 THD+N: <0.01%  
 Noise: -84 dBu at 20 Hz to 20 kHz



RM20-9262-B



RM20-9262-B/S



» ORDERING INFORMATION

9262 AES/EBU Digital to Stereo Analog Audio Converter

**RM20-9262-B** 20-Slot Frame Rear I/O Module (Standard Width) 1 AES Input BNC, 4 AES Reclocked Output BNCs, 4 Analog Audio Outputs

**RM20-9262-B/S** 20-Slot Frame Rear I/O Module (Split) Dual AES Input, 2 AES Outputs per card, 2 Analog Outputs (Stereo Pair) per card

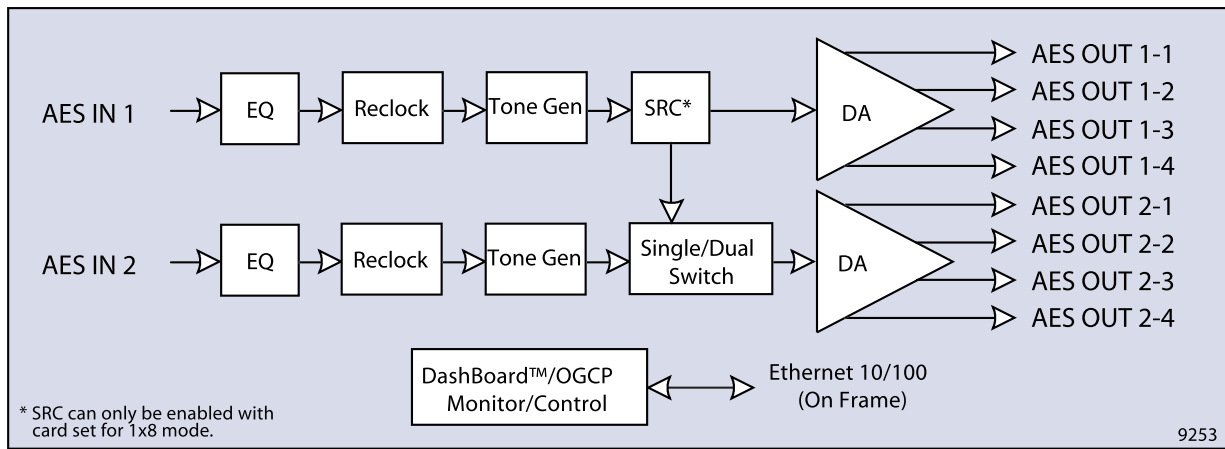


**9253 » 2X4 AES AUDIO DISTRIBUTION AMPLIFIER, 75 Ohms**



The **9253** is a dual AES/EBU distribution amplifier, providing four copies of each incoming signal. The card supports audio sampling frequencies from 30 kHz to 192 kHz. It can also be used as a 1x8 distribution amplifier, providing eight outputs that are sample rate converted. Cable equalization and reclocking techniques enable the 9253 to reliably recover the incoming digital audio signal.

The 9253 has two 75Ω unbalanced AES inputs and four 75Ω unbalanced AES outputs per AES input. Card status can be monitored using DashBoard™ remote control software.



**FEATURES**

Supports audio sampling frequencies from 30 kHz to 192 kHz

Cable equalization and data reclocking on AES inputs

Configurable as dual 1x4 or 1x8 distribution amplifier

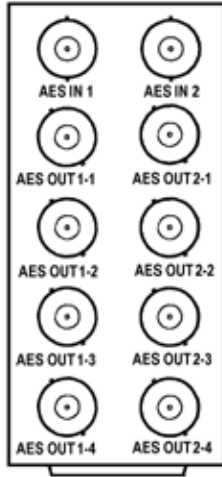
DashBoard™ remote control status monitoring and setup/control

Hot-swappable

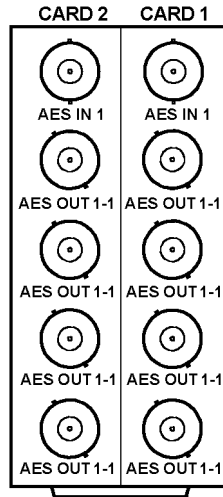
Five year warranty



9253 » 2X4 AES AUDIO DISTRIBUTION AMPLIFIER, 75 Ohms

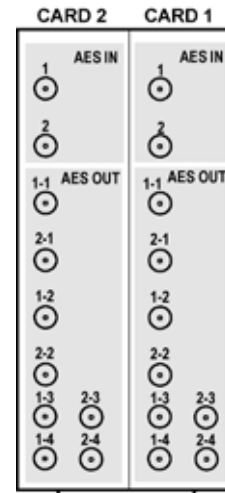


**RM20-9253-A**



Note: Because input AES IN 2 cannot be used with this rear module, card should be set to 1x8 mode instead of 2x4 mode. Using 2x4 mode with this rear module will result in IN2 error indication.

**RM20-9253-A/S**



**RM20-9253-B/S**

**9253 » 2X4 AES AUDIO DISTRIBUTION AMPLIFIER, 75 Ohms****SPECIFICATIONS****Electrical**

Power: 4 Watts

**AES Input**

Number of Inputs: 2 unbalanced BNC (2 Ch per BNC)

Impedance: 75  $\Omega$ 

Supported external reference type: DARS (via frame reference or AES IN 2 set as ref input). Ref source set using card jumpers.

Resolution: 24-bit

Level: 0.2 - 7 Vp-p

Sample rate: 30 kHz to 192 kHz

**AES Output**

Number of outputs: 8 unbalanced BNC (2 Ch per BNC)

Impedance: 75  $\Omega$ 

Resolution: 24-bit

Level: 1 Vp-p

Sample rate: 30 kHz to 192 kHz

Jitter: &lt; 5 ns

**ORDERING INFORMATION****9253** 2 X 4 AES/EBU Reclocking Distribution Amplifier, 75 Ohm, Unbalanced, BNC I/O**RM20-9253-A** 20-Slot Frame Rear I/O Module (Standard Width) 2 AES Input BNCs, 8 AES Output BNCs**RM20-9253-A/S** 20-Slot Frame Rear I/O Module (Split, supports 2 cards) AES IN 1 Input BNC, 4 AES DA Output BNCs (connections are per card)**RM20-9253-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split, supports 2 cards) 2 AES Input BNCs, 8 AES Output BNCs (connections are per card; all connectors HD-BNC)**RM20-9253-B/S-DIN** 20-Slot Frame Rear I/O Module (Split, supports 2 cards) 2 AES Input BNCs, 8 AES Output BNCs (connections are per card; all connectors DIN1.0/2.3)

9257 » 1X9 MADI AUDIO DISTRIBUTION AMPLIFIER



The 9257 provides an award-winning card-based solution for distribution of AES10 MADI signals. The card supports sampling frequencies up to 96 kHz, with a 64-channel payload supported at the industry standard 48 kHz sampling rate (all other sampling rates specified as valid per AES10-2003 are also supported at various payload capacities). Utilizing the openGear® open-architecture platform, the 9257 offers scalable incorporation and the easy-to-use DashBoard™ setup and control operator interface. Up to 20 of the 9257 cards can be installed in a 20-Slot frame.

The 9257 can reliably equalize up to 250m of 1694A, and offers DashBoard™ display and alarm for input signal status and LOS alarms. The card is available with several Rear I/O Module choices that offer BNC, DIN1.0/2.3, or HD-BNC connectors. Full user remote and card-edge monitor/control allows full card status and control access locally or across a standard Ethernet network.

» FEATURES

Card-based design allows scalability, with up to 20 input channels per frame

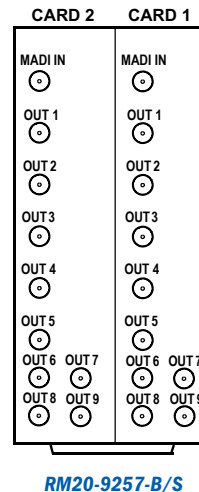
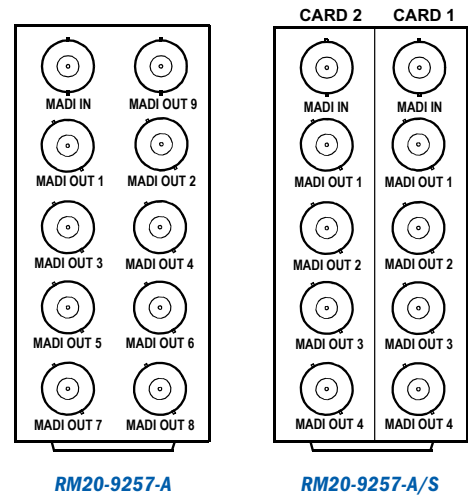
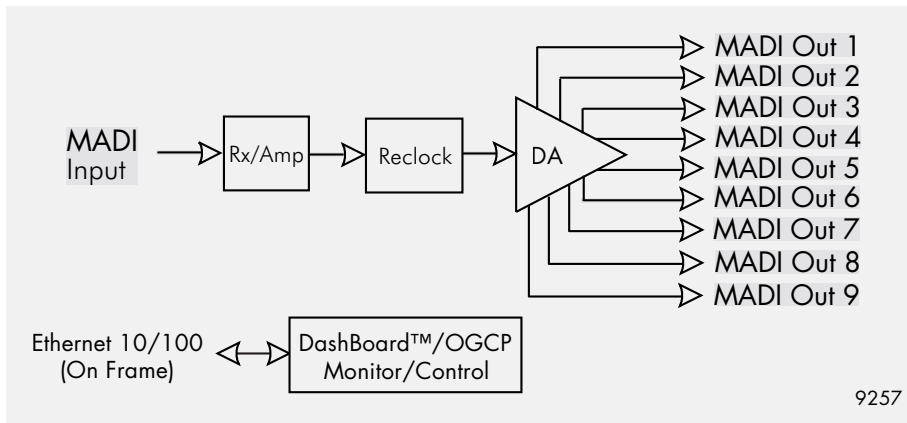
Specifically designed and optimized for AES10 MADI interface

Remote control/monitoring via DashBoard™ software

Low power/high-density design; only 3.3 Watts per card

Up to 250m 1694A receive EQ capability

Five-year warranty



» SPECIFICATIONS

Electrical

Power: 3.3 watts

MADI (AES10-2003) Input

Number of Inputs: 1  
 Impedance: 75 Ω  
 Data Rate: 125 Mbps  
 Level: 0.15 - 0.6 Vp-p

MADI (AES10-2003) Outputs

Number of Outputs: 9 (max.)  
 Impedance: 75 Ω  
 Level: 0.3 - 0.6 Vp-p  
 Jitter: 0.1 UI



» ORDERING INFORMATION

9257 1x9 MADI (AES10-2003) Audio Distribution Amplifier

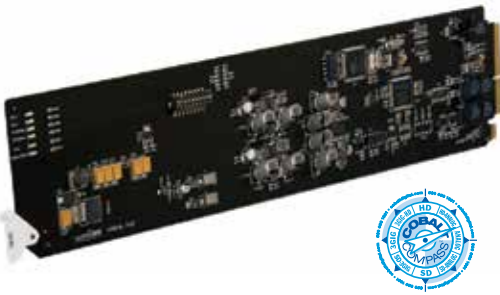
**RM20-9257-A** 20-Slot Frame Rear I/O Module (Standard Width) 1 MADI Input BNC, 9 MADI Output BNCs

**RM20-9257-A/S** 20-Slot Frame Rear I/O Module (Split) Dual MADI Input BNC, 4 MADI Output BNCs per card

**RM20-9257-B/S-DIN** 20-Slot Frame Rear I/O Module (Split) Dual MADI Input (DIN1.0/2.3), 9 MADI Outputs (All connectors DIN1.0/2.3) per card

**RM20-9257-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split) Dual MADI Input (HD-BNC), 9 MADI Outputs (All connectors HD-BNC) per card

9345 » STEREO ANALOG AUDIO TO AES A/D CONVERTER



The 9345 is an analog-to-AES digital audio converter, providing A/D audio conversion and AES signal distribution. The card supports audio sampling frequencies from 30 kHz to 192 kHz, and converts the incoming stereo analog audio signal to an AES digital audio signal using 24-bit conversion.

» FEATURES

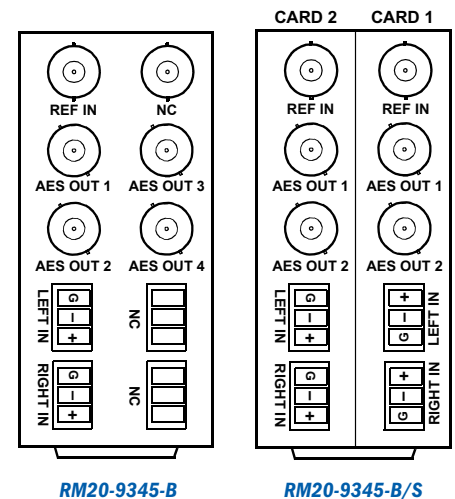
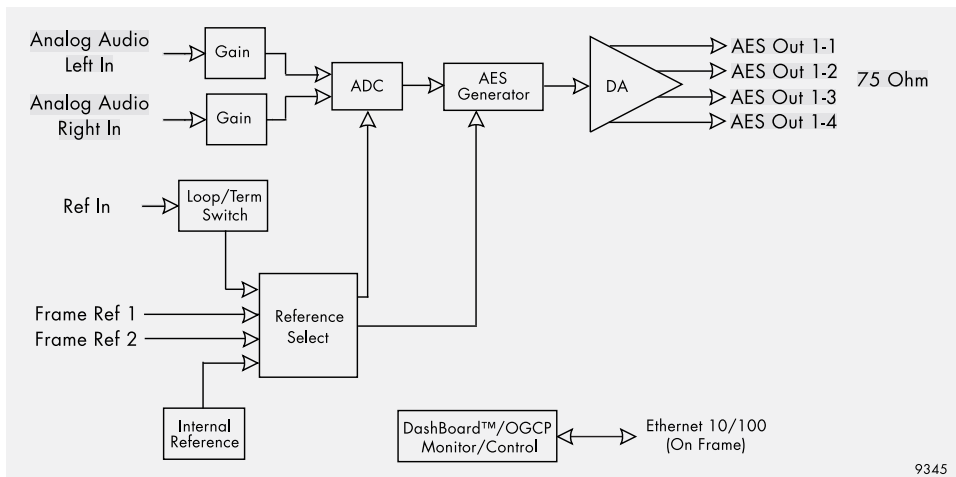
Internal clock generates audio sampling frequencies from 32 kHz to 192 kHz

Can synchronize to frame, external or internally generated reference signals

24-bit audio conversion

Remote control/monitoring via DashBoard™ software

Five-year warranty



» SPECIFICATIONS

Electrical

Power: 4 watts

Analog Audio Input

Number of Inputs: 2 balanced  
 Impedance: >20 kΩ balanced  
 Signal Level: up to +24 dBu  
 Freq. Response: +/-0.2 dB at 20 Hz to 20 kHz  
 THD+N: <0.01%  
 Noise: -84 dBu at 20 Hz to 20 kHz

AES Output

Number of Outputs: 4 unbalanced  
 Impedance: 75 Ω  
 Resolution: 24-bit  
 Level: 1 Vp-p  
 Sample rate: 30 kHz to 192 kHz  
 Jitter: <5 ns

» ORDERING INFORMATION

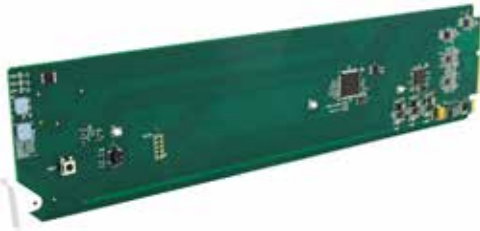
9345 Stereo Analog to AES/EBU Digital Audio Converter

RM20-9345-B 20-Slot Frame Rear I/O Module (Standard Width) 2 Balanced Analog Audio In, 4 AES Output BNCs, 1 Reference Input BNC

RM20-9345-B/S 20-Slot Frame Rear I/O Module (Split) 2 Balanced Analog Audio In, 2 AES Output BNCs, 1 Reference Input BNC (per card)



**9910DA-WC » AUDIO WORD CLOCK DISTRIBUTION AMPLIFIER**



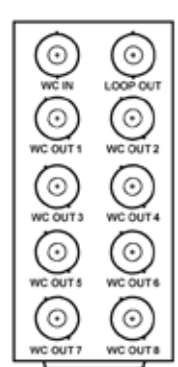
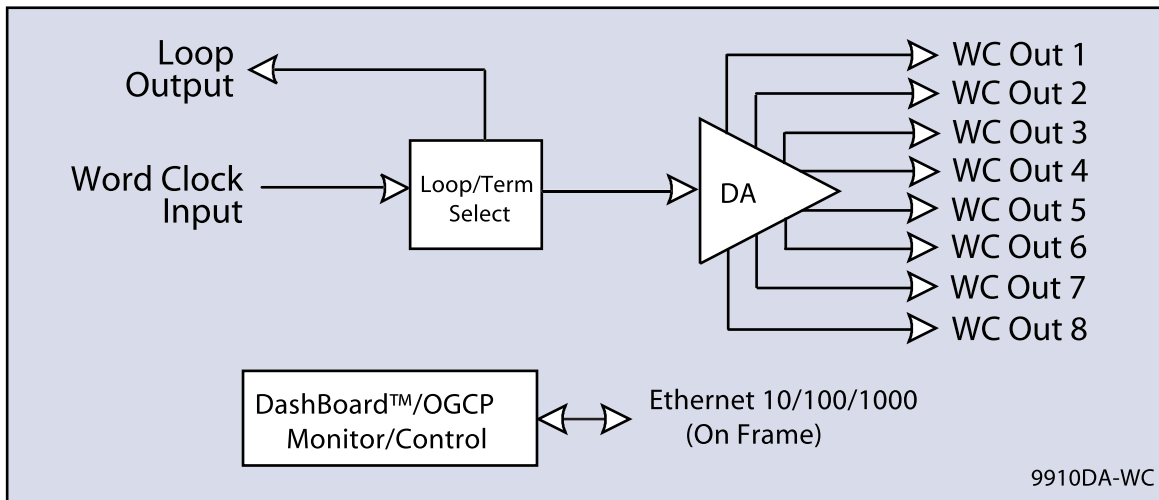
The Cobalt® **9910DA-WC Audio Word Clock Distribution Amplifier** provides 1x8 distribution with one word clock input and eight 75Ω word clock outputs. Card jumpers allow setting the input as Hi-Z looping input or on-card 75Ω terminated. The card can be accessed using Dashboard™ remote control for status monitoring.

**FEATURES**

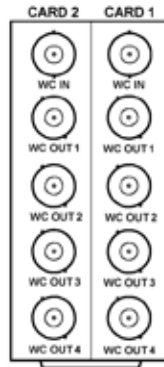
Multi-mode input provides hi-Z looping or card-terminated operation

Five year warranty

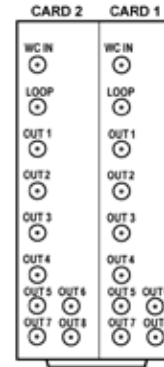
Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels



**RM20-9910WC-B**



**RM20-9910WC-AIS**



**RM20-9910WC-BS-DIN**  
**RM20-9910WC-BS-DIN**



**9910DA-WC » AUDIO WORD CLOCK DISTRIBUTION AMPLIFIER****SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

2 Watts

**Word Clock Input**

Number of inputs: (1)

Impedance: User selectable as hi-Z looping or card-terminated 75Ω

Sensitivity: 200 mV

**Word Clock Outputs**

Number of DA outputs: up to (8)

Impedance: 75Ω

Level: 10 Vp-p square wave (unterminated), 5 Vp-p square wave (terminated into 75Ω)

Looping Output: (1)

**ORDERING INFORMATION**

**9910DA-WC** Audio Word Clock Distribution Amplifier

**RM20-9910WC-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) Word Clock Input BNC, (8) Word Clock DA Output BNCs, (1) Input Loop Output BNC

**RM20-9910WC-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Word Clock Input BNC, (4) Word Clock DA Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9910WC-B/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Word Clock Input, (8) Word Clock DA Outputs, (1) Input Loop Output (connections are per each Card 1 / Card 2 connector bank; all connectors are DIN 1.0/2.3)

**RM20-9910WC-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) Word Clock Input, (8) Word Clock DA Outputs, (1) Input Loop Output ((connections are per each Card 1 / Card 2 connector bank; all connectors are HD-BNC)

**9913DA-AES75-RG » 75-OHM (UNBALANCED) AES DISTRIBUTION AMPLIFIER**  
with Remote Gain Control



The **9913DA-AES75-RG 75-Ohm (Unbalanced) AES Distribution Amplifier with Remote Gain Control** is a broadcast-quality AES distribution amplifier that provides up to eight copies of the input AES-3id signal. A transformer-coupled input helps prevent ground loop and other grounding-related problems.

The 9913DA-AES75-RG supports audio sampling frequencies from 32kHz to 96kHz. Cable equalization and reclocking techniques enable the 9913DA-AES75-RG to recover the incoming digital audio signal reliably. The 9913DA-AES75-RG also includes built-in loudness measurement, with ITU1770 LKFS loudness measurement displayed in DashBoard.

A built-in DSP allows mono-mix and L/R-only outputs (these functions can be locked out for Dolby® signal processing). The DSP attenuation function allows overall gain (stereo ganged) trim (offset) via DashBoard™ remote control.

The space-saving design and very low power consumption of the 9913DA-AES75-RG provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard-width “split” rear module.

**FEATURES**

Full remote control of operating mode and gain control

Multiple DSP modes - stereo/pass-thru, mono mix, L/R only outputs

Transformer-coupled input prevents ground loop issues and other ground-related problems

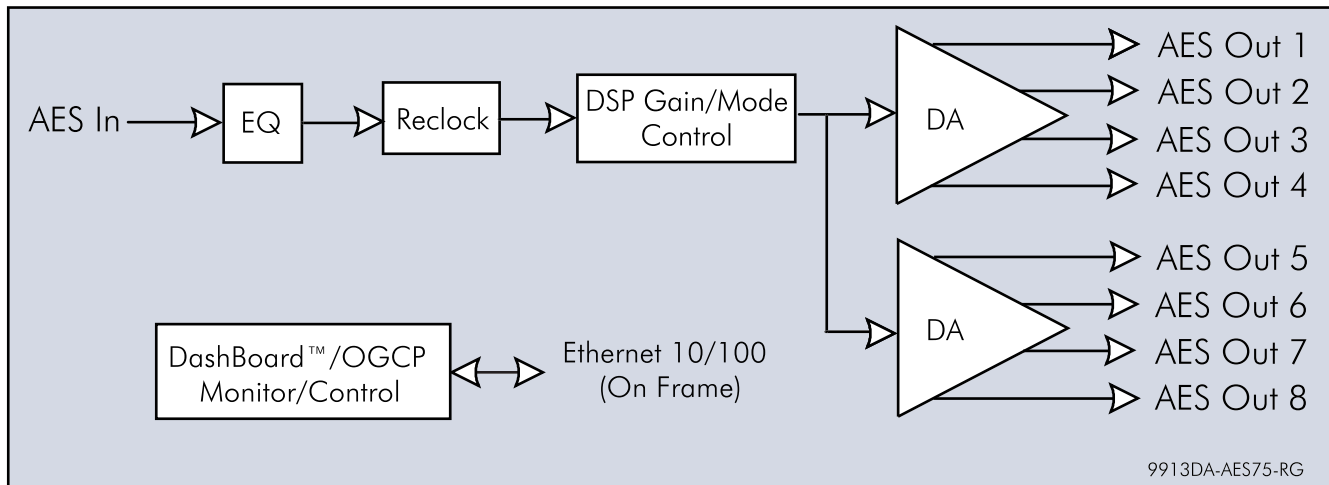
Convenient DSP gain trim via DIP or remote control (gain disable for Dolby/non-PCM usage)

DashBoard LKFS loudness display (10-second averaging)

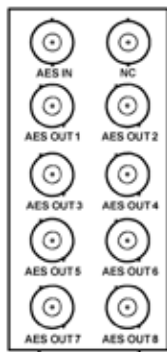
Selectable card switch control or DashBoard™ remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels)

Hot-swappable

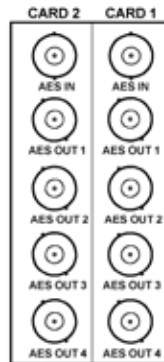
Five year warranty



9913DA-AES75-RG



RM20-9913DA75-A



RM20-9913DA75-AIS





**9913DA-AES75-RG » 75-OHM (UNBALANCED) AES DISTRIBUTION AMPLIFIER**  
with Remote Gain Control

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 2.2 Watts

**AES Input**

Number of Inputs: (1), unbalanced AES-3id (transformer-coupled)  
Impedance: 75 Ω  
Maximum Input Level: +27.5 dBu

**Performance**

Sampling Rates: 32 kHz to 96 kHz  
Signal Level: 0.2 – 7 Vp-p  
Resolution: 24-bit  
Output Jitter: < 5 ns

**AES Output**

Number of Outputs: (8) max, unbalanced AES-3id (available as stereo, pass-thru, mono-mixed, or L/R only)  
Impedance: 75 Ω  
Return Loss: -25 dB

**ORDERING INFORMATION**

**9913DA-AES75-RG** 75-Ohm (Unbalanced) AES Distribution Amplifier with Remote Gain Control

**RM20-9913DA75-A** 20-Slot Frame Rear I/O Module (Standard Width) (1) AES Audio In BNC, (8) AES Audio Out BNCs

**RM20-9913DA75-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) AES Audio In BNC, (4) AES Audio Out BNCs (connections are per card)

**9913DA-AES110-RG » 110-OHM (BALANCED) AES/EBU DISTRIBUTION AMPLIFIER**  
with Remote Gain Control



The **9913DA-AES110-RG 110-Ohm (Balanced) AES/EBU Distribution Amplifier with Remote Gain Control** is a broadcast-quality AES distribution amplifier that provides up to eight copies of the input AES/EBU signal. A transformer-coupled input helps prevent ground loop and other grounding-related problems.

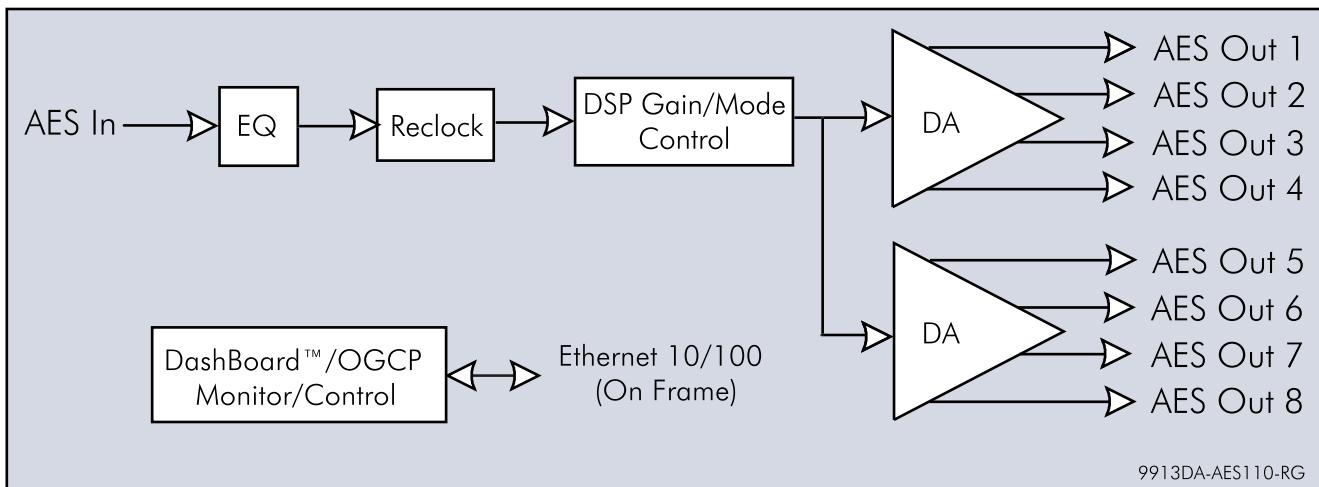
The 9913DA-AES110-RG supports audio sampling frequencies from 32kHz to 96kHz. Cable equalization and reclocking techniques enable the 9913DA-AES110-RG to recover the incoming digital audio signal reliably. The 9913DA-AES110-RG also includes built-in loudness measurement, with ITU1770 LKFS loudness measurement displayed in Dashboard.

A built-in DSP allows mono-mix and L/R-only outputs (these functions can be locked out for Dolby® signal processing). The DSP attenuation function allows overall gain (stereo ganged) trim (offset) via Dashboard™ remote control.

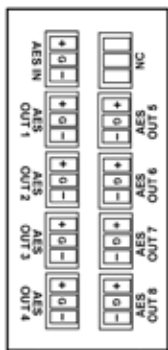
The space-saving design and very low power consumption of the 9913DA-AES110-RG provides for high density, allowing two cards to be collocated in adjacent slots and served by a single, standard-width “split” rear module.

**FEATURES**

Full remote control of operating mode and gain control	Dashboard LKFS loudness display (10-second averaging)
Multiple DSP modes – stereo/pass-thru, mono mix, L/R only outputs	Selectable card switch control or Dashboard™ remote control (usable with Dashboard™ and Cobalt OGCP-9000 remote control panels)
Transformer-coupled input prevents ground loop issues and other ground-related problems	Hot-swappable
Convenient DSP gain trim via DIP or remote control (gain disable for Dolby/non-PCM usage)	Five year warranty

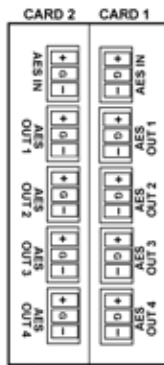


9913DA-AES110-RG



Note: + / G / - orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.

RM20-9913DA110-B



Note: + / G / - orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.

RM20-9913DA110-BIS



**9913DA-AES110-RG » 110-OHM (BALANCED) AES/EBU DISTRIBUTION AMPLIFIER**  
with Remote Gain Control

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 2.2 Watts

**AES Input**

Number of Inputs: (1), balanced AES/EBU (transformer coupled)  
Impedance: 110 Ω, balanced  
Maximum Input Level: +27.5 dBu  
Connector Type: WECO® removable modular  
Equalization: 2000ft (650m) over 110 Ω, twisted-pair cable

**Performance**

Sampling Rates: 32 kHz to 96 kHz  
Signal Level: 0.2 – 7 Vp-p  
Resolution: 24-bit  
Output Jitter: < 5 ns

**AES Output**

Number of Outputs: (8) max, balanced AES/EBU (available as stereo, pass-thru, mono-mixed, or L/R only)  
Impedance: 110 Ω balanced  
Return Loss: -25 dB  
Connector Type: WECO® removable modular

**ORDERING INFORMATION**

**9913DA-AES110-RG** 110-Ohm (Balanced) AES/EBU Distribution Amplifier with Remote Gain Control

**RM20-9913DA110-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) AES Audio In, (8) AES Audio Out (all connectors 3-terminal)

**RM20-9913DA110-B/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) AES Audio In, (4) AES Audio Out (all connectors 3-terminal; connections are per card)

9121 » 3G/HD/SD-SDI / ASI REDUNDANCY SWITCH



The 9121 3G/HD/SD-SDI / ASI Redundancy Switch allows manual or failover changeover control between two SDI or ASI sources to a common SDI or ASI output. Output routing uses latching relay routing to retain the selected I/O path even if the card/frame is powered down or the card is removed from its slot. Switchover can be manually activated or be set to provide intelligent automatic failover based on GPI or signal validity.

The 9121 is very straightforward in operation in that the signal path is via a direct (passive) relay path output (the selected input is also available via non-relay coupled 4x DA drivers). The entire signal package is kept intact with no modification of the signal.

FEATURES

Automatically provides passive-path switchover protection to alternate SDI/ASI stream in case of signal loss

Simple relay routing signal path maintains full signal integrity. Rear-module located latching relays maintain signal path even if card/power is lost.

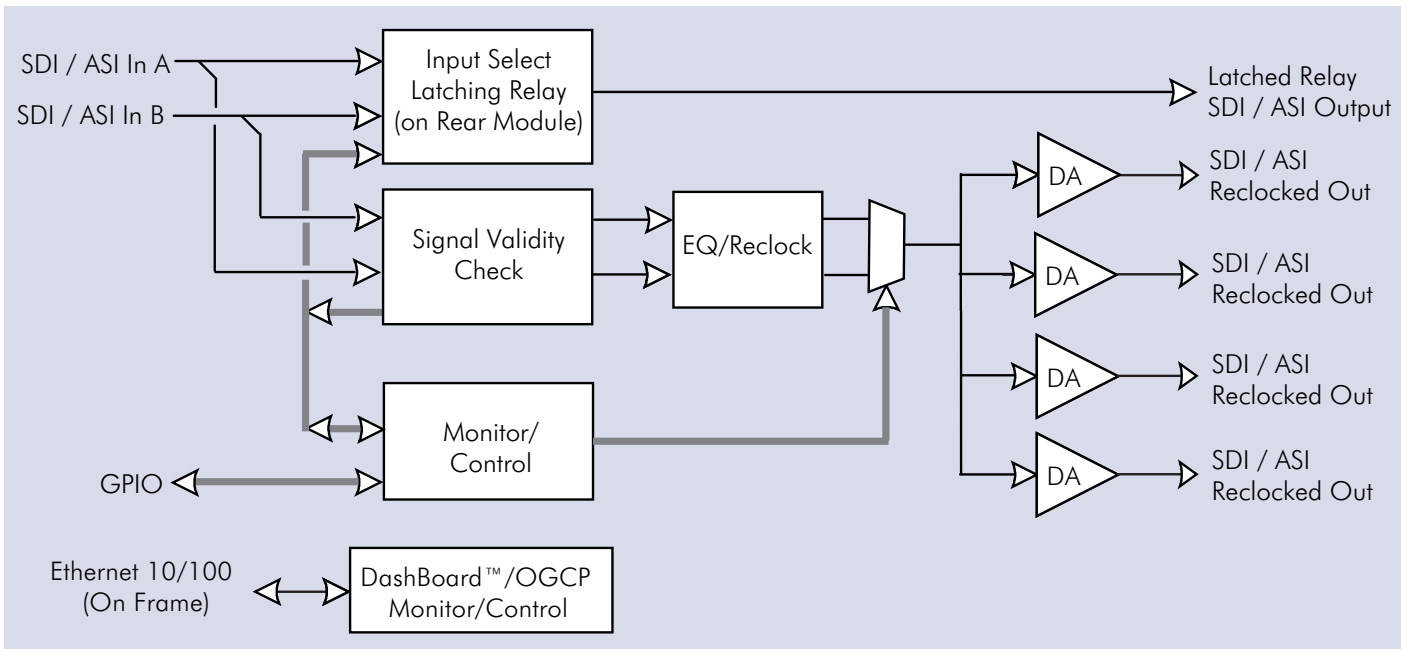
Alternate non-relay 4x DA output (with reclock enable/disable) also provided

Selectable input switchover with automatic failover on loss of input, or manual switchover using DashBoard remote control or GPI

3G/HD/SD-SDI and ASI compatible on all inputs and outputs

DashBoard™ signal status monitoring of both active and alternate inputs. Card log page shows a history of recent routing events (whether manually or auto-failover invoked).

Five year warranty



## 9121 » 3G/HD/SD-SDI / ASI REDUNDANCY SWITCH

### SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

#### Power

< 6 Watts

#### Switchover Triggering

Selectable automatic failover upon loss of valid SMPTE 424M, 292M, or 259M formatted signal. Manual switchover using Dashboard remote control or GPI.

#### 3G/HD/SD-SDI / ASI Inputs

Number of inputs: 2  
 Standards (SDI):  
 3G-SDI (SMPTE 424M)  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M)  
 Impedance: 75Ω

#### SDI/ASI Outputs

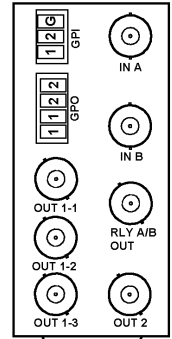
Number of outputs:  
 (1) 75Ω BNC Latching relay direct from selected input A or B  
 (4) 75Ω BNC Reclocked via mux from selected input A or B  
 213Mbit/s maximum ASI TS bit-rate per port

#### GPI

Two independent inputs  
 Independent edge-triggered on H/L transition  
 Connector: 3-terminal Phoenix; GPI-1/GPI-2/COM

#### GPO

Two, independent non-referenced opto-isolated upon configurable true condition(s).  
 Connector: 4-terminal Phoenix; GPO-1/GPO-2



RM20-9121-B

### ORDERING INFORMATION

9121 3G/HD/SD-SDI / ASI Redundancy Switch

RM20-9121-B 20-Slot Frame Rear I/O Module (Standard Width) Dual SDI/ASI Input BNCs, Relay SDI/ASI Output BNC, 4 SDI/ASI Reclockable Output BNCs, 2 GPI, 2 GPO

# 9940-ACO » 3G/HD/SD-SDI MULTI-INPUT INTELLIGENT AUTO-CHANGEOVER SWITCH

with Optional Trouble Slate Inserter



The Cobalt® 9940-ACO 3G/HD/SD-SDI Multi-Input Intelligent Auto-Changeover Switch with Optional Trouble Slate Inserter allows manual selection of input, or failover to alternate inputs (Auto-Changeover) on loss of input conditions as well as user-configurable Video Quality Event intelligent assessments such as black/frozen frame or audio silence. Also included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Video Quality or Closed-Captioning event status can independently be propagated for each event type as GPO, automated alert email, input routing changes, or card user presets you can configure to provide any number of special actions such as routing changes or burn-in text alert messages. A user trouble slate graphic file can be uploaded to the card, which in turn can be automatically inserted in active video if any Video Quality Event triggered errors occur.

Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Any of several standard test patterns can be inserted as an input LOS marker. A moving-box

insertion can serve as a dynamic raster confidence check even when the input video image is static. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode, and in turn outputted and burned-in on the output video.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

## FEATURES

Multi-input, with manual selection or Intelligent Auto-Changeover failover. Latching relay bypass retains manual or failover input-to-output routing even in the event of power failure.

Intelligent Auto-Changeover can be set to invoke failover or alerts for basic input loss as well as intelligent failover/alert based on black/frozen frame or audio silence. Threshold and hold-off are user configurable.

Video Quality and Closed-Captioning Absence detection and flagging with GPO, automated alert email, input auto-changeover, or engage custom user preset actions

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Optional Clean and Quiet Switching provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Optional User Trouble Slate Graphic Import allows trouble slate to be displayed upon user-selectable input error conditions (such as CC or audio loss, or frozen frame)

Frame Sync with full H/V offset and manual/LOS video pattern generator

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

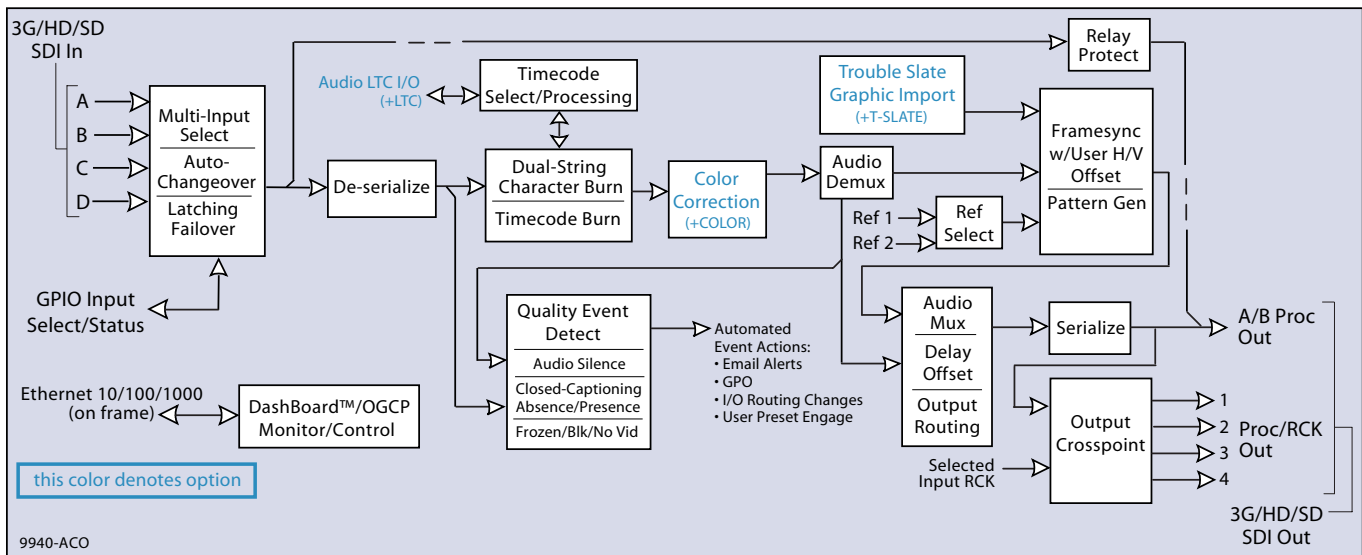
Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs

Low-power/high-density design - less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

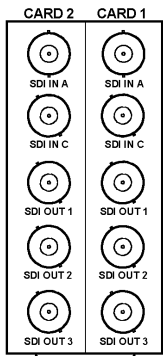
Hot-swappable

Five year warranty

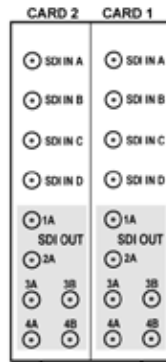


**SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS (OPENGear CARDS AND STANDALONE/DESKTOP MODELS)**

**9940-ACO » 3G/HD/SD-SDI MULTI-INPUT INTELLIGENT AUTO-CHANGEOVER SWITCH**  
with Optional Trouble Slate Inserter



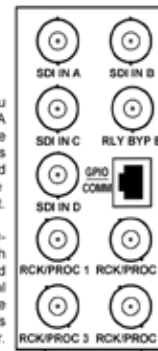
**RM20-9940-AIS**



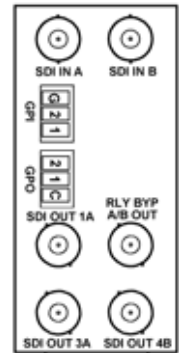
**RM20-9940-BIS-DIN**  
**RM20-9940-BIS-HDBNC**

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input.

RLY BYP B is a relay-protected path which carries processed SDI out under normal conditions and passive routes SDI IN B to this BNC upon loss of power.



**RM20-9940-C**



**RM20-9940-F**

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**  
< 18 Watts

**SDI Input/Outputs**  
Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Minimum Latency (frame sync disabled): SD: 127 pixels (9.4 us); 720p: 330 pixels (4.45 us); 1080i: 271 pixels (3.65 us); 1080p: 361 pixels (2.43 us)

**Input Select/Auto-Changeover Failover**  
Manual selection (forced) of any input.  
· Failover to alternate input on loss of target input. Failover invoked upon LOS and/or (with option +QC) user configurable parametric criteria such as black/frozen frame or audio silence.  
· Relay bypass SDI IN B to RLY BYP B upon loss of power.

**GPIO/COMM**  
(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

**Frame Reference Input**  
(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level".

**ORDERING INFORMATION**

**9940-ACO** 3G/HD/SD-SDI Multi-Input Intelligent Auto-Changeover Switch with Optional Trouble Slate Inserter

**RM20-9940-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Processed or Relocked Output BNCs (connections are per Card 1 and Card 2 connector banks)

**RM20-9940-B/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9940-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9940-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9940-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs (GUI-selectable as processed or relocked of selected input, (2) GPI, (2) GPO

**+T-SLATE** User Trouble Slate Graphic Import Option

**+CQS** Clean and Quiet Switching Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**BBG-1040-ACO » 3G/HD/SD-SDI STANDALONE MULTI-INPUT INTELLIGENT AUTO-CHANGEOVER SWITCH** with Optional Trouble Slate Inserter



The Cobalt® **BBG-1040-ACO 3G/HD/SD-SDI Standalone Multi-Input Intelligent Auto-Changeover Switch with Optional Trouble Slate Inserter** allows manual selection of input, or failover to alternate inputs (Auto-Changeover) on loss of input conditions as well as user-configurable Video Quality Event intelligent assessments such as black/frozen frame or audio silence. Also Included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Video Quality or Closed-Captioning event status can independently be propagated for each event type as GPO, automated alert email, input routing changes, or card user presets you can configure to provide any number of special actions such as routing changes or burn-in text alert messages. A user trouble slate graphic file can be uploaded to the unit, which in turn can be automatically inserted in active video if any Video Quality Event triggered errors occur.

Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Any of several standard test patterns can be inserted as an input LOS marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode, and in turn outputted and burned-in on the output video.

The BBG-1040-ACO can be remote-controlled using DashBoard™. GPIO allows direct input routing control and status monitoring. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1040-ACO allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Multi-input, with manual selection or Intelligent Auto-Changeover failover. Latching relay bypass retains manual or failover input-to-output routing even in the event of power failure.

Intelligent Auto-Changeover can be set to invoke failover or alerts for basic input loss as well as intelligent failover/alert based on black/frozen frame or audio silence. Threshold and hold-off are user configurable.

Video Quality and Closed-Captioning Absence detection and flagging with GPO, automated alert email, input auto-changeover, or engage custom user preset actions

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Optional user trouble slate graphic import allows trouble slate to be displayed upon user-selectable input error conditions (such as CC or audio loss, or frozen frame)

Moving-box/motion insertion enable serves as a dynamic raster confidence check even when the input video image is static

Frame Sync with full H/V offset and manual/LOS video pattern generator. Frame sync can also convert raster format between 29.97/59.94 and 30/60 formats. Rear-panel looping reference connectors.

Full audio crosspoint with delay control available for all audio outputs

Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC, with output/burn-in timecode using selected format

Remote control/monitoring via DashBoard™ software, OGCP-9000 Remote Control Panel, or Web Browser User Interface

Redundant power supply option

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Five year warranty

**OPTIONS**

User Trouble Slate Graphic Import (+T-SLATE) – Allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events

Color Corrector (+COLOR) – Provides full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Clean and Quiet Switching (+CQS) – Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches

Audio LTC I/O (+LTC)

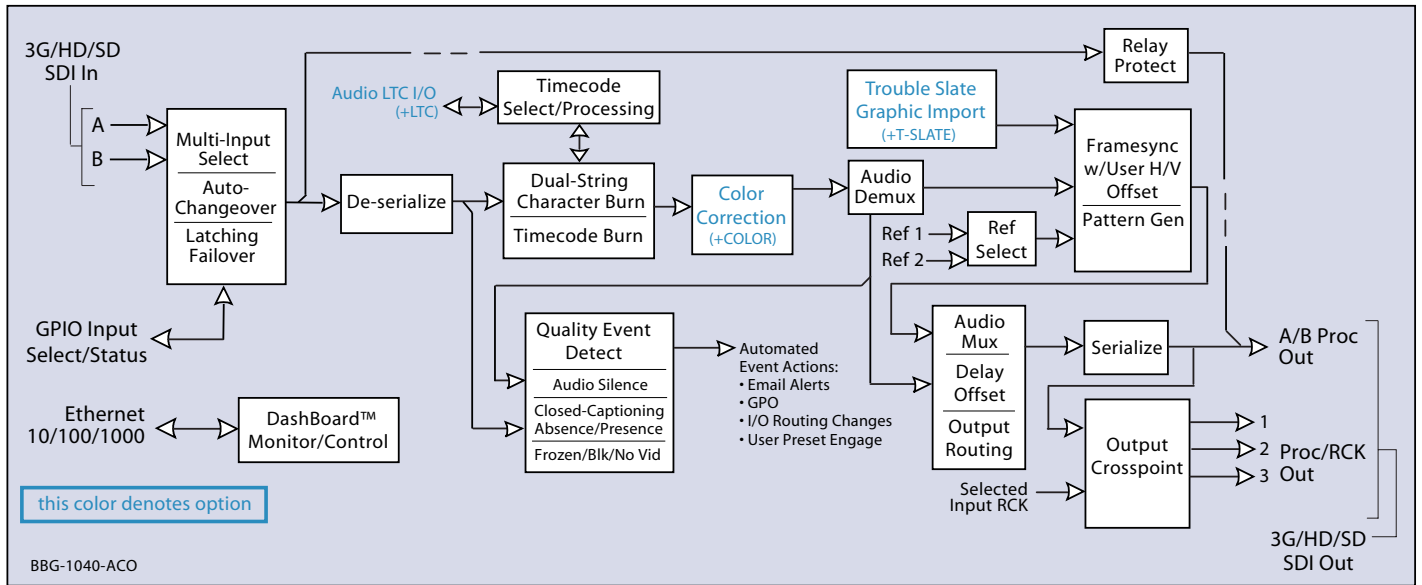
1RU Mounting Tray (supports 3 units) (BBG-1000-TRAY)

Redundant Power Supply Module (BBG-1000-PS)

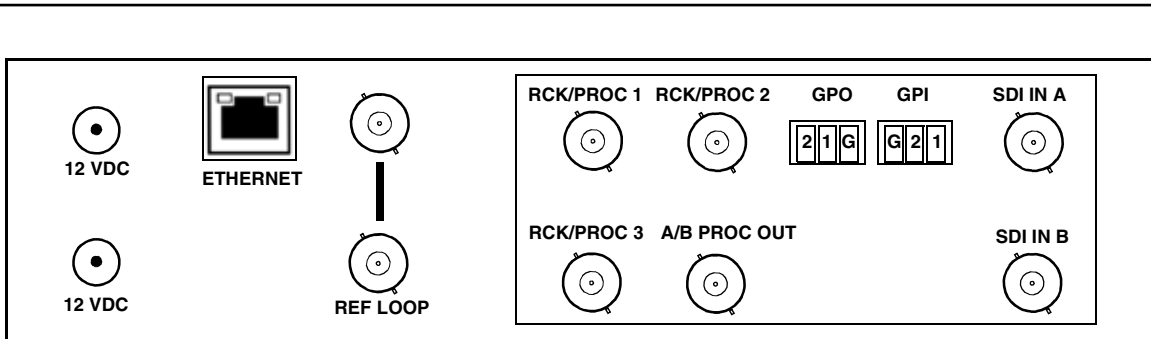




**BBG-1040-ACO » 3G/HD/SD-SDI STANDALONE MULTI-INPUT INTELLIGENT AUTO-CHANGEOVER SWITCH** with Optional Trouble Slate Inserter



BBG-1040-ACO



**Note:** A/B PROC OUT is the card processed output which uses either input SDI IN A or SDI IN B. This output uses relay latching to retain selected routing in the event of power loss regardless of whether a selection was manually invoked or by a unit-detected failover (for example, if an auto-changeover from A to B was invoked while active, routing of input B to this output is retained in the event of power loss).

RCK/PROC 1 thru RCK/PROC 3 are DA outputs which can be individually set as relocked or processed outputs of the currently-selected input. These outputs are not relay-equipped and will lose signal in the event of power loss.

**BBG-1040-ACO » 3G/HD/SD-SDI STANDALONE MULTI-INPUT INTELLIGENT AUTO-CHANGEOVER SWITCH** with Optional Trouble Slate Inserter

**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency:  
 SD: 127 pixels; 9.4 us  
 720p: 330 pixels; 4.45 us  
 1080i: 271 pixels; 3.65 us  
 1080p: 361 pixels; 2.43 us

**Input Select/Auto-Changeover Failover**

Manual selection (forced) of any input via Dashboard or GPI.  
 Failover to alternate input on loss of target input. Failover invoked upon LOS or user configurable parametric criteria such as black/frozen frame or audio silence.  
 Relay latching for manually or failover selected path retains routing in loss of power conditions.

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**Audio Output**

16-ch embedded. User crosspoint allows routing of any embedded channel to any embedded channel output. Multi-frequency tone generator for each audio output. Downmix output available for any output channel pair. Master delay control; range of -33 msec to +3000 msec.

**GPIO**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected.

**Control/Monitor Interface**

Front panel network setup. Dashboard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
 Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
 Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1040-ACO** 3G/HD/SD-SDI Standalone Multi-Input Intelligent Auto-Changeover Switch with Optional Trouble Slate Inserter (includes one BBG-1000-PS Power Supply)

Options and Accessories:

**+T-SLATE** Usert Trouble Slate Graphic Import Option

**+COLOR** Color Correction Option

**+CQS** Clean and Quiet Switching Option

**+LTC** Audio LTC I/O Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

## 9940-4x1-CS » 3G/HD/SD-SDI 4X1 CLEAN AND QUIET BYPASS ROUTER

with Relay-Protected Input and GPIO Monitoring / Control

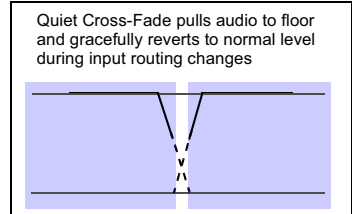


The Cobalt® **9940-4x1-CS 3G/HD/SD-SDI 4x1 Clean and Quiet Bypass Router** with Relay-Protected Input and GPIO Monitoring / Control provides Clean & Quiet routing in a high-density card-based openGear® solution. The Clean & Quiet routing not only provides switching on the RP168-specified VANC switch line, but also provides audio cross-fade upon switches to provide video switches free of switching artifacts, and provides dead-quiet audio between switches.

Multiple SDI input ports allow manual selection of input, or failover to alternate inputs (Auto-Changeover) on loss of input conditions. Also included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Option **+QC** provides user-configurable Video Quality Event intelligent assessments such as black/frozen frame or audio silence. Video Quality or Closed-Captioning event status can independently be propagated for each event type as GPO, automated alert email, input routing changes, or card user presets you can configure to provide any number of special actions such as routing changes or burn-in text alert messages.

Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Any of several standard test patterns can be inserted as an input LOS marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode, and in turn outputted and burned-in on the output video.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.



### FEATURES

Clean & Quiet Routing ensures program video switches free from video artifacts and audio clicks or pops

Multi-input, with manual selection or intelligent Auto-Changeover failover

Closed-captioning absence detection

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option (**+QC**) provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Input selection and status can be propagated via GPIO, serial, or IP interfaces

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Video options include color correction

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty

### OPTIONS

Quality Check (**+QC**) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

Color Correction (**+COLOR**) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

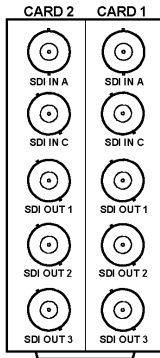
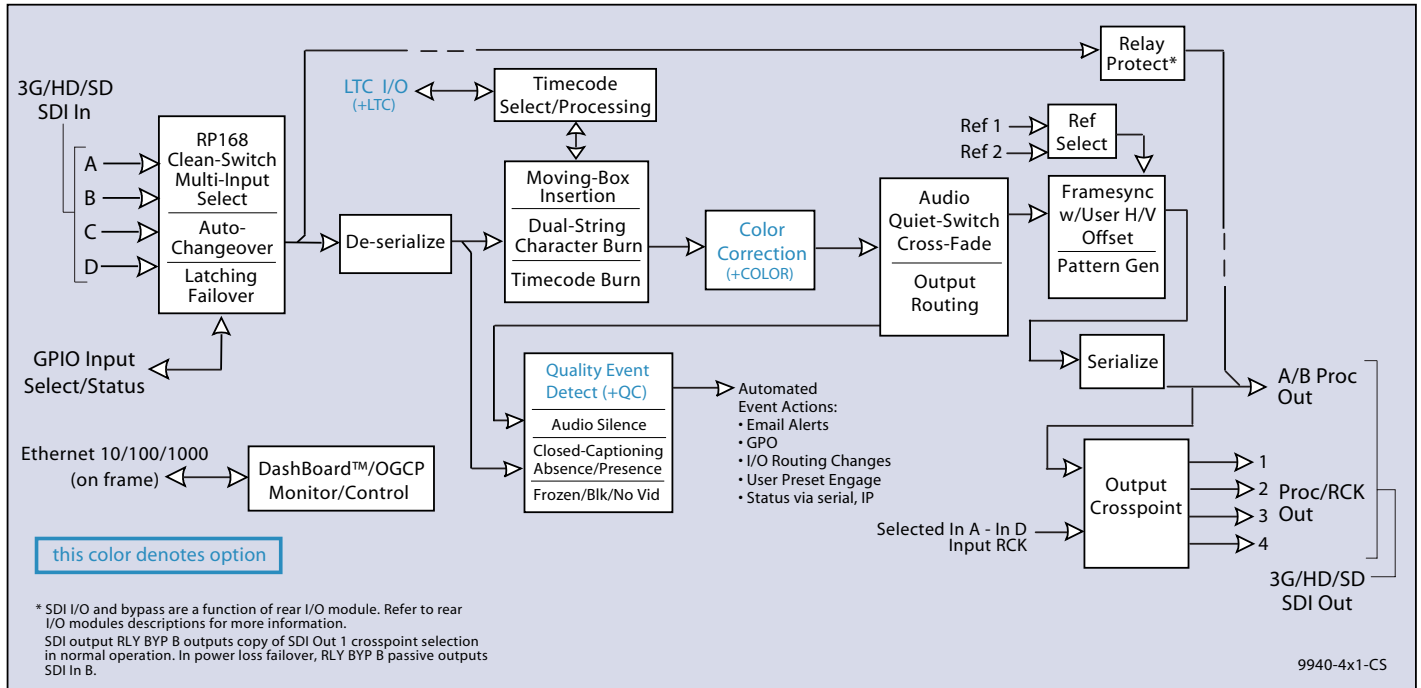
Audio LTC I/O (**+LTC**)



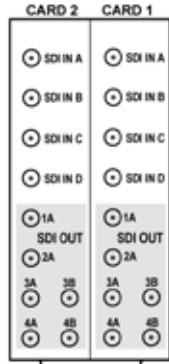
SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS (OPENGEAR CARDS AND STANDALONE/DESKTOP MODELS)

**9940-4x1-CS » 3G/HD/SD-SDI 4X1 CLEAN AND QUIET BYPASS ROUTER**

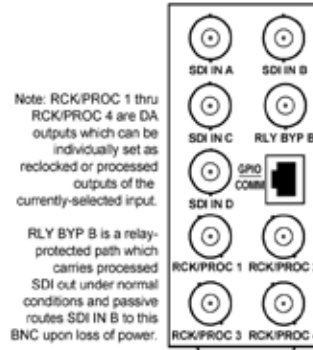
with Relay-Protected Input and GPIO Monitoring / Control



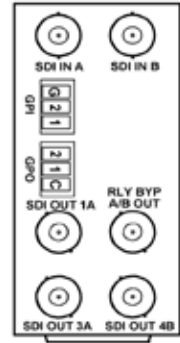
RM20-9940-AIS



RM20-9940-BIS-DIN  
RM20-9940-BIS-HDBNC



RM20-9940-C



RM20-9940-F

## 9940-4x1-CS » 3G/HD/SD-SDI 4X1 CLEAN AND QUIET BYPASS ROUTER

with Relay-Protected Input and GPIO Monitoring / Control

### SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

#### Power

< 18 Watts

#### SDI Input/Outputs

Up to (4) 75Ω BNC inputs  
 Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
 SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
 SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
 SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
 SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
 Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
 Minimum Latency (frame sync disabled):  
 SD: 127 pixels (9.4 us)  
 720p: 330 pixels (4.45 us)  
 1080i: 271 pixels (3.65 us)  
 1080p: 361 pixels (2.43 us)

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

#### Timecode Insertion/Burn-In

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

#### Text Burn-In

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

#### GPIO/COMM

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port.

### ORDERING INFORMATION

**9940-4X1-CS** 3G/HD/SD-SDI 4x1 Clean and Quiet Bypass Router with Relay-Protected Input and GPIO Monitoring / Control

**RM20-9940-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNCs, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9940-B/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9940-B/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (6) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9940-C** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (4) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), (1) GPIO/COMM RJ-45 connector

**RM20-9940-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (3) 3G/HD/SD-SDI Output BNCs, (2) GPI, (2) GPO

**+QC** Quality Check Option

**+COLOR** Color Correction Option

**+LTC** Audio LTC I/O Option

**BBG-1040-4x1-CS » 3G/HD/SD-SDI STANDALONE 4X1 CLEAN AND QUIET BYPASS ROUTER**  
with Relay-Protected Input and GPIO Monitoring / Control



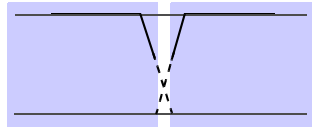
The Cobalt® **BBG-1040-4x1-CS 3G/HD/SD-SDI Standalone 4x1 Clean and Quiet Bypass Router with Relay-Protected Input and GPIO Monitoring / Control** provides Clean & Quiet routing in a high-density standalone solution. The Clean & Quiet routing not only provides switching on the RP168-specified VANC switch line, but also provides audio cross-fade upon switches to provide video switches free of switching artifacts, and provides dead-quiet audio between switches.

Multiple SDI input ports allow manual selection of input, or failover to alternate inputs (Auto-Changeover) on loss of input conditions. Also included standard is closed captioning absence/presence detection for CEA 608/708 and line 21 SD closed captioning. Option +QC provides user-configurable Video Quality Event intelligent assessments such as black/frozen frame or audio silence. Video Quality or Closed-Captioning event status can independently be propagated for each event type as GPO, automated alert email, input routing changes, or user presets you can configure to provide any number of special actions such as routing changes or burn-in text alert messages.

Two discrete character burn strings can be inserted on output video, with each string inserted as static text and/or insert only upon LOS. Any of several standard test patterns can be inserted as an input LOS marker. A moving-box insertion can serve as a dynamic raster confidence check even when the input video image is static. Timecode can be received and prioritized among any standard SMPTE embedded or audio LTC timecode, and in turn outputted and burned-in on the output video.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern (audio routing, for example) while not changing any other processing settings or aspects. The BBG-1040-4x1-CS can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1040-4x1-CS allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

Quiet Cross-Fade pulls audio to floor and gracefully reverts to normal level during input routing changes



**FEATURES**

Clean & Quiet Routing ensures program video switches free from video artifacts and audio clicks or pops

Multi-input, with manual selection or intelligent Auto-Changeover failover

Closed-captioning absence detection

Auto-Changeover can be set to invoke failover for basic input loss. Quality Check option (+QC) provides alert actions on criteria such as black/frozen frame, audio silence, and closed-captioning absence. Threshold and hold-off are user configurable.

Moving-box/motion insertion enable serves as a dynamic raster confidence check even in cases where the input video image is static

Dual independent burn-in text string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)

Input selection and status can be propagated via GPIO, serial, or IP interfaces

Video options include color correction

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard software or Web Browser User Interface

Five year warranty

**OPTIONS**

Quality Check (+QC) – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.

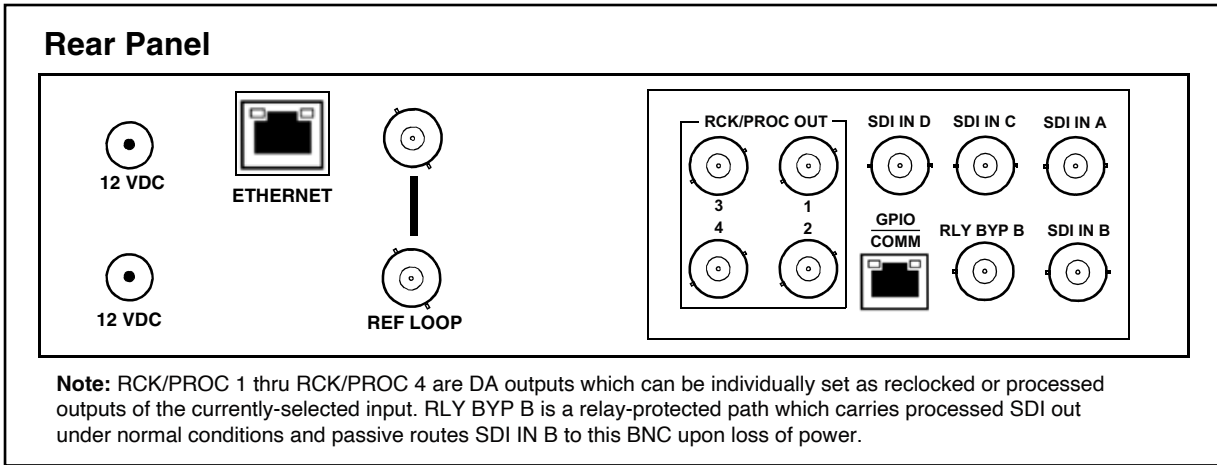
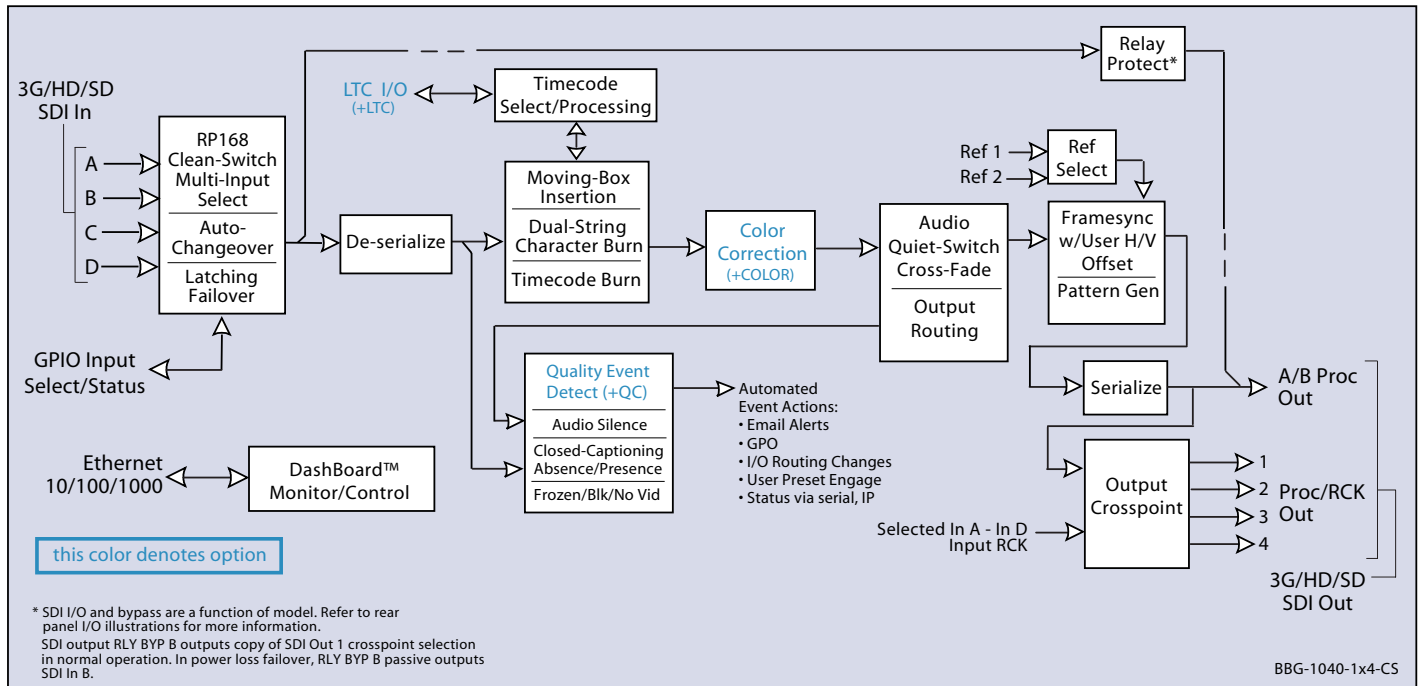
Color Correction (+COLOR) – Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Audio LTC I/O (+LTC)



**BBG-1040-4x1-CS » 3G/H/SD-SDI STANDALONE 4X1 CLEAN AND QUIET BYPASS ROUTER**

with Relay-Protected Input and GPIO Monitoring / Control



**BBG-1040-4x1-CS » 3G/HD/SD-SDI STANDALONE 4X1 CLEAN AND QUIET BYPASS ROUTER**  
with Relay-Protected Input and GPIO Monitoring / Control

**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

Up to (4) 75Ω BNC inputs  
Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI  
Minimum Latency (frame sync disabled):  
SD: 127 pixels; 9.4 us  
720p: 330 pixels; 4.45 us  
1080i: 271 pixels; 3.65 us  
1080p: 361 pixels; 2.43 us  
Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1040-4X1-CS** 3G/HD/SD-SDI Standalone 4x1 Clean and Quiet Bypass Router with Relay-Protected Input and GPIO Monitoring / Control

Options and Accessories:

**+COLOR** Color Correction Option

**+QC** Quality Check Option

**+LTC** Audio LTC I/O Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)



HEVC-UPGRADABLE MPEG ENCODERS

9992-DEC » HEVC UPGRADEABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

The Cobalt® 9992-DEC HEVC Upgradeable AVC/MPEG-2 Software Defined Broadcast Decoder is a broadcast-grade multi-standard decoder designed to meet the most stringent requirements for today's broadcasters. It supports MPEG-2 and AVC (H.264), with resolution optionally up to 4K, as well as offering a full complement of audio decoding capabilities. The 9992-DEC is an industry standard openGear® card module and provides an ideal platform for transitioning to state-of-the-art decoding capabilities.

FEATURES

**Future-Proof** – The 9992-DEC Decoder supports MPEG-2, MPEG-4 AVC (H.264) and (optionally) HEVC (H.265), so it can be deployed today and upgraded as your needs change.

**Industry Standard Form-Factor** – The 9992-DEC is offered in the industry-standard openGear format, and is compatible with existing deployed openGear frames.

**High Density** – The 9992-DEC supports a 1080p60 input stream (two independent streams with +AVC option), or (optionally) a single UHD 4Kp60 input stream. One openGear frame can support up to 10 cards, for a total of 20 HD or 10 UHD 4K channels.

**Full Audio Support** – The 9992-DEC supports MPEG-1 Layer II, AAC-LC, HE-AAC, Dolby AC-3/EAC-3 and LPCM (SMPT-302M), as well as Dolby AC-3/EAC-3 pass-thru. With an optional audio board, the decoder can support up to 16 audio channels with each video service.

**Ultra Low Latency** – Low latency modes available

Base Unit Features –

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Support for one decode channel up to 1080p60

Support for MPEG-2 and MPEG-4 AVC (H.264)

Support for 4:2:0 8-bit/10-bit decoding

Full ancillary data support

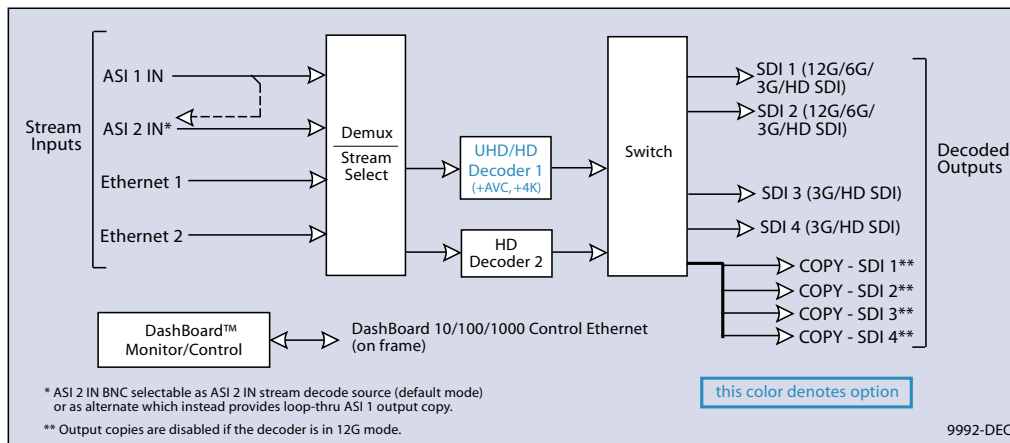
Support for 4 stereo pairs (8 audio channels) in any combination of MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes

Supports UDP and RTP. Other protocols available as options.

Remote control/monitoring via Dashboard™ software

Hot-swappable

Five-year warranty



\* ASI 2 IN BNC selectable as ASI 2 IN stream decode source (default mode) or as alternate which instead provides loop-thru ASI 1 output copy.  
 \*\* Output copies are disabled if the decoder is in 12G mode.

SOFTWARE LICENSABLE OPTIONS

**+HEVC-DEC** Enables HEVC decoding on one AVC encode engine (up to 2 licenses max per unit).

**+AVC-DEC** Additional 1080p60 decoder channel with MPEG-2, MPEG-4 AVC, HEVC (up to one additional channel, for a total of 2 channels per unit). Includes support for two additional stereo pairs in MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes.

**+4K-DEC** 4K support. Requires +AVC-DEC and +HEVC-DEC license on card.

**+422** 4:2:2 decoding support (per unit)

**+DEC-2.0** Dolby Digital/Dolby Digital Plus stereo audio decoding license

**+DEC-5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license

**+DEC-E** Dolby E audio decode license license

**+DEC-RTMP-SVR** RTMP Server License Option

**+FEC-DEC** Add SMPTE-2022 support (per unit)

**+SRT-DEC** SRT Support (per unit)

**+TSMON** – Adds continuous monitoring of current transport stream being decoded. Provides a list of all PIDs available in the transport stream, their current individual bit rates, and keeps numerical track of any continuity counter errors. Can also be configured to watch up to 8 PIDs and issue an alarm if PID disappears for a configurable amount of time. (If SNMP is available, this alarm is also provided as a trap.)

**+GENLOCK** Add Genlock support (license is per channel)

**+MP1L2-AAC-DEC** MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair. Three AAC licenses can be combined to allow one 5.1 surround decode.

**+RIST/ARQ-DEC** RIST RTP/ARQ support (per unit)

**+RIST/ENCRP-DEC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

## HEVC-UPGRADABLE MPEG ENCODERS

## 9992-DEC » HEVC UPGRADEABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

## SPECIFICATIONS

**Inputs**

- (2) DVB-ASI inputs
- (2) Gigabit Ethernet ports for IP input, supporting the following protocols:
  - UDP unicast/multicast
  - RTP unicast/multicast with optional SMPTE-2022 FEC
  - HTTP Live Streaming
  - RIST for contribution over the Internet
- Optional SMPTE-2110 baseband video over IP turnaround\*
- \* Future release availability

**Outputs**

- (2) SDI outputs each supporting 12G-SDI, 3G-SDI, HD-SDI and SD-SDI
- (2) SDI outputs each supporting 3G-SDI, HD-SDI and SD-SDI
- Support for all standard frame rates (interlaced and progressive): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60

**Video Post-Processing**

- Support for up/down/cross conversion of output video (independent of incoming stream)\*
- Conversion between interlaced and progressive
- Frame rate conversion
- High Dynamic Range (HDR) support
- \* Future release availability

**Video Decoding**

- Decoding Standards:
  - MPEG-2
  - MPEG-4 AVC (H.264)
  - HEVC (H.265) (Option)
- Support for one 1080p60 decode session (dual 1080p60 decode session support optional)
- Support for UHD decoding (option) in AVC and HEVC modes (Maximum resolution 3840x2160p60)
- Support for 4:2:0 and 4:2:2 (option) color spaces in all modes
- Support for 8-bit / 10-bit decoding in all modes
- Low latency decoding supported

**Audio Decoding**

- Decoding Standards:
  - MPEG-1 Layer II
  - AAC-LC
  - HE-AAC (v1/v2)
  - Dolby AC-3 / EAC-3
  - LPCM (SMPTE-302M)
  - Dolby AC-3/EAC-3 pass-thru support
- (5.1-Surround decoding available for AAC-LC, HE-AAC, Dolby AC-3 and Dolby EAC-3; subject to licensing)
- Maximum number of channels supported (subject to licensing):
  - MPEG-1 Layer II: 16 stereo pairs (32 audio channels)
  - Dolby AC-3: 16 stereo pairs (32 audio channels)
  - Dolby EAC-3: 8 stereo pairs (16 audio channels)
  - AAC-LC: 8 stereo pairs (16 audio channels)
  - HE-AAC (v1/v2) 8 stereo pairs (16 audio channels)
- Optional support for 5.1 Surround Sound decoding, in AAC and Dolby modes.
- Optional audio module: increases the capacity to 32 stereo pairs (64 audio channels), allowing full 16-channel support for the four HD inputs, in all compression modes\*
- \* Future release availability

**Ancillary Data Support**

- Closed-Captioning: SMPTE-334M (EIA-608 and EIA-708 supported), Line 21 (SD sources)
- OP-47/SMPTE RDD-08 teletext subtitles\*
- AFD: SMPTE-2016, Line 20/22 WSS (SD sources)
- SCTE-35 to SCTE-104 conversion
- SMPTE-2038 generic ancillary data transport (timecode, KLV, etc.)
- \* Future release availability

HEVC-UPGRADABLE MPEG ENCODERS

9992-DEC » HEVC UPGRADEABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

ORDERING INFORMATION

**Note:** For Software Options and Upgrades, as well as Hardware Options, please see the respective Options sections listed above.

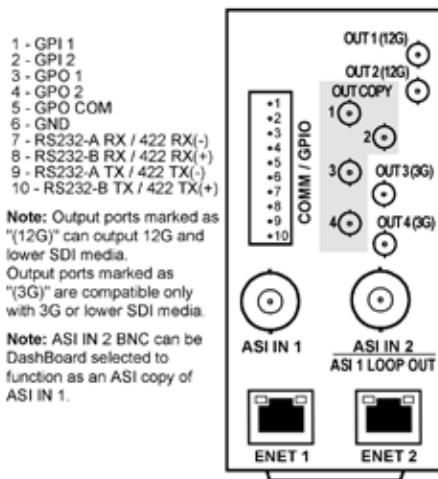
**9992-DEC** Single-channel HEVC Upgradeable AVC / MPEG-2 Software Defined Broadcast Decoder (includes (1) +AVC and (2) +MP1L2-AAC licenses)

**Option Licenses:**

- +HEVC-DEC Enable HEVC decoding on one AVC encode engine (up to 2 licenses max per unit).
- +AVC-DEC Additional 1080p60 decoder channel with MPEG-2, MPEG-4 AVC, HEVC (up to one additional channel, for a total of 2 channels per unit).
- +4K-DEC Add 4K support. Requires +AVC-DEC and +HEVC-DEC license on card.
- +422 Add 4:2:2 decoding support (per unit)
- +DEC-2.0 Dolby Digital/Dolby Digital Plus stereo audio decoding license
- +DEC-5.1 Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license
- +DEC-E Dolby E audio decoding license
- +SRT-DEC SRT Support license
- +DEC-RTMP-SVR RTMP Server License Option
- +FEC-DEC Add SMPTE-2022 support (per unit)
- +TSMON - Adds transport stream continuous monitoring
- +GENLOCK Add Genlock support (license is per channel)
- +MP1L2-AAC-DEC MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair
- +RIST/ARQ-DEC Add RIST RTP/ARQ support (per unit)
- +RIST/ENCRP-DEC Add RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

**Rear I/O Modules:**

**RM20-9992-DEC-B** 20-Slot Frame Rear I/O Module (Standard-Width) (2) ASI Input BNCs, (2) GigE Ethernet Media Ports, (2) 12G/6G/3G/HD-SD-SDI Coaxial Outputs, (2) 3G/HD/SD-SDI Coaxial Outputs, (4) Output Copy Coaxial Outputs, COMM/GPIO Port (All SDI coaxial connectors HD-BNC. See Notes in illustration regarding port functions and limitations.)



1 - GPI 1  
 2 - GPI 2  
 3 - GPO 1  
 4 - GPO 2  
 5 - GPO COM  
 6 - GND  
 7 - RS232-A RX / 422 RX(-)  
 8 - RS232-B RX / 422 RX(+)  
 9 - RS232-A TX / 422 TX(-)  
 10 - RS232-B TX / 422 TX(+)

**Note:** Output ports marked as "12G" can output 12G and lower SDI media.  
 Output ports marked as "3G" are compatible only with 3G or lower SDI media.

**Note:** ASI IN 2 BNC can be DashBoard selected to function as an ASI copy of ASI IN 1.

**RM20-9992-DEC-B-HDBNC**

HEVC-UPGRADABLE MPEG ENCODERS

**9992-DEC-4K-HEVC » 4K HEVC / AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER**  
with Single-Channel 4K or Dual-Channel 2K Video Paths

The Cobalt® **9992-DEC-4K-HEVC 4K HEVC/AVC/MPEG-2 Software Defined Broadcast Decoder** with Single-Channel 4K or Dual-Channel 2K Video Paths is a broadcast-grade multi-standard decoder designed to meet the most stringent requirements for today's broadcasters. It supports MPEG-2, AVC (H.264) and HEVC (H.265), with resolution up to 4K, and a full complement of audio decoding capabilities. The 9992-DEC-4K-HEVC is an industry standard openGear® card module and provides an ideal platform for transitioning to state-of-the-art decoding capabilities.

**FEATURES**

**Future-Proof** – The 9992-DEC-4K-HEVC Decoder supports MPEG-2, MPEG-4 AVC (H.264) and HEVC (H.265), so it can be deployed today as well as tomorrow.

**Industry Standard Form-Factor** – The 9992-DEC-4K-HEVC is offered in the industry-standard openGear format, and is compatible with existing deployed openGear frames.

**High Density** – The 9992-DEC-4K-HEVC supports up to two independent 1080p60 input streams, or a single UHD 4Kp60 input stream. One openGear frame can support up to 10 cards, for a total of 20 HD or 10 UHD 4K channels.

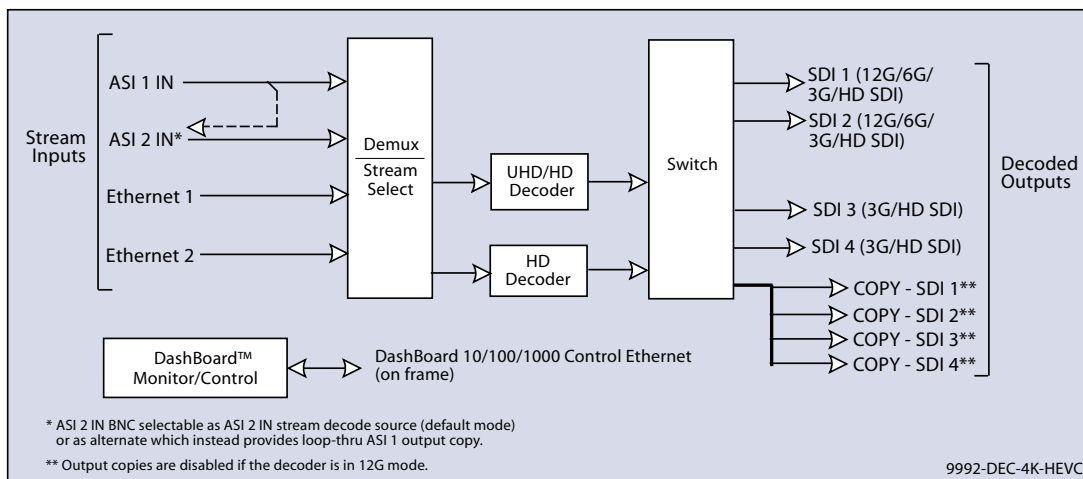
**Full Audio Support** – The 9992-DEC-4K-HEVC supports MPEG-1 Layer II, AAC-LC, HE-AAC, Dolby AC-3/EAC-3 and LPCM (SMPTE-302M), as well as Dolby AC-3/EAC-3 pass-thru. With an optional audio board, the decoder can support up to 16 audio channels with each video service.

**Ultra Low Latency** – Low latency modes available

**Base Unit Features –**

- Support for two decode channels up to 1080p60, or one 4K channel
- Support for MPEG-2, MPEG-4 AVC (H.264), and HEVC (H.265)
- Support for 4:2:0 8-bit/10-bit decoding
- Supports UDP and RTP. Other protocols available as options.
- Full ancillary data support

- Support for 4 stereo pairs (8 audio channels) in any combination of MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes
- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p
- Remote control/monitoring via Dashboard™ software
- Hot-swappable
- Five-year warranty



**SOFTWARE LICENSABLE OPTIONS**

- +DEC-2.0 Dolby Digital/Dolby Digital Plus stereo audio decoding license
- +DEC-5.1 Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license
- +DEC-E Dolby E audio decoding license
- +MP1L2-AAC-DEC MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair. Three AAC licenses can be combined to allow one 5.1 surround decode.
- +GENLOCK Add Genlock support (license is per channel)
- +FEC-DEC Add SMPTE-2022 support (per unit)
- +DEC-RTMP-SVR RTMP Server License Option

- +TSMON – Adds continuous monitoring of current transport stream being decoded. Provides a list of all PIDs available in the transport stream, their current individual bit rates, and keeps numerical track of any continuity counter errors. Can also be configured to watch up to 8 PIDs and issue an alarm if PID disappears for a configurable amount of time. (If SNMP is available, this alarm is also provided as a trap.) (License is **per channel**)
- +SRT-DEC SRT Support (per unit) license
- +422 4:2:2 decoding support (per unit)
- +RIST/ARQ-DEC RIST RTP/ARQ support (per unit)
- +RIST/ENCRP-DEC RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

## HEVC-UPGRADABLE MPEG ENCODERS

## 9992-DEC-4K-HEVC » 4K HEVC / AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

with Single-Channel 4K or Dual-Channel 2K Video Paths

### SPECIFICATIONS

#### Inputs

- (2) DVB-ASI inputs
- (2) Gigabit Ethernet ports for IP input, supporting the following protocols:
  - UDP unicast/multicast
  - RTP unicast/multicast with optional SMPTE-2022 FEC
  - HTTP Live Streaming
  - RIST for contribution over the Internet
- Optional SMPTE-2110 baseband video over IP turnaround\*
- \* Future release availability

#### Outputs

- (2) SDI outputs each supporting 12G-SDI, 3G-SDI, HD-SDI and SD-SDI
- (2) SDI outputs each supporting 3G-SDI, HD-SDI and SD-SDI
- Support for all standard frame rates (interlaced and progressive): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60

#### Video Post-Processing

- Support for up/down/cross conversion of output video (independent of incoming stream)\*
- Conversion between interlaced and progressive
- Frame rate conversion
- High Dynamic Range (HDR) support
- \* Future release availability

#### Video Decoding

- Decoding Standards:
  - MPEG-2
  - MPEG-4 AVC (H.264)
  - HEVC (H.265)
- Support for two independent 1080p60 decode sessions
- Support for UHD decoding in AVC and HEVC modes (Maximum resolution 3840x2160p60)
- Support for 4:2:0 and 4:2:2 (option) color spaces in all modes
- Support for 8-bit / 10-bit decoding in all modes
- Low latency decoding supported

#### Audio Decoding

- Decoding Standards:
  - MPEG-1 Layer II
  - AAC-LC
  - HE-AAC (v1/v2)
  - Dolby AC-3 / EAC-3
  - LPCM (SMPTE-302M)
  - Dolby AC-3/EAC-3 pass-thru support
- (5.1-Surround decoding available for AAC-LC, HE-AAC, Dolby AC-3 and Dolby EAC-3; subject to licensing)
- Maximum number of channels supported (subject to licensing):
  - MPEG-1 Layer II: 16 stereo pairs (32 audio channels)
  - Dolby AC-3: 16 stereo pairs (32 audio channels)
  - Dolby EAC-3: 8 stereo pairs (16 audio channels)
  - AAC-LC: 8 stereo pairs (16 audio channels)
  - HE-AAC (v1/v2) 8 stereo pairs (16 audio channels)
- Optional support for 5.1 Surround Sound decoding, in AAC and Dolby modes.
- Optional audio module: increases the capacity to 32 stereo pairs (64 audio channels), allowing full 16-channel support for the four HD inputs, in all compression modes\*
- \* Future release availability

#### Ancillary Data Support

- Closed-Captioning: SMPTE-334M (EIA-608 and EIA-708 supported), Line 21 (SD sources)
- OP-47/SMPTE RDD-08 teletext subtitles\*
- AFD: SMPTE-2016, Line 20/22 WSS (SD sources)
- SCTE-35 to SCTE-104 conversion
- SMPTE-2038 generic ancillary data transport (timecode, KLV, etc.)
- \* Future release availability

HEVC-UPGRADABLE MPEG ENCODERS

**9992-DEC-4K-HEVC » 4K HEVC / AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER**  
with Single-Channel 4K or Dual-Channel 2K Video Paths

**ORDERING INFORMATION**

**Note:** For Software Options and Upgrades, as well as Hardware Options, please see the respective Options sections listed above.

**9992-DEC-4K-HEVC** 4K HEVC/AVC/MPEG-2 Software Defined Broadcast Decoder with Single-Channel 4K or Dual-Channel 2K Video Paths

**Option Licenses:**

- +422 Add 4:2:2 decoding support (per unit)
- +DEC-2.0 Dolby Digital/Dolby Digital Plus stereo audio decoding license
- +DEC-5.1 Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license
- +DEC-E Dolby E audio decoding license
- +SRT-DEC SRT Support license
- +FEC-DEC Add SMPTE-2022 support (per unit)
- +DEC-RTMP-SVR RTMP Server License Option
- +TSMON - Adds transport stream continuous monitoring
- +GENLOCK Add Genlock support (license is per channel)
- +MP1L2-AAC-DEC MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair
- +RIST/ARQ-DEC Add RIST RTP/ARQ support (per unit)
- +RIST/ENCRP-DEC Add RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

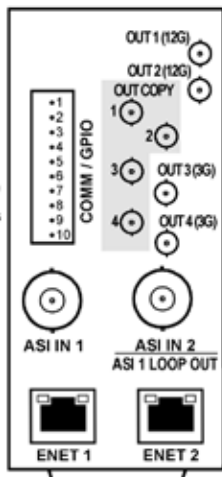
**Rear I/O Modules:**

**RM20-9992-DEC-B** 20-Slot Frame Rear I/O Module (Standard-Width) (2) ASI Input BNCs, (2) GigE Ethernet Media Ports, (2) 12G/6G/3G/HD-SD-SDI Coaxial Outputs, (2) 3G/HD/SD-SDI Coaxial Outputs, (4) Output Copy Coaxial Outputs, COMM/GPIO Port (All SDI coaxial connectors HD-BNC. See Notes in illustration regarding port functions and limitations.)

- 1 - GPI 1
- 2 - GPI 2
- 3 - GPO 1
- 4 - GPO 2
- 5 - GPO COM
- 6 - GND
- 7 - RS232-A RX / 422 RX(-)
- 8 - RS232-B RX / 422 RX(+)
- 9 - RS232-A TX / 422 TX(-)
- 10 - RS232-B TX / 422 TX(+)

**Note:** Output ports marked as "(12G)" can output 12G and lower SDI media.  
Output ports marked as "(3G)" are compatible only with 3G or lower SDI media.

**Note:** ASI IN 2 BNC can be DashBoard selected to function as an ASI copy of ASI IN 1.



**RM20-9992-DEC-B-HDBNC**

HEVC-UPGRADABLE MPEG ENCODERS

9992-2DEC » DUAL UPGRADABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

The Cobalt® 9992-2DEC Dual Upgradeable AVC/MPEG-2 Software Defined Broadcast Decoder is a broadcast-grade multi-standard decoder designed to meet the most stringent requirements for today's broadcasters. It supports two channels of MPEG-2 and AVC (H.264) decoding, with resolution optionally up to 4K over a single channel, and offers a full complement of audio decoding capabilities. The 9992-2DEC is an industry standard openGear® card module and provides an ideal platform for transitioning to state-of-the-art decoding capabilities.

FEATURES

**Future-Proof** – The 9992-2DEC Decoder supports MPEG-2, MPEG-4 AVC (H.264) and (optionally) HEVC (H.265), so it can be deployed today and upgraded as your needs change.

**Industry Standard Form-Factor** – The 9992-2DEC is offered in the industry-standard openGear format, and is compatible with existing deployed openGear frames.

**High Density** – The 9992-2DEC supports two independent 1080p60 input streams, or (optionally) a single UHD 4Kp60 input stream. One openGear frame can support up to 10 cards, for a total of 20 HD channels standard, or optionally 10 UHD 4K channels.

**Full Audio Support** – The 9992-2DEC supports MPEG-1 Layer II, AAC-LC, HE-AAC, Dolby AC-3/EAC-3 and LPCM (SMPTE-302M), as well as Dolby AC-3/EAC-3 pass-thru. With an optional audio board, the decoder can support up to 16 audio channels with each video service.

**Ultra Low Latency** – Low latency modes available

Base Unit Features –

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

Support for two decode channels up to 1080p60

Support for MPEG-2 and MPEG-4 AVC (H.264)

Support for 4:2:0 8-bit/10-bit decoding

Full ancillary data support

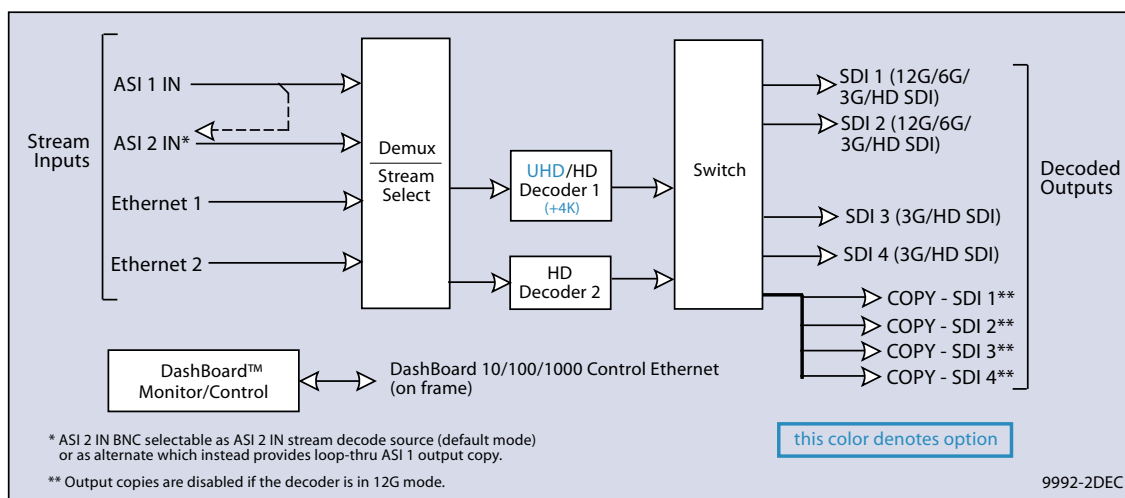
Support for 4 stereo pairs (8 audio channels) per decode channel in any combination of MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes

Supports UDP and RTP. Other protocols available as options.

Remote control/monitoring via Dashboard™ software

Hot-swappable

Five-year warranty



SOFTWARE LICENSABLE OPTIONS

**+HEVC-DEC** Enables HEVC decoding on one AVC encode engine (up to 2 licenses max per unit).

**+4K-DEC** 4K support. Requires +HEVC-DEC license on card.

**+422** 4:2:2 decoding support (per unit)

**+DEC-2.0** Dolby Digital/Dolby Digital Plus stereo audio decoding license

**+DEC-5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license

**+DEC-E** Dolby E audio decoding license

**+GENLOCK** Add Genlock support (license is **per channel**)

**+FEC-DEC** Add SMPTE-2022 support (per unit)

**+DEC-RTMP-SVR** RTMP Server License Option

**+SRT-DEC** SRT Support (per unit) Option

**+TSMON** – Adds continuous monitoring of current transport stream being decoded. Provides a list of all PIDs available in the transport stream, their current individual bit rates, and keeps numerical track of any continuity counter errors. Can also be configured to watch up to 8 PIDs and issue an alarm if PID disappears for a configurable amount of time. (If SNMP is available, this alarm is also provided as a trap.) (License is **per channel**)

**+MP1L2-AAC-DEC** MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair. Three AAC licenses can be combined to allow one 5.1 surround decode.

**+RIST/ARQ-DEC** RIST RTP/ARQ support (per unit)

**+RIST/ENCRP-DEC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

## HEVC-UPGRADABLE MPEG ENCODERS

## 9992-2DEC » DUAL UPGRADABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

## SPECIFICATIONS

**Inputs**

- (2) DVB-ASI inputs
- (2) Gigabit Ethernet ports for IP input, supporting the following protocols:
  - UDP unicast/multicast
  - RTP unicast/multicast with optional SMPTE-2022 FEC
  - HTTP Live Streaming
  - RIST for contribution over the Internet
- Optional SMPTE-2110 baseband video over IP turnaround\*
- \* Future release availability

**Outputs**

- (2) SDI outputs each supporting 12G-SDI, 3G-SDI, HD-SDI and SD-SDI
- (2) SDI outputs each supporting 3G-SDI, HD-SDI and SD-SDI
- Support for all standard frame rates (interlaced and progressive): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60

**Video Post-Processing**

- Support for up/down/cross conversion of output video (independent of incoming stream)\*
- Conversion between interlaced and progressive
- Frame rate conversion
- High Dynamic Range (HDR) support
- \* Future release availability

**Video Decoding**

- Decoding Standards:
  - MPEG-2
  - MPEG-4 AVC (H.264)
  - HEVC (H.265) (Option)
- Support for up to two independent 1080p60 decode sessions
- Support for UHD decoding (option) in AVC and HEVC modes (Maximum resolution 3840x2160p60)
- Support for 4:2:0 and 4:2:2 (option) color spaces in all modes
- Support for 8-bit / 10-bit decoding in all modes
- Low latency decoding supported

**Audio Decoding**

- Decoding Standards:
  - MPEG-1 Layer II
  - AAC-LC
  - HE-AAC (v1/v2)
  - Dolby AC-3 / EAC-3
  - LPCM (SMPTE-302M)
  - Dolby AC-3/EAC-3 pass-thru support
- (5.1-Surround decoding available for AAC-LC, HE-AAC, Dolby AC-3 and Dolby EAC-3; subject to licensing)
- Maximum number of audio channels supported (subject to licensing):
  - MPEG-1 Layer II: 16 stereo pairs (32 audio channels)
  - Dolby AC-3: 16 stereo pairs (32 audio channels)
  - Dolby EAC-3: 8 stereo pairs (16 audio channels)
  - AAC-LC: 8 stereo pairs (16 audio channels)
  - HE-AAC (v1/v2) 8 stereo pairs (16 audio channels)
- Optional support for 5.1 Surround Sound decoding, in AAC and Dolby modes.
- Optional audio module: increases the capacity to 32 stereo pairs (64 audio channels), allowing full 16-channel support for the four HD inputs, in all compression modes\*
- \* Future release availability

**Ancillary Data Support**

- Closed-Captioning: SMPTE-334M (EIA-608 and EIA-708 supported), Line 21 (SD sources)
- OP-47/SMPTE RDD-08 teletext subtitles\*
- AFD: SMPTE-2016, Line 20/22 WSS (SD sources)
- SCTE-35 to SCTE-104 conversion
- SMPTE-2038 generic ancillary data transport (timecode, KLV, etc.)
- \* Future release availability



HEVC-UPGRADABLE MPEG ENCODERS

9992-2DEC » DUAL UPGRADABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

ORDERING INFORMATION

**Note:** For Software Options and Upgrades, as well as Hardware Options, please see the respective Options sections listed above.

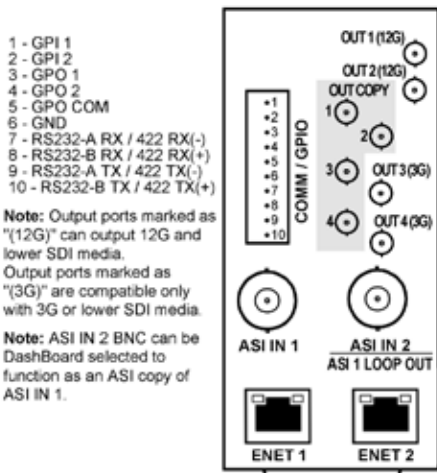
**9992-2DEC** Dual Upgradeable AVC / MPEG-2 Software Defined Broadcast Decoder (includes (2) +AVC and (4) +MP1L2-AAC licenses)

Option Licenses:

- +HEVC-DEC Enable HEVC decoding on one AVC encode engine (up to 2 licenses max per unit).
- +4K-DEC Add 4K support. Requires +HEVC-DEC license on card.
- +422 Add 4:2:2 decoding support (per unit)
- +DEC-2.0 Dolby Digital/Dolby Digital Plus stereo audio decoding license
- +DEC-5.1 Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio decoding license
- +DEC-E Dolby E audio decoding license
- +SRT-DEC SRT Support license
- +FEC-DEC Add SMPTE-2022 support (per unit)
- +DEC-RTMP-SVR RTMP Server License Option
- +TSMON - Adds transport stream continuous monitoring
- +GENLOCK Add Genlock support (license is per channel)
- +MP1L2-AAC-DEC MPEG-1 Layer II, AAC-LC, and HE-AAC audio decoding per pair
- +RIST/ARQ-DEC Add RIST RTP/ARQ support (per unit)
- +RIST/ENCRP-DEC Add RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

Rear I/O Modules:

**RM20-9992-DEC-B** 20-Slot Frame Rear I/O Module (Standard-Width) (2) ASI Input BNCs, (2) GigE Ethernet Media Ports, (2) 12G/6G/3G/HD-SD-SDI Coaxial Outputs, (2) 3G/HD/SD-SDI Coaxial Outputs, (4) Output Copy Coaxial Outputs, COMM/GPIO Port (All SDI coaxial connectors HD-BNC. See Notes in illustration regarding port functions and limitations.)



RM20-9992-DEC-B-HDBNC

HEVC-UPGRADABLE MPEG ENCODERS

9992-ENC » HEVC UPGRADABLE AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER

The Cobalt® 9992-ENC HEVC Upgradeable AVC / MPEG2 Software Defined Broadcast Encoder is an upgradeable broadcast-grade encoder designed to meet the most stringent requirements for today's broadcasters. Software-defined upgradeable to add multiple channels (up to four), the 9992-ENC is also upgradeable to add HEVC video encoding technology that provides a dramatic compression efficiency improvement over previous video compression standards, while also supporting existing MPEG-2 and MPEG-4 AVC. The 9992-ENC is an industry standard openGear® card and provide an ideal platform for transitioning to state-of-the-art encoding capabilities.

FEATURES

**Future-Proof** – The 9992-ENC software-defined architecture supports MPEG-2, MPEG-4 AVC (H.264) and HEVC (H.265) with an optional license, so it can be deployed today and upgraded as your needs change.

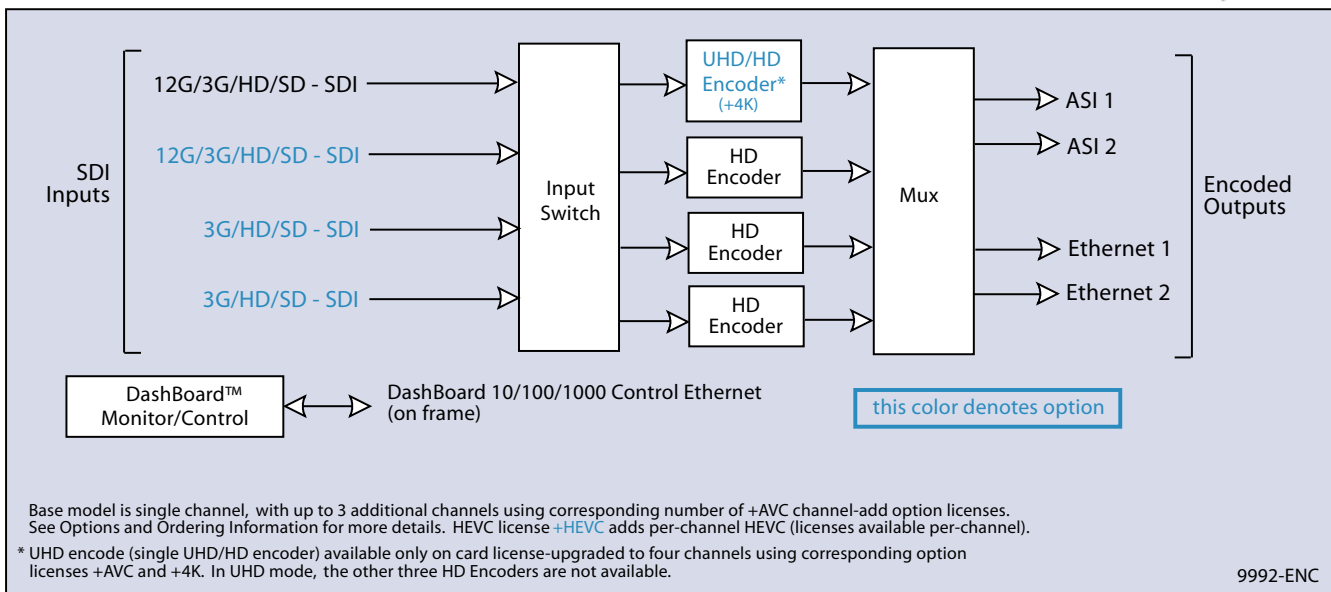
**Industry Standard Form-Factor** – The 9992-ENC is offered in the industry-standard openGear format, and is compatible with existing deployed openGear frames.

**High Density** – The 9992-ENC can be licensed to support up to four independent 1080p60 input signals, or a single UHD 4Kp60 input signal. One openGear frame can support up to 10 cards, for a total of 40 HD or 10 4K channels.

**Full Audio Support** – The 9992-ENC supports MPEG-1 Layer II, AAC-LC, HE-AAC, LPCM (SMPTE-302M) and Dolby AC-3/EAC-3 (optional license).

Base Unit Features –

- Support for one encode channel up to 1080p60
- Support for MPEG-2 and MPEG-4 AVC (H.264)
- Support for 4:2:0 8-bit/10-bit encoding
- All network protocols (RIST and SMPTE-2022 FEC available with corresponding Options)
- Full ancillary data support
- Support for 2 stereo pairs (4 audio channels) in any combination of MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes
- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p
- Remote control/monitoring via Dashboard™ software
- Hot-swappable
- Five-year warranty



SOFTWARE LICENSABLE OPTIONS

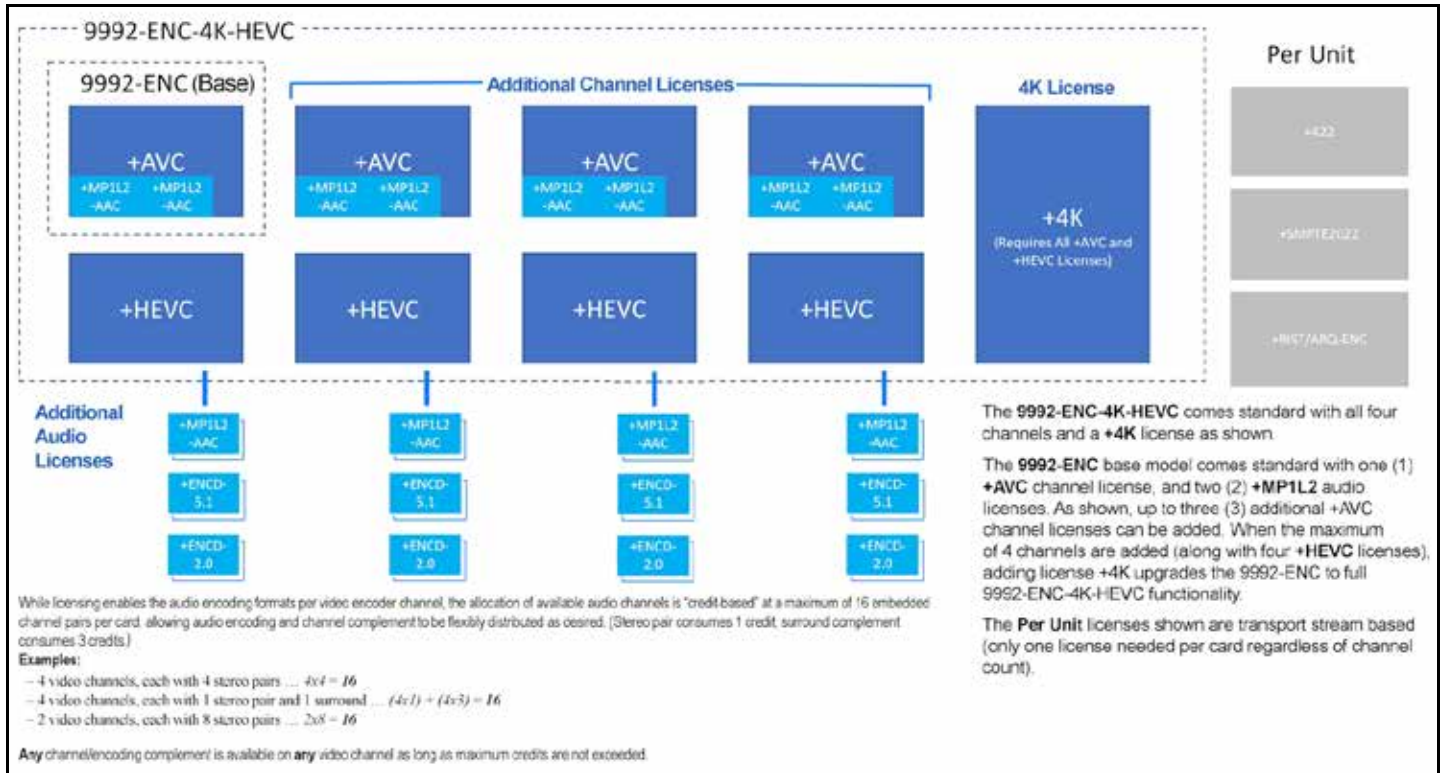
- +AVC** Additional 1080p60 encoder channel with MPEG-2 and MPEG-4 AVC (up to three additional channels, for a total of four channels per unit). Each license includes two +MP1L2-AAC licenses.
- +HEVC** Enables HEVC encoding (per channel; up to four +HEVC licenses may be applied to a single unit; when running in HEVC mode all encoders must be in HEVC mode).
- +4K** Enables 4K encoding. (Requires all four encoding engines are licensed.)
- +MP1L2-AAC** MPEG-1 Layer II, AAC-LC, and HE-AAC audio encoding per pair. Three AAC licenses can be combined to allow one 5.1 surround encode.
- +SRT-ENC** SRT Support (per unit)
- +ULL** Adds support for HEVC Ultra-Low Latency support (per unit). Encoder latency is 10ms for the common frame rates. (In this mode, the maximum encoder capacity is one 4K or two HD streams.)

- +ENC2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license.
- +ENC5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio encoding license.
- +RIST/ARQ-ENC** RIST RTP/ARQ support (transport stream based option; only one license needed per unit).
- +RIST/ENCRP-ENC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-ENC license to be also present on the encoder.)
- +SMPTE2022** Add SMPTE-2022 support (per unit). Provides one FEC insertion per device Ethernet port (transport stream based option; only one license needed per unit).
- +422** Adds 4:2:2 encoding support (transport stream based option; only one license needed per unit).

**ALSO AVAILABLE:**  
9992-2ENC-4K-HEVC and 9992-4ENC-4K-HEVC

HEVC-UPGRADABLE MPEG ENCODERS

9992-ENC » HEVC UPGRADEABLE AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER



SPECIFICATIONS

Inputs

- (2) SDI inputs each supporting 12G-SDI, 3G-SDI, HD-SDI and SD-SDI
- (2) SDI inputs each supporting 3G-SDI, HD-SDI and SD-SDI
- Support for all standard frame rates (interlaced and progressive): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- Optional support for SMPTE-2110 baseband video over IP inputs\*
- \* Future release availability.

**Note:** Although two 12G/3G/HD/SD-SDI inputs are present, only one input can be used at a time to route to the maximum-available single UHD encoder engine.

**Note:** UHD encode (single UHD/HD encoder) available only on 9992-ENC-4K-HEVC encoder model or models license-upgraded to +4K. In UHD mode, the other three HD encoder channels are not available.

Outputs

- (2) DVB-ASI outputs
- (2) Gigabit Ethernet ports for IP output, supporting the following protocols:
  - UDP unicast/multicast
  - RTP unicast/multicast with optional SMPTE-2022 FEC
  - HTTP Live Streaming (local or remote server)
  - RTMP (limited to H.264 only)
- Integrated multiplexer creates MPTS over IP or over DVB-ASI
- Support for DVB table generation
- Support for PSIP table generation\*
- Optional SMPTE-2110 baseband video over IP turnaround\*
- \* Future release availability.

ALSO AVAILABLE:  
9992-2ENC-4K-HEVC and 9992-4ENC-4K-HEVC

HEVC-UPGRADABLE MPEG ENCODERS

9992-ENC » HEVC UPGRADEABLE AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER

**Video Pre-Processing**

- Support for arbitrary down-scaling input video, extending down to 320x240
- Support for up-scaling input video\*
- Interlaced to progressive conversion
- Progressive to interlaced conversion\*
- Frame rate conversion
- Basic noise reduction filter and spatial filter
- Enhanced pre-processing filters\*
- High Dynamic Range (HDR) support
- \* Future release availability.

**Video Encoding**

- Encoding Standards:
  - MPEG-2
  - MPEG-4 AVC (H.264)
  - HEVC (H.265)
- Support for up to four independent 1080p60 encode sessions<sup>(1)</sup>
- Support for UHD encoding in AVC and HEVC modes (Maximum resolution 4096x2160p60)
- Maximum bit rates:
  - UHD (4K) encoding: 150 Mb/s
  - HD encoding: 40 Mb/s<sup>(2)</sup>
- Support for 4:2:0 and 4:2:2 color spaces in all modes
- Support for 8-bit / 10-bit encoding in all modes
- Full control of GOP size and structure
- Advanced compression controls available
- (1) All encode sessions must use the same standard; mixed-standard encoding is not supported.
- (2) The first HD channel can be as high as 150 Mb/s.

**Audio Encoding**

- Encoding Standards:
  - MPEG-1 Layer II
  - AAC-LC
  - HE-AAC (v1/v2)
  - Dolby AC-3
  - Dolby EAC-3
  - LPCM (SMPTE-302M)
  - Dolby AC-3/EAC-3 pass-through support
- (5.1-Surround encoding available for AAC-LC, HE-AAC, Dolby AC-3 and Dolby EAC-3; subject to licensing)
- Maximum number of channels supported (subject to licensing):
  - MPEG-1 Layer II: 16 stereo pairs (32 audio channels)
  - Dolby AC-3: 16 stereo pairs (32 audio channels)
  - Dolby EAC-3: 8 stereo pairs (16 audio channels)
  - AAC-LC: 8 stereo pairs (16 audio channels)
  - HE-AAC (v1/v2) 8 stereo pairs (16 audio channels)
- Optional support for 5.1 Surround Sound encoding, in AAC and Dolby modes. Three stereo licenses are required to enable one 5.1 surround encode.
- Optional audio module: increases the capacity to 32 stereo pairs (64 audio channels), allowing full 16-channel support for the four HD inputs, in all compression modes\*
- \* Future release availability.

**Ancillary Data Support**

- Closed-Captioning: SMPTE-334M (EIA-608 and EIA-708 supported), Line 21 (SD sources)
- OP-47/SMPTE RDD-08 teletext subtitles\*
- AFD: SMPTE-2016, Line 20/22 WSS (SD sources)
- SCTE-104 to SCTE-35 conversion
- SMPTE-2038 generic ancillary data transport (timecode, KLV, etc.)
- \* Future release availability.

**ALSO AVAILABLE:**  
**9992-2ENC-4K-HEVC and 9992-4ENC-4K-HEVC**

HEVC-UPGRADABLE MPEG ENCODERS

9992-ENC » HEVC UPGRADEABLE AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER

ORDERING INFORMATION

**9992-ENC** HEVC Upgradeable AVC / MPEG2 Software Defined Broadcast Encoder. Single-channel; expandable to up to four channels using +AVC licenses. Per-channel HEVC upgradeable using +HEVC licenses.)

**Option Licenses:**

**+AVC** Additional 1080p60 encoder channel

**+HEVC** HEVC encoding license (per channel)

**+4K** 4K encoder license

**+MP1L2-AAC** MPEG-1 Layer II, AAC-LC, and HE-AAC audio encoding license (each license adds one encoded pair)

**+ENC-D-2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license (each license adds one encoded pair)

**+ENC-D-5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio encoding license (each license adds one encoded pair)

**+RIST/ARQ-ENC** RIST RTP/ARQ support license (per unit)

**+RIST/ENCRP-ENC** RIST Encryption/Authentication support license (per unit). (Requires the +RIST/ARQ-ENC license to also be present on the encoder.)

**+SMPTE2022** Add SMPTE-2022 support license (per unit)

**+422** 4:2:2 encoding support license (per unit)

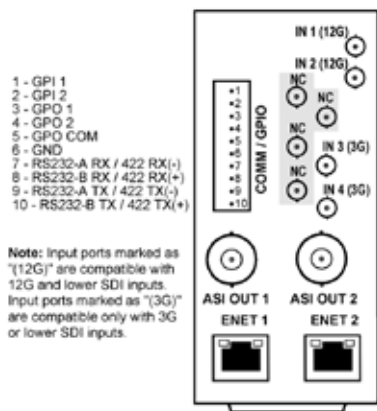
**+SRT-ENC** SRT Support (per unit)

**+ULL** HEVC Ultra-Low Latency support license (per unit)

**Note:** The 9992-ENC is also available factory-configured as fully-featured 4K ready model **9992-ENC-4K-HEVC**. Please see 9992-ENC-4K-HEVC web page for more details.

**Rear I/O Modules:**

**RM20-9992-ENC-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (2) 12G/6G/3G/HD-SD-SDI Coaxial Inputs, (2) 3G/HD/SD-SDI Coaxial Inputs, (2) ASI Coaxial Outputs, (2) GigE Ethernet Media Ports, COMM/GPIO Port (All SDI coaxial connectors HD-BNC.) (**Note:** Mates to card in **odd** slot.)



RM20-9992-ENC-B-HDBNC

**ALSO AVAILABLE:**  
**9992-2ENC-4K-HEVC and 9992-4ENC-4K-HEVC**

HEVC-UPGRADABLE MPEG ENCODERS

**9992-4ENC-4K-HEVC » 4K HEVC / AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER**  
with Single-Channel 4K or Quad-Channel 2K Video Paths

The Cobalt® **9992-4ENC-4K-HEVC 4K HEVC / AVC / MPEG2 Software Defined Broadcast Encoder** is a multi-channel broadcast-grade encoder designed to meet the most stringent requirements for today's broadcasters. Our HEVC video encoding technology provides a dramatic compression efficiency improvement over previous video compression standards, while also supporting existing MPEG-2 and MPEG-4 AVC. The 9992-4ENC-4K-HEVC is an industry standard openGear® card and provide an ideal platform for transitioning to state-of-the-art encoding capabilities.

**FEATURES**

**Future-Proof** – Software-defined architecture supports MPEG-2, MPEG-4 AVC (H.264) and HEVC (H.265). Additional audio licenses available using optional licenses.

**Industry Standard Form-Factor** – The 9992-4ENC 4K-HEVC is offered in the industry-standard openGear format, and is compatible with existing deployed openGear frames.

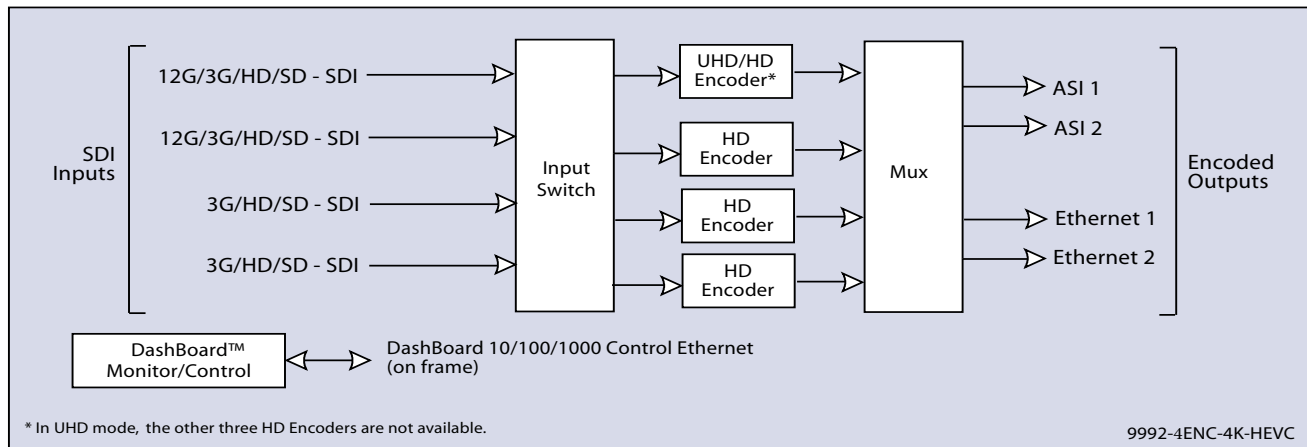
**High Density** – Supports up to four independent 1080p60 input signals, or a single UHD 4Kp60 input signal. One openGear frame can support up to 10 cards, for a total of 40 HD or 10 UHD 4K channels.

**Full Audio Support** – The 9992-4ENC-4K-HEVC supports MPEG-1 Layer II, AAC-LC, HE-AAC, LPCM (SMPTE-302M) and Dolby AC-3/EAC-3 (optional license).

**Base Unit Features –**

- Support for one 4K encode channel or up to four encode channels up to 1080p60
- Support for MPEG-2 and MPEG-4 AVC (H.264)
- Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p
- HEVC encoding
- Support for 4:2:0 8-bit/10-bit encoding
- Full ancillary data support

- Support for 2 stereo pairs (4 audio channels) in any combination of MPEG-1 Layer II, AAC-LC, and HE-AAC (v1/v2) modes
- All network protocols (RIST and SMPTE-2022 FEC available with corresponding Options)
- Remote control/monitoring via Dashboard™ software
- Hot-swappable
- Five-year warranty



9992-4ENC-4K-HEVC

**SOFTWARE LICENSABLE OPTIONS**

**+MP1L2-AAC** Additional MPEG-1 Layer II, AAC-LC, and HE-AAC audio encoding per pair. Three AAC licenses can be combined to allow one 5.1 surround encode.

**+ENC2-2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license.

**+ENC2-5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio encoding license.

**+SRT-ENC** SRT Support (per unit)

**+ULL** Adds support for HEVC Ultra-Low Latency support (per unit). Encoder latency is 10ms for the common frame rates. (In this mode, the maximum encoder capacity is one 4K or two HD streams.)

**+RIST/ARQ-ENC** RIST RTP/ARQ support (transport stream based option; only one license needed per unit).

**+RIST/ENCRP-ENC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-ENC license to be also present on the encoder.)

**+SMPTE2022** Add SMPTE-2022 support. Provides one FEC insertion per device Ethernet port (transport stream based option; only one license needed per unit).

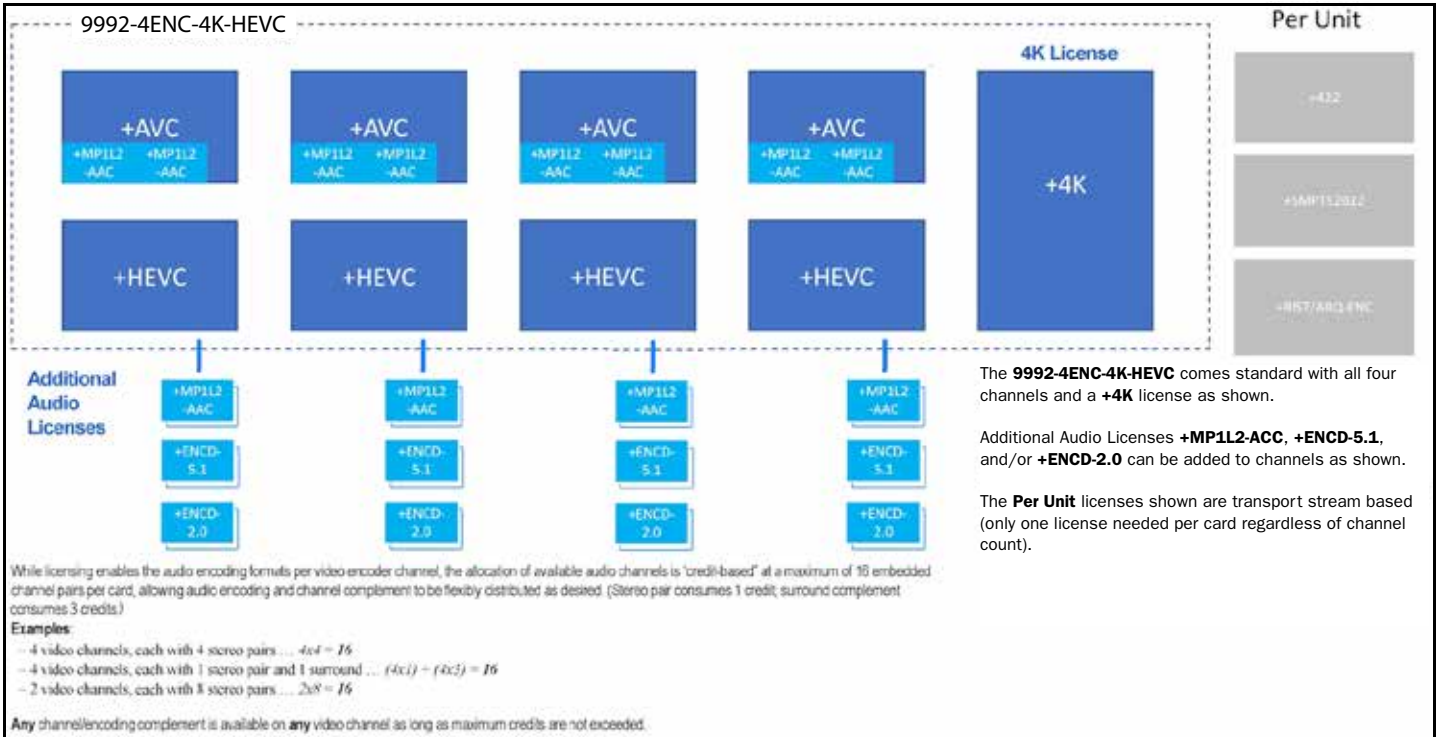
**+422** Adds 4:2:2 encoding support (transport stream based option; only one license needed per unit).

**ALSO AVAILABLE:**

**9992-ENC and 9992-2ENC-4K-HEVC**

HEVC-UPGRADABLE MPEG ENCODERS

**9992-4ENC-4K-HEVC » 4K HEVC / AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER**  
with Single-Channel 4K or Quad-Channel 2K Video Paths



**SPECIFICATIONS**

**Inputs**

- (2) SDI inputs each supporting 12G-SDI, 3G-SDI, HD-SDI and SD-SDI
- (2) SDI inputs each supporting 3G-SDI, HD-SDI and SD-SDI
- Support for all standard frame rates (interlaced and progressive): 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- Optional support for SMPTE-2110 baseband video over IP inputs\*
- \* Future release availability.

**Note:** Although two 12G/3G/HD/SD-SDI inputs are present, only one input can be used at a time to route to the maximum-available single UHD encoder engine.  
**Note:** In UHD mode, the other three HD encoder channels are not available.

**Outputs**

- (2) DVB-ASI outputs
- (2) Gigabit Ethernet ports for IP output, supporting the following protocols:
  - UDP unicast/multicast
  - RTP unicast/multicast with optional SMPTE-2022 FEC
  - HTTP Live Streaming (local or remote server)
  - RTMP (limited to H.264 only)
  - Cobalt's RTP/ARQ for contribution over the Internet
- Integrated multiplexer creates MPTS over IP or over DVB-ASI
- Support for DVB table generation
- Support for PSIP table generation\*
- Optional SMPTE-2110 baseband video over IP turnaround\*
- \* Future release availability.

**Video Pre-Processing**

- Support for arbitrary down-scaling input video, extending down to 320x240
- Support for up-scaling input video\*
- Interlaced to progressive conversion
- Progressive to interlaced conversion\*
- Frame rate conversion
- Basic noise reduction filter and spatial filter
- Enhanced pre-processing filters\*
- High Dynamic Range (HDR) support
- \* Future release availability.

**ALSO AVAILABLE:**  
**9992-ENC and 9992-2ENC-4K-HEVC**

## HEVC-UPGRADABLE MPEG ENCODERS

## 9992-4ENC-4K-HEVC » 4K HEVC / AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER

with Single-Channel 4K or Quad-Channel 2K Video Paths

### Video Encoding

Encoding Standards:

- MPEG-2
- MPEG-4 AVC (H.264)
- HEVC (H.265)

Support for up to four independent 1080p60 encode sessions<sup>(1)</sup>

Support for UHD encoding in AVC and HEVC modes (Maximum resolution 4096x2160p60)

Maximum bit rates:

- UHD (4K) encoding: 150 Mb/s
- HD encoding: 40 Mb/s<sup>(2)</sup>

Support for 4:2:0 and 4:2:2 color spaces in all modes

Support for 8-bit / 10-bit encoding in all modes

Full control of GOP size and structure

Advanced compression controls available

(1) All encode sessions must use the same standard; mixed-standard encoding is not supported.

(2) The first HD channel can be as high as 150 Mb/s.

### Audio Encoding

Encoding Standards:

- MPEG-1 Layer II
- AAC-LC
- HE-AAC (v1/v2)
- Dolby AC-3
- Dolby EAC-3
- LPCM (SMPTE-302M)
- Dolby AC-3/EAC-3 pass-through support

(5.1-Surround encoding available for AAC-LC, HE-AAC, Dolby AC-3 and Dolby EAC-3; subject to licensing)

Maximum number of channels supported (subject to licensing):

- MPEG-1 Layer II: 16 stereo pairs (32 audio channels)
- Dolby AC-3: 16 stereo pairs (32 audio channels)
- Dolby EAC-3: 8 stereo pairs (16 audio channels)
- AAC-LC: 8 stereo pairs (16 audio channels)
- HE-AAC (v1/v2) 8 stereo pairs (16 audio channels)

Optional support for 5.1 Surround Sound encoding, in AAC and Dolby modes. Three stereo licenses are required to enable one 5.1 surround encode.

Optional audio module: increases the capacity to 32 stereo pairs (64 audio channels), allowing full 16-channel support for the four HD inputs, in all compression modes\*

\* Future release availability.

### Ancillary Data Support

Closed-Captioning: SMPTE-334M (EIA-608 and EIA-708 supported), Line 21 (SD sources)

OP-47/SMPTE RDD-08 teletext subtitles\*

AFD: SMPTE-2016, Line 20/22 WSS (SD sources)

SCTE-104 to SCTE-35 conversion

SMPTE-2038 generic ancillary data transport (timecode, KLV, etc.)

\* Future release availability.

ALSO AVAILABLE:

**9992-ENC and 9992-2ENC-4K-HEVC**



HEVC-UPGRADABLE MPEG ENCODERS

**9992-4ENC-4K-HEVC » 4K HEVC / AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER**  
with Single-Channel 4K or Quad-Channel 2K Video Paths

**ORDERING INFORMATION**

**9992-4ENC-4K-HEVC** 4K HEVC / AVC / MPEG2 Software Defined Broadcast Encoder with Single-Channel 4K or Quad-Channel 2K Video Paths

**Option Licenses:**

**+MP1L2-AAC** MPEG-1 Layer II, AAC-LC, and HE-AAC audio encoding license (each license adds one encoded pair)

**+ENC2-2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license (each license adds one encoded pair)

**+ENC2-5.1** Dolby Digital/Dolby Digital Plus 5.1 Surround Sound audio encoding license (each license adds one encoded pair)

**+RIST/ARQ-ENC** RIST RTP/ARQ support (per unit)

**+RIST/ENCRP-ENC** RIST Encryption/Authentication support license (per unit). (Requires the +RIST/ARQ-ENC license to also be present on the encoder.)

**+SMPTE2022** Add SMPTE-2022 support (per unit)

**+SRT-ENC** SRT Support (per unit)

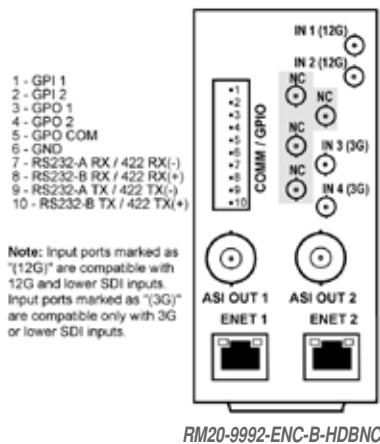
**+422** 4:2:2 encoding support license (per unit)

**+ULL** HEVC Ultra-Low Latency support license (per unit)

**Note:** 9992-ENC is also available in an upgradeable basic single-channel version (up to 1080p60); upgradeable to full 9992-ENC-4K-HEVC with progressive licensing. For info on **9992-ENC** HEVC Upgradeable AVC / MPEG2 Software Defined Broadcast Encoder model, please see 9992-ENC web page for more details.

**Rear I/O Modules:**

**RM20-9992-ENC-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width) (2) 12G/6G/3G/HD-SD-SDI Coaxial Inputs, (2) 3G/HD/SD-SDI Coaxial Inputs, (2) ASI Coaxial Outputs, (2) GigE Ethernet Media Ports, COMM/GPIO Port (All SDI coaxial connectors HD-BNC.) (**Note:** Mates to card in **odd** slot.)



**ALSO AVAILABLE:**  
**9992-ENC and 9992-2ENC-4K-HEVC**

**BBG-IP-TO-SDI-10GE-2022 » SMPTE ST 2022-6/7 TO 3G/HD/SD-SDI DE-ENCAPSULATOR**  
with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs



The Blue Box **BBG-IP-TO-SDI-10GE-2022** SMPTE ST 2022-6/7 To 3G/HD/SD-SDI De-Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG-IP-TO-SDI-10GE-2022 offers a compact throwdown unit that provides the flexibility of IP-to-SDI de-encapsulation as well as providing an HDMI output, two reclocked SDI coax outputs, and a convenience analog stereo de-embed monitor pair with built-in Lt/Rt downmixer. The 10GigE host connection can be used directly with 10GigE video switches and routers. BBG-IP-TO-SDI-10GE-2022 can support ST 2022-6, or receive a copy of the intended SDI output for ST 2022-7 seamless protection switching over the network.

BBG-IP-TO-SDI-10GE-2022 can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-IP-TO-SDI-10GE-2022 over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

ST 2022-6/7 (HBRMT), ST 424, ST 292, and ST 259 compliant

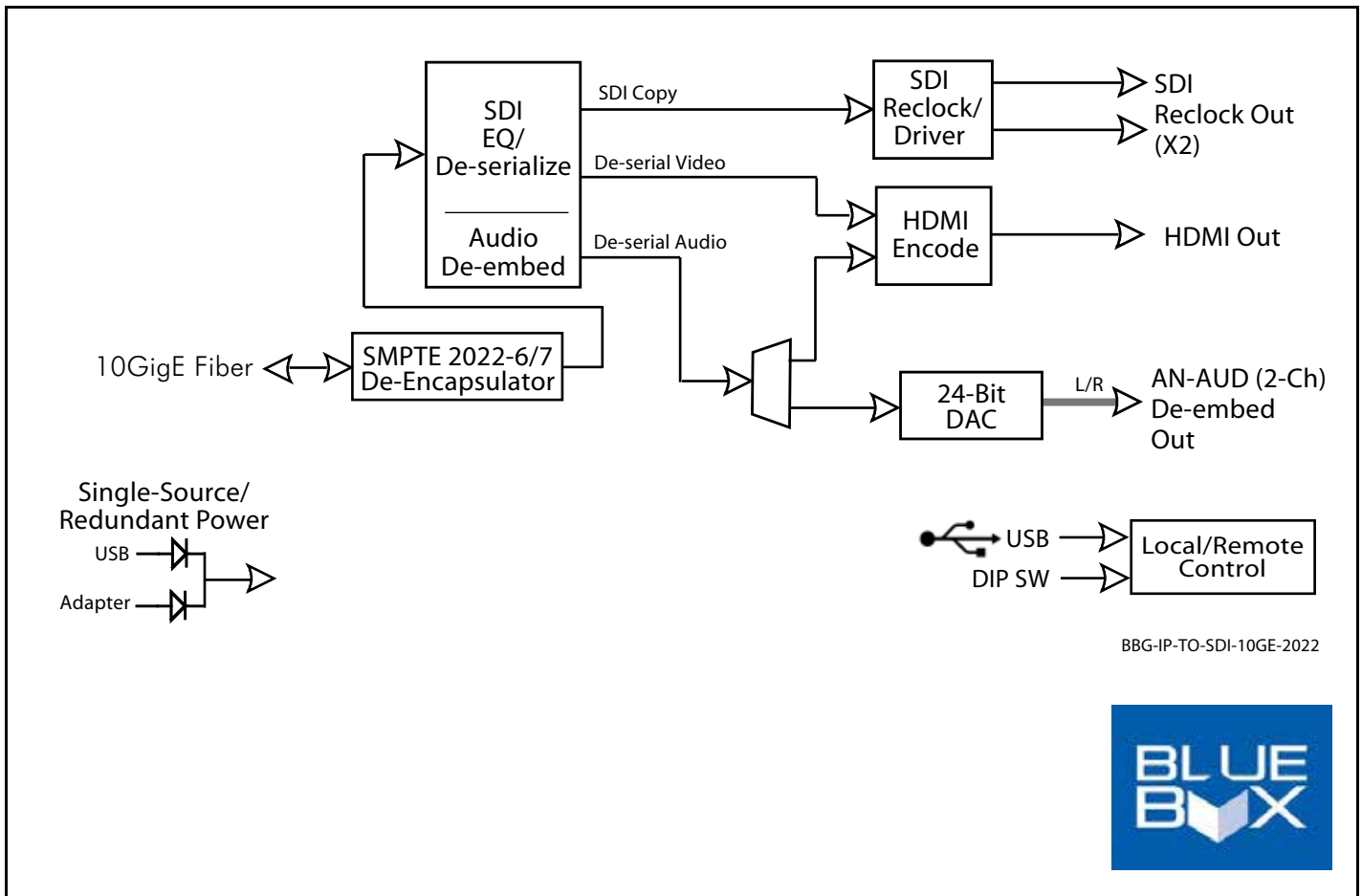
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Stereo analog audio monitoring output with Lt/Rt downmixer

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Rugged construction backed with a five-year warranty



**BBG-IP-TO-SDI-10GE-2022 » SMPTE ST 2022-6/7 TO 3G/HD/SD-SDI DE-ENCAPSULATOR**  
with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M, ST 2022-6 (HBRMT), ST 2022-7, ST 424, ST 292, and ST 259

**Inputs/Outputs**

- (1) 10GigE Fiber I/O; Multi-Mode; LC connectors
- (2) 3G/HD/SD-SDI 75Ω BNC outputs
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

48 kHz sampling, 24-bit  
8-Ch HDMI from SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 5W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 95°F  
(0°C to 35°C)

**ORDERING INFORMATION**

**BBG-IP-TO-SDI-10GE-2022** SMPTE ST 2022-6/7 To 3G/HD/SD-SDI De-Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** The USB GUI application available for BBG-IP-TO-SDI-10GE is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-IP-TO-SDI-10GE-2110 » SMPTE ST 2110 TO 3G/HD/SD-SDI DE-ENCAPSULATOR**  
with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs



The Blue Box **BBG-IP-TO-SDI-10GE-2110** SMPTE ST 2110 To 3G/HD/SD-SDI De-Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG-IP-TO-SDI-10GE-2110 offers a compact throwdown unit that provides the flexibility of IP-to-SDI de-encapsulation as well as providing an HDMI output, two reclocked SDI coax outputs, and a convenience analog stereo de-embed monitor pair with built-in Lt/Rt downmixer. The 10GigE host connection can be used directly with 10GigE video switches and routers. BBG-IP-TO-SDI-10GE-2110 supports 2110 video (part 20), audio (part 30), and ancillary data (part 40) as well as timing (part 21).

BBG-IP-TO-SDI-10GE-2110 can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-IP-TO-SDI-10GE-2110 over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

ST 2110, ST 424, ST 292, and ST 259 compliant

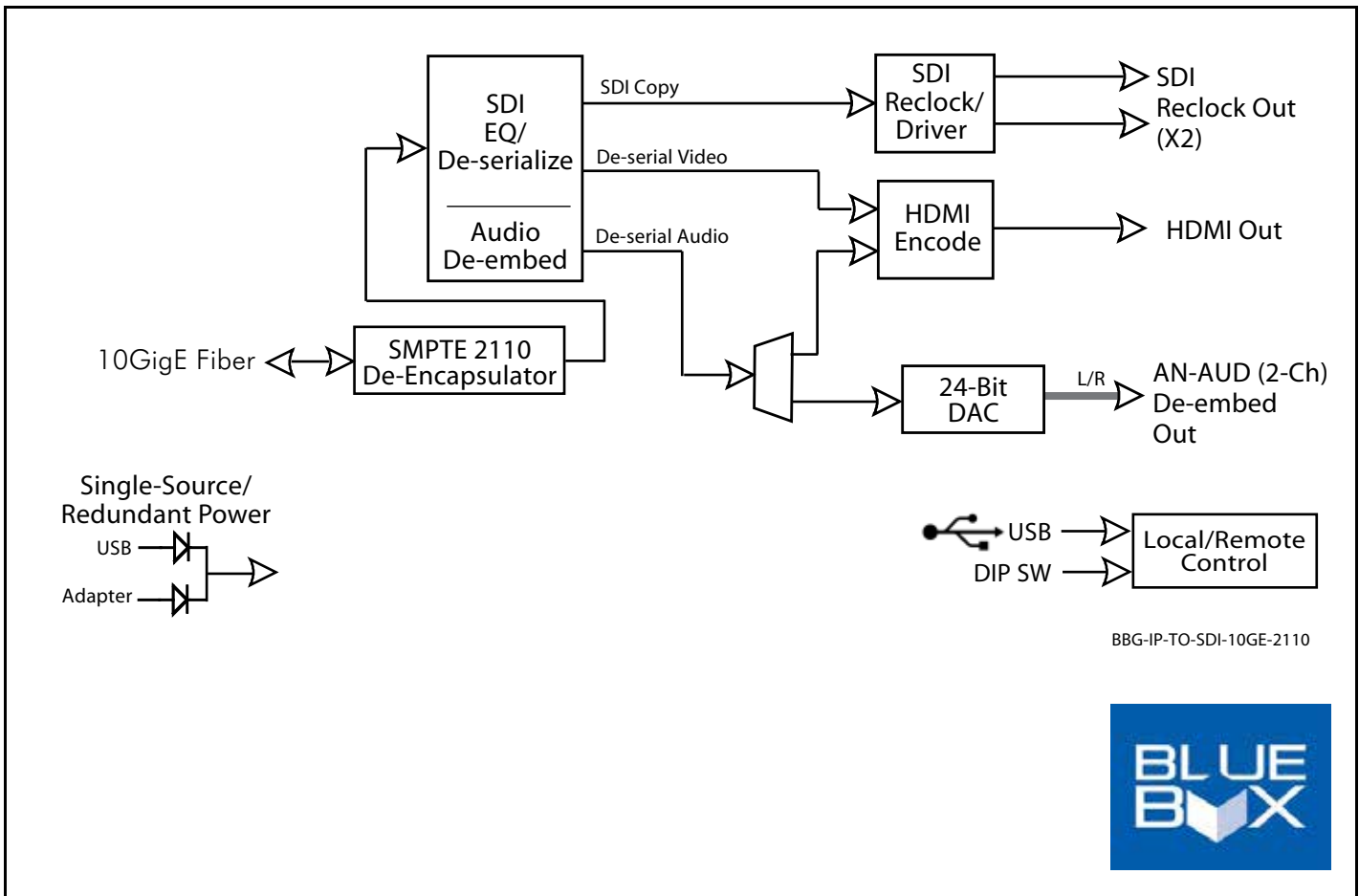
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Stereo analog audio monitoring output with Lt/Rt downmixer

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Rugged construction backed with a five-year warranty



**BBG-IP-TO-SDI-10GE-2110 » SMPTE ST 2110 TO 3G/HD/SD-SDI DE-ENCAPSULATOR**  
with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M, ST 2110, ST 424, ST 292, and ST 259

**Inputs/Outputs**

- (1) 10GigE Fiber I/O; Multi-Mode; LC connectors
- (2) 3G/HD/SD-SDI 75Ω BNC outputs
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

48 kHz sampling, 24-bit  
8-Ch HDMI from SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 5W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 95°F  
(0°C to 35°C)

**ORDERING INFORMATION**

**BBG-IP-TO-SDI-10GE-2110** SMPTE ST 2110 To 3G/HD/SD-SDI De-Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** The USB GUI application available for BBG-IP-TO-SDI-10GE is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-SDI-TO-IP-10GE-2022 » 3G/HD/SD-SDI TO SMPTE 2022-6/7 ENCAPSULATOR**

with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs



The Blue Box **BBG-SDI-TO-IP-10GE-2022** 3G/HD/SD-SDI To SMPTE 2022-6/7 Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG-SDI-TO-IP-10GE-2022 offers a compact throwdown unit that provides the flexibility of SDI-to-IP encapsulation as well as providing an HDMI output, a reclocked SDI coax output, and a convenience analog stereo de-embed monitor pair with built-in Lt/Rt downmixer. The 10GigE port can be used directly with 10GigE video switches and routers. ST 2022-6 is supported as well as ST 2022-7 seamless protection switching over the network.

BBG-SDI-TO-IP-10GE-2022 can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-SDI-TO-IP-10GE over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

ST 2022-6 (HBRMT), ST 2022-7, ST 424, ST 292, and ST 259 compliant

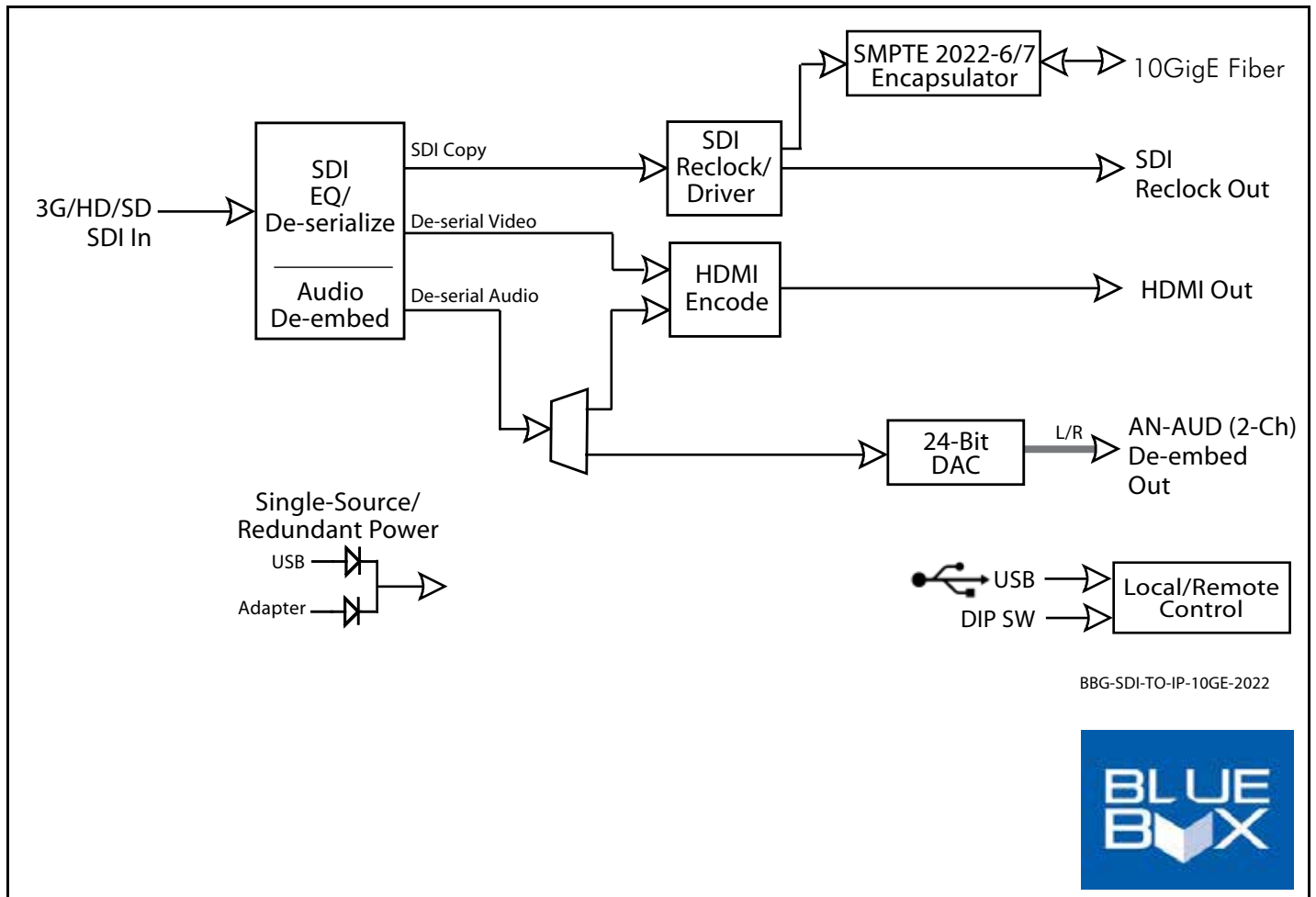
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Stereo analog audio monitoring output with Lt/Rt downmixer

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Rugged construction backed with a five-year warranty



**BBG-SDI-TO-IP-10GE-2022 » 3G/HD/SD-SDI TO SMPTE 2022-6/7 ENCAPSULATOR**

with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M, ST 2022-6 (HBRMT), ST 2022-7, ST 424, ST 292, and ST 259

**Inputs/Outputs**

- (1) 3G/HD-SD-SDI 75Ω BNC input
- (1) 10GigE Fiber I/O; Multi-Mode; LC connectors
- (1) 3G/HD/SD-SDI 75Ω BNC reclocked output
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

- 48 kHz sampling, 24-bit
- 8-Ch HDMI from SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included).

**Power**

5-16 VDC, 5W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 95°F  
(0°C to 35°C)

**ORDERING INFORMATION**

**BBG-SDI-TO-IP-10GE-2022** 3G/HD/SD-SDI To SMPTE ST 2022-6/7 Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** The USB GUI application available for BBG-SDI-TO-IP-10GE is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-SDI-TO-IP-10GE-2110 » 3G/HD/SD-SDI TO SMPTE 2110 ENCAPSULATOR**  
with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs



The Blue Box **BBG-SDI-TO-IP-10GE-2110** 3G/HD/SD-SDI To SMPTE 2110 Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG-SDI-TO-IP-10GE-2110 offers a compact throwdown unit that provides the flexibility of SDI-to-IP encapsulation as well as providing an HDMI output, a reclocked SDI coax output, and a convenience analog stereo de-embed monitor pair with built-in Lt/Rt downmixer. The 10GigE port can be used directly with 10GigE video switches and routers. BBG-SDI-TO-IP-10GE-2110 provides support of 2110 video (part 20), audio (part 30), and ancillary data (part 40) as well as timing (part 21).

BBG-SDI-TO-IP-10GE-2110 can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-SDI-TO-IP-10GE over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

ST 2110, ST 424, ST 292, and ST 259 compliant

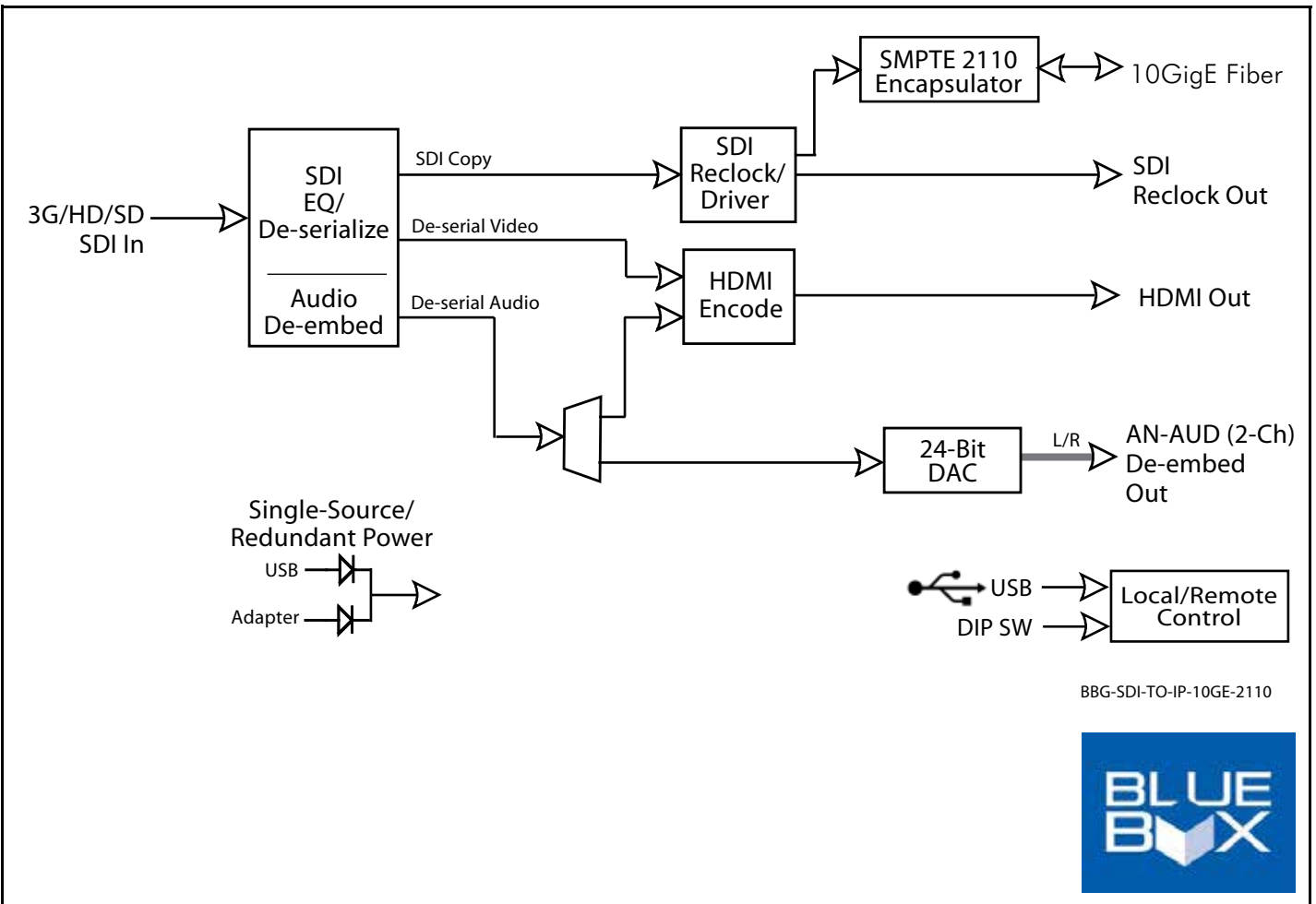
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Stereo analog audio monitoring output with Lt/Rt downmixer

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Rugged construction backed with a five-year warranty





**BBG-SDI-TO-IP-10GE-2110 » 3G/HD/SD-SDI TO SMPTE 2110 ENCAPSULATOR**

with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M, ST 2110, ST 424, ST 292, and ST 259

**Inputs/Outputs**

- (1) 3G/HD-SD-SDI 75Ω BNC input
- (1) 10GigE Fiber I/O; Multi-Mode; LC connectors
- (1) 3G/HD/SD-SDI 75Ω BNC reclocked output
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

- 48 kHz sampling, 24-bit
- 8-Ch HDMI from SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included).

**Power**

5-16 VDC, 5W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 95°F  
(0°C to 35°C)

**ORDERING INFORMATION**

**BBG-SDI-TO-IP-10GE-2110** 3G/HD/SD-SDI To SMPTE ST 2110 Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** The USB GUI application available for BBG-SDI-TO-IP-10GE is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

## 9220 » BIDIRECTIONAL ASI/MPTS GATEWAY



The **9220 Bidirectional ASI/IP Gateway** can receive transport streams over ASI and transmit streams over IP, or receive transport streams over IP and transmit streams over ASI. Utilizing the openGear® open-architecture control/monitoring platform, the 9220 can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface.

It features up to 6 ASI ports, individually configurable as inputs or outputs. With option +TS, the 9220 can support up to six ASI/IP bidirectional conversions simultaneously (standard support with no additional licenses supports one ASI/IP bidirectional gateway). The 9220 can be used to facilitate seamless plant distribution/contribution over IP. It also includes advanced redundancy protection features, allowing for automatic failover if the primary signal disappears. The 9220 supports both unicast and multicast, with IGMP V1, V2 and V3. DashBoard™ remote control allows easy centralized control and monitoring access.

### FEATURES

Compact self-contained form with built-in AC power supply

Up to six ASI inputs/outputs supported (standard supports one ASI/IP gateway with up to five additional with corresponding +TS licensing)

Bidirectional ASI/IP encapsulation or de-encapsulation

1x Gigabit Ethernet IP interface

Optional 2x Gigabit IP interface

Multicast IGMP v1, v2, and v3 support

Easy integration and control/monitoring via DashBoard™ remote control

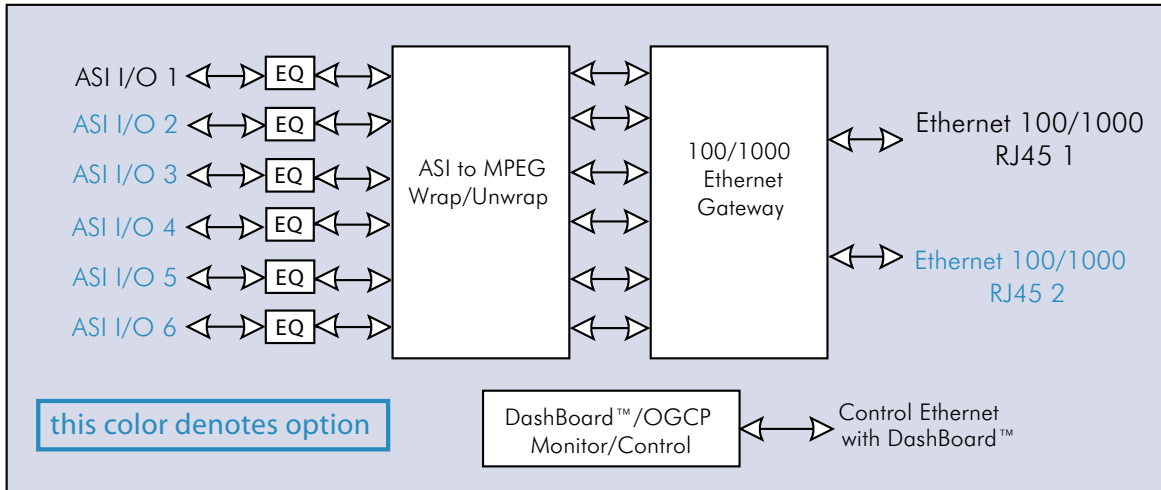
Hot-swappable

Five year warranty

### OPTIONS

+TS - Additional ASI or IP Transport Stream Output

+GBE - Second Activated Gigabit Ethernet Port



## 9220 » BIDIRECTIONAL ASI/MPTS GATEWAY

### SPECIFICATIONS

#### DVB-ASI Input/Output

Number of ports: 6 (max) bi-directional, 75Ω BNC DVB-ASI  
213Mbit/s maximum ASI TS bit-rate per port

#### Network I/O

Number of ports: (2) 100/1000Base-T RJ-45  
IPv4, IPv6, UDP, and RTP  
900Mbit/s usable GbE per Rx port  
900Mbit/s usable GbE per Tx port  
600Mbit/s maximum processing per card  
213Mbit/s maximum ASI TS bitrate per port

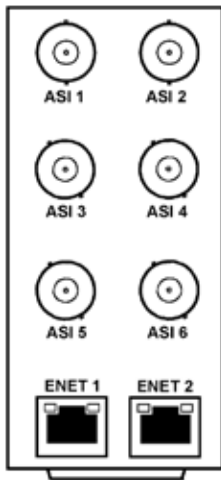
### ORDERING INFORMATION

**9220** Bidirectional ASI/MPTS Gateway

**+TS** Optional Additional ASI or IP Transport Stream Output. License is per added transport stream exiting the gateway, either IP or ASI-based (example: 1 added transport stream as ASI and 1 added transport stream as IP requires 2 added licenses).

**+GBE** Optional Activated Second Gigabit Ethernet Port

**RM20-9220-B** 20-Slot Frame Rear I/O Module (Standard Width) (6) ASI Input/Output BNCs (software configurable), (2) Gigabit Ethernet Ports



**RM20-9220-B**

H.264 ENCODERS (OPENGear CARDS AND STANDALONE MODELS)

9223-S » SINGLE-CHANNEL 3G/HD/SD MPEG-4 ENCODER



The **9223-S Single-Channel 3G/HD/SD MPEG-4 Encoder** provides a card-based solution for distribution of MPEG-4 encoding. Utilizing the openGear® open-architecture platform, the 9223-S offers scalable incorporation and the easy-to-use DashBoard™ setup and control operator interface. Up to 10 of the 9223 cards can be installed in a 20-slot frame, offering distribution delivery of up to 10 channels in a single frame, using less than 150W total, for reduced operating expenses. In addition to SD/HD-SDI inputs, the 9223-S provides the flexibility of supporting SD analog composite video and an analog audio stereo pair per input channel (using MPEG-1 Layer II audio encoding as standard).

The 9223-S offers the latest advances in video compression that delivers excellent video quality at very low bit rates.

Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. In addition to ASI outputs, the 9223 provides Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices.

When using the Ethernet output, the 9223-S supports the traditional UDP/RTP/SPMTE 2022 FEC protocols, as well as the HTTP Live Streaming protocol for transmitting live video over the Internet. Using HTTP Live Streaming, the 9223-S can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported), tablets, and a variety of consumer set-top boxes (such as the Amino A140 and the Roku Player).

RTMP support allows direct publishing of real-time, live content to Adobe® Media Servers or any other servers, web sites and CDNs with RTMP ingress, such as Justin.tv, UStream, LiveStream and Akamai. Publish professional-quality real-time SD/HD content to Internet viewers (including some critical features not available in PC-based software encoders) such as ancillary data support (closed-captioning, AFD) and SD-SDI/HD-SDI video inputs with embedded audio support – all in broadcast-grade video quality. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported.

Full user remote monitor/control allows full card status and control access across a standard Ethernet network. Status monitoring is also available at card edge. 9223 encoders are also available in dual encoding channel configuration (some 9223-S models can be upgraded to dual-channel; see Options and Ordering Information). For 9223 dual-channel encoder models information, please see **9223-D Dual-Channel 3G/HD/SD MPEG-4 Encoders** web page.

FEATURES

- Card-based design allows scalability, from 1 channels to 10 channels per frame

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- Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling

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- Low power/high-density design; only 6 Watts per card

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- DVB-ASI and Ethernet outputs

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- Full support of CEA-608 and CEA-708 closed captioning and PMT information. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

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- SCTE 104 to SCTE 35 conversion

- Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

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- License-based options allow tailoring functionality as needed, with upgrades available if later desired

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- Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

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- RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers

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- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

- Optional support for additional audio pairs

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- Optional RTP/ARQ support

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- Built-in Packet Test Generators allow pre-validation of transport

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- Multiple pre-defined control templates provide automatic setup of popular contribution-to-distribution schemes

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- Remote control/monitoring via DashBoard™ software

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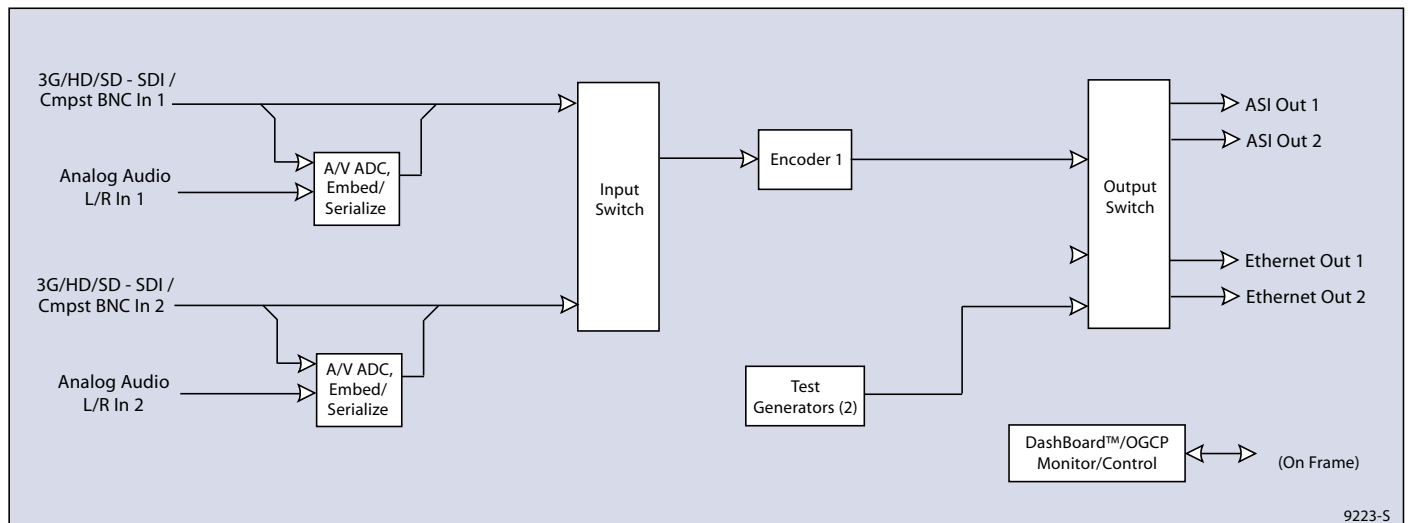
- Hot-swappable

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- Five year warranty

OPTIONS

Please see Ordering Information



9223-S



**H.264 ENCODERS** (OPENGEAR CARDS AND STANDALONE MODELS)

**9223-S » SINGLE-CHANNEL 3G/HD/SD MPEG-4 ENCODER**

**SPECIFICATIONS**

**Power**

6W

**3G/HD/SD-SDI Inputs**

Number of inputs: (2), each configurable as:  
 3G-SDI (SMPTE 424M)  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M) with EDH  
 Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI, AC-3 (optional)  
 (2) L/R pairs (max) of analog audio embed

**Video Encoding**

HD Video:  
 MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
 MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
 CBR, VBR  
 2Mbps to 30Mbps (configurable)  
 SD Video:  
 MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
 CBR, VBR  
 1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-1 layer II, 1 stereo pair base (Dolby® pass-thru)  
 MPEG-4 AAC-LC up to 2 pairs  
 Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
 1080 x 1920/1440i 30/29.97/25  
 1280 x 720/960/640p 59.94/50/30/29.97/25  
 SD: 576 x 720/528i 29.97fps  
 576 x 720/528i 25fps

**Video Pre-Processing**

Advanced adaptive spatial filtering  
 Closed Captions CEA 608B and CEA-708C  
 WSS/AFD

**ASI Outputs**

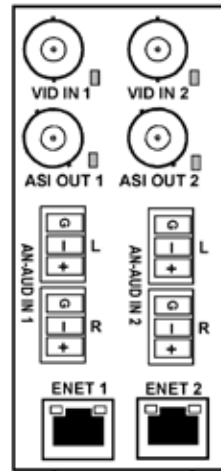
Number of outputs: (2) 75Ω BNC DVB-ASI  
 213Mbit/s maximum ASI TS bit-rate per port

**Ethernet**

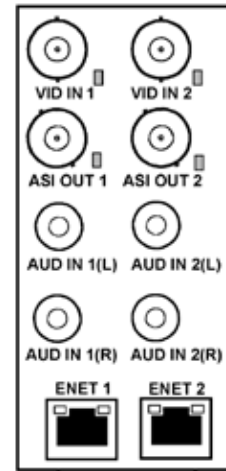
Number of control/monitor connections: (2) redundant 10/100Base-T RJ-45  
 Number of transport outputs: (2) 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 IPv4, IPv6, UDP, RTP  
 SMPTE 2022 ProMPEG FEC CoP3, 'Forward Error Correction' (Row and Column)

**Regulatory Compliance**

CE: CE marked in accordance with 93/68/EEC  
 (22/07/03) Directive  
 UL: UL approval  
 US FCC: Part 15  
 EMC: EN55022, EN55024, EN6100-3-2



RM20-9223-B



RM20-9223-U

**H.264 ENCODERS (OPENGEAR CARDS AND STANDALONE MODELS)**

**9223-S » SINGLE-CHANNEL 3G/HD/SD MPEG-4 ENCODER**

**ORDERING INFORMATION**

**9223-S** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD

**9223-S-HD-I** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080i

**9223-S-HD-P** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080p

**9223-A8-S** Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD. Support for 4 audio pairs (8-ch).

**9223-A8-S-HD-I** Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080i. Support for 4 audio pairs (8-ch).

**9223-A8-S-HD-P** Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080p. Support for 4 audio pairs (8-ch).

**RM20-9223-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/SD BNC Composite In, (2) DVB-ASI BNC Out, (4) Balanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**RM20-9223-U** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/SD BNC Composite In, (2) DVB-ASI BNC Out, (4) Unbalanced Analog Audio RCA In, (2) 100/1000Base-T RJ-45 Ethernet

**Options:**

**Note:** - Although the -A8 versions support eight channels, encoding is not designed for phase coherency between PCM pairs (i.e., using six available channels to carry 5.1 PCM surround-sound).

- Add Encoder Second Channel options cannot be used with -A8 (8-channel audio) models.
- 9223-A8 models come standard with maximum audio channel capacity. +2A option cannot be added to these models.
- Unless indicated as program channel or audio channel pair license, licenses below are **card-based** licenses and require **only one license per card**.
- RTMP and HLS modes can only use stereo encoding.
- Options denoted as "+" are software-based options which can be fitted on new product at ordering or field-installed as a software upload upgrade. Options denoted as "-" are hardware-based options which are factory-installed upon ordering, or factory-installed by returning fielded product to Cobalt for option installation.

**-SD-HD-I** Upgrade License; Upgrade (1) SD Channel to HD up to 1080i

**-SD-HD-P** Upgrade License; Upgrade (1) SD Channel to HD up to 1080p

**-HD-I-HD-P** Upgrade License; Upgrade (1) HD 1080i Channel to HD 1080p

**+RTP/ARQ** Automatic Repeat Request License

**+UP-AAC** AAC Audio License; Add (1) AAC-LC Stereo Channel

**-SD** Add Encoder Second Channel H.264 SD

**-HD-I** Add Encoder Second Channel H.264 SD/HD (up to 1080i)

**-HD-P** Add Encoder Second Channel H.264 SD/HD (up to 1080p)

**-PIP** Encoder 2nd channel H.264 low resolution PIP option

**+RIST/ARQ-ENC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

**+2A** Additional Audio Pair License

**+SMPTE2022** SMPTE 2022 FEC License

– **Audio Capacity (Base and with Audio Add Option Licenses +2A or +UP-AAC) –**

**Base** – (1) standard MP1L2 encoding license on 1 PID

**Add PIDs:**

- Can have 2 audio PIDs total (1 additional +2A license or 1 additional +UP-AAC license).
- Can expand up to 4 audio PIDs with +PIP license (3 additional +2A and/or 2 additional +UP-AAC licenses)

**Note:** 9223-S-A8 models come standard with 4 x MP1L2 stereo encoders for full eight channels of audio support in a single ordering option.

## 9223-D » DUAL-CHANNEL 3G/HD/SD MPEG-4 ENCODER



The **9223-D Dual-Channel 3G/HD/SD MPEG-4 Encoders** provide a card-based solution for distribution of MPEG-4 encoding. Utilizing the openGear® open-architecture platform, the 9223-D offers scalable incorporation and the easy-to-use DashBoard™ setup and control operator interface. Up to 10 of the 9223-D cards can be installed in a 20-slot frame, offering distribution delivery of up to 20 individual or simulcast channels in a single frame, using less than 150W total, for reduced operating expenses. In addition to SD/HD-SDI inputs, the 9223-D provides the flexibility of supporting SD analog composite video and an analog audio stereo pair per input channel (using MPEG-1 Layer II audio encoding as standard).

The 9223-D offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. In addition to two ASI outputs, the 9223-D provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input video

auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices.

When using the Ethernet output, the 9223-D supports the traditional UDP/RTP/SPMTE 2022 FEC protocols, as well as the HTTP Live Streaming protocol for transmitting live video over the Internet. Using HTTP Live Streaming, the 9223-D can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported), tablets, and a variety of consumer set-top boxes (such as the Amino A140 and the Roku Player).

RTMP support allows direct publishing of real-time, live content to Adobe® Media Servers or any other servers, web sites and CDNs with RTMP ingress, such as Justin.tv, UStream, LiveStream and Akamai. Publish professional-quality real-time SD/HD content to Internet viewers (including some critical features not available in PC-based software encoders) such as ancillary data support (closed-captioning, AFD) and SD-SDI/HD-SDI video inputs with embedded audio support – all in broadcast-grade video quality. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Full user remote monitor/control allows full card status and control access across a standard Ethernet network. Status monitoring is also available at card edge.

9223 encoders are also available in single encoding channel configuration. For 9223 single-channel encoder models information, please see **9223-S Single-Channel 3G/HD/SD MPEG-4 Encoders** web page.

### FEATURES

Card-based design allows scalability, from 2 channels to 20 channels per frame

Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling

Low power/high-density design; only 6 Watts per card

DVB-ASI and Ethernet outputs

Full support of CEA-608 and CEA-708 closed captioning and PMT information. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

SCTE 104 to SCTE 35 conversion

Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

License-based options allow tailoring functionality as needed, with upgrades available if later desired

Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers

Optional support for additional audio pairs

HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

Multi-angle support allows creation of transport streams with two synchronized video PIDs

Optional RTP/ARQ support

Built-in Packet Test Generators allow pre-validation of transport

Multiple pre-defined control templates provide automatic setup of popular contribution-to-distribution schemes

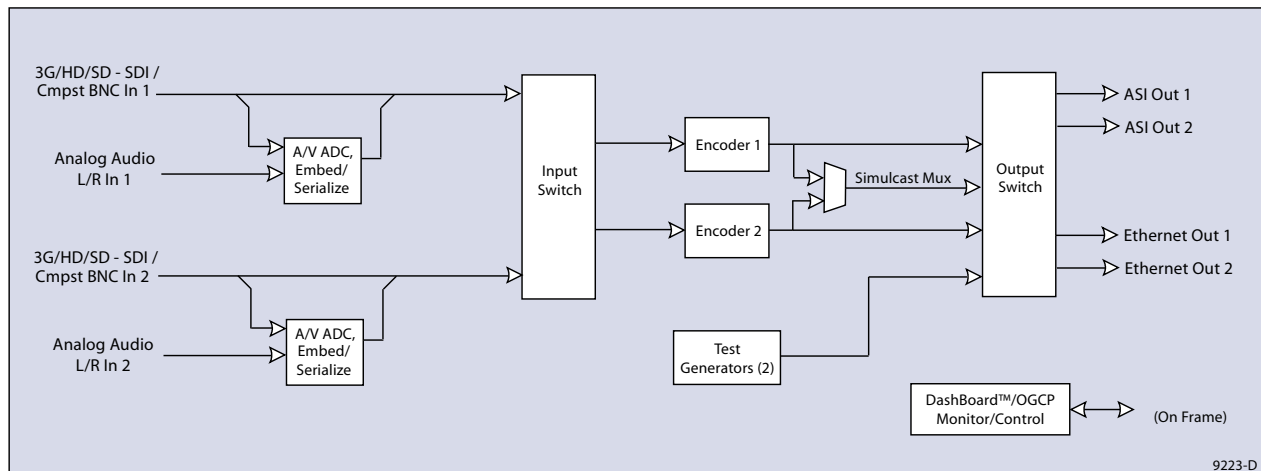
Remote control/monitoring via DashBoard™ software

Hot-swappable

Five year warranty

### OPTIONS

Please see Ordering Information



9223-D



**H.264 ENCODERS** (OPENGEAR CARDS AND STANDALONE MODELS)

**9223-D » DUAL-CHANNEL 3G/HD/SD MPEG-4 ENCODER**

**SPECIFICATIONS**

**Power**

6W

**3G/HD/SD-SDI Inputs**

Number of inputs: (2) each configurable as:

3G-SDI (SMPTE 424M)

HD-SDI (SMPTE 292M)

SD-SDI (SMPTE 259M) with EDH

Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI, AC-3 (optional)

(2) L/R pairs (max) of analog audio embed

**Video Encoding**

Dual-channel HD Video:

MPEG-4 AVC High profile at level 4.2 (HP@L4.2)

MPEG-4 AVC High profile at level 4.0 (HP@L4.0)

CBR, VBR

2Mbps to 30Mbps (configurable)

Dual-channel SD Video:

MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)

CBR, VBR

1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-1 layer II, up to 2 stereo pairs base (Dolby® pass-thru)

MPEG-4 AAC-LC up to 2 pairs

Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25

1080 x 1920/1440i 30/29.97/25

1280 x 720/960/640p 59.94/50/30/29.97/25

SD: 576 x 720/528i 29.97fps

576 x 720/528i 25fps

**Video Pre-Processing**

Advanced adaptive spatial filtering

Closed Captions CEA 608B and CEA-708C

WSS/AFD

**ASI Outputs**

Number of outputs: (2) 75Ω BNC DVB-ASI

213Mbit/s maximum ASI TS bit-rate per port

**Ethernet**

Number of control/monitor connections: (2) redundant 10/100Base-T RJ-45

Number of transport outputs: (2) 100/1000Base-T RJ-45

ports, auto-negotiate or fixed speed

IPv4, IPv6, UDP, RTP

SMPTE 2022 ProMPEG FEC CoP3, 'Forward Error

Correction' (Row and Column)

**Regulatory Compliance**

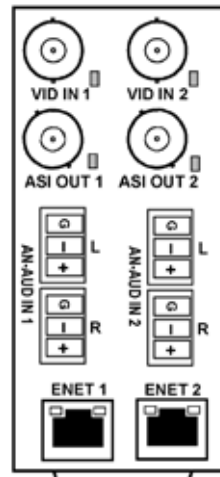
CE: CE marked in accordance with 93/68/EEC

(22/07/03) Directive

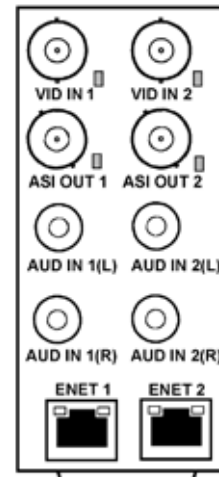
UL: UL approval

US FCC: Part 15

EMC: EN55022, EN55024, EN6100-3-2



**RM20-9223-B**



**RM20-9223-U**



## 9223-D » DUAL-CHANNEL 3G/HD/SD MPEG-4 ENCODER

### ORDERING INFORMATION

**9223-D** Dual-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD

**9223-D-HD-I** Dual-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080i

**9223-D-HD-P** Dual-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080p

**RM20-9223-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/SD BNC Composite In, (2) DVB-ASI BNC Out, (4) Balanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**RM20-9223-U** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/SD BNC Composite In, (2) DVB-ASI BNC Out, (4) Unbalanced Analog Audio RCA In, (2) 100/1000Base-T RJ-45 Ethernet

#### Options:

**Note:** - Unless indicated as program channel or audio channel pair license, licenses below are **card-based** licenses and require **only one license per card**.

- Options denoted as "+" are software-based options which can be fitted on new product at ordering or field-installed as a software upload upgrade. Options denoted as "-" are hardware-based options which are factory-installed upon ordering, or factory-installed by returning fielded product to Cobalt for option installation.

**-D-SD-HD-I** Upgrade License; Upgrade (1) SD Channel to HD up to 1080i

**-D-SD-HD-P** Upgrade License; Upgrade (1) SD Channel to HD up to 1080p

**-D-HD-I-HD-P** Upgrade License; Upgrade (1) HD 1080i Channel to HD 1080p

**+RIST/ARQ-ENC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

**+UP-AAC** AAC Audio License; Add (1) AAC-LC Stereo Channel

**+2A** Additional Audio Pair License

**+SMPTE2022** SMPTE 2022 FEC License

– **Audio Capacity (Base and with Audio Add Option Licenses +2A or +UP-AAC)** –

**Base** – (2) standard MP1L2 encoding licenses on 2 PIDs.

**Add PIDs:**

– Can have 4 audio PIDs total (2 additional +2A licenses or 2 additional +UP-AAC licenses).

## BBG-1123-ENC » SINGLE-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT



The **BBG-1123-ENC** provides a compact form-factor standalone unit for distribution of MPEG-4 encoding. Utilizing the openGear® open-architecture control/monitoring platform, the BBG-1123-ENC can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface. (When connected to your network, the BBG-1123-ENC appears in DashBoard just like any other device.) The BBG-1123-ENC includes dual redundant 10/100/1000 Mb/s Ethernet ports for control. Low-profile packaging fits 1 RU installations.

The BBG-1123-ENC offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. In addition to SD/HD-SDI/3G-SDI inputs, the BBG-1123-ENC provides the flexibility of supporting SD analog composite video and one pair of analog stereo audio per channel (using MPEG-1 Layer II audio encoding as standard). The BBG-1123-ENC features two ASI outputs, as well as two simultaneous transport Ethernet outputs, supporting full-duplex 100 Mb/s and scaling set to same as input or other applicable choices.

1 Gb/s operation. Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices.

When using the Ethernet output, the BBG-1123-ENC supports the traditional UDP/RTP/SPMTE 2022 FEC protocols, as well as the HTTP Live Streaming protocol for transmitting live video over the Internet. Using HTTP Live Streaming, the BBG-1123-ENC can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported), tablets, and a variety of consumer set-top boxes (such as the Amino A140 and the Roku Player).

RTMP support allows direct publishing of real-time, live content to Adobe® Media Servers or any other servers, web sites and CDNs with RTMP ingress, such as Justin.tv, UStream, LiveStream and Akamai. Publish professional-quality real-time SD/HD content to Internet viewers (including some critical features not available in PC-based software encoders) such as ancillary data support (closed-captioning, AFD) and SD-SDI/HD-SDI video inputs with embedded audio support – all in broadcast-grade video quality. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Full user remote monitor/control allows full device status and control access across a standard Ethernet network.

BBG-1123-ENC encoders are also available in dual encoding channel configuration (some BBG-1123-ENC models can be upgraded to dual-channel; see Options and Ordering Information). For BBG-1123-ENC dual-channel encoder models information, please see **BBG-1123-ENC2 Dual-Channel 3G/HD/SD MPEG-4 Standalone Encoder Units** web page.

### FEATURES

Compact self-contained form with built-in AC power supply. Up to 3 units can be installed in a 1RU tray.

Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling

DVB-ASI and Ethernet outputs

Full support of CEA-608 and CEA-708 closed captioning and PMT information. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

Optional RTP/ARQ support

License-based options allow tailoring functionality as

Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

Optional support for additional audio pairs per encoded output

Built-in Packet Test Generators allow pre-validation of transport

SCTE 104 to SCTE 35 conversion

HTTP Live Streaming protocol allows viewing by Apple®

Multiple pre-defined control templates provide automatic setup of popular contribution-to-distribution schemes

Ethernet remote control/monitoring via free DashBoard™ software. Advanced front panel display/user interface allows initial and basic configuration setup without needing connection to external network or remote control.

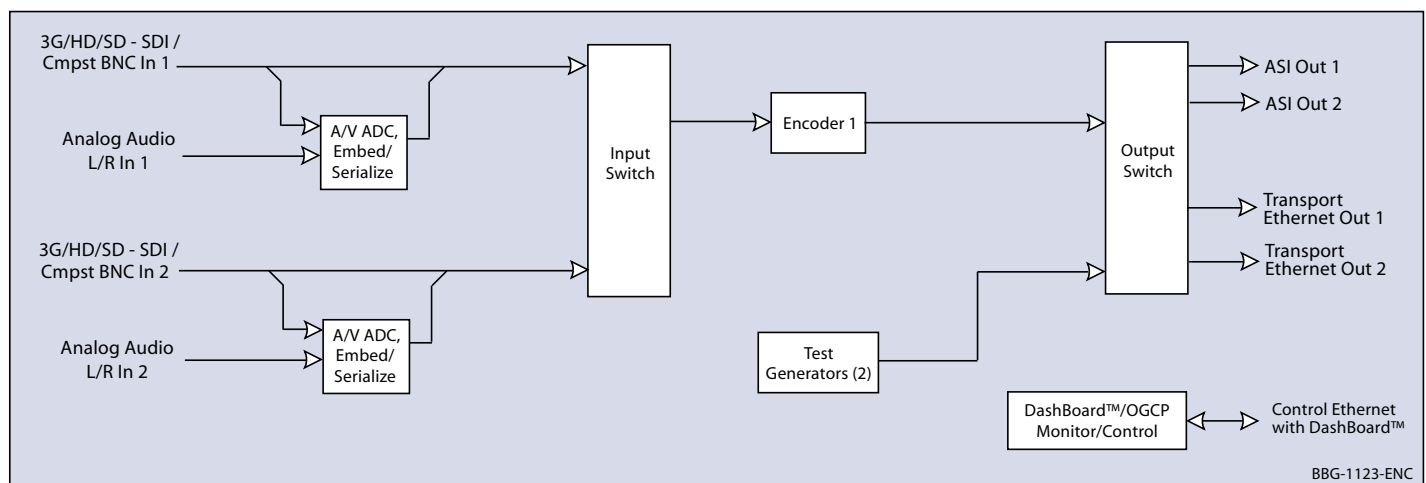
RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers

Dual-redundant internal power supplies

Five year warranty

### OPTIONS

Please see Ordering Information



BBG-1123-ENC



**BBG-1123-ENC » SINGLE-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT**

**SPECIFICATIONS**

**Power**

100-250 VAC, 47-63 Hz, 12W

**3G/HD/SD-SDI Inputs**

Number of inputs: 2, each configurable as:  
 3G-SDI (SMPTE 424M)  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M) with EDH  
 Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI, AC-3 (optional)  
 (2) L/R pairs (max) of analog audio embeds

**Video Encoding**

HD Video:  
 MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
 MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
 CBR, VBR  
 2Mbps to 30Mbps (configurable)  
 SD Video:  
 MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
 CBR, VBR  
 1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-1 layer II, up to 2 stereo pairs base (Dolby® pass-thru)  
 MPEG-4 AAC-LC up to 2 pairs  
 Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
 1080 x 1920/1440i 30/29.97/25  
 1280 x 720/960/640p 59.94/50/30/29.97/25  
 SD: 576 x 720/528i 29.97fps  
 576 x 720/528i 25fps

**Video Pre-Processing**

Advanced adaptive spatial filtering  
 Closed Captions CEA 608B and CEA-708C  
 WSS/AFD

**ASI Outputs**

Number of outputs: 2, 75Ω BNC DVB-ASI  
 213Mbit/s maximum ASI TS bit-rate per port

**Ethernet**

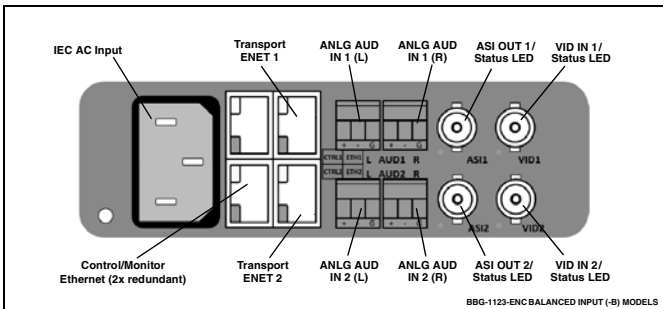
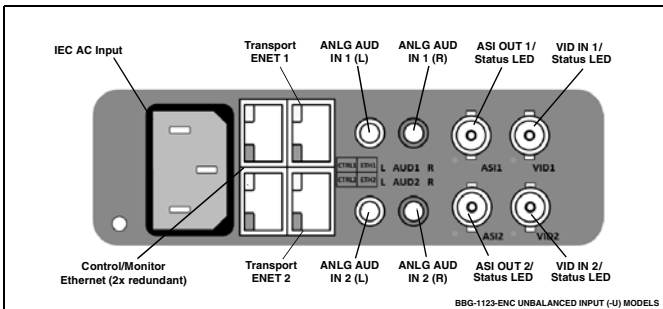
Number of control/monitor connections: 2, redundant 10/100Base-T RJ-45  
 Number of transport outputs: 2, 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 IPv4, IPv6, UDP, RTP  
 SMPTE 2022 ProMPEG FEC CoP3, 'Forward Error Correction' (Row and Column)

**Regulatory Compliance**

CE: CE marked in accordance with 89/336/EEC, 72/23/EEC and 1999/5/EEC Directive  
 UL: UL approval  
 US FCC: Part 15  
 EMC: EN55022, EN55024, EN6100-3-2  
 Safety: IEC60950  
 RoHS: 2011/65/EU  
 WEEE: 2012/19/EU

**Physical**

Dimensions (WxDxH): 5.8 x 14 x 1.7 in (14.6 x 35.6 x 4.4 cm) (including component projection)  
 Operating Temperature/Humidity: 32°F to 122°F (0°C to 50°C); 5% to 95% non-condensing



**H.264 ENCODERS (OPENGEAR CARDS AND STANDALONE MODELS)**

**BBG-1123-ENC » SINGLE-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT**

**ORDERING INFORMATION**

**Note:** All models are available with unbalanced (RCA) analog audio inputs or balanced 3-wire (Phoenix connector) analog audio inputs. Use -U suffix on part number for unbalanced-input unit (example: "BBG-1123-ENC-U"). Use -B suffix on part number for balanced-input unit (example: "BBG-1123-ENC-B").

**BBG-1123-ENC** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD

**BBG-1123-ENC-HD-I** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080i

**BBG-1123-ENC-HD-P** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080p

**BBG-1123-ENC-A8** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD. Support for 4 audio pairs (8-ch).

**BBG-1123-ENC-A8-HD-I** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080i. Support for 4 audio pairs (8-ch).

**BBG-1123-ENC-A8-HD-P** Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080p. Support for 4 audio pairs (8-ch).

**Options and Accessories:**

**Note:** - Although the -A8 versions support eight channels, encoding is not designed for phase coherency between PCM pairs (i.e., using six available channels to carry 5.1 PCM surround-sound).

- Add Encoder Second Channel options cannot be used with -A8 (8-channel audio) models.
- BBG-1123-ENC-A8 models come standard with maximum audio channel capacity. +2A option cannot be added to these models.
- Unless indicated as program channel or audio channel pair license, licenses below are **device-based** licenses and require **only one license per unit**.
- RTMP and HLS modes can only use stereo encoding.
- Options denoted as "+" are software-based options which can be fitted on new product at ordering or field-installed as a software upload upgrade. Options denoted as "-" are hardware-based options which are factory-installed upon ordering, or factory-installed by returning fielded product to Cobalt for option installation.

**-SD-HD-I-SA** Upgrade License; Upgrade (1) SD Channel to HD up to 1080i

**-SD-HD-P-SA** Upgrade License; Upgrade (1) SD Channel to HD up to 1080p

**-HD-I-HD-P-SA** Upgrade License; Upgrade (1) HD 1080i Channel to HD 1080p

**+UP-AAC** AAC Audio License; Add (1) AAC-LC Stereo Channel

**-SD-SA** Add Encoder Second Channel H.264 SD

**-HD-I-SA** Add Encoder Second Channel H.264 SD/HD (up to 1080i)

**-HD-P-SA** Add Encoder Second Channel H.264 SD/HD (up to 1080p)

**-PIP** Encoder 2nd channel H.264 low resolution PIP option

**+RIST/ARQ-ENC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

**+2A-SA** Additional Audio Pair License

**+SMPTE2022** SMPTE 2022 FEC License

**BBG-1100-TRAY** 1RU Rack-Mount Tray (supports up to 3 BBG-1100 units)

**– Audio Capacity (Base and with Audio Add Option Licenses +2A or +UP-AAC) –**

**Base** - (1) standard MP1L2 encoding license on 1 PID

**Add PIDs:**

- Can have 2 audio PIDs total (1 additional +2A license or 1 additional +UP-AAC license).
- Can expand up to 4 audio PIDs with +PIP license (3 additional +2A and/or 2 additional +UP-AAC licenses)

**Note:** BBG-1123-ENC-A8 models come standard with 4 x MP1L2 stereo encoders for full eight channels of audio support in a single ordering option.

H.264 ENCODERS (OPENGEAR CARDS AND STANDALONE MODELS)

**BBG-1123-ENC2 » DUAL-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT**



The **BBG-1123-ENC2** provides a compact form-factor standalone unit for distribution of MPEG-4 encoding. Utilizing the openGear® open-architecture control/monitoring platform, the BBG-1123-ENC2 can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface. (When connected to your network, the BBG-1123-ENC2 appears in DashBoard just like any other device.) The BBG-1123-ENC2 includes dual redundant 10/100/1000 Mb/s Ethernet ports for control. Low-profile packaging fits 1 RU installations.

The BBG-1123-ENC2 offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. In addition to two ASI outputs, the BBG-1123-ENC2 provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices.

When using the Ethernet output, the BBG-1123-ENC2 supports the traditional UDP/RTP/SPMTE 2022 FEC protocols, as well as the HTTP Live Streaming protocol for transmitting live video over the Internet. Using HTTP Live Streaming, the BBG-1123-ENC2 can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported), tablets, and a variety of consumer set-top boxes (such as the Amino A140 and the Roku Player).

RTMP support allows direct publishing of real-time, live content to Adobe® Media Servers or any other servers, web sites and CDNs with RTMP ingress, such as Justin.tv, UStream, LiveStream and Akamai. Publish professional-quality real-time SD/HD content to Internet viewers (including some critical features not available in PC-based software encoders) such as ancillary data support (closed-captioning, AFD) and SD-SDI/HD-SDI video inputs with embedded audio support – all in broadcast-grade video quality. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Full user remote monitor/control allows full device status and control access across a standard Ethernet network.

BBG-1123-ENC encoders are also available in single encoding channel configuration. For BBG-1123-ENC single-channel encoder models information, please see **BBG-1123-ENC Single-Channel 3G/HD/SD MPEG-4 Encoder Units** web page.

**FEATURES**

Compact self-contained form with built-in AC power supply. Up to 3 units can be installed in a 1RU tray.

Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling

DVB-ASI and Ethernet outputs

Full support of CEA-608 and CEA-708 closed captioning and PMT information. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

Optional RTP/ARQ support

License-based options allow tailoring functionality as needed, with upgrades available if later desired

Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

Optional support for additional audio pairs per encoded output

Built-in Packet Test Generators allow pre-validation of transport

HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

SCTE 104 to SCTE 35 conversion

Multi-angle support allows creation of transport streams with two synchronized video PIDs

Multiple pre-defined control templates provide automatic setup of popular contribution-to-distribution schemes

Ethernet remote control/monitoring via free DashBoard™ software. Advanced front panel display/user interface allows initial and basic configuration setup without needing connection to external network or remote control.

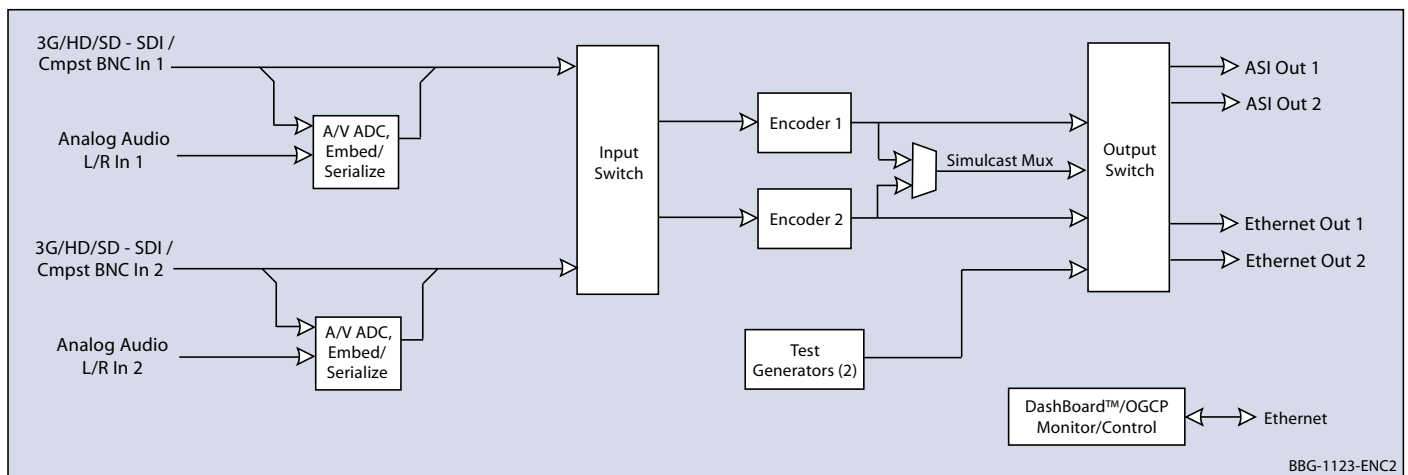
RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers

Dual-redundant internal power supplies

Five year warranty

**OPTIONS**

Please see Ordering Information



**BBG-1123-ENC2 » DUAL-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT**

**SPECIFICATIONS**

**Power**

100-250 VAC, 47-63 Hz, 12W

**3G/HD/SD-SDI Inputs**

Number of inputs: 2, each configurable as:  
 3G-SDI (SMPTE 424M)  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M) with EDH  
 Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI, AC-3 (optional)  
 (2) L/R pairs (max) of analog audio embeds

**Video Encoding**

Dual-channel HD Video:  
 MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
 MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
 CBR, VBR  
 2Mbps to 30Mbps (configurable)  
 Dual-channel SD Video:  
 MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
 CBR, VBR  
 1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-1 layer II, up to 2 stereo pairs base (Dolby® pass-thru)  
 MPEG-4 AAC-LC up to 2 pairs  
 Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
 1080 x 1920/1440i 30/29.97/25  
 1280 x 720/960/640p 59.94/50/30/29.97/25  
 SD: 576 x 720/528i 29.97fps  
 576 x 720/528i 25fps

**Video Pre-Processing**

Advanced adaptive spatial filtering  
 Closed Captions CEA 608B and CEA-708C  
 WSS/AFD

**ASI Outputs**

Number of outputs: 2, 75Ω BNC DVB-ASI  
 213Mbit/s maximum ASI TS bit-rate per port

**Ethernet**

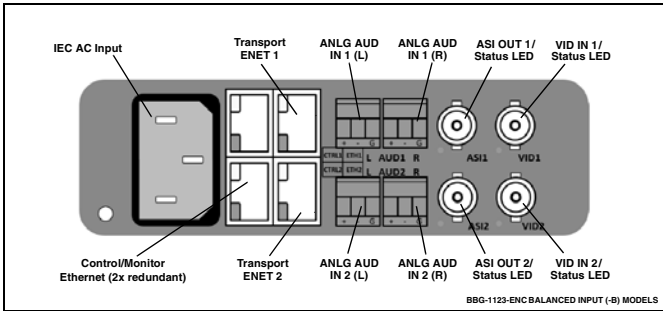
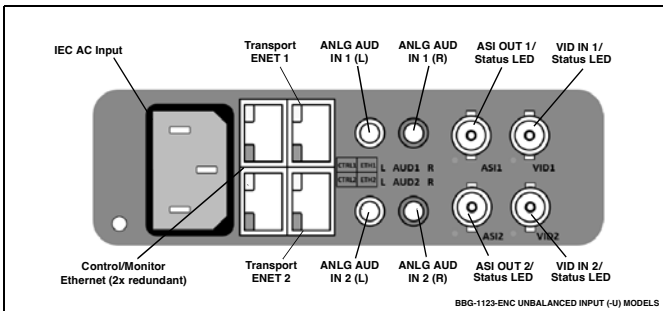
Number of control/monitor connections: 2, redundant 10/100Base-T RJ-45  
 Number of transport outputs: 2, 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 IPv4, IPv6, UDP, RTP  
 SMPTE 2022 ProMPEG FEC CoP3, 'Forward Error Correction' (Row and Column)

**Regulatory Compliance**

CE: CE marked in accordance with 89/336/EEC, 72/23/EEC and 1999/5/EEC Directive  
 UL: UL approval  
 US FCC: Part 15  
 EMC: EN55022, EN55024, EN6100-3-2  
 Safety: IEC60950  
 RoHS: 2011/65/EU  
 WEEE: 2012/19/EU

**Physical**

Dimensions (WxDxH): 5.8 x 14 x 1.7 in (14.6 x 35.6 x 4.4 cm) (including component projection)  
 Operating Temperature/Humidity: 32°F to 122°F (0°C to 50°C); 5% to 95% non-condensing



**H.264 ENCODERS (OPENGear CARDS AND STANDALONE MODELS)**

**BBG-1123-ENC2 » DUAL-CHANNEL 3G/HD/SD MPEG-4 STANDALONE ENCODER UNIT**

**ORDERING INFORMATION**

**Note:** All models are available with unbalanced (RCA) analog audio inputs or balanced 3-wire analog audio inputs. Use -U suffix on part number for unbalanced-input unit (example: "BBG-1123-ENC2-U"). Use -B suffix on part number for balanced-input unit (example: "BBG-1123-ENC2-B").

**BBG-1123-ENC2** Dual-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD

**BBG-1123-ENC2-HD-I** Dual-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080i

**BBG-1123-ENC2-HD-P** Dual-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080p

**Options and Accessories:**

**Note:** - Unless indicated as program channel or audio channel pair license, licenses below are **device-based** licenses and require **only one license per unit**.

- Options denoted as "+" are software-based options which can be fitted on new product at ordering or field-installed as a software upload upgrade. Options denoted as "-" are hardware-based options which are factory-installed upon ordering, or factory-installed by returning fielded product to Cobalt for option installation.

**-D-SD-HD-I-SA** Upgrade License; Upgrade (1) SD Channel to HD up to 1080i

**-D-SD-HD-P-SA** Upgrade License; Upgrade (1) SD Channel to HD up to 1080p

**-D-HD-I-HD-P-SA** Upgrade License; Upgrade (1) HD 1080i Channel to HD 1080p

**+RIST/ARQ-ENC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

**+UP-AAC-SA** AAC Audio License; Add (1) AAC-LC Stereo Channel

**+2A-SA** Additional Audio Pair License

**+SMPTE2022** SMPTE 2022 FEC License

**BBG-1100-TRAY** 1 RU Rack Mount Tray (supports up to three BBG-1100 units)

— **Audio Capacity (Base and with Audio Add Option Licenses +2A or +UP-AAC)** —

**Base** - (2) standard MP1L2 encoding licenses on 2 PIDs.

**Add PIDs:**

- Can have 4 audio PIDs total (2 additional +2A licenses or 2 additional +UP-AAC licenses).

## 9990-TRX-MPEG » MULTI-STANDARD BROADCAST TRANSCODER



The **9990-TRX-MPEG Multi-Standard Broadcast Transcoder** offers a powerful transcoding solution combining IPTV, professional broadcast, enterprise video delivery, and streaming video environments, making it ideally suited for content repurposing, edge transcoding, and video distribution network bandwidth optimization.

The 9990-TRX-MPEG is a full-featured quad-channel video transcoder using the latest advances in video compression technology to ensure excellent video quality at low bit rates. Simultaneous support of DVB-ASI, broadcast over IP, MPEG-DASH Streaming, and HTTP Live Streaming allows content to be freely distributed over virtually any video network.

The 9990-TRX-MPEG provides transcoding of two video services (channels) using either MPEG-2 or MPEG-4 AVC codecs in SD format and the output of MPEG-1 Layer II services. The single program can be outputted over ASI and IP interfaces individually or simultaneously. License options allow easy scalability via easy to install software uploads without removing or powering-down the card.

The openGear® card form factor and DashBoard™ remote control makes for easy integration into existing terminal equipment environments.



### FEATURES

Dual-channel multi-standard HD/SD transcoding standard – scalable for additional transcoding using software licenses as simple downloads

Supports MPEG-1 Layer II, AAC, and Dolby® AC-3 audio inputs

Full, future-proof “any-to-any” multi-standard codec support – adapts services from both MPEG-2 and MPEG-4 AVC systems

Low-power, high-density design; <14 Watts – up to 10 cards per frame

IP transmission using unicast or multicast

Gigabit Ethernet and DVB-ASI input/outputs

Audio pass-through

VBI and closed-captioning pass-through

Easy integration and control/monitoring via DashBoard remote control

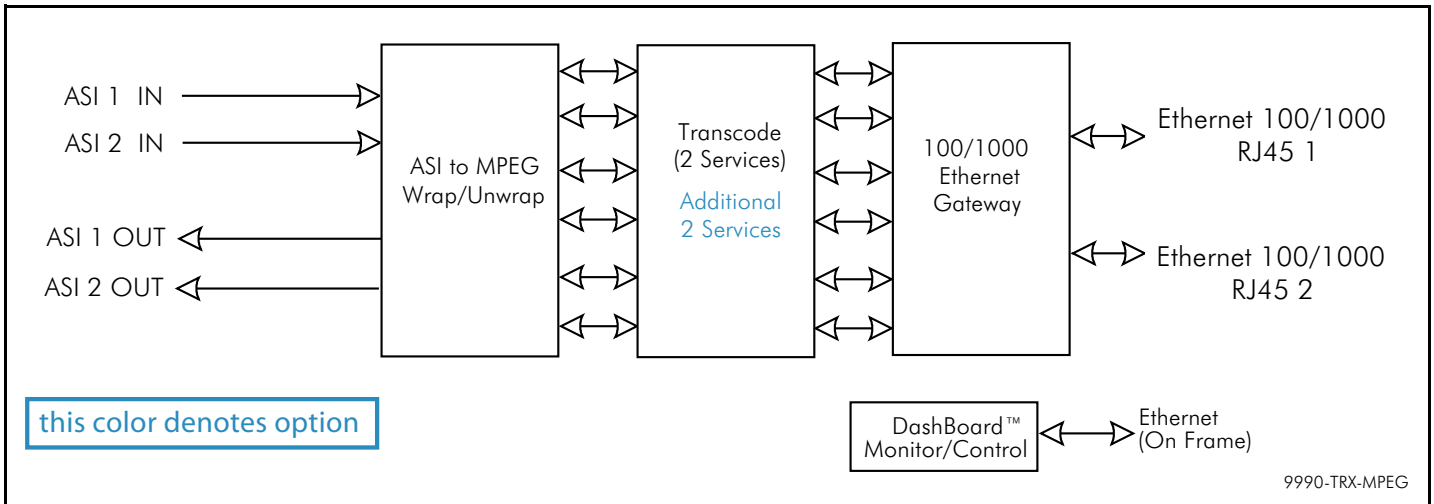
Hot-swappable

Five year warranty

### OPTIONS

+TRX2 – Adds two transcoding licenses

+TRXDDEC – Dolby® decoding license (per video service (channel))





## 9990-TRX-MPEG » MULTI-STANDARD BROADCAST TRANSCODER

### SPECIFICATIONS

#### Power

14 Watts

#### Inputs/Outputs

2x 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 2x DVB-ASI input ports, BNC 75Ω  
 2x DVB-ASI output ports, BNC 75Ω  
 213Mbit/s maximum ASI TS bit-rate per port  
 Ethernet  
 Number of Ports: See Rear Module Options  
 Cable Type: Standard straight-thru CAT-5e  
 Connector Type: RJ-45  
 Network Transport Protocols  
 UDP/IP (Unicast and Multicast)  
 RTP/IP (Unicast and Multicast)  
 RTMP (Flash)  
 HTTP Live Streaming (HLS): populates an external web server through FTP or SFTP  
 Direct HTTP Streaming: encodes directly to an HTTP connection. Automatically generates web pages with a video window for all supported modes (VLC plug-in required)

#### Transcode Modes

Multi-codec capable  
 MPEG-2 to MPEG-4 AVC  
 MPEG-4 AVC to MPEG-2  
 SD/HD MPEG-2 to MPEG-2 and AVC to AVC re-encode  
 - format conversion  
 - rate reduction

#### Video Processing

Integrated downconversion  
 - HD to SD  
 - Sub-SD resolutions  
 Adaptive deinterlacer  
 Frame rate reduction  
 AFD handling  
 Closed captions and VBI passthrough  
 Video Transcoding  
 Input:  
 MPEG-4 AVC HP @ L4.0, HP @ L4.2 (HD)  
 MPEG-4 AVC MP @ L3.0 (SD)  
 MPEG-2 HP @ HL (HD)  
 MPEG-2 MP @ ML (SD)  
 Output:  
 MPEG-4 AVC HP @ L4.0, HP @ L4.2 (HD)  
 MPEG-4 AVC MP @ L3.0 (SD)  
 MPEG-2 HP @ HL (HD)  
 MPEG-2 MP @ ML (SD)  
 CBR & VBR  
 1.5Mbps to 10 Mbps (profile dependent)

#### Video Formats

Input:  
 1080 x 1920p 60/50  
 1080 x 1920/1440i 25 29.97/30  
 720 x 1280/960 50/59.94  
 960 x 540 25/29.97  
 480 x 720/704/640/528 29.97  
 576 x 720/704/640/528 25  
 640x480, 480x270, 320x240, 320x180

#### Video Formats (cont.)

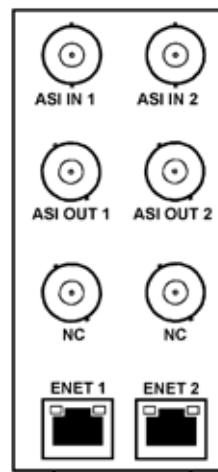
Output:  
 1080 x 1920p 60/50  
 1080 x 1920/1440i 25 29.97/30  
 720 x 1280/960 50/59.94  
 960 x 540 25/29.97  
 480 x 720/704/640/528 29.97  
 576 x 720/704/640/528 25  
 640x480, 480x270, 320x240, 320x180  
 29.97, 25, 15, 12.5, 7.5, 6.25 frames/sec

#### Audio Transcoding

Input:  
 MPEG-1 layer II stereo  
 MPEG-4 AAC-LC stereo and 5.1  
 MPEG-4 HE-AAC 5.1  
 Dolby AC-3 stereo, 5.1, 7.1  
 Output:  
 MPEG-1 layer II  
 MPEG-4 AAC-LC  
 Pass-through  
 Conversion:  
 5.1 -> 5.1, 2.0

#### Management

10/100/1000Base-T Ethernet (RJ-45)  
 Configuration import/export  
 Visual fault indicator  
 SNMP v1,v2  
 Datasafe™ automated card configuration  
 Accurate bit rate control



RM20-9990-TRX-B

## 9990-TRX-MPEG » MULTI-STANDARD BROADCAST TRANSCODER

### ORDERING INFORMATION

**9990-TRX-MPEG** Multi-Standard Broadcast Transcoder

**RM20-9990TRX-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) ASI Input BNCs, (2) ASI Output BNCs, (2) Gigabit Transport Ethernet ports

**RM20-9223-U** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI/SD BNC Composite In, (2) DVB-ASI BNC Out, (4) Unbalanced Analog Audio RCA In, (2) 100/1000Base-T RJ-45 Ethernet

#### Options:

**+TRX2** Add Transcoding License. Adds transcoding for two additional services.

**+TRXDDEC** Dolby® decoding license (per video service (channel))

H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)

**9990-ENC-H264-IP » HD/SD-SDI/CVBS (SINGLE-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUT** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP



The **9990-ENC-H264-IP HD/SD-SDI/CVBS H.264 Encoder with Streaming IP Output** provides a card-based solution for distribution of MPEG-4 encoding. The encoder is **designed specifically for distribution**, with cost savings of offering only streaming IP instead of IP and DVB-ASI which is not needed for distribution. The 9990-ENC-H264-IP is perfectly suited for IP video distribution over the Internet or over a dedicated IP link. Utilizing the openGear® open-architecture platform, the 9990-ENC-H264-IP offers easy-to-use DashBoard™ setup and control operator interface. Up to 10 of the cards can be installed in a 20-slot frame, using less than 150W total, for reduced operating expenses. In addition to HD/SD-SDI inputs, the 9990-ENC-H264-IP provides the flexibility of supporting SD analog composite video and an analog audio stereo pair per input channel.

The 9990-ENC-H264-IP offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. The

9990-ENC-H264-IP provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported.

Using HTTP Live Streaming, the 9990-ENC-H264-IP can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported) and tablets.

Full user remote monitor/control allows full card status and control access across a standard Ethernet network. Status monitoring is also available at card edge.

**FEATURES**

- Card-based design allows scalability, from 1 channel to 20 channels per frame

---

- Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling or convert formats using built-in UDX scaler

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- Low power/high-density design

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- Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

---

- Full support of CEA-608 and CEA-708 closed captioning. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

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- Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

- SCTE 104 to SCTE 35 conversion

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- RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers. Streams to CDNs, Akamai, Ustream, YouTube, Wowza Cloud service and many others

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- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

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- Remote control/monitoring via DashBoard™ software

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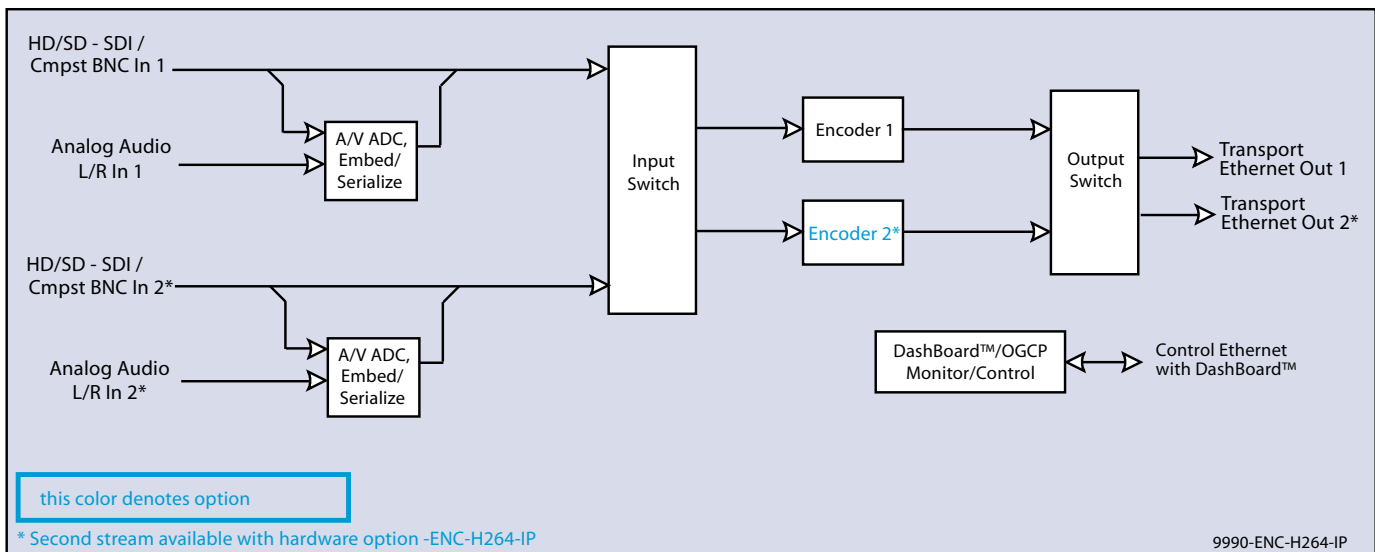
- Hot-swappable

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- Five year warranty

**OPTIONS**

Please see **Ordering Information** for descriptions and details.



**H.264 ENCODERS AND BROADCAST TRANSCODERS** (OPENGear CARDS AND STANDALONE MODELS)

**9990-ENC-H264-IP » HD/SD-SDI/CVBS (SINGLE-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUT** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Electrical**

Power: 6 Watts

**Processing Channels**

(1) channel  
(Second additional channel available with option -ENC-H264-IP)

**HD/SD-SDI Input**

(1) input/channel; each configurable as:  
HD-SDI (SMPTE 292M)  
SD-SDI (SMPTE 259M) with EDH  
Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI (1 pair/channel)  
Unbalanced or balanced stereo audio pair (see Ordering Information)

**Video Encoding**

MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
CBR & VBR  
2Mbps to 12Mbps (configurable)  
SD Video:  
MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
CBR & VBR  
1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-4 AAC-LC  
Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
1080 x 1920/1440i 30/29.97/25  
1280 x 720/960/640p 59.94/50/30/29.97/25  
SD: 576 x 720/528i 29.97fps  
576 x 720/528i 25fps

**Video Pre-Processing**

Closed Captions CEA 608B and CEA-708C  
WSS/AFD

**Management and Control**

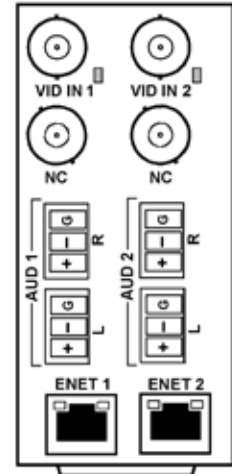
10/100Base-T Ethernet  
Configuration Import/Export  
Audible/visual fault warning  
In-band and out-of-band control  
SNMP v1, v2  
Datasafe automated card configuration  
Accurate bit rate control  
Startup to streaming in seconds

**Ethernet Outputs**

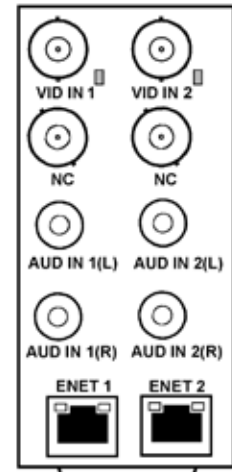
Number of outputs: (2) 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
IPv4, IPv6, UDP

**Regulatory Compliance**

CE: CE marked in accordance with 93/68/EEC (22/07/03) Directive  
UL: UL approval  
US FCC: Part 15  
EMC: EN55022, EN55024, EN6100-3-2



RM20-9990-ENC-B



RM20-9990-ENC-U

**H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)**

**9990-ENC-H264-IP » HD/SD-SDI/CVBS (SINGLE-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUT** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**ORDERING INFORMATION**

**9990-ENC-H264-IP** HD/SD-SDI/CVBS (Single Channel) H.264 Encoder with Streaming IP Output with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**RM20-9990-ENC-B** 20-slot Frame Rear I/O Module (Standard Width), (2) 3G/HD/SD-SDI/SD BNC Composite In, (4) Balanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**RM20-9990-ENC-U** 20-slot Frame Rear I/O Module (Standard Width), (2) 3G/HD/SD-SDI/SD BNC Composite In, (4) RCA Unbalanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**Note:**

- Options denoted as "+" are software-based options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.
- Options or ordering line items denoted as "-" are hardware-based options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**Options (Hardware-Based)**

**-ENC-H264-IP** Add Encoder Second Channel Option (hardware factory-installed option applicable for single-channel card 9990-ENC-H264-IP)

**Options (Software-Based)**

**+IP-TO-BROADCAST-P-OG** Upgrade a 9990-ENC-H264-IP (single-channel model) to the 9223-S-HD-P (single-channel model) plus one +AAC license

**+IP-TO-BROADCAST-I-OG** Upgrade a 9990-ENC-H264-IP (single-channel model) to the 9223-S-HD-I (single-channel model) plus one +AAC license

**+IP-TO-BROADCAST-Dual-P-OG** Upgrade a dual-channel optioned card to the 9223-D-HD-P (dual-channel model) plus two +AAC licenses

**+IP-TO-BROADCAST-Dual-I-OG** Upgrade a dual-channel optioned card to the 9223-D-HD-I (dual-channel model) plus two +AAC licenses

H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)

**9990-ENC2-H264-IP » HD/SD-SDI/CVBS (DUAL-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUTS** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP



The **9990-ENC2-H264-IP HD/SD-SDI/CVBS H.264 Encoder with Streaming IP Outputs** provide a card-based solution for distribution of MPEG-4 encoding. The encoder is **designed specifically for distribution**, with cost savings of offering only streaming IP instead of IP and DVB-ASI which is not needed for distribution. The 9990-ENC2-H264-IP is perfectly suited for IP video distribution over the Internet or over a dedicated IP link. Utilizing the openGear® open-architecture platform, the 9990-ENC2-H264-IP offers easy-to-use DashBoard™ setup and control operator interface. Up to 10 of the cards can be installed in a 20-slot frame, offering distribution delivery of up to 20 individual or simulcast channels in a single frame, using less than 150W total, for reduced operating expenses. In addition to HD/SD-SDI inputs, the 9990-ENC2-H264-IP provides the flexibility of supporting SD analog composite video and an analog audio stereo pair per input channel.

The 9990-ENC2-H264-IP offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. The 9990-ENC2-H264-IP provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Using HTTP Live Streaming, the 9990-ENC2-H264-IP can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported) and tablets.

Full user remote monitor/control allows full card status and control access across a standard Ethernet network. Status monitoring is also available at card edge.

**FEATURES**

- Card-based design allows scalability, from 1 channel to 20 channels per frame

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- Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling or convert formats using built-in UDX scaler

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- Low power/high-density design

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- Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

---

- Full support of CEA-608 and CEA-708 closed captioning. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

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- Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

- SCTE 104 to SCTE 35 conversion

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- RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers. Streams to CDNs, Akamai, Ustream, YouTube, Wowza Cloud service and many others

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- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

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- Remote control/monitoring via DashBoard™ software

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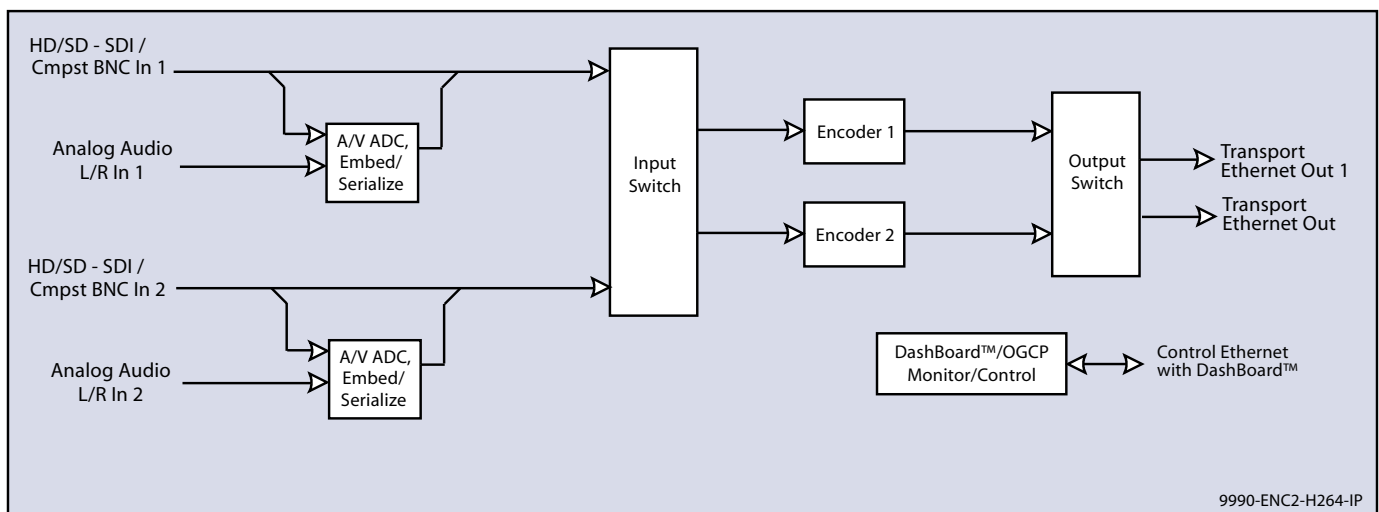
- Hot-swappable

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- Five year warranty

**OPTIONS**

Please see **Ordering Information** for descriptions and details.



9990-ENC2-H264-IP



**H.264 ENCODERS AND BROADCAST TRANSCODERS** (OPENGear CARDS AND STANDALONE MODELS)

**9990-ENC2-H264-IP » HD/SD-SDI/CVBS (DUAL-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUTS** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Electrical**

Power: 6 Watts

**Processing Channels**

(2) channels

**HD/SD-SDI Input**

(1) input/channel; each configurable as:  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M) with EDH  
 Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI (1 pair/channel)  
 Unbalanced or balanced stereo audio pair (see Ordering Information)

**Video Encoding**

MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
 MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
 CBR & VBR  
 2Mbps to 12Mbps (configurable)  
 SD Video:  
 MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
 CBR & VBR  
 1.5Mbps to 10 Mbps (configurable)

**Audio Encoding**

MPEG-4 AAC-LC  
 Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
 1080 x 1920/1440i 30/29.97/25  
 1280 x 720/960/640p 59.94/50/30/29.97/25  
 SD: 576 x 720/528i 29.97fps  
 576 x 720/528i 25fps

**Video Pre-Processing**

Closed Captions CEA 608B and CEA-708C  
 WSS/AFD

**Management and Control**

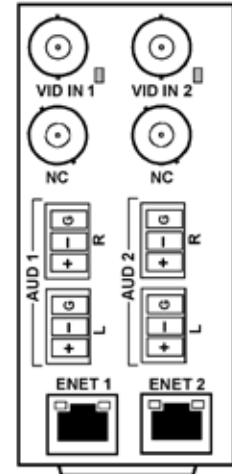
10/100Base-T Ethernet  
 Configuration Import/Export  
 Audible/visual fault warning  
 In-band and out-of-band control  
 SNMP v1, v2  
 Datasafe automated card configuration  
 Accurate bit rate control  
 Startup to streaming in seconds

**Ethernet Outputs**

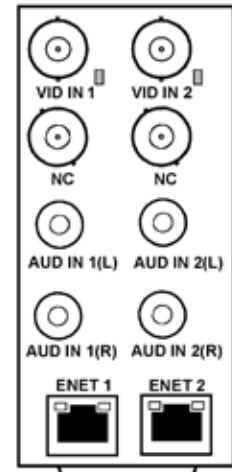
Number of outputs: (2) 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 IPv4, IPv6, UDP

**Regulatory Compliance**

CE: CE marked in accordance with 93/68/EEC (22/07/03) Directive  
 UL: UL approval  
 US FCC: Part 15  
 EMC: EN55022, EN55024, EN6100-3-2



RM20-9990-ENC-B



RM20-9990-ENC-U

**H.264 ENCODERS AND BROADCAST TRANSCODERS** (OPENGear CARDS AND STANDALONE MODELS)

**9990-ENC2-H264-IP » HD/SD-SDI/CVBS (DUAL-CHANNEL) H.264 ENCODER WITH STREAMING IP OUTPUTS** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**ORDERING INFORMATION**

**9990-ENC2-H264-IP** HD/SD-SDI/CVBS (Dual-Channel) H.264 Encoder with Streaming IP Outputs with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**RM20-9990-ENC-B** 20-slot Frame Rear I/O Module (Standard Width), (2) 3G/HD/SD-SDI/SD BNC Composite In, (4) Balanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**RM20-9990-ENC-U** 20-slot Frame Rear I/O Module (Standard Width), (2) 3G/HD/SD-SDI/SD BNC Composite In, (4) RCA Unbalanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet

**Note:**

- Options denoted as "+" are software-based options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.
- Options or ordering line items denoted as "-" are hardware-based options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**Options (Software-Based)**

**+IP-T0-BROADCAST-Dual-P-OG** Upgrade a 9990-ENC2-H264-IP (dual-channel model) to the 9223-D-HD-P (dual-channel model) plus two +AAC licenses

**+IP-T0-BROADCAST-Dual-I-OG** Upgrade a 9990-ENC2-H264-IP (dual-channel model) to the 9223-D-HD-I (dual-channel model) plus two +AAC licenses



H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1190-ENC-H264-IP » HD/SD-SDI/CVBS H.264 STANDALONE ENCODER (SINGLE-CHANNEL) WITH STREAMING IP OUTPUT** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP



The **BBG-1190-ENC-H264-IP** encoder provides a compact form-factor standalone unit for distribution of MPEG-4 encoding. The encoder is **designed specifically for distribution**, with cost savings of offering only streaming IP instead of IP and DVB-ASI which is not needed for distribution. The BBG-1190-ENC-H264-IP is perfectly suited for IP video distribution over the Internet or over a dedicated IP link. Utilizing the openGear® open-architecture platform, the BBG-1190-ENC-H264-IP offers easy-to-use DashBoard™ setup and control operator interface. The advanced front panel display/user interface also allows initial and basic configuration setup without needing a computer or connection to remote control. Low-profile packaging fits 1 RU installations.

The BBG-1190-ENC-H264-IP offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. In addition to HD/SD-SDI inputs, the BBG-1190-ENC-H264-IP provides the flexibility of supporting SD analog composite video and an analog audio stereo pair per input channel. The BBG-1190-ENC-H264-IP provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation.

Input video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Using HTTP Live Streaming, the BBG-1190-ENC-H264-IP can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported) and tablets. Full user remote monitor/control allows full card status and control access across a standard Ethernet network.

**FEATURES**

Compact self-contained form with built-in AC power supply. Up to 3 units can be installed in a 1RU tray.

Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling or convert formats using built-in UDX scaler

Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

Full support of CEA-608 and CEA-708 closed captioning. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

SCTE 104 to SCTE 35 conversion

Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

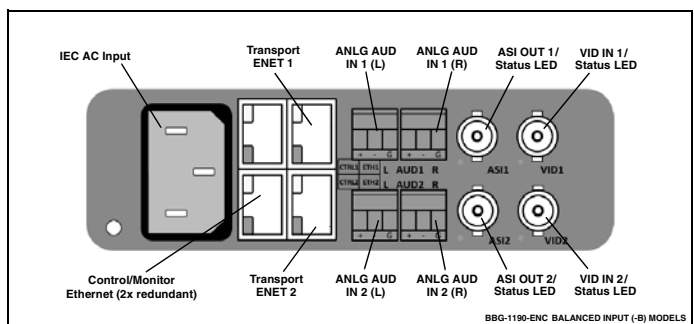
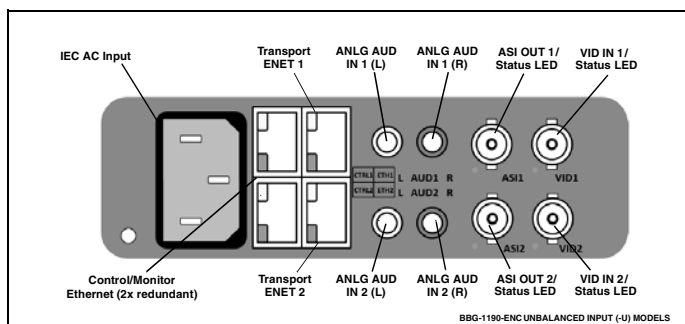
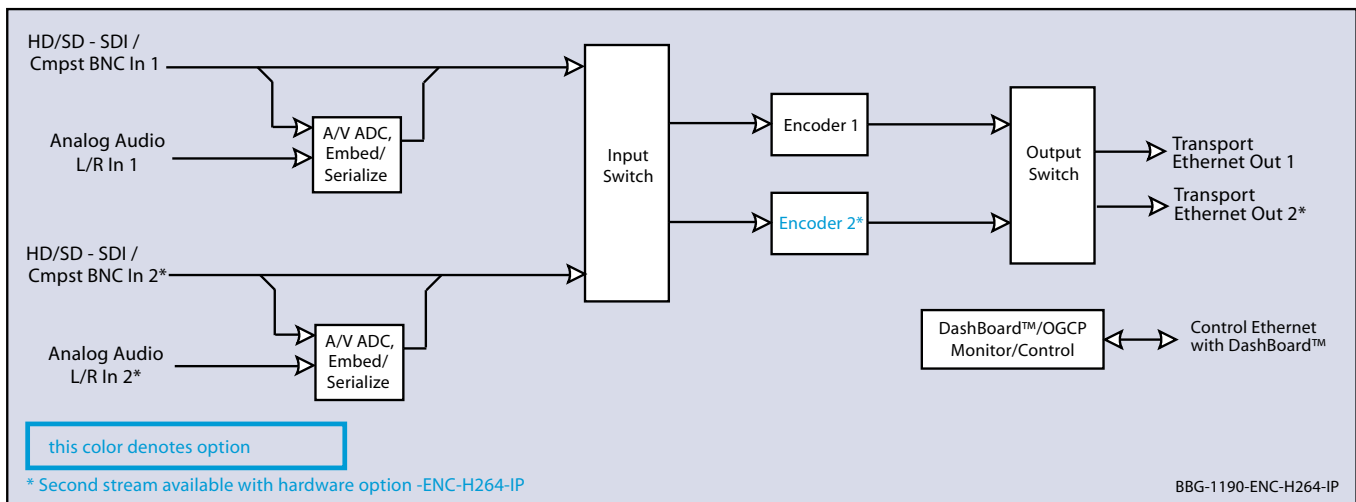
HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers. Streams to CDNs, Akamai, Ustream, YouTube, Wowza Cloud service and many others.

Remote control/monitoring via DashBoard™ software. Initial and basic setup without connection to external network or remote control via front panel UI.

Dual-redundant internal power supplies

Five year warranty



**H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)**

**BBG-1190-ENC-H264-IP » HD/SD-SDI/CVBS H.264 STANDALONE ENCODER (SINGLE-CHANNEL) WITH STREAMING IP OUTPUT** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**SPECIFICATIONS**

**Electrical**

Power: 100-250 VAC, 47-63 Hz, 14W

**Processing Channels**

(1) channel  
(Second additional channel available with option -ENC-H264-IP)

**HD/SD-SDI Input**

(1) input/channel; each configurable as:  
HD-SDI (SMPTE 292M)  
SD-SDI (SMPTE 259M) with EDH  
Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI (1 pair/channel)  
Unbalanced or balanced stereo audio pair (see Ordering Information)

**Audio Encoding**

MPEG-4 AAC-LC  
Lip sync adjustment

**Video Encoding**

MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
CBR & VBR  
2Mbps to 12Mbps (configurable)  
SD Video:  
MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
CBR & VBR  
1.5Mbps to 10 Mbps (configurable)

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
1080 x 1920/1440i 30/29.97/25  
1280 x 720/960/640p 59.94/50/30/29.97/25  
SD: 576 x 720/528i 29.97fps  
576 x 720/528i 25fps

**Video Pre-Processing**

Closed Captions CEA 608B and CEA-708C  
WSS/AFD

**Management and Control**

10/100Base-T Ethernet  
Configuration Import/Export  
Audible/visual fault warning  
In-band and out-of-band control  
SNMP v1, v2  
Datasafe automated card configuration  
Accurate bit rate control  
Startup to streaming in seconds

**Ethernet Outputs**

Number of outputs: (2) 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
IPv4, IPv6, UDP

**Regulatory Compliance**

CE: CE marked in accordance with 89/336/EEC, 72/23/EEC and 1999/5/EEC Directive  
UL: UL approval  
US FCC: Part 15  
EMC: EN55022, EN55024, EN6100-3-2  
Safety: IEC60950  
RoHS: 2011/65/EU  
WEEE: 2012/19/EU

**Physical**

Dimensions (WxDxH): 5.8 x 14 x 1.7 in (14.6 x 35.6 x 4.4 cm) (including component projection)  
Operating Temperature/Humidity: 32°F to 122°F (0°C to 50°C); 5% to 95% non-condensing

**ORDERING INFORMATION**

**BBG-1190-ENC-H264-IP-B** HD/SD-SDI/CVBS H.264 Standalone Encoder (Single-Channel) with Streaming IP Output with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP - Balanced Analog Audio Input

**BBG-1190-ENC-H264-IP-U** HD/SD-SDI/CVBS H.264 Standalone Encoder (Single-Channel) with Streaming IP Output with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP - Unbalanced Analog Audio Input

**Note:**

- Options denoted as "+" are software-based options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.
- Options or ordering line items denoted as "-" are hardware-based options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**Options (Software-Based)**

**+IP-TO-BROADCAST-P-SA** Upgrade a BBG-1190-ENC-H264-IP (single-channel model) to single-channel model BBG-1190-ENC-HD-P plus one +AAC license

**+IP-TO-BROADCAST-I-SA** Upgrade a BBG-1190-ENC-H264-IP (single-channel model) to single-channel model BBG-1190-ENC-HD-I plus one +AAC license

**+IP-TO-BROADCAST-Dual-P-SA** Upgrade a BBG-1190-ENC2-H264-IP (dual-channel model) to dual-channel model BBG-1190-ENC2-HD-P plus two +AAC licenses

**+IP-TO-BROADCAST-Dual-I-SA** Upgrade a BBG-1190-ENC2-H264-IP (dual-channel model) to dual-channel model BBG-1190-ENC2-HD-I plus two +AAC licenses

**Options (Hardware-Based and Accessories):**

**-ENC-H264-IP** Add Encoder Second Channel Option (applicable for single-channel model BBG-1190-ENC-H264-IP)

**BBG-1100-TRAY** 1 RU Rack Mount Tray (supports up to 3 BBG-1100 series units)

H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1190-ENC2-H264-IP » HD/SD-SDI/CVBS H.264 STANDALONE ENCODER (DUAL CHANNEL) WITH STREAMING IP OUTPUTS** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP



The **BBG-1190-ENC2-H264-IP** encoder provides a compact form-factor standalone unit for distribution of MPEG-4 encoding. These encoder is **designed specifically for distribution**, with cost savings of offering only streaming IP instead of IP and DVB-ASI which is not needed for distribution. The BBG-1190-ENC2-H264-IP is perfectly suited for IP video distribution over the Internet or over a dedicated IP link. Utilizing the openGear® open-architecture platform, the BBG-1190-ENC2-H264-IP offers easy-to-use DashBoard™ setup and control operator interface. The advanced front panel display/user interface also allows initial and basic configuration setup without needing a computer or connection to remote control. Low-profile packaging fits 1 RU installations.

The BBG-1190-ENC2-H264-IP offers the latest advances in video compression that delivers excellent video quality at very low bit rates. Unique encoding designs allow delivery of multiple HD and SD video services simultaneously. The BBG-1190-ENC2-H264-IP provides two Ethernet outputs, supporting full-duplex 100 Mb/s and 1 Gb/s operation. Input

video auto-detect mode allows encoding to automatically configure an output that correspond to the input, with resolution and frame rate same as input, and scaling set to same as input or other applicable choices. SMPTE-2038 processing allows inserting generic ancillary data packets in the transport stream, with frame accuracy. Up to four DID/SDID pairs can be supported. Using HTTP Live Streaming, the BBG-1190-ENC2-H264-IP can transmit broadcast-quality video to mobile phones (Apple and Android 4.0 supported) and tablets. Full user remote monitor/control allows full card status and control access across a standard Ethernet network.

**FEATURES**

Compact self-contained form with built-in AC power supply. Up to 3 units can be installed in a 1RU tray.

Input video auto-detect mode automatically configures output to correspond to input frame rate and scaling or convert formats using built-in UDX scaler

Built-in video/audio ADC and embedder allows direct use with SD composite video and audio analog sources

Full support of CEA-608 and CEA-708 closed captioning. Closed-captioning filtering allows filtering to allow and use only SMPTE-334M and/or CEA-708 closed captioning.

SCTE 104 to SCTE 35 conversion

Support for inserting generic ancillary data packets in the transport stream using SMPTE-2038, with frame accuracy. Up to four DID/SDID pairs can be supported.

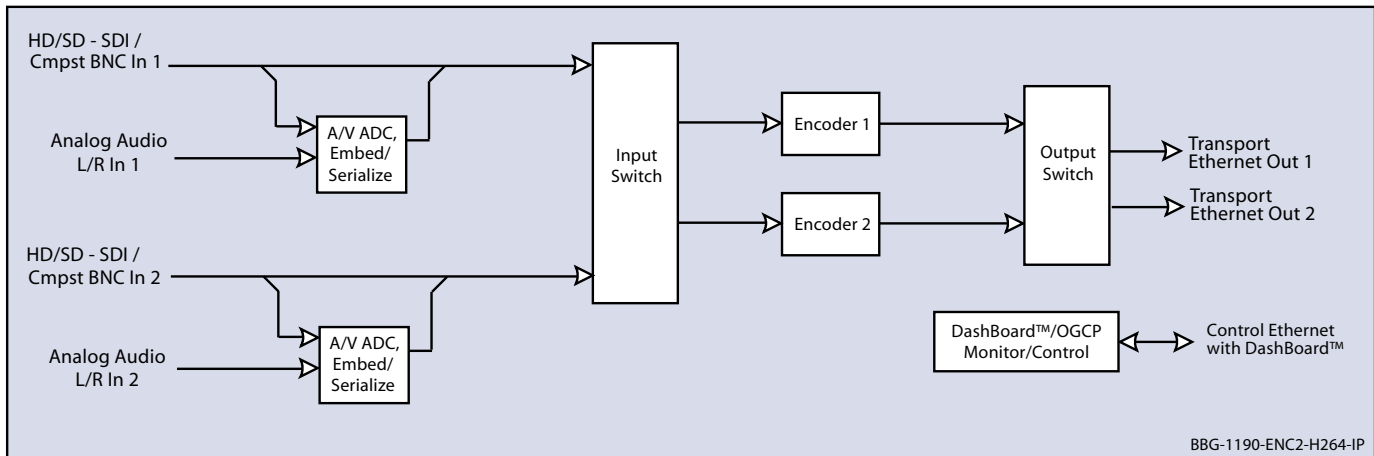
HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices

RTMP support for publishing to Adobe® Media Server, availing SDI content to Internet viewers. Streams to CDNs, Akamai, Ustream, YouTube, Wowza Cloud service and many others.

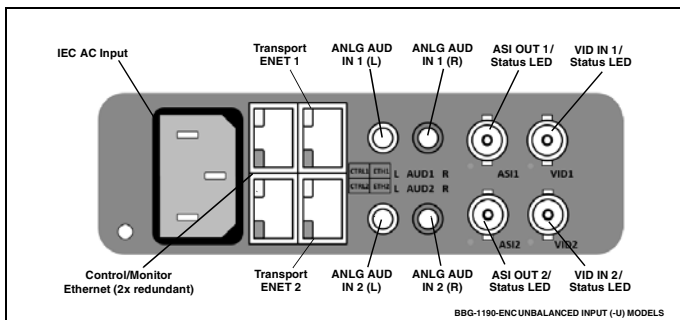
Remote control/monitoring via DashBoard™ software. Initial and basic setup without connection to external network or remote control via front panel UI.

Dual-redundant internal power supplies

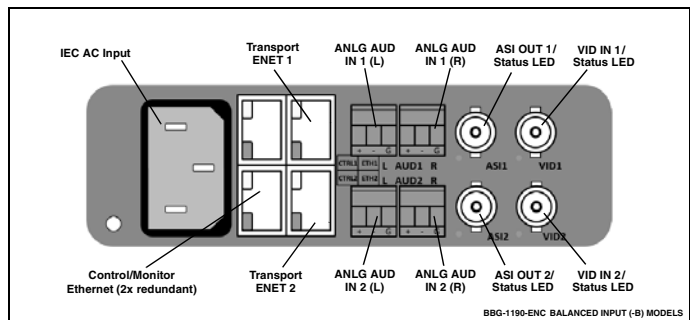
Five year warranty



BBG-1190-ENC2-H264-IP



BBG-1190-ENC UNBALANCED INPUT (-U) MODELS



BBG-1190-ENC BALANCED INPUT (-B) MODELS



H.264 ENCODERS AND BROADCAST TRANSCODERS (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1190-ENC2-H264-IP » HD/SD-SDI/CVBS H.264 STANDALONE ENCODER (DUAL CHANNEL) WITH STREAMING IP OUTPUTS** with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP

**SPECIFICATIONS**

**Electrical**

Power: 100-250 VAC, 47-63 Hz, 14 W

**Processing Channels**

(2) channels

**HD/SD-SDI Input**

(1) input/channel; each configurable as:  
 HD-SDI (SMPTE 292M)  
 SD-SDI (SMPTE 259M) with EDH  
 Composite analog video (PAL/NTSC)

**Audio Inputs Supported**

Embedded SDI (1 pair/channel)  
 Unbalanced or balanced stereo audio pair (see Ordering Information)

**Audio Encoding**

MPEG-4 AAC-LC  
 Lip sync adjustment

**Video Resolution Supported**

HD: 1920 x 1080p 60/50/30/29.97/25  
 1080 x 1920/1440i 30/29.97/25  
 1280 x 720/960/640p 59.94/50/30/29.97/25  
 SD: 576 x 720/528i 29.97fps  
 576 x 720/528i 25fps

**Video Encoding**

MPEG-4 AVC High profile at level 4.2 (HP@L4.2)  
 MPEG-4 AVC High profile at level 4.0 (HP@L4.0)  
 CBR & VBR  
 2Mbps to 12Mbps (configurable)  
 SD Video:  
 MPEG-4 AVC Main profile at level 3.0 (MP@L3.0)  
 CBR & VBR  
 1.5Mbps to 10 Mbps (configurable)

**Video Pre-Processing**

Closed Captions CEA 608B and CEA-708C  
 WSS/AFD

**Management and Control**

10/100Base-T Ethernet  
 Configuration Import/Export  
 Audible/visual fault warning  
 In-band and out-of-band control  
 SNMP v1, v2  
 Datasafe automated card configuration  
 Accurate bit rate control  
 Startup to streaming in seconds

**Ethernet Outputs**

Number of outputs: (2) 100/1000Base-T RJ-45 ports, auto-negotiate or fixed speed  
 IPv4, IPv6, UDP

**Regulatory Compliance**

CE: CE marked in accordance with 89/336/EEC, 72/23/EEC and 1999/5/EEC Directive  
 UL: UL approval  
 US FCC: Part 15  
 EMC: EN55022, EN55024, EN6100-3-2  
 Safety: IEC60950  
 RoHS: 2011/65/EU  
 WEEE: 2012/19/EU

**Physical**

Dimensions (WxDxH): 5.8 x 14 x 1.7 in (14.6 x 35.6 x 4.4 cm) (including component projection)  
 Operating Temperature/Humidity: 32°F to 122°F (0°C to 50°C); 5% to 95% non-condensing

**ORDERING INFORMATION**

**BBG-1190-ENC2-H264-IP-B** HD/SD-SDI/CVBS H.264 Standalone Encoder (Dual-Channel) with Streaming IP Output with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP – Balanced Analog Audio Input

**BBG-1190-ENC2-H264-IP-U** HD/SD-SDI/CVBS H.264 Standalone Encoder (Dual-Channel) with Streaming IP Outputs with Advanced Protocol Support including UDP Single/Multicast, HLS, and RTMP – Unbalanced Analog Audio Input

**Note:**  
 • Options denoted as "+" are software-based options which are available on new product when ordered or can be customer field-installed as a software upload upgrade.  
 • Options or ordering line items denoted as "-" are hardware-based options/items. These options are available as factory-installed only on new product, or product returned to Cobalt for factory installation.

**Options (Software-Based)**

**+IP-TO-BROADCAST-Dual-P-SA** Upgrade a BBG-1190-ENC2-H264-IP (dual-channel model) to dual-channel model BBG-1190-ENC2-HD-P plus two +AAC licenses

**+IP-TO-BROADCAST-Dual-I-SA** Upgrade a BBG-1190-ENC2-H264-IP (dual-channel model) to dual-channel model BBG-1190-ENC2-HD-I plus two +AAC licenses

**Options (Accessories):**

**BBG-1100-TRAY** 1 RU Rack Mount Tray (supports up to 3 BBG-1100 series units)

**MPEG DECODERS (OPENGear CARDS AND STANDALONE MODELS)**

**9990-DEC-MPEG » MPEG4 AVC and MPEG2 DECODER with ASI and IP Inputs and SDI Outputs**



The Cobalt® **9990-DEC-MPEG MPEG4 AVC and MPEG2 Decoder** with ASI and IP Inputs and SDI Outputs provides a high performance real-time MPEG-2 and MPEG-4 SD and HD video decoding openGear® solution. Its design is practically future-proof and decodes traditional video formats such as UDP and RTP (MPEG Transport Stream) as well as Internet and Mobile formats such as RTMP (Adobe® Flash) and HLS (Apple® HTTP Live Streaming).

The 9990-DEC-MPEG supports newer cameras that output RTMP and security cameras that output RTSP. Its high-density, low power design saves on operating expenses, with up to 10 cards installed in a 20-slot openGear® frame.

IP and DVB-ASI input streams are supported, with outputs as ASI, DVB-ASI, SDI, and CVBS (for SD streams) using MPEG4 AVC or MPEG2 decoding. The 9990-DEC-MPEG can decode from several audio codecs and provides Dolby® pass-thru. SMPTE-2038 processing allows de-embedding SMPTE-2038 generic ancillary data packets.

Full user Dashboard™ remote control allows full status and control access locally or across a standard Ethernet network. A complete SNMP MIB is also included.

**FEATURES**

Comprehensive MPEG decoding solution – MPEG4 AVC and MPEG2 to ASI, SDI, and CVBS with built-in audio codecs. Up to two DA SDI BNC outputs. Convenience IP output also.

IP reception of unicast or multicast

DVB-ASI Turnaround to IP and ASI with SPTS Splitting

MPEG-1 Layer II, AAC -LC, AAC-HE, E-AC-3 and AC-3 audio codecs standard (Dolby pass-thru; Dolby decode option available)

Supports RTMP and RTSP sources

SMPTE-2038 processing allows de-embedding of SMPTE-2038 generic ancillary data packets

Support for RTP/ARQ interoperability with **+RTP/ARQ** Cobalt Encoder option. (Decoder **+ARQ** license included standard.)

Support for selecting desired video PID in multi-angle streams

Several options available for scalable configuring  
SNMP MIB included

Low-power/high-density design

Remote control/monitoring via Dashboard™ software

Hot-swappable

Five year warranty

**OPTIONS**

Dolby® Decode License (**+DEC-DDEC**) – Allows Dolby audio to be decoded as SDI embedded PCM audio or analog audio output

SMPTE 2022 Forward Error Correction License (**+FEC-DEC**)

Automatic Repeat Request, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard. (**+RIST/ARQ-DEC**)

Genlock License (**+GENLOCK**)

RTMP Server License Option (**+DEC-RTMP-SVR**)

SRT Support Option (per unit) (**+SRT-DEC**)

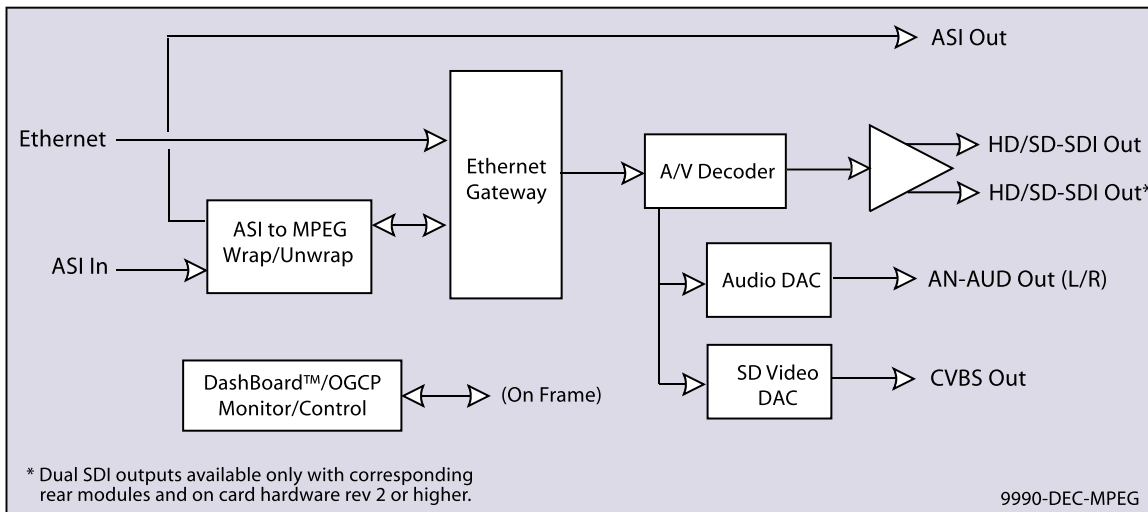
IP IN License (**+IP-IN**) – Enables IP Port and IP Protocols for IP-to-SDI conversion

Monitoring License (**+TSMON**) – Adds continuous monitoring of current transport stream being decoded. Provides a list of all PIDs available in the transport stream, their current individual bit rates, and keeps numerical track of any continuity counter errors. Can also be configured to watch up to 8 PIDs and issue an alarm if PID disappears for a configurable amount of time. (If SNMP is available, this alarm is also provided as a trap.)

RTMP Server License Option (**+DEC-RTMP-SVR**)

RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.) (**+RIST/ENCRP-DEC**)

IP Out License (**+IP-OUT**) – ASI-to-IP conversion option (If host card has **+FEC-DEC** license, card will also be able to generate FEC on the output stream)



9990-DEC-MPEG



**9990-DEC-MPEG » MPEG4 AVC and MPEG2 DECODER** with ASI and IP Inputs and SDI Outputs

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 8 Watts

**Inputs**

- (1) DVB-ASI 75Ω BNC
- (1) IP; 1000Base-T RJ-45
- Gen lock (from frame ref 1/2)

**Outputs**

- Up to (2) HD/SD-SDI 75Ω BNC (4:2:2 10-bit; dual SDI outputs available only on Rev 2 or higher hardware)
- (1) CVBS 75Ω BNC
- (1) DVB-ASI 75Ω BNC
- (1) HDMI
- (2) Analog Audio Out L/R (balanced 3-pin terminals or unbal RCA depending on rear module used)

**Network Transport Protocols**

- UPD (Unicast or Multicast)
- RTP (Unicast or Multicast)
- RTMP (Adobe Flash)
- RTSP (Security Camera)
- SMPTE 2022 Pro-MPEG-FEC
- ARQ
- HTTP Live Streaming (HLS) client

**Video Resolution**

- 3G:  
1920 x 1080p - 50/59.94/60
- HD:  
1920 x 1080i - 50/59.94/60
- 720 x 1280p - 50/59.94
- SD:  
480 x 720 - 29.97
- 576 x 720 - 25

**Video Codec Supported**

- MPEG-2
- H.264 4:2:0 High Profile

**Audio Codec Supported/Processing**

- MPEG-1 Layer 2 (mp2)
- AAC-LC
- HE-AAC
- AC-3, E-AC-3 (Dolby® pass-thru)

**ORDERING INFORMATION**

**9990-DEC-MPEG** MPEG4 AVC and MPEG2 Decoder with ASI and IP Inputs and SDI Outputs

**RM20-9990DEC-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) RJ-45 Ethernet connector, (1) ASI Input BNC, (1) ASI Output BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) HDMI Output, (2) Balanced Analog Audio Outputs

**RM20-9990DEC-C** 20-Slot Frame Rear I/O Module (Standard Width) (1) RJ-45 Ethernet connector, (1) ASI Input BNC, (1) ASI Output BNC, (1) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (1) HDMI Output, (2) Unbalanced Analog Audio Outputs (RCA)

**RM20-9990DEC-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) RJ-45 Ethernet connector, (1) ASI Input BNC, (1) ASI Output BNC, (2) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (2) Balanced Analog Audio Outputs (RM20-9990DEC-D compatible only with rev 2 or higher card hardware)

**RM20-9990DEC-E** 20-Slot Frame Rear I/O Module (Standard Width) (1) RJ-45 Ethernet connector, (1) ASI Input BNC, (1) ASI Output BNC, (2) 3G/HD/SD-SDI Output BNC, (1) CVBS Output BNC, (2) Unbalanced Analog Audio Outputs (RCA) (RM20-9990DEC-E compatible only with rev 2 or higher card hardware)

**+DEC-DDEC** Dolby® Decode License Option

**+FEC-DEC** SMPTE 2022 Forward Error Correction License Option

**+GENLOCK** Genlock License Option

**+DEC-RTMP-SVR** RTMP Server License Option

**+IP-IN** IP iN License Option

**+IP-OUT** ASI-to-IP Conversion License Option

**+TSMON** Monitoring License Option

**+SRT-DEC** SRT Support Option

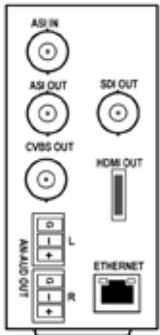
**+ DEC-RTMP-SVR** RTMP Server License Option

**+RIST/ARQ-DEC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

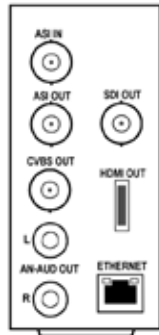
**+RIST/ENCRP-DEC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

**MPEG DECODERS** (OPENGEAR CARDS AND STANDALONE MODELS)

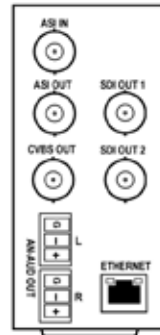
**9990-DEC-MPEG » MPEG4 AVC and MPEG2 DECODER** with ASI and IP Inputs and SDI Outputs



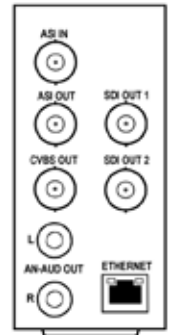
**RM20-9990DEC-B**



**RM20-9990DEC-C**



**RM20-9990DEC-D**



**RM20-9990DEC-E**

**MPEG DECODERS (OPENGEAR CARDS AND STANDALONE MODELS)**

**BBG-1190-DEC-MPEG » STANDALONE MPEG4 AVC AND MPEG2 DECODER**

with ASI and IP Inputs and SDI Outputs



The Cobalt® **BBG-1190-DEC-MPEG Standalone MPEG4 AVC and MPEG2 Decoder** with ASI and IP Inputs and SDI Outputs provides a high performance real-time MPEG-2 and MPEG-4 SD and HD video decoding solution. Its design is practically future proof and decodes traditional video formats such as UDP and RTP (MPEG Transport Stream) as well as Internet and Mobile formats such as RTMP (Adobe® Flash) and HLS (Apple® HTTP Live Streaming).

The BBG-1190-DEC-MPEG supports newer cameras that output RTSP. Its low power design saves on operating expenses. IP and DVB-ASI input streams are supported, with outputs as ASI, DVB-ASI, SDI, HDMI, and CVBS (for SD streams) using MPEG4 AVC or MPEG2 decoding. The BBG-1190-DEC-MPEG can decode from several audio codecs and provides Dolby® pass-thru. SMPTE-2038 processing allows de-embedding SMPTE-2038 generic ancillary data packets. Low-profile packaging fits 1 RU installations. Full user Dashboard™ remote control allows full status and control access locally or across a standard Ethernet network. A complete SNMP MIB is also included.

**FEATURES**

Comprehensive MPEG decoding solution – MPEG4 AVC and MPEG2 to ASI, SDI, HDMI and CVBS with built-in audio codecs. Convenience IP output also.

IP reception of unicast or multicast

DVB-ASI Turnaround to IP and ASI with SPTS Splitting

Supports RTMP and RTSP sources

MPEG-1 Layer II, AAC-LC, AAC-HE, E-AC-3 and AC-3 audio codecs standard (Dolby pass-thru; Dolby decode option available)

SMPTE-2038 processing allows de-embedding of SMPTE-2038 generic ancillary data packets

SCTE-35 to SCTE-104 conversion

Support for RTP/ARQ interoperability with **+RTP/ARQ** Cobalt Encoder option. (Decoder **+ARQ** license included standard.)

Support for selecting desired video PID in multi-angle streams.

SNMP MIB included

Low-power/high-density design – less than 14 Watts

Dual-redundant internal power supplies

Remote control/monitoring via Dashboard™ software. Advanced front panel display/user interface allows initial and basic configuration setup without needing connection to external network or remote control.

Five year warranty

**OPTIONS**

Dolby® Decode License (**+DEC-DDEC**) – Allows Dolby audio to be decoded as SDI embedded PCM audio or analog audio output

SMPTE 2022 Forward Error Correction License (**+FEC-DEC**)

IP In License (**+IP-IN**) – Enables IP Port and IP Protocols for IP-to-SDI conversion

Automatic Repeat Request, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard (**+RIST/ARQ-DEC**)

Genlock License (**+GENLOCK**)

RTMP Server License Option (**+DEC-RTMP-SVR**)

IP License (**+IP**)

Monitoring License (**+TSMON**) – Adds continuous monitoring of current transport stream being decoded. Provides a list of all PIDs available in the transport stream, their current individual bit rates, and keeps numerical track of any continuity counter errors. Can also be configured to watch up to 8 PIDs and issue an alarm if PID disappears for a configurable amount of time. (If SNMP is available, this alarm is also provided as a trap.)

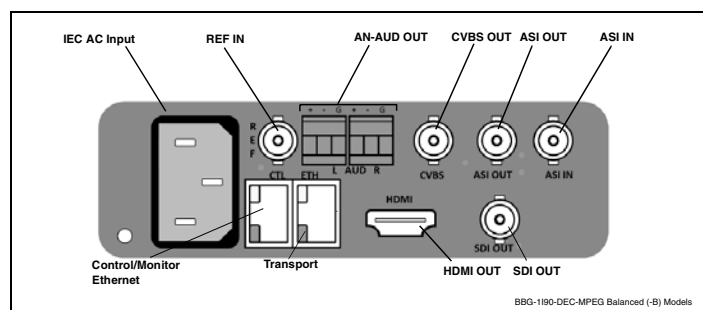
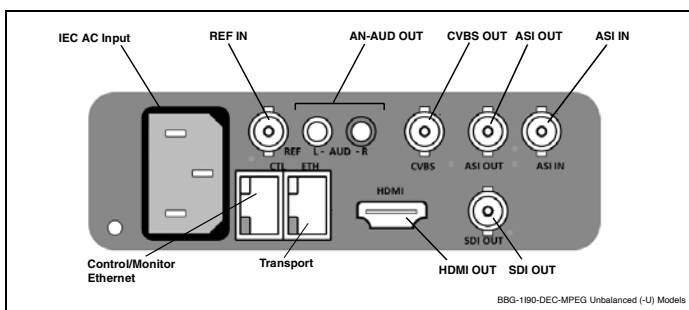
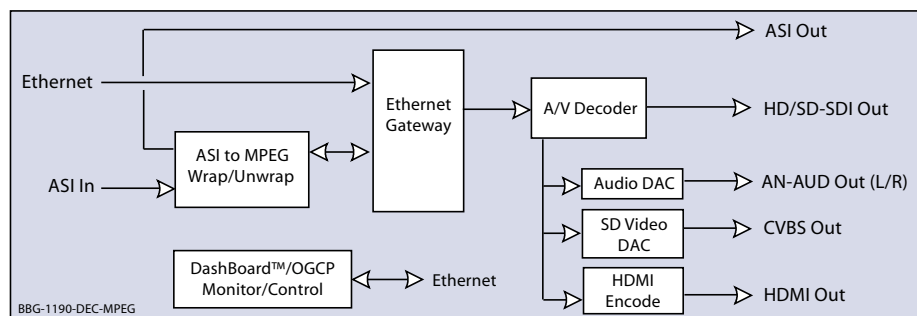
RTMP Server License (**+DEC-RTMP-SVR**)

SRT Support (per unit) License (**+SRT-DEC**)

RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.) (**+RIST/ENCRP-DEC**)

ASI-to-IP conversion option (**+IP-OUT**)

Mounting Tray (holds up to three BBG-1100 series units) (**BBG-1100-TRAY**)





## BBG-1190-DEC-MPEG » STANDALONE MPEG4 AVC AND MPEG2 DECODER

with ASI and IP Inputs and SDI Outputs

### SPECIFICATIONS

<p><b>Power</b> 100-250 VAC, 47-63 Hz, 8 Watts max.</p> <hr/> <p><b>Inputs</b> (1) DVB-ASI 75Ω BNC (1) IP; 1000Base-T RJ-45</p> <hr/> <p><b>Outputs</b> (1) HD/SD-SDI 75Ω BNC (4:2:2 10-bit) (1) CVBS 75Ω BNC (1) DVB-ASI 75Ω BNC (1) HDMI (2) Analog Audio Out L/R (balanced 3-pin terminals or unbal RCA depending on model)</p> <hr/> <p><b>Network Transport Protocols</b> UDP (Unicast or Multicast) RTP (Unicast or Multicast) RTMP Client or Server (Adobe Flash) RTSP (Security Camera) SMPTE 2022 Pro-MPEG-FEC ARQ HTTP Live Streaming (HLS) client</p> <hr/> <p><b>Video Resolution</b> 3G: 1920 x 1080p - 50/59.94/60 HD: 1920 x 1080i - 50/59.94/60 720 x 1280p - 50/59.94 SD: 480 x 720 - 29.97 576 x 720 - 25</p>	<p><b>Video Codec Supported</b> MPEG-2 H.264 4:2:0 High Profile</p> <hr/> <p><b>Audio Codec Supported/Processing</b> MPEG-1 Layer 2 (mp2) AAC-LC HE-AAC AC-3, E-AC-3 (Dolby® pass-thru)</p> <hr/> <p><b>Regulatory Compliance</b> CE: CE marked in accordance with 89/336/EEC, 72/23/EEC and 1999/5/EEC Directive UL: UL approval US FCC: Part 15 EMC: EN55022, EN55024, EN6100-3-2 Safety: IEC60950 RoHS: 2011/65/EU WEEE: 2012/19/EU</p> <hr/> <p><b>Physical</b> Dimensions (WxDxH): 5.8 x 14 x 1.7 in (14.6 x 35.6 x 4.4 cm) (including component projection) Operating Temperature/Humidity: 32°F to 122°F (0°C to 50°C); 5% to 95% non-condensing</p>
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### ORDERING INFORMATION

**BBG-1190-DEC-MPEG** Standalone MPEG4 AVC and MPEG2 Decoder with ASI and IP Inputs and SDI Outputs, available in the following rear-panel I/O configurations:

**BBG-1190-DEC-MPEG-B** Balanced analog audio outputs

**BBG-1190-DEC-MPEG-U** Unbalanced (RCA) analog audio outputs

+**DEC-DDEC** Dolby® Decode License Option

+**FEC-DEC** SMPTE 2022 Forward Error Correction License Option

+**GENLOCK** Genlock License Option

+**DEC-RTMP-SVR** RTMP Server License Option

+**IP-IN** IP In License Option

+**IP-OUT** SPTS Stream Splitting License Option

+**SRT-DEC** SRT Support License Option

+**TSMON** Monitoring License Option

+**DEC-RTMP-SVR** RTMP Server License Option

+**RIST/ARQ-DEC** Automatic Repeat Request License, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard

+**RIST/ENCRP-DEC** RIST Encryption/Authentication Support (per unit). (Requires the +RIST/ARQ-DEC license to also be present on the decoder.)

**BBG-1100-TRAY** 1 RU Rack Mount Tray (supports up to 3 BBG-1100 series units)

**9990-RTR-8x16 MPEG-IP » 8 INPUT / 16 OUTPUT STREAMING IP (MPEG2-TS) RECLOCKING DISTRIBUTION AMPLIFIER AND ROUTER with Dual 10GigE NICs**



The **9990-RTR-8X16-MPEG-IP** offers a flexible card-based solution for providing distribution copies of unicast or multicast IP streams. Unicast streams, by design, have only one destination and cannot easily be monitored by test equipment. To solve this, the 9990-RTR-8X16-MPEG-IP provides copies that can easily be sent to multiple destinations for monitoring or other purposes. With the 9990-RTR-8X16-MPEG-IP, the originating UDP/RTP stream can be replicated to reach its intended destination, as well as providing ample copies for monitoring or other purposes.

Using its two 1GigE RJ-45 ports, the 9990-RTR-8X16-MPEG-IP supports up to 8 inputs (16 with option **+9990RTR-16X16**), and up to 16 outputs. Each input can be replicated up to eight times. The 9990-RTR-8X16-MPEG-IP also includes advanced redundancy protection features, allowing for automatic failover if the primary signal disappears. De-jittering and reclocking features help ensure reliable operation in all conditions and actually “cleans up” inputs with jittery IPGs. Utilizing the openGear® open-architecture control/monitoring platform, the 9990-RTR-8X16-MPEG-IP can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface.

**FEATURES**

Card-based design allows scalability of up to 10 cards per frame

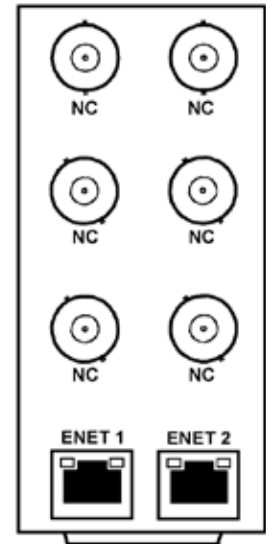
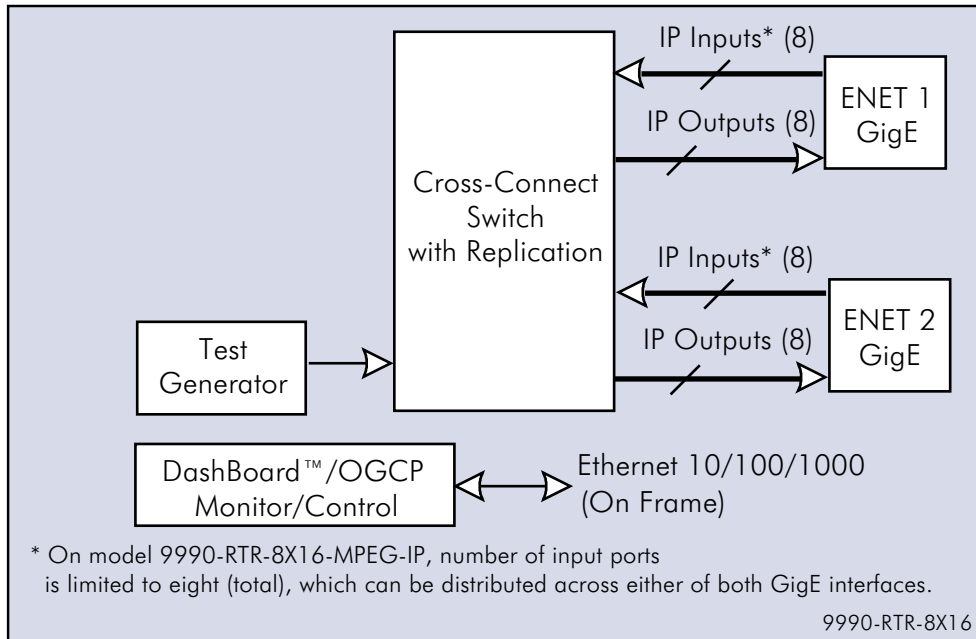
Economical card-based solution provides distribution copies of unicast or multicast IP streams

De-jittering and reclocking features help ensure reliable operation – even with jittery sources

Easy integration and control/monitoring via DashBoard™ remote control

Hot-swappable

Five year warranty



**RM20-9990-RTR-B**



**9990-RTR-8x16 MPEG-IP » 8 INPUT / 16 OUTPUT STREAMING IP (MPEG2-TS) RECLOCKING DISTRIBUTION AMPLIFIER AND ROUTER** with Dual 10GigE NICs**SPECIFICATIONS****Power**

12W

**Routing Capacity**

8 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.

**Note:** The two GigE ports each are limited to 8 inputs and 8 outputs per port. Also, replication limit is 8 (i.e., a given input can be replicated only up to 8 copies).**Network I/O**

Number of ports: (2) 1GigE RJ-45

IPv4, IPv6, UDP, and RTP

900 Mb/s usable GbE per Rx port

900 Mb/s usable GbE per Tx port

2 Gb/s maximum processing per card

**Note:** SMPTE-2022 FEC is not supported. FEC packets are discarded at the input and not generated at the output.**Regulatory Compliance**

CE: CE marked in accordance with 93/68/EEC (22/07/03) Directive

UL: UL approval

US FCC: Part 15

EMC: EN55022, EN55024, EN6100-3-2

**ORDERING INFORMATION****9990-RTR-8X16-MPEG-IP** 8x16 Streaming IP (MPEG2-TS) Reclocking Distribution Amplifier and Router with Dual 10GigE NICs**RM20-9990-RTR-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) GigE RJ-45 Ethernet**Note:** BNC connectors on rear module are not used for this model and are all NC.**+9990RTR-16X16** Option; Upgrades 9990-RTR-8X16-MPEG-IP to model 9990-RTR-16X16-MPEG-IP (adds 8 inputs for a total available of 16 inputs)

**9990-RTR-16x16-MPEG-IP » 16 INPUT / 16 OUTPUT STREAMING IP (MPEG2-TS) RECLOCKING DISTRIBUTION AMPLIFIER AND ROUTER** with Dual 10GigE NICs



The **9990-RTR-16X16-MPEG-IP** offers a flexible card-based solution for providing distribution copies of unicast or multicast IP streams. Unicast streams, by design, have only one destination and cannot easily be monitored by test equipment. To solve this, the 9990-RTR-16X16-MPEG-IP provides copies that can easily be sent to multiple destinations for monitoring or other purposes. With the 9990-RTR-16X16-MPEG-IP, the originating UDP/RTP stream can be replicated to reach its intended destination, as well as providing ample copies for monitoring or other purposes.

Using its two 1GigE RJ-45 ports, the 9990-RTR-16X16-MPEG-IP supports up to 16 inputs, and up to 16 outputs. Each input can be replicated up to eight times. The 9990-RTR-16X16-MPEG-IP also includes advanced redundancy protection features, allowing for automatic failover if the primary signal disappears. De-jittering and reclocking features help ensure reliable operation in all conditions and actually “cleans up” inputs with jittery IPGs. Utilizing the openGear® open-architecture control/monitoring platform, the 9990-RTR-16X16-MPEG-IP can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface.

**FEATURES**

Card-based design allows scalability of up to 10 cards per frame

Economical card-based solution provides distribution copies of unicast or multicast IP streams

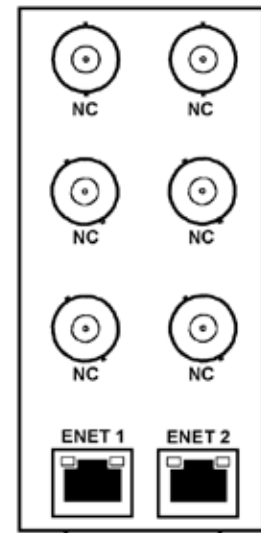
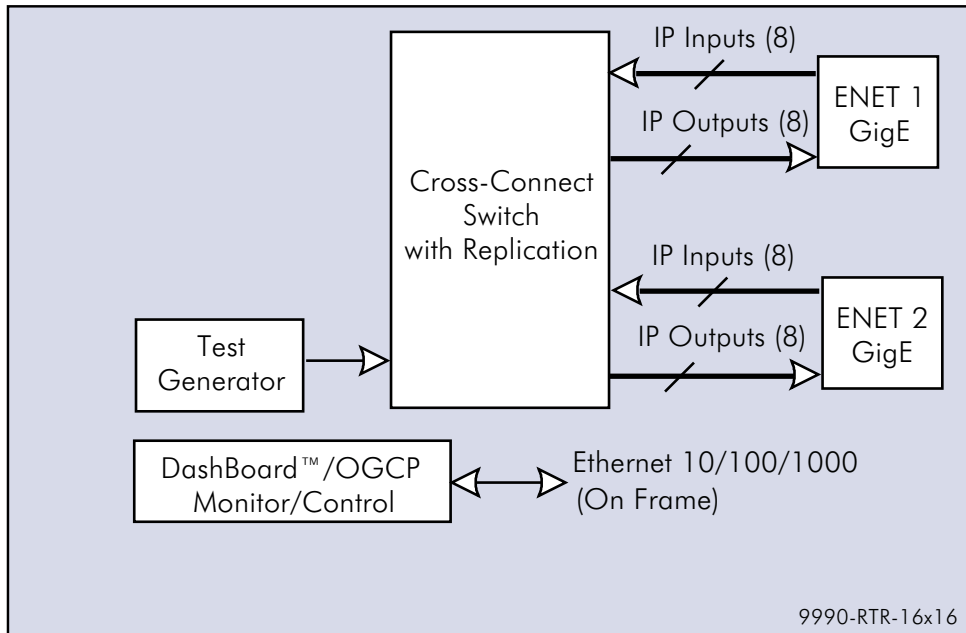
De-jittering and reclocking features help ensure reliable operation - even with jittery sources

Up to 16x16 inputs and outputs using two 1GigE Ethernet ports

Easy integration and control/monitoring via DashBoard™ remote control

Hot-swappable

Five year warranty



**RM20-9990-RTR-B**



**9990-RTR-16x16-MPEG-IP » 16 INPUT / 16 OUTPUT STREAMING IP (MPEG2-TS) RECLOCKING DISTRIBUTION AMPLIFIER AND ROUTER** with Dual 10GigE NICs**SPECIFICATIONS****Power**

12W

**Routing Capacity**

16 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.

**Note:** The two GigE ports each are limited to 8 inputs and 8 outputs per port. Also, replication limit is 8 (i.e., a given input can be replicated only up to 8 copies).**Network I/O**

Number of ports: (2) 1GigE RJ-45

IPv4, IPv6, UDP, and RTP

900 Mb/s usable GbE per Rx port

900 Mb/s usable GbE per Tx port

2 Gb/s maximum processing per card

**Note:** SMPTE-2022 FEC is not supported. FEC packets are discarded at the input and not generated at the output.**Regulatory Compliance**

CE: CE marked in accordance with 93/68/EEC (22/07/03) Directive

UL: UL approval

US FCC: Part 15

EMC: EN55022, EN55024, EN6100-3-2

**ORDERING INFORMATION****9990-RTR-16X16-MPEG-IP** 16x16 Streaming IP (MPEG2-TS) Reclocking Distribution Amplifier and Router with Dual 10GigE NICs**RM20-9990-RTR-B** 20-Slot Frame Rear I/O Module (Standard Width) (2) GigE RJ-45 Ethernet**Note:** BNC connectors on rear module are not used for this model and are all NC.

SPOTCHECK® » TRANSPORT STREAM COMPLIANCE MONITOR



**SpotCheck® provides easy to use, no-guesswork, automatic A/85 loudness measurement and access to all audio loudness records.** Because SpotCheck® monitors an IP, ASI, or a transmitted over-the-air MPEG stream at the transmit (emission) encode point, SpotCheck® measures and logs loudness for all programming emanating from the facility.

Segments can be searched using date - time with the intuitive display of loudness plots along with date-time-stamped thumbnails of the actual corresponding programming, or can be queried and correlated with the facility as-run automation list. SpotCheck® readily pinpoints any segments that are out of CALM A/85 compliance, and conversely helps in documenting compliance should an erroneous complaint appear.

Options allow even more transport stream/programming analysis. Option QUALITYCHECK checks for the presence of CEA708/608 closed-captioning, as well as the string content text, and also can detect transport communication errors as well as frozen/black frame and audio silence, with Alert Manager sending these alerts to your designated personnel as simple e-mails. Option AIRCHECK provides easily managed lo-res proxy downloads of user-selected transport stream segments that can be sent and viewed over e-mail to recipients with common smart devices and media players.

Easy to use web user interface provides for easy setup and use. Requiring no breakout from the MPEG stream and not affecting the emission stream in any way, SpotCheck® provides an easily integrated, facility-based, superior solution for loudness records and compliance verification.

Clearly displayed session loudness plot continuously displayed for all programming. Where loudness deviates from dialnorm by more than 2 LU, segment is highlighted.

Programming thumbnails with date-time and as-run ID provide ready correlation between loudness measurement records and programming

On-screen mode selections including ATSC A/85 measurement. Instant selection of audio sub-programs.

Select plotting to show Dialnorm, True Peak, and/or Loudness Envelop (min/max instantaneous LUFS)

Select spot segmenting to correlate to as-run data. Where as-run is not available, programming can be segmented into regular user-selected Short or Long intervals.

Selecting a date on the Reports calendar shows a report for the day, with segments grouped into loudness too high, too low, or complying.

A list of segments is displayed, with direct correlation to loudness, airtime, and as-run data for each spot or segment. Reports can be set up to sort by loudness, time, as-run code or other criteria.

Reports can be automatically e-mailed, triggered to send at several severity level choices.

**SPOTCHECK**  
A/85 Compliance Report

Video: WA3D-HD  
Audio: AC3  
Date: 08/14/2012

Average Loudness Too High

Airline	Duration	Description	Code	Diabnorm	Loudness LUFS	Loudness Error LU
110229	00:00:00:00	STATION ID: WA3D-HD	110229	-24.20	-19.65	4.55
110272	00:00:00:00	WJL The Ladies (CBS)	000000	-24.20	-19.91	4.29
110273	00:00:00:00	STAR TREK: THE	110273	-24.20	-20.16	4.04
110274	00:00:00:00	STARS & STRIPES	000000	-24.20	-20.32	3.88



TRANSPORT STREAM COMPLIANCE MONITORS

SPOTCHECK® » TRANSPORT STREAM COMPLIANCE MONITOR

» FEATURES

Automated 24/7 loudness measurement and logging for every programming segment sent as emission. Full CALM compliant logging and record access.

Easy data search by date/time range and as-run data allows rapid and no-hassle pinpointing to any programming segment

Support for sending loudness alert e-mails to multiple personnel. User-defined multiple-level severity escalation.

Straightforward display of actual loudness plot and clear OK/non-compliant tagging of programming segments – no tedious lists or spreadsheets to analyze

Full compatibility with MPTS and SPTS streams

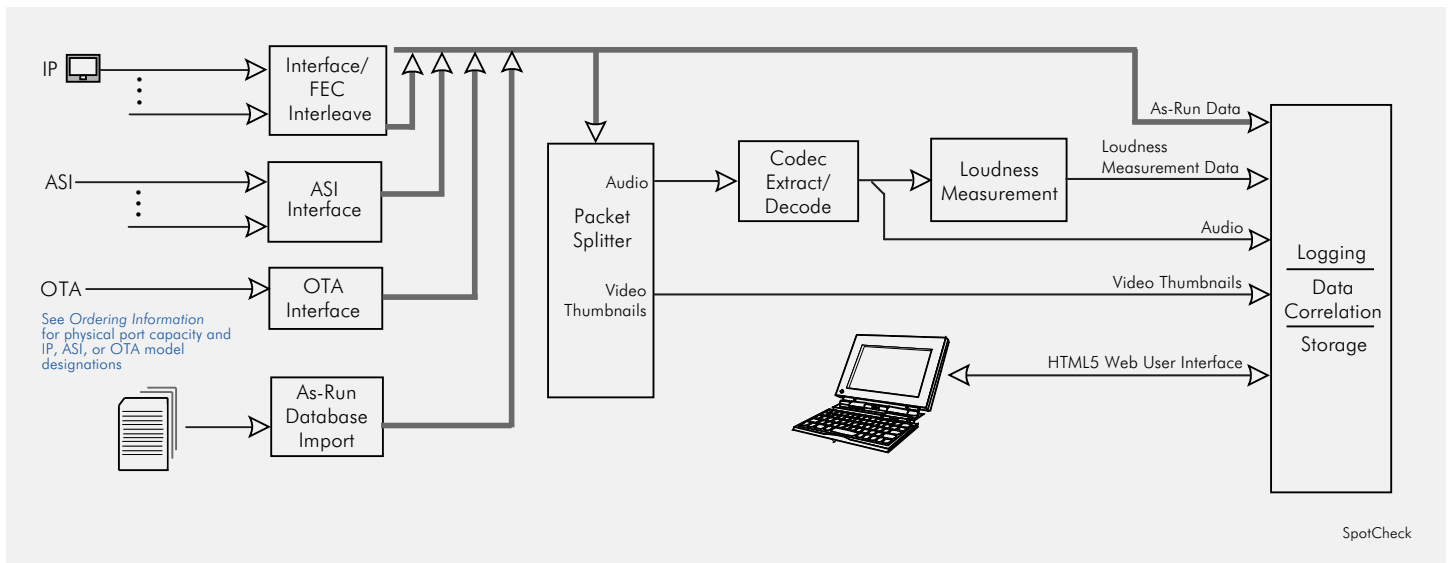
Direct GigE MPEG, ASI, or OTA interface. No complicated external breakout of signals.

Automatically accounts for program loudness, dialnorm, and DRC effect on audio – no interpretation of readings or loudness metadata needed

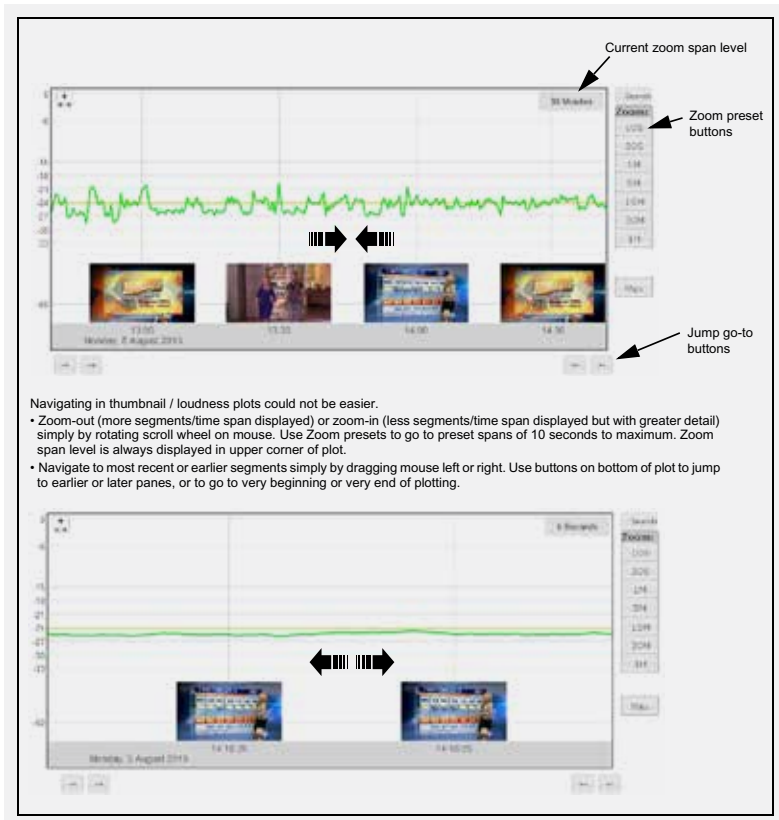
Three year warranty with extension options available

Robust product support – upgrades and enhancements field-installed via firmware upload from our Support web page

Cobalt Support Network feature provides, where desired, a direct VPN connection between your SpotCheck unit and our engineering support



SPOTCHECK® » TRANSPORT STREAM COMPLIANCE MONITOR



Transport Manager **Video Streams Grid** and **Video Streams List** show all programs and status/details within a transport stream. Clicking on a program opens a streaming thumbnail display showing status and real-time per-channel audio levels and details.

Video Streams Grid

Video Streams: Prime SA - HD [29] (W2IX)

As-run: Up to date

Audio status: Main: -25 LUFS D1: 24 SARC: -25 LUFS D1: 24

Video Streams: Prime SA - HD [49] (W2IX)

As-run: Up to date

Audio status: Main: -25 LUFS D1: 24 SARC: -25 LUFS D1: 24

Video #ID: 09  
Resolution: 1920x1080 1:1 28.97  
Multicast IP: 224.0.1.1  
Multicast Port: 55000  
Audio Stream: W2IX-Audio-0  
#ID: 52  
Codec: AAC SBR-AAC 3/2L  
Bitstream: -24 LUFS

Session: -25 LUFS, -16.56 TP, 0.20RA, 0:00:00sw

Reset

Each audio subprogram display has a Session tool in which a loudness session can be started and run for any interval to provide an instant evaluation of program loudness. Independent sessions can be run on any audio subprogram within a stream.

- Pressing **Reset** starts the session timer. At this point, session moving-average momentary LUFS, true peak, and LRA is displayed.
- Pressing **Reset** again clears the session data and starts a new session. A session can be run indefinitely, or as short as desired.

Session: -25 LUFS, -16.56 TP, 0.20RA, 0:00:00sw

Reset

Session: -25 LUFS, -16.56 TP, 0.20RA, 0:02:50sw

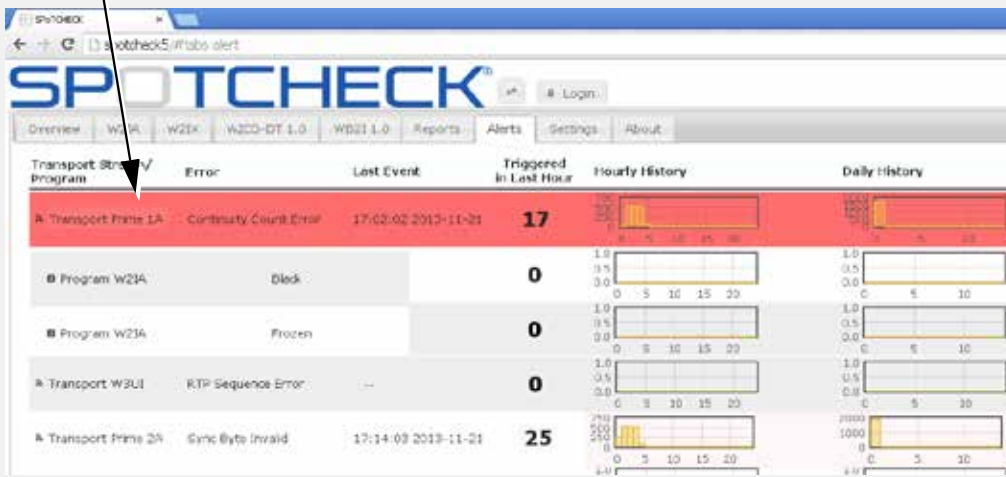
Reset



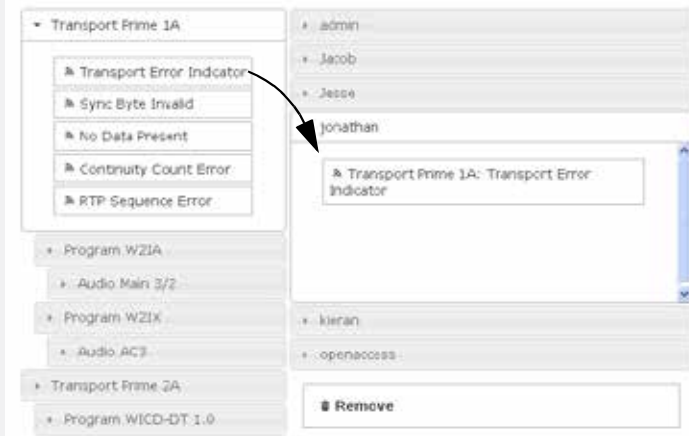
SPOTCHECK® » TRANSPORT STREAM COMPLIANCE MONITOR

Option **QUALITYCHECK** detects transport communication errors as well as frozen/black frame and audio silence. It also checks for the presence of CEA708/608 closed-captioning.

At the moment an error occurs, the error display row highlights in red (then fades to the normal background color after a few seconds). This is useful for real-time monitoring and pinpointing troubleshooting of transport streams or programs experiencing problems.



Alert Manager



**QUALITYCHECK** Alert Manager allows transport and program error notification to be forwarded as e-mail to SpotCheck users by simply dragging the error notification into the user's mailbox.

Presence of CEA708 and/or CEA608 packets is indicated by the yellow **(CC) 708** or **(CC) 608** bands just above the thumbnail images. Zooming in tighter displays the closed-captioning text (which can be copied and pasted into a text file if desired).



TRANSPORT STREAM COMPLIANCE MONITORS

SPOTCHECK® » TRANSPORT STREAM COMPLIANCE MONITOR



» SPECIFICATIONS

Physical

SpotCheck-1000

Power: 120/240 VAC, 50/60 Hz, 200 W (max)

Size: 1RU

Depth required: 24 in (61 cm) minimum

SpotCheck-2000

Power: 120/240 VAC, 50/60 Hz, 350 W (max)

Size: 1RU

Depth required: 24 in (61 cm) minimum

Transport Interface

SpotCheck-IP: GigE (1000 Base-T) via RJ-45

SpotCheck-ASI: ASI, 75Ω BNC input

SpotCheck-OTA: 8VSB (RF), female F-connector input

See Ordering Information for port complements and other information.

Loudness Measurement

ATSC A/85 -24 LKFS

Formats Supported

Transport: MPEG over IP or ASI, UDP, RTP, SMPTE 2022, FEC wrappers  
 Multicast: Supports IPV4 multicast and IGMPv2 multicast management  
 Audio Codecs Supported: Dolby® Digital (AC-3), Dolby® Digital Plus (E-AC-3)  
 Video Codecs Supported: MPEG2  
 As-run import: Imports as-run data from common automation systems via Windows Share or drop/drag into program as-run folders

Control/Monitor Interface

HTML5 web browser via dedicated 10/100/1000 Ethernet port.

Storage Capacity (per SpotCheck® Unit)

SpotCheck-1000, SpotCheck-2000  
 12 months

» ORDERING INFORMATION

**SPOTCHECK®-1000-IP** ATSC A/85 Compliance Monitor for IP Transport Streams. 1 Control IP Port, 1 Media IP Port. Includes one license of SPOTCHECK-LICENSE-AUDIO-FULL. Maximum capacity of four programs. 12-month analysis storage.

**SPOTCHECK®-1000-ASI** ATSC A/85 Compliance Monitor for ASI Transport Streams - 1 Control IP Port, 1 ASI Input Port. Includes one license of SPOTCHECK-LICENSE-AUDIO-FULL. Maximum capacity of four programs. 12-month analysis storage.

**SPOTCHECK®-1000-OTA** ATSC A/85 Compliance Monitor for OTA Transport Streams - 1 Control IP Port, 1 RF Input for over-the-air reception. Includes one license of SPOTCHECK-LICENSE-AUDIO-FULL. Maximum capacity of four programs. 12-month analysis storage.

**SPOTCHECK®-2000** ATSC A/85 Compliance Monitor for IP Transport Streams - 1 Control IP Port, 5 Media IP Ports (ASI support available using option OPT-ASI; 1 ASI port max.). Includes four licenses of SPOTCHECK-LICENSE-AUDIO-FULL. Maximum capacity of 16 programs. 1RU. PSU redundancy. Dual power RAID hard drive configuration. 12-month analysis storage.

**OPT-ASI** Adds a 75Ω BNC ASI input and setup interface to any SpotCheck model.

**OPT-OTA** Adds an RF OTA input and setup interface to any SpotCheck model.

» ADDITIONAL PROGRAM LICENSES

**SPOTCHECK®-LICENSE-AUDIO-FULL** Complete program analysis for one program (1 video PID plus 2 audio PIDs). Each optional additional license adds complete analysis for one program.

**SPOTCHECK®-LICENSE-AUDIO-LITE** Program analysis for one program (1 video PID plus 1 audio PID), but omits As-Run support.

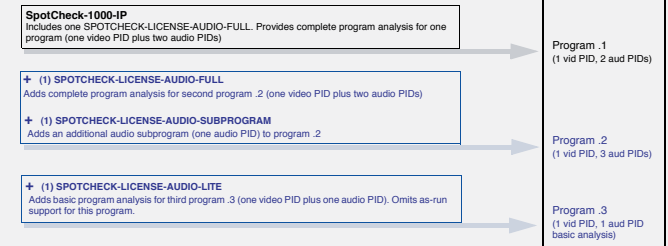
**SPOTCHECK®-LICENSE-AUDIO-SUBPROGRAM** Adds an additional audio subprogram (one audio PID, such as DVS or SAP) to a FULL or LITE program license. (Available only in conjunction with an already-provisioned SpotCheck®-LICENSE-AUDIO-FULL or SpotCheck®-LICENSE-AUDIO-LITE program license.)

**SPOTCHECK®-LICENSE-QUALITYCHECK** Adds CEA 708/608 presence detect and stream/program quality checks. (Option is available on a unit basis (one license (max.)); adds QUALITYCHECK to entire unit, with all transport streams accommodated).

**SPOTCHECK®-LICENSE-AIRCHECK** Adds transport stream lo-res proxy download. (Option is available on a per-program basis).

SpotCheck® Licensing

Adding licenses to SpotCheck® allows scalable provisioning above the standard capacity as shown in this example.

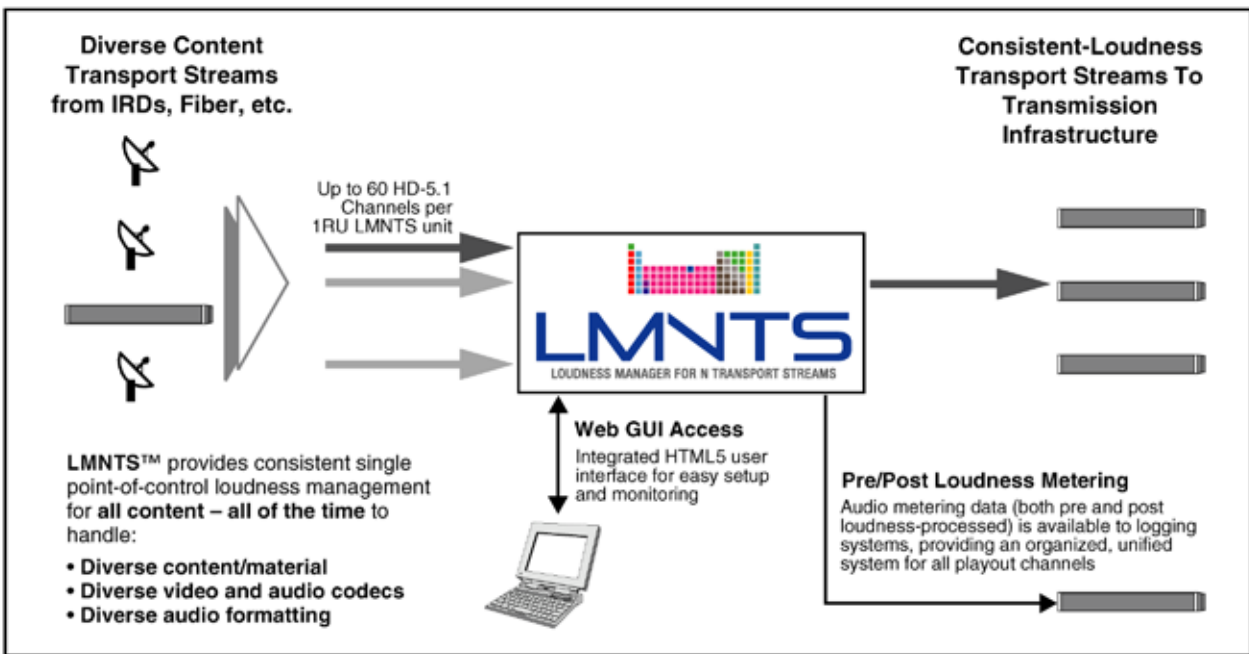


TRANSPORT STREAM LOUDNESS PROCESSING

LMNTS® » TRANSPORT STREAM LOUDNESS PROCESSOR



**LMNTS (Loudness Management for n-Transport Streams)** is a first in comprehensive transport-based loudness processing. LMNTS represents a new level in multi-stream loudness processing integration ease, economy, confidence, and consistency. Operating at the MPEG transport layer, LMNTS provides a practical loudness management solution for MVPD operators without the need or complexity of external codecs transferring between baseband and MPEG interfaces.



Using unique depacketing/repackaging processing and decode/re-encode, LMNTS extracts and decodes audio codec packets from the program stream, performs high-quality PCM loudness processing, and then re-encodes and re-packets the audio with its stream. An ASI option provides additional ASI transport stream support. Physically, all data connection to LMNTS is via GigE IP or ASI interfaces using an industry-standard IT hardware platform with no intermediary breakouts.

Because LMNTS uses the same high-quality Linear Acoustic® Aeromax™ loudness processing for each stream, perfect loudness consistency is assured for all programming passing through the system. For AC-3 streams, LMNTS can accommodate varying received loudness and dialnorm, and repackage the audio using consistent loudness and consistent re-authored dialnorm for perfect loudness matching for all programming.

LMNTS is fully scalable, with licenses available to progressively add the number of audio programs accommodated.



TRANSPORT STREAM LOUDNESS PROCESSING

LMNTS® » TRANSPORT STREAM LOUDNESS PROCESSOR

FEATURES

Unmatched integration ease and practicality for multi-stream head-end loudness processing. Directly interfaces with GigE-based playout servers.

Integrated HTML5 user interface for easy setup and local or remote monitoring

ASI option provides ASI transport stream processing

Low delay latency (500 msec)

Consistent, uniformly controlled loudness processing across all program channels (including interstitials). Loudness processing performed in PCM domain.

Post-processed AC-3 is re-encoded using re-authored matching dialnorm across all programming

Full compatibility with MPTS and SPTS streams

Integrated video/audio delay re-alignment compensates for any internal processing delays

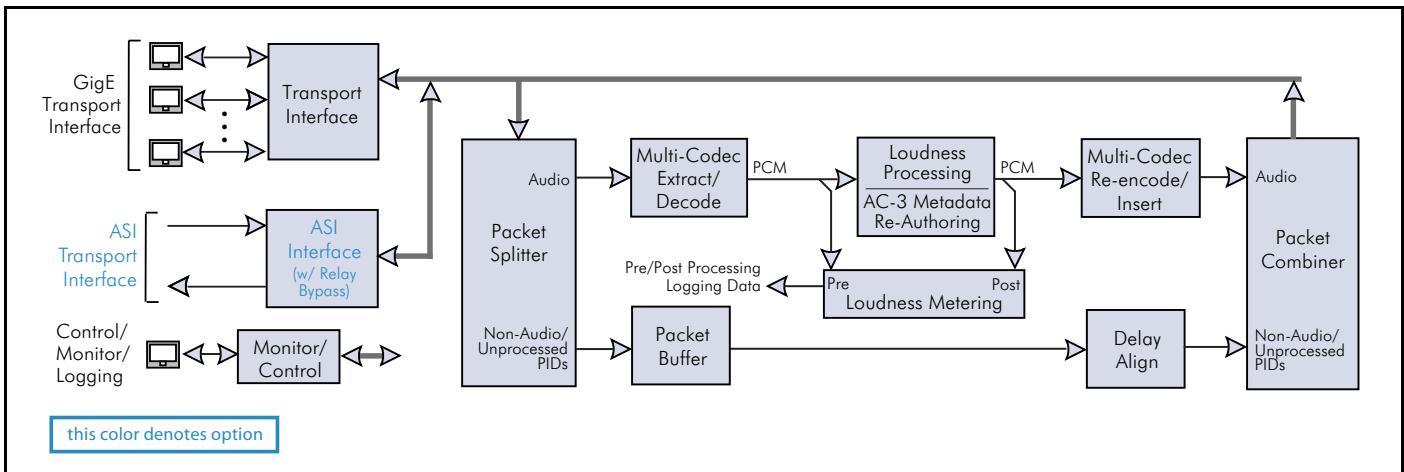
Transparent processing maintains payload size and video/audio quality. No added re-compression or de-compression.

Three year warranty with extension options available

OPTIONS

**ASI Transport I/O Interface (LMNTS-OPT-ASI-1x1)** Adds an ASI I/O BNC pair (with relay bypass protection). Capacity for various models is as follows:

- LMNTS-500: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports).
- LMNTS-1000: Supports up to (2) ASI options (second ASI interface card installed deletes (2) IP media ports).
- LMNTS-2000: Supports up to (7) ASI options (second ASI interface card installed deletes (2) IP media ports).



SPECIFICATIONS

Physical

**LMNTS-500**

Power: 120/240 VAC, 50/60 Hz, 350 W (max)  
 Size: 1RU  
 Depth required: 24 in (61 cm) minimum

**LMNTS-1000**

Power: 120/240 VAC, 50/60 Hz, 550 W (max)  
 Size: 1RU  
 Depth required: 24 in (61 cm) minimum

**LMNTS-2000**

Power: 120/240 VAC, 50/60 Hz, 750 W (max)  
 Size: 2RU  
 Depth required: 24 in (61 cm) minimum

## LMNTS® » TRANSPORT STREAM LOUDNESS PROCESSOR

## SPECIFICATIONS (cont.)

## Capacity

## LMNTS-500

Data throughput: (3) GigE (1000 Base-T) RJ-45 Media Ports  
 Channel capacity: Up to 10 surround audio PIDs; up to 25 stereo audio PIDs (see Note below)  
 Processing latency delay: 500 msec

## LMNTS-1000

Data throughput: (5) GigE (1000 Base-T) RJ-45 Media Ports  
 Channel capacity: Up to 60 surround audio PIDs; up to 100 stereo audio PIDs (see Note below)  
 Processing latency delay: 500 msec

## LMNTS-2000

Data throughput: (5) GigE (1000 Base-T) RJ-45 Media Ports  
 Channel capacity: Up to 100 surround audio PIDs; up to 140 stereo audio PIDs (see Note below)  
 Processing latency delay: 500 msec

**Note:** Channel capacities above are typical maximum capacities. Practical capacity is a function of licenses added. Capacity is based on processing "credits". For example on LMNTS-500, 100 credits are available for which each surround PID consumes 10 credits, and each stereo PID consumes 4 credits. Any combination of stereo and surround PIDs can be supported, noting the total available processing credits. For any of the models listed above, a Cobalt Sales Manager can assist you in determining the maximum processing capacity to support your requirements.

## Control/Monitoring

HTML5 web browser via dedicated 10/100/1000 Ethernet port

## Interface

IP Transport: GigE (1000 Base-T) via RJ-45  
 ASI Transport (Optional; LMNTS-OPT-ASI-1X1): ASI I/O, 75Ω BNCs with relay bypass

## Format Supported

Transport: MPEG over IP or ASI, UDP, RTP  
 Multicast: Supports IPV4 multicast and IGMPV2/V3 multicast management  
 Audio Codecs: Dolby® Digital (AC-3), Dolby® Digital Plus(TM) (E-AC-3), MPEG 1 Layer 2, AAC  
 Video Codecs: Supports all video codecs; video passed without alterations

## ORDERING INFORMATION

**LMNTS-500** Transport Stream Loudness Processor, 1RU, (10) 5.1-channel capacity, (25) 2.0-channel capacity. 1 Control IP Port, 3 Media IP Ports.

**LMNTS-1000** Transport Stream Loudness Processor, 1RU, (60) 5.1-channel capacity, (100) 2.0-channel capacity. 1 Control IP Port, 5 Media IP Ports.

**LMNTS-2000** Transport Stream Loudness Processor, 2RU, (100) 5.1-channel capacity, (140) 2.0-channel capacity. 1 Control IP Port, 5 Media IP Ports.

**Note:** Channel capacities listed above for all models are typical max. Refer to Specifications for more details.

**LMNTS-OPT-ASI-1X1** Adds one ASI input and output to any LMNTS unit

**LMNTS-LICENSE-E-AC-3-SURROUND** Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital Plus (EAC-3). Can also be used to process Dolby Digital (AC-3)

**LMNTS-LICENSE-E-AC-3-STEREO** Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital Plus (EAC-3). Can also be used to process Dolby Digital (AC-3)

**LMNTS-LICENSE-AC-3-SURROUND** Loudness processing license for one stream (one PID) of 5.1 (surround) Dolby Digital (AC-3)

**LMNTS-LICENSE-AC-3-STEREO** Loudness processing license for one stream (one PID) of 2.0 (stereo) Dolby Digital (AC-3)

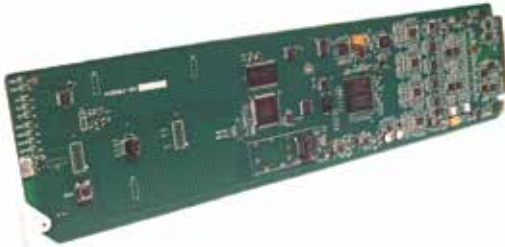
**LMNTS-LICENSE-AAC-SURROUND** Loudness processing license for one stream (one PID) of 5.1 (surround) AAC-LC or HE-AACv1

**LMNTS-LICENSE-AAC-STEREO** Loudness processing license for one stream (one PID) of 2.0 (stereo) AAC-LC or HE-AACv1

**LMNTS-LICENSE-MP1L2** Loudness processing license for one stream (one PID) of MPEG 1 Layer II

**Note:** A 5.1 (surround) license can be used to process a 2.0 (stereo) stream of the same codec type.

**9933-EMDE-ADDA » 3G/HD/SD-SDI 16-CHANNEL AES / 8-CHANNEL ANALOG AUDIO EMBEDDER / DE-EMBEDDER**



The Cobalt® 9933-EMDE-ADDA 3G/HD/SD-SDI 16-Channel AES / 8-Channel Analog Audio Embedder / De-Embedder offers full-flexibility AES and analog audio embedding/de-embedding in a basic, economical, high-efficiency openGear® card.

The 9933-EMDE-ADDA provides full 16-channel embed / de-embed between AES, 8-channel analog audio, and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Analog embed/de-embed conforms with professional balanced audio at 0 dBFS to pro 24 dBu levels using full 24-bit conversion.

Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

16-channel AES support and 8-channel analog audio support in one card. Individual per-pair embedding or de-embedding. Provides four-group SDI embed/de-embed and cross-conversions between analog and AES discrete audio.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

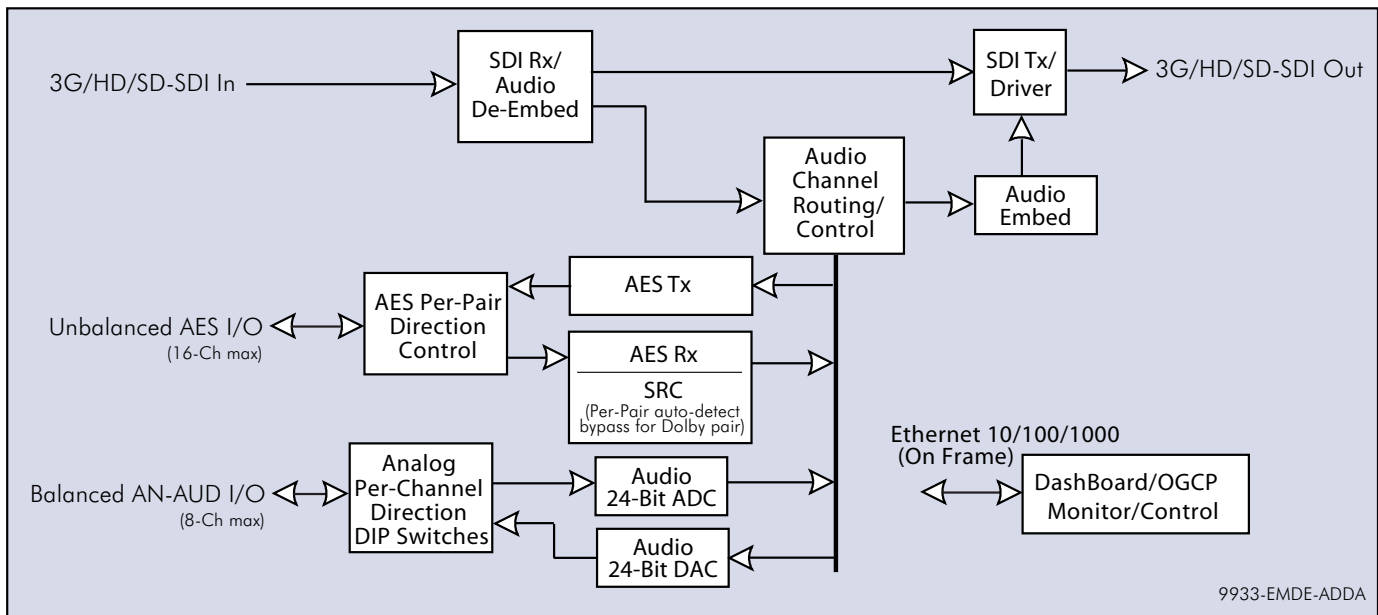
Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



9933-EMDE-ADDA



# 9933-EMDE-ADDA » 3G/HD/SD-SDI 16-CHANNEL AES / 8-CHANNEL ANALOG AUDIO EMBEDDER / DE-EMBEDDER

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

### Power

<18 Watts

### SDI Inputs/Outputs

- (1) 75Ω BNC input
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

### Audio Conversion Format

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs. Analog audio I/O conforms to +24 dBu <=> 0 dBFS.

### Analog Audio Specifications

- Input Impedance: >10 kΩ
- Reference Level: -20 dBFS
- Nominal Level: +4 dBu
- Input Clip Level: +24 dBu (0 dBFS)
- Freq. Response: ±0.2 dB (20 Hz to 20 kHz)
- SNR: 115 dB (A weighted)
- THD+N: -96 dB (20 Hz to 10 kHz)
- Crosstalk: -106 dB (20 Hz to 20 kHz)
- Output Impedance: < 50 Ω
- Max. Output Level: +24 dBu (0 dBFS)

### Discrete Audio Input/Output

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced Analog Audio with per-channel port direction switches

## ORDERING INFORMATION

**9933-EMDE-ADDA** 3G/HD/SD-SDI 16-Channel AES / 8-Channel Analog Audio Embedder / De-Embedder

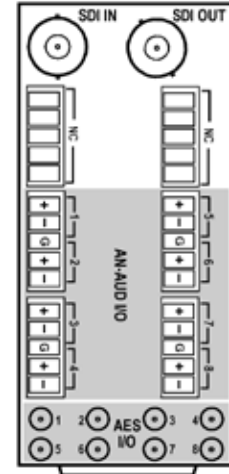
**RM20-9933EMDE-B-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (8) Balanced Analog Audio I/O, 8 Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

**RM20-9933EMDE-B-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (8) Balanced Analog Audio I/O, 8 Unbalanced AES I/O (coaxial; HD-BNC)

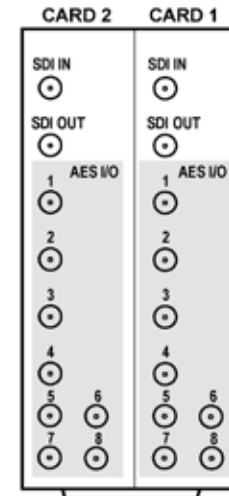
**RM20-9933EMDE-C/S-DIN** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 3G/HD/SD-SDI Output, (8) Unbalanced AES I/O (connections are per card; all connectors are DIN 1.0/2.3)

**RM20-9933EMDE-C/S-HDBNC** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 3G/HD/SD-SDI Output, (8) Unbalanced AES I/O Outputs (connections are per card; all connectors are HD-BNC)

**Note:** Some rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.

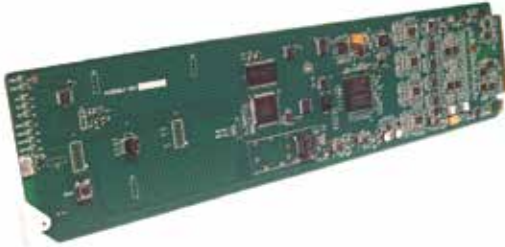


**RM20-9933EMDE-B-DIN**  
**RM20-9933EMDE-B-HDBNC**



**RM20-9933EMDE-C/S-DIN**  
**RM20-9933EMDE-C/S-HDBNC**

**9933-EMDE-75/110 » 3G/HD/SD-SDI 16-CHANNEL UNBALANCED/BALANCED AES EMBEDDER / DE-EMBEDDER**



The Cobalt® 9933-EMDE-75/110 3G/HD/SD-SDI 16-Channel Unbalanced/Balanced AES Embedder / De-Embedder offers full-flexibility AES embedding/de-embedding for unbalanced and balanced AES in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9933-EMDE-75/110 offers the flexibility of AES balun functions as well as fully flexible AES embedding/de-embedding.

The 9933-EMDE-75/110 provides full 16-channel embed / de-embed between both unbalanced and balanced AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Supports all popular formats: 480i, 576i, 720p, 1080i, 1080pSF, 1080p

16-channel AES support for both balanced and unbalanced. Individual per-pair embedding or de-embedding. Can be used to provide cross-balun I/O as well as 4-group embed/de-embed.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

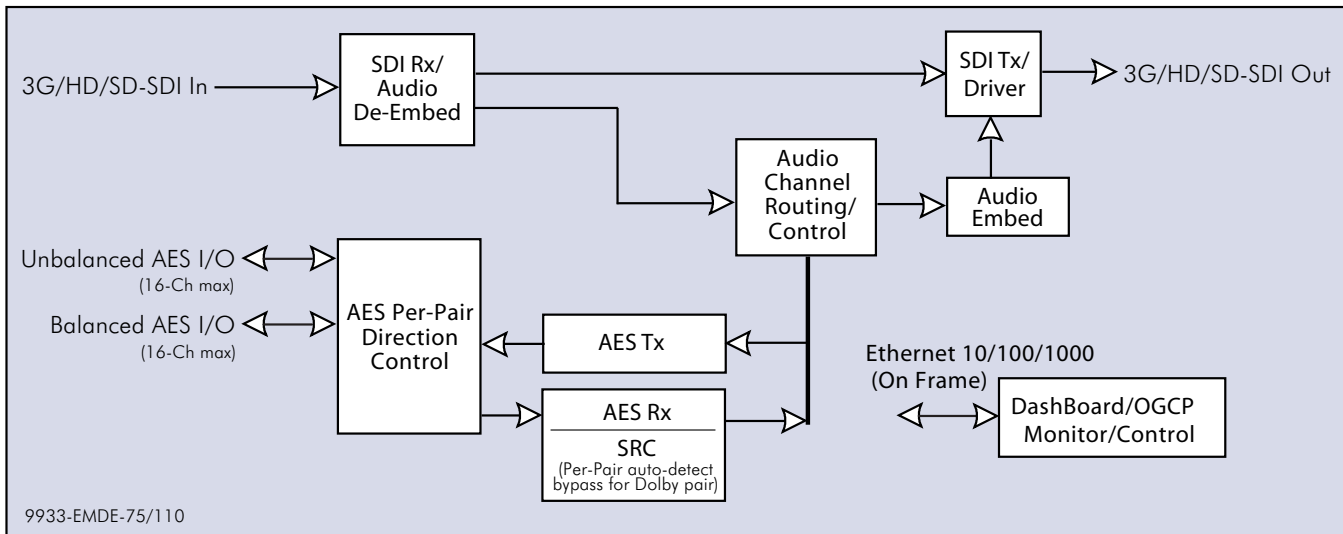
Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty





# 9933-EMDE-75/110 » 3G/HD/SD-SDI 16-CHANNEL UNBALANCED/BALANCED AES EMBEDDER / DE-EMBEDDER

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

### Power

<18 Watts

### SDI Inputs/Outputs

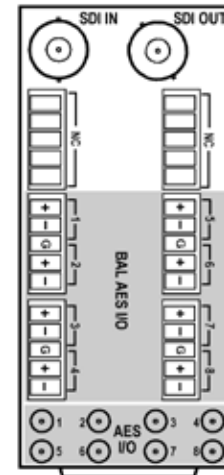
- (1) 75Ω BNC input
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

### Audio Conversion Format

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs.

### AES Audio Input/Output

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced AES (AES/EBU; 110Ω) with per-pair port direction controls



**RM20-9933EMDE-A-DIN**  
**RM20-9933EMDE-A-HDBNC**

## ORDERING INFORMATION

**9933-EMDE-75/110** 3G/HD/SD-SDI 16-Channel Unbalanced/Balanced AES Embedder / De-Embedder

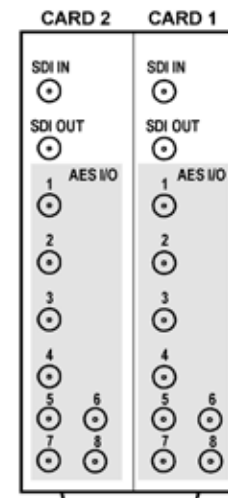
**RM20-9933EMDE-A-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN1.0/2.3)

**RM20-9933EMDE-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9933EMDE-C/S-DIN** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 3G/HD/SD-SDI Output, (8) Unbalanced AES I/O (connections are per card; all connectors are DIN 1.0/2.3)

**RM20-9933EMDE-C/S-HDBNC** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 3G/HD/SD-SDI Output, (8) Unbalanced AES I/O Outputs (connections are per card; all connectors are HD-BNC)

**Note:** Some rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.



**RM20-9933EMDE-C/S-DIN**  
**RM20-9933EMDE-C/S-HDBNC**

**BBG-DE-AA » 3G/H/SD ANALOG AUDIO DE-EMBEDDER**



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality. The BlueBox™ **BBG-DE-AA 3G/H/SD Analog Audio De-Embedder** provides de-embedding to professional balanced audio at 0 dBFS to pro 24 dBu levels using full 24-bit conversion.

De-embed selection can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-DE-AA over a PC's USB port. The GUI app allows dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

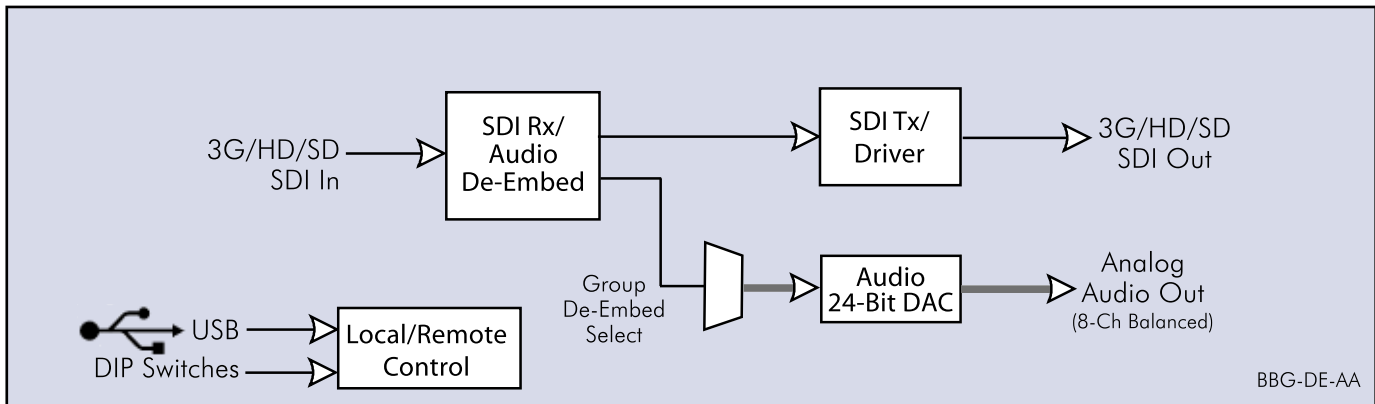
Eight balanced analog audio outputs with user-selectable direct de-embedding of groups 1 thru 4. DB-25 connector provides compact footprint. Balanced analog audio outputs can utilize direct connection to standard DB-25 connectors, or by using accessory DB-25/XLR breakout cable (available separately).

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. USB GUI audio meters provide ready assessment of content presence and line-up.

Balanced audio de-embed with full 0 dBFS to 24 dBu 24-bit conversion

Small rugged portable standalone package ideal for portable installations. Compact size and low weight design easily affixes directly to host device chassis.

Rugged construction backed with a five-year warranty



BBG-DE-AA



**BBG-DE-AA » 3G/HD/SD ANALOG AUDIO DE-EMBEDDER****SPECIFICATIONS****Power**

5-16 VDC, &lt;5 W (AC adapter included)

**DC Power Connector**

Coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for USB remote control connection and firmware upgrade upload to device)

**Standards/Data Rates Supported**

SMPTE 292M, 259M, 424M

**Inputs/Outputs**

3G/HD/SD-SDI In (75Ω BNC)

8-channel balanced analog audio output via DB-25 connector and XLR breakout adapter (available separately)

3G/HD/SD-SDI Out (75Ω BNC)

**Audio Conversion Format**

48 kHz sampling, 24-bit. Supports outputs up to 24 dBu.

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)

(139 x 77 x 26 mm)

**ORDERING INFORMATION****BBG-DE-AA** 3G/HD/SD Analog Audio De-Embedder (includes PS4 Power Supply AC adapter)**BBG-CA-110-XLRM** DB-25 Male-to-8 XLR Male Connector Breakout Cable**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG-DE-AA is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-EM-AA » 3G/HD/SD ANALOG AUDIO EMBEDDER**



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality. The BlueBox™ **BBG-EM-AA 3G/HD/SD Analog Audio Embedder** provides embedding from professional balanced audio at pro 24 dBu to 0 dBFS to levels using full 24-bit conversion.

Embed selection can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-EM-AA over a PC's USB port. The GUI app allows dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

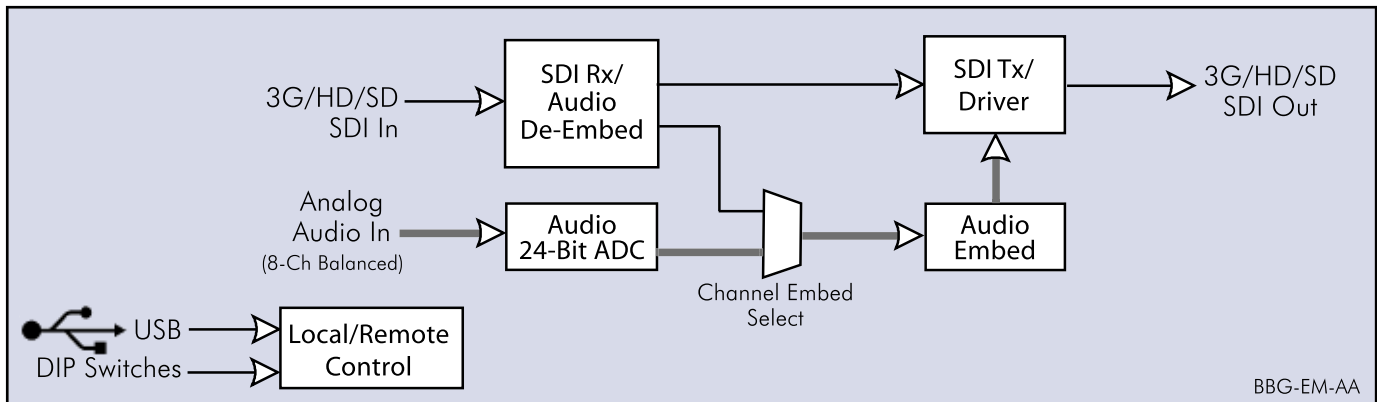
Eight balanced analog audio inputs with user-selectable direct embedding to groups 1 thru 4. DB-25 connector provides compact footprint. Balanced analog audio inputs can utilize direct connection to standard DB-25 connectors, or by using accessory DB-25/XLR breakout cable (available separately).

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. USB GUI audio meters provide ready assessment of content presence and line-up.

Balanced audio embed with full 24 dBu-to-0 dBFS 24-bit conversion

Small rugged portable standalone package ideal for portable installations. Compact size and low weight design easily affixes directly to host device chassis.

Rugged construction backed with a five-year warranty



BBG-EM-AA



**BBG-EM-AA » 3G/HD/SD ANALOG AUDIO EMBEDDER****SPECIFICATIONS****Power**

5-16 VDC, <5 W (AC adapter included)

**DC Power Connector**

Coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for USB remote control connection and firmware upgrade upload to device)

**Standards/Data Rates Supported**

SMPTE 292M, 259M, 424M

**Inputs/Outputs**

3G/HD/SD-SDI In (75Ω BNC)

8-channel balanced analog audio input via DB-25 connector and XLR breakout adapter (available separately)

3G/HD/SD-SDI Out (75Ω BNC)

**Audio Conversion Format**

48 kHz sampling, 24-bit. Supports outputs up to 24 dBu.

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**ORDERING INFORMATION**

**BBG-EM-AA** 3G/HD/SD Analog Audio Embedder (includes PS4 Power Supply AC adapter)

**BBG-CA-110-XLRF** DB-25 Male-to-8 XLR Female Connector Breakout Cable

**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG-EM-AA is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-EMDE-AES75 » 3G/HD/SD AES AUDIO EMBEDDER/DE-EMBEDDER – AES-3id 75Ω (BNC)**



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality. The BlueBox™ **BBG-EMDE-AES75** 3G/HD/SD AES Audio Embedder/De-Embedder provides full 16-channel embed and de-embed between AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with device 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Embed/de-embed selection can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-EMDE-AES over a PC's USB port. The GUI app allows dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

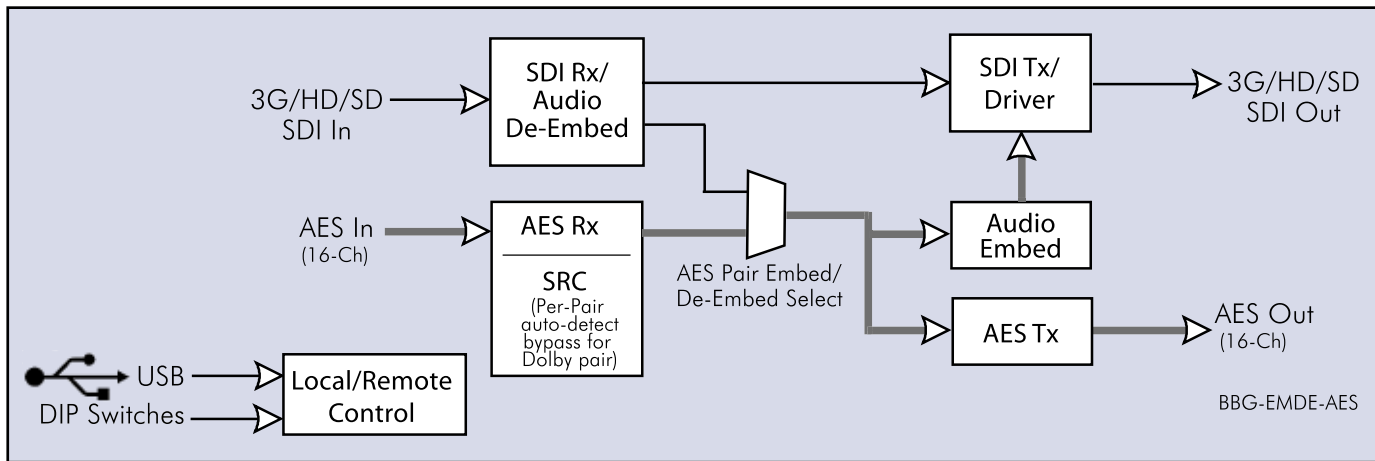
8-pair (16-channel) AES support. Individual per-pair embedding or de-embedding. Multi-pin AES I/O connector provides compact footprint. AES I/O can utilize direct connection to standard HD-15 connectors, or by using accessory BNC breakout cable (available separately).

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with device 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. USB GUI audio meters provide ready assessment of content presence and line-up.

Small rugged portable standalone package ideal for portable installations. Compact size and low weight design easily affixes directly to host device chassis.

Rugged construction backed with a five-year warranty



**BBG-EMDE-AES75 » 3G/HD/SD AES AUDIO EMBEDDER/DE-EMBEDDER – AES-3ID 75Ω (BNC)****SPECIFICATIONS****Power**

5-16 VDC, &lt;5 W (AC adapter included)

**DC Power Connector**

Coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for USB remote control connection and firmware upgrade upload to device)

**Standards/Data Rates Supported**

SMPTE 292M, 259M, 424M

**Inputs/Outputs**

3G/HD/SD-SDI In (75Ω BNC)

8-pair AES-3id

AES I/O via HD-15 connector and AES BNC breakout adapter (available separately)

3G/HD/SD-SDI Out (75Ω BNC)

**Audio Conversion Format**

48 kHz sampling, 24-bit. Supports outputs up to 24 dBu.

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)

(139 x 77 x 26 mm)

**ORDERING INFORMATION****BBG-EMDE-AES75** 3G/HD/SD AES Audio Embedder/De-Embedder; AES-3id 75Ω (BNC) AES I/O (includes PS4 Power Supply AC adapter)**BBG-CA-75-BNCF** HD-15 Male-to-8 BNC Female Connector Breakout Cable (for use with model BBG-EMDE-AES75)**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG-EMDE-AES75 is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-EMDE-AES110 » 3G/HD/SD AES AUDIO EMBEDDER/DE-EMBEDDER – AES/EBU 110Ω (XLR)**



BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality. The BlueBox™ **BBG-EMDE-AES110** 3G/HD/SD AES Audio Embedder/De-Embedder provides full 16-channel embed and de-embed between AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with device 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Embed/de-embed selection can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-EMDE-AES over a PC's USB port. The GUI app allows dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

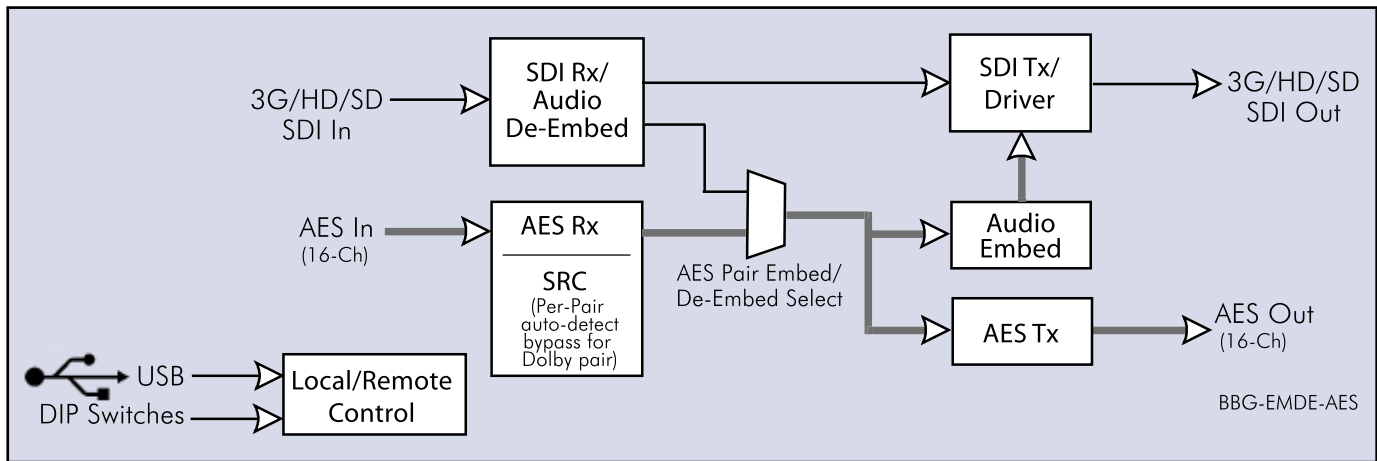
8-pair (16-channel) AES support. Individual per-pair embedding or de-embedding. Multi-pin AES I/O connector provides compact footprint. AES I/O can utilize direct connection to standard DB-25 connectors, or by using accessory XLR breakout cable (available separately).

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with device 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, audio meters, tone generators, and other advanced control functions not commonly found on "throwdown" packages. USB GUI audio meters provide ready assessment of content presence and line-up.

Small rugged portable standalone package ideal for portable installations. Compact size and low weight design easily affixes directly to host device chassis.

Rugged construction backed with a five-year warranty





**BBG-EMDE-AES110 » 3G/HD/SD AES AUDIO EMBEDDER/DE-EMBEDDER – AES/EBU 110Ω (XLR)****SPECIFICATIONS****Power**

5-16 VDC, <5 W (AC adapter included)

**DC Power Connector**

Coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for USB remote control connection and firmware upgrade upload to device)

**Standards/Data Rates Supported**

SMPTE 292M, 259M, 424M

**Inputs/Outputs**

3G/HD/SD-SDI In (75Ω BNC)  
 8-pair AES/EBU (110Ω balanced)  
 AES I/O via DB-25 connector and AES XLR breakout adapter (available separately)  
 3G/HD/SD-SDI Out (75Ω BNC)

**Audio Conversion Format**

48 kHz sampling, 24-bit. Supports outputs up to 24 dBu.

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**ORDERING INFORMATION**

**BBG-EMDE-AES110** 3G/HD/SD AES Audio Embedder/De-Embedder; AES/EBU 110Ω (XLR) AES I/O (includes PS4 Power Supply AC adapter)

**BBG-CA-110-XLRF** DB-25 Male-to-8 XLR Female Connector Breakout Cable (for use with model BBG-EMDE-AES110)

**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG-EMDE-AES110 is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

9950-EMDE-ANC » 3G/HD/SD-SDI ANCILLARY DATA EMBEDDER/DE-EMBEDDER



The **9950-EMDE-ANC 3G/HD/SD-SDI Ancillary Data Embedder/De-Embedder** offers full VANC/HANC ancillary data de-embedding and embedding for 3G/HD/SD-SDI streams. The easy to use user interface allows direct access to DID and SDID locations to extract or insert user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads. Data insertion and extraction is via serial or IP interfaces. Easy to use DashBoard control provides for easy setup and configuration. The openGear® card-based form-factor and high-density design allows up to ten 9950-EMDE-ANC cards to be fitted to a 20-slot frame. The standard rear I/O module offers SDI I/O and data interface connections, as well as a relay-protected SDI copy output. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

FEATURES

Full insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, GPI/GPO via ANC, and other specialized user payloads. HANC/VANC data interchange between SDI and GPIO, serial, and IP/Ethernet interfaces.

(Option +SCTE104) – SCTE 104 Insertion Provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

Full user VANC/HANC access

SMPTTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Low latency pass-thru for all 3G/HD/SD-SDI payloads

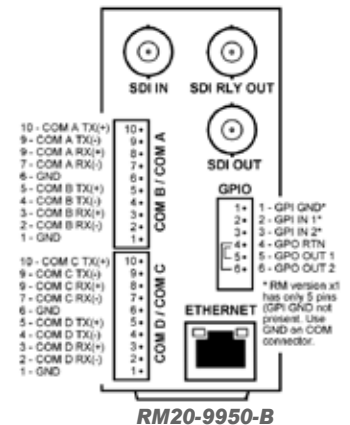
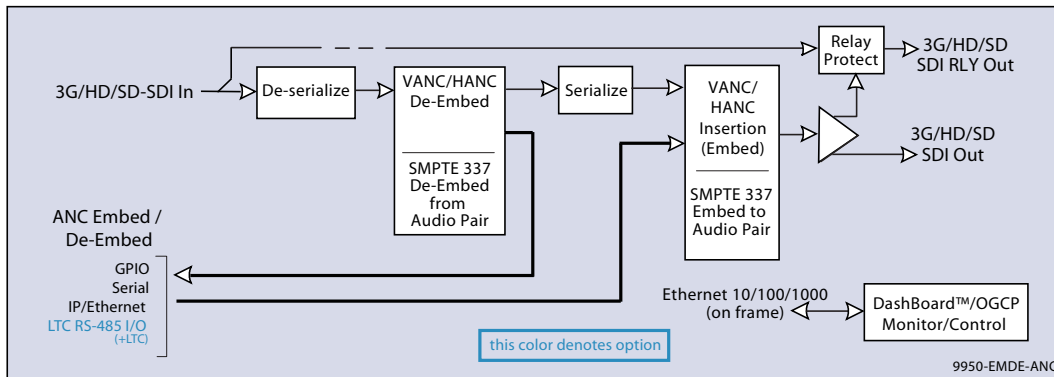
(Option +LTC) – Provides LTC embed to SDI from embedded audio or external RS-485 LTC sources. Also provides de-embed from SDI of timecode as embedded audio LTC or RS-485 LTC.

Latching relay protect SDI output provides input SDI bypass backup even in the event of power failure

(Option +SCTE104-FAST) SCTE104 Frame-Accurate SCTE Trigger Insertion uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

DashBoard™ remote control status monitoring and setup/control.

Five year warranty



SPECIFICATIONS

Power

<18 Watts

SDI Input/Output

Number of Inputs: (1) 3G/HD/SD-SDI 75° BNC

Standards: SMPTE 259M, 292M, 424M

Supported Formats:

1080p60, 59.94, 50, 29.97, 25, 24, 23.98

1080i60, 59.94, 50

720p60, 59.94, 50, 29.97, 25, 24, 23.98

625i50, 525i59.94

Return Loss: 15 dB up to 1.485 GHz, 10 dB up to 2.970 GHz

Number of Outputs: (1) 3G/HD/SD-SDI 75° BNC

SDI Signal Level: 800 mV nominal

SDI Return Loss: >15 dB up to 1.485 GHz, >10 dB up to 2.970 GHz

Reference Video Input

Number of Inputs: (2) reference from frame bus. SMPTE 170M/318 "Black Burst", SMPTE 274M/296M "Tri-level"

Return Loss: >35 dB up to 5.75 MHz

ORDERING INFORMATION

**9950-EMDE-ANC** 3G/HD/SD-SDI Ancillary Data Embedder/De-Embedder

**RM20-9950-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Processed Output BNC, (1) 3G/HD/SD-SDI Processed Output BNC w/ Relay Failover Protect, (4) RS-485 Serial Tx/Rx Ports, (2) GPIO, (1) 10/100/1000 Ethernet Data I/O Port

+SCTE104 SCTE 104 Insertion Option

+SCTE104-FAST Frame-Accurate SCTE 104 Trigger Insertion Option

+LTC Audio/RS-485 LTC Embed/De-Embed Option



**BBG-1050-EMDE-ANC » 3G/HD/SD-SDI STANDALONE ANCILLARY DATA EMBEDDER/DE-EMBEDDER**



The **BBG-1050-EMDE-ANC 3G/HD/SD-SDI Standalone Ancillary Data Embedder/De-Embedder** offers full VANC/HANC ancillary data de-embedding and embedding for 3G/HD/SD-SDI streams. The easy to use user interface allows direct access to DID and SDID locations to extract or insert user data such as camera PTZ, SCTE 104, closed-captioning read/insert, GPI/GPO via ANC, or other specialized user payloads.

Data insertion and extraction is via serial or IP interfaces. Easy to use DashBoard control provides for easy setup and configuration. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1050-EMDE-ANC allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Full insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCTE 104, closed captioning, GPI/GPO via ANC, and other specialized user payloads. HANC/VANC data interchange between SDI and GPIO, serial, and IP/Ethernet interfaces.

(Option +SCTE104) – SCTE 104 Insertion provides generation/insertion of SCTE 104 data into baseband SDI. Message send can be triggered from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets.

Full user VANC/HANC access

SMPTE 337 embed/de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.

Low latency pass-thru for all 3G/HD/SD-SDI payloads

(Option +LTC) – Provides LTC embed to SDI from embedded audio or external RS-485 LTC sources. Also provides de-embed from SDI of timecode as embedded audio LTC or RS-485 LTC.

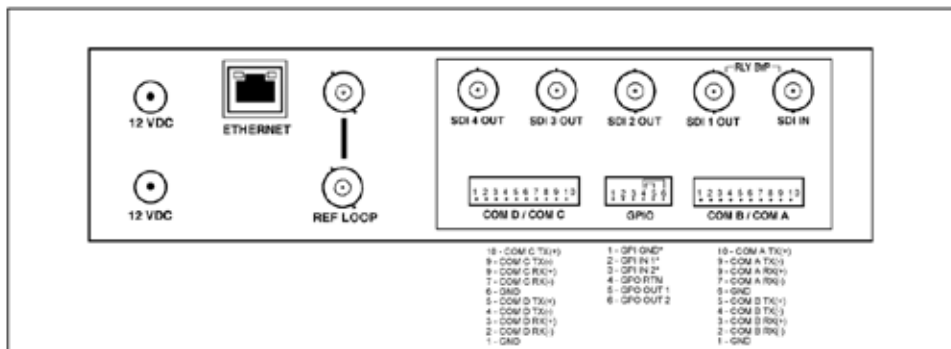
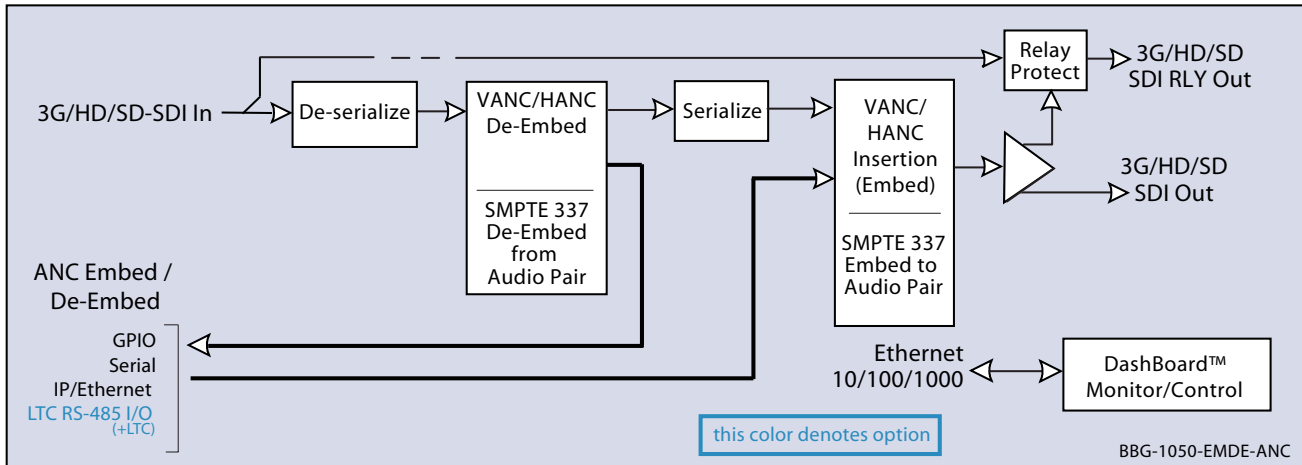
SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST) – Uses Time Stamp data derived from broadcast automation to provide deterministic, frame-accurate Digital Program Insertion (DPI) message embedding into SDI. The linear channel is output with precise metadata marking the beginning and ending of each program and commercial segment, optimizing it for automatic dissemination to CDN and VOD systems.

Latching relay protect SDI output provides input SDI bypass backup even in the event of power failure

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Uses DashBoard remote control (device appears as single-card frame)

Five year warranty



**Rear Panel**



**BBG-1050-EMDE-ANC » 3G/HD/SD-SDI STANDALONE ANCILLARY DATA EMBEDDER/DE-EMBEDDER**

**SPECIFICATIONS**

**Power**

<18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Output**

Number of Inputs: (1) 3G/HD/SD-SDI 75Ω BNC

Standards: SMPTE 259M, 292M, 424M

Supported Formats:

1080p60, 59.94, 50, 29.97, 25, 24, 23.98

1080i60, 59.94, 50

720p60, 59.94, 50, 29.97, 25, 24, 23.98

625i50, 525i59.94

Return Loss: 15 dB up to 1.485 GHz, 10 dB up to 2.970 GHz

Number of Outputs: (1) 3G/HD/SD-SDI 75Ω BNC

SDI Signal Level: 800 mV nominal

SDI Return Loss: >15 dB up to 1.485 GHz, >10 dB up to 2.970 GHz

**Reference Video Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"

Return Loss: >35 dB up to 5.75 MHz

**ORDERING INFORMATION**

**BBG-1050-EMDE-ANC** 3G/HD/SD-SDI Standalone Ancillary Data Embedder/De-Embedder

**+SCTE104** SCTE 104 Insertion Option

**+SCTE104-FAST** Frame-Accurate SCTE 104 Trigger Insertion Option

**+LTC** Audio/RS-485 LTC Embed/De-Embed Option

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

9923-DSK-LG » 3G/HD/SD-SDI Downstream Keyer with Dual Key/Fill Paths and Logo Insertion



The Cobalt® 9923-DSK-LG 3G/HD/SD-SDI Downstream Keyer with Dual Key/Fill Paths and Logo Insertion card provides flexible SDI downstream keying and logo insertion. The single program video input can be directed to either or both of two key/fill/logo insertion paths, allowing changing from one key/fill/insertion scheme to another in an instant. The openGear® form factor card can also store up to four logo graphic files which can be flexibly inserted into either key/fill path. Two key/fill paths can be outputted simultaneously, with each path using uniquely different key/fill and logo insertions as desired. For each path, two discrete character burn strings and timecode can be inserted on output video.

The 9923-DSK-LG is a perfect solution for flexible multi-market program branding and keyed character generator crawl insertion.

FEATURES

Dual independent key/fill engines and two processing paths allow changing from one key/fill/insertion scheme to another in an instant.

On-card memory stores logo/ID bug graphic files, with independent logo insertion on each key/fill path

Supports 3G/HD/SD-SDI inputs as program and key/fill

Convenient HDMI Preview Output allows preview of path 1 or path 2 outputs

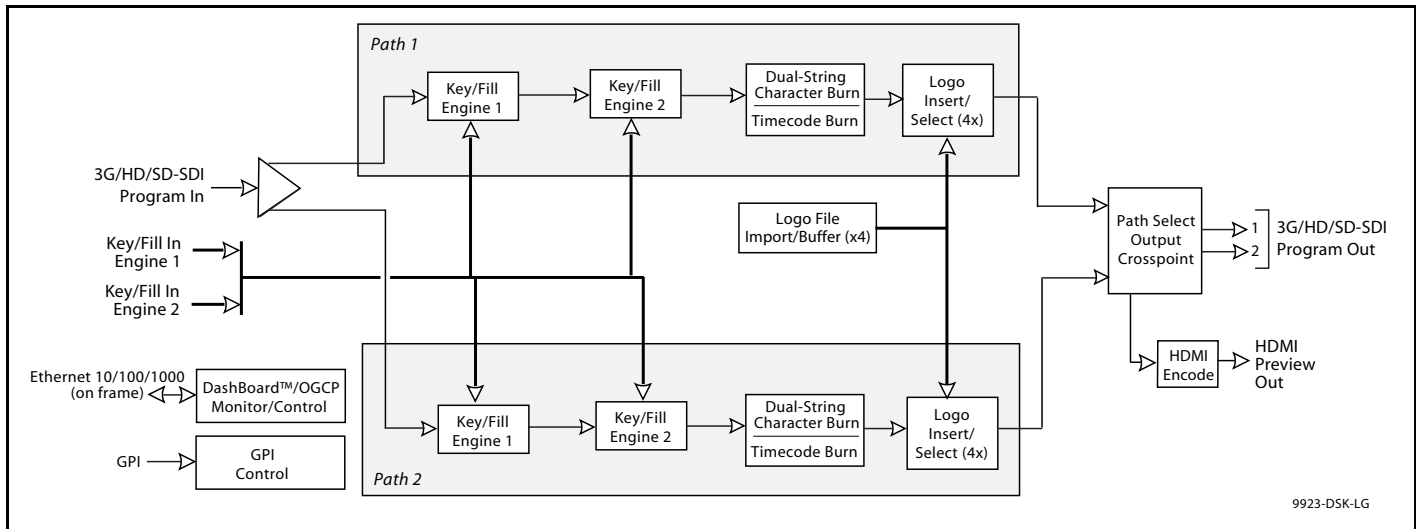
Per-path dual independent burn-in text string and timecode insertion

Remote control/monitoring via Dashboard™ remote control and GPI

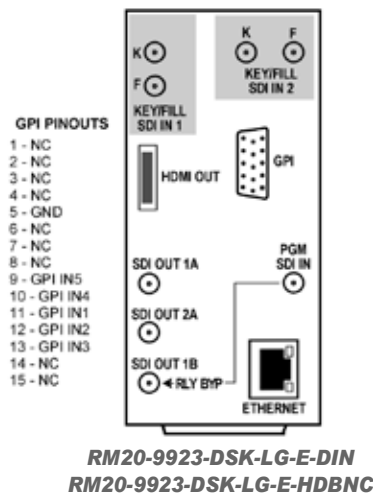
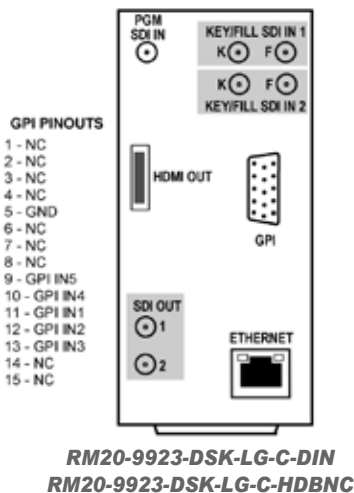
Hot-swappable

High-density openGear form factor - up to 10 cards per 20-slot frame

Five year warranty



9923-DSK-LG



**9923-DSK-LG » 3G/HD/SD-SDI Downstream Keyer** with Dual Key/Fill Paths and Logo Insertion**SPECIFICATIONS****Power**

&lt; 18 Watts

**Video Input/Outputs**

Video Inputs: (1) 3G/HD/SD-SDI Program Video SDI In; (2) 3G/HD/SD-SDI Key/Fill pair SDI In; all 75Ω

SDI Outputs: (2) 3G/HD/SD-SDI Program Video + Key/Fill SDI Out; 75Ω

HDMI Output: (1) HDMI output/preview (video only)

Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

Return Loss: &gt;15 dB up to 1.485 GHz; &gt;10 dB up to 2.970 GHz

Alignment Jitter: 3G/HD/SD: &lt; 0.3/0.2/0.2 UI

**Audio Output**

16-ch embedded

**ORDERING INFORMATION****9923-DSK-LG** 3G/HD/SD-SDI Downstream Keyer with Dual Key/Fill Paths and Logo Insertion**RM20-9923-DSK-LG-C-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Program Video Input, (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (2) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), Ethernet Port (all coaxial connectors DIN1.0/2.3)**RM20-9923-DSK-LG-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Program Video Input, (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (2) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), Ethernet Port (all coaxial connectors HD-BNC)**RM20-9923-DSK-LG-E-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Program Video Input (relay protected), (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (3) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs; 1 with relay bypass protect), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), Ethernet Port (all coaxial connectors DIN1.0/2.3)**RM20-9923-DSK-LG-E-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Program Video Input (relay protected), (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (3) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs; 1 with relay bypass protect), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), Ethernet Port (all coaxial connectors HD-BNC)

3G/HD/SD-SDI DOWNSTREAM KEYS WITH LOGO INSERTION (OPENGear CARDS AND STANDALONE MODELS)

**BBG-1023-DSK-LG » 3G/HD/SD-SDI Standalone Downstream Keyer**  
with Dual Key/Fill Paths and Logo Insertion



The Cobalt® **BBG-1023-DSK-LG 3G/HD/SD-SDI Standalone Downstream Keyer with Dual Key/Fill Paths and Logo Insertion** provides flexible SDI downstream keying and logo insertion. The single program video input can be directed to either or both of two key/fill/logo insertion paths, allowing changing from one key/fill/insertion scheme to another in an instant. The device can also store up to four logo graphic files which can be flexibly inserted into either key/fill path. Two key/fill paths can be outputted simultaneously, with each path using uniquely different key/fill and logo insertions as desired. For each path, two discrete character burn strings and timecode can be inserted on output video. The BBG-1023-DSK-LG is a perfect solution for flexible multi-market program branding and keyed character generator crawl insertion.

The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1023-DSK-LG allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

**FEATURES**

Dual independent key/fill engines and two processing paths allow changing from one key/fill/insertion scheme to another in an instant.

On-card memory stores logo/ID bug graphic files, with independent logo insertion on each key/fill path

Supports 3G/HD/SD-SDI inputs as program and key/fill

Convenient HDMI Preview Output allows preview of path 1 or path 2 outputs

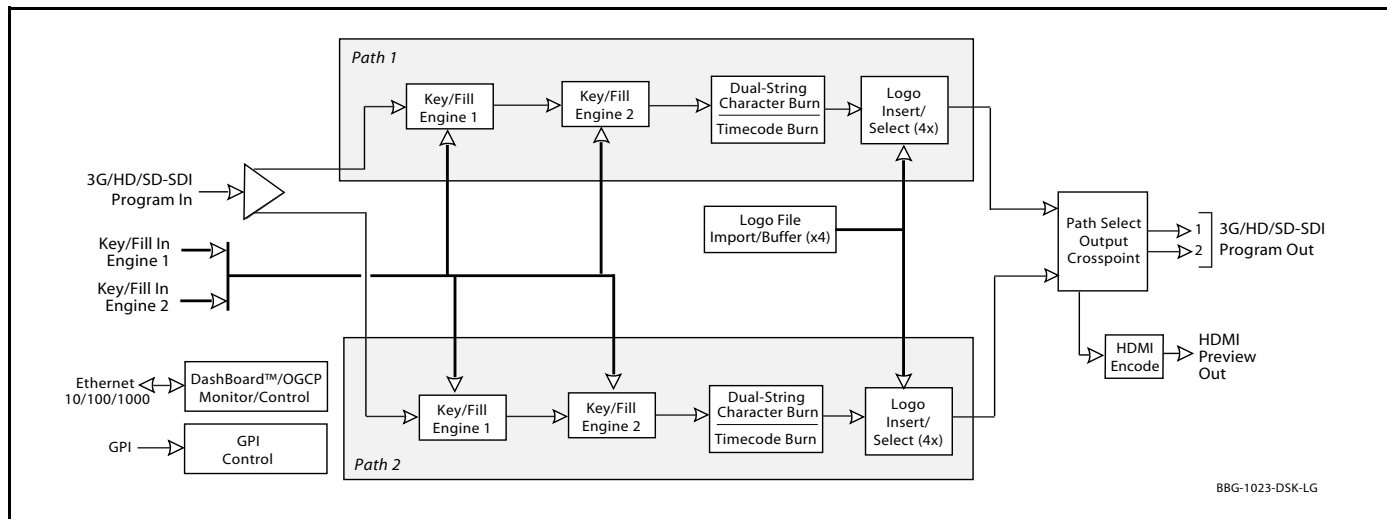
Per-path dual independent burn-in text string and timecode insertion

Remote control/monitoring via Dashboard™ software, OGCP-9000 Remote Control Panel, GPI, or Web Browser User Interface

Redundant power supply option

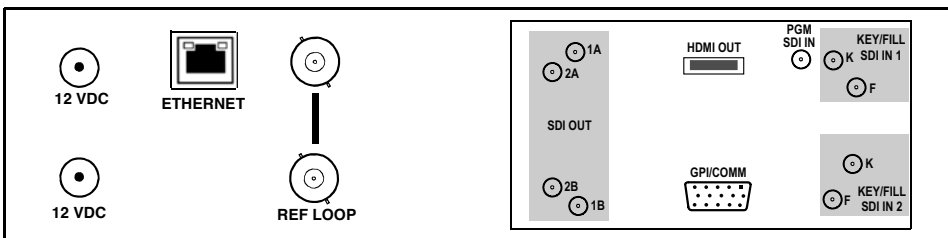
Compact footprint - up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Five year warranty



BBG-1023-DSK-LG

**Rear Panel**



**GPI / COMM PINOUTS**

- 1 - COM A\_RX2 / 422(+)
- 2 - COM A\_TX2 / 422(+)
- 3 - COM B\_RX2 / 422(+)
- 4 - GPO OUT1
- 5 - SHELL - GND
- 6 - COM A\_RX1 / 422(-)
- 7 - COM A\_TX1 / 422(-)
- 8 - COM B\_RX1 / 422(-)
- 9 - GPI IN5
- 10 - GPI IN4
- 11 - GPI IN1
- 12 - GPI IN2
- 13 - GPI IN3
- 14 - NC
- 15 - NC



3G/HD/SD-SDI DOWNSTREAM KEYS WITH LOGO INSERTION (OPENGear CARDS AND STANDALONE MODELS)

## BBG-1023-DSK-LG » 3G/HD/SD-SDI Standalone Downstream Keyer with Dual Key/Fill Paths and Logo Insertion

### SPECIFICATIONS

#### Power

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

#### Video Input/Outputs

Video Inputs: (1) 3G/HD/SD-SDI Program Video SDI In; (2) 3G/HD/SD-SDI Key/Fill pair SDI In; all 75Ω  
SDI Outputs: (2) 3G/HD/SD-SDI Program Video + Key/Fill SDI Out; 75Ω  
HDMI Output: (1) HDMI output/preview (video only)  
Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

#### Audio Output

16-ch embedded

#### Physical

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

### ORDERING INFORMATION

**BBG-1023-DSK-LG** 3G/HD/SD-SDI Standalone Downstream Keyer with Dual Key/Fill Paths and Logo Insertion, available in the following rear-panel I/O configurations:

**BBG-1023-DSK-LG-C-DIN** (1) 3G/HD/SD-SDI Program Video Input, (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (2) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), (all coaxial connectors DIN1.0/2.3)

**BBG-1023-DSK-LG-C-HDBNC** (1) 3G/HD/SD-SDI Program Video Input, (4) 3G/HD/SD-SDI Key/Fill Video Inputs (2 key/fill pairs), (2) 3G/HD/SD-SDI Program Video Outputs (user selectable as path 1 or path 2 key/fill program outputs), (1) HDMI/DVI Preview Output, (1) GPIO Port (HD-15), (all coaxial connectors HD-BNC)

#### Accessories:

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)



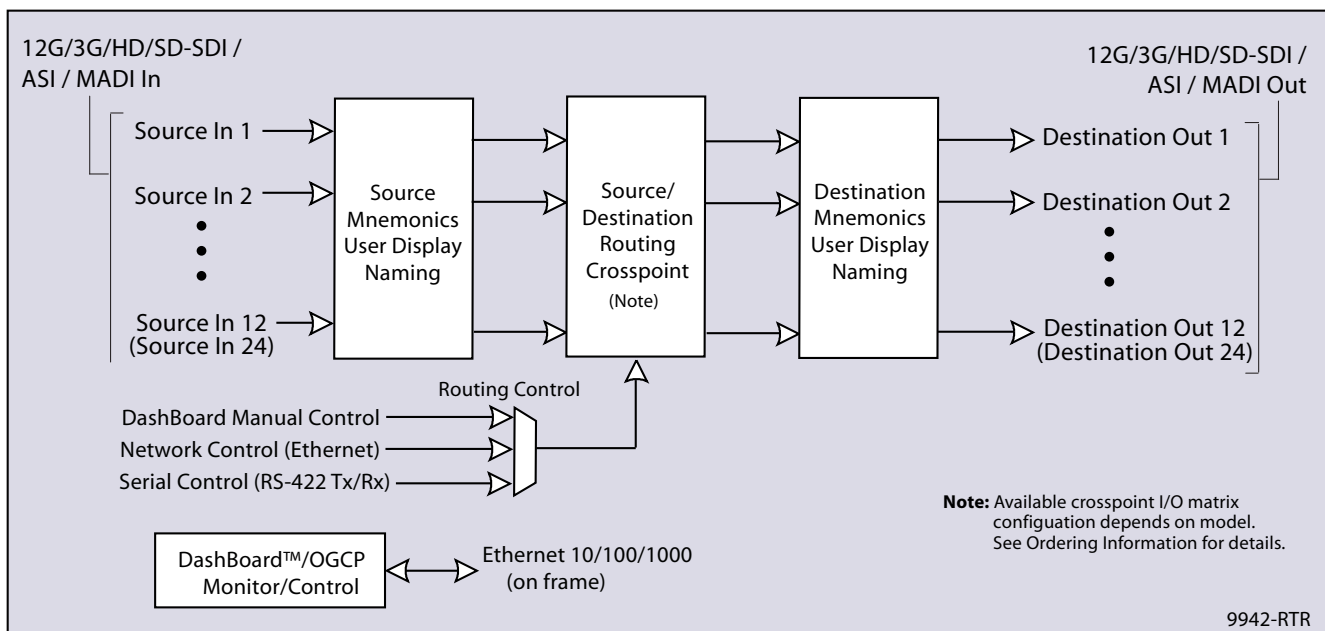
**9942-RTR Series » 12G/3G/HD/SD-SDI/ASI/MADI ROUTERS** for openGear® Systems



Cobalt introduces the **9942-RTR** series of SDI/ASI /MADI routers for the openGear® form factor. Using the openGear platform, the 9942-RTR series provides a high-density card-based solution that offers unprecedented flexibility and ease of use and integration that makes it an **exclusive** within the openGear platform.

In addition to standard DashBoard™ support, The 9942-RTR series offer a built-in Ethernet port for IP-based protocols such as Cobalt's ReFLEX and SW-P-08. The 9942-RTR series also offer serial and GPIO interfaces. The 9942-RTR series is available in 24x24 and 12x12 sizes.

DashBoard user matrix provides easy to use manual routing setup. Routing setups can be saved as presets, allowing one-button engage with DashBoard or OGCP-9000 Remote Control Panel. Full user DashBoard™ and Remote Control Panel remote control allows full setup, status, and local control across a standard Ethernet network.



**FEATURES**

- Exclusive openGear card-based scalable router solution

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- Design specifically optimized for 12G support

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- High-density design in openGear form offers compact 2RU solution

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- RP-168 reference-based switching

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- Direct interface compatibility with openGear®, Cobalt Reflex, SW-P-08, and Sierra Video (serial) protocols. Direct compatibility with DNF, PESA PNET, and LAWO SNAP panels (and other panels conforming with supported protocols).

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- Supports software upgrades allowing expanded functionality without removing cards and minimal disruption

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- DashBoard™ remote control status monitoring and setup/control

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- Hot-swappable

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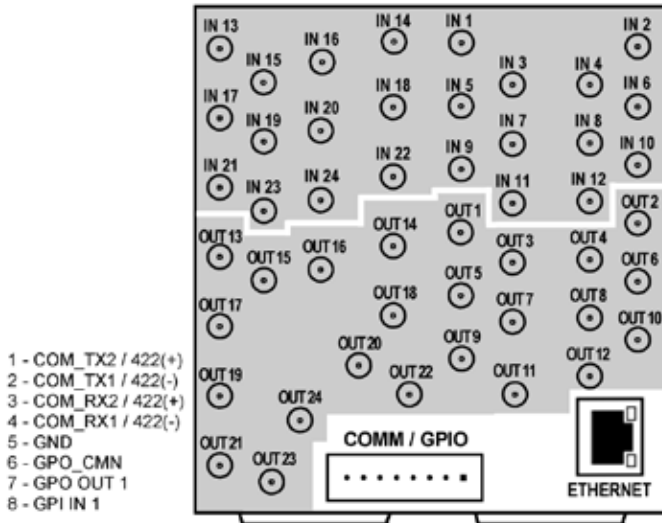
- Five year warranty

**9942-RTR Models**

- **9942-RTR-12x12-12G** 12G/3G/HD/SD-SDI / ASI / MADI 12x12 Router
- **9942-RTR-24x24-12G** 12G/3G/HD/SD-SDI / ASI / MADI 24x24 Router



**9942-RTR Series » 12G/3G/HD/SD-SDI/ASI/MADI ROUTERS** for openGear® Systems



Note: RM20-9942-24x24-A-HDBNC is compatible with 9942-RTR-12x12-12G and 9942-RTR-24x24-12G models. When used with the 12x12 model, IN 13 thru IN 24 and OUT 13 thru OUT 24 ports are NC.

**RM20-9942-24x24-A-HDBNC**

**ORDERING INFORMATION**

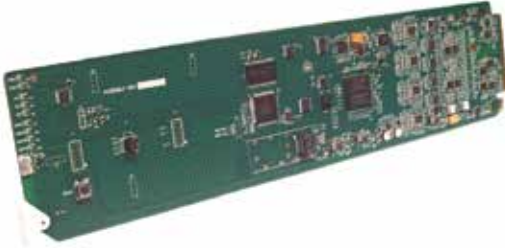
**9942-RTR-12x12-12G** 12G/3G/HD/SD-SDI / ASI / MADI 12x12 Router

**9942-RTR-24x24-12G** 12G/3G/HD/SD-SDI / ASI / MADI 24x24 Router (Expected Availability Q4 2020)

**RM20-9942-24X24-A-HDBNC** 20-Slot Frame Rear I/O Module (Double Width). (24) SDI/ASI/MADI coaxial inputs, (24) SDI/ASI/MADI coaxial outputs, COMM/GPIO connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HDBNC.)

**9433-EMDE-75/110-E00E » 3G/HD/SD-SDI FIBER-OPTIC TRANSCEIVER**

with 16-Channel Unbalanced/Balanced AES Embed / De-Embed



The Cobalt® **9433-EMDE-75/110-E00E 3G/HD/SD-SDI Fiber-Optic Transceiver** with 16-Channel Unbalanced/Balanced AES Embed / De-Embed offers full-flexibility AES embedding/de-embedding for unbalanced and balanced AES with the built-in versatility of both coaxial and fiber SDI I/O in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-75/110-E00E offers the flexibility of SDI/Fiber EO - OE transceiver as well as providing AES balun functions and fully flexible embedding/de-embedding.

The 9433-EMDE-75/110-E00E provides full 16-channel embed / de-embed between both unbalanced and balanced AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. The 9433-EMDE-75/110-E00E is available with numerous CWDM wavelengths that allow the card to be used with CWDM systems. Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Versatile EO - OE fiber transceiver with fiber and coax as both inputs and outputs

16-channel AES support for both balanced and unbalanced. Individual per-pair embedding or de-embedding. Can be used to provide cross-balun I/O as well as 4-group embed/de-embed.

Dashboard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

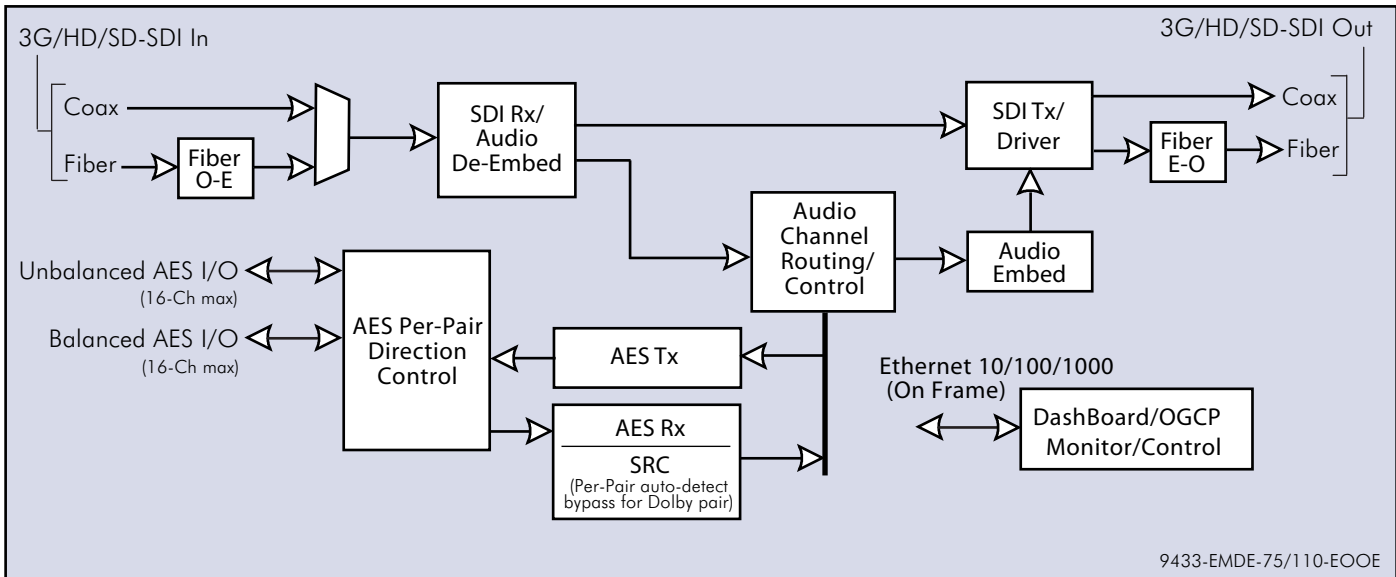
Low-power/high-density design - less than 18 Watts per card

Available with CWDM wavelength divisions allowing use in CWDM systems

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



**9433-EMDE-75/110-E00E » 3G/HD/SD-SDI FIBER-OPTIC TRANSCEIVER**

with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

<18 Watts

**SDI/Fiber Inputs/Outputs**

- (1) 75Ω BNC inputs
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- (1) Fiber input; LC connector
- (1) Fiber output; LC connector
- Fiber Wavelength, Tx: 1310 nm
- Fiber Rx Sensitivity: -23 dBm; 1260 to 1620 nm
- Fiber Tx Power: -5.0 dBm (min)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs.

**AES Audio Input/Output**

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced AES (AES/EBU; 110Ω) with per-pair port direction controls

**ORDERING INFORMATION**

**9433-EMDE-75/110-E00E** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

**9433-EMDE-75/110-E00E-CWDM-WX** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel Unbalanced/Balanced AES Embed / De-Embed with Fiber Optic CWDM I/O

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

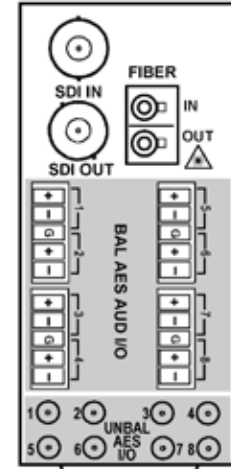
(Example: 9433-EMDE-75/110-E00E-CWDM-27 has 1270 nm FIBER OUT wavelength)

**RM20-9433EMDE-E00E-A-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

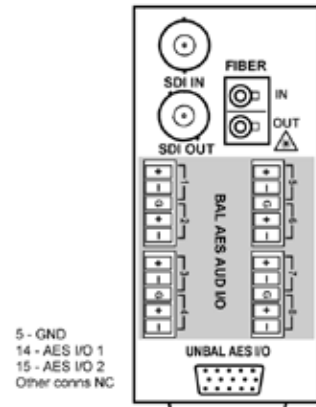
**RM20-9433EMDE-E00E-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-E00E-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced AES Audio I/O, Unbalanced AES I/O (via HD-15 connector)

**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.



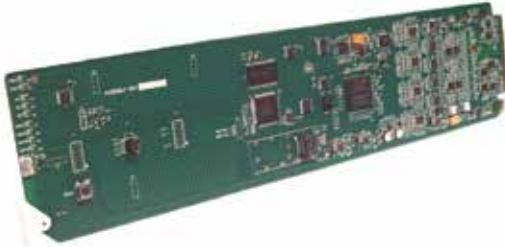
**RM20-9433EMDE-E00E-A-DIN**  
**RM20-9433EMDE-E00E-A-HDBNC**



**RM20-9433EMDE-E00E-B**

**9433-EMDE-75/110-EO » 3G/HD/SD-SDI FIBER-OPTIC EO TRANSMITTER**

with 16-Channel Unbalanced/Balanced AES Embed / De-Embed



The Cobalt® **9433-EMDE-75/110-EO 3G/HD/SD-SDI Fiber-Optic EO Transmitter** with 16-Channel Unbalanced/Balanced AES Embed / De-Embed offers full-flexibility AES embedding/de-embedding for unbalanced and balanced AES with SDI-to-fiber EO in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-75/110-EO offers the flexibility of SDI-to-fiber EO as well as providing AES balun functions and fully flexible embedding/de-embedding.

The 9433-EMDE-75/110-EO provides full 16-channel embed / de-embed between both unbalanced and balanced AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. The 9433-EMDE-75/110-EO is available with numerous CWDM wavelengths that allow the card to be used with CWDM systems.

Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

EO fiber transmitter with fiber and coax as outputs

16-channel AES support for both balanced and unbalanced. Individual per-pair embedding or de-embedding. Can be used to provide cross-balun I/O as well as 4-group embed/de-embed.

Dashboard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

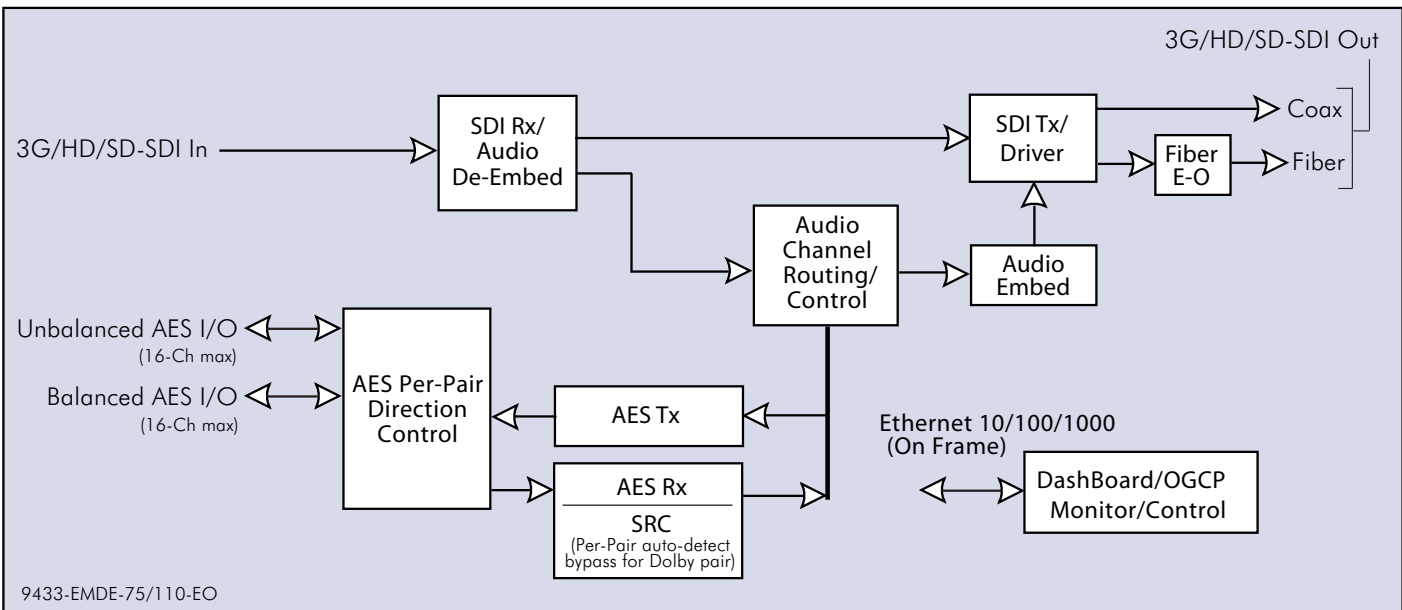
Low-power/high-density design – less than 18 Watts per card

Available with CWDM wavelength divisions allowing use in CWDM systems

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



FIBER EO / OE CONVERTERS WITH AUDIO EMBED / DE-EMBED OPENGear CARDS

**9433-EMDE-75/110-EO » 3G/HD/SD-SDI FIBER-OPTIC EO TRANSMITTER**  
with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

<18 Watts

**SDI/Fiber Inputs/Outputs**

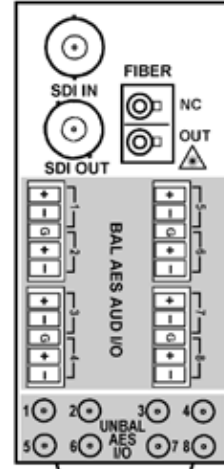
- (1) 75Ω BNC inputs
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- (1) Fiber output; LC connector
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Audio Conversion Format**

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs.

**AES Audio Input/Output**

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced AES (AES/EBU; 110Ω) with per-pair port direction controls



**RM20-9433EMDE-EO-A-DIN**  
**RM20-9433EMDE-EO-A-HDBNC**

**ORDERING INFORMATION**

**9433-EMDE-75/110-EO** 3G/HD/SD-SDI Fiber-Optic EO Transmitter with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

**9433-EMDE-75/110-EO-CWDM-WX** 3G/HD/SD-SDI Fiber-Optic EO Transmitter with 16-Channel Unbalanced/Balanced AES Embed / De-Embed with Fiber Optic CWDM I/O

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

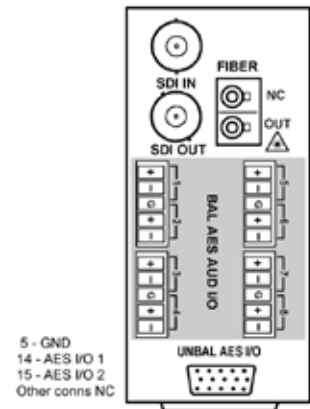
(Example: 9433-EMDE-75/110-CWDM-27 has 1270 nm FIBER OUT CWDM wavelength)

**RM20-9433EMDE-EO-A-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connector), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

**RM20-9433EMDE-EO-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connector), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-EO-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connector), (8) Balanced AES Audio I/O, Unbalanced AES I/O (via HD-15 connector)

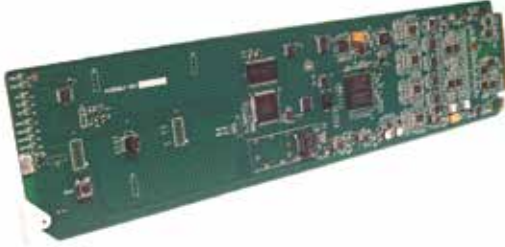
**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.



**RM20-9433EMDE-EO-B**

**9433-EMDE-75/110-OE » 3G/HD/SD-SDI FIBER-OPTIC OE RECEIVER**

with 16-Channel Unbalanced/Balanced AES Embed / De-Embed



The Cobalt® **9433-EMDE-75/110-OE 3G/HD/SD-SDI Fiber-Optic OE Receiver with 16-Channel Unbalanced/Balanced AES Embed / De-Embed** offers full-flexibility AES embedding/de-embedding for unbalanced and balanced AES with the built-in versatility of both coaxial and fiber SDI inputs in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-75/110-OE offers the flexibility of fiber-to-SDI OE as well as providing AES balun functions and fully flexible embedding/de-embedding.

The 9433-EMDE-75/110-OE provides full 16-channel embed / de-embed between both unbalanced and balanced AES and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

OE fiber receiver with fiber and coax as inputs

16-channel AES support for both balanced and unbalanced. Individual per-pair embedding or de-embedding. Can be used to provide cross-balun I/O as well as 4-group embed/de-embed.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

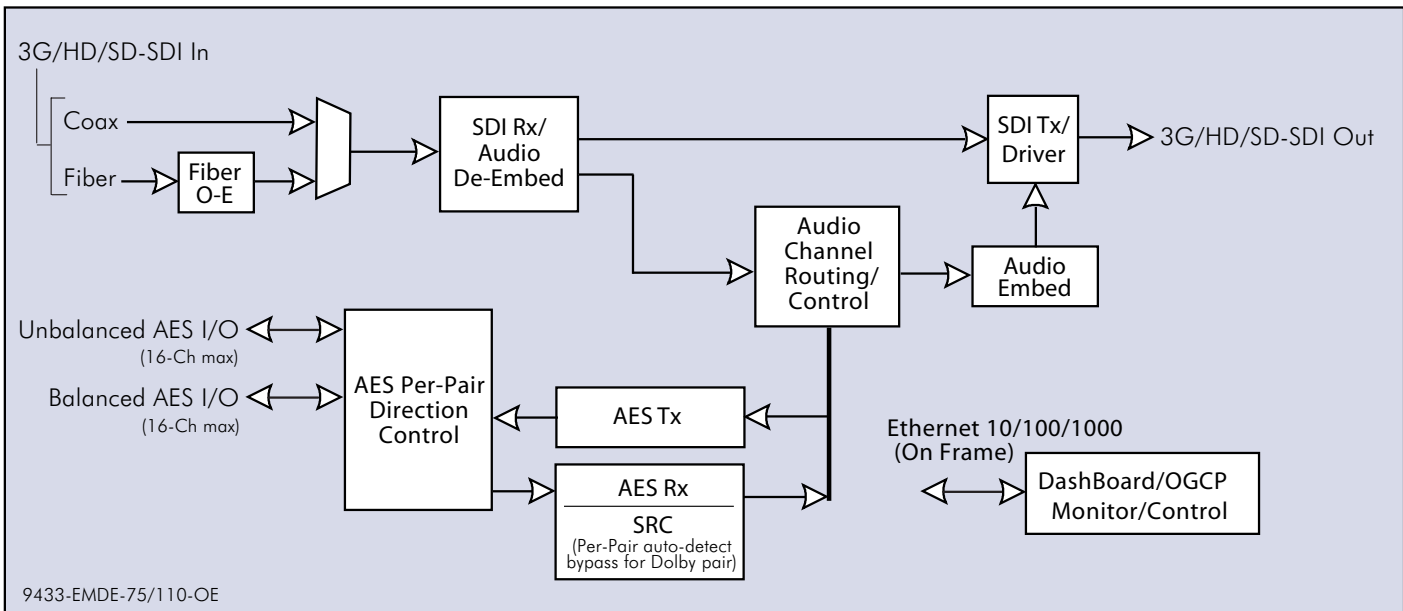
Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



# 9433-EMDE-75/110-OE » 3G/HD/SD-SDI FIBER-OPTIC OE RECEIVER

with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

### Power

<18 Watts

### SDI/Fiber Inputs/Outputs

(1) 75Ω BNC inputs

(1) 75Ω BNC output

SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

(1) Fiber input; LC connector

Receive Sensitivity: -23 dBm; 1260 to 1620 nm

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

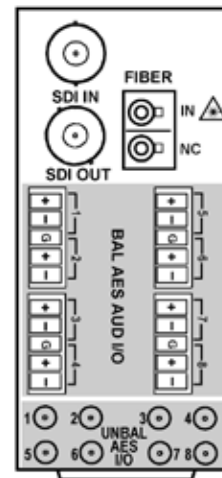
### Audio Conversion Format

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs.

### AES Audio Input/Output

(8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls

(8) Balanced AES (AES/EBU; 110Ω) with per-pair port direction controls



**RM20-9433EMDE-OE-A-DIN**  
**RM20-9433EMDE-OE-A-HDBNC**

## ORDERING INFORMATION

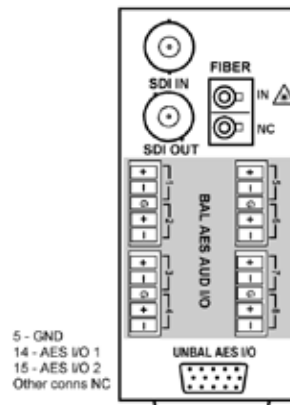
**9433-EMDE-75/110-OE** 3G/HD/SD-SDI Fiber-Optic OE Receiver with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

**RM20-9433EMDE-OE-A-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input (LC connector), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

**RM20-9433EMDE-OE-A-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input (LC connector), (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-OE-B** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (LC connector), (8) Balanced AES Audio I/O, Unbalanced AES I/O (via HD-15 connector)

**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.

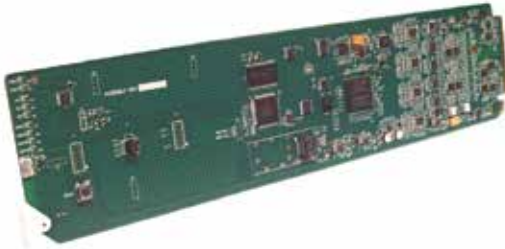


**RM20-9433EMDE-OE-B**



**9433-EMDE-ADDA-E00E » 3G/HD/SD-SDI FIBER-OPTIC TRANSCEIVER**

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed



The Cobalt® **9433-EMDE-ADDA-E00E 3G/HD/SD-SDI Fiber-Optic Transceiver** with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed offers full-flexibility AES and analog audio embedding/de-embedding with the built-in versatility of both coaxial and fiber SDI I/O in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-ADDA-E00E offers the flexibility of SDI/Fiber EO – OE transceiver as well as providing fully flexible AES and analog audio embedding/de-embedding.

The 9433-EMDE-ADDA-E00E provides full 16-channel embed / de-embed between AES, 8-channel analog audio, and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Analog embed/de-embed conforms with professional balanced audio at 0 dBFS to pro 24 dBu levels using full 24-bit conversion. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. The 9433-EMDE-ADDA-E00E is available with numerous CWDM wavelengths that allow the card to be used with CWDM systems. Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Versatile EO - OE fiber transceiver with fiber and coax as both inputs and outputs

16-channel AES support and 8-channel analog audio support in one card. Individual per-pair embedding or de-embedding. Provides four-group SDI embed/de-embed and cross-conversions between analog and AES discrete audio.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

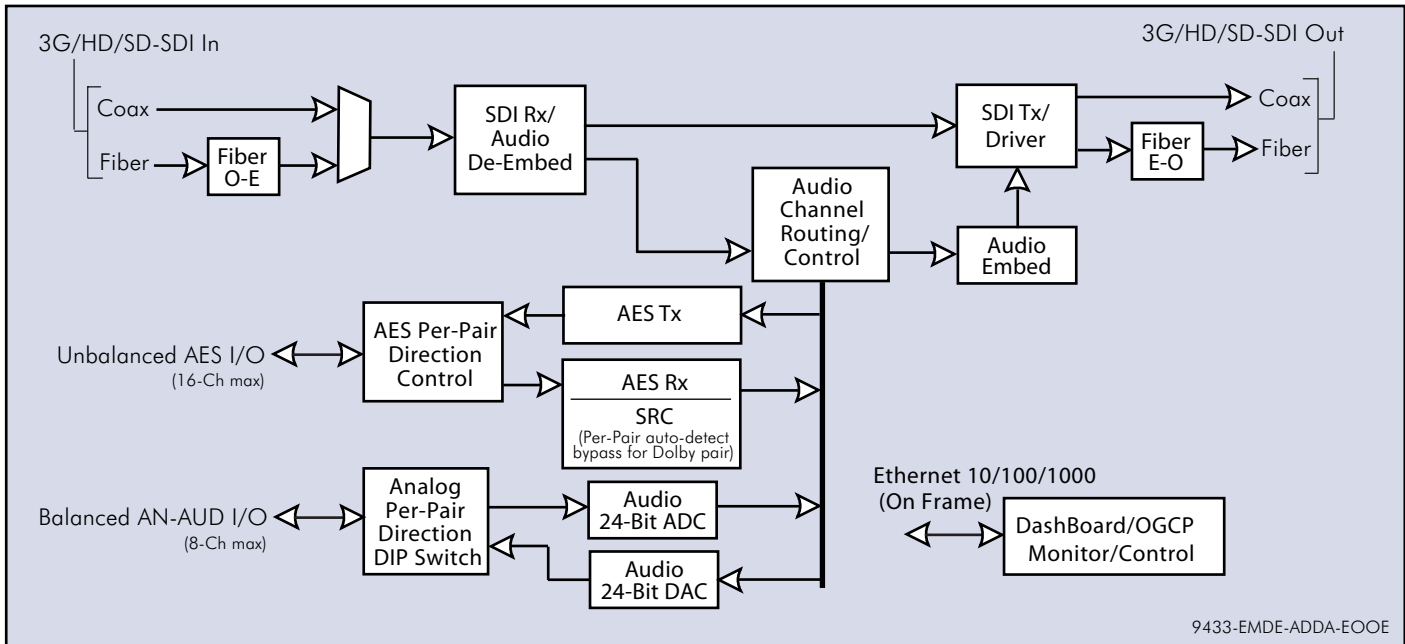
Low-power/high-density design – less than 18 Watts per card

Available with CWDM wavelength divisions allowing use in CWDM systems

Remote control/monitoring via DashBoard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



9433-EMDE-ADDA-E00E



# 9433-EMDE-ADDA-E00E » 3G/HD/SD-SDI FIBER-OPTIC TRANSCIVER

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

### Power

<18 Watts

### SDI/Fiber Inputs/Outputs

- (1) 75Ω BNC inputs
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- (1) Fiber input; LC connector
- (1) Fiber output; LC connector
- Fiber Wavelength, Tx: 1310 nm
- Receive Sensitivity: -23 dBm; 1260 to 1620 nm
- Tx Power: -5.0 dBm (min)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

### Audio Conversion Format

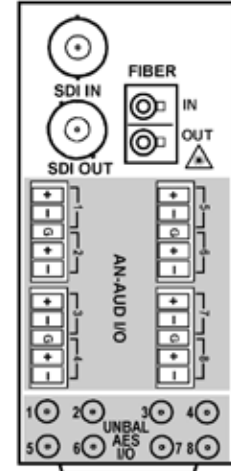
48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs. Analog audio I/O conforms to +24 dBu <=> 0 dBFS.

### Analog Audio Specifications

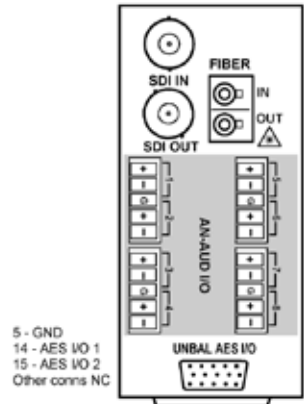
- Input Impedance: >10 kΩ
- Reference Level: -20 dBFS
- Nominal Level: +4 dBu
- Input Clip Level: +24 dBu (0 dBFS)
- Freq. Response: ±0.2 dB (20 Hz to 20 kHz)
- SNR: 115 dB (A weighted)
- THD+N: -96 dB (20 Hz to 10 kHz)
- Crosstalk: -106 dB (20 Hz to 20 kHz)
- Output Impedance: < 50 Ω
- Max. Output Level: +24 dBu (0 dBFS)

### Discrete Audio Input/Output

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced Analog Audio with per-pair port direction controls



**RM20-9433EMDE-E00E-C-DIN**  
**RM20-9433EMDE-E00E-C-HDBNC**



**RM20-9433EMDE-E00E-D**

## ORDERING INFORMATION

**9433-EMDE-ADDA-E00E** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

**9433-EMDE-ADDA-E00E-CWDM-WX** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed with Fiber Optic CWDM I/O

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm -29: 1290nm -31: 1310nm -33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm -45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm -57: 1570nm -59: 1590nm -61: 1610nm

(Example: 9433-EMDE-ADDA-E00E-27 has 1270 nm FIBER OUT wavelength)

**RM20-9433EMDE-E00E-C-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

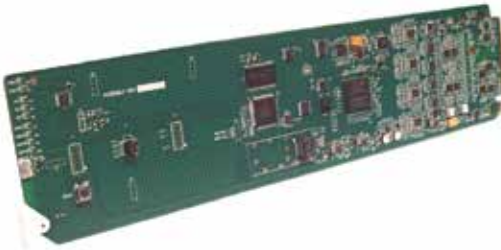
**RM20-9433EMDE-E00E-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-E00E-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, Unbalanced AES I/O (via HD-15 connector)

**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.

**9433-EMDE-ADDA-EO » 3G/HD/SD-SDI FIBER-OPTIC EO TRANSMITTER**

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed



The Cobalt® **9433-EMDE-ADDA-EO 3G/HD/SD-SDI Fiber-Optic EO Transmitter** with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed offers full-flexibility AES and analog audio embedding/de-embedding with SDI-to-fiber EO in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-ADDA-EO offers the flexibility of SDI-to-fiber EO as well as providing fully flexible AES and analog audio embedding/de-embedding.

The 9433-EMDE-ADDA-EO provides full 16-channel embed / de-embed between AES, 8-channel analog audio, and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Analog embed/de-embed conforms with professional balanced audio at 0 dBFS to pro 24 dBu levels using full 24-bit conversion. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. The 9433-EMDE-ADDA-EO is available with numerous CWDM wavelengths that allow the card to be used with CWDM systems.

Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

EO fiber transmitter with fiber and coax as outputs

16-channel AES support and 8-channel analog audio support in one card. Individual per-pair embedding or de-embedding. Provides four-group SDI embed/de-embed and cross-conversions between analog and AES discrete audio.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

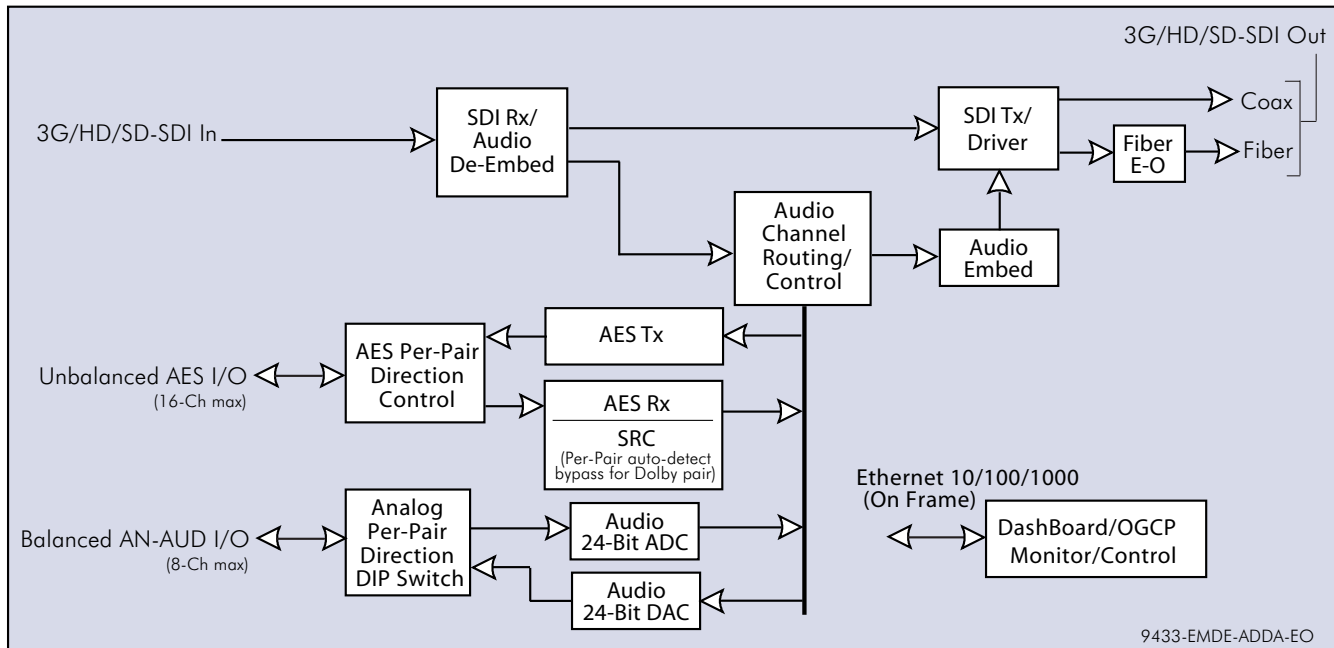
Low-power/high-density design – less than 18 Watts per card

Available with CWDM wavelength divisions allowing use in CWDM systems

Remote control/monitoring via DashBoard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



# 9433-EMDE-ADDA-EO » 3G/HD/SD-SDI FIBER-OPTIC EO TRANSMITTER

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

## SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

### Power

<18 Watts

### SDI/Fiber Inputs/Outputs

- (1) 75Ω BNC input
- (1) 75Ω BNC output
- SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)
- SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz
- Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.
- Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI
- Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI
- (1) Fiber output; LC connector
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

### Audio Conversion Format

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs. Analog audio I/O conforms to +24 dBu <=> 0 dBFS.

### Analog Audio Specifications

- Input Impedance: >10 kΩ
- Reference Level: -20 dBFS
- Nominal Level: +4 dBu
- Input Clip Level: +24 dBu (0 dBFS)
- Freq. Response: ±0.2 dB (20 Hz to 20 kHz)
- SNR: 115 dB (A weighted)
- THD+N: -96 dB (20 Hz to 10 kHz)
- Crosstalk: -106 dB (20 Hz to 20 kHz)
- Output Impedance: < 50 Ω
- Max. Output Level: +24 dBu (0 dBFS)

### Discrete Audio Input/Output

- (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
- (8) Balanced Analog Audio with per-pair port direction controls

## ORDERING INFORMATION

**9433-EMDE-ADDA-EO** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

**9433-EMDE-ADDA-EO-CWDM-WX** 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed with Fiber Optic CWDM I/O

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

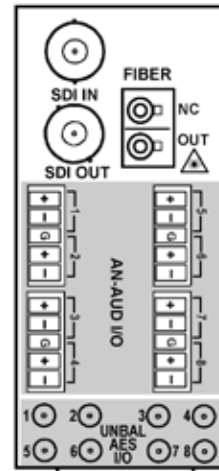
(Example: 9433-EMDE-ADDA-EO-CWDM-27 has 1270 nm FIBER OUT wavelength)

**RM20-9433EMDE-EO-C-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

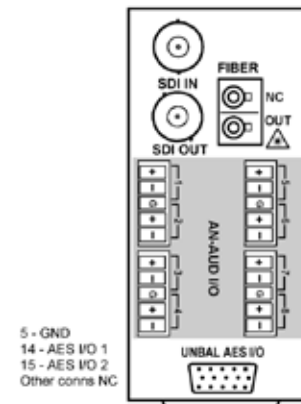
**RM20-9433EMDE-EO-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-EO-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Output (LC connectors), (8) Balanced Analog Audio I/O, Unbalanced AES I/O (via HD-15 connector)

**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.



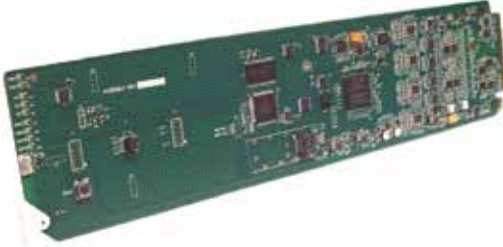
**RM20-9433EMDE-EO-C-DIN**  
**RM20-9433EMDE-EO-C-HDBNC**



**RM20-9433EMDE-EO-D**

**9433-EMDE-ADDA-OE » 3G/HD/SD-SDI FIBER-OPTIC OE RECEIVER**

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed



The Cobalt® **9433-EMDE-ADDA-OE 3G/HD/SD-SDI Fiber-Optic OE Receiver** with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed offers full-flexibility AES and analog audio embedding/de-embedding with the built-in versatility of both coaxial and fiber SDI inputs in a basic, economical, high-efficiency openGear® card. More than only a basic embedder/de-embedder, the 9433-EMDE-ADDA-OE offers the flexibility of fiber to-SDI OE receive as well as providing fully flexible AES and analog audio embedding/de-embedding.

The 9433-EMDE-ADDA-OE provides full 16-channel embed / de-embed between AES, 8-channel analog audio, and all four groups of embedded audio. Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with program video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair. Analog embed/de-embed conforms with professional balanced audio at 0 dBFS to pro 24 dBu levels using full 24-bit conversion. Fully error-free pathological pattern operation is fully compatible with professional fiber video interfaces. Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

OE fiber receiver with fiber and coax as inputs

16-channel AES support and 8-channel analog audio support in one card. Individual per-pair embedding or de-embedding. Provides four-group SDI embed/de-embed and cross-conversions between analog and AES discrete audio.

DashBoard™ status display, audio meters, tone generators. GUI audio meters provide ready assessment of content presence and line-up.

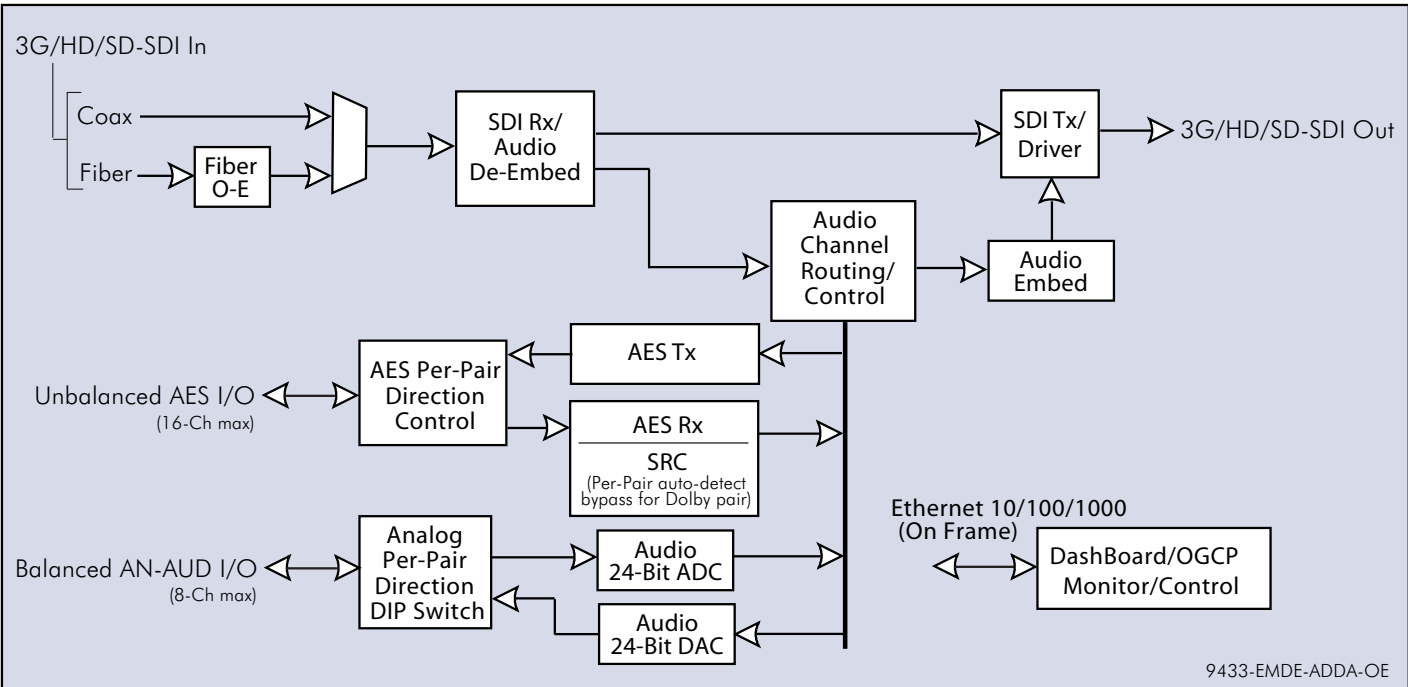
Audio embed adaptive SRC allows asynchronous 48 kHz AES audio to automatically sync with video 48 kHz timing for glitch-free embedding. Individual, per-pair SRC auto-detects and disables SRC when a Dolby pair is detected on an input pair.

Low-power/high-density design – less than 18 Watts per card

Remote control/monitoring via DashBoard™ software or OGCP-9000 remote control panels

Hot-swappable

Five year warranty



## 9433-EMDE-ADDA-OE » 3G/HD/SD-SDI FIBER-OPTIC OE RECEIVER

with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

### SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

#### Power

<18 Watts

#### SDI/Fiber Inputs/Outputs

(1) 75Ω BNC inputs

(1) 75Ω BNC output

SDI Receive Cable Length (1694A): 120m/180m/360m (3G/HD/SD)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

Note: SDI Return loss and receive cable length are affected by rear I/O module used. Specifications represent typical performance.

Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI

Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

(1) Fiber input; LC connector

Receive Sensitivity: -23 dBm; 1260 to 1620 nm

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

#### Audio Conversion Format

48 kHz sampling, 24-bit. Auto-SRC bypass for Dolby inputs. Analog audio I/O conforms to +24 dBu <=> 0 dBFS.

#### Analog Audio Specifications

Input Impedance: >10 kΩ

Reference Level: -20 dBFS

Nominal Level: +4 dBu

Input Clip Level: +24 dBu (0 dBFS)

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

SNR: 115 dB (A weighted)

THD+N: -96 dB (20 Hz to 10 kHz)

Crosstalk: -106 dB (20 Hz to 20 kHz)

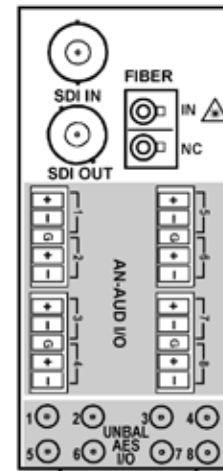
Output Impedance: < 50 Ω

Max. Output Level: +24 dBu (0 dBFS)

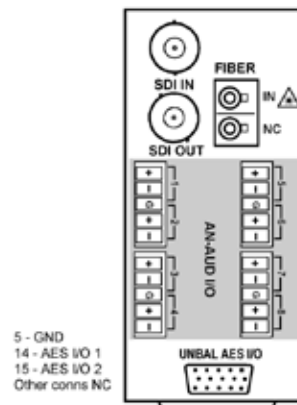
#### Discrete Audio Input/Output

(8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls

(8) Balanced Analog Audio with per-pair port direction controls



**RM20-9433EMDE-OE-C-DIN**  
**RM20-9433EMDE-OE-C-HDBNC**



**RM20-9433EMDE-OE-D**

5 - GND  
14 - AES I/O 1  
15 - AES I/O 2  
Other conns NC

### ORDERING INFORMATION

**9433-EMDE-ADDA-OE** 3G/HD/SD-SDI Fiber-Optic OE Receiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

**RM20-9433EMDE-OE-C-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input (LC connector), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

**RM20-9433EMDE-OE-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input (LC connector), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9433EMDE-OE-D** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, (1) Fiber Input, (8) Balanced Analog Audio I/O, Unbalanced AES I/O (via HD-15 connector)

**Note:** Rear module(s) have been available in two manufacturing versions (with correspondingly different MPN numbers). New cards with SN: 450452R or greater use the current/latest rear module version. Earlier-version and latest-version rear modules and cards are mutually incompatible. Manufacturing Part Number (MPN) is screened on the rear module PCB. See card web page for more information.

FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-EO » 3G/HD/SD-SDI / ASI / MADI FIBER EO TRANSPORT/DISTRIBUTION AMPLIFIER**  
with Full-Flexibility Crosspoint



The Cobalt® **9410DA-EO 3G/HD/SD-SDI / ASI / MADI Fiber EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint** provides a card-based solution for high-density conversion from coax to fiber, as well as coaxial distribution. The 9410DA-EO is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

An SFP-based EO converter provides state-of-the-art fiber performance, power consumption, and compactness. A crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows the card to apply any of the card inputs to various coax DA outputs as well as a fiber output. Up to 9 flexibly-sourced coaxial DA outputs are available per each card.

Using a high-density low-power design along with a high-density split rear module, up to 20 cards can be installed in a frame, providing 20 channels of EO conversion as well as up to 180 coaxial DA outputs. Excellent receive performance allows coaxial receive EQ for up to 110m 3G, 180m HD, and 360m SD cable length (1694A). Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Fully-flexible coaxial crosspoint/DA provides up to 9 copies per card. Crosspoint can select from any card input.

Excellent coax receive performance – EQ allows 1694A cable lengths up to 110m (3G) / 180m (HD) / 360m (SD)

SFP-based EO converter provides state-of-the-art fiber performance, power consumption, and compactness.

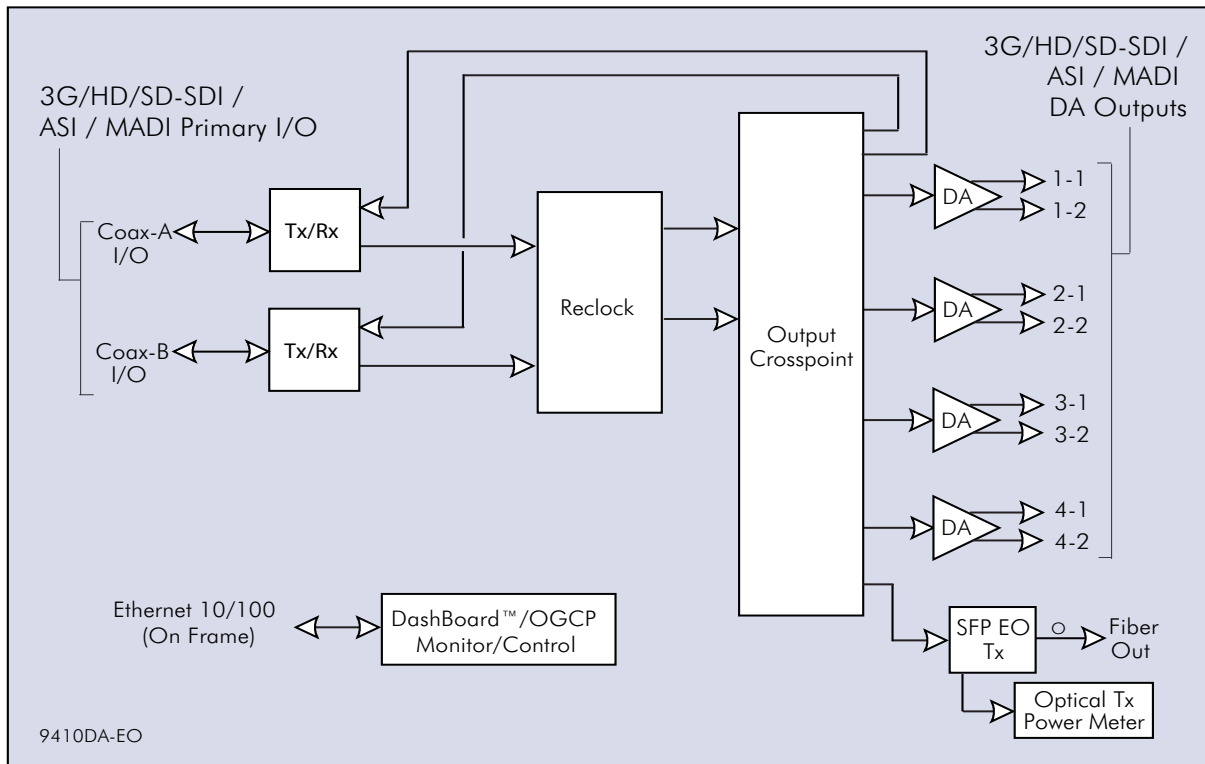
Automatic reclocking for all SDI data rates (auto-bypass for non-SDI data rates)

Optical Tx power status field allows optical transmit confidence assessment

All outputs are non-inverting – ASI can be outputted on any output

DashBoard™ status and full remote control

Five year warranty



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-EO » 3G/HD/SD-SDI / ASI / MADI FIBER EO TRANSPORT/DISTRIBUTION AMPLIFIER**  
with Full-Flexibility Crosspoint

**SPECIFICATIONS**

Note: Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

**Power**

< 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**

(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Coaxial Receive Performance (Cable Length; Belden 1694A)**

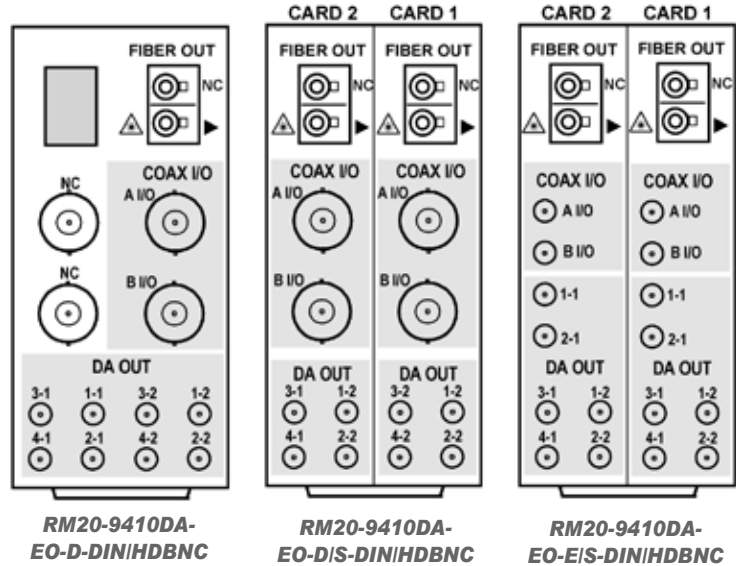
SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD)

**Fiber Transmit Output**

(1) Fiber output; LC connector  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

**3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)**

Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.  
Signal Level: 800 mV nominal  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI



**ORDERING INFORMATION**

**9410DA-EO** 3G/HD/SD-SDI / ASI / MADI Fiber EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint

**9410DA-EO-CWDM-WX** 3G/HD/SD-SDI / ASI / MADI Fiber EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint (CWDM)

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

In "WX" places in part number, substitute code for wavelengths in each place as listed below:

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

(Example: 9410DA-EO-CWDM-27 has 1270 nm FIBER OUT CWDM wavelength)

**RM20-9410-EO-D-DIN** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber out (LC connector), (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) (Note: Mates to card in odd frame slot.) (Note: This rear module supersedes -B model (which is discontinued).

**RM20-9410-EO-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber out (LC connector), (8) DA coaxial outputs (DA output connectors are HD-BNC) (Note: Mates to card in odd frame slot.) (Note: This rear module supersedes -B model (which is discontinued).

**RM20-9410DA-EO-D/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber out (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are DIN1.0/2.3) (Note: This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-EO-D/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber out (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are HD-BNC) (Note: This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-EO-E/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber out (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (Note: This rear module supersedes -C/S model (which is discontinued).

**RM20-9410DA-EO-E/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber out (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (Note: This rear module supersedes -C/S model (which is discontinued).



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-OE » 3G/HD/SD-SDI / ASI / MADI FIBER OE TRANSPORT/DISTRIBUTION AMPLIFIER**  
with Full-Flexibility Crosspoint



The Cobalt® **9410DA-OE 3G/HD/SD-SDI / ASI / MADI Fiber OE Transport/Distribution Amplifier with Full-Flexibility Crosspoint** provides a card-based solution for high-density conversion from fiber to coax, as well as coaxial distribution. The 9410DA-OE is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

An SFP-based OE converter provides state-of-the-art fiber performance, power consumption, and compactness. A crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows the card to apply any of the card inputs to various coax DA outputs. Up to 10 flexibly-sourced coaxial DA outputs are available per each card.

Using a high-density low-power design along with a high-density split rear module, up to 20 cards to be installed in a frame, providing 20 channels of OE fiber conversion as well as up to 200 coaxial DA outputs. Excellent receive performance allows receive EQ for up to 110m 3G, 180m HD, and 360m SD cable length (1694A). Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Fully-flexible coaxial crosspoint/DA provides up to 10 copies per card. Crosspoint can select from any card input.

Excellent coax receive performance - EQ allows 1694A cable lengths up to 110m (3G) / 180m (HD) / 360m (SD)

Input user selectable as fiber or coaxial

SFP-based OE converter provides state-of-the-art fiber performance, power consumption, and compactness.

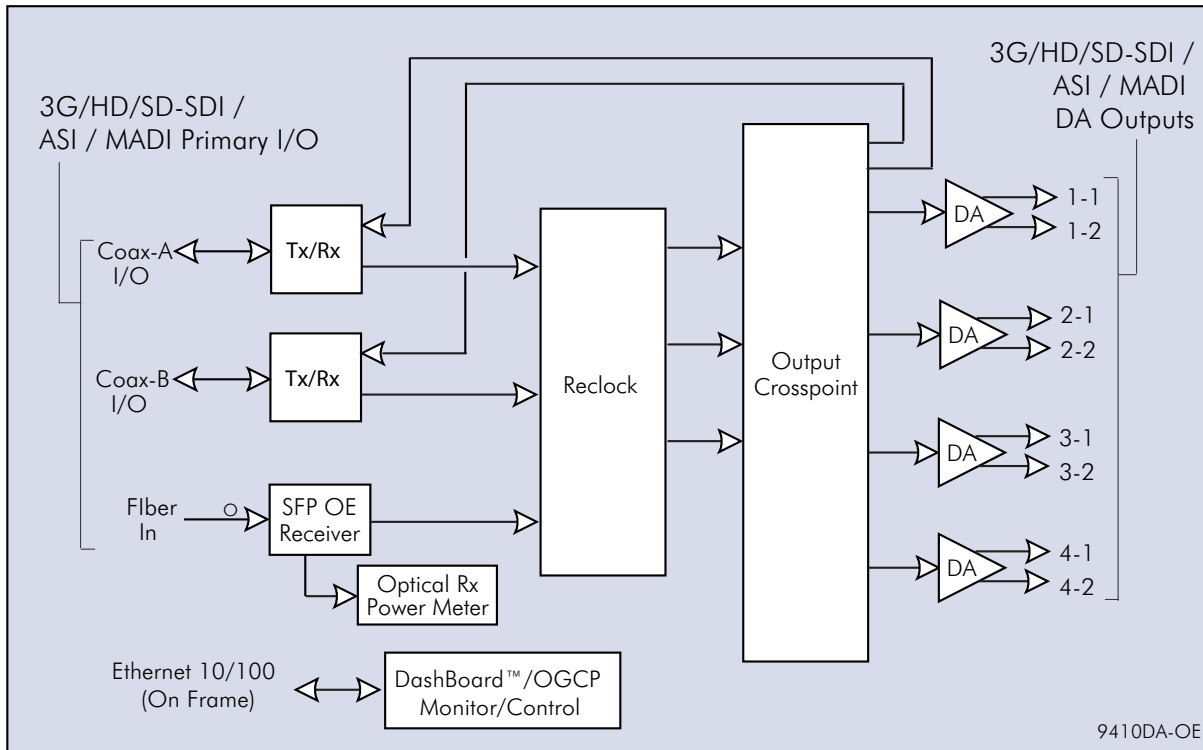
Automatic reclocking for all SDI data rates (auto-bypass for non-SDI data rates)

Optical Rx receive power status field allows optical receive assessment

All outputs are non-inverting - ASI can be outputted on any output

DashBoard™ status and full remote control

Five year warranty



9410DA-OE



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-OE » 3G/HD/SD-SDI / ASI / MADI FIBER OE TRANSPORT/DISTRIBUTION AMPLIFIER**  
with Full-Flexibility Crosspoint

**SPECIFICATIONS**

**Note:** Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

**Power**

< 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**

(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Coaxial Receive Performance (Cable Length; Belden 1694A)**

SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD)

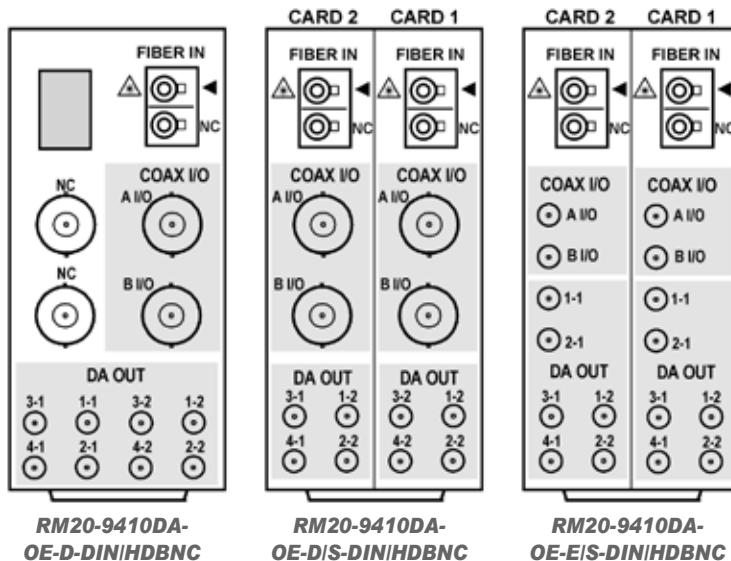
**Fiber Receive Input**

(1) Fiber input; LC connector  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm (with internal power meter status display)

**3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)**

Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.

Signal Level: 800 mV nominal  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI



**ORDERING INFORMATION**

**9410DA-OE** 3G/HD/SD-SDI / ASI / MADI Fiber OE Transport/Distribution Amplifier with Full-Flexibility Crosspoint

**RM20-9410-OE-D-DIN** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber in (LC connector), (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410-OE-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber in (LC connector), (8) DA coaxial outputs (DA output connectors are HD-BNC) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410DA-OE-D/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-OE-D/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are HD-BNC) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-OE-E/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -C/S model (which is discontinued).

**RM20-9410DA-OE-E/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (**Note:** This rear module supersedes -C/S model (which is discontinued).

FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-2EO » 3G/HD/SD-SDI / ASI / MADI FIBER DUAL EO TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoints



The Cobalt® **9410DA-2EO 3G/HD/SD-SDI / ASI / MADI Fiber Dual EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint** provides a card-based solution for high-density conversion from coax to fiber (with two independent EO channels), as well as coaxial distribution. The 9410DA-2EO is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

SFP-based EO converters provide state-of-the-art fiber performance, power consumption, and compactness. A crosspoint (which is user-configurable via Dashboard™ GUI remote control) allows the card to apply any of the card inputs to various coax DA outputs as well as two independent fiber output channels. Up to 9 flexibly-sourced coaxial DA outputs are available per each card.

Using a high-density low-power design along with a high-density split rear module, up to 20 cards can be installed in a frame, providing 40 channels of EO conversion as well as up to 180 coaxial DA outputs. Excellent receive performance allows coaxial receive EQ for up to 110m 3G, 180m HD, and 360m SD cable length (1694A). Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Dual independent coax-to-fiber channels. Fiber outputs can be sourced from any card coaxial input.

Full support of 3G/HD/SD-SDI and ASI/DVB

Fully-flexible coaxial crosspoint/DA provides up to 9 copies per card. Crosspoint can select from any card input.

Excellent coax receive performance - EQ allows 1694A cable lengths up to 110m (3G) / 180m (HD) / 360m (SD)

SFP-based EO converters provide state-of-the-art fiber performance, power consumption, and compactness.

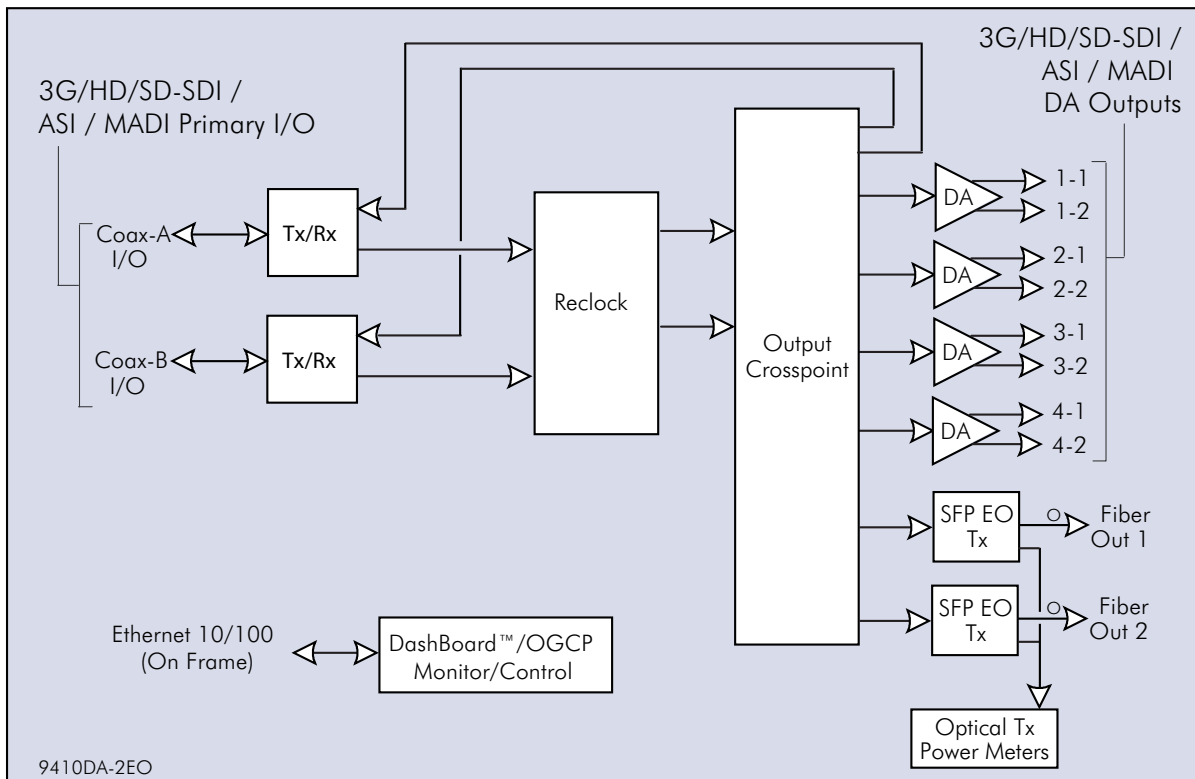
Automatic reclocking for all SDI data rates (auto-bypass for non-SDI data rates)

Optical Tx power status fields allow optical transmit confidence assessment

All outputs are non-inverting - ASI can be outputted on any output

Dashboard™ status and full remote control

Five year warranty



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-2EO » 3G/HD/SD-SDI / ASI / MADI FIBER DUAL EO TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoints

**SPECIFICATIONS**

**Note:** Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

**Power**

< 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**

(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Coaxial Receive Performance (Cable Length; Belden 1694A)**

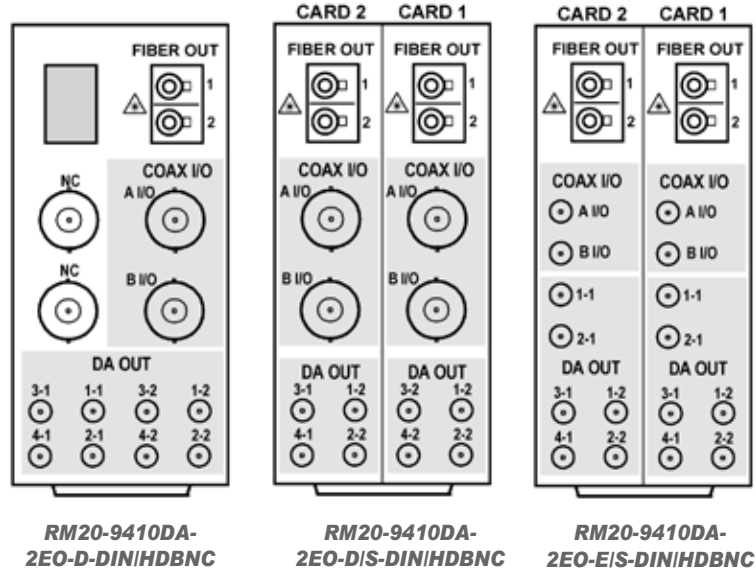
SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD)

**Fiber Transmit Output**

(2) Fiber outputs (independent paths from card crosspoint); LC connectors  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

**3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)**

Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.  
Signal Level: 800 mV nominal  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI



**ORDERING INFORMATION**

**9410DA-2EO** 3G/HD/SD-SDI / ASI / MADI Fiber Dual EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint

**9410DA-2EO-CWDM-WXWX** 3G/HD/SD-SDI / ASI / MADI Fiber Dual EO Transport/Distribution Amplifier with Full-Flexibility Crosspoint (CWDM)

Use fiber wavelength codes below for card Fiber Optic Modules (FOMs) when ordering. Available wavelengths (in nm) are as follows: 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610.

In "WX" places in part number, substitute code for wavelengths in each place as listed below. First set of codes sets wavelength for FIBER OUT 1; 2nd set of codes sets wavelength for FIBER OUT 2:

- 27: 1270nm -29: 1290nm -31: 1310nm
- 33: 1330nm -35: 1350nm -37: 1370nm
- 39: 1390nm -41: 1410nm -43: 1430nm
- 45: 1450nm -47: 1470nm -49: 1490nm
- 51: 1510nm -53: 1530nm -55: 1550nm
- 57: 1570nm -59: 1590nm -61: 1610nm

(Example: 9410DA-2EO-CWDM--2733 has 1270 nm FIBER OUT 1 and 1330 nm FIBER OUT 2 CWDM wavelengths)

**RM20-9410-2EO-D-DIN** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (2) Fiber out (LC connectors), (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410-2EO-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (2) Fiber out (LC connectors), (8) DA coaxial outputs (DA output connectors are HD-BNC) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410DA-2EO-D/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber out (LC connectors), (4) DA coaxial outputs (connections are per card; DA output connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-2EO-D/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber out (LC connectors), (4) DA coaxial outputs (connections are per card; DA output connectors are HD-BNC) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-2EO-E/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber out (LC connectors), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -C/S model (which is discontinued).

**RM20-9410DA-2EO-E/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber out (LC connectors), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (**Note:** This rear module supersedes -C/S model (which is discontinued).

FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-20E » 3G/HD/SD-SDI / ASI / MADI FIBER DUAL OE TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoints



The Cobalt® **9410DA-20E 3G/HD/SD-SDI / ASI / MADI Fiber Dual OE Transport/Distribution Amplifier with Full-Flexibility Crosspoint** provides a card-based solution for high-density conversion from fiber to coax (with two independent OE channels), as well as coaxial distribution. The 9410DA-20E is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

SFP-based OE converters provide state-of-the-art fiber performance, power consumption, and compactness. A crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows the card to apply any of the card inputs to various coax DA outputs as well as two independent fiber input channels. Up to 10 flexibly-sourced coaxial DA outputs are available per each card.

Using a high-density low-power design along with a high-density split rear module, up to 20 cards can be installed in a frame, providing 40 channels of OE fiber conversion as well as up to 200 coaxial DA outputs. Excellent receive performance allows receive EQ for up to 110m 3G, 180m HD, and 360m SD cable length (1694A). Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Dual independent fiber-to-coax input channels. Fiber inputs can serve as source for any card coaxial outputs.

Full support of 3G/HD/SD-SDI and ASI/DVB

Fully-flexible coaxial crosspoint/DA provides up to 10 copies per card. Crosspoint can select from any card input.

Excellent coax receive performance – EQ allows 1694A cable lengths up to 110m (3G) / 180m (HD) / 360m (SD)

Input user selectable as fiber or coaxial

SFP-based OE converters provide state-of-the-art fiber performance, power consumption, and compactness.

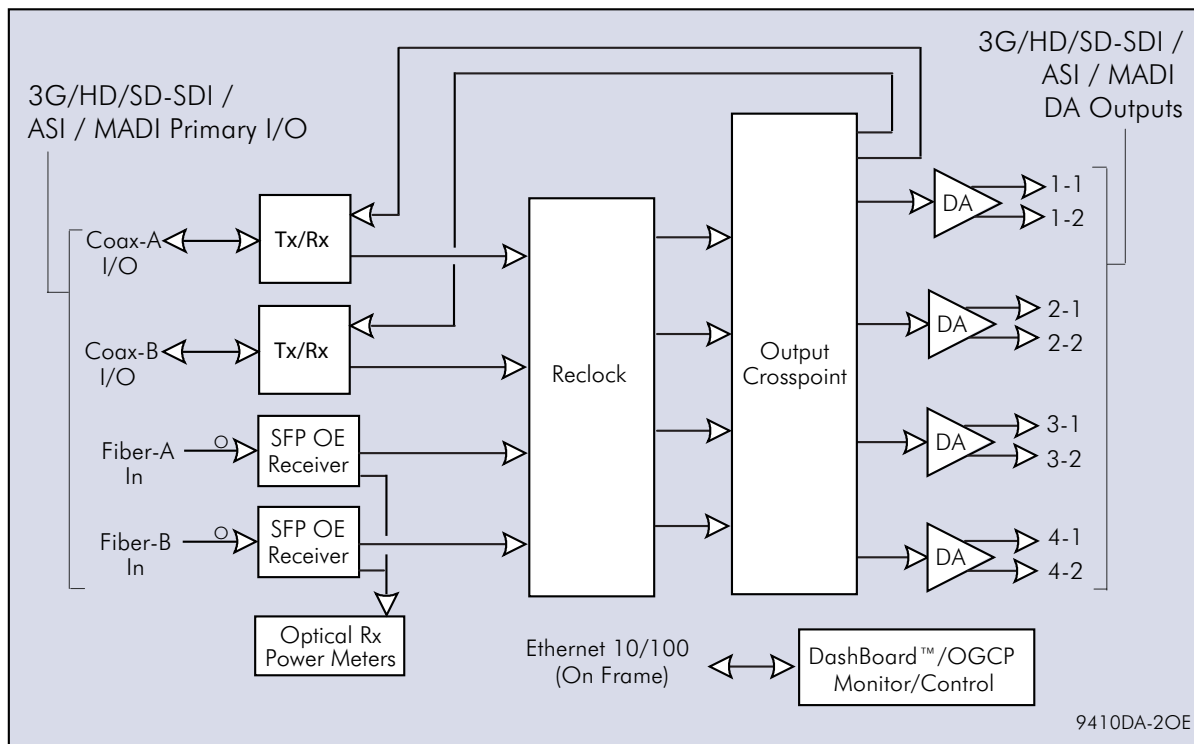
Automatic relocking for all SDI data rates (auto-bypass for non-SDI data rates)

Optical Rx receive power status fields allow optical receive assessment

All outputs are non-inverting – ASI can be outputted on any output

DashBoard™ status and full remote control

Five year warranty



9410DA-20E



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-20E » 3G/HD/SD-SDI / ASI / MADI FIBER DUAL OE TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoints

**SPECIFICATIONS**

**Note:** Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

**Power**

< 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**

(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Coaxial Receive Performance (Cable Length; Belden 1694A)**

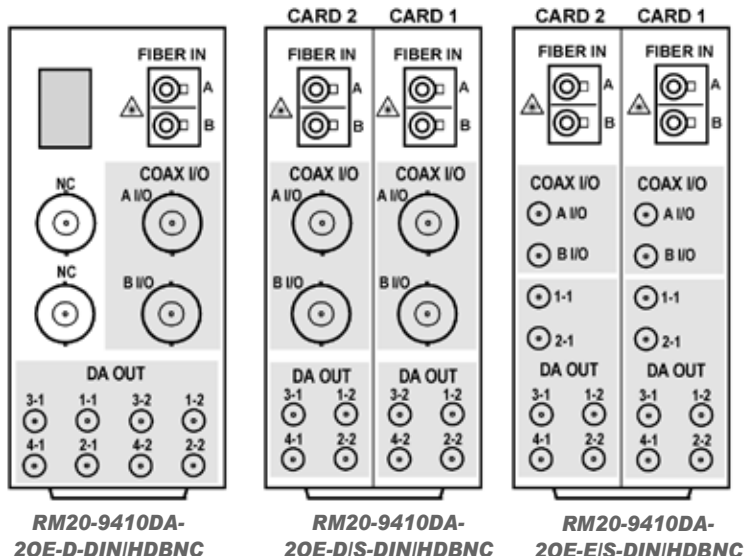
SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD)

**Fiber Receive Input**

(2) Fiber input; LC connectors  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm (with internal power meter status display)

**3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)**

Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.  
Signal Level: 800 mV nominal  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI



**ORDERING INFORMATION**

**9410DA-20E** 3G/HD/SD-SDI / ASI / MADI Fiber Dual OE Transport/Distribution Amplifier with Full-Flexibility Crosspoint

**RM20-9410-20E-D-DIN** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (2) Fiber in (LC connectors), (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).)

**RM20-9410-20E-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (2) Fiber in (LC connectors), (8) DA coaxial outputs (DA output connectors are HD-BNC) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).)

**RM20-9410DA-20E-D/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber in (LC connectors), (4) DA coaxial outputs (connections are per card; DA output connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -B/S model (which is discontinued).)

**RM20-9410DA-20E-D/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber in (LC connectors), (4) DA coaxial outputs (connections are per card; DA output connectors are HD-BNC) (**Note:** This rear module supersedes -B/S model (which is discontinued).)

**RM20-9410DA-20E-E/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber in (LC connectors), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -C/S model (which is discontinued).)

**RM20-9410DA-20E-E/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (2) Fiber in (LC connectors), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (**Note:** This rear module supersedes -C/S model (which is discontinued).)

FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-E00E » 3G/HD/SD-SDI / ASI / MADI FIBER EOOE TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoint



The Cobalt® **9410DA-E00E 3G/HD/SD-SDI / ASI / MADI Fiber EOOE Transport/Distribution Amplifier with Full-Flexibility Crosspoint** provides a card-based solution for high-density conversion between coax and fiber, as well as coaxial distribution. The 9410DA-E00E is multi-rate, and supports SDI and ASI/DVB on all inputs and outputs with non-inverting outputs.

SFP-based EO and OE converters provide state-of-the-art fiber performance, power consumption, and compactness. A crosspoint (which is user-configurable via DashBoard™ GUI remote control) allows the card to apply any of the card inputs to various coax DA outputs as well as a fiber output. Up to 10 flexibly-sourced coaxial DA outputs are available per each card. Because the card's fiber input and output can be linked to any channel handled by the card, independent EO and OE paths are available with true independent EOOE transceiver operation.

Using a high-density low-power design along with a high-density split rear module, up to 20 cards can be installed in a frame, providing 20 channels of EO and OE conversion as well as up to 200 coaxial DA outputs. Excellent receive performance allows coaxial receive EQ for up to 110m 3G, 180m HD, and 360m SD cable length (1694A). Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

**FEATURES**

Full support of 3G/HD/SD-SDI and ASI/DVB

Fully-flexible coaxial crosspoint/DA provides up to 10 copies per card. Crosspoint can select from any card input.

Independent fiber receiver and transmitters can be linked to any card channel, offering full EOOE transceiver operation

Excellent coax receive performance - EQ allows 1694A cable lengths up to 110m (3G) / 180m (HD) / 360m (SD)

SFP-based EO/OE converters provide state-of-the-art fiber performance, power consumption, and compactness

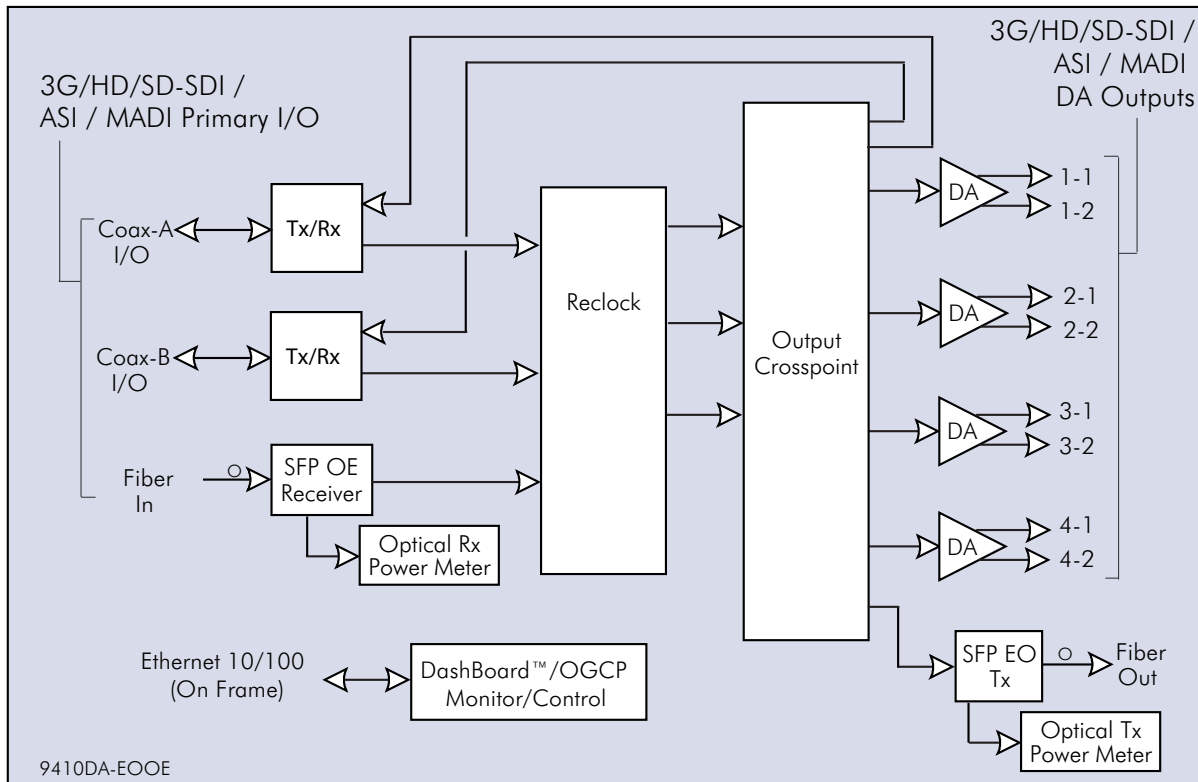
Automatic reclocking for all SDI data rates (auto-bypass for non-SDI data rates)

All outputs are non-inverting - ASI can be outputted on any output

Optical Tx and Rx power status fields allow optical Tx/Rx confidence assessment

DashBoard™ status and full remote control

Five year warranty



FIBER EO/OE CONVERTERS WITH COAXIAL DISTRIBUTION AMPLIFIERS

**9410DA-E00E » 3G/HD/SD-SDI / ASI / MADI FIBER E00E TRANSPORT/ DISTRIBUTION AMPLIFIER** with Full-Flexibility Crosspoint

**SPECIFICATIONS**

**Note:** Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

**Power**

< 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**

(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

**Coaxial Receive Performance (Cable Length; Belden 1694A)**

SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD)

**Fiber Transmit Output**

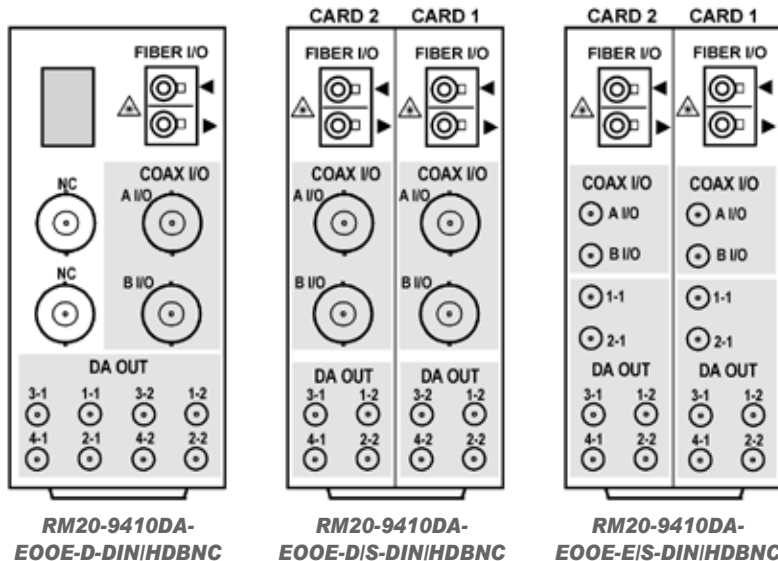
(1) Fiber output; LC connector  
Fiber Wavelength, Tx: 1310 nm  
Tx Power: -5.0 dBm (min)

**Fiber Receive Input**

(1) Fiber input; LC connector  
Receive Sensitivity: -23 dBm; 1260 to 1620 nm (with internal power meter status display)

**3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)**

Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.  
Signal Level: 800 mV nominal  
Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI



**ORDERING INFORMATION**

**9410DA-E00E** 3G/HD/SD-SDI / ASI / MADI Fiber E00E Transport/Distribution Amplifier with Full-Flexibility Crosspoint

**RM20-9410-E00E-D-DIN** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410-E00E-D-HDBNC** 20-Slot Frame Rear I/O Module (Standard-Width). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (8) DA coaxial outputs (DA output connectors are HD-BNC) (**Note:** Mates to card in **odd** frame slot.) (**Note:** This rear module supersedes -B model (which is discontinued).

**RM20-9410DA-E00E-D/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-E00E-D/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (4) DA coaxial outputs (connections are per card; DA output connectors are HD-BNC) (**Note:** This rear module supersedes -B/S model (which is discontinued).

**RM20-9410DA-E00E-E/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (**Note:** This rear module supersedes -C/S model (which is discontinued).

**RM20-9410DA-E00E-E/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/outputs, (1) Fiber in (LC connector), (1) Fiber out (LC connector), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (**Note:** This rear module supersedes -C/S model (which is discontinued).



**BBG-EO-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT TRANSMITTER**



The Blue Box **BBG-EO-MK2 Coax-to-Fiber** throw-down converter unit is a new part of the BlueBox™ group of compact, rugged, and portable converter boxes. Super-easy to use, Blue Box BBG-EO-MK2 supports SMPTE 424M, 292M, and 259M as well as ASI and MADI audio. Auto-mode EQ/reclocking automatically sets to the signal type being received while allowing unrecognized formats to be safely passed without reclocking (auto-reclock can also be manually disabled). Its wide operating range (from 5Mbps to 3Gbps) flexibly supports most professional digital serial communications. Fully error-free pathological pattern operation is fully compatible with other professional fiber video interfaces. An SFP-based EO converter provides state-of-the-art fiber performance, power consumption, and compactness.

BBG-EO-MK2 receives its operating power via a USB connection or using an AC adapter connection. These power sources can be simultaneously used to provide redundant power sourcing.

**FEATURES**

Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode EQ/reclocking. No switches to set for different payloads.

Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio

Input lock status indicator. Optical Tx power meter field allows optical Tx confidence assessment.

Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards.

Compact size and low weight design easily affixes directly to camera or host device chassis. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.

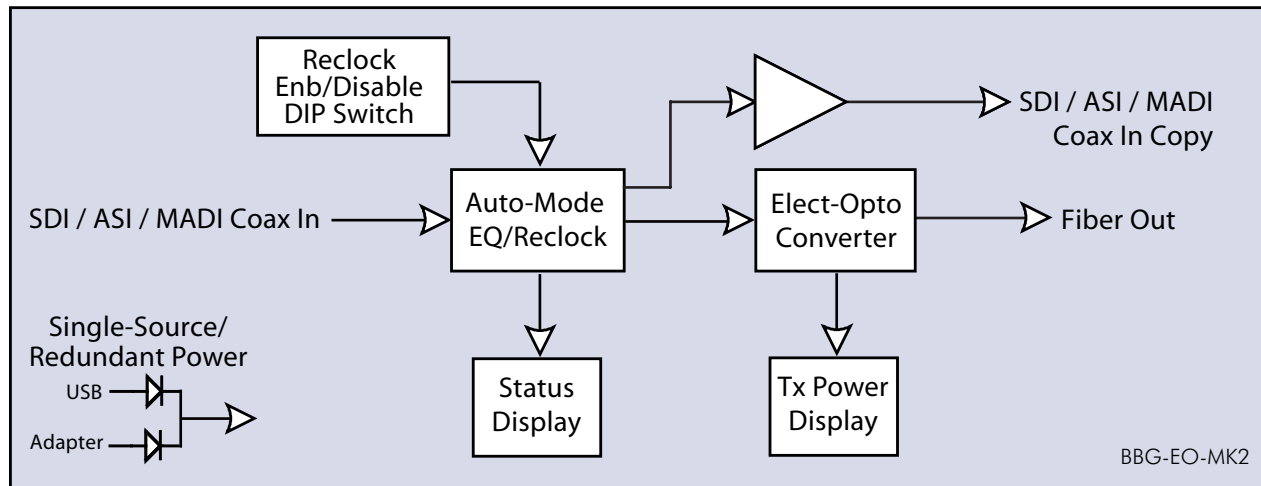
SFP-based EO converter provides state-of-the-art fiber performance, power consumption, and compactness

Available with ST, LC, or FC fiber termination

Auxiliary reclocked coax BNC input copy output

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Rugged construction backed with a five-year warranty



BBG-EO-MK2



ALSO AVAILABLE: **BBG-EO-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transmitter

[LEARN MORE](#)

**BBG-EO-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT TRANSMITTER**

**SPECIFICATIONS**

**Power**

5-16 VDC, 2.4 W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Standards/Data Rates Supported**

SMPTE 424M, 292M, 259M, 344M, 305M, DVB-ASI  
 5Mbps to 3Gbps pathological pattern operation  
 (does not support AES-3id audio or other standards using data rates < 5Mbps)

**Inputs**

(1) 75Ω BNC. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Outputs**

(1) Fiber output. FC, ST, or LC connectors per ordered configuration (see Ordering Info)  
 Wavelength: 1310 nm  
 Power: -5.0 dBm (min)  
 (1) 75Ω BNC input copy. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**Note:** Specifications subject to change.

**ORDERING INFORMATION**

- BBG-EO-MK2-FC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transmitter (Type FC fiber connector)
- BBG-EO-MK2-ST** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transmitter (Type ST fiber connector)
- BBG-EO-MK2-LC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transmitter (Type LC fiber connector)

**BBG-MB** Mounting Bracket

**ALSO AVAILABLE: BBG-EO-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transmitter

[LEARN MORE](#)

**BBG-OE-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT RECEIVER**



The Blue Box™ **BBG-OE-MK2 Fiber-To-Coax** throw-down converter unit is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. Super-easy to use, BBG-OE-MK2 supports SMPTE 424M, 292M, and 259M as well as ASI and MADI audio. Auto-mode EQ/reclocking automatically sets to the signal type being received while allowing unrecognized formats to be safely passed without reclocking (auto-reclock can also be manually disabled). Its wide operating range (from 5Mbps to 3Gbps) flexibly supports most professional digital serial communications. Fully error-free pathological pattern operation is fully compatible with other professional fiber video interfaces. An SFP-based OE converter provides state-of-the-art fiber performance, power consumption, and compactness.

BBG-OE-MK2 receives its operating power via a USB connection or using an AC adapter connection. These power sources can be simultaneously used to provide redundant power sourcing.

**FEATURES**

Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode EQ/reclocking. No switches to set for different payloads.

Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio

Input lock status indicator. Optical Rx power meter field allows optical Rx confidence assessment.

Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards.

Compact size and low weight design easily affixes directly to camera or host device chassis. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.

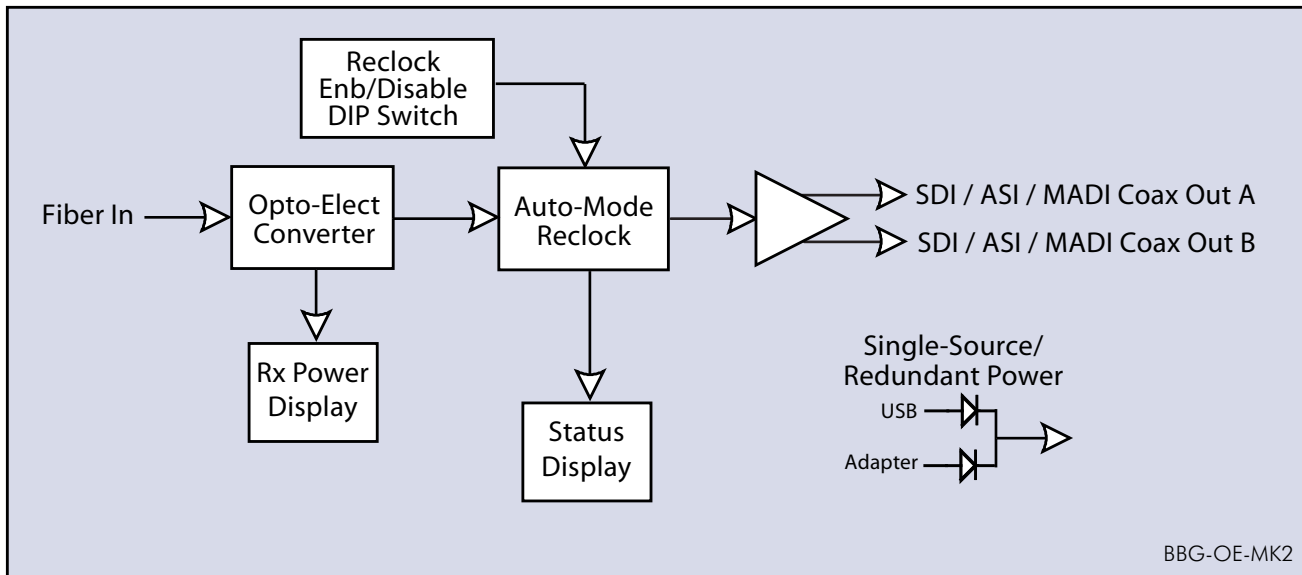
SFP-based OE converter provides state-of-the-art fiber performance, power consumption, and compactness

Available with ST, LC, or FC fiber termination

Dual buffered/reclocked coax BNC outputs

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Rugged construction backed with a five-year warranty



BBG-OE-MK2



ALSO AVAILABLE: **BBG-OE-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver

[LEARN MORE](#)

**BBG-OE-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT RECEIVER**

**SPECIFICATIONS**

**Power**

5-16 VDC, 2.4 W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Standards/Data Rates Supported**

SMPTE 424M, 292M, 259M, 344M, 305M, DVB-ASI  
 5Mbps to 3Gbps pathological pattern operation  
 (does not support AES-3id audio or other standards using data rates < 5Mbps)

**Input**

(1) Fiber input. FC, ST, or LC connectors per ordered configuration (see Ordering Info)  
 Wavelength: 1260 to 1620 nm  
 Sensitivity/Input Usable Range: -18 dBm min; -1dBm max

**Outputs**

(2) 75Ω BNC. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**Note:** Specifications subject to change.

**ORDERING INFORMATION**

**BBG-OE-MK2-FC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type FC fiber connector)

**BBG-OE-MK2-ST** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type ST fiber connector)

**BBG-OE-MK2-LC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type LC fiber connector)

**BBG-MB** Mounting Bracket

**ALSO AVAILABLE: BBG-OE-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver

[LEARN MORE](#)

BLUEBOX™ COMPACT THROWDOWN FIBER EO / OE CONVERTERS

**BBG-2EO-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC DUAL TRANSPORT TRANSMITTER**



The **BBG-2EO-MK2 Dual Coax-To-Fiber** throw-down converter unit is a new part of the Blue Box group of compact, rugged, and portable converter boxes. Super-easy to use, Blue Box Dual Coax-To-Fiber supports SMPTE 424M, 292M, and 259M as well as ASI and MADI audio on two independent coax-to-fiber paths. Auto-mode EQ/reclocking automatically sets to the signal type being received while allowing unrecognized formats to be safely passed without reclocking (auto-reclock can also be manually disabled for either path as desired). Its wide operating range (from 5Mbps to 3Gbps) flexibly supports most professional digital serial communications. Fully error-free pathological pattern operation is fully compatible with other professional fiber video interfaces. SFP-based EO converters provide state-of-the-art fiber performance, power consumption, and compactness.

BBG-2EO-MK2 receives its operating power via a USB connection or using an AC adapter connection. These power sources can be simultaneously used to provide redundant power sourcing.

**FEATURES**

- Dual independent fiber-to-coax paths – all in one easy to use throw-down box

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- Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode EQ/reclocking. No switches to set for different payloads.

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- Dual-channel input lock status indicators. Optical Tx power meter fields allow optical Tx confidence assessment.

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- Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards.

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- Available with ST, LC, or FC fiber termination

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- Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio

- Compact size and low weight design easily affixes directly to camera or host device chassis. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.

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- USB remote control/status in addition to device indicator and switches

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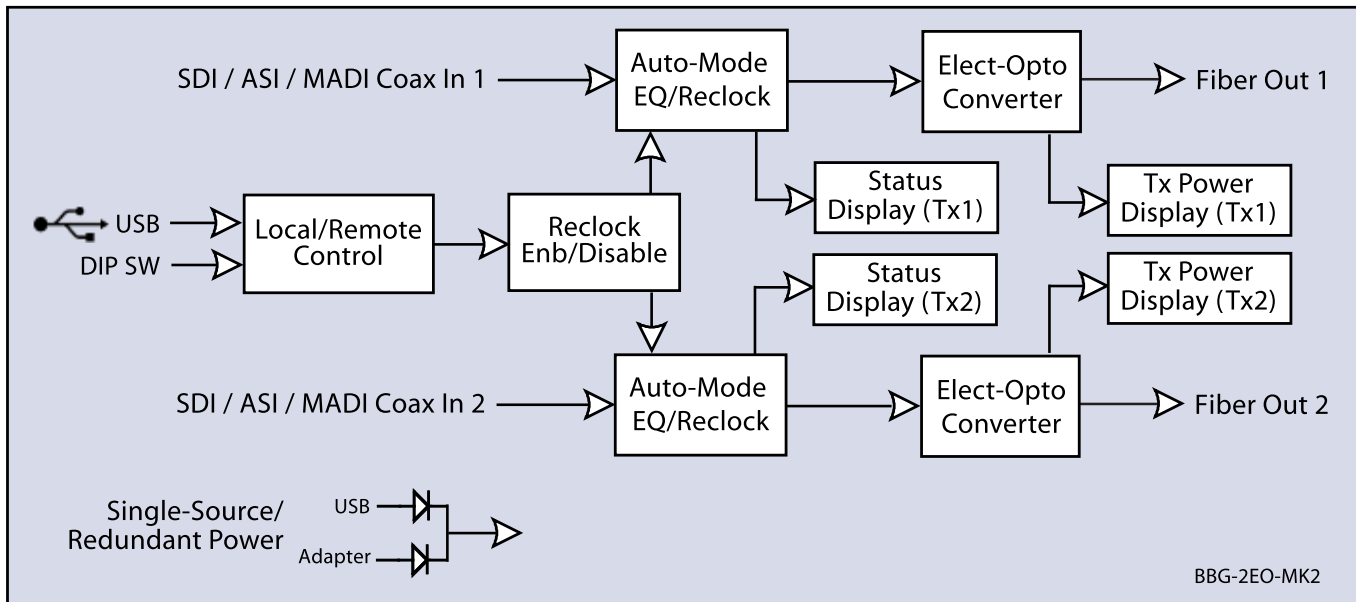
- SFP-based EO converters provide state-of-the-art fiber performance, power consumption, and compactness

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- Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

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- Rugged construction backed with a five-year warranty



BBG-2EO-MK2



ALSO AVAILABLE: **BBG-2EO-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter

[LEARN MORE](#)

**BBG-2EO-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC DUAL TRANSPORT TRANSMITTER**

**SPECIFICATIONS**

**Power**

5-16 VDC, 2.4 W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Standards/Data Rates Supported**

SMPTE 424M, 292M, 259M, 344M, 305M, DVB-ASI  
 5Mbps to 3Gbps pathological pattern operation  
 (does not support AES-3id audio or other standards using data rates < 5Mbps)

**Inputs**

(2) 75Ω BNCs. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Outputs**

(2) Fiber outputs. FC, ST, or LC connectors per ordered configuration (see Ordering Info)  
 Wavelength: 1310 nm  
 Power: -5.0 dBm (min)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**Note:** Specifications subject to change.

**ORDERING INFORMATION**

**BBG-2EO-MK2-FC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter (Type FC fiber connectors)

**BBG-2EO-MK2-ST** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter (Type ST fiber connectors)

**BBG-2EO-MK2-LC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter (Type LC fiber connectors)

**BBG-MB** Mounting Bracket

**ALSO AVAILABLE: BBG-2EO-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter

[LEARN MORE](#)

**BBG-20E-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC DUAL TRANSPORT RECEIVER**



The Blue Box **BBG-20E-MK2 Dual Fiber-To-Coax** throw-down converter unit is a new part of the Blue Box Group™ of compact, rugged, and portable converter boxes. Super-easy to use, Blue Box Dual Fiber-To-Coax supports SMPTE 424M, 292M, and 259M as well as ASI and MADI audio on two independent fiber-to-coax paths. Auto-mode EQ/reclocking automatically sets to the signal type being received while allowing unrecognized formats to be safely passed without reclocking (auto-reclock can also be manually disabled for either path as desired). Its wide operating range (from 5Mbps to 3Gbps) flexibly supports most professional digital serial communications. Fully error-free pathological pattern operation is fully compatible with other professional fiber video interfaces. SFP-based OE converters provide state-of-the-art fiber performance, power consumption, and compactness.

BBG-20E-MK2 receives its operating power via a USB connection or using an AC adapter connection. These power sources can be simultaneously used to provide redundant power sourcing.

**FEATURES**

Dual independent fiber-to-coax paths – all in one easy to use throw-down box

Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode reclocking. No switches to set for different payloads.

Available with ST, LC, or FC fiber termination

Dual-channel input lock status indicators. Optical Rx power meter fields allow optical Rx confidence assessment.

Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards.

Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio

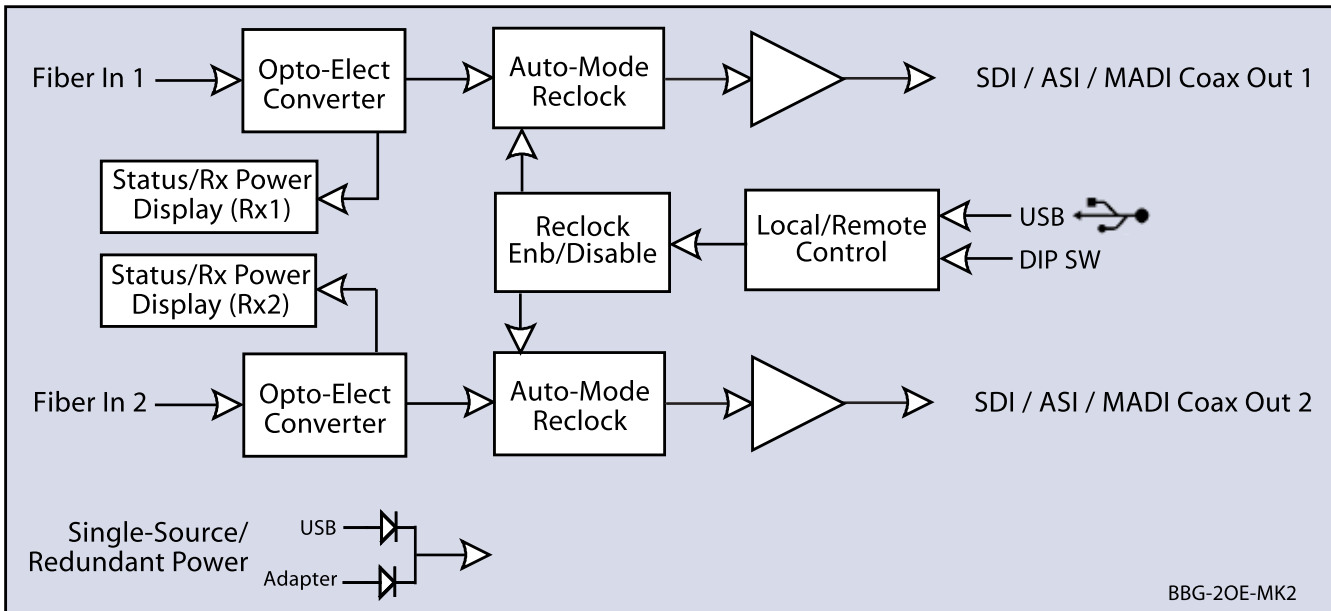
Compact size and low weight design easily affixes directly to camera or host device chassis. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.

USB remote control/status in addition to device indicator and switches

SFP-based OE converters provide state-of-the-art fiber performance, power consumption, and compactness

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Rugged construction backed with a five-year warranty



BBG-20E-MK2



ALSO AVAILABLE: **BBG-20E-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver

[LEARN MORE](#)

**BBG-20E-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC DUAL TRANSPORT RECEIVER**

**SPECIFICATIONS**

**Power**

5-16 VDC, 2.4 W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Standards/Data Rates Supported**

SMPTE 424M, 292M, 259M, 344M, 305M, DVB-ASI  
 5Mbps to 3Gbps pathological pattern operation  
 (does not support AES-3id audio or other standards using data rates < 5Mbps)

**Inputs**

2) Fiber input. FC, ST, or LC connectors per ordered configuration (see Ordering Info)  
 Wavelength: 1260 to 1620 nm  
 Sensitivity/Input Usable Range: -18 dBm min; -1dBm max

**Outputs**

(2) 75Ω BNC. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**Note:** Specifications subject to change.

**ORDERING INFORMATION**

**BBG-20E-MK2-FC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type FC fiber connectors)

**BBG-20E-MK2-ST** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type ST fiber connectors)

**BBG-20E-MK2-LC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type LC fiber connectors)

**BBG-MB** Mounting Bracket

**ALSO AVAILABLE: BBG-20E-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver

[LEARN MORE](#)



**BBG-E00E-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT TRANSCEIVER**



The Blue Box **BBG-E00E-MK2 Coax/Fiber Transceiver** throw-down converter unit is a new part of the BlueBox™ group of compact, rugged, and portable converter boxes. Super-easy to use, BBG-E00E-MK2 supports SMPTE 424M, 292M, and 259M as well as ASI and MADI audio on independent fiber-coax and coax-fiber paths. Auto-mode EQ/reclocking automatically sets to the signal type being received while allowing unrecognized formats to be safely passed without reclocking (auto-reclock can also be manually disabled for either path as desired). Its wide operating range (from 5Mbps to 3Gbps) flexibly supports most professional digital serial communications. Fully error-free pathological pattern operation is fully compatible with other professional fiber video interfaces. SFP-based EO and OE converters provide state-of-the-art fiber performance, power consumption, and compactness.

BBG-E00E-MK2 receives its operating power via a USB connection or using an AC adapter connection. These power sources can be simultaneously used to provide redundant power sourcing.

**FEATURES**

Independent companion fiber Rx and Tx paths – all in one easy to use throw-down box. 4-mode crosspoint provides for numerous coax/fiber conversions and routing schemes.

Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode EQ/reclocking. No switches to set for different payloads.

Available with ST, LC, or FC fiber termination

Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio

Dual-channel input lock status indicators. Optical Tx and Rx power status fields allow optical Tx/Rx confidence assessment.

Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards.

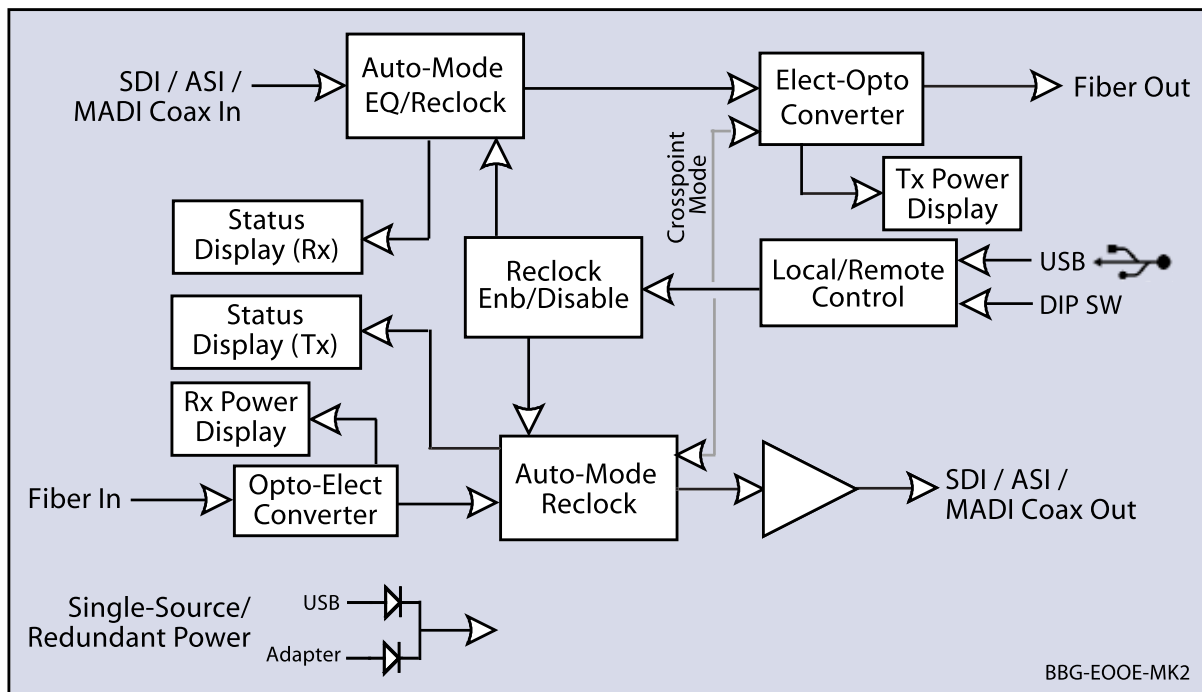
Compact size and low weight design easily affixes directly to camera or host device chassis. Optional BBG-MB mounting bracket provides rigid, secure mounting to mounting surfaces.

USB remote control/status in addition to device indicator and switches. USB BBGConfig app (free download) offers device alternate OEO mode.

SFP-based EO/OE converters provide state-of-the-art fiber performance, power consumption, and compactness

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Rugged construction backed with a five-year warranty



ALSO AVAILABLE: **BBG-E00E-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transceiver

[LEARN MORE](#)

**BBG-E00E-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC TRANSPORT TRANSCEIVER**

**SPECIFICATIONS**

**Power**

5-16 VDC, 2.4 W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Standards/Data Rates Supported**

SMPTE 424M, 292M, 259M, 344M, 305M, DVB-ASI  
 5Mbps to 3Gbps pathological pattern operation  
 (does not support AES-3id audio or other standards using data rates < 5Mbps)

**Input (Fiber-to-Coax Path; Fiber Receive)**

(1) Fiber input. FC, ST, or LC connectors per ordered configuration (see Ordering Info)  
 Wavelength: 1260 to 1620 nm  
 Sensitivity/Input Usable Range: -18 dBm min; -1dBm max

**Output (Fiber-to-Coax Path; Fiber Receive)**

(1) 75Ω BNC. Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Return Loss: >18 dBm up to 270 MHz

**Input (Coax-to-Fiber Path; Fiber Transmit)**

(1) 75Ω BNC  
 Return Loss: >18 dBm up to 270 MHz

**Output (Coax-to-Fiber Path; Fiber Transmit)**

(1) Fiber output. FC, ST, or LC connectors per ordered configuration (see Ordering Info). Reclocking automatically engaged for recognized signal standards; bypassed for unrecognized standards.  
 Wavelength: 1310 nm  
 Power: -5.0 dBm (min)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**Note:** Specifications subject to change.

**ORDERING INFORMATION**

**BBG-E00E-MK2-FC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transceiver (Type FC fiber connectors)

**BBG-E00E-MK2-ST** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transceiver (Type ST fiber connectors)

**BBG-E00E-MK2-LC** 3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transceiver (Type LC fiber connectors)

**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG-E00E-MK2 is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

**ALSO AVAILABLE: BBG-E00E-12G** 12G/6G/3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Transceiver

[LEARN MORE](#)

BLUEBOX™ COMPACT THROWDOWN FIBER EO / OE CONVERTERS

**BBG-SFP-SXH » 3G/HD/SD-SDI / ASI RECONFIGURABLE VIDEO SFP TRANSCEIVER**  
with Externally-Accessible SFP Module



The Blue Box **BBG-SFP-SXH** 3G/HD/SD-SDI / ASI Reconfigurable Video SFP Transceiver with Externally-Accessible SFP Module throw-down converter unit is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes.

The unprecedented flexibility of user-accessible, externally-mounted SFP modules on a throwdown unit makes BBG-SFP-SXH easily configurable as transceiver/converter between coaxial and fiber interfaces. The external SFP cage (along with numerous SFP choices) makes BBG-SFP-SXH virtually obsolescence-proof. BBG-SFP-SXH also features a 3G/HD/SD-SDI selectable input or output with SDI reclock copy and can convert SDI to HDMI. A convenience stereo analog audio de-embed output is also provided.

BBG-SFP-SXH can be configured using the device DIP switches or by using the intuitive BBGConfig GUI application that communicates with BBG-SFP-SXH over a PC's USB port. The GUI app allows dynamic configuration control, status display (including optical receive power where applicable), and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

Utmost in flexibility with external SFP cage. Configure to numerous media and format types with a simple SFP change using industry-standard Embrionix™ SFPs.

Direct conversion to HDMI from SMPTE 259M, 292M and 424M SDI

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

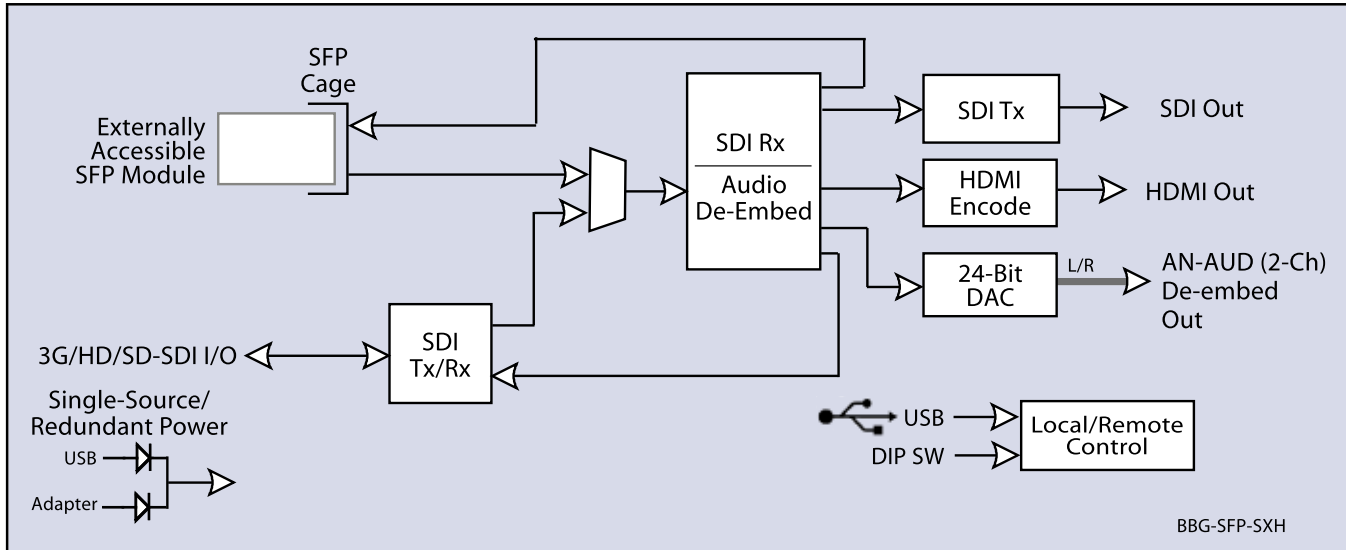
Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Wide range of available state-of-the-art Embrionix™ SFPs supported, offering fiber and coaxial options

Compact size and low weight design easily affixes directly to camera or host device chassis

Convenient 2-channel analog audio output

Rugged construction backed with a five-year warranty



**BLUEBOX™ COMPACT THROWDOWN FIBER EO / OE CONVERTERS**

**BBG-SFP-SXH » 3G/HD/SD-SDI / ASI RECONFIGURABLE VIDEO SFP TRANSCEIVER**  
with Externally-Accessible SFP Module

**SPECIFICATIONS**

**Standards Supported (SDI)**

SMPTE 259M, 292M, 424M

**Inputs/Outputs**

- (1) Bidirectional SFP external cage connector (supports Embrionix Video SFPs; see Ordering Info)
- (1) Bidirectional SDI / ASI BNC connector (mode user selectable)
- (1) SDI reclocked output
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)

**Fiber Tx/Rx Specifications**

Tx Wavelength (SPF EO, EOOE): 1310 nm  
 Tx Power (SFP EO, EOOE): -5.0 dBm (min)  
 Rx Sensitivity (SFP OE, EOOE): -23 dBm  
 Rx Wavelength Range (SFP OE, EOOE): 1260 to 1620 nm

**Audio Conversion Format**

48 kHz sampling, 24-bit  
 8-Ch HDMI to SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 5W  
 DC Power Connectors  
 USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
 (0°C to 50°C)

**ORDERING INFORMATION**

**BBG-SFP-SXH** 3G/HD/SD-SDI / ASI Reconfigurable Video SFP Transceiver with Externally-Accessible SFP Module

**Note:** Options denoted as "+" are software-based options which can be uploaded on new product when ordered. The SFP-IP-SWD SFP module is purposed to the types described and specified below using a corresponding factory software upload.

The following SFP modules are available for BBG-SFP-SXH (purchased and available separately):

- SFP-EO** Single-Channel Video Optical Transmitter (EO); Embrionix™ G02918
- SFP-OE** Single-Channel Video Optical Receiver (OE); Embrionix™ G02917
- SFP-EOOE** Single-Channel Video Optical Transceiver (EOOE); Embrionix™ G02929
- SFP-IP-SWD** Software-Defined EmSFP 2011/2022-6 Encap/De-Encap Host. 10GigE Multi-Mode Optical Interface with Female LC Duplex Connectors. The following I/O purposing software options are available for units using SFP type -SPF-IP-SWD:
- +**ADD-SFP-2SDI-TO-IP-2022-6** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2022-6
- +**ADD-SFP-2SDI-TO-IP-2110** SFP Software License; Dual-Channel Encapsulator 2SDI-to-IP-2110
- +**ADD-SFP-IP-TO-2SDI-2022-6** SFP Software License; Dual-Channel De-Encapsulator IP-2022-6-to-2SDI
- +**ADD-SFP-IP-TO-2SDI-2110** SFP Software License; Dual-Channel De-Encapsulator IP-2110-to-2SDI
- +**ADD-SFP-IP-TO-SDI-2022-6** SFP Software License; Single-Channel De-Encapsulator IP-2022-6-to-SDI
- +**ADD-SFP-IP-TO-SDI-2110** SFP Software License; Single-Channel De-Encapsulator IP-2110-to-SDI
- +**ADD-SFP-SDI-TO-IP-2022-6** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
- +**ADD-SFP-SDI-TO-IP-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

**Note:** The USB GUI application available for BBG-SFP-SXH is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. Currently, this application is available only for Windows Vista thru Windows 10.

**BBG-MB** Mounting Bracket

**Note:** Device includes one PS4 Power Supply (AC adapter). Power supplies listed below are for replacement or spares purposes:

- **PS4** Universal Power Supply, UL/CSA. Input: 100-240V, 60/50 Hz. Output: 5 VDC @ 12 Watts
- **PS5** Universal Power Supply, IEC Connector, CE/UL/CSA. Input: 100-240V, 60/50 Hz. Output: 5V, 2A (International Power Supply. Specify country of destination.)

**BBG-H-TO-F » 3G/HD/SD HDMI-TO-FIBER OPTIC CONVERTER**



The Blue Box™ **BBG-H-TO-F HDMI-to-Fiber** throw-down converter unit is a part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG-H-TO-F offers a compact throwdown unit that provides direct HDMI-to-fiber conversion and much more.

BBG-H-TO-F also provides a 3G/HD/SD-SDI output, and also provides a stereo analog audio embed input. The HDMI input can also receive and convert DVI-D sources (limited to SMPTE HD formats). Along with the analog audio embedding offered by BBG-H-TO-F, this allows a fiber and coax SDI output with embedded audio from DVI-D video sources.

BBG-H-TO-F can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-H-TO-F over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

Provides simultaneous HDMI-to-fiber and HDMI-to-coax SDI conversions. Accepts DVI-D input sources with SDI format conversions to coax and fiber SDI.

Direct conversion from HDMI to SMPTE 259M, 292M and 424M SDI

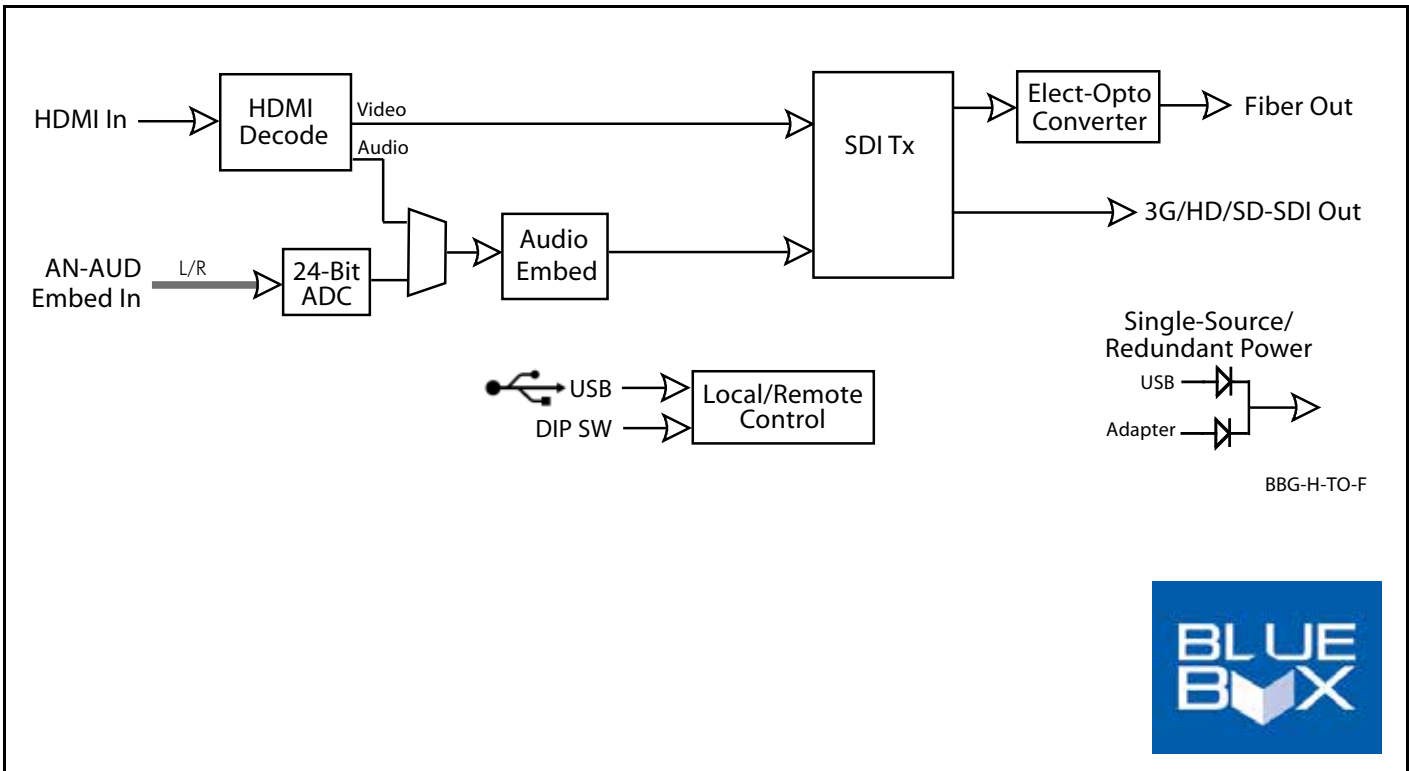
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Singlemode fiber link distance >10 km (3Gbps), >20 km (1.5Gbps), and >35 km (270Mbps). Multimode typically >200 m.

Rugged construction backed with a five-year warranty



## BBG-H-TO-F » 3G/HD/SD HDMI-TO-FIBER OPTIC CONVERTER

### SPECIFICATIONS

#### Standards Supported

SMPTE 259M, 292M, 424M

#### Inputs/Outputs

HDMI input (HDMI 1.4a compliant). DVI-D compliant input (limited to SMPTE HD formats).

(1) Fiber output. FC, ST, or LC connectors per ordered configuration (see Ordering Info).

(1) Stereo analog audio pair in (L/R unbalanced pair via 3.5mm TRS jack)

(1) SDI output

#### Audio Conversion Format

48 kHz sampling, 24-bit

8-Ch HDMI to SDI groups 1 and 2

#### Power Source

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

#### Power

5-16 VDC, 2.4 W

DC Power Connectors

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

#### USB Port

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

#### Dimensions (WxHxD)

5.5" x 3" x 1" (including connector projections)

(139 x 77 x 26 mm)

#### Operating Temperature Range

32°F to 122°F

(0°C to 50°C)

### ORDERING INFORMATION

**BBG-H-TO-F-FC** 3G/HD/SD HDMI-To-Fiber Optic Converter (Type FC fiber connector)

**BBG-H-TO-F-ST** 3G/HD/SD HDMI-To-Fiber Optic Converter (Type ST fiber connector)

**BBG-H-TO-F-LC** 3G/HD/SD HDMI-To-Fiber Optic Converter (Type LC fiber connector)

**BBG-MB** Mounting Bracket

**Note:** The USB GUI application available for BBG H-TO-F is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10

**BBG-F-TO-H » 3G/HD/SD-SDI FIBER OPTIC-TO-HDMI CONVERTER**



The Blue Box™ **BBG F-TO-H Fiber-To-HDMI** throw-down converter unit is a new part of the Blue Box Group™ of compact, rugged, and portable converter boxes. BBG F-TO-H offers a compact throwdown unit that provides direct fiber-To-HDMI conversion and much more.

The flexible built-in crosspoint and flexible I/O allows BBG-F-TO-H to also act as a fiber regen while providing an HDMI output. The HDMI output can be set to instead provide a DVI-D output directly compatible with computer monitors. The BBG-F-TO-H also can receive a coax SDI input (SMPTE 259M, 292M, and 424M) and in turn provide an HDMI and a fiber output. BBG F-TO-H can also provide a coax SDI output while converting fiber to HDMI. A convenience stereo analog audio de-embed output is also provided.

BBG-F-TO-H can be configured using the device DIP switches or by using an intuitive GUI application that communicates with BBG-F-TO-H over a PC's USB port. The GUI app allows dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages. When configured using the GUI app, the USB connection can be removed with all settings held in non-volatile device memory.

**FEATURES**

Flexible crosspoint and multiple inputs/outputs provide fiber-To-HDMI, SDI-To-fiber, and fiber regen conversions. HDMI output can be set as DVI-D for direct connection to computer monitors.

Direct conversion to HDMI from SMPTE 259M, 292M and 424M SDI

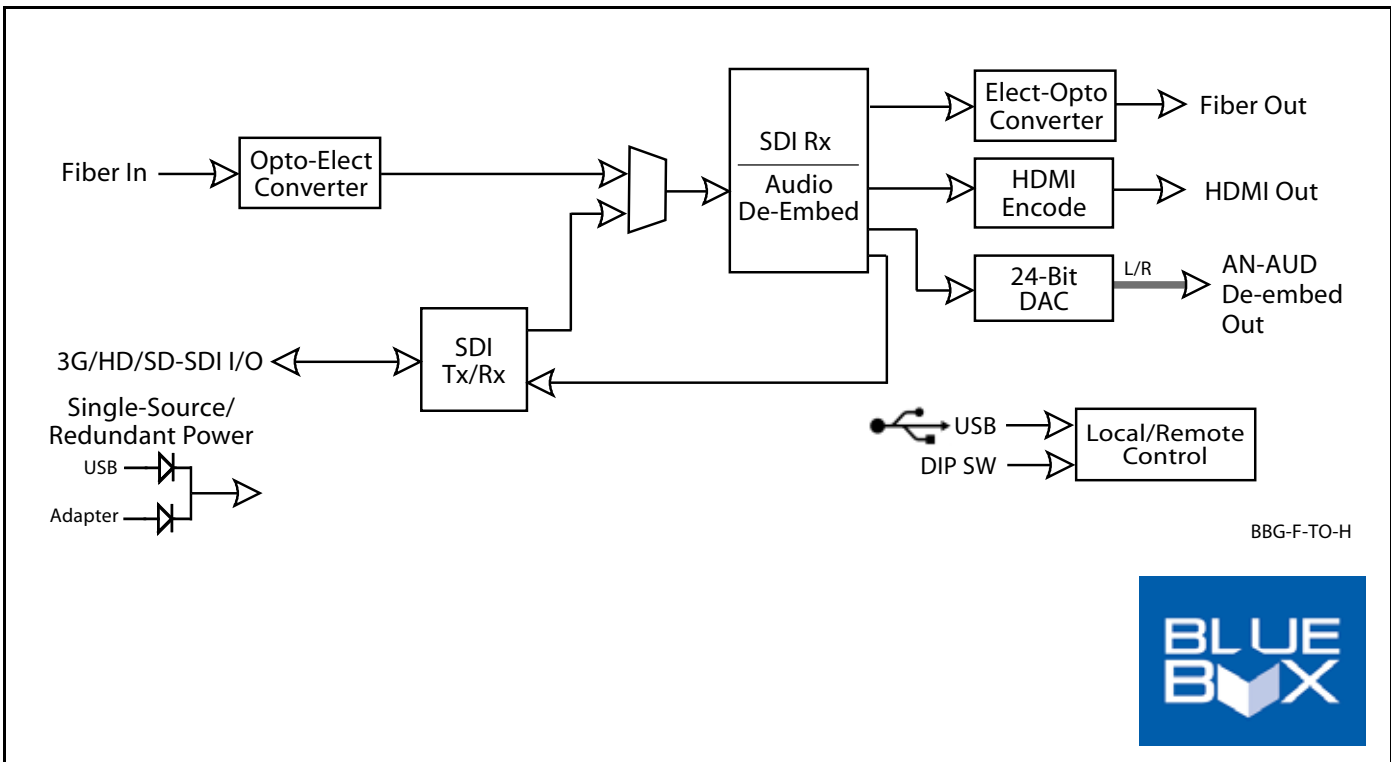
Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

Configurable using device DIP switches or USB GUI remote control offering dynamic configuration control, status display, and other advanced control functions not commonly found on "throwdown" packages

Compact size and low weight design easily affixes directly to camera or host device chassis

Singlemode fiber link distance >10 km (3Gbps), >20 km (1.5Gbps), and >35 km (270Mbps). Multimode typically >200 m.

Rugged construction backed with a five-year warranty



**BBG-F-TO-H » 3G/HD/SD-SDI FIBER OPTIC-TO-HDMI CONVERTER**

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M

**Inputs/Outputs**

- (1) Fiber input. FC, ST, or LC connectors per ordered configuration (see Ordering Info)
- (1) Fiber regen output. FC, ST, or LC connectors per ordered configuration (see Ordering Info)
- (1) SDI I/O (mode user selectable)
- (1) HDMI output (HDMI 1.4a compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).
- (1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)

**Audio Conversion Format**

48 kHz sampling, 24-bit  
8-Ch HDMI to SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 2.4 W  
DC Power Connectors  
USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**USB Port**

Mini-USB (used for power source, USB remote control connection, and firmware upgrade upload to device)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

32°F to 122°F  
(0°C to 50°C)

**ORDERING INFORMATION**

**BBG-F-TO-H-FC** 3G/HD/SD-SDI Fiber Optic-To-HDMI Converter (Type FC fiber connectors)

**BBG-F-TO-H-ST** 3G/HD/SD-SDI Fiber Optic-To-HDMI Converter (Type ST fiber connectors)

**BBG-F-TO-H-LC** 3G/HD/SD-SDI Fiber Optic-To-HDMI Converter (Type LC fiber connectors)

**BBG-MB** Mounting Bracket (see Product Downloads for downloading installation instruction sheet)

**Note:** The USB GUI application available for BBG F-TO-H is a free download (Windows Security Certified) that can be downloaded from our Support web page. Instructions for downloading and using the app are included in product documentation. The application is not required for device usage where only DIP switch configuration is desired.

Currently, this application is available for only the following operating systems:

- Windows Vista
- Windows 7
- Windows 8
- Windows 8.1
- Windows 10



**BBG-H-TO-S » HDMI-TO-3G/HD/SD-SDI WITH AUDIO EMBEDDER**



The Blue Box **BBG-H-TO-S** HDMI-to-SDI throw-down converter unit is a part of the BlueBox™ group of compact, rugged, and portable converter boxes.

Embedded audio on the 2x SDI output can be sourced from the HDMI input (channels 1-8) or from a line-level analog audio pair input. Along with the analog audio embedding offered by BBG H-To-S, this allows an SDI output with embedded audio using DVI-D video sources.

Blue Box can power directly via USB to get its power from video monitors or other equipment. Blue Box BBG H-To-S provides true 3G and HD conversions from HDMI to SMPTE 424M, 292M, or 259M. The HDMI input can also receive and convert DVI-D sources (limited to SMPTE HD formats).

**FEATURES**

Direct conversion from HDMI to SMPTE 259M, 292M and 424M SDI. Accepts DVI-D input sources with conversion to coax SDI.

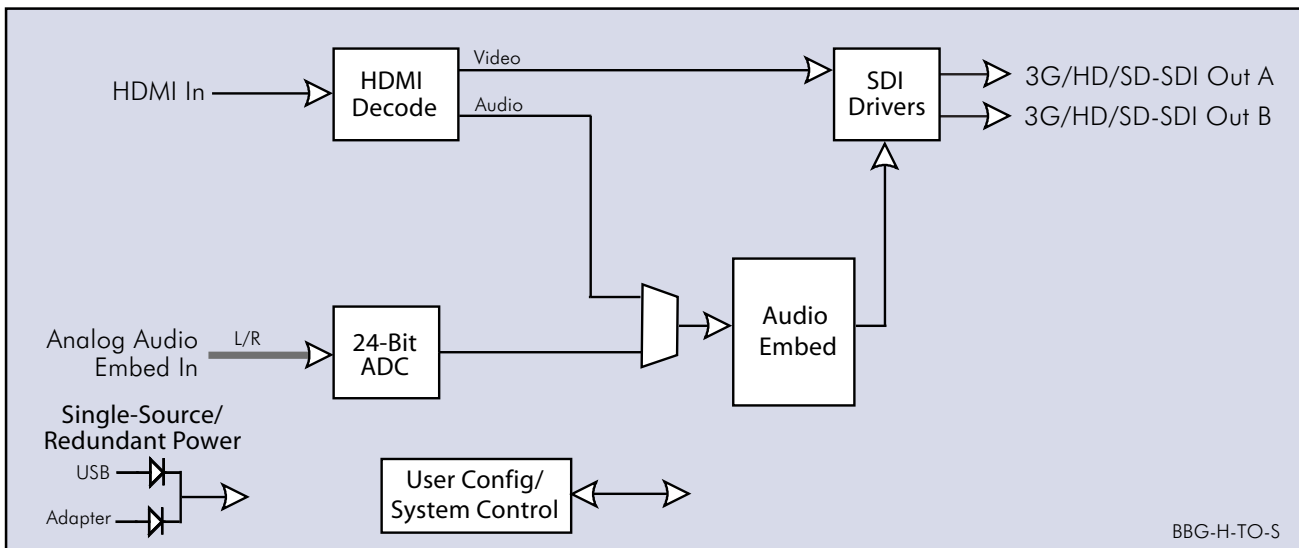
Compact size and low weight design easily affixes directly to camera or host device chassis

5.1-channel embedding from HDMI audio. Stereo analog audio embedding from stereo analog audio input pair.

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

2x SDI DA output

Rugged construction backed with a five-year warranty



**BBG-H-T0-S » HDMI-TO-3G/HD/SD-SDI WITH AUDIO EMBEDDER**

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M

**Inputs**

HDMI (HDMI 1.4a compliant). DVI-D compliant input (limited to SMPTE HD formats).  
 (2) analog audio (unbalanced consumer RCA)  
 DC power (via USB or adapter)

**Outputs**

(2) SDI (75Ω BNC)

**Latency Delay**

SD: <30 us  
 HD: <17 us  
 3G <8 us

**Audio Conversion Format**

48 kHz sampling, 24-bit  
 8-Ch HDMI to SDI groups 1 and 2

**Power Source**

Power-sourced directly from host equipment USB port. Converter can also be powered using corded AC adapter (included)

**Power**

5-16 VDC, 2.4 W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
 (139 x 77 x 26 mm)

**Operating Temperature Range**

-4°F to 158°F  
 (-20°C to 70°C)

**ORDERING INFORMATION**

**BBG-H-T0-S** HDMI-to-HD/SD-SDI with Audio Embedder Converter Unit

**BBG-MB** Mounting Bracket

**BBG-S-TO-H » 3G/HD/SD-SDI-TO-HDMI WITH AUDIO DE-EMBEDDER**



The Blue Box **BBG-S-TO-H** SDI-to-HDMI throw-down converter unit is a part of the BlueBox™ group of compact, rugged, and portable converter boxes.

Blue Box can power directly via USB to get its power from video monitors or other equipment. BBG-S-to-H provides direct conversion from SMPTE 259M, 292M and 424M SDI to HDMI. Easy to use DIP switch sets YPbPr or RGB colorspace and HDMI or DVI output modes.

Full group 1/2 conversion to HDMI audio is provided, with user control of C/LFE channel line-up as well as group 1/2 selected audio pair de-embed to a stereo line-level audio output pair.

**FEATURES**

Rugged construction backed with a five-year warranty

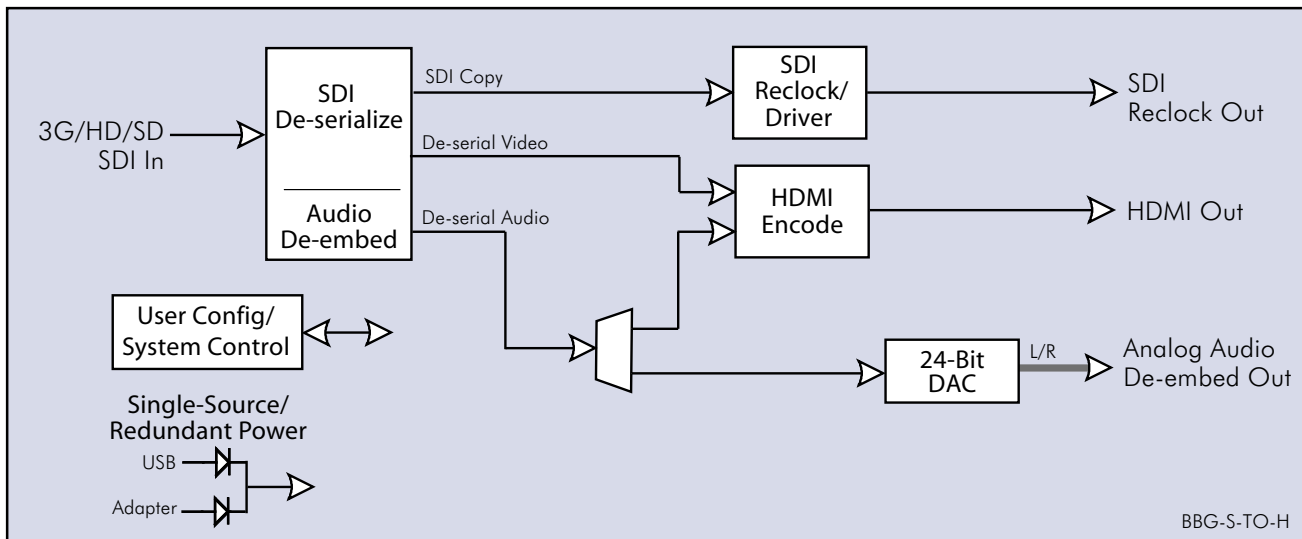
Selectable YPbPr or RGB colorspace and HDMI/DVI output modes

Full 5.1 channel audio conversion to HDMI audio with selectable C/LFE line-up control. Audio de-embed of selected group 1/2 pair to analog audio output pair.

Powers directly from host equipment USB or standard corded power adapter. USB power and corded adapter can be simultaneously used to provide redundant power sourcing.

SDI input copy output allows converter to provide SDI pass-thru

Compact size and low weight design easily affixes directly to camera or host device chassis



**BBG-S-TO-H » 3G/HD/SD-SDI-TO-HDMI WITH AUDIO DE-EMBEDDER**

**SPECIFICATIONS**

**Standards Supported**

SMPTE 259M, 292M, 424M  
(10-bit video processing)

**Inputs**

SDI (75Ω BNC)  
DC power (via USB or adapter)

**Outputs**

HDMI (HDMI 1.4 compliant). HDMI output can be set as DVI-D (limited to SMPTE HD formats).  
SDI reclocked input copy (75Ω BNC)  
(2) analog audio (unbalanced consumer RCA)

**Latency Delay**

SD: <30 us  
HD: <17 us  
3G <8 us

**Audio Conversion Format**

48 kHz sampling, 24-bit  
SDI groups 1/2 to HDMI Ch 1-8 (with user-selectable C/LFE line-up)

**Power**

5-16 VDC, 2.4 W

**DC Power Connectors**

USB Mini and coaxial locking connector (for use with supplied Cobalt power adapter)

**Dimensions (WxHxD)**

5.5" x 3" x 1" (including connector projections)  
(139 x 77 x 26 mm)

**Operating Temperature Range**

-4°F to 158°F  
(-20°C to 70°C)

**ORDERING INFORMATION**

**BBG-S-TO-H** HD/SD-SDI-to-HDMI with Audio De-Embedder Converter Unit

**BBG-MB** Mounting Bracket

9450GT » FIBER ETHERNET SWITCH TRANSCEIVERS



The **9450GT** series of fiber Ethernet switch transceivers are available in several versions providing various link length support using dual-fiber Tx/Rx. (Non-fiber model 9450GT-NF is also available.) A built-in switch accommodates four Ethernet ports. Gbit ports flexibly support most communications including IP-based video/audio, control, and other data.

RJ-45 Ethernet ports provide 1Gb/s connectivity for multiple Ethernet enabled devices or links to additional network switches. A dual-fiber optical port provides an Ethernet link over a dual fiber connection for extended distances (available in 20km, 40km, and 80km link-length versions). CWDM models are available with 16 wavelength divisions, allowing 64 discrete Ethernet ports to be muxed onto a single fiber pair.

FEATURES

- Four independent copper Gigabit Ethernet ports supporting DHCP, ARP, Multicast/Broadcast

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- Dual LC Optical Connection. Blindmate connections with no active components on rear I/O module.

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- Low-power, high-density design; <8 Watts

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- Internal GigE midplane connection (with OG3-FR frame only)

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- CWDM models available in 16 different wavelength divisions, offering up to 64 channels of discrete Ethernet port muxing

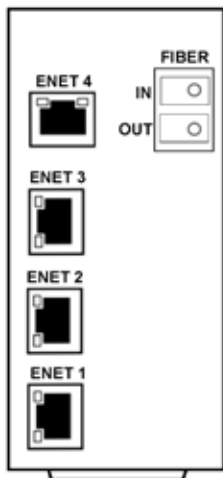
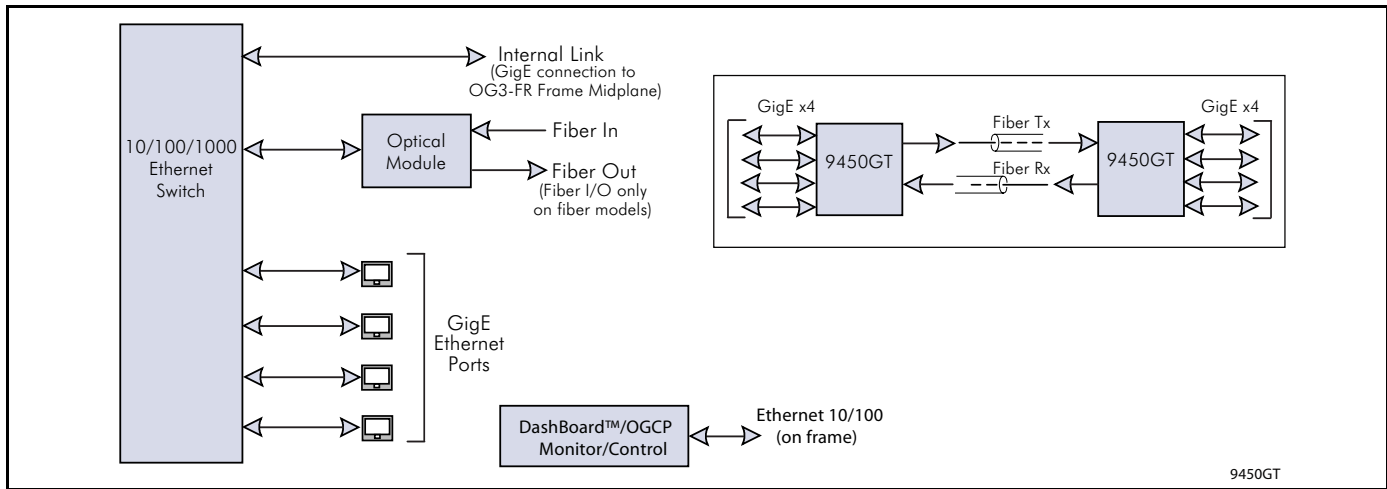
- SNMP compliant

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- Available in 20km, 40km, and 80km versions using LC-terminated fiber
  - 9450GT-20KM-LC - 20km link length
  - 9450GT-40KM-LC - 40km link length
  - 9450GT-80KM-LC - 80km link length
  - 9450GT-CWDM - see Ordering Information

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- Five year warranty



**RM20-9450GT-B**  
(Model 9450GT-NF has fiber ports unpopulated)



## 9450GT » FIBER ETHERNET SWITCH TRANSCEIVERS

### SPECIFICATIONS

#### Electrical

Power: 7 Watts

#### Optical

Number of inputs/outputs: 1

Nominal Wavelength: 1310nm (9450GT-20KM, 9450GT-40KM)

1550 (9450GT-80KM)

Tx Power:

-3dBm to -8dBm (9450GT-20KM)

+3dBm to -2dBm (9450GT-40KM)

+5dBm to 0dBm (9450GT-80KM, 9450GT-CWDM-XX-LC)

+7dBm to +2dBm (9450GT-CWDM-XXH-LC)

Rx Sensitivity:

-3dBm to -22dBm (9450GT-20KM)

-3dBm to -24dBm (9450GT-40KM, 9450GT-80KM, 9450GT-CWDM-XX-LC)

-10dBm to -32dBm (9450GT-CWDM-XXH-LC)

Optical Budget:

14 dB (9450GT-20KM)

22 dB (9450GT-40KM)

24 dB (9450GT-80KM, 9450GT-CWDM-XX-LC) 34 dB (9450GT-80KM, 9450GT-CWDM-XXH-LC) Receiver Overload: values above -3dB; -10dBm (9450GT-CWDM-XXH-LC)

Connector Type: Single Mode LC/UPC.

#### Ethernet

Number of Ports: 4

Cable Type: Standard straight-thru CAT-5e

Connector Type: RJ-45

### ORDERING INFORMATION

**9450GT-20KM-LC** Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, 1310nm Tx/Rx. Includes Rear I/O Module (LC connectors only)

**9450GT-40KM-LC** Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 40km, 1310nm Tx/Rx. Includes Rear I/O Module (LC connectors only)

**9450GT-80KM-LC** Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 80km, 1550nm Tx/Rx. Includes Rear I/O Module (LC connectors only)

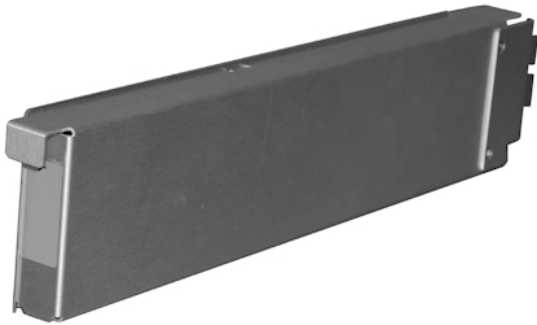
**9450GT-NF** 4-Port Ethernet Switch (omits fiber I/O interfaces). Includes Rear I/O Module.

**9450GT-CWDM-XX-LC** Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, CWDM Tx/Rx. Includes Rear I/O Module (LC connectors only). Replace "XX" with desired CWDM wavelength when ordering. See table below for available CWDM wavelengths.

**9450GT-CWDM-XXH-LC** Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, CWDM Tx/Rx with high-sensitivity Rx. Includes Rear I/O Module (LC connectors only). Replace "XX" with desired CWDM wavelength when ordering. See table below for available CWDM wavelengths.

-27: 1270nm	-29: 1290nm	-31: 1310nm
-33: 1330nm	-35: 1350nm	-37: 1370nm
-43: 1430nm	-45: 1450nm	-47: 1470nm
-49: 1490nm	-51: 1510nm	-53: 1530nm
-55: 1550nm	-57: 1570nm	-59: 1590nm
-61: 1610nm		

9490-OS Series » FIBER OPTIC PASSIVE SPLITTERS FOR 20-SLOT FRAMES



The **9490-OS** series of passive splitters offer a flexible, cost-effective solution of fiber distribution using our HPF-9000 or OG3-FR 20-slot frames. Similar to a DA, these splitters provide branching of optical signals. Fully passive with low-loss optics, the devices require no frame power or communications for operation. The 9490-OS models are available in 1x2, 1x4, and 1x8 splitting fan-outs. Fully passive operation helps ensure the utmost in reliability. Each device occupies 2 frame slots.

**9490-OS Models**

- **9490OS-1X2-LC** Optical 1x2 Splitter (LC connectors)
- **9490OS-D1X2-LC** Dual Optical 1x2 Splitter (LC connectors)
- **9490OS-1X4-LC** Optical 1x4 Splitter (LC connectors)
- **9490OS-D1X4-LC** Dual Optical 1x4 Splitter (LC connectors)
- **9490OS-1X8-LC** Optical 1x8 Splitter (LC connectors)

**FEATURES**

Modular, scalable design allows easy expansion. Available in several 1x2, 1x4, and 1x8 versions.

Fully passive design using low-loss filters. Requires no frame power or communications.

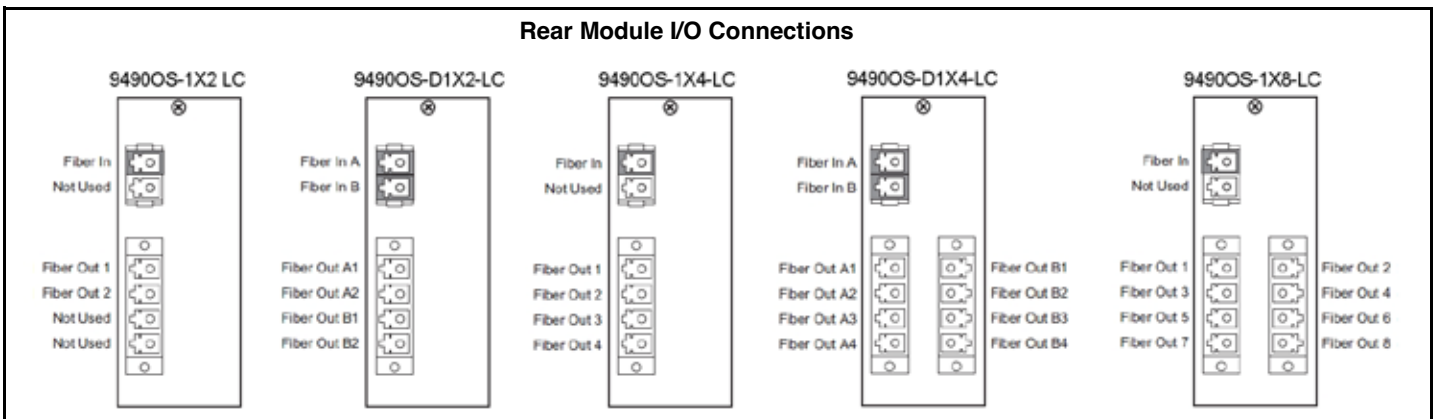
Wavelength agnostic operation - supports 1270nm thru 1620nm signals

Supports single-mode fiber

Fits 20-slot openGear frames using blindmate-connection rear I/O modules

Five year warranty

**Rear Module I/O Connections**



**SPECIFICATIONS**

**Wavelength Range**  
1260nm to 1650nm

**Return Loss (minimum)**  
50 dB

**Insertion Loss (maximum)**  
9490OS-1x2, 9490OS-D1x2: 4 dB  
9490OS-1x4, 9490OS-D1x4: 8 dB  
9490OS-1x8: 11 dB

**Uniformity**  
9490OS-1x2, 9490OS-D1x2: 0.4 dB  
9490OS-1x4, 9490OS-D1x4: 0.6 dB  
9490OS-1x8: 0.8 dB

**Directivity**  
55 dB

**Slots required per device**  
2

**Connector Type**  
Single Mode, LC/UPC

**ORDERING INFORMATION**

**9490OS-1x2-LC** Optical 1x2 Splitter (LC connectors only). Includes type LC connector Rear I/O Module

**9490OS-D1x2-LC** Dual Optical 1x2 Splitter (LC connectors only). Includes type LC connector Rear I/O Module

**9490OS-1x4-LC** Optical 1x4 Splitter (LC connectors only). Includes type LC connector Rear I/O Module

**9490OS-D1x4-LC** Dual Optical 1x4 Splitter (LC connectors only). Includes type LC connector Rear I/O Module

**9490OS-1x8-LC** Optical 1x8 Splitter (LC connectors only). Includes type LC connector Rear I/O Module



**BBG-4490-CWDM » MODULAR MULTI-CHANNEL FIBER OPTICAL MULTIPLEXERS/DE-MULTIPLEXERS**



The BlueBox™ BBG-4490 series of CWDM passive multiplexers (mux) / de-multiplexers (demux) offer a flexible, scalable, cost-effective solution to mux and demux up to 18 fiber channels onto a shared fiber trunk. 4 and 8-channel units are available which can be used as standalones or rack-mounted using an optional 1RU mounting panel (12, 16, and 18-channel units are rack-mounted 1RU units). Used in conjunction with our fiber EO and OE converter cards, digital video, audio, and IP can all be carried over a shared fiber trunk. Coarse Wave Division Multiplexing (CWDM) offers a cost-effective, scalable, and convenient solution for multiplexing and de-multiplexing discrete channels onto a shared fiber trunk. Each model can be used as a mux or a de-mux unit (**two units are required for a complete mux/de-mux setup**).

**OPTIONS**

**RMT** Rack Mounting Panel; 3-device. Provides 1RU rack mounting for up to three BBG-4490-CWDM-4A, 4B, and/or BBG-4490-CWDM-OS.

**RMD** Rack Mounting Panel; 2-device. Provides 1RU rack mounting for up to two BBG-4490-CWDM-8.

The BBG-4490 mux/de-mux units are available in 4, 8, 12, 16, and 18-channel versions. Epoxy-free optical paths help ensure reliability over a wide range of operating conditions. The low-loss passive devices use no external power.

» **FEATURES**

Modular design allows use as a standalone or rack-mounted without a frame

Available in several connector configurations - ST, SC, LC, FC

Same models can be used either as mux or demux unit - fully bidirectional

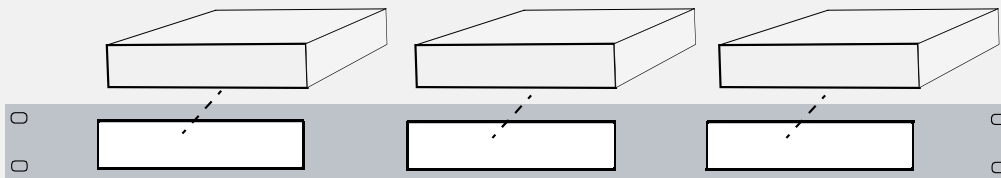
Epoxy-free optical paths help ensure reliability over a wide range of operating conditions

Fully passive design using low-loss filters. Requires no power or communications.

Five year warranty

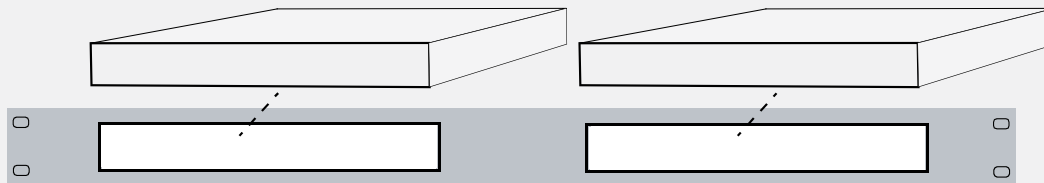
**BBG-4490-CWDM-4**

BBG-4490-CWDM-4 provide 4-in mux or 4-out demux which can be used as standalone, or used as 1RU triple rack-mounted using optional RMT mounting panel



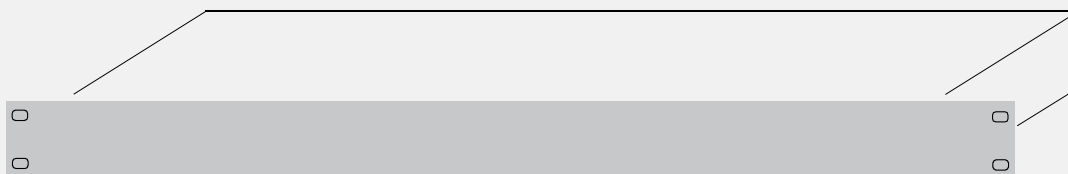
**BBG-4490-CWDM-8**

BBG-4490-CWDM-8 provide 8-in mux or 8-out demux which can be used as standalone, or used as 1RU dual rack-mounted using optional RMD mounting panel



**BBG-4490-CWDM-12**  
**BBG-4490-CWDM-16**  
**BBG-4490-CWDM-18**

These units (available as 12, 16, or 18-channel) provide multi-channel mux or demux and are available each as an integral 1RU unit

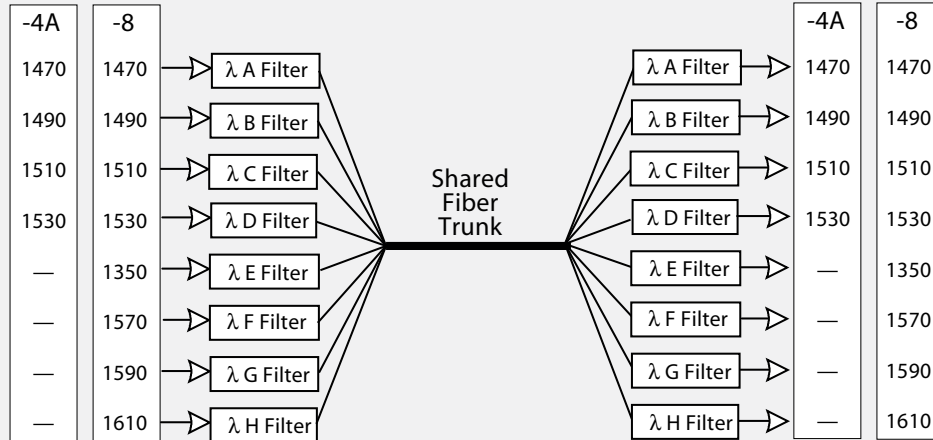




**BBG-4490-CWDM » MODULAR MULTI-CHANNEL FIBER OPTICAL MULTIPLEXERS/DE-MULTIPLEXERS**

BBG-4490-CWDM-8 (as Mux)

BBG-4490-CWDM-8 (as De-Mux)



BBG-4490-CWDM offers several choices in fiber wavelength (channel) capacity, ranging from 4-channel to 18-channel (shown here are the 4- and 8-channel models; see Ordering Info that lists wavelength divisions for 12-, 16-, and 18-channel models). All units can be used as a mux or a de-mux unit. Two units (min) are required for a complete mux / de-mux setup.

» SPECIFICATIONS

**Filter Wavelengths**

See Ordering Information

**Central Wavelength Accuracy**

< ± 1nm

**In-band Ripple**

0.5 dB

**Passband Width @ 0.5 dB**

>13nm

**Insertion Loss**

<= 3.6 dB

**Adjacent Channel Isolation**

>= 15 dB

**Non-adjacent Channel Isolation (demux usage)**

>= 40 dB

**Uniformity**

3 dB (max)

**Polarization-dependent Loss**

0.15 dB (max)

**Polarization Mode Dispersion**

0.1 ps (max)

**Return Loss**

50 dB (min)

**Directivity**

50 dB (min)

**Temperature Stability**

0.007 dB/°C (max)

**Temperature Wavelength Drift**

0.005 nm/°C (max)

**Power Handling**

300 mW (max)

**Tensile Load**

5N (max)

**Temperature Range**

0-70°C (operating)

-40 to +85°C (storage)

» ORDERING INFORMATION

**BBG-4490-CWDM-4A-XX** 4-Channel CWDM Mux/Demux; 1470-1490-1510-1530 nm. (3 units per 1RU optional mounting panel)

**BBG-4490-CWDM-4B-XX** 4-Channel CWDM Mux/Demux; 1550-1570-1590-1610 nm. (3 units per 1RU optional mounting panel)

**BBG-4490-CWDM-8-XX** 8-Channel CWDM Mux/Demux; 1470-1490-1510-1530-1550-1570-1590-1610 nm. (2 units per 1RU optional mounting panel)

**BBG-4490-CWDM-12-XX** 12-Channel CWDM Mux/Demux; 1270-1290-1310-1330-1470-1490-1510-1530-1550-1570-1590-1610 nm. (1RU unit)

**BBG-4490-CWDM-16-XX** 16-Channel CWDM Mux/Demux; 1310-1330-1350-1370-1390-1410-1430-1450-1470-1490-1510-1530-1550-1570-1590-1610 nm. (1RU unit)

**BBG-4490-CWDM-18-XX** 16-Channel CWDM Mux/Demux; 1270-1290-1310-1330-1350-1370-1390-1410-1430-1450-1470-1490-1510-1530-1550-1570-1590-1610 nm. (1RU unit)

**BBG-4490-CWDM-OS-1X2-SC** 1x2 50/50 Optical Splitter. SC connectors only. <3.5 dBm insertion loss. (3 units per 1RU optional mounting panel)

**RMT** Rack Mounting Panel; 3-device. Provides 1RU rack mounting for up to three BBG-4490-CWDM-4A, 4B, and/or BBG-4490-CWDM-OS.

**RMD** Rack Mounting Panel; 2-device. Provides 1RU rack mounting for up to two BBG-4490-CWDM-8.

**Note:** All units can be used as multiplexer or de-multiplexer. Two units are required for a complete mux-de-mux setup. Where operating wavelength differences are specified, make certain mux/demux pair is ordered with correspondingly matched wavelengths.

**Note:** Add fiber connector suffix to part numbers to specify fiber connection type (LC, ST, SC, FC). (For example, BBG-4490-CWDM-4A-XX fitted with LC connectors is ordered as BBG-4490-CWDM-4A-LC".)

## 9978-ANC-MON » 3G/HD/SD-SDI ANCILLARY DATA MONITORING PROBE

with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding



The Cobalt® 9978-ANC-MON 3G/HD/SD-SDI Ancillary Data Monitoring Probe with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding provides an easy to use, economical solution that offers comprehensive ancillary data monitoring/"probing" to validate and ensure expected presence and handling of ancillary data in SDI streams.

Unlike expensive and hard to use waveform monitors or typical test systems, the 9978-ANC-MON is an economical openGear®-based solution that provides on-screen burn-in status in "plain language" text and icons. Unlike typical test equipment, the 9978-ANC-MON user interface is designed from the ground up to be used by everyday operations personnel and not just engineers. The status burn-in is available on the card SDI output as well as a convenience HDMI output that can be directly connected to a wall monitor.

In addition to its user interface, the 9978-ANC-MON can integrate with automation systems via its IP and SNMP interfaces. The 9978-ANC-MON is an unprecedented first in the high-density openGear® based card form factor that fits in your existing openGear environment without the need for expensive, delicate, bulky test gear. The 9978-ANC-MON supports and offers monitoring for many data packages such as closed captioning, SCTE 104, 608-XDS, AFD and others, providing not just presence/absence status but also interpreters that parse the payload and display it as a burn-in. Also included standard is a continuously running display of ATSC A/85 LKFS loudness. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

Intuitive layout clearly and simultaneously showing multiple aspects of the input signal and its ancillary data are displayed in real time along with programming.

Conditions for any number of criteria are immediately apparent via color coding to indicate normal operation, errors, ancillary data absence or other errors. No difficult nested menus or difficult to interpret messages.



### FEATURES

Easy to use, economical solution for comprehensive ancillary data monitoring/"probing"

"Plain language" easy to understand status burn-in overlay displayed along with program video makes status monitoring easy. HDMI output allows use with standard consumer monitor panels.

Quality Check provides immediate alert status for quality issues such as black/frozen frame or audio silence. Threshold and hold-off are user configurable.

On-screen presence/absence of selected DID/SDIDs

Fully flexible and configurable with user presets to simplify setup

Closed Captioning, SCTE 104, AFD, and 608-XDS monitoring and payload interpret

Full status forwarding to automated systems using IP and SNMP interfaces

Audio level bars display and LKFS numeric display

Low-power/high-density design - less than 18 Watts per card

Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

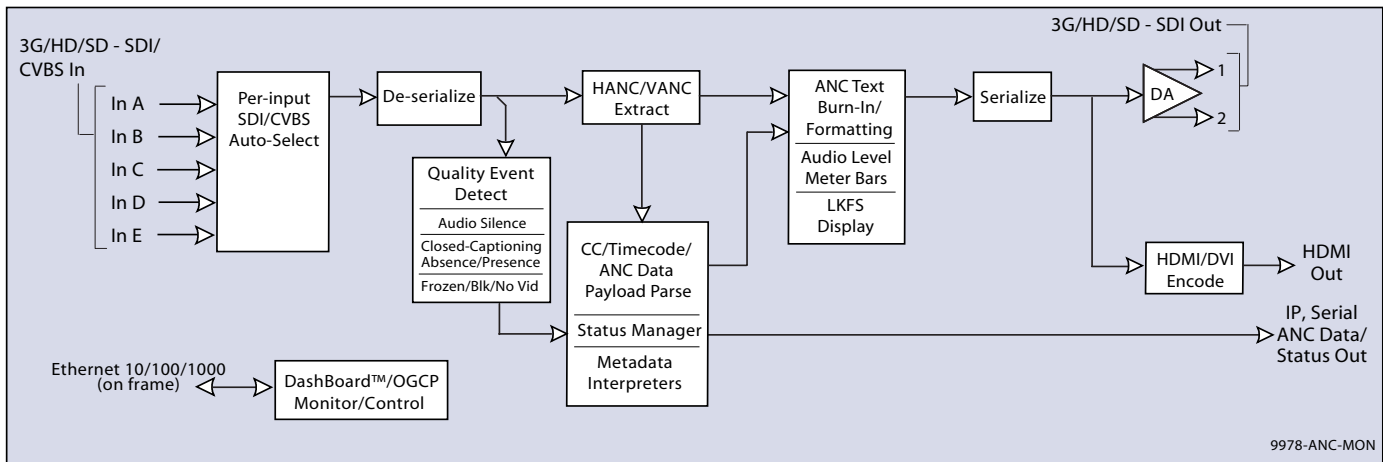
Five year warranty



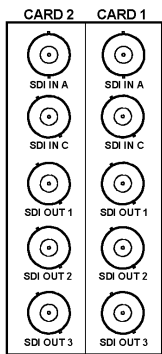
3G/HD/SD-SDI ANCILLARY DATA MONITORING PROBE UNITS WITH FAULT DETECTION/FORWARDING (OPENGear CARDS AND STANDALONEMODELS)

9978-ANC-MON » 3G/HD/SD-SDI ANCILLARY DATA MONITORING PROBE

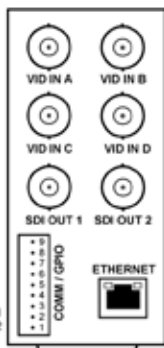
with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding



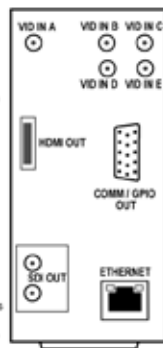
9978-ANC-MON



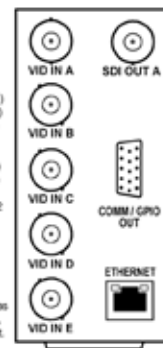
RM20-9978-AIS



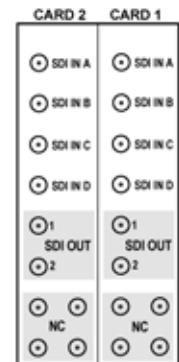
RM20-9978-B



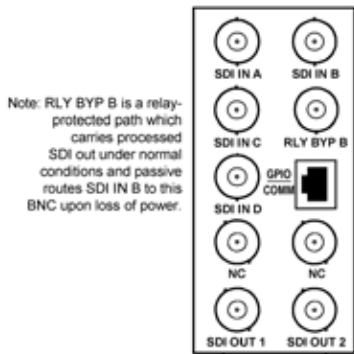
RM20-9978-C-DIN  
RM20-9978-C-HDBNC



RM20-9978-D

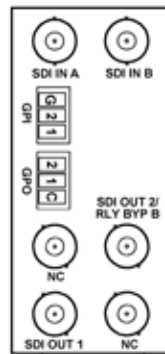


RM20-9978-GIS-DIN  
RM20-9978-GIS-HDBNC

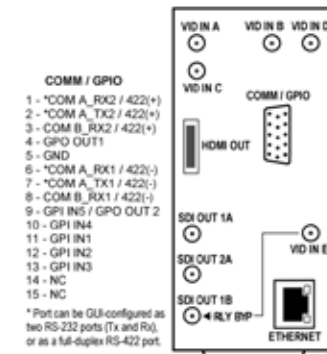


RM20-9978-E

Note: RLY BYP B is the card processed output which uses either input SDI IN A or SDI IN B. This output uses relay latching to retain selected routing in the event of power loss regardless of whether a selection was manually invoked or by a unit-detected failover (for example, if an auto-changover from A to B was invoked while active, routing of input B to this output is retained in the event of power loss).



RM20-9978-F



RM20-9978-H-DIN  
RM20-9978-H-HDBNC

Note: Some rear module illustrations may show GPIO/COMM connections. These connections/functions are reserved and currently NC for this model.



## 9978-ANC-MON » 3G/HD/SD-SDI ANCILLARY DATA MONITORING PROBE

with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding

### SPECIFICATIONS

Note: Inputs/outputs are a function in some cases of rear I/O module used.

#### Power

< 18 Watts

#### Video Input/Outputs

Video Inputs: (5, max) 75Ω BNC; auto-detect/setup for 3G/HD/SD-SDI or CVBS

SDI Outputs: (4) 75Ω BNC (rear module determines number of outputs)

HDMI Output: (1) HDMI output with audio embedding

SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M

SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)

SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

### ORDERING INFORMATION

**9978-ANC-MON** 3G/HD/SD-SDI Ancillary Data Monitoring Probe with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding

**RM20-9978-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (2) 3G/HD/SD-SDI Input BNCs, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)

**RM20-9978-B** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD-SD-SDI Input BNCs, (2) 3G/HD/SD-SDI Output BNCs, Ethernet Port

**RM20-9978-C-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI Outputs, HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9978-C-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI Outputs, HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

**RM20-9978-D** 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SD-SDI/CVBS Input BNCs, (1) 3G/HD/SD-SDI Output BNC, Ethernet Port

**RM20-9978-E** 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Input BNCs, (2) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover)

**RM20-9978-F** 20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Input BNCs, (1) 3G/HD/SD-SDI Processed Out BNC w/ Latching Input Select/Bypass, (1) 3G/HD/SD-SDI Processed Output BNC

**RM20-9978-G/S-DIN** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (2) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)

**RM20-9978-G/S-HDBNC** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD/SD-SDI Inputs, (2) 3G/HD/SD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)

**RM20-9978-H-DIN** 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI Outputs, (1) 3G/HD/SD-SDI Output with Relay Bypass Protect, HDMI Output, Ethernet Port (all coaxial connectors DIN 1.0/2.3)

**RM20-9978-H-HDBNC** 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SD-SDI/CVBS Inputs, (2) 3G/HD/SD-SDI Outputs, (1) 3G/HD/SD-SDI Output with Relay Bypass Protect, HDMI Output, Ethernet Port (all coaxial connectors HD-BNC)

3G/HD/SD-SDI ANCILLARY DATA MONITORING PROBE UNITS WITH FAULT DETECTION/FORWARDING (OPENGEAR CARDS AND STANDALONEMODELS)

**BBG-1078-ANC-MON » 3G/HD/SD-SDI STANDALONE ANCILLARY DATA MONITORING PROBE**  
with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding



The Cobalt® **BBG-1078-ANC-MON 3G/HD/SD-SDI Standalone Ancillary Data Monitoring Probe with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding** provides an easy to use, economical solution that offers comprehensive ancillary data monitoring/"probing" to validate and ensure expected presence and handling of ancillary data in SDI streams.

Unlike expensive and hard to use waveform monitors, the BBG-1078-ANC-MON shows status in "plain language" on-screen overlays. Unlike typical test equipment, its user interface is designed from the ground up to be used by everyday operations personnel and not just engineers. The status burn-in is available on the card SDI output as well as a convenience HDMI output that can be directly connected to a wall monitor.

In addition to its user interface, the BBG-1078-ANC-MON can integrate with automation systems via its IP and SNMP interfaces. The BBG-1078-ANC-MON is an unprecedented first in a compact standalone form factor that fits in your existing environment without the need for expensive, delicate, bulky test gear. The BBG-1078-ANC-MON supports and offers

monitoring for many data packages such as closed captioning, SCTE 104, 608-XDS, AFD and others, providing not just presence/absence status but also interpreters that parse the payload and display it as a burn-in. Also included standard is a continuously running display of ATSC A/85 LKFS loudness.

The BBG-1078-ANC-MON can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1078-ANC-MON allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting to a standard 19" frame).

Intuitive layout clearly and simultaneously showing multiple aspects of the input signal and its ancillary data are displayed in real time along with programming.

Conditions for any number of criteria are immediately apparent via color coding to indicate normal operation, errors, ancillary data absence or other errors. No difficult nested menus or difficult to interpret messages.



**FEATURES**

Easy to use, economical solution for comprehensive ancillary data monitoring/"probing"

"Plain language" easy to understand status burn-in overlay displayed along with program video makes status monitoring easy. HDMI output allows use with standard consumer monitor panels.

Quality Check provides immediate alert status for quality issues such as black/frozen frame or audio silence. Threshold and hold-off are user configurable.

On-screen presence/absence of selected DID/SDIDs

Fully flexible and configurable with user presets to simplify setup

Closed Captioning, SCTE 104, AFD, and 608-XDS monitoring and payload interpret

Audio level bars display and LKFS numeric display

Full status forwarding to automated systems using IP and SNMP interfaces

Low-power/high-density design - less than 18 Watts

Compact footprint - up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Uses DashBoard remote control (device appears as single-card frame)

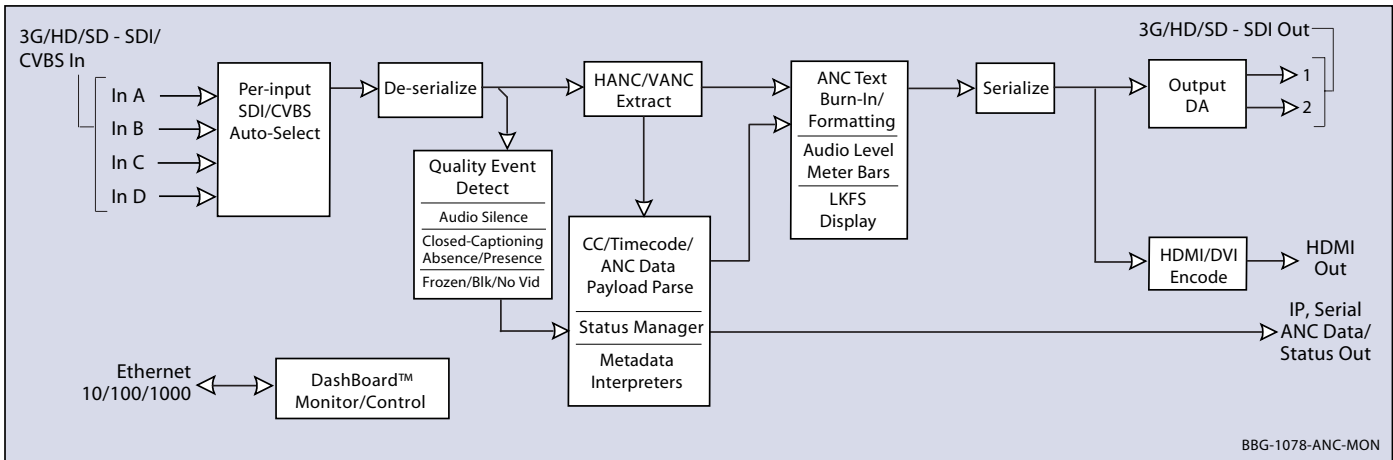
Five year warranty

**OPTIONS**

1RU Mounting Tray (supports 3 units) (BBG-1000-TRAY)

Redundant Power Supply Module (BBG-1000-PS)

**BBG-1078-ANC-MON » 3G/HD/SD-SDI STANDALONE ANCILLARY DATA MONITORING PROBE**  
with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding

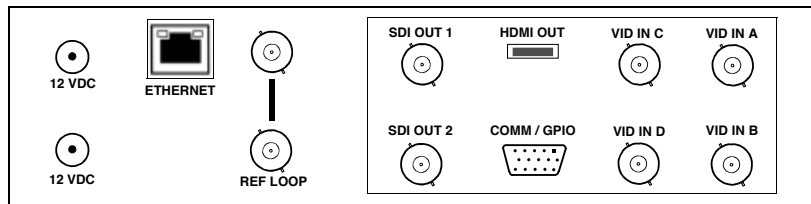


BBG-1078-ANC-MON

Note: Rear panel illustrations may show GPIO/COMM connections. These connections/functions are reserved and currently NC for this model.



**Rear Panel**



**SPECIFICATIONS**

**Power**  
< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**Video Input/Outputs**  
Video Inputs: (4) 75Ω BNC; auto-detect/setup for 3G/HD/SD-SDI or CVBS |  
SDI Outputs: (2) 75Ω BNC  
HDMI Output: (1) HDMI output with audio embedding)  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Belden 1694A)  
SDI Return Loss: >15 dB up to 1.485 GHz; >10 dB up to 2.970 GHz

**Control/Monitor Interface**  
Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**  
Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M "Tri-Level"  
Return Loss: >35 dB up to 5.75 MHz

**Physical**  
Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

- BBG-1078-ANC-MON** 3G/HD/SD-SDI Standalone Ancillary Data Monitoring Probe with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding
- BBG-1000-PS** Redundant Power Supply Module
- BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

3G/HD/SD-SDI DUAL TEST SIGNAL GENERATORS WITH USER CHARACTER BURNERS, MOTION PATTERNS, AND OPTIONAL TROUBLE SLATE INSERTERS (OPENGEAR CARDS AND STANDALONE MODELS)

**9960-TG2-REF1 » 3G/HD/SD-SDI DUAL TEST SIGNAL GENERATOR** with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out



The Cobalt® 9960-TG2-REF1 3G/HD/SD-SDI Dual Test Signal Generator with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out offers an easy to use, economical solution to providing comprehensive test signal packages to ensure validity of downstream baseband SDI systems. The 9960-TG2-REF1 is an unprecedented first in the high-density openGear® based card form factor. Two independent generator blocks can be set to offer dual test packages which can be simultaneously outputted or selectively fed to a single downstream path via a 2x4 output crosspoint.

SCTE 104 insertion function provides generation and insertion of SCTE 104 messages into baseband SDI. Message send can be triggered from automation GPI, manual, or other event action modes. The function can also execute card actions based on SCTE 104 messages received by the card, as well as send triggered SCTE 104 packets to other downstream systems.

The 9960-TG2-REF1 also provides AES and analog audio test tones (both using 24-bit data). A moving-box insertion can be enabled to serve as a dynamic raster confidence check. The 9960-TG2-REF1 can use either of two frame references to provide an output that's synchronous with house ref, or use its internal ref timing to generate its own ref. An analog video output offers SD black burst or HD tri-level reference output.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern while not changing any other settings or aspects. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network. GPIO allows direct input routing control and status monitoring.

**FEATURES**

Comprehensive test signal generation for SDI/analog video and baseband discrete audio in an easily integrated openGear® card

Easy to use, intuitive, flexible, and far more economical than typical bench equipment

Fully-independent dual generator blocks offer simultaneous output of user-configured test packages, or instant user selection between generators via output crosspoint

Moving-box/motion insertion enable serves as an easy to use dynamic raster confidence check

Closed-captioning CEA 608 generator allows user test packages of VBI closed captioning for testing downstream systems

SCTE 104 insertion available using ancillary data, GPI, SNMP, or JSON via HTTP POST / WebSocket, with full control of splice start, end, and cancel as well as pre-roll and break duration offsets

SDI import allows insertion of user static raster/patterns as an alternative addition to standard test pattern outputs

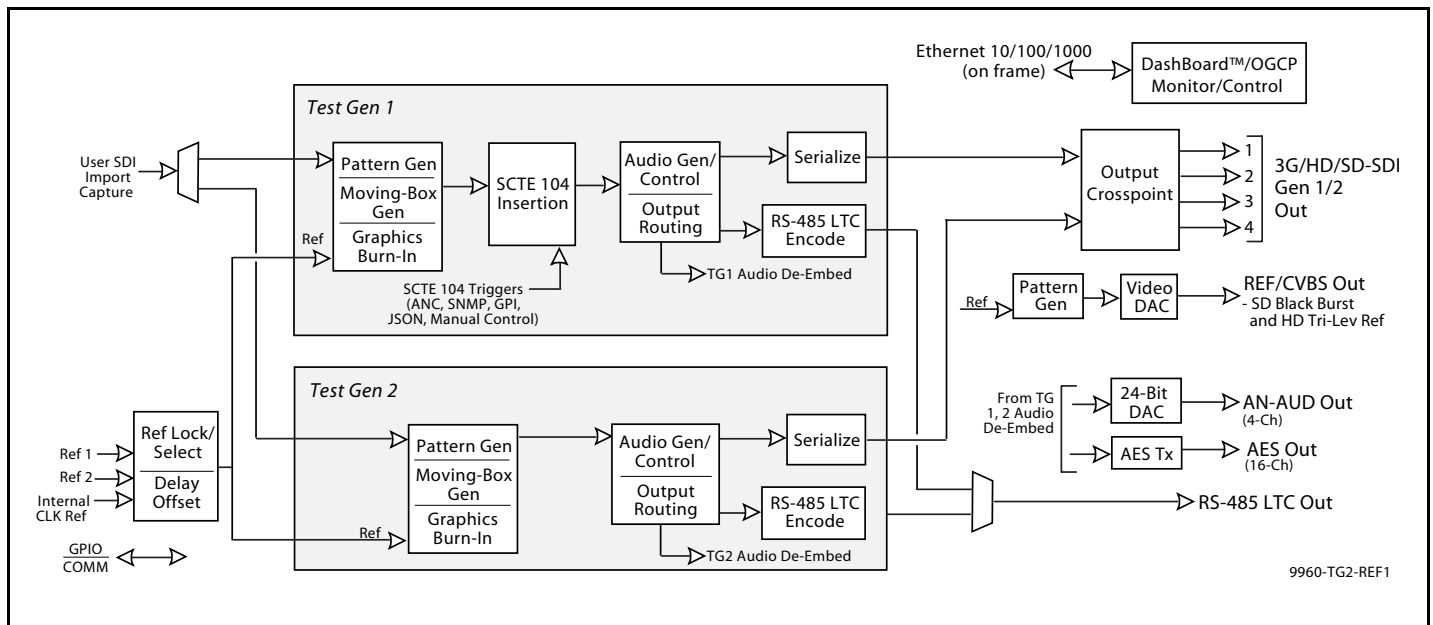
Full suite of output interfaces - SDI, CVBS, AES and analog audio

Convenience RS-485 LTC output works with legacy systems and checks bi-phase LTC/SMPTE 12 correlation in mixed systems

Low-power/high-density design - less than 18 Watts per card

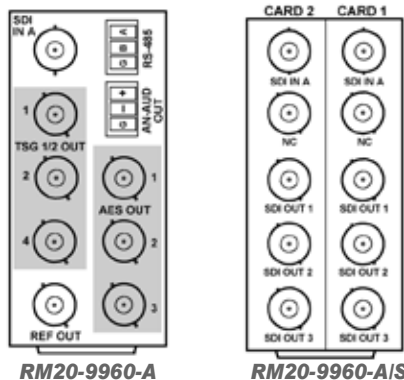
Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels

Five year warranty



3G/HD/SD-SDI DUAL TEST SIGNAL GENERATORS WITH USER CHARACTER BURNERS, MOTION PATTERNS, AND OPTIONAL TROUBLE SLATE INSERTERS (OPENGEAR CARDS AND STANDALONE MODELS)

**9960-TG2-REF1 » 3G/HD/SD-SDI DUAL TEST SIGNAL GENERATOR** with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out



**SPECIFICATIONS**

Note: Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

< 18 Watts

**SDI Inputs/Outputs**

(1) SDI User Input (75Ω BNC)  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

**CVBS Video Output**

(1) 75Ω BNC output

**Discrete Audio Outputs**

AES-3id 75Ω outputs (8 pair (16-Ch) max)  
Balanced analog audio outputs (4-Ch max)  
(I/O conforms to 0 dBFS = +24 dBu)  
Analog Output Impedance: < 50 Ω  
Analog Reference Level: -20 dBFS  
Analog Nominal Level: +4 dBu  
Analog Max Output Level: +24 dBu (0 dBFS)  
Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
Analog SNR: 115 dB (A weighted)  
Analog THD+N: -96 dB (20 Hz to 10 kHz)  
Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**GPIO/COMM**

(2) GPI configurable to select input routing. (2) GPO configurable to invoke upon input selected. RS-232/485 comm port. All connections via rear module RJ-45 GPIO/COMM jack.

**Frame Reference Input**

(2) reference from frame bus. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M. Return Loss: >35 dB up to 5.75 MHz

**ORDERING INFORMATION**

**9960-TG2-REF1** 3G/HD/SD-SDI Dual Test Signal Generator with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out

**RM20-9960-A** 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (3) 3G/HD/SD-SDI Output BNCs, (1) REF/CVBS Out BNC, (3) AES Out BNC, (1) Balanced Analog Audio Output, (1) RS-485 I/O

**RM20-9960-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (1) 3G/HD/SD-SDI Input BNC, (2) 3G/HD/SD-SDI Input BNCs, (3) 3G/HD/SD-SDI Processed or Reclocked Output BNCs (connections are per each Card 1 / Card 2 connector bank)



3G/HD/SD-SDI DUAL TEST SIGNAL GENERATORS WITH USER CHARACTER BURNERS, MOTION PATTERNS, AND OPTIONAL TROUBLE SLATE INSERTERS (OPENGEAR CARDS AND STANDALONE MODELS)

## BBG-1060-TG2-REF1 » 3G/HD/SD-SDI STANDALONE DUAL TEST SIGNAL GENERATOR

with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out



The Cobalt® **BBG-1060-TG2-REF1 3G/HD/SD-SDI Standalone Dual Test Signal Generator** with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out offers an easy to use, economical solution to providing comprehensive test signal packages to ensure validity of downstream baseband SDI systems. Two independent generator blocks can be set to offer dual test packages which can be simultaneously outputted.

SCTE 104 insertion function provides generation and insertion of SCTE 104 messages into baseband SDI. Message send can be triggered from automation GPI, manual, or other event action modes. The function can also execute device actions based on SCTE 104 messages received by the BBG-1060, as well as send triggered SCTE 104 packets to other downstream systems.

The BBG-1060-TG2-REF1 also provides AES and analog audio test tones (both using 24-bit data). A moving-box insertion can be enabled to serve as a dynamic raster confidence check. The BBG-1060-TG2-REF1 can use an external reference to provide an output that's synchronous with house ref, or use its internal ref timing to generate its own ref. An analog video output offers SD black burst or HD tri-level reference output.

Preset save/load allows saving custom settings while allowing one-button revert to factory settings. Layered presets allow invoking changes related only to a specific area of concern while not changing any other processing settings or aspects. The BBG-1060-TG2-REF1 can be remote-controlled using DashBoard™. The compact standalone form factor allows desktop usage, as well as the 1/3-rack size of the BBG-1060-TG2-REF1 allowing 3 units to be installed in a 1RU space (an optional mounting tray is available that provides secure mounting of the units to a standard 19" frame).

### FEATURES

Comprehensive test signal generation for SDI/analog video and baseband discrete audio in an easily integrated standalone unit

Easy to use, intuitive, flexible, and far more economical than typical bench equipment

Fully-independent dual generator blocks offer simultaneous output of user-configured test packages, or instant user selection between generators via output crosspoint

Full suite of output interfaces – SDI, CVBS, AES and analog audio.

Closed-captioning CEA 608 generator allows user test packages of VBI closed captioning for testing downstream systems

SCTE 104 insertion available using ancillary data, GPI, SNMP, or JSON via HTTP POST / WebSocket, with full control of splice start, end, and cancel as well as pre-roll and break duration offsets

Moving-box/motion insertion enable serves as an easy to use dynamic raster confidence check

SDI import allows insertion of user static raster/patterns as an alternative addition to standard test pattern outputs

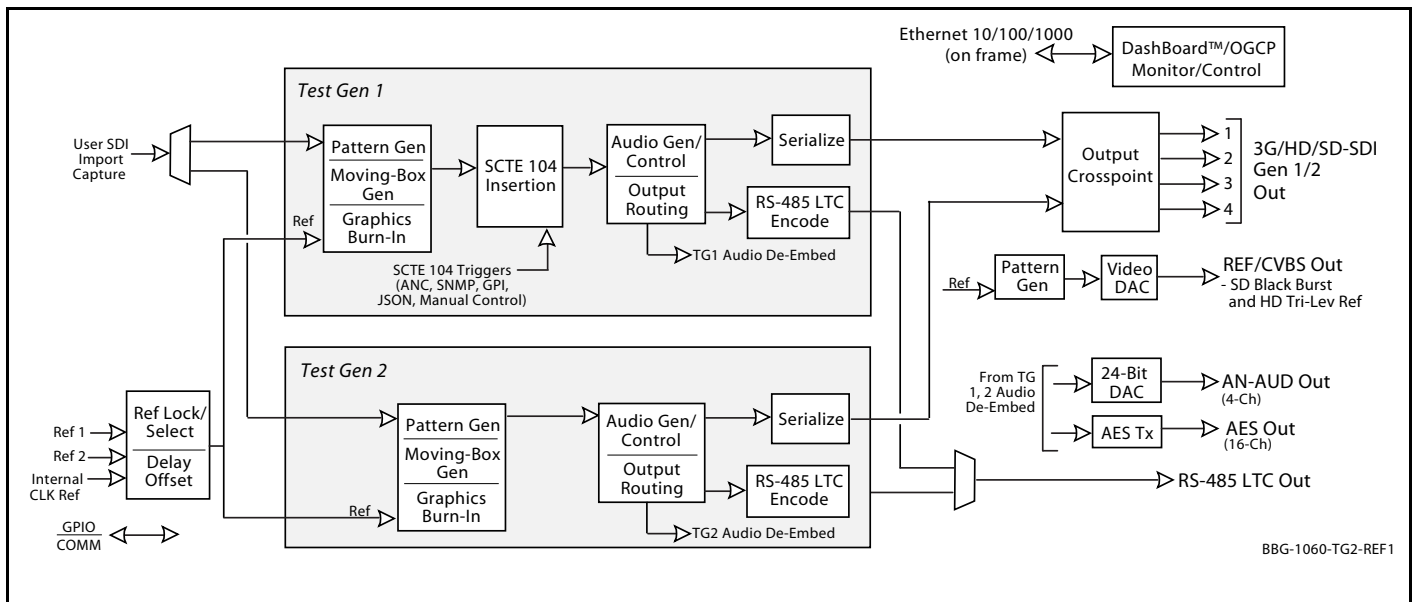
Convenience RS-485 LTC output works with legacy systems and checks bi-phase LTC/SMPTE 12 correlation in mixed systems

Low-power/high-density design – less than 18 Watts

Compact footprint – up to 3 units in a 1RU space. Optional tray provides secure captive-fastener mounting of 3 units in a 1RU tray.

Remote control/monitoring via DashBoard™ software or Web Browser User Interface

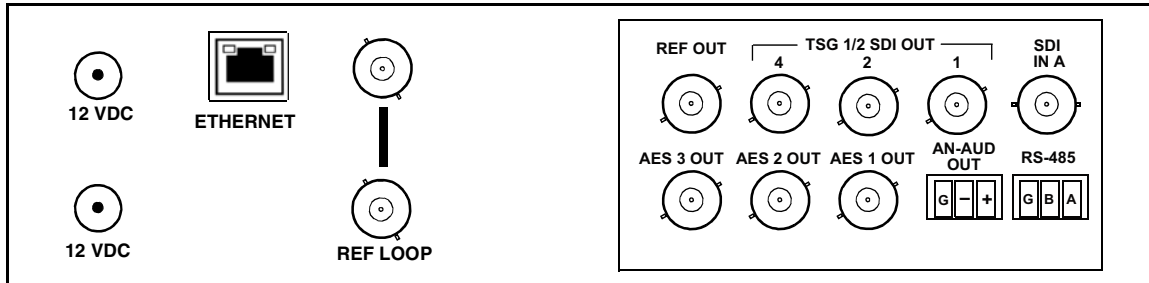
Five year warranty



3G/HD/SD-SDI DUAL TEST SIGNAL GENERATORS WITH USER CHARACTER BURNERS, MOTION PATTERNS, AND OPTIONAL TROUBLE SLATE INSERTERS (OPENGEAR CARDS AND STANDALONE MODELS)

**BBG-1060-TG2-REF1 » 3G/HD/SD-SDI STANDALONE DUAL TEST SIGNAL GENERATOR**  
with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out

**Rear Panel**



**SPECIFICATIONS**

**Power**

< 18 Watts. Power supplied by 12VDC AC adapter, universal input (included).

**SDI Input/Outputs**

(1) SDI User Input (75Ω BNC)  
Up to (4) 75Ω BNC outputs  
SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M  
SDI Alignment Jitter: 3G/HD/SD: < 0.3/0.2/0.2 UI  
Timing Jitter: 3G/HD/SD: < 2.0/1.0/0.2 UI

**CVBS Video Output**

(1) 75Ω BNC output

**Discrete Audio Outputs**

AES-3id 75Ω outputs (8 pair (16-Ch) max)  
Balanced analog audio outputs (4-Ch max)  
(I/O conforms to 0 dBFS = +24 dBu)  
Analog Output Impedance: < 50 Ω  
Analog Reference Level: -20 dBFS  
Analog Nominal Level: +4 dBu  
Analog Max Output Level: +24 dBu (0 dBFS)  
Analog Freq. Response: ±0.2 dB (20 Hz to 20 kHz)  
Analog SNR: 115 dB (A weighted)  
Analog THD+N: -96 dB (20 Hz to 10 kHz)  
Analog Crosstalk: -106 dB (20 Hz to 20 kHz)

**Timecode Insertion/Burn-In**

Burn-in and embedded video output timecode selected via user controls from input video SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, seconds:frames, seconds:frames:field. User controls for text size and H/V position.

**Text Burn-In**

(2) independent strings supported. Independent insertions controls for enable/disable and enable upon LOS. User controls for text size and H/V position.

**User Audio Delay Offset from Video**

Bulk delay control: -33 msec to +3000 msec.  
Per-channel delay controls: -800 msec to +800 msec

**Control/Monitor Interface**

Front panel network setup. DashBoard remote control via 10/100/1000 Ethernet port.

**Frame Reference Input**

Looping 2-BNC connection. SMPTE 170M/318M "Black Burst", SMPTE 274M/296M  
Return Loss: >35 dB up to 5.75 MHz

**Physical**

Dimensions (WxHxD): 5.7 x 1.4 x 14.7 in (14.5 x 3.5 x 37.3 cm) Dimensions include connector projections.  
Weight: 6 lb (2.8 kg)

**ORDERING INFORMATION**

**BBG-1060-TG2-REF1** 3G/HD/SD-SDI Standalone Dual Test Signal Generator with Moving Box Active Signal Indication and Bi-Level/Tri-Level Sync Out

**BBG-1000-PS** Redundant Power Supply Module

**BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)

9363 » MULTI-FORMAT REFERENCE GENERATOR

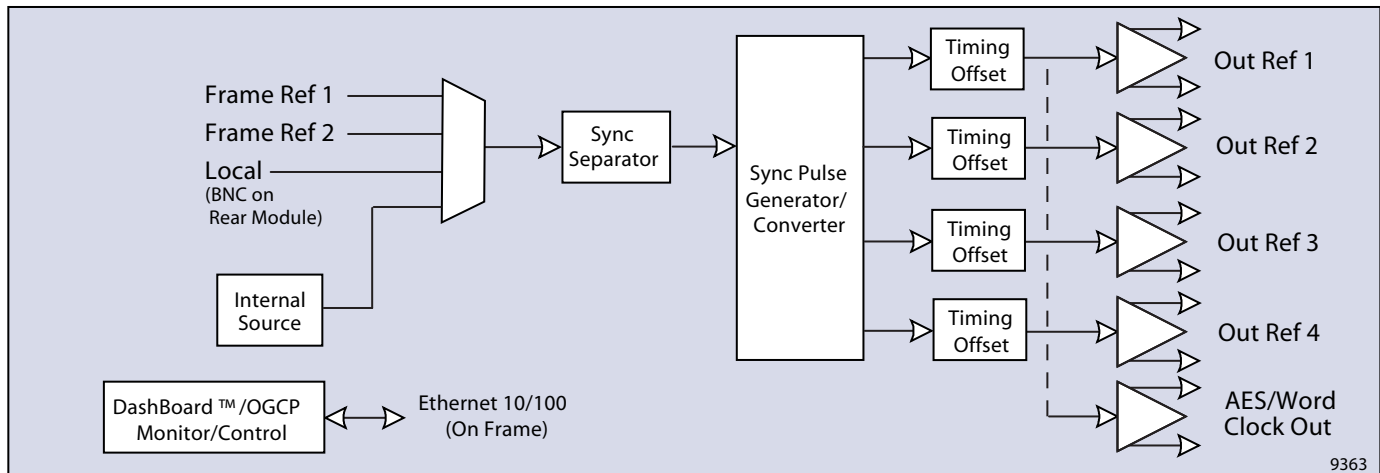


The highly flexible **9363 Multi-Format Reference Generator** generates four reference signal pairs that are independently configurable as composite black burst or tri-level reference sources. Each output can be any industry standard rate related to a received input reference source, or can be generated using the card's internal clocking source. Timing for each output pair can be independently offset (in vertical lines or horizontal pixels) from the received reference or internal clock.

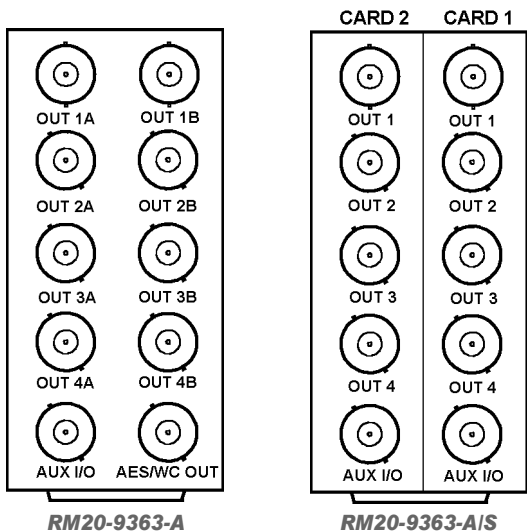
FEATURES

- Flexible, single-card source for any NTSC or PAL SD/HD broadcast or film reference rate
- Develops output reference using external analog reference or stand-alone internal clock source
- AES/Word Clock output synchronized to any of the four card reference outputs
- Outputs can be independently set for frame rate and delay relative from input/internal reference, or from each other

- Genlock to output rates of 1:1, 1:2, or 2:1 relationship with clock source. Field Lock for interlaced format outputs from progressive clock sources.
- Remote control/monitoring via Dashboard™ software
- Hot-swappable
- Five year warranty



9363



**9363 » MULTI-FORMAT REFERENCE GENERATOR****SPECIFICATIONS**

**Note:** Inputs/outputs are a function in some cases of rear I/O module used.

**Power**

6 Watts

**Reference Input**

Impedance: 75  $\Omega$

Standard: SMPTE 274M, 296M, 170M; ITU-R BT.470-6 (PAL-B)

Return Loss: >40 dB to 10 MHz

**Reference Outputs**

Reference Outputs: 4 pairs max. (each pair independently configurable)

Rates (Hz; internal clock): 60, 59.94, 50, 30, 29.97, 25, 24, 23.98

Signal Level: 1 Vp-p

Impedance: 75  $\Omega$

Return Loss: >40 dB to 30 MHz

Internal Clock Count Stability: 1 ppm initial (4.6 ppm 10 years; all conditions within specifications)

Thermal Stability:  $\pm 0.25$  ppm (0° to 70° C)

**AES/Word Clock Output**

Signal Level: 1 Vp-p

Impedance: 75  $\Omega$

Return Loss: >25 dB to 10 MHz

AES Sample Rate: 48 kHz

**ORDERING INFORMATION**

**9363** Multi-Format Reference Generator

**RM20-9363-A** 20-Slot Frame Rear I/O Module (Standard Width) BNC Analog Reference Input or AES/Word Clock Output (configurable), 4x2 BNC Analog Reference Outputs, dedicated AES/Word Clock BNC Output

**RM20-9363-A/S** 20-Slot Frame Rear I/O Module (Split; supports 2 cards) BNC Analog Reference Input or AES/Word Clock Output (configurable), 4 BNC Analog Reference Outputs (connections are per card)



Cobalt Digital Inc. designs and manufactures award-winning IP and 12G/6G/3G/HD/SD conversion, throwdown, and multiviewer technology for the production and broadcast television environment. As a founding member in the openGear® initiative, Cobalt offers a full range of openGear-compliant solutions as well as video and audio processing products for closed caption compliance, production trucks, master control, HD news, signal transport, audio loudness processing, and color correction. Cobalt's Blue Box Group™ line of interface converter throwdown boxes streamlines and simplifies a wide range of IP and 12G/6G/3G/HD/SD conversion and processing tasks. In addition, the company's multi-image display processors enable multiviewer capabilities in the most demanding studio and remote production/broadcasting environments. Cobalt Digital products are distributed through a worldwide network of dealers, system integrators, and other partnerships.

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