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.

**Engineering beyond the signal starts with Innovation.**

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**ENGINEERING BEYOND THE SIGNAL.**

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At Cobalt, we believe that a scalable and flexible approach in providing terminal equipment and systems offers you the best value and choice in meeting your needs without compromising ease of integration, features or cost.

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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).
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.

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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.

VIDE O 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.

+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 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

+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.

+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.

+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.)

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 OPTIONS

+TTS – Text-To-Speech Option
Cobalt Digital +TTS is a complete 21CVA 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 playout). +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 (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.

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.
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.

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.

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: 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 WITH 2-CARD CAPACITY

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.

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 optional 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)
BBG-1300-SNMP  SNMP Option

Front bezel opens to access card slots. Up to 2 openGear® cards can be inserted into BBG-1300-FR card area.

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 WITH 2-CARD CAPACITY**

### SPECIFICATIONS

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

**AC Line Input**

(2) AC IEC inputs 90-264 VAC, 47-63 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**


**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**  
2-Slot openGear® 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
- **BBG-1300-SNMP** SNMP Option
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, 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**

### 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**

- **2** card slots used
- **1** card per rear module
- **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 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.
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.

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™ 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.
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**  
  - 1.6 GHz (2.56 GHz burst)
  - 4-Core
  - 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.**

### Rear Panel User Ports

- (3) GigE*
- (2) USB 3.0
- (2) USB 2.0
- (1) HDMI
- (1) RS-232
- (1) DisplayPort

### Rear I/O Module

**From Frame Power**

**Power Interface**

**HDD RAID Mirror Support**

*This color denotes option*  

*Third GigE port (connection to frame midplane) available only on oGx frame.*

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OG-PC-x86-A
### 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 worst-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.
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
- Real time adjustments, excellent for on-air manipulation
- No deep submenus, all parameters can be accessed quickly
- Completely configurable with password protected web interface
- Save and restore panel configuration with web interface and USB drive
- 10/100 Mbps Ethernet TCP/IP connection
- Optimized for bright and low light environments
- Seamless integration with DashBoard™ remote control software
- Rugged 2RU rack mounted chassis
- Five-year warranty

### SPECIFICATIONS

- **Power**
  - 9 watts
- **AC Input**
  - IEC C14 Chassis Plug accepting 90-264 VAC @ 47-63 Hz
- **DC Input**
  - 12 VDC 1.0 A
- **Ethernet**
  - 10/100 Mbps with Auto-MDIX on RJ45 socket with DC isolation
- **LCD**
  - 500 cd/m² (nits) of brightness, 300:1 contrast ratio, 120 degree viewing angle
- **Size**
  - Standard 2RU; 5" depth

### 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.)
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 PIPS 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 control 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 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.

Independent per-PiP audio meters

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

Independent per-PiP timecode insertion

Per PIP User UMD text and tally indicators

User-configurable reticules

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.
### FEATURES

<table>
<thead>
<tr>
<th>Scalable openGear® PiP solution. Card-based form factor provides high density, space-saving economical integration.</th>
<th>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 definitions. Cascade Config consolidated control can span card chains within a frame or across multiple frames.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>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’s input or output video signals.</td>
</tr>
<tr>
<td>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.</td>
<td>Audio routing directs selected PiP audio to combined-stream outputs. Audio downmixing also provided.</td>
</tr>
<tr>
<td>GPI, Ethernet, and serial tally inputs provide dual, per-PiP tally indicators</td>
<td>3G/HD/SD-SDI 2x DA and HDMI with audio embed outputs</td>
</tr>
<tr>
<td>Closed captioning overlays provide direct closed captioning presence/quality compliance checks for up to 5 simultaneous video streams per card</td>
<td>Wall-clock time burn-in on merged output or within PiPs. NTP sync via IP connection with timezone localization.</td>
</tr>
<tr>
<td>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.</td>
<td>Per-PiP audio meter, tally, user text, and timecode overlays</td>
</tr>
</tbody>
</table>

#### MULTIVIEWERS

**3G/HD/SD-SDI Expandable Multiviewers**

### 9970-QS

**3G/HD/SD-SDI/CVBS Expandable Multiviewer**

- **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.

### FEATURES

- **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 definitions. 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’s 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.**

### NOTES

- **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.

- **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.
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

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)
The all-new 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 PIPs 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).
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.
- 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.
- 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/alarm 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.
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

- **12 VDC**
- **ETHERNET**
- **REF LOOP**

**VID IN E**
- HDMI OUT
- VID IN C
- VID IN A
- SDI OUT
- COMM / GPIO
- VID IN D
- VID IN B

**COMM / GPIO**
1. "COM A_RX2 / 422(+)"
2. "COM A_TX2 / 422(+)"
3. "COM B_RX2 / 422(+)"
4. "GPIO OUT1"
5. "GND"
6. "COM A_RX1 / 422(-)"
7. "COM A_TX1 / 422(-)"
8. "COM B_RX1 / 422(-)"
9. "GPIO IN5"
10. "GPIO IN4"
11. "GPIO IN1"
12. "GPIO IN2"
13. "GPIO IN3"
14. "NC"
15. "NC"

* Port can be G/L-configured as two RS-232 ports (Tx and Rx), or as a full-duplex RS-422 port.
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 Inputs/Outputs**
- Video Inputs: (5) 75Ω BNC; auto-detect/setup for 3G/HD-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.
- Return 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**

**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**

**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)
**Multiviewers**

**3G/HD-SDI Expandable Multiviewers**

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

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**

- 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/alarms 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.
- Per-PIP audio meter, tally, user text, and timecode overlays.
- 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-SDI 2x DA and HDMI with audio embed outputs.
- 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.
- Five year warranty.

**Cobalt Digital**

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Multiple 9970-QS-MC cards can operate in a cascading mode, where four PIP inputs serve as program video inputs, and the PIPS 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.

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**DashBoard™/OGCP**

Monitor/Control

Ethernet 10/100/1000

(1x frame)

9970-QS-MC
9970-QS-MC 3G/HD/SD-SDI/CVBS EXPANDABLE MASTER CONTROL MULTIVIEWER
with Advanced On-Screen Graphics
## 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, 1080p, 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 1684A)
- 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**


**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

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<td>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</td>
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<td>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)</td>
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<td>RM20-9970-C-HDBNC</td>
<td>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)</td>
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<td>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</td>
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<tr>
<td>RM20-9970-E-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9970-E-HDBNC</td>
<td>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)</td>
</tr>
</tbody>
</table>
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 UHD 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, integrated HTML5 web interface, SNMP, 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
- Easy to configure PiP sizing and borders
- UHD 3840x2160 output raster support
- Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, integrated HTML5 web interface, SNMP, 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.

* Six discrete PiP image input supported using 12G-SDI only. Quad 3G-SDI consumes four SDI inputs per PiP.

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

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): < 0.3/0.3/0.2 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

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

RM20-9971-B-HDBNC 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI SDI Inputs, (8) 12G/6G/3G/HD/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-SDI SDI Inputs, (4) 12G/6G/3G/HD/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-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, integrated HTML5 web interface, SNMP, 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
- UHD 3840x2160 output raster support
- Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, integrated HTML5 web interface, SNMP, 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.

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### Screen 1 (DUAL)

- Multi-Input Select
- Multi-Split ARC Scaler/Formatting
- Border Insert/Formatting
- Video Combiner/Formatting
- Identity Text Burn-In/Formatting
- Tally Graphics Insert/Control
- Audio PPM Meters

### Screen 2 (DUAL)

- SDI IN 1
- SDI IN 2
- SDI IN 18
- Multi-Input Select
- De-Serialize
- Input-to-PiP Positioning

* 18 discrete PiP image input supported using 12G-SDI only.
  Quad 3G-SDI consumes four SDI inputs per PiP.

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

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

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-SDI Inputs, (4) 12G/6G/3G/HD/SD-SDI Processed Outputs, GPI/COMM, (2) HDMI 2.0 Output (type A standard), 10/100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)
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 rater 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 GPIO, 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) – Generates 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.
- SCTE 104 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™, Dasdelec™, 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/SDI 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.

**SPECIFICATIONS**

- Multi-Input/Frame sync/Variable rate of SDI/3G-SDI output with precise metadata marking the beginning and ending of each program and commercial segment.
9902-UDX » 3G/HD/SD UP-DOWN-CROSS CONVERTER/FRAME SYNC/Audio Embed/De-Embed with Multi-Input Auto-Changeover

SDI I/O and bypasses are a function of rear I/O module. Refer to rear I/O modules descriptions for more information.

9902-UDX
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)
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/SDI Processed or Relocked 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/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/SDI-SDI Output BNCs, (1) 3G/HD/SDI Output BNC (with relay bypass failover), GPIO/COMM RJ-45 connector

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/SDI Outputs, (1) CVBS Processed Output, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC.)

RM20-9902-D-DIN 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (4) 3G/HD/SDI-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) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/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/SDI-SDI Outputs, (8) AES Outputs (All coaxial connectors DIN1.0/2.3.)

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

RM20-9902-F-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/SDI-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.)
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-SDI Inputs, (6) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)
RM20-9902-K-HDBNC 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD-SDI Inputs, (6) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)
RM20-9902-L-DIN 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SDI Inputs, (8) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)
RM20-9902-L-HDBNC 20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD-SDI Inputs, (8) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors HD-BNC)
RM20-9902-M/S-DIN 20-Slot Frame Rear I/O Module (Split; supports 2 cards) (4) 3G/HD-SDI Inputs, (6) 3G/HD-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-SDI Inputs, (6) 3G/HD-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-SDI Inputs, (8) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; all coaxial connectors DIN1.0/2.3)
RM20-9902-N-HDBNC 20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD-SDI Inputs, (8) 3G/HD-SDI Outputs (Connections are per each Card 1 / Card 2 connector bank; 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
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 bum-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 burst 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/analogue 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).
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)
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
- 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)

**SDI Input/Outputs**
- Up to (4) 75Ω BNC outputs (selectable as processed SDI IN or IN RCK)
- 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
  - CVBS Input Format: 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/Vide 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) GPIO 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)
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 Embed-De-Embed with Multi-Input Auto-Changeover

BBG-1002-UDX-C  3G/HD/SD-SDI Stand-alone Up/Down/Cross Converting Frame Sync and Audio Embed-De-Embed 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 Embed-De-Embed with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (2) Balanced Analog Audio Out, (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 Embed-De-Embed with (4) 3G/HD/SD-SDI Inputs, (2) Balanced Analog Audio In, (2) Balanced Analog Audio Out, (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 1 RU 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

12 VDC 12 VDC
ETHERNET  REF LOOP

12 VDC

RCK/PROC OUT SDI IN D SDI IN C SDI IN A
1 2 3
GPIO RLY BYP B SDI IN B

CVBS IN AES IN AN-AUD IN SDI IN A
CVBS OUT AES OUT AN-AUD OUT SDI OUT

AES OUT 1 SDI OUT AES IN 1 SDI IN

AES IN 2 CVBS OUT AES IN 2 CVBS IN

1A 2A 3A 4A

GPIO COMM

RLY BYP -UDX-B

SDI A

AES IO
01 02 03 04

11 12 13 14

1A 2A

GPIO COMM

RLY BYP -UDX-C

12 VDC

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

Specifications subject to change. E&OE. ©2018 Cobalt Digital Inc.
## 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)**

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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 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. Analog video (CVBS) input, with AES and analog 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.

Presets 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.
# 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: < 0.2/0.1/0.2 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)
## SPECIFICATIONS (cont.)

**Frame Sync Audio/Video Delay**
- Max offset: 20 frames
- Latency (min): 1 frame
- Option +DLY Delay (3G/HD/SDI): >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) GPIO 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 BNCs, (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 HD-BNC)

**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-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 HD-BNC)

**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)

**RM20-9902-2UDX-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 DIN1.0/2.3)

**RM20-9902-2UDX-D-X-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 HD-BNC)

**RM20-9902-2UDX-J-DIN**
20-Slot Frame Rear I/O Module (Standard Width) (3) 3G/HD/SD-SDI Inputs, (2) AES 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-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 DIN1.0/2.3)

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

**Ordering Information (cont.)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM20-9902-2UDX-L-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-L-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-M-S-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-M-S-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-N-DIN</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-N-HDBNC</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-P-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-2UDX-P-HDBNC</td>
<td>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)</td>
</tr>
</tbody>
</table>

**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
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 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. 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 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 4 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**

- 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, VT, 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, 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/SIDI 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.

**SCTE104 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)
BBG-1002-2UDX 3G/HD/SD-SDI STANDALONE DUAL-CHANNEL UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED

**Rear Panel**

- **12 VDC**
- **ETHERNET**
- **REF LOOP**
- **RCK/PROC OUT**
- **SDI IN D**
- **SDI IN C**
- **SDI IN A**
- **GPIO COMM**
- **RLY BYP B**
- **SDI IN B**

This color denotes option.
## 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)

#### 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)
- 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 Freq. Response: ±0.2 dB (20 Hz to 20 kHz)
- Analog SNR: > 70 dB (unweighted)
- Analog Crosstalk: -96 dB (20 Hz to 10 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
- 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-1002-2UDX** 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:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1002-2UDX-B</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1002-2UDX-C-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-2UDX-C-HDBNC</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-2UDX-D-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-2UDX-D-HDBNC</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-2UDX-E-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-2UDX-E-HDBNC</td>
<td>(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)</td>
</tr>
</tbody>
</table>

**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)
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. 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 OGC-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 YDCC/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 SCCT 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.**
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

- 3G/HD/SD - SDI In
- Multi-Input Select w/ Failover
- Video ADC
- Timecode Select / Processing
- De-serialize
- GPIO Input Select/Status
- Color Correction (+COLOR)
- Audio Demux
- Up/Down/Cross Conversion/ARC
- Framesync w/User H/V Offset
- Ref Select
- IP, Serial ANC Data I/O
- 1x4 Output DA
- Serialize
- 3G/HD/SD - SDI Out
- AES In (16-ch)
- LTC RS-485 (1 LTC)
- AES Rx
- 24-Bit ADC
- Ethernet 10/100/1000
- DashBoard™/OGCP Monitor/Control
- Video DAC
- CVBS/Component Video Out
- 24-Bit DAC
- AN-AUD Out (2-Ch)
- AES Tx
- AES Out (16-Ch)
- CVBS/Component Video In
- SDI IN A
- SDI IN B
- AES IN 1
- AES IN 2
- AES OUT 1
- AES OUT 2
- CVBS IN
- CVBS OUT
- AES OUT (2-Ch)
- 24-Bit DAC
- AES In (16-ch)
- AES Rx
- LTC RS-485 (1 LTC)
- AES Tx
- AES Out (16-Ch)
- CVBS/Component Video Out
- 24-Bit DAC
- AN-AUD Out (2-Ch)
- AES In (16-ch)
- LTC RS-485 (1 LTC)
- AES Rx
- 24-Bit ADC
- Ethernet 10/100/1000
- DashBoard™/OGCP Monitor/Control
- Video DAC
- CVBS/Component Video Out
- 24-Bit DAC
- AN-AUD Out (2-Ch)
- AES In (16-ch)
- LTC RS-485 (1 LTC)
- AES Rx
- 24-Bit ADC
- Ethernet 10/100/1000
- DashBoard™/OGCP Monitor/Control
- Video DAC
- CVBS/Component Video Out
- 24-Bit DAC
- AN-AUD Out (2-Ch)
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: < 2.0/1/0.2 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 upconverted 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: -96 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
## 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 Inputs, 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
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 PIZ, 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**

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 PIZ, 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

Rear Panel

- D model available as -DIN (DIN 1.0/2.3 connectors) or -HD-BNC (HD-BNC connector)
- 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.
### 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 Input Reference Level: ±0.2 dB (20 Hz to 20 kHz)
- 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**

- 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-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

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1003-UDX-ADDA-B</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1003-UDX-ADDA-D-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1003-UDX-ADDA-D-HDBNC</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1003-UDX-ADDA-E</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1003-UDX-ADDA-F</td>
<td>(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</td>
</tr>
</tbody>
</table>

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)
The Cobalt® 9902-UDX-DSP is 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 equipped 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 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/analogue audio embedding and de-embedding.

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. Dual-string character/timecode bum-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
Five year warranty

**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
- Dolby encoding/decoding, Dolby Real-Time Loudness Leveling (RTLL) loudness leveling with full parametric control setup, and Linear Acoustic UPMAX™ DSP audio options available
- 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. Dual-string character/timecode bum-in.

**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-ENC) –** 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
- **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) –** Provides extended delay capabilities
- **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/SDI ancillary data, with insert/extract to and from IP and GPI0 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) –** Provides audio LTC I/O options available

**SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. E. & O.E. ©2020 COBALT DIGITAL INC.**
### 9902-UDX-DSP 3G/HD/SD-SDI UP-DOWN-CROSS CONVERTER / FRAME SYNC / AUDIO EMBED/DE-EMBED with DSP Audio Options Support

**Diagram Description:**
- **Input:** 3G/HD/SD-SDI (SDI In)
- **Multi-Input Select/Failover:** A, B, C, D, CVBS In
- **Video ADC:** De-serialize
- **Timecode Processing:** Color Correction (+COLOR)
- **Audio Demux:** Audio DSP
- **Up/Down/Cross Conversion/ARC:** CC Detect/Formatting
- **NR / Detail Enhancement:** Framesync w/User H/V Offset, Pattern Gen
- **Output Routing:** Audio DSP, Audio Mux, Delay Offset
- **Output:** 3G/HD/SD-SDI Out

**Options:**
- AES In
- CVBS In
- AN-AUD In
- 24-Bit ADC
- Ethernet 10/100/1000 (on frame)
- DashBoard™/OGCP Monitor/Control

**Note:** This color denotes option.

**Part Numbers:**
- RM20-9902-B
- 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-L-DIN
- RM20-9902-L-HDBNC
- RM20-9902-K-DIN
- RM20-9902-K-HDBNC
- RM20-9902-N-DIN
- RM20-9902-N-HDBNC
- RM20-9902-B

**Specifications:**
- **Quality Event Detect (+QC):** CC Detect/Formatting
- **Audio Silence:** Framesync w/User H/V Offset, Pattern Gen
- **Closed-Captioning:** Audio DSP
- **Audio DSP:** Dolby AC-3 / E, Encode/Decode
- **Audio Demux:** Dolby RTLL (+DSP-RTLL)
- **Audio Mux:** Dolby AC-3 / E, Encode/Decode
- **Delay Offset:** Dolby AC-3 / E, Encode/Decode
- **Output Routing:** Dolby AC-3 / E, Encode/Decode
- **Output:** 3G/HD/SD-SDI Out
- **Routing:** Audio DSP, Audio Mux, Delay Offset
- **Output:** 3G/HD/SD-SDI Out

**Options:**
- AES In
- CVBS In
- AN-AUD In
- 24-Bit ADC
- Ethernet 10/100/1000 (on frame)
- DashBoard™/OGCP Monitor/Control

**Part Numbers:**
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- 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-L-DIN
- RM20-9902-L-HDBNC
- RM20-9902-K-DIN
- RM20-9902-K-HDBNC
- RM20-9902-N-DIN
- RM20-9902-N-HDBNC

**Notes:**
- **SDI In A** through **SDI In D** outputs which can be individually set as clocked or processed outputs of the currently-selected input.
- **Ryc Bx 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.

**Part Numbers:**
- RM20-9902-B
- RM20-9902-C
- RM20-9902-D-DIN
- RM20-9902-D-HDBNC
- RM20-9902-E-DIN
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- RM20-9902-H-DIN
- RM20-9902-H-HDBNC
- RM20-9902-J-DIN
- RM20-9902-J-HDBNC
- RM20-9902-L-DIN
- RM20-9902-L-HDBNC
- RM20-9902-K-DIN
- RM20-9902-K-HDBNC
- RM20-9902-N-DIN
- RM20-9902-N-HDBNC

**Notes:**
- **SDI In A** through **SDI In D** outputs which can be individually set as clocked or processed outputs of the currently-selected input.
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**Part Numbers:**
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- RM20-9902-D-DIN
- RM20-9902-D-HDBNC
- RM20-9902-E-DIN
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- RM20-9902-F
- RM20-9902-H-DIN
- RM20-9902-H-HDBNC
- RM20-9902-J-DIN
- RM20-9902-J-HDBNC
- RM20-9902-L-DIN
- RM20-9902-L-HDBNC
- RM20-9902-K-DIN
- RM20-9902-K-HDBNC
- RM20-9902-N-DIN
- RM20-9902-N-HDBNC

**Notes:**
- **SDI In A** through **SDI In D** outputs which can be individually set as clocked or processed outputs of the currently-selected input.
- **Ryc Bx 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.
### 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: < 0.5/0.3/0.2 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)
- 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.
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)).

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM20-9902-B</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9902-C</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9902-D-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-D-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-E-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-E-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-F</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9902-H-DIN</td>
<td>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 GP/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9902-H-HDBNC</td>
<td>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 GP/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)</td>
</tr>
<tr>
<td>RM20-9902-J-DIN</td>
<td>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 GP/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9902-J-HDBNC</td>
<td>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 GP/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)</td>
</tr>
<tr>
<td>RM20-9902-K-DIN</td>
<td>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, GPO RJ-45 connector (All coaxial connectors DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9902-K-HDBNC</td>
<td>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, GPO RJ-45 connector (All coaxial connectors HD-BNC)</td>
</tr>
<tr>
<td>RM20-9902-L-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-L-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9902-N-DIN</td>
<td>20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (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) GPO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9902-N-HDBNC</td>
<td>20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (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) GPO RJ-45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC)</td>
</tr>
</tbody>
</table>
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
+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
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 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 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).

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 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.

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 disconnecting the unit. Included as standard features are downmixing, flex mixing, and full AES and balanced analog audio/echo/echo-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.

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™. GPI/O provides 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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>Advanced audio processing</td>
<td>Allows routing, gain, smooth delay, and flexible mixing as standard features</td>
</tr>
<tr>
<td>Option +TTS</td>
<td>Provides Text-To-Speech synthesis, directly converting EAS text to high-quality digital audio speech with no baseband signal breakouts or add-on units</td>
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<tr>
<td>Up/Down/Cross Conversion with user and AFD, VI, and WSS ARC</td>
<td>Specifically tailored for broadcast video</td>
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<td>Supports import of user trouble slate graphic file for LOS failover insertion</td>
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<tr>
<td>3:2 pulldown optimization</td>
<td>Allows A-frame alignment correlated to received timecode or 6 Hz external input over GPI</td>
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<tr>
<td>Option +ANC</td>
<td>Adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PIZ, 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.</td>
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<tr>
<td>Compact footprint</td>
<td>Up to 3 units in a 1RU space.</td>
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<tr>
<td>Optional tray</td>
<td>Provides secure captive-fastener mounting of 3 units in a 1RU tray.</td>
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<tr>
<td>Remote control/monitoring via DashBoard™ software, OGCP-9000</td>
<td>Remote Control Panel, or Web Browser User Interface</td>
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<td>Five year warranty</td>
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**Specifications subject to change. E&OE. ©2018 Cobalt Digital 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

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 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.

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.

Add Extended Delay Option (+DLY)

Audio LTC I/O (+LTC)

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.

Ancillary Data Processor Option (+ANC) – Provides full user VANC/HANC packet insertion/extraction access to DID/SDI 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  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 295M, SMPTE 292M, SMPTE 424M
SDI Receive Cable Length: 3G/HD/SD: 120/180/320 m (Beiden 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)

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

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

**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)

**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.

**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)
## Order 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

### Options and Accessories:

- **+DSP-RTLLE-5.1** Dolby® RTLL™ 5.1-Channel Loudness Processor Option
- **+DSP-RTLLE-2.0** Dolby® RTLL™ Stereo Loudness Processor Option
- **+DSP-ENC-5.1** Dolby® Digital/Digital Plus 5.1 Encoder
- **+DSP-ENC-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
- **+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 1/0 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)
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/VCBS 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/VCBS Up/Down/Cross Converter-Frame Sync and Embedder/De-Eembedder 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 (RTL) Loudness Processing Options**
- **Dolby® Encode/Decode Options**
- **Stereo to Surround 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 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 all Lmarkets. The Channel Integrator is offered with a wide range of rear I/O options including high-density DIN and HDBNC 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 sophisticated channel delivery requirements.

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.
- Retrieval/Scrubbing of any loaded or source loaded set of ingest Audio/Video signals.
- 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 footprint 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 including high-density DIN and HDBNC and can be configured with a SFP I/O port option which adds support for either HDMI, fiber optic, or IP (SMPT 2110 or SMpte 2022-6).

**FEATURES**

- 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
- Frame Sync synchronizes to external reference and provides audio/video offsets as desired
- Supports SNMP and Cobalt’s Reflex (JSON) Protocols

**OPTIONS**

- **Color Correction Option (+COLOR)** provides full RGB color corrector (offset, gain, gamma) with extended YCrCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip
- **Audio LTC I/O Option (+LTC)**
- **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-UMPX-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)**
- **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.**
- **Loudness Processing Options (+DSP-RLT) provide numerous Dolby Real-Time Loudness Leveling loudness processing options (See Ordering Information for more info)**

**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 -C1-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) allows uploading of up to three different user trouble slate graphic file to card, with automated insertion controlled by screened 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)
- Extended Frame Sync Delay Option (+DLY)

Supports SNMP and Cobalt’s Reflex (JSON) Protocols

Color Correction Option (+COLOR) provides full RGB color corrector (offset, gain, gamma) with extended YCrCr proc controls with white hard clip, white soft clip, black hard clip, and saturation clip

Audio LTC I/O Option (+LTC)

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-UMPX-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)

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.

Loudness Processing Options (+DSP-RLT) provide numerous Dolby Real-Time Loudness Leveling loudness processing options (See Ordering Information for more info)
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

Standards Conversion Table

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<th>625i 50</th>
<th>720p 23.98</th>
<th>720p 25</th>
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Note: Option -CI-SFP consumes SDI IN C and SDI OUT 4A.
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 allows flexible added I/O (including fiber, HDMI, and IP encap/de-encap) as well as repurposing by simply swapping SFP modules as desired.
## Specifications

### Power
- 24 Watts (including +DSP options)
- Add 3 Watts for option +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): 3G: 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).
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
+F-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-ENCOD-5.1  Dolby® Digital / Digital Plus 5.1 Encoder
+DSP-ENCOD-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
**ORDERING INFORMATION (cont.)**

- **-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-ED** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Transmitter, Medium Haul, 1310nm

- **-SFP-EO** 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-ED-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)
  
  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-ED-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 -SFP-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-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) CBVS 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, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CBVS 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, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CBVS 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.)
### Format Converters

**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

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#### Ordering Information (cont.)

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<td>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</td>
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<td>RM20-9902-UDX-DSP-CI-G-DIN</td>
<td>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)</td>
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<td>RM20-9902-UDX-DSP-CI-J-DIN</td>
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<td>RM20-9902-UDX-DSP-CI-K-DIN</td>
<td>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, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (2) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)</td>
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<td>RM20-9902-UDX-DSP-CI-K-HDBNC</td>
<td>20-Slot Frame Rear I/O Module (Double Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) AES Inputs, (4) Balanced Analog Audio 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/COMM RJ-45 connector (All coaxial connectors HD-BNC)</td>
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<td>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)</td>
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**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.

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**Rear Panel Options**: (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)
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 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 +TIS 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-captions 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/SIDID ancillary data
- Text-To-Speech (+TIS) – 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 trigged from automation GPI or other modes. Full control of splice start, end, and cancel as well as pre-roll offsets provides.
- 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)
9902-UDX-FS 3G/HD/SD-SDI DUAL-CHANNEL – PATH 1 UDX / PATH 2 FRAME SYNC
with Audio Embed/De-Embed

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RM20-9902-UDX-FS-A
RM20-9902-UDX-FS-C
RM20-9902-UDX-FS-D (DIN / HDBNC)
RM20-9902-UDX-FS-E
RM20-9902-UDX-FS-F
RM20-9902-UDX-FS-H (DIN / HDBNC)
RM20-9902-UDX-FS-J (DIN / HDBNC)
RM20-9902-UDX-FS-K (DIN / HDBNC)
RM20-9902-UDX-FS-L (DIN / HDBNC)

RM20-9902-UDX-FS-A RM20-9902-UDX-FS-D
RM20-9902-UDX-FS-C RM20-9902-UDX-FS-E
RM20-9902-UDX-FS-F RM20-9902-UDX-FS-H
RM20-9902-UDX-FS-J RM20-9902-UDX-FS-K
RM20-9902-UDX-FS-L

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked 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.
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

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 (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/SDI): >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 BNCs, (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, (2) AES Inputs, (4) 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-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 DIN1.0/2.3)

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)

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 (GPIO-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 HD-BNC)

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 DIN1.0/2.3)

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 HD-BNC)

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
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. ARC processing can detect an incoming ARC code and correspondingly set scaling and ARC to track with ARC. This processor also allows independent custom ARC to be applied for each incoming ARC code, and set the desired ARC 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 enables 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. GP90 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 of 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 with Audio Embed/De-Embed.
- Frame sync with 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

### 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 DIB/SDI 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 (+DLT) - 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)
- 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, OCPP-9000 Remote Control Panel, or Web Browser User Interface
- Five year warranty
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**

- **12 VDC**
- **ETHERNET**
- **REF LOOP**

**BBG-1002-UDX-FS**

**COBALTDIGITAL.COM**
## 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
- 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

<table>
<thead>
<tr>
<th>BBG-1002-UDX-FS</th>
<th>3G/HD/SD-SDI Standalone Dual-Channel – Path 1 UDX / Path 2 Frame Sync available in the following rear-panel I/O configurations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1002-UDX-FS-B</td>
<td>(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. (All coaxial connectors DIN 1.0/2.3)</td>
</tr>
<tr>
<td>BBG-1002-UDX-FS-C-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-UDX-FS-C-HDBNC</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1002-UDX-FS-D-DIN</td>
<td>(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)</td>
</tr>
</tbody>
</table>

## 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)
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 UHDI 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 offers 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, but also offers a DSP-based platform that supports multiple audio DSP options, including Dolby® Real-Time Loudness Leveling automation 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 to be installed in one 2RU openGear® frame. Card control/monitoring is available via Dashboard™ software, OGCP-9000 remote control panels, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol.

Alternate Models:
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 SNMP and 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, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol
- 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 (Lookup Table) options provide 33 cube LUT mapping between 10-bit RGB and HDR color spaces.
- 3D LUT Cube Presets Option (+3D-LUT-BBC) – Licensed product developed by the BBC, provides the BBC 3D LUT CUBE presets as optional SDR-to-HDR and HDR-to-SDR profiles.

A color option indicates that the feature is only available in the corresponding option.
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:
> 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; 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.

HDMI Output
HDMI 2.0 Output; type A standard 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”
**ORDERING INFORMATION**

9904-UDX-4K  12G/6G/3G/HD/SD UHD Up/Down/Cross Converter/Frame Sync/Embed/De-Embed Audio Processor

**RM20-9904-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, (4) AES I/O (User Selectable), GPI/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port (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), 100/1000 BaseT Ethernet Port (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, GPI/COMM, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9904-E-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, (4) 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), 100/1000 BaseT Ethernet Port (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), 100/1000 BaseT Ethernet Port (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

+**HDR-TCHCLR**   SDR/HDR Conversion Option

+**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)

+**3DLUT-BBC**   BBC 3DLUT CUBE 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

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

-**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. **Note:** To support SFP option(s) below, card must be fitted with rear module (such as RM20-9904-C-HDBNC, RM20-9904-E-HDBNC, or RM20-9904-F-HDBNC) that supports MSA SFP plug-in modules.

-**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-OE-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-OE-MSA**   Single-Channel Video Optical Receiver (LC female connector)

-**SFP-IP-SWD-MSA**   Software-Defined EmSFP 2021/2022-6 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-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-2110**   SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110

9904-UDX-4K » 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC / EMBED/DE-EMBED AUDIO PROCESSOR
9904-UDX-4K-DSP  12G/6G/3G/HD/SD UHD Up/Down/Cross Converter / Frame Sync with 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 synchronizers 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, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol.

**SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. E. & O.E. ©2020 COBALT DIGITAL INC. COBALTDIGITAL.COM**

**FEATURES**

- High-density openGear comprehensive UHD UDX solution
- 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
- DSP-based platform supports multiple audio DSP options, with multiple instances available using allocatable license “credits”

**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 (Lookup Table) options provide 33 cube LUT mapping between 10-bit RGB and HDR color spaces.
- 3D LUT Cube Presets Option (+3DLUT-BBC) - Licensed product developed by the BBC, provides the BBC 3D LUT CUBE presets as optional SDR-to-HDR and HDR-to-SDR profiles.

**Dolby**

- 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
- Supports SNMP and Cobalt’s Reflex (JSON) Protocols
- Full embedded audio processing with user delay offset and AES I/O
- Noise Reduction and Detail Enhancement provide image quality optimization
- Remote control/monitoring via Dashboard™ software, OGCP-9000 remote control panels, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol
- Five year warranty

**DE-INTERLACE**

- De-Interlace (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 Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
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**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)

**COBALT**

- Audio LTC I/O Option (+LTC)
- Dolby® / Linear Acoustic® DSP Audio Options (+DSP)
- 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.
- Audio LTC I/O Option (+LTC)
9904-UDX-4K-DSP 12G/6G/3G/HD/SD UHD UP/DOWN/CROSS CONVERTER / FRAME SYNC with 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; port direction assignbable 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.

**HDMI Output**

- HDMI 2.0 Output; type A standard 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"
# 9904-UDX-4K-DSP 12G/6G/3G/HD/SD UHD Up/Down/Cross Converter / Frame Sync with 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

**RM20-9904-B-HDBNC**  20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (8) 12G/6G/3G/HD/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 (All coaxial connectors HD-BNC.)

**RM20-9904-D-HDBNC**  20-Slot Frame Rear I/O Module (Standard-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (6) 12G/6G/3G/HD/SD-SDI Processed Outputs, (4) AES I/O, GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9904-F-HDBNC**  20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD-SDI Processed Outputs, (8) AES I/O, GPIO/COMM, HDMI 2.0 Output (type A standard connector), 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

*Note:* 9904-UDX-4K-DSP model does not support SFP ports. SFPs are not supported nor present when using this rear module on this card model.

### Options:

- +HDR-TCHCLR-4K  4K SDR/HDR Conversion Option
- +HDR-TCHCLR  SDR/HDR Conversion Option
- +3DLUT-PRO-4K  3D LUT 4K Option
- +3DLUT-PRO  3D LUT Option
- +3DLUT-BBC  BBC 3DLUT CUBE 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
- +LTC  Audio LTC I/O 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-ENC-5.1  Dolby® Digital / Digital Plus 5.1 Encoder
- +DSP-ENC-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
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 UHD 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-IP offers numerous options, including SDR-to-HDR conversion and color correction.

The 9904-UDX-4K-IP provides 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, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol.

### FEATURES

- High-density openGear comprehensive UHD UDX solution
- 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 SNMP and 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, integrated HTML5 web interface, SNMP, or Cobalt’s RESTful-based Reflex protocol
- 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 IFM Intelligent Tone Management.
- 3D LUT Options (+3DLUT-PRO-4K, +3DLUT-PRO) – 3D LUT (Lookup Table) options provide 33 cube LUT mapping between 10-bit RGB and HDR color spaces.
- 3D LUT Cube Presets Option (+3D-LUT-BBC) – Licensed product developed by the BBC, provides the BBC 3D LUT CUBE presets as optional SDR-to-HDR and HDR-to-SDR profiles.
- 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.
- Audio LTC I/O Option (+LTC)
- SFP Options – Rear module externally-accessible dual SFP cage supports numerous plug-in SFP options. (See Ordering Information for SFP types available and detailed descriptions.)

### Diagram

The diagram illustrates the functionality and connections of the 9904-UDX-4K-IP with various inputs and outputs, including SDI, HDMI, AES, and Ethernet interfaces.
FORMAT CONVERTERS

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

12G/6G/3G/HD/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 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; 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.

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 GPIO (max); 2 GPIO (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”
**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: All Rear I/O Modules are preliminary designs/layouts and subject to change.

**RM20-9904-C-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (4) 12G/6G/3G/HD/SD-SDI Processed Outputs, GP/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9904-E-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD-SDI Processed Outputs, (4) AES I/O, GP/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)

**RM20-9904-F-HDBNC** 20-Slot Frame Rear I/O Module (Double-Width) (6) 12G/6G/3G/HD/SD-SDI Inputs, (9) 12G/6G/3G/HD/SD-SDI Processed Outputs, (8) AES I/O, GP/COMM, HDMI 2.0 Output (type A standard connector), (2) SFP cage receptacles, 100/1000 BaseT Ethernet Port (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

**+HDR-TCHCLR** SDR/HDR Conversion Option

**+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)

**+3DLUT-BBC** BBC 3DLUT CUBE Option (Requires +3DLUT-PRO or +3DLUT-PRO-4K option to also be present to support this option)

**+COLOR-4K** 4K Color Correction Option

**+COLOR** Color Correction Option

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

Note: To support SFP option(s) below, card must be fitted with rear module (such as RM20-9904-C-HDBNC, RM20-9904-E-HDBNC, or RM20-9904-F-HDBNC) that supports MSA SFP plug-in modules.

**-SFP-EOOE-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-EO-MSA-12G** 12G/6G/3G/HD/SD-SDI UHD Receiver (LC female connector)

**-SFP-EOOE-MSA** Single-Channel Video Optical Transceiver (LC female connectors)

**-SFP-E0-MSA** Single-Channel Video Optical Transmitter (LC female connector)

**-SFP-EO-MSA** Single-Channel Video Optical Receiver (LC female connector)

**-SFP-SPF-SWD-MSA** 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-SPF-SWD-MSA (Up to 3 software licenses can be added to the -SFP-SPF-SWD-MSA, 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-2110** SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110
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.)

-SFP-IP-SWD-MSA  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-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-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-2110  SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110
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
- 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
- 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 embedded audio control with selectable downmix and analog audio de-embed
- 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
- 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. Installation: Hardware feature available only on new card. (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

- 3G/HD/SD SDI In
- Input Sel/EQ
- Reclock/De-serialize
- Color Correction
- Down Convert + ARC
- Path Routing
- Sync Gen
- Reticle Overlay
- Framesync
- Audio D/A
- Audio Processing
- Audio LTC
- TC/CC Processing
- SD Analog Encode + 4x DA
- SDI Serialize + 4x DA
- Analog Composite or SD - SDI Output
- Ethernet 10/100/1000 (On Frame)
- DashBoard/OGCP Monitor/Control
- Analog Audio Out

RM20-9501-A
RM20-9501-A/S
RM20-9501-B
RM20-9501-C/S-DIN
RM20-9501-C/S-HDBNC
RM20-9501-F-DIN
RM20-9501-F-HDBNC

Note: Although this rear module offers only two SDI/Composite OUT BNCs, the two outputs on the rear module correlate to card output channels 3 and 4.
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
9501-DCDA-3G  Down-Converter/DA with 3G/HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

#### 9501-DCDA-HD
9501-DCDA-HD  Down-Converter/DA with HD/SD-SDI Input, Reclocking, SD-SDI and Analog Video/Audio Outputs

#### RM20-9501-A
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
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
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
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
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
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
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

+FS  Frame Sync Software Option

+DLY  Extended Frame Sync Delay Option (add-on to option +FS; option +FS required)

+LTC  Audio LTC Option
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
- 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
- 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. Installation: Hardware feature available only on new card. (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-SDI Input, HD-SDI Processed Outputs, and SDI Input Reclocking

- **3G/HD/SD SDI In A**
  - EQ Reclock
  - Input Select
  - De-serialize
  - Color Correction
  - Down Convert + ARC
  - Path Routing
  - SSI Serializing DA
  - HD/SD - SDI Output
  - Audio LTC
  - Sync Gen
  - Reticle Overlay
  - Framesync
  - Audio Processing
  - TC/CC Processing
  - AES (8-ch) Output

- **3G/HD/SD SDI In B**
  - EQ Reclock

This color denotes option

- Ethernet 10/100/1000 (On Frame)
- DashBoard/OGCP Monitor/Control

**Specifications subject to change without notice. E. & O. E. ©2020 COBALT DIGITAL INC.**

**FORMAT CONVERTERS**
**DOWNCONVERTING DISTRIBUTION AMPLIFIERS**
## 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:
  - 1080i/59.94, 29.97, 25, 24, 23.98
  - 1080i/59.44, 50
  - 625/50, 525/59.44
- 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) (2) 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
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-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-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
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
- Redundant power supply option
- 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
- 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)
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**
- Return Loss: >35 dB up to 5.75 MHz

**Physical**
- Dimensions (WxD): 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)
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 bum-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 (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
- 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 bum-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 P1Z, SCTE 104, closed captioning, and other localized user payloads. SMPTE 337 embed/ de-embed allows serial user data to be embedded and de-embedded over unused embedded audio pairs.
- 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
- 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, black hard clip, and saturation clip
- Key/Fill Keyer (+KEYER)
- Audio LTC I/O (+LTC)
- Extended Frame Sync Delay (+OLY) – 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.
9922-FS ›› 3G/HD/SD-SDI FRAME SYNC with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O

**Specifications Subject to Change Without Notice. E. & O. E. ©2020 Cobalt Digital Inc.**

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**RM20-9922-FS-A/S RM20-9922-FS-D**

**RM20-9922-FS-B RM20-9922-FS-C**

**RM20-9922-FS-E**

**RM20-9922-FS-F RM20-9922-FS-H**

**RM20-9922-FS-J RM20-9922-FS-K**

**RM20-9922-FS-L**

**3G/HD/SD SDI In**

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<tr>
<td><strong>A</strong></td>
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<td><strong>RP16B Clean-Switch Multi-Input Select</strong></td>
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<td><strong>AES Rx</strong></td>
<td><strong>24-Bit ADC</strong></td>
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<td><strong>Moving-Box Insertion</strong></td>
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<td><strong>Timecode Burn</strong></td>
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<td><strong>Framesync w/User H/V Offset Pattern Gen</strong></td>
<td><strong>Audio Select Key/Fill (+FILTER)</strong></td>
<td><strong>Wings Insert</strong></td>
<td><strong>Ref 2</strong></td>
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<tr>
<td><strong>Framesync w/User H/V Offset Pattern Gen</strong></td>
<td><strong>Audio Select Key/Fill (+FILTER)</strong></td>
<td><strong>Wings Insert</strong></td>
<td><strong>Ref Select</strong></td>
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<td><strong>Relay Protect</strong></td>
<td><strong>Output Crosspoint</strong></td>
<td><strong>Output Crosspoint</strong></td>
<td><strong>Video DAC</strong></td>
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<td><strong>3G/HD/SD SDI Out</strong></td>
<td><strong>A/B Proc Out</strong></td>
<td><strong>3 Out</strong></td>
<td><strong>AES Out (16-Ch)</strong></td>
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</tbody>
</table>

**Note: ROK/PROC 1 thru ROK/PROC 4 are DA outputs which can be individually set as reencoded 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.**

**LTC 1/O (+UTC)**

**DashBoard™/OGCP Monitor/Control**

**Input RCK**

**Selected In A - In D Input RCK**

**Audio Silence**

**Closed-Captioning Absence/Presence**

**Frozen/Blk/No Vid**

**Audio Demux**

**Audio Select Key/Fill (+FILTER)**

**Wings Insert**

**Ref 1**

**Ref 2**

**Ref Select**

**Output Crosspoint**

**Video DAC**

**A/B Proc Out**

**3 Out**

**AES Out (16-Ch)**

**COBALTDIGITAL.COM**
9922-FS 3G/HD/SD-SDI 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 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-3d 75Ω inputs: (8 pair (16-Ch) max)
AES-3d 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)
### 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 LDS. 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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<tbody>
<tr>
<td>RM20-9922-FS-A/S</td>
<td>2- 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)</td>
</tr>
<tr>
<td>RM20-9922-FS-B</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9922-FS-C</td>
<td>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/SD-SDI Output BNC (with relay bypass failover), (1) GPI/COMM RJ-45 connector</td>
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<tr>
<td>RM20-9922-FS-D</td>
<td>20- Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (4) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (8) AES Outputs, (2) Balanced Analog Audio Outputs (All coaxial connectors HD-BNC)</td>
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<td>RM20-9922-FS-E-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-FS-F</td>
<td>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</td>
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<tr>
<td>RM20-9922-FS-H-DIN</td>
<td>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)</td>
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<tr>
<td>RM20-9922-FS-J-HDBNC</td>
<td>20- Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (2) Balanced Analog Audio Inputs, (4) AES Inputs, (4) 3G/HD/SD-SDI Outputs, (2) AES Outputs (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC)</td>
</tr>
<tr>
<td>RM20-9922-FS-K-DIN</td>
<td>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, (4) GPO/COMM RJ-45 connector (All coaxial connectors HD-BNC)</td>
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### ORDERING INFORMATION (cont.)

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<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>RM20-9922-FS-L-DIN</td>
<td>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)</td>
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<tr>
<td>RM20-9922-FS-L-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-FS-M/S-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-FS-M/S-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-FS-N-DIN</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9922-FS-N-HDBNC</td>
<td>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).</td>
</tr>
</tbody>
</table>

**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
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. 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 23.98/29.97/29.94 to 24/30/60 frame rates. Frame sync can select from multiple reference inputs, with failover to alternate selected sources. 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 in case of 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 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**

- 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. 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
- 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-ENC) - 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

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)
9922-FS-DSP  3G/HD/SD-SDI FRAME SYNC  with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O

ADVANCED 3G/HD/SD-SDI FRAME SYNC WITH AUDIO EMBED/DE-EMBED AND A/V DELAY CONTROL (OPENGEAR CARDS AND STANDALONE MODELS)

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as redlocked 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.

Diagram showing connections and functions.

RM20-9922-B
RM20-9922-C
RM20-9922-D-DIN
RM20-9922-D-HDBNC
RM20-9922-E-DIN
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-L-DIN
RM20-9922-L-HDBNC
RM20-9922-K-DIN
RM20-9922-K-HDBNC
RM20-9922-N-DIN
RM20-9922-N-HDBNC

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"
## 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: +8 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 HD-BNC)

RM20-9922-O-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-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-F-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, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ-45 connector, 100/1000 BaseT Ethernet Port (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, (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-G-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 GPO/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

RM20-9922-H-DIN  20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (8) AES Inputs, (4) Balanced Analog Audio Inputs, (8) AES Outputs (All coaxial connectors HD-BNC)

RM20-9922-I-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, (2) 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-J-HDBNC  20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD/SD-SDI Inputs, (1) CVBS Input, (8) AES Inputs, (2) Balanced Analog Audio Inputs, (2) 3G/HD/SD-SDI Outputs, (1) CVBS Output, (2) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPO/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors DIN1.0/2.3)

RM20-9922-K-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 GPO w/ Isolated Return (All coaxial connectors D/BNC)

RM20-9922-L-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 (one 3G/HD/SDI Output with relay bypass failover), (6) AES Outputs, (2) Balanced Analog Audio Outputs, (4) AES Outputs, GPIO RJ-45 connector (All coaxial connectors DIN1.0/2.3)

RM20-9922-M-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 Outputs, (2) Balanced Analog Audio Outputs, (4) AES Outputs, GPIO RJ-45 connector (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 DIN1.0/2.3)
**9922-FS-DSP**  
**3G/HD/SD-SDI Frame Sync with Audio/Video Processing, DSP Audio Support, Audio Embed/De-Embed and CVBS I/O**

<table>
<thead>
<tr>
<th>OPTIONS</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>+DSP-RTLL-5.1</td>
<td>Dolby® RTLL™ 5.1-Channel Loudness Processor Option</td>
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<tr>
<td>+DSP-RTLL-2.0</td>
<td>Dolby® RTLL™ Stereo Loudness Processor Option</td>
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<tr>
<td>+DSP-ENC-5.1</td>
<td>Dolby® Digital/Digital Plus 5.1 Encoder</td>
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<td>Dolby® Digital/Digital Plus 2.0 Encoder</td>
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<td>+DSP-DEC</td>
<td>Dolby® Decoder</td>
</tr>
<tr>
<td>+DSP-UPMIX-LA</td>
<td>Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer</td>
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<td>+2L-SPAN</td>
<td>Add Spanish-language upgrade (add-on to option +TTS; option +TTS required)</td>
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**ORDERING INFORMATION (cont.)**

Specifications subject to change. E&OE. ©2019 Cobalt Digital Inc.
BBG-1022-FS • 3G/HD/SD-SDI Standalone Frame Sync

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 +T-SLATE 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**

- 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
- Frame Sync with full H/V offset and manual/LOS video 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
- 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.
- 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. (Upgrade 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 the 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)

Specifications subject to change without notice. E. & O. E. ©2018 Cobalt Digital Inc.
BBG-1022-FS 3G/HD/SD-SDI STANDALONE FRAME SYNC with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding, and CVBS I/O
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)
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

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1022-FS</td>
<td>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:</td>
</tr>
<tr>
<td>BBG-1022-FS-B</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1022-FS-C</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1022-FS-D-DIN</td>
<td>((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)</td>
</tr>
<tr>
<td>BBG-1022-FS-D-HDBNC</td>
<td>((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)</td>
</tr>
</tbody>
</table>

#### 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)
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-FS offers a DSP-based platform that supports multiple audio DSP options. When optioned with various audio processing options, the BBG-1022-FS offers multiple simultaneous processing engines uses license "credits" which allows flexible tailoring of multiple proc function instances. The 9922-FS-FS offers high flexability within other audio processors that used fixed processing assets (for example, this flexability 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 downsampling, 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. 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.

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 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 captive-fastener 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" – up to largest DSP capacity
- **Dolby encoding/decoding**, Dolby Real-Time Loudness Leveling (RTL) loudness leveling with full parametric control setup, and Linear Acoustic UPMAX™ DSP options available
- 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. Dual-string character/timecode burn-in.
- 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

- **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/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
- **Quality Check Option (+QC)** – Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence or 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 SCET 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
## 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-3i'd 75Ω inputs (8 pair (16-Ch) max)  AES-3i'd 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 “In-Level”
- Return Loss: >35 dB up to 5.75 MHz

#### Physical
- Dimensions (WithD): 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 failure), (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 Output 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-ENC-D-5.1** Dolby® Digital/Digital Plus 5.1 Encoder

+ **DSP-ENC-D-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

+ **ANC** Ancillary Data Processor Option

+ **COLOR** Color Correction Option

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

+ **LOGO** Logo Insertion Option

+ **SCTE104** SCET 104 Insertion Option

+ **SCTE104-FAST** Frame-Accurate SCET 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)
## FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-input RP168 clean switch Path inputs can also be sourced from opposite path output with no external patching.</td>
<td>-</td>
</tr>
<tr>
<td>Frame sync with full H/V offset and manual/LOS video pattern generator</td>
<td>-</td>
</tr>
<tr>
<td>Per-path dual independent burn-in test string insertion allows condition-based insertion (such as basic ID text for valid input and different text message for failover conditions)</td>
<td>-</td>
</tr>
<tr>
<td>Timecode processing can prioritize, filter for, and convert between specific SMPTE embedded-video or audio LTC</td>
<td>-</td>
</tr>
<tr>
<td>Option +TTS provides Text-To-Speech synthesis, directly converting AES text to high-quality digital audio speech with no baseband signal breakouts or add-on units</td>
<td>-</td>
</tr>
<tr>
<td>Full audio crosspoint with delay control and 5.1-to-stereo downmix available for all audio outputs</td>
<td>-</td>
</tr>
<tr>
<td>CVBS analog video I/O and analog/AES embed / de-embed with 4-line Adaptive Comb Filter</td>
<td>-</td>
</tr>
<tr>
<td>Pattern generator for each channel can provide raster/test pattern and patterns for LOS failover insertion</td>
<td>-</td>
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<td>Low-power/high-density design - less than 18 Watts per card</td>
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<td>Remote control/monitoring via Dashboard™ software or OCGP-9000 remote control panels</td>
<td>-</td>
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<tr>
<td>Five year warranty</td>
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</table>

## OPTIONS

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Check (+QC)</td>
<td>Provides failover, alert, or user presets action on criteria such as black/frozen frame, audio silence, and CC absence.</td>
</tr>
<tr>
<td>Text-To-Speech (+TTS)</td>
<td>Provides Text-To-Speech synthesis, directly converting AES text to digital audio speech with no baseband signal breakouts or add-ons. High-quality Text-To-Speech from Acapela Group.</td>
</tr>
<tr>
<td>Emergency Alert System Text Crawl Generation Option (+EAS)</td>
<td>Provides a single-card solution for keying Emergency Alert System (EAS) text crawls in the active video and inserting station identification logs. Compatible with Sage™, Dasdec™, and other EAS crawl generators, with automated control insertion via presence of crawl data or GPI.</td>
</tr>
<tr>
<td>Trouble Slate Import (+T-SLATE)</td>
<td>Allows uploading of up to four different user trouble slate graphic file to card, with automated insertion controlled by GPI or other events.</td>
</tr>
<tr>
<td>Logo Insertion (+LOGO)</td>
<td>Allows uploading of user logo graphic file to card, with automated insertion controlled by GPI or other events.</td>
</tr>
<tr>
<td>Clean and Quiet Switching Option (+CQS)</td>
<td>Provides automatic audio muting during switching transitions from one SDI input source to another to provide silence between input switches.</td>
</tr>
<tr>
<td>SCTE 104 Insertion (+SCTE104)</td>
<td>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.</td>
</tr>
<tr>
<td>SCTE104 Frame-Accurate SCTE Trigger Insertion Option (+SCTE104-FAST)</td>
<td>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.</td>
</tr>
<tr>
<td>Color Correction (+COLOR)</td>
<td>Full RGB color corrector (offset, gain, gamma) with extended YCbCr proc controls with white/black hard clip, white soft clip, and saturation clip.</td>
</tr>
<tr>
<td>Ancillary Data Processor (+ANC)</td>
<td>Provides full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data.</td>
</tr>
<tr>
<td>Expanded Frame Sync Delay (+DLY)</td>
<td>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. Installation: Hardware feature available only on new card.</td>
</tr>
</tbody>
</table>

## Specifications

- **9922-2FS** 3G/HD/SD-SDI Dual-Channel Frame Sync with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O.
9922-2FS > 3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O
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.
- 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
- 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. SMPTE embedded timecode and/or audio LTC. Burn-in enable/disable user controls. Configurable for burn-in string of seconds, frames, seconds:frames, seconds:frames:field. User controls for test 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 test 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

**3G/HD/SD-SDI DUAL-CHANNEL FRAME SYNC**

**with Audio/Video Processing, AES/Analog Audio Embedding/De-Embedding and CVBS I/O**

**Specifications subject to change. E&OE. ©2019 Cobalt Digital 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

ORDERING INFORMATION (cont.)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM20-9922-2FS-L-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-2FS-L-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-2FS-M-S-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-2FS-M-S-HDBNC</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-2FS-N-DIN</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9922-2FS-N-HDBNC</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9922-2FS-P-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9922-2FS-P-HDBNC</td>
<td>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.)</td>
</tr>
</tbody>
</table>

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
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 test string insertion** — Allows condition-based insertion (such as basic ID text for valid input and different test 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**
- **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/DSDI 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 files 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.
- **SCTE 104 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

12 VDC
ETHERNET

12 VDC
REF LOOP

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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**
- < 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 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

**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
- Y/C separation: 4 line Adaptive Comb Filter
- Freq. Response: ± 0.25 dB up 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)
- 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

**User Audio Delay Offset from Video**
- Bulk delay control: ± 33 msec to ±3000 msec.
- Per-channel delay controls: ±600 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.

**GPI/O/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-1022-2FS  3G/HD/SD-SDI Standalone Dual-Channel Frame Sync with Audio/Video Processing, AES/Analogue 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/Analogue Audio Embedding/De-Embedding and CVBS I/O available in the following rear-panel I/O configurations:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1022-2FS-B</td>
<td>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)</td>
</tr>
<tr>
<td>BBG-1022-2FS-C</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1022-2FS-D-DIN</td>
<td>(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)</td>
</tr>
<tr>
<td>BBG-1022-2FS-D-HDBNC</td>
<td>(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)</td>
</tr>
</tbody>
</table>

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       | Test-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 Test 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)                                                         |

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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 configured with various processing options, the DSP-based processing core (which supports numerous simultaneous processing engines) uses license “credits” which allows the flexibility of multiple processing 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 “leasing” credits for Dolby encoder cards 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.

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

Option +ANC adds full user VANC/HANC packet insertion/extraction access to DID/SDID ancillary data such as camera PTZ, SCIE 1104, closed captioning, and other specialized user payloads

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

High-density design

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

Five year warranty
**ADVANCED AUDIO PROCESSING 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

---

**Specifications**

- **3G/HD/SD-SDI In**
- **CVBS In**
- **GPIO Input Select/Status**
- **AES In**
- **AN-AUD In (4-Ch)**
- **Video ADC**
- **24-Bit ADC**
- **AES Rx**
- **RSA**
- **Selected Input**
- **Select/Status**
- **Audio DSP Functions:**
  - Automatic Loudness Leveling (RTLL), Upmixing, Dolby D/DD+/E Encode/Decode
  - Quality Event Detect (+QC)
  - Audio Silence
  - Closed-Captioning Absence/Presence
  - Frozen/Blk/No Vid
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.

**Dashboard™/OGCP**

- **Monitor/Control**
- **Ethernet 10/100/1000 (on frame)**
- **DashBoard™/OGCP Monitor/Control**
- **Frame sync w/ User H/V Offset**
- **Audio Processing**
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.
  - Audio DSP Functions:
    - Automatic Loudness Leveling (RTLL), Upmixing, Dolby D/DD+/E
      Encode/Decode
    - Quality Event Detect (+QC)
    - Audio Silence
    - Closed-Captioning Absence/Presence
    - Frozen/Blk/No Vid
    - Audio Routing, Gain Control, Tone Generation, Downmixing,
      Rate Conversion, Smooth Delay Adj.

**Relay Protection**

- **RLY Bypass B**
- **RLY BYP**
- **RLY BYP B**
- **Selected In A - In D**
- **Input RCK**
- **Closed-Captioning**
  - Absence/Presence
  - Frozen/Blk/No Vid
  - Audio Silence
  - Quality Event Detect (+QC)
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.

**SDI I/O and bypass are a function of rear I/O module. Refer to rear I/O modules descriptions for more information.**

SDI output RLY BYP B outputs copy of SDI Out 1 crosspoint selection in normal operation. In power loss failover, RLY BYP B passive outputs SDI In B.

---

**Additional Info**

- **Ref 1/2 Internal Input Video**
- **3G/HD/SD - SDI Out**
- **Video DAC**
- **24-Bit DAC**
- **AN-AUD Out (4-Ch)**
- **AES Out**
- **AES Tx**
- **CVBS Out**
- **RCK (to Output Crosspoint)*
- **RLY Bypass (to Output RLY BYP B)*
- **Copy 1A**
- **Copy 1B**
- **Selected Input A - D**
- **Input RCK**
- **Closed-Captioning**
  - Absence/Presence
  - Frozen/Blk/No Vid
  - Audio Silence
  - Quality Event Detect (+QC)
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.

**Audio Processor**

- **Audio Processing**
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.
  - Audio DSP Functions:
    - Automatic Loudness Leveling (RTLL), Upmixing, Dolby D/DD+/E
      Encode/Decode
    - Quality Event Detect (+QC)
    - Audio Silence
    - Closed-Captioning Absence/Presence
    - Frozen/Blk/No Vid
    - Audio Routing, Gain Control, Tone Generation, Downmixing,
      Rate Conversion, Smooth Delay Adj.

**Relay Protection**

- **RLY Bypass B**
- **RLY BYP**
- **RLY BYP B**
- **Selected In A - In D**
- **Input RCK**
- **Closed-Captioning**
  - Absence/Presence
  - Frozen/Blk/No Vid
  - Audio Silence
  - Quality Event Detect (+QC)
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.

**SDI I/O and bypass are a function of rear I/O module. Refer to rear I/O modules descriptions for more information.**

SDI output RLY BYP B outputs copy of SDI Out 1 crosspoint selection in normal operation. In power loss failover, RLY BYP B passive outputs SDI In B.

---

**Additional Info**

- **Ref 1/2 Internal Input Video**
- **3G/HD/SD - SDI Out**
- **Video DAC**
- **24-Bit DAC**
- **AN-AUD Out (4-Ch)**
- **AES Out**
- **AES Tx**
- **CVBS Out**
- **RCK (to Output Crosspoint)*
- **RLY Bypass (to Output RLY BYP B)*
- **Copy 1A**
- **Copy 1B**
- **Selected Input A - D**
- **Input RCK**
- **Closed-Captioning**
  - Absence/Presence
  - Frozen/Blk/No Vid
  - Audio Silence
  - Quality Event Detect (+QC)
  - Audio Routing, Gain Control, Tone Generation, Downmixing,
    Rate Conversion, Smooth Delay Adj.
### 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: >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
## ADVANCED AUDIO PROCESSING

### 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM20-9934-B</td>
<td>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) AES Output BNC, (2) Balanced Analog Audio Outputs</td>
</tr>
<tr>
<td>RM20-9934-C</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9934-D</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9934-D-HDBNC</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9934-E</td>
<td>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.)</td>
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<tr>
<td>RM20-9934-E-DIN</td>
<td>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</td>
</tr>
<tr>
<td>RM20-9934-F</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9934-H</td>
<td>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) 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.)</td>
</tr>
<tr>
<td>RM20-9934-H-DIN</td>
<td>20-Slot Frame Rear I/O Module (Standard Width) (2) 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.)</td>
</tr>
<tr>
<td>RM20-9934-J</td>
<td>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) AES Outputs, (4) Balanced Analog Audio Outputs, (1) Coaxial GPI/6 Hz, (1) Coaxial GPO w/ Isolated Return (All coaxial connectors HD-BNC.)</td>
</tr>
<tr>
<td>RM20-9934-K</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9934-L</td>
<td>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 failover), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors DIN1.0/2.3.)</td>
</tr>
<tr>
<td>RM20-9934-L-DIN</td>
<td>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 failover), (1) CVBS Analog Video Out, (8) AES Outputs, (4) Balanced Analog Audio Outputs, (1) GPIO RJ45 connector, 100/1000 BaseT Ethernet Port (All coaxial connectors HD-BNC.)</td>
</tr>
<tr>
<td>RM20-9934-M</td>
<td>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.)</td>
</tr>
<tr>
<td>RM20-9934-N</td>
<td>20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs, (2) AES Inputs, (4) Balanced Analog Audio Inputs, (8) AES Outputs (All coaxial connectors HD-BNC.)</td>
</tr>
<tr>
<td>RM20-9934-O</td>
<td>20-Slot Frame Rear I/O Module (Standard-Width) (4) 3G/HD/SD-SDI Inputs, (4) AES Inputs, (4) Balanced Analog Audio Inputs, (8) AES Outputs (All coaxial connectors HD-BNC.)</td>
</tr>
</tbody>
</table>

### 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)).
9934-AUD-PRO-DSP ▶ 3G/HD/SD-SDI Advanced Audio Processor with DSP Audio Options Support and Full Embed/De-Embed

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<th>ORDERING INFORMATION (cont.)</th>
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<td><strong>Options:</strong></td>
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<tr>
<td>+DSP-RTL-5.1 Dolby® RTLL™ 5.1-Channel Loudness Processor Option</td>
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<tr>
<td>+DSP-RTL-2.0 Dolby® RTLL™ Stereo Loudness Processor Option</td>
</tr>
<tr>
<td>+DSP-ENC-5.1 Dolby® Digital/Digital Plus 5.1 Encoder</td>
</tr>
<tr>
<td>+DSP-ENC-2.0 Dolby® Digital/Digital Plus 2.0 Encoder</td>
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<tr>
<td>+DSP-DEC Dolby® Decoder</td>
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<tr>
<td>+DSP-UMIX-LA Linear Acoustic® UPMAX™ 2.0-to-5.1 Upmixer</td>
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<tr>
<td>+ANC Ancillary Data Processor Option</td>
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<tr>
<td>+FS Add Frame Sync Option</td>
</tr>
<tr>
<td>+DLY Extended Frame Sync Delay Option (available only in conjunction with option +FS)</td>
</tr>
<tr>
<td>+UDX Add Up/Down/Cross Converter Option</td>
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<tr>
<td>+LTC Audio LTC I/O Option</td>
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<tr>
<td>+QC Quality Check Option</td>
</tr>
<tr>
<td>+CQS Clean and Quiet Switching Option</td>
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<tr>
<td>+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.)</td>
</tr>
<tr>
<td>+2L-SPAN Add Spanish-language upgrade (add-on to option +TTS, option +TTS required)</td>
</tr>
<tr>
<td>+EAS Emergency Alert System Text Crawl Generation Option</td>
</tr>
</tbody>
</table>
**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. Numerous other options are available to maximize 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 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

- 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-embedded
- 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
- 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.
- 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-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-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

- **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 (+DL) 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)**
BBG-1034-AUD-PRO-DSP  3G/HD-SDI STANDALONE ADVANCED AUDIO PROCESSOR

with DSP Audio Options Support and Full Embed/De-Embed

Audio Processing
Audio Routing, Gain Control, Tone Generation, Downmixing, Rate Conversion, Smooth Delay Adj.

Audio DSP Functions:
Automatic Loudness Leveling (RTL), Upmixing, Dolby D/DD+/E Encode/Decode (see Options for more info)

FrameSync w/User H/V Offset

3G/HD-SDI Out

RLY Bypass

Copy 1A

 Relay Protect

Selected In A - In D
Input RCK

Serializable

Output Crosspoint

FrameSync

w/User H/V Offset

Error Event

Copying

Audio Silence

Closed-Captioning Absence/Presence Frozen/Blk/No Vid

Video

ADC

CVBS

DAC

RP168

Clean-Switch Multi-Input Select

Auto-Changeover

Video

ADC

AES Rx

24-Bit ADC

GPIO Input
Select/Status*

DE-Serialize Timecode

Processing

SDI output RLY BYP B outputs copy of SDI Out 1 crosspoint selection in normal operation. In power loss failover, RLY BYP B passive outputs SDI In B.

Audio Route, Gain Control, Tone Gen, Downmix, Rate Conv, Smooth Delay Adj.

Audio DSP Functions:
Automatic Loudness Leveling (RTL), Upmixing, Dolby D/DD+/E Encode/Decode (see Options for more info)

Audio Select

Ref 1/2

Internal Input Video

Selected Input RCK to Output Crosspoint*

De-serialize

Timecode Processing

IP/Serial
ANC Data I/O

LTC RS-485

(= LTC)

Quality Event
Detect (+ QC)

Audio Silence

Closed-Captioning

Absence/Presence

Frozen/Blk/No Vid

Selected Input

RCK (to Output
Crosspoint)*

RLY Bypass (to
Output RLY BYP B)*

SDI I/O and bypass are a function of model. Refer to rear panel I/O illustrations for more information. SDI output RLY BYP B outputs copy of SDI Out 1 crosspoint selection in normal operation. In power loss failover, RLY BYP B passive outputs SDI In B.
**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  
- 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: < -86 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)
# 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:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBG-1034-AUD-PRO-DSP-B</td>
<td>(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</td>
</tr>
<tr>
<td>BBG-1034-AUD-PRO-DSP-C</td>
<td>(1) 3G/HD/SD-SDI Input BNC, (8) AES Input BNCs, (1) 3G/HD/SD-SDI Output BNC</td>
</tr>
<tr>
<td>BBG-1034-AUD-PRO-DSP-D-DIN</td>
<td>(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.)</td>
</tr>
<tr>
<td>BBG-1034-AUD-PRO-DSP-D-HDBNC</td>
<td>(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.)</td>
</tr>
<tr>
<td>BBG-1034-AUD-PRO-DSP-E-DIN</td>
<td>(4) 3G/HD/SD-SDI Outputs (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.)</td>
</tr>
<tr>
<td>BBG-1034-AUD-PRO-DSP-E-HDBNC</td>
<td>(4) 3G/HD/SD-SDI Outputs (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.)</td>
</tr>
</tbody>
</table>

**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-ENC-5.1** Dolby® Digital/Digital Plus 5.1 Encoder
- **+DSP-ENC-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
- **+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
- **BBG-1000-PS** Redundant Power Supply Module
- **BBG-1000-TRAY** 1RU Mounting Tray (supports 3 units)
Our latest +DSP suite of DSP-based audio processing features represents our greatest single-device audio processor 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 (ENC-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.

**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-ENC-5.1 Dolby® Digital/Digital Plus 5.1 Encoder
- +DSP-ENC-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
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.
- 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

**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 293M, SMPTE 424M

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: 310 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 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 Input 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/SD-SDI Output BNC (with relay bypass failover), (2) GPIO/COMM RJ-45 connector

RM20-9980-F  20-Slot Frame Rear I/O Module (Standard-Width) (2) 3G/HD/SD-SDI Input BNCs, (3) 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)

OGCP-9000/CC  2RU Remote Control Panel for Color Correction (Specify country of destination for power cord)
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

![Schematic Diagram](image-url)
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

Rear Panel

12 VDC  ETHERNET
12 VDC  REF LOOP

RCK/PROC OUT
3 4
SDI IN D  SDI IN C  SDI IN A

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked 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.

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); 1080p: 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
ChO 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)
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 YCrC gamut in unity gain configuration
- Extended YCrC 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.
- Five year warranty
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: 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
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
Cr/Cb Saturation clip (values limited at or below): 50% to 160% in 0.1% steps
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 BNCs, (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, (5) 3G/HD/SD-SDI Output BNCs, (1) 3G/HD/SD-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) GPIO

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-DHDBC  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)
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**

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**DashBoard™ Monitor/Control**

### Path 1

1. **De-serialize**
2. **Video Ref**
3. **Frame sync w/User H/V Offset**
4. **Pattern Gen**
5. **Color Correction**
6. **Serialize**

### Path 2

1. **De-serialize**
2. **Video Ref**
3. **Frame sync w/User H/V Offset**
4. **Pattern Gen**
5. **Color Correction**
6. **Serialize**
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

Rear Panel

12 VDC  12 VDC  ETHERNET  REF LOOP

Note: RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked 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.

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)
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 test; operators can select either a white or black background. Other features include a fully backlit keypad and user-adjustable LED backlight.

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
- No deep submenus – all parameters can be accessed quickly
- 10/100 Mbps Ethernet TCP/IP connection
- Save and restore panel configuration with web interface
- Completely configurable with password protected web interface
- Optimized for bright and low light environments
- Seamless integration with DashBoard™ control software
- Rugged 2RU rack mounted chassis
- Low-power/high-density design – less than 18 Watts per card
- Five year warranty

**SPECIFICATIONS**

**Power**
- 9 Watts

**AC Power**
- IEC C14 Chassis Plug accepting 90-264 VAC @ 47-63 Hz

**DC Power**
- 12 VDC 1.0 A

**Ethernet**
- 10/100 Mbps with Auto-MDIX on RJ45 socket with DC isolation

**LCD**
- 500 cd/m² (nits) of brightness, 300:1 contrast ratio, 120 degree viewing angle

**Size**
- Standard 2 RU; 5” depth

**ORDERING INFORMATION**

OGCP-9000/CC 2RU Color Correction Remote Control Panel (Specify country of destination for power cord)

9980-CSC-3G 3G/HD/SD-SDI RGB Color Space Corrector / Framesync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

9980-2CSC-3G 3G/HD/SD-SDI Dual-Channel RGB Color Space Corrector / Framesync with Integrated Test Signal Generator and OGCP-9000/CC Control Panel Support

+COLOR  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 +COLOR or individual product pages for availability.)
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
- Multiple DSP modes – stereo/pass-thru, mono mix, L/R only outputs
- Supports audio sampling frequencies from 32 kHz to 96 kHz
- Convenient input sensitivity trim optimizes ADC performance for various input levels.
- Control available via DIP or remote control
- Selectable card switch control or DashBoard™ remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels)
- Five year warranty

---

**Diagram: 9930ADC-AES75-RG**

**Note:** +1 and -2 analog audio inputs correlate to stereo designations L and R, respectively.

**Diagram:** RM20-9930ADC75-B
## 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 kΩ
- 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: ±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 Ω
- 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 ±10%
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
- Also provides 2x1 reclocked DA outputs for each AES input
- Full remote control of operating mode and gain control
- Multiple DSP modes – stereo/pass-thru, mono mix, L/R only outputs
- Supports audio sampling frequencies from 32 kHz to 96 kHz
- Convenient DSP gain trim via DIP or remote control
- Selectable card switch control or DashBoard™ remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels)
- Five year warranty

---

**Diagram**

The diagram shows the flow of signals from the AES input to the 24-bit DAC, and then to the analog outputs. The diagram also includesDashBoard™/OGCP Monitor/Control, Ethernet 10/100 (On Frame), and the 5-year warranty indication.

**Note:** The analog audio outputs correlate to stereo designations L and R, respectively. Orientation on connectors varies from that on other Cobalt products. Make certain connections are as shown here.

---

**Specifications**

- **Sampling Frequencies:** 32kHz to 96kHz
- **Gain Control:** Overall gain (stereo ganged) trim (offset) via DashBoard™ remote control
- **Remote Control:** Selectable card switch control or DashBoard™ remote control
- **Warranty:** Five year warranty
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 Ω
- Input Level: 0.2 – 7 Vp-p

**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 Ω balanced
- Maximum Output Level: +24 dBu
- Frequency Response: ±0.2dB, 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
## 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

<table>
<thead>
<tr>
<th>BBG-A-TO-S</th>
<th>BlueBox™ Analog-to-SDI HD/SD Analog Component/Composite-to-HD/SD-SDI with Audio Embedder Converter Unit</th>
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<tbody>
<tr>
<td>BBG-MB</td>
<td>Mounting Bracket</td>
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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 Diagram](image-url)

**BBG-S-TO-A**

**VIDEO/AUDIO A/D - D/A CONVERSION**

**BLUEBOX COMPACT THROWDOWN A/D - D/A CONVERTERS**

COBALT DIGITAL INC.

COBALTDIGITAL.COM

US SALES 800 669-1691 / DIRECT +1 217-344-1243 / SALES@COBALTDIGITAL.COM

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**BBG-S-TO-A ➔ HD/SD-SDI-TO-HD/SD ANALOG COMPONENT/COMPOSITE** with Audio De-Embedder

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<td>DC power (via USB or adapter)</td>
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<td><strong>Outputs</strong></td>
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<tr>
<td>YPbPr, RGB, Y/C, or CVBS analog video (75Ω BNCs)</td>
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<tr>
<td>SDI reclocked input copy (75Ω BNC)</td>
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<tr>
<td>(2) analog audio (unbalanced consumer RCA)</td>
</tr>
<tr>
<td><strong>Audio Conversion Format</strong></td>
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<td><strong>Power</strong></td>
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<td><strong>DC Power Connectors</strong></td>
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<td><strong>Dimensions (WxHxD)</strong></td>
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<tr>
<td>5.5” x 3” x 1” (including connector projections)</td>
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<tr>
<td>(139 x 77 x 26 mm)</td>
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<tr>
<td><strong>Operating Temperature Range</strong></td>
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<tr>
<td>-13°F to 149°F</td>
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<td>(-25°C to 65°C)</td>
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<tr>
<td>HD/SD-SDI-to-HD/SD Analog Component/Composite with Audio De-Embedder Converter Unit</td>
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<tr>
<td><strong>BBG-MB</strong></td>
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<td>Mounting Bracket</td>
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</tbody>
</table>
### 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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>Full support of 12G/6G/3G/HD/SD-SDI and ASI/DVB</td>
<td>One-card solution for distribution of 8K/4K content over 12G-SDI interfaces</td>
</tr>
<tr>
<td>Input data rate auto-detection for all industry-standard data rates</td>
<td>Card display and DashBoard status input lock indicators</td>
</tr>
<tr>
<td>Five year warranty</td>
<td></td>
</tr>
</tbody>
</table>

### DIAGRAM

- **12G/6G/3G/HD/SD-SDI Input**
  - SDI In A
  - SFP Cage 1
    - SFP-1-A Rx
  - Ethernet 10/100/1000 (On Frame)

- **Reclock/Crosspoint**
  - EQ
  - Crosspoint

- **12G/6G/3G/HD/SD-SDI Reclocked DA Outputs**
  - 1-1
  - 1-2
  - 1-3
  - 1-4
  - 2-1
  - 2-2
  - 2-3
  - 2-4
  - 3-1
  - 3-2
  - 3-3
  - 3-4
  - 4-1
  - 4-2
  - 4-3
  - 4-4

- **SFP Cage 2**
  - Tx SFP-2-1
  - Tx SFP-2-2

*This color denotes option*

SFP I/O is available only with option -DA-SFP. When option -DA-SFP is included, a 2x16 crosspoint is also included. See text for additional info.
9915DA-1x16-12G  12G/6G/3G/HD/SD-SDI 1x16 Reclocking Distribution Amplifier

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.

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

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.)

ORDERING INFORMATION

9915DA-1x16-12G  12G/6G/3G/HD-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-SDI Input (IN B thru IN D NC), (16) 12G/6G/3G/HD-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-1x16-XPT-12G card

-SFP-OE-12G  12G/6G/3G/HD-SDI UHD Single Receiver SFP Module; 1260 nm - 1620 nm; type LC connector

-SFP-EO-12G  12G/6G/3G/HD-SDI UHD Single Transmitter SFP Module; 1310 nm; type LC connector

-SFP-2EO-12G  12G/6G/3G/HD-SDI UHD Dual Transmitter SFP Module; 1310 nm; type LC connector

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.
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-SDI and ASI/DVB

Input data rate auto-detection for all industry-standard data rates

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.

Five year warranty

SFP I/O and SFP crosspoint select are available only with option -DA-SFP. See text for additional info.
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 SDQ5/2SI quad 3G compliant.

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

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.)

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-2EO-12G  12G/6G/3G/HD-SD-SDI UHD Dual Transmitter SFP Module; 1310 nm; type LC connector
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-SDI and ASI/DVB
- 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.
- Five year warranty

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

- SDI In A
- SDI In B
- SDI In C
- SDI In D
- SFP Cage 1 (as Rx)
  - SFP-1-A Rx
  - SFP-1-B Rx
- SFP Cage 2 (as Rx)
  - SFP-2-A Rx
  - SFP-2-B Rx
- Ethernet 10/100/1000 (On Frame) - DashBoard™/OGCP Monitor/Control

12G/6G/3G/HD-SDI Reclocked DA Outputs

- 1-1
- 1-2
- 1-3
- 1-4
- 2-1
- 2-2
- 2-3
- 2-4
- 3-1
- 3-2
- 3-3
- 3-4
- 4-1
- 4-2
- 4-3
- 4-4

SFP I/O and SFP crosspoint select are available only with option -DA-SFP. Individual ports within SFP cages 1 and 2 can be used as Rx or Tx as desired, and as determined by SFP type fitment. See text for SFP types available and additional info.
9915DA-4x16-XPT-12G 12G/6G/3G/HD/SD Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

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.

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

ORDERING INFORMATION

9915DA-4x16-XPT-12G 12G/6G/3G/HD/SD-SDI Quad-Channel Multi-Rate Reclocking DA with x4 Output Crosspoint

Rear Modules:


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

-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-EOOE-12G 12G/6G/3G/HD/SD-SDI UHD Transceiver SFP Module; 1310 nm Tx / 1260 nm - 1620 nm Rx; type LC connector
The Cobalt® 9001 3G/HD/SD 1x9 Reclocking Distribution Amplifier is a multi-rate 1x9 SDI and ASI distribution amplifier capable of equalizing and reclocking 3G, HD, and SD signals. All outputs are non-inverting, allowing for reclocking of ASI signals. Excellent receiver EQ performance allows up to 150m cable lengths for HD signals.

**FEATURES**

- Equalize up to 150m of Belden 1694A cable at 1.485 Gbit
- Automatic rate detection for all industry-standard data rates
- ASI reclocking on all outputs
- Available high-density rear modules allow up to 20 cards per frame
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Five year warranty
## SPECIFICATIONS

### Power
2 Watts

### 3G/HD/SD-SDI Inputs
Number of Inputs: 1
Standard: SMPTE 424M, 292M, and 259M
Return Loss: >15 dB at 5 MHz - 1.485 GHz
>10 dB at 1.5 GHz to 3 GHz

### Cable Length Equalized (w/Belden 1694A)
3 Gbps: 80m
1.485 Gbps: 150m
143-360 Mbps: 350m

### 3G/HD/SD-SDI Output
Number of outputs: 9 (ASI compatible)
Standard: SMPTE 424M, 292M, and 259M
Return Loss: >15 dB at 5 MHz - 1.485 GHz
>10 dB at 1.5 GHz to 3 GHz
Rise/Fall Time: <150 ps
Jitter (wideband): HD: <0.2 UI

### ORDERING INFORMATION

**9001 3G/HD/SD 1x9 Reclocking Distribution Amplifier**

**RM20-9001-A**
- 20 Slot Frame Rear I/O Module (Standard Width)
- 3G/HD-SDI Input BNC, 9 Reclocked 3G/HD-SDI Output BNCs

**RM20-9001-A/S**
- 20 Slot Frame Rear I/O Module (Split; supports 2 cards)
- 3G/HD-SDI Input BNC, 4 Reclocked 3G/HD-SDI Output BNCs (connections are per card)

**RM20-9001-B/S-DIN**
- 20 Slot Frame Rear I/O Module (Split; supports 2 cards)
- 3G/HD-SDI Input, 9 Reclocked 3G/HD-SDI Outputs (connections are per card; all connectors are DIN 1.0/2.3)

**RM20-9001-B/S-HDBNC**
- 20 Slot Frame Rear I/O Module (Split; supports 2 cards)
- 3G/HD-SDI Input, 9 Reclocked 3G/HD-SDI Outputs (connections are per card; all connectors are HD-BNC)
9002 3G/HD/SD 1X9 DISTRIBUTION AMPLIFIER (NON-RELOCKING)

The Cobalt® 9002 3G/HD/SD 1x9 Reclocking Distribution Amplifier (Non-Reclocking) is a multi-rate 1x9 SDI and ASI distribution amplifier capable of equalizing 3G, HD, and SD signals. All outputs are non-inverting, allowing for distribution of ASI signals. Excellent receiver EQ performance allows up to 150m cable lengths for HD signals.

FEATURES

- Equalize up to 150m of Belden 1694A cable at 1.485 Gbit
- Automatic rate detection for all industry-standard data rates
- ASI reclocking on all outputs
- Available high-density rear modules allow up to 20 cards per frame
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Five year warranty

![Diagram of 9002 3G/HD/SD 1x9 Distribution Amplifier](image)
9002  3G/HD/SD 1x9 DISTRIBUTION AMPLIFIER (NON-RELOCKING)

**SPECIFICATIONS**

**Power**
- 2 Watts

**3G/HD/SD-SDI Inputs**
- Number of Inputs: 1
- Standard: SMPTE 424M, 292M, and 259M
- Return Loss: >15 dB at 5 MHz - 1.485 GHz
- >10 dB at 1.5 GHz to 3 GHz

**Cable Length Equalized (w/Belden 1694A)**
- 3 Gbps: 80m
- 1.485 Gbps: 150m
- 143-360 Mbps: 350m

**3G/HD/SD-SDI Output**
- Number of outputs: 9 (ASI compatible)
- Standard: SMPTE 424M, 292M, and 259M
- Signal Level: 800 mV nominal
- Return Loss: >15 dB at 5 MHz - 1.485 GHz
- >10 dB at 1.5 GHz to 3 GHz
- Rise/Fall Time: <150 ps
- Jitter (wideband): HD: <0.2 UI

**ORDERING INFORMATION**

9002  3G/HD/SD 1x9 Reclocking Distribution Amplifier (Non-Reclocking)

<table>
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<tbody>
<tr>
<td>20 Slot Frame Rear I/O Module (Standard Width) 3G/HD/SD-SDI Input BNC, 9 Reclocked 3G/HD/SD-SDI Output BNCs</td>
<td>20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input BNC, 4 Reclocked 3G/HD/SD-SDI Output BNCs (connections are per card)</td>
<td>20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 9 Reclocked 3G/HD/SD-SDI Outputs (connections are per card; all connectors are DIN 1.0/2.3)</td>
<td>20 Slot Frame Rear I/O Module (Split; supports 2 cards) 3G/HD/SD-SDI Input, 9 Reclocked 3G/HD/SD-SDI Outputs (connections are per card; all connectors are HD-BNC)</td>
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</table>
The Cobalt® 9003 Dual-Channel 3G/HD/SD Reclocking Distribution Amplifier is a two-channel, multi-rate SDI distribution amplifier capable of equalizing and reclocking 3G, HD, and SD signals. Excellent receiver EQ performance allows for up to 160m cable lengths for HD signals.

The 9003 can be set up as either a single-channel 1:8, dual-channel 1:4, or 1:8 with failsafe using DashBoard™ remote control software or card-edge switches. In failsafe mode, the card automatically switches to the secondary input if the primary input is lost.

### FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>Dual or single input with user-configurable modes</td>
<td>Automatic rate detection for all industry-standard data rates</td>
</tr>
<tr>
<td>Automatic rate detection for all industry-standard data rates</td>
<td>Equalize up to 160m of Belden 1694A cable at 1.485 Gbit.</td>
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<tr>
<td>Failsafe mode automatically switches to secondary input on loss of primary input</td>
<td>Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels</td>
</tr>
<tr>
<td>Available high-density rear modules allow up to 20 cards per frame</td>
<td>Five year warranty</td>
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</tbody>
</table>

### Diagram

- **3G/HD/SD SDI In 1**
  - EQ
  - Reclock
- **3G/HD/SD SDI In 2**
  - EQ
  - Reclock
- **3G/HD/SD - SDI Reclocked Out A**
  - DA
  - A1
  - A2
- **3G/HD/SD - SDI Reclocked Out B**
  - DA
  - B1
  - B2
- **3G/HD/SD - SDI Reclocked Out A**
  - DA
  - A3
  - A4
- **3G/HD/SD - SDI Reclocked Out B**
  - DA
  - B3
  - B4
- **Ethernet 10/100 (On Frame)**
  - DashBoard™/OGCP Monitor/Control
9003 • Dual-Channel 3G/HD/SD Reclocking Distribution Amplifier

**SPECIFICATIONS**

### Power
- 3 Watts

### 3G/HD/SD-SDI Inputs
- **Number of Inputs:** 2
- **Standard:** SMPTE 424M, 292M, and 259M
- **Return Loss:**
  - >15 dB at 5 MHz - 1.485 GHz
  - >10 dB at 1.5 GHz to 3 GHz

### Cable Length Equalized (w/Belden 1694A)
- 3 Gbps: 80m
- 1.485 Gbps: 150m
- 143-360 Mbps: 350m

### 3G/HD/SD-SDI Output
- **Number of Outputs:** 8 (4 ASI Compatible)
- **Standard:** SMPTE 424M, 292M, and 259M
- **Signal Level:** 800 mV nominal
- **Return Loss:**
  - >15 dB at 5 MHz - 1.485 GHz
  - >10 dB at 1.5 GHz to 3 GHz
- **Rise/Fall Time:** <150 ps
- **Jitter (wideband):** HD: <0.2 UI

### ORDERING INFORMATION

**9003**
- Dual-Channel 3G/HD/SD Reclocking Distribution Amplifier, 2 X 4 or 1 X 8 Configurations, Failover Mode

**RM20-9003-A**
- 20 Slot Frame Rear I/O Module (Standard Width) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes)

**RM20-9003-B/S-DIN**
- 20 Slot Frame Rear I/O Module (Split; supports 2 cards) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes) (connections are per card; all connections are DIN 1.0/2.3)

**RM20-9003-B/S-HDBNC**
- 20 Slot Frame Rear I/O Module (Split; supports 2 cards) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes) (connections are per card; all connections are HD-BNC)
The Cobalt® 9004 Dual-Channel 3G/HD/SD Distribution Amplifier (Non-Reclocking) is a dual multi-rate SDI distribution amplifier capable of equalizing 3G, HD, and SD signals. Excellent receiver EQ performance allows for up to 160m cable lengths for HD signals.

The 9004 can be set up as either a single-channel 1:8, dual-channel 1:4, or 1:8 with failsafe using DashBoard™ remote control software or card-edge switches. In failsafe mode, the card automatically switches to the secondary input if the primary input is lost.

### FEATURES

- Dual or single input with user-configurable modes
- Automatic rate detection for all industry-standard data rates
- Equalize up to 160m of Belden 1694A cable at 1.485 Gbit
- Failsafe mode automatically switches to secondary input on loss of primary input
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Available high-density rear modules allow up to 20 cards per frame
- Five year warranty

---

**3G/HD/SD SDI In 1**

**EQ**

**Route**

**3G/HD/SD SDI A**

**3G/HD/SD SDI B**

**A1**

**A2**

**A3**

**A4**

**B1**

**B2**

**B3**

**B4**

**DashBoard™/OGCP Monitor/Control**

**Ethernet 10/100 (On Frame)**

---

**3G/HD/SD SDI In 2**

**EQ**

**Route**

**3G/HD/SD SDI A**

**3G/HD/SD SDI B**

**A1**

**A2**

**A3**

**A4**

**B1**

**B2**

**B3**

**B4**

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**9004**

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SPECIFICATIONS

**Power**
- 3 Watts

**3G/HD/SD-SDI Inputs**
- Number of Inputs: 2
  - Standard: SMPTE 424M, 292M, and 259M
  - Return Loss: >15 dB at 5 MHz - 1.485 GHz
  - >10 dB at 1.5 GHz to 3 GHz

**Cable Length Equalized (w/Belden 1694A)**
- 3 Gbps: 80m
- 1.485 Gbps: 150m
- 143-360 Mbps: 350m

**3G/HD/SD-SDI Output**
- Number of outputs: 8 (4 ASI Compatible)
  - Standard: SMPTE 424M, 292M, and 259M
  - Signal Level: 800 mV nominal
  - Return Loss: >15 dB at 5 MHz - 1.485 GHz
  - >10 dB at 1.5 GHz to 3 GHz
  - Rise/Fall Time: <150 ps
  - Jitter (wideband): HD: <0.2 UI

ORDERING INFORMATION

**9004** Dual 3G/HD/SD Non-Reclocking Distribution Amplifier, 2 X 4 or 1 X 8 Configurations, Failover Mode

**RM20-9004-A** 20 Slot Frame Rear I/O Module (Standard Width) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes)

**RM20-9004-B/S-DIN** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes) (connections are per card; all connections are DIN 1.0/2.3)

**RM20-9004-B/S-HDBNC** 20 Slot Frame Rear I/O Module (Split; supports 2 cards) Dual 3G/HD/SD-SDI Inputs, 8 Reclocked 3G/HD/SD-SDI Outputs (1x8 or 1x4/1x4 DA Modes) (connections are per card; all connections are HD-BNC)
**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
- 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
- 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 (for example, SDI OUT 3 in diagrams below is tied to (driven from) DA quadrant "SDI Out (1-4)" in the block diagram; SDI OUT 5 in diagrams below is tied to (driven from) DA quadrant "SDI Out (5-8)" in the 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: 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 the 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 available outputs. (For example, the rear module offers a reduced subset of DA quadrant SDI OUT (1-4) (shown in the block diagram) consisting of SDI OUT 3 and SDI OUT 4 only.)

See Product Manual for more information.
**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 BNC 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 BNC 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) (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
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
- 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
- Card edge and DashBoard™ status and individual input lock indicators
- Five year warranty

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**Diagram**

![Diagram of 9910DA-4Q-3G-RCK](image_url)

**Basic Crosspoint Modes**

- Quad 1x4
- Dual 1x8
- Single 1x16

---

**OpenGear 3G/HD/SD-SDI / ASI DA Cards**

**Distribution Amplifiers & Routing**

**Cobalt Digital**

**Specifications subject to change without notice. E. & O. E. ©2020 Cobalt Digital Inc.**
Rear I/O Module output designations here correlate to output numbers for four DA quadrants as shown in the card block diagram (for example, SDI OUT 3 in diagrams below is tied to (driven from) DA quadrant “SDI Out (1-4)” in the block diagram; SDI OUT 5 in diagrams below is tied to (driven from) DA quadrant “SDI Out (5-8)” in the 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).
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 BNC 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 BNC 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, (6) 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)
- 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
- Five year warranty

SDI / ASI In

Primary (PRI) In

Backup (BKUP) In

Ethernet 10/100/1000 (On Frame)

DashBoard™/OGCP Monitor/Control

SDI / ASI Reclocked Out

Out 1

Out 2 PRI RLY BYP

Out 3

Out 4

Out 5

Out 6

Out 7

Out 8
9911DA-8-BPX • Dual-Input 3G/HD/SD-SDI / ASI 1x8 Distribution Amplifier and Bypass Protection Switch with Passive Relay Protected Output

**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.
- Five year warranty

**RM20-9910AV-A/S**

**RM20-9910AV-B**

**RM20-9910AV-BS-DIN**

**RM20-99910AV-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)
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 75Ω 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.
- Five year warranty

**Specifications**

- **Card Jumpers:**
  - Input: Differential (floating ground) or single-ended
  - Output: Hi-Z looping or card-terminated
- **Gain Control:** Trim control on the front of the card
- **Remote Monitoring:**
  - DashBoard™ software
  - OGCP-9000 Remote Control Panel
- **Card Status Display:** Presence and video format of input signal

**Models**

- **RM20-9910AV-B**
- **RM20-9910AV-A/S**
- **RM20-9910AV-BS-DIN**

**OpenGear®**

The Cobalt® 9910DA-AV Analog Video Distribution Amplifier is part of the Cobalt OpenGear® family, offering flexibility and compatibility with other Cobalt modules.

**DashBoard™/OGCP Monitor/Control**

- Ethernet 10/100/1000 (On Frame)

**Card Connectivity**

- **CARD 2:**
  - ANLG IN
  - LOOP IN
  - OUT 1
  - OUT 2
  - OUT 3
  - OUT 4
  - OUT 5
  - OUT 6
  - OUT 7
  - OUT 8

- **CARD 1:**
  - ANLG IN
  - LOOP IN
  - OUT 1
  - OUT 2
  - OUT 3
  - OUT 4
  - OUT 5
  - OUT 6
  - OUT 7
  - OUT 8
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

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<tr>
<th>Model</th>
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<td>9910DA-AV</td>
<td>Analog Video Distribution Amplifier</td>
</tr>
<tr>
<td>RM20-9910AV-B</td>
<td>20-Slot Frame Rear I/O Module (Standard Width) (1) Analog Video Input BNC, (8) Analog DA Output BNCs, (1) Input Loop Output BNC</td>
</tr>
<tr>
<td>RM20-9910AV-A/S</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9910AV-B/S-DIN</td>
<td>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)</td>
</tr>
<tr>
<td>RM20-9910AV-B/S-HDBNC</td>
<td>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)</td>
</tr>
</tbody>
</table>
BBG-DA-3G-1x6 3G/HD/SD/ASI RECLOCKING DISTRIBUTION AMPLIFIER with Bit-Rate Status

The Blue Box™ BBG-DA-3G-1x6 is a 3G/HD/SD-SDI / ASI multi-rate distribution amplifier that features 3G/HD/SD status LEDs for quick identification of the input bit rate. The unit is fully automatic and supports SMPTE 424 (3 Gbit), 292 and 259M signals, and is equipped with 1 input and 6 reclocked SDI outputs. (Reclocking on 424M, 292 and 259M-C inputs, all other bit rates are non-reclocking.) The unit supports 1x3 ASI distribution using its non-inverting outputs.

FEATURES

- Six 3G/HD/SD equalized and reclocked outputs
- 1x3 ASI distribution capability
- Signal type (3G/HD/SD) status display
- Auto-standard detect and configuration SMPTE 424M/292/259M
- 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

**Features Diagram**

- 3G/HD/SD SDI/ASI In → EQ → Reclock and Signal Bit Rate Decode → 3G/HD/SD Bit Rate LED
- 3G/HD/SD-SDI RCK Out → DA → 3G/HD/SD RCK Out
- 3G/HD/SD - SDI RCK Out
- 3G/HD/SD-ASI RCK Out → DA → 3G/HD/SD RCK Out
- 3G/HD/SD - ASI RCK Out
- 3G/HD/SD-ASI RCK Out → DA → 3G/HD/SD RCK Out
- 3G/HD/SD - ASI RCK Out

BBG-DA-3G-1x6
BBG-DA-3G-1x6  3G/HD/SD/ASI Reclocking Distribution Amplifier with Bit-Rate Status

### SPECIFICATIONS

**Power**
- <2 Watts; 5-16 VDC (compatible with Power Supply PS4 (North America) or PS5 (International). (See Ordering Information for details.)

**Input**
- SMPTE 424M-3Gbit
- SMPTE 292 1.485-Gbit
- SMPTE 259M 143-540 Mbit
- ASI
  - Impedance: 75Ω

**Outputs**
- (6) reclocked 3G/HD/SD-SDI
  - Impedance: 75Ω

**Return Loss**
- > 15 dB

**Dimensions (WxHxD)**
- 5.8” x 2.9” x 1.1” (including connector projections)
- (147 x 74 x 28 mm)

### ORDERING INFORMATION

**BBG-DA-3G-1x6**  3G/HD/SD-SDI / ASI Reclocking Distribution Amplifier with Bit-Rate Status

**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.)
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.

### FEATURES

- **Input status LED indicator**
- **Auto-reclock for SMPTE 2082-1, 424M, 292M, 259M, and MADI**
- **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**

### Specifications

- **12G/6G/3G/HD/SD-SDI / ASI / MADI In**
- **EQ**
- **Reclock and Signal Bit Rate Decode**
- **Input Status LED**
- **1x6 DA**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 1**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 2**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 3**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 4**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 5**
- **12G/6G/3G/HD/SD-SDI / ASI / MADI Out 6**

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**DISTRIBUTION AMPLIFIERS & ROUTING**

**BLUEBOX COMPACT THROWDOWN 3G/HD/SD-SDI / ASI DA UNITS**

**BBG-DA-12G-1x6** **12G/3G/HD/SD-SDI / ASI / MADI RECLOCKING DISTRIBUTION AMPLIFIER**

**with Input Status LED**
BBG-DA-12G-1x6  12G/3G/HD/SD-SDI / ASI / MADI RECLLOCKING 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.)
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
- Selectable card switch control or DashBoard™ remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels)
- Five-year warranty
- Full broadcast-grade balanced signal capability with 27.5 dBu maximum input level support. Low-impedance outputs.
- 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.

### SPECIFICATIONS

**Electrical**
- Power: < 5 Watts
- Analog Audio Input
  - Number of Inputs: Two, 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: Eight, 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

<table>
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<tr>
<th>9242 Analog Audio Distribution Amplifier with Remote Gain Control</th>
<th>RM20-9242-B</th>
<th>20-Slot Frame Rear I/O Module (Standard Width) 2 Balanced Analog Audio In, 8 Balanced Analog Audio Out</th>
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<tr>
<td>RM20-9242-C/S</td>
<td>20-Slot Frame Rear I/O Module (Split) 1x4 Balanced Analog Audio I/O (per card)</td>
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<tr>
<td>RM20-9242-D/S</td>
<td>20-Slot Frame Rear I/O Module (Split) Dual 1x4 Balanced Analog Audio I/O (per card)</td>
<td></td>
</tr>
</tbody>
</table>

Note: + / G / - orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.
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-B/S-DIN** 20-Slot Frame Rear I/O Module (Split) Dual MADI Input (DIN1.0/2.3), 9 MADI Outputs (All connectors HD-BNC) 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
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
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Five year warranty
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™/OGCP Monitor/Control
- DashBoard LKFS loudness display (10-second averaging)
- Selectable card switch control or DashBoard™/OGCP-9000 remote control (usable with DashBoard™ and Cobalt OGCP-9000 remote control panels)
- Five year warranty
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
- 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)
- Five year warranty

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**Diagram:**

- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 1
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 2
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 3
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 4
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 5
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 6
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 7
- AES In → EQ → Reclock → DSP Gain/Mode Control → DA → AES Out 8

**Notes:**

- RM20-9913DA110-B: Orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.
- RM20-9913DA110-B/S: Orientation on connectors varies from that on other Cobalt products. Make certain hookup is as shown here.
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: 2000 ft (650 m) 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)
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-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

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
The Cobalt® 9940-ACO 3G/HD-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 is standard 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. 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)

**SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. E. & O.E. ©2020 COBALT DIGITAL INC.**
**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 Reclocked 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 BNC, (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 reclocked of selected input, (2) GPO, (2) GPIO

+**T-SLATE** User Trouble Slate Graphic Import Option
+**CQS** Clean and Quiet Switching Option
+**COLOR** Color Correction Option
+**LTC** Audio LTC I/O Option
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

3G/HD/SD SDI In

Multi-Input Select
Auto-Changeover
Latching Failover

De-serialize

Audio LTC I/O (+LTC)

Timecode Select/Processing

Dual-String Character Burn
Timecode Burn

Color Correction (+COLOR)

Quality Event Detect
Audio Silence
Closed-Captioning
Absence/Presence
Frozen/Blk/No Vid

Automated Event Actions:
• Email Alerts
• GPO
• I/O Routing Changes
• User Preset Engage

Audio Demux

Ref 1
Ref 2
Ref Select

Audio Mux
Delay Offset
Output Routing

Selected Input RCK

Pattern Gen

Framesync w/User H/V Offset

Relay Protect

Serialize

A/B Proc Out

Output Crosspoint

3G/HD/SD SDI Out

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 reclocked 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**
- 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** Use 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 GPIO, 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.
- 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 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.
- 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)
**9940-4x1-CS** 3G/HD/SD-SDI 4X1 CLEAN AND QUIET BYPASS ROUTER

with Relay-Protected Input and GPIO Monitoring / Control

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**Specifications**

- **3G/HD/SD SDI In**
  - A
  - B
  - C
  - D

- **De-serialize**

- **Timecode Select/Processing**
  - LTC I/O (+LTC)

- **Moving-Box Insertion**

- **Color Correction (+COLOR)**

- **Audio Quiet-Switch**

- **Cross-Fade**

- **Output Routing**

- **Framesync w/User H/V Offset Pattern Gen**

- **Serialize**

- **A/B Proc Out**

- **Output Crosspoint**

- **3G/HD/SD SDI Out**

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**DashBoard™/OGCP Monitor/Control**

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

- **Timecode Select/Processing**

- **Moving-Box Insertion**

- **Color Correction (+COLOR)**

- **Audio Quiet-Switch**

- **Cross-Fade**

- **Output Routing**

- **Framesync w/User H/V Offset Pattern Gen**

- **Serialize**

- **A/B Proc Out**

- **Output Crosspoint**

- **3G/HD/SD SDI Out**

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**SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS**

OPENGEAR CARDS AND STANDALONE/DESKTOP MODELS

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**De-serialize**

- **Timecode**

- **Select/Processing**

- **Dual-String Character Burn**

- **Timecode Burn**

- **Color Correction (+COLOR)**

- **Audio Silence**

- **Closed-Captioning Absence/Presence**

- **Frozen/Blk/No Vid**

- **Quality Event Detect (+QC)**

- **Automated Event Actions**:
  - Email Alerts
  - GPIO
  - I/O Routing Changes
  - User Preset Engage
  - Status via serial, IP

- **Moving-Box Insertion**

- **Color Correction (+COLOR)**

- **Audio Quiet-Switch**

- **Cross-Fade**

- **Output Routing**

- **Framesync w/User H/V Offset Pattern Gen**

- **Serialize**

- **A/B Proc Out**

- **Output Crosspoint**

- **3G/HD/SD SDI Out**

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**RP168 Clean-Switch Multi-Input Select**

- **Auto-Changeover**

- **Latching Failover**

- **GPIO Input Select/Status**

- **Ethernet 10/100/1000 (on frame)**

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**SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS**

OPENGEAR CARDS AND STANDALONE/DESKTOP MODELS

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**COBALT DIGITAL INC.**

US SALES 800 669-1691 / DIRECT +1 217-344-1243 / SALES@COBALTDIGITAL.COM

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**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)
  - 1080p: 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/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-DHDNC**
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/SD-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

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 GPIO, 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).

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)

DashBoard™

Quiet Cross-Fade pulls audio to floor and gracefully reverts to normal level during input routing changes
**3G/HD/SD-SDI Standalone 4x1 Clean and Quiet Bypass Router**

**BBG-1040-4x1-CS**

With Relay-Protected Input and GPIO Monitoring / Control

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**Rear Panel**

- **12 VDC**
- **ETHERNET**
- **REF LOOP**

**Note:** RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked 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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**Specifications:**

- **3G/HD/SD SDI In**
- **RP168 Clean-Switch Multi-Input Select**
- **Auto-Changeover Latching Failover**
- **GPIO Input Select/Status**
- **Ethernet 10/100/1000**
- **DashBoard™ Monitor/Control**

- **De-serialize**
- **LTC I/O (+LTC)**
- **Timecode Select/Processing**
- **Moving-Box Insertion**
- **Dual-String Character Burn**
- **Timecode Burn**
- **Color Correction (+COLOR)**
- **Quality Event Detect (+QC)**
- **Audio Silence**
- **Closed-Captioning Absence/Presence**
- **Frozen/Blk/No Vid**
- **Automated Event Actions:**
  - Email Alerts
  - GPO
  - I/O Routing Changes
  - User Preset Engage
  - Status via serial, IP

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**Relay Protection**

- **Ref 1**
- **Ref 2**

**Output Crosspoint**

- **Selected In A - In D Input RCK**
- **SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS (OPENGEAR CARDS AND STANDALONE/DESKTOP MODELS)**

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**SDI REDUNDANCY SWITCHES AND BYPASS ROUTERS**

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**Rear Panel**

- **12 VDC**
- **ETHERNET**
- **REF LOOP**

**Note:** RCK/PROC 1 thru RCK/PROC 4 are DA outputs which can be individually set as reclocked 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.
**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: 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.
- 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)
The Cobalt® 9991-IP-TO-SDI-10GE 3G/HD/SD-SDI SMPTE De-Encapsulator (2022-6 or 2110 Options) with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface 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 just a basic embedder/de-embedder, the 9991-IP-TO-SDI-10GE offers the flexibility of IP-to-SDI as well as providing fully flexible AES and analog audio embedding/de-embedding. When ordered, the 9991-IP-TO-SDI-10GE can be factory-fitted with either a SMPTE 2022-6 or 2110 IP de-encapsulator SFP module.

The 9991-IP-TO-SDI-10GE 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. The 10GigE host connection can be used directly with 10GigE video switches and routers.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Full user Dashboard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

### FEATURES

**Orderable as SMPTE 2022-6 or 2110 compliant. 2022-6 model is ST 2022-6 (HBRMT), ST-424, ST-292, and ST-259 compliant.**

- 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.

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

- Option +DT User COM Data Insert/Extract Software Option allows serial data insert/extract over SDI (User DID/SDID access)

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

- Five year warranty

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![Diagram of 9991-IP-TO-SDI-10GE](image)

### Schematic Diagram

- **3G/HD/SD-SDI Coax In**
- **10GigE Fiber**
- **De-Encapsulator**
- **SDI Rx/ Audio De-Embed**
- **SDI Tx/ Driver**
- **3G/HD/SD-SDI Out**
- **Unbalanced AES I/O** (16-Ch max)
- **Balanced AN-AUD I/O** (8-Ch max)
- **AES Per-Pair Direction Control**
- **AES Tx**
- **AES Rx**
- **SRC** (Per-Pair auto-detect bypass for Dolby pair)
- **Audio 24-Bit ADC**
- **Audio 24-Bit DAC**
- **Audio Channel Routing/Control**
- **Ethernet 10/100 (On Frame)**
- **DashBoard/OGCP Monitor/Control**

*When ordered, 9991-IP-TO-SDI can be factory-fitted with either a SMPTE 2022-6 or 2110 de-encapsulator SFP module.*
### 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) GigE Fiber I/O; Multi-Mode; LC connectors
- Fiber Wavelength, Tx: 1310 nm
- Tx Power: -5.0 dBm (min)
- SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424AM

**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 Clipping: +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-3d; 75Ω) with per-pair port direction controls
- (8) Balanced Analog Audio with per-pair port direction controls

### Ordering Information

**9991-IP-TO-SDI-10GE-2022-6**
3G/HD/SD-SDI SMPTE 2022-6 De-Encapsulator with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface

**9991-IP-TO-SDI-10GE-2110**
3G/HD/SD-SDI SMPTE 2110 De-Encapsulator with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface

**RM20-9991-IP-SDI-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 GigE I/O (LC connector), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

**RM20-9991-IP-SDI-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 GigE (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

**RM20-9991-IP-SDI-D**
20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, Fiber GigE I/O (LC connectors), (8) Balanced Analog Audio I/O, Unbalanced AES I/O/COMM (via HD-15 connector)

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

**Note:** COMM port setup and usage available only with option +DT.
The Cobalt® **9991-SDI-TO-IP-10GE** 3G/HD/SD-SDI SMPTE Encapsulator (2022-6 or 2110 Options) with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface offers full-flexibility AES and analog audio embedding/de-embedding with SMPTE IP encapsulation in a basic, economical, high-efficiency openGear® card. More than just a basic embedder/de-embedder, the 9991-SDI-TO-IP-10GE offers the flexibility of SDI-to-IP as well as providing fully flexible AES and analog audio embedding/de-embedding. When ordered, the 9991-SDI-TO-IP-10GE can be factory-fitted with either a SMPTE 2022-6 or 2110 IP encapsulator SFP module.

The 9991-SDI-TO-IP-10GE 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. The 10GigE port can be used directly with 10GigE video switches and routers.

Full audio crosspoint allows per-channel gain and routing controls, as well as built-in tone generators.

Preset save/load allows saving custom card settings while allowing one-button revert to factory settings. Full user DashBoard™ or Remote Control Panel remote control allows full status and control access locally or across a standard Ethernet network.

### FEATURES

- **Orderable as SMPTE 2022-6 or 2110 compliant. 2022-6 model is ST 2022-6 (HBRMT), ST-424, ST-292, and ST-259 compliant.**
- 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**
- Option +DT User COM Data Insert/Extract Software Option allows serial data insert/ extract over SDI (User DID/SDID access)
- Remote control/monitoring via Dashboard™ software or OGCP-9000 remote control panels
- Five year warranty

### Diagram

![Diagram of the 9991-SDI-TO-IP-10GE](image-url)

*When ordered, 9991-SDI-TO-IP can be factory-fitted with either a SMPTE 2022-6 or 2110 encapsulator SFP module.*

**SDI Rx/ Audio De-Embed**

- **AES Per-Pair Direction Control**
- **AES Tx**
- **AES Rx**
- **SRC** (Per-Pair auto-detect bypass for Dolby pair)

**Audio Channel Routing/ Control**

- **Audio 24-Bit DAC**
- **Audio 24-Bit ADC**
- **DIP Switch**
- **Balanced AN-AUD I/O** (8-Ch max)
- **Unbalanced AES I/O** (16-Ch max)

**Encapsulator**

- **Encapsulator**
- **10GigE Fiber**
- **3G/HD/SD-SDI Coax Out**

**DashBoard/OGCP Monitor/Control**

- **Ethernet 10/100 (On Frame)**

**SDI Tx/ Driver**

- **AES Per-Pair Direction Control**
- **AES Tx**
- **AES Rx**
- **SRC** (Per-Pair auto-detect bypass for Dolby pair)

**9991-SDI-TO-IP-10GE**

**3G/HD/SD-SDI In**

- **SDI Rx/ Audio De-Embed**
- **SDI Tx/ Driver**

**Unbalanced AES I/O** (16-Ch max)

**Balanced AN-AUD I/O** (8-Ch max)
9991-SDI-TO-IP-10GE 3G/HD/SD-SDI SMPTE Encapsulator (2022-6 or 2110 Options) with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface

**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) GigE Fiber I/O; Multi-Mode; LC connectors
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-3d; 75Ω) with per-pair port direction controls
(8) Balanced Analog Audio with per-pair port direction controls

**ORDERING INFORMATION**


9991-SDI-TO-IP-10GE-2110: 3G/HD/SD-SDI SMPTE 2110 Encapsulator with AES / Analog Audio Embed / De-Embed and 10GigE IP Optical Interface

RM20-9991-SDI-IP-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 GigE I/O (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN 1.0/2.3)

RM20-9991-SDI-IP-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 GigE I/O (LC connectors), (8) Balanced Analog Audio I/O, (8) Unbalanced AES I/O (coaxial; HD-BNC)

RM20-9991-SDI-IP-D: 20-Slot Frame Rear I/O Module (Standard Width) (1) 3G/HD/SD-SDI Input BNC, (1) 3G/HD/SD-SDI Output BNC, Fiber GigE I/O (LC connectors), (8) Balanced Analog Audio I/O, Unbalanced AES I/O/COMM (via HD-15 connector)

+DT: User COM Data Insert/Extract Software Option

Note: COMM port setup and usage available only with option +DT.
The Cobalt® 9992-DEC 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 (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 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

**Switch**

<table>
<thead>
<tr>
<th>Decoded Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDI 1 (12G/6G/3G/HD SDI)</td>
</tr>
<tr>
<td>SDI 2 (12G/6G/3G/HD SDI)</td>
</tr>
<tr>
<td>SDI 3 (3G/HD SDI)</td>
</tr>
<tr>
<td>SDI 4 (3G/HD SDI)</td>
</tr>
<tr>
<td>COPY - SDI 1**</td>
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<tr>
<td>COPY - SDI 2**</td>
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<tr>
<td>COPY - SDI 3**</td>
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<tr>
<td>COPY - SDI 4**</td>
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</tbody>
</table>

- **DashBoard™ Monitor/Control**  
  - DashBoard 10/100/1000 Control Ethernet (on frame)

**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

**+FEC-DEC** Add SMPTE-2022 support (per unit)

**+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 encoder.)
### 9992-DEC | 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
  - RTMP (Server or Client; limited to H.264 only)
  - 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
- 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
9992-DEC » AVC / MPEG-2 Software Defined Broadcast Decoder

BASE MODEL 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 AVC / MPEG-2 Software Defined Broadcast Decoder (includes (1) +AVC and (2) +MP1L2-AAC licenses)

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.

Note: OUT COPY ports are disabled when card is in 12G mode.

RM20-9992-DEC-B-HDBNC
9992-DEC-4K-HEVC ▶ 4K / AVC / MPEG-2 Software Defined Broadcast Decoder
with Single-Channel 4K or Dual-Channel 2K Video Paths

The Cobalt® 9992-DEC-4K-HEVC 4K/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, 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
- 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, RTP, HLS, and RTMP (Client mode). Other protocols available as options.
- Remote control/monitoring via Dashboard™ software
- 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
- **+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.
- **+FEC-DEC** Add SMPTE-2022 support (per unit)
- **+GENLOCK** Add Genlock support (license is per channel)
- **+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 encoder.)
## 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
  - RTMP (Server or Client; limited to H.264 only)
  - 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)
Optiona
  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
BASE MODEL 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 / AVC / MPEG-2 Software Defined Broadcast Decoder with Single-Channel 4K or Dual-Channel 2K Video Paths

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

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.

Note: OUT COPY ports are disabled when card is in 12G mode.
9992-2DEC » DUAL UPGRADEABLE 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, 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
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, RTP, HLS, and RTMP (Client mode). Other protocols available as options.
Remote control/monitoring via Dashboard™ software
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
+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 encoder.)
**9992-2DEC** DUAL 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
  - RTMP (Server or Client; limited to H.264 only)
  - 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 6-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
9992-2DEC  ›› DUAL UPGRADEABLE AVC / MPEG-2 SOFTWARE DEFINED BROADCAST DECODER

BASE MODEL 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)

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.

**Note:** OUT COPY ports are disabled when card is in 12G mode.

RM20-9992-DEC-B-HDBNC
9992-ENC » HEVC UPGRADEABLE 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
- 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
- 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.
- +ENCD-5.1 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 license to be also present on the encoder.)
- +SMPTE2022 Add SMPTE-2022J support (per unit). Provides one FEC insertion per device Ethernet port (transport stream based option; only one license needed per unit).
**9992-ENC**  HEVC UPGRADEABLE AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER

### Inputs
- (2) SDI inputs each supporting 12G-SDI, 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.

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**SPECIFICATIONS**

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### Video Pre-Processing
- Support for arbitrary down-scaling input video, extending down to 320x240
- Support for up-scaling input video
- Interfaced to progressive conversion
- Progressive to interfaced 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\(^1\)
- 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\(^2\)

- 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
- AF/D: 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.
**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)
- **+ENCD-2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license (each license adds one encoded pair)
- **+ENCD-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.)
- **+SMPT2022** Add SMPTE-2022 support license (per unit)
- **+422** 4:2:2 encoding 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-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.

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**Note:** Input ports marked as "12G" are compatible with 12G and lower SDI inputs. Input ports marked as "3G" are compatible only with 3G or lower SDI inputs.
The Cobalt® **9992-ENC-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-ENC-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-ENC-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-ENC-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)
- HEVC encoding
- Support for 4:2:0 8-bit/10-bit encoding
- Full ancillary data support

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<td>12G/3G/HD/SD - SDI</td>
<td><strong>ASI 2</strong></td>
</tr>
<tr>
<td>3G/HD/SD - SDI</td>
<td><strong>Ethernet 1</strong></td>
</tr>
<tr>
<td>3G/HD/SD - SDI</td>
<td><strong>Ethernet 2</strong></td>
</tr>
</tbody>
</table>

**DashBoard™ Monitor/Control**

* In UHD mode, the other three HD Encoders are not available.

**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.
- **ENCD-2.0** Dolby Digital/Dolby Digital Plus stereo audio encoding license.
- **ENCD-5.1** 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. 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).
9992-ENC-4K-HEVC  4K HEVC / AVC / MPEG2 SOFTWARE DEFINED BROADCAST ENCODER
with Single-Channel 4K or Quad-Channel 2K Video Paths

**Inputs**
- (2) SDI inputs each supporting 12G-SDI, 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.

**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

**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.

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**Specifications Subject to Change Without Notice. E. & O. E. ©2020 Cobalt Digital Inc.**

*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\(^{(1)}\)
  - 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\(^{(2)}\)
  - 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.
**ORDERING INFORMATION**

**9992-ENC-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-HE** Dolby Digital/Dolby Digital Plus stereo audio encoding license (each license adds one encoded pair)

- **ENC6-5.1** 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/ENC-2.0** RIST Encryption/Authentication support license (per unit). (Requires the +RIST/ARQ-ENC license to also be present on the encoder.)

- **SMPT2022** Add SMPTE-2022 support (per unit)

- **422** 4:2:2 encoding 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, COM/GPIO Port (All SDI coaxial connectors HD-BNC.) (Note: Mates to card in odd slot.)

---

**Diagram:**

```
+----------------+-----------------------+-------------------+-------------------+
| 1 - GPI 1      | 2 - GPI 2             | 3 - GPI 1          | 4 - GPI 2         |
| 5 - GPI COM     | 6 - GND               | 7 - RS232-A RX     | 8 - RS232-A RX    |
| 9 - RS232-A TX  | 10 - RS232-A TX       |                  |                  |
| NC              | NC                    |                  |                  |
|                  | ASI OUT 1             | ENET 1            |                  |
|                  | ASI OUT 2             | ENET 2            |                  |
|                  | IN 1 (12G)            | IN 2 (12G)        |                  |
|                  | IN 3 (3G)             | IN 4 (3G)         |                  |
+----------------+-----------------------+-------------------+-------------------+
```

*Note: Input ports marked as "12G" are compatible with 12G and lower-SDI inputs. Input ports marked as "3G" are compatible only with 3G or lower-SDI inputs.*
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
- 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
- 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

**Diagram:**

- **10GigE Fiber**
- **SDI EQ/De-serialize**
- **Audio De-embed**
- **SDI Copy**
- **SDI Reclock/Driver**
- **De-serial Video**
- **HDMI Encode**
- **HDMI Out**
- **SDI Reclock Out (X2)**
- **24-Bit DAC**
- **AN-AUD (2-Ch) De-embed Out**
- **USB/DIP SW**
- **Local/Remote Control**
## SPECIFICATIONS

### Standards Supported
- SMPTE 259M, 292M, 424M, ST 2022-6 (HBRMT), ST 2022-7, ST 424, ST 292, and ST 259

### Inputs/Outputs
- (1) GigE 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, 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-IP-TO-SDI-10GE-2022**  SMPTE 2022-6 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
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
**SPECIFICATIONS**

**Standards Supported**
- SMPTE 259M, 292M, 424M, ST 2110, ST 424, ST 292, and ST 259

**Inputs/Outputs**
- (1) GigE 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, 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

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**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
The Blue Box BBG-SDI-TO-IP-10GE-2022 is a 3G/HD/SD-SDI to SMPTE 2022-6/7 Encapsulator. It provides SDI, HDMI, and Stereo Analog Audio Monitoring Outputs. The encapsulator offers the flexibility of SDI-to-IP encapsulation along with an HDMI output, a reclocked SDI coax output, and a convenient 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 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**

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**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**

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**ST 2022-6/7 Encapsulator**

**SDI Reclock Out**

**SDI Copy**

**De-serial Video**

**SDI Reclock/Driver**

**HDMI Encode**

**HDMI Out**

**24-Bit DAC**

**AN-AUD (2-Ch) De-embed Out**

**USB Adapter**

**Local/Remote Control**

**BBG-SDI-TO-IP-10GE-2022**

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**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

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**SMPTE 2022-6/7 Encapsulator**

**10GigE Fiber**

**SDI Reclock Out**

**HDMI Out**

**AN-AUD (2-Ch) De-embed Out**

**USB Adapter**

**Local/Remote Control**

**BBG-SDI-TO-IP-10GE-2022**
FIBER OPTIC TRANSPORT AND ROUTING

BLUEBOX™ COMPACT THROWDOWN IP-SDI ENCAPSULATORS / DE-ENCAPSULATORS

BBG-SDI-TO-IP-10GE-2022  3G/HD/SD-SDI TO SMPTE 2022-6 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) GigE 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, 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-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
The Blue Box BBG-SDI-TO-IP-10GE-2110 is a 3G/HD/SD-SDI to SMPTE 2110 Encapsulator with SDI, HDMI, and Stereo Analog Audio Monitoring Outputs. It is 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 redlocked 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
- 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
- Compatability and support of 2110 video (part 20), audio (part 30), and ancillary data (part 40) as well as timing (part 21)
- Compact size and low weight design easily affixes directly to camera or host device chassis
- Rugged construction backed with a five-year warranty

**Diagram:**

- 3G/HD/SD-SDI In
- SDI EQ/De-serialize
- Audio De-embed
- Single-Source/Redundant Power
- USB Adapter
- SDI Copy
- De-serial Video
- De-serial Audio
- SDI Reclock/Driver
- HDMI Encode
- HDMI Out
- 24-Bit DAC
- AN-AUD (2-Ch) De-embed Out
- L/R
- 10GigE Fiber
- SDI Reclock Out
- Local/Remote Control
- USB DIP SW
- BBG-SDI-TO-IP-10GE-2110
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) GigE Fiber I/O; Multi-Mode; LC connectors
(1) 3G/HD-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, 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-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-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
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
- Five year warranty

**OPTIONS**

- +TS – Additional ASI or IP Transport Stream Output
- +GBE – Second Activated Gigabit Ethernet Port

---

**Diagram**

```
ASI I/O 1  →  ASI to MPEG Wrap/Unwrap  →  100/1000 Ethernet Gateway  →  Ethernet 100/1000 RJ45 1
ASI I/O 2  →                  ▶                      ▶                  ▶                  ▶
ASI I/O 3  →                  ▶                      ▶                  ▶                  ▶
ASI I/O 4  →                  ▶                      ▶                  ▶                  ▶
ASI I/O 5  →                  ▶                      ▶                  ▶                  ▶
ASI I/O 6  →                  ▶                      ▶                  ▶                  ▶

ASI I/O 1  ▶  ASI I/O 2  ▶  ASI I/O 3  ▶  ASI I/O 4  ▶  ASI I/O 5  ▶  ASI I/O 6
```

**this color denotes option**

DashBoard™/OGCP Monitor/Control
### 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 bitrate 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

![Diagram of RM20-9220-B](image-url)
**BIDIRECTIONAL ASI/IP/GATEWAYS (OPENGEAR CARDS AND STANDALONE MODELS)**

**9220-SA ▶ BIDIRECTIONAL ASI/MPTS STANDALONE GATEWAY UNIT**

The **9220-SA** provides a compact form-factor standalone bidirectional ASI/IP gateway that 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-SA can be remotely controlled and monitored with the free, easy-to-use DashBoard™ setup and control operator interface. (When connected to your network, the 9220-SA appears in DashBoard just like any other device.)

It features up to 6 ASI ports, individually configurable as inputs or outputs. With option +TS-SA, the 9220-SA can support up to six ASI/IP bidirectional conversions simultaneously (standard support with no additional licenses supports one ASI/IP bidirectional gateway). The 9220-SA 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-SA 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-SA 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**
- **Five year warranty**

### OPTIONS

- **+TS-SA – Additional ASI or IP Transport Stream Output**
- **+GBE-SA – Second Activated Gigabit Ethernet Port**

![Diagram](image)

**this color denotes option**

**DashBoard™/OGCP Monitor/Control**

**Ethernet 100/1000 RJ45 1**

**Ethernet 100/1000 RJ45 2**

**Transport ENET 1**

**Transport ENET 2**

**ASI 1**

**ASI 2**

**ASI 3**

**ASI 4**

**ASI 5**

**ASI 6**

**IEC AC Input POWER switch**

**Control/Monitor Ethernet (2x redundant)**

**DashBoard™**

**Control Ethernet with DashBoard™**

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## 9220-SA  » BIDIRECTIONAL ASI/MPTS STANDALONE GATEWAY UNIT

### SPECIFICATIONS

**Power**
- 100-250 VAC, 47-63 Hz, 15W

**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

**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

**Physical**
- Dimensions (WxHxD): 5.8 x 1.8 x 14 in (14.7 x 4.6 x 35.6 cm) (including component projection)

### ORDERING INFORMATION

**9220-SA** Bidirectional ASI/MPTS Standalone Gateway Unit

**+TS-SA** 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-SA** Optional Activated Second Gigabit Ethernet Port

**TRAY** 1 RU Rack Mount Tray (supports up to 3 units)
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
- 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
- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices
- Optional support for additional audio pairs
- 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
- Five year warranty

**OPTIONS**

Please see Ordering Information
**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)
  - 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
- MPEG-2 (ADTS); MPEG-4 (LATM/LAOS encapsulation)
- 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 720/1440i 29.94/50/30/29.97/25
- **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

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**RM20-9223-B RM20-9223-U**

**IP / DTV / COMPRESSION**

**H.264 ENCODERS (OPENGEAR CARDS AND STANDALONE MODELS)**

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## ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9223-S</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD</td>
</tr>
<tr>
<td>9223-S-HD-I</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080i</td>
</tr>
<tr>
<td>9223-S-HD-P</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder Unit with H.264 SD/HD up to 1080p</td>
</tr>
<tr>
<td>9223-A8-S</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD, Support for 4 audio pairs (8-ch)</td>
</tr>
<tr>
<td>9223-A8-S-HD-I</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080i, Support for 4 audio pairs (8-ch)</td>
</tr>
<tr>
<td>9223-A8-S-HD-P</td>
<td>Single-Channel 3G/HD/SD MPEG-4 Encoder with H.264 SD/HD up to 1080p, Support for 4 audio pairs (8-ch)</td>
</tr>
<tr>
<td>RM20-9223-B</td>
<td>20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD-SDI/SDI BNC Composite In, (2) DVB-ASI BNC Out, (4) Balanced Analog Audio In, (2) 100/1000Base-T RJ-45 Ethernet</td>
</tr>
<tr>
<td>RM20-9223-U</td>
<td>20-Slot Frame Rear I/O Module (Standard Width) (2) 3G/HD-SDI/SDI BNC Composite In, (2) DVB-ASI BNC Out, (4) Unbalanced Analog Audio RCA In, (2) 100/1000Base-T RJ-45 Ethernet</td>
</tr>
</tbody>
</table>

### Options:

- **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 3G/HD/SD low resolution PIP option
- **RIST/ARQ-ENC** Automatic Repeat 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

---

**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.
- RMTP 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.

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**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 3G/HD/SD low resolution PIP option

**RIST/ARQ-ENC** Automatic Repeat 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

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**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.
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, allowing SDI content to Internet viewers
- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices
- Optional support for additional audio pairs
- 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
- Five year warranty

**OPTIONS**

Please see Ordering Information
### 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
- MPEG-2 (ADTS), MPEG-4 (LATM/LAOS encapsulation)
- Lip sync adjustment

**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, EN61000-3-2

---

**Video Resolution Supported**

- HD: 1920 x 1080p 60/50/29.97/25
- 1080 x 1920/1440 30/29.97/25
- 1280 x 720/960/59.94/50/30/29.97/25
- SD: 576 x 720/528i 29.97fps
- 576 x 720/528i 25fps

---

**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, EN61000-3-2

---

**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
- MPEG-2 (ADTS), MPEG-4 (LATM/LAOS encapsulation)
- Lip sync adjustment

**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, EN61000-3-2

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**Video Resolution Supported**

- HD: 1920 x 1080p 60/50/29.97/25
- 1080 x 1920/1440 30/29.97/25
- 1280 x 720/960/59.94/50/30/29.97/25
- SD: 576 x 720/528i 29.97fps
- 576 x 720/528i 25fps

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9223-D » DUAL-CHANNEL 3G/HD/SD MPEG-4 ENCODER

9223-D • Dual-Channel 3G/HD/SD MPEG-4 Encoders

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

+SMPT2022 • 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.

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 needed.
- 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 output
- 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, allowing SDI content to Internet viewers
- Dual-redundant internal power supplies
- Five year warranty

**OPTIONS**

Please see Ordering Information
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
- MPEG-2(ADTS), MPEG-4(LATM/LAOS encapsulation)
- 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 720/576i 29.97fps
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/AMD

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
- UL: UL approval
- US FCC: Part 15
- EMC: EN55022, EN55024, EN61000-3-2
- Safety: IEC60601-1
- 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
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 359M)
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)

Video Resolution Supported
HD: 1920 x 1080p 60/50/30/29.97/25
1080 x 1920/1440 30/29.97/25
1280 x 720/960/640i 59.94/50/29.97/25
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
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
**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-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-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-ENC2 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 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.

**OPTIONS**

Please see Ordering Information

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![Diagram](image_url)
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 (SMPT 292M)
- HD-SDI (SMPT 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
- MPEG-2 (ADTS), MPEG-4 (LATM/LAOS encapsulation)
- 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 720/1920/1440i 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, 7511 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
- 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
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
- **+SMPT2022** 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 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.

The 9990-TRX-MPEG is a full-featured quad-channel video transcoder that delivers up to 40 individual HD/SD channels. The latest advances in video compression technology 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
- Five year warranty

**OPTIONS**

- +XC2HD – Adds two transcoding licenses

**ASl **

- ASI 1 IN
- ASI 2 IN
- ASI 1 OUT
- ASI 2 OUT

**ASl to MPEG Wrap/Unwrap**

**Transcode (2 Services)**

**Additional 2 Services**

**100/1000 Ethernet Gateway**

- Ethernet 100/1000 RJ45 1
- Ethernet 100/1000 RJ45 2

**DashBoard™ Monitor/Control**

- Ethernet 10/100 (On Frame)
## 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: 4
- 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 704, 480x270, 320x240, 320x180

**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 704, 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

### ORDERING INFORMATION

**9990-TRX-MPEG**
- Multi-Standard Broadcast Transcoder

**+TRX2**
- Add Transcoding License. Adds transcoding for two additional services

**RM20-9990-B**
- 20-Slot Frame Rear I/O Module (Standard Width)
  - 2 ASI Input BNCs, 2 Gigabit Transport Ethernet ports
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
- Low power/high-density design
- 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.
- 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
- 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
- HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices
- Remote control/monitoring via DashBoard™ software
- Five year warranty

**OPTIONS**

Please see Ordering Information for descriptions and details.

<table>
<thead>
<tr>
<th>Input Switch</th>
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<th>Encoder 2*</th>
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<tr>
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<td>A/V ADC, Embed/Serialize</td>
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<td>Control Ethernet with DashBoard™</td>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>HD/SD - SDI / Cmpst BNC In 2*</td>
<td>A/V ADC, Embed/Serialize</td>
<td>Transport Ethernet Out 2*</td>
<td></td>
</tr>
<tr>
<td>Analog Audio L/R In 2*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DashBoard™/OGCP Monitor/Control

* Second stream available with hardware option -ENC-H264-IP

this color denotes option
### 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 1920/1440 30/29.97/25
- 1280 x 720/1400i 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, EN61000-3-2
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-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-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-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-Dual-OG** Upgrade a dual-channel optioned card to the 9223-D-HD-P (dual-channel model) plus two +AAC licenses
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.

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
- **Input video auto-detect mode automatically configures output** to correspond to input frame rate and scaling or convert formats using built-in UDX scaler
- **Low power/high-density design**
- **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.
- **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**
- **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
- **HTTP Live Streaming protocol allows viewing by Apple® and Android™ 3.0 (or higher) devices**
- **Remote control/monitoring via DashBoard™ software**
- **Five year warranty**

### OPTIONS

- **DashBoard™/OGCP Monitor/Control**
- **Control Ethernet with DashBoard™**

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![Diagram of 9990-ENC2-H264-IP](9990-ENC2-H264-IP_diagram.png)

**9990-ENC2-H264-IP**

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**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 (HPxL4.2)
- MPEG-4 AVC High profile at level 4.0 (HPxL4.0)
- CBR & VBR
  - 2Mbps to 12Mbps (configurable)
- SD Video:
  - MPEG-4 AVC Main profile at level 3.0 (MPWxL3.0)
  - 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 720/528i 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
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-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-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-TO-BROADCAST-Dual-OG  Upgrade a 9990-ENC2-H264-IP (dual-channel model) to the 9223-D-HD-P (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.
- Dual-redundant internal power supplies.
- Five year warranty.

**Specifications**

- **Input Switch**
  - HD/SD - SDI / Cmpst BNC In 1
  - Analog Audio L/R In 1
  - A/V ADC, Embed/Serialize

- **Encoder 1**
  - Transport Ethernet Out 1

- **Encoder 2**
  - Transport Ethernet Out 2

- **Output Switch**
  - **DashBoard™/OGCP**
  - Monitor/Control
  - Control Ethernet with DashBoard™

- **IEC AC Input**
  - Transport ENET 1
  - ANLG AUD IN 1 (L)
  - ANLG AUD IN 1 (R)
  - ASI OUT 1 / Status LED
  - VID IN 1 / Status LED

- **Transport ENET 2**
  - ANLG AUD IN 2 (L)
  - ANLG AUD IN 2 (R)
  - ASI OUT 2 / Status LED
  - VID IN 2 / Status LED

- **Control/Monitor Ethernet (2x redundant)**
  - Transport ENET 1
  - ANLG AUD IN 1 (L)
  - ANLG AUD IN 1 (R)
  - ASI OUT 1 / Status LED
  - VID IN 1 / Status LED

- **Transport ENET 2**
  - ANLG AUD IN 2 (L)
  - ANLG AUD IN 2 (R)
  - ASI OUT 2 / Status LED
  - VID IN 2 / Status LED

**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.
**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 1920/1440 30/29.97/25
- 1280 x 720/576i 29.97fps
- 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
- UL: UL approval
- US FCC: Part 15
- EMC: EN55022, EN55024, EN61000-3-2
- 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-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-Dual-SA** Upgrade a BBG-1190-ENC2-H264-IP (dual-channel model) to dual-channel model BBG-1190-ENC2-HD-P 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)
**9990-DEC-MPEG-SDI**  
**MPEG4 AVC and MPEG2 DECODER** with ASI and IP Inputs and SDI Outputs

The Cobalt® **9990-DEC-MPEG-SDI** 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-SDI 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-SDI 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.

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**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.
- 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
- 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)
- IP IN License (+IP-IN) - Enables IP Port and IP Protocols for IP-to-SDI conversion
- Monitoring License (+TSMON)
- Genlock License (+GENLOCK)
- RTMP Server License Option (+DEC-RTMP-SVR)
- 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)
- 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)

---

**Diagram Description**

- **Ethernet**
- **ASI In** → **ASI to MPEG Wrap/Unwrap** → **Audio DAC** → **AN-AUD Out (L/R)** → **CVBS Out**
- **ASi Out**
- **HD/SD-SDI Out**
- **HD/SD-SDI Out**
- **A/V Decoder**
- **Audio DAC**
- **SD Video DAC**
- **DashBoard™/OGCP Monitor/Control**
- **Ethernet**

* Dual SDI outputs available only with corresponding rear modules and on card hardware rev 2 or higher.

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9990-DEC-MPEG-SDI  »  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.

<table>
<thead>
<tr>
<th>Power</th>
<th>&lt; 8 Watts</th>
</tr>
</thead>
</table>

**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) 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
  - 1280 x 720p – 50/59.94/60
- **HD:**
  - 1920 x 1080i - 50/59.94/60
  - 1280 x 720p – 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

- AAC-LC
- HE-AAC
- AC-3, E-AC-3 (Dolby® pass-thru)

### Ordering Information

**9990-DEC-MPEG-SDI**  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

**+IP-IN**  IP IN License Option

**+IP-OUT**  ASI-to-IP Conversion 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
9990-DEC-MPEG-SDI » 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
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). In addition to full remote control/monitoring via Dashboard™ software, the advanced front panel display/user interface allows initial and basic configuration setup without needing a computer or connection to remote control.

The BBG-1190-DEC-MPEG supports newer cameras that output RTMP and security 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 SDI 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
- 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. Several options available for scalable configuring
- 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)
- Automatic Repeat Request, Error Correction Assigned For Live Video Over IP / Internet Based on the Reliable Internet Streaming Transport (RIST) Standard (+RIST/ARQ-DEC)
- Monitoring License (+TSMON)
- Genlock License (+GENLOCK)
- RTMP Server License (+DEC-RTMP-SVR)
- Stream Splitting License Option (+SPTS)
- 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**

**Power**
100-250 VAC, 47-63 Hz, 8 Watts max.

**Inputs**
1 DVB-ASI 75Ω BNC
1 IP, 1000Base-T RJ-45

**Outputs**
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)

**Network Transport Protocols**
UDP (Unicast or Multicast)
RTP (Unicast or Multicast)
RTMP Client or Server (Adobe Flash)
RTSP (Security Camera)
SMPT 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)

**Regulatory Compliance**
UL: UL approval
US FCC: Part 15
EMC: EN55022, EN55024, EN6100-3-2
Safety: IEC600950
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-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  SMPTE 2022 Forward Error Correction License Option
+GENLOCK  Genlock License Option
+DEC-RTMP-SVR  RTMP Server License Option
+IP  IP License Option
+SPTS  SPTS Stream Splitting 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

BBG-1100-TRAY  1 RU Rack Mount Tray (supports up to 3 BBG-1100 series units)
The 9990-RTR-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-MPEG-IP provides copies that can easily be sent to multiple destinations for monitoring or other purposes. With the 9990-RTR-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-MPEG-IP supports up to 16 inputs, and up to 16 outputs. Each input can be replicated up to eight times. The 9990-RTR-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-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
- Up to 16x16 inputs and outputs using two 1GigE Ethernet ports
- De-jittering and reclocking features help ensure reliable operation – even with jittery sources
- Easy integration and control/monitoring via DashBoard™ remote control
- Five year warranty

**SPECIFICATIONS**

- IP Inputs* (8)
- IP Outputs (8)
- Cross-Connect Switch with Replication
- ENET 1 GigE
- ENET 2 GigE
- Ethernet 10/100/1000 (On Frame)
- Test Generator

* On model 9990-RTR-8X16-MPEG-IP, number of input ports is limited to eight (total), which can be distributed across either of both GigE interfaces.
9990-RTR-MPEG-IP   STREAMING IP (MPEG2-TS) RELOCKING DISTRIBUTION AMPLIFIER AND ROUTER

SPECIFICATIONS

Power
12W

Routing Capacity
Model 9990-RTR-8X16-MPEG-IP: 8 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.
Model 9990-RTR-16X16-MPEG-IP: 16 inputs available for routing to up to 16 outputs. Outputs can be on either or both GigE ports.
Note: For all models, 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

9990-RTR-16X16-MPEG-IP  16x16 Streaming IP (MPEG2-TS) Reclocking Distribution Amplifier and Router

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  Upgrades 9990-RTR-8X16-MPEG-IP to model 9990-RTR-16X16-MPEG-IP (adds 8 inputs for a total available of 16 inputs)
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.

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.

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.
### FEATURES

**SPOTCHECK® TRANSPORT STREAM COMPLIANCE MONITOR**

**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.**

**See Ordering Information for physical port capacity and IP, ASI, or OTA model designations.**

**Clicking the icon in the plot upper-left corner opens a cursor-defined region in which average LKFS, true peak, and loudness range (LRA) over a selected span is displayed.**

**This tool can also download a transport stream interval set by the cursor boundaries.**
Navigating in thumbnail / loudness plots could not be easier.
- Zoom-out (more segments/time span displayed) or zoom-in (less segments/time span displayed but with greater detail) simply by rotating scroll wheel on mouse. Use Zoom presets to go to preset spans of 10 seconds to maximum. Zoom span level is always displayed in upper corner of plot.
- Navigate to most recent or earlier segments simply by dragging mouse left or right. Use buttons on bottom of plot to jump to earlier or later panes, or to go to very beginning or very end of plotting.

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.

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.
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.

**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).
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, 50Ω BNC input
- SpotCheck-OTA: 8VSB (RF), female F-connector input

**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: 12 months
- 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).

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**SPOTCHECK® Licensing**
- Adding license to SpotCheck® allows scalable provisioning above the standard capacity as shown in this example.
- SpotCheck-1000-IP: Includes one SPOTCHECK-LICENSE-AUDIO-FULL. Provides complete program analysis for one program (one video PID plus two audio PIDs).
- (1) SPOTCHECK-LICENSE-AUDIO-FULL
- Adds complete program analysis for second program (one video PID plus two audio PIDs).
- (1) SPOTCHECK-LICENSE-AUDIO-LITE
- Adds an additional audio subprogram (one audio PID) to program.
- (1) SPOTCHECK-LICENSE-AUDIO-LITE
- Adds program analysis for third program (one video PID plus one audio PID). Omits as-run support for this program.

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**ADDITIONAL PROGRAM LICENSES**
- Program 1: (1 vs P: 2 audio PIDs)
- Program 2: (1 vs P: 3 audio PIDs)
- Program 3: (1 vs P: 3 audio PIDs)
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/repacketing 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.
**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 10 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.
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

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

Five year warranty
## 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: 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-292M, SMPTE-293M, SMPTE-422M

#### 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, B 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, B Unbalanced AES I/O (coaxial; HD-BNC)
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**

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

Five year warranty
9933-EMDE-75/110  3G/HD-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
2. 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**
1. (8) Unbalanced AES (AES-3id; 75Ω) with per-pair port direction controls
2. (8) Balanced AES (AES/EBU; 110Ω) with per-pair port direction controls

**ORDERING INFORMATION**

**9933-EMDE-75/110** 3G/HD-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-SDI Input BNC, (1) 3G/HD-SDI Output BNC, (8) Balanced AES Audio I/O, (8) Unbalanced AES I/O (coaxial; DIN1.0/2.3)

BlueBox™ offers excellent performance, and excels to a new level of ease of use and installation practicality. The BlueBox™ BBG-DE-AA 3G/HD/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

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**Diagram:**

- 3G/HD/SD SDI In
- SDI Rx/ Audio De-Embed
- USB DIP Switches
- Local/Remote Control
- Group De-Embed Select
- Audio 24-Bit DAC
- Analog Audio Out (8-Ch Balanced)
- SDI Tx/ Driver
- 3G/HD/SD SDI Out

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BlueBox™

BBG-DE-AA

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Specifications subject to change. E. & O. E.
BBG-DE-AA 3G/HD/SD Analog Audio De-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 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

SDI Rx/Audio De-Embed

3G/HD/SD SDI In

Audio 24-Bit ADC

Audio Embed

SDI Tx/Driver

3G/HD/SD SDI Out

Local/Remote Control

USB

DIP Switches

Channel Embed Select

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-SDI In (75 Ω BNC)
8-channel balanced analog audio input via DB-25 connector and XLR breakout adapter (available separately)
3G/HD-SDI Out (75 Ω 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
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.

**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, <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
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.
**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)

**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

- 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.

- 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

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**openGear®**

**RM20-9950-B**

**SD IN**

**SDI OUT**

**SDI RLY OUT**

**GPIO**

**COM A**

**COM B**

**COM C**

**LTC RS-485 I/O**

**+LTC** this color denotes option

**this color denotes option**

**Ethernet 10/100/1000 (on frame)**

**DashBoard™/OGCP Monitor/Control**

**9950-EMDE-ANC**

**De-serialize**

**VANC/HANC De-Empbed**

**VANC/ HANC Insertion (Embedded)**

**3G/HD/SD SDI RLY Out**

**Relay Protect**

**SMpte 337 De-Empbed from Audio Pair**

**SMpte 337 Embed to Audio Pair**

**EMBEDDER / DE-EMBEDDER**

**3G/HD/SD-SDI Ancillary Data Embedder/De-Embedders (openGear Cards and Standalone Models)**

**COBALT DIGITAL, INC.**

**US Sales 800 669-1691 / Direct +1 217-344-1243 / sales@cobaltdigital.com**

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BBG-1050-EMDE-ANC  3G/HD/SD-SDI STANDALONE ANCILLARY DATA EMBREDDER/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 GPI, 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

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**Diagram**

The diagram illustrates the flow of data through the BBG-1050-EMDE-ANC device, showing the processes of 3G/HD-SDI insertion, VANC/HANC de-embedding, SMPTE 337 embedding, and relay protection. It also highlights the input/output connectivity, including GPI, serial, IP/Ethernet, and LTC RS-485 I/O (option +LTC). The Rear Panel diagram provides a visual of the physical connections and interface options, including 12VDC, Ethernet, and other I/O ports for various purposes.
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 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)
**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
- Remote control/monitoring via Dashboard™ remote control and GPI
- High-density openGear form factor - up to 10 cards per 20-slot frame
- Five year warranty

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.

The 9923-DSK-LG is a perfect solution for flexible multi-market program branding and keyed character generator crawl insertion.
9923-DSK-LG  3G/HD/SD-SDI Downstream Keyer with Dual Key/Fill Paths and Logo Insertion

SPECIFICATIONS

Power
< 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: 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

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)
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

**Rear Panel**

- 12 VDC
- ETHERNET
- 12 VDC
- REF LOOP
- SDI OUT
- HDMI OUT
- PGM SDI IN
- GPI
- KEYFILL SDI IN 1
- KEYFILL SDI IN 2
**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)
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.

### 9942-RTR Models

- **9942-RTR-12x12-12G** 12G/3G/HD-SDI / ASI / MADI 12x12 Router
- **9942-RTR-24x24-12G** 12G/3G/HD-SDI / ASI / MADI 24x24 Router

**FEATURES**

- Exclusive openGear card-based scalable router solution
- Design specifically optimized for 12G support
- High-density design in openGear form offers compact 2RU solution
- RP-168 reference-based switching
- 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).
- Supports software upgrades allowing expanded functionality without removing cards and minimal disruption
- DashBoard™ remote control status monitoring and setup/control
- Five year warranty

**Network Control (Ethernet)**
- Routing Control
- DashBoard Manual Control
- Network Control (Ethernet)
- Serial Control (RS-422 Tx/Rx)

**DashBoard™/OGCP Monitor/Control**
- Ethernet 10/100/1000 (on frame)

**Source/Destination Routing Crosspoint**

**Note:** Available crosspoint I/O matrix configuration depends on model. See Ordering Information for details.
**9942-RTR Series**  
**12G/3G/HD/SD-SDI/ASI/MADI ROUTERS** for openGear® Systems

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**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.

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**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.)

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**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

- **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.)
The Cobalt® 9415DA-SFP 3G/HD/SD-SDI / ASI / MADI Reconfigurable Video SFP Transceiver/Distribution Amplifier with Full-Flexibility Crosspoint and Externally-Accessible SFP Module provides a card-based solution for high-density conversions between coax SDI/ASI, fiber, HDMI, and MADI. With an externally-accessible SFP cage on the card rear module, SFP modules can be easily hot-swapped for maintenance or card repurposing. Because all connections are direct to the card rear module and external SFPs, all cabling remains undisturbed for card removal/installation.

A crosspoint (which is user-configurable via DashBoard™ remote control) allows the card to apply any of the card inputs to various coax DA outputs as well as up to 2 Rx and Tx paths through the external SFP. Up to 10 coaxial DA outputs are available per each card. Using a high-density split rear module, up to 20 cards can be installed in a frame, providing 40 channels of conversion.

The card accepts non-MSA video SFP modules, with single and dual-channel Tx and Rx modules available, supporting an extensive range of electrical/coax and fiber conversions. 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**

- Externally-accessible SFP cages allow easy card repurposing, Wide array of industry-standard SFP modules available, including fiber I/O, and HDMI.
- 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)
- Full support of 3G/HD/SD-SDI and ASI/DVB
- Automatic reclocking for all SDI data rates (auto-bypass for non-SDI data rates)
- SFP-based converters provide state-of-the-art fiber performance, power consumption, and compactness.
- All outputs are non-inverting – ASI can be outputted on any output
- DashBoard™ status and full remote control
- Five year warranty

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**3G/HD/SD-SDI / ASI / MADI Primary I/O**

- **Coax-A**
  - I/O
  - Tx/Rx

- **Coax-B**
  - I/O
  - Tx/Rx

**DashBoard™/OGCP Monitor/Control**

**Ethernet 10/100/1000 (On Frame)**

**Rear Module SFP Cage**

**Output Crosspoint**

**Reclock**

**3G/HD/SD-SDI / ASI / MADI DA Outputs**

- 1A
- 1B
- 2A
- 2B
- 3A
- 3B
- 4A
- 4B

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**OPENGEAR**
**SPECIFICATIONS**

Note: Inputs/outputs are a function of rear I/O module used. Fiber specifications are typical, and only applicable for card fitted with Tx or Rx (as applicable) fiber SFP module. Specifications subject to change.

**Power**
- < 10 Watts

**3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)**
- (2) 75Ω BNC input/outputs max (I/O-A and I/O-B)
- 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 (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)

**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**

9415DA-SFP 3G/HD/SD-SDI / ASI / MADI Reconfigurable Video SFP Transceiver/Distribution Amplifier with Full-Flexibility Crosspoint and Externally-Accessible SFP Module

Options:
- Note: Options denoted as "+" are software-based options which can be uploaded on new product when ordered or typically field-installed as a software upload upgrade. Options or ordering line items denoted as "-" are hardware orderable items (such as SFP and expansion modules).

  - **-SFP-EO** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Transmitter, Medium Haul, 1310nm
  - **-SFP-OE** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Single Receiver, Medium Haul
  - **-SFP-EOOE** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Transceiver, Medium Haul, 1310nm
  - **-SFP-EO-CWDM-WX** 3G/HD/SD-SDI/ASI/MADI Video SFP Optical, Transceiver, Long Haul. Specify CWDM Wavelength in place of -WX (see table below)

  - **-SFP-EOOE-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-EO-CWDM-27 has 1270 nm FIBER OUT CWDM wavelength)
**FIBER OPTIC TRANSPORT AND ROUTING**

**EXTERNAL SFP TRANSMITTERS/RECEIVERS**

**9415DA-SFP**

3G/HD/SD-SDI / ASI / MADI RECONFIGURABLE VIDEO SFP TRANSCEIVER / DISTRIBUTION AMPLIFIER with Full-Flexibility Crosspoint and Externally-Accessible SFP Module

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### ORDERING INFORMATION - (cont.)

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| -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 -SFP-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-2110 | SFP Software License; Single-Channel De-Encapsulator IP-2110-to-2SDI |
| +ADD-SFP-SDI-TO-IP-2110 | SFP Software License; Single-Channel Encapsulator SDI-to-IP-2110 |

#### Rear I/O Modules:

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM20-9415DA-SFP-B-DIN</td>
<td>20-Slot Frame Rear I/O Module. (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (8) DA coaxial outputs (DA output connectors are DIN1.0/2.3) <em>(Note: Mates to card in odd frame slot.)</em></td>
</tr>
<tr>
<td>RM20-9415DA-SFP-B-HDBNC</td>
<td>20-Slot Frame Rear I/O Module. (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (8) DA coaxial outputs (DA output connectors are HD-BNC) <em>(Note: Mates to card in odd frame slot.)</em></td>
</tr>
<tr>
<td>RM20-9415DA-SFP-C/S-DIN</td>
<td>20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (4) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9415DA-SFP-C/S-HDBNC</td>
<td>20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (4) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC)</td>
</tr>
<tr>
<td>RM20-9415DA-SFP-C/S-DIN</td>
<td>20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3)</td>
</tr>
<tr>
<td>RM20-9415DA-SFP-C/S-HDBNC</td>
<td>20-Slot Frame Rear I/O Module (Split; supports 2 cards). (2) 3G/HD/SD-SDI / ASI / MADI input/output BNCs, (1) SFP cage receptacle, (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC)</td>
</tr>
</tbody>
</table>
The Cobalt® 9433-EMDE-75/110-EOOE 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-EOOE offers the flexibility of SDI/Fiber EO – OE transceive as well as providing AES balun functions and fully flexible embedding/de-embedding. The 9433-EMDE-75/110-EOOE 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-EOOE 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
- Five year warranty

**3G/HD/SD-SDI In**

- Coax
- Fiber

**Fiber O-E**

**Unbalanced AES I/O** (16-Ch max)

**Balanced AES I/O** (16-Ch max)

- AES Per-Pair Direction Control

**SDI Rx/ Audio De-Embed**

**3G/HD/SD-SDI Out**

- Coax
- Fiber

**Fiber E-O**

- AES Tx
- AES Rx
- SRC (Per-Pair auto-detect bypass for Dolby pair)

- Audio Embed

- Audio Channel Routing/Control

- Ethernet 10/100/1000 (On Frame)

- DashBoard/OGCP Monitor/Control

**Specifications**

- 9433-EMDE-75/110-EOOE
- 3G/HD/SD-SDI In
- 3G/HD/SD-SDI Out
- AES Per-Pair Direction Control
- AES Tx
- AES Rx
- SRC (Per-Pair auto-detect bypass for Dolby pair)
- Audio Embed
- Audio Channel Routing/Control
- Ethernet 10/100/1000 (On Frame)
- DashBoard/OGCP Monitor/Control
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-EOOE 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel Unbalanced/Balanced AES Embed / De-Embed

9433-EMDE-75/110-EOOE-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, 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-EOOE-CWDM-27 has 1270 nm FIBER OUT wavelength)

RM20-9433EMDE-EOOE-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-EOOE-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, Unbalanced AES I/O (coaxial; HD-BNC)

RM20-9433EMDE-EOOE-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)
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
- Five year warranty
### 9433-EMDE-75/110-E0 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 |

#### ORDERING INFORMATION

| 9433-EMDE-75/110-E0 | 3G/HD/SD-SDI Fiber-Optic EO Transmitter with 16-Channel Unbalanced/Balanced AES Embed / De-Embed |
| 9433-EMDE-75/110-E0-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, 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) |
FIBER OPTIC TRANSPORT AND ROUTING

FIBER EO / OE CONVERTERS WITH AUDIO EMBED / DE-EMBED OPENGEAR CARDS

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
- Five year warranty

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**Diagram**

3G/HD/SD-SDI In

- Coax
- Fiber O-E

SDI Rx/ Audio De-Embed

Unbalanced AES I/O (16-Ch max)
Balanced AES I/O (16-Ch max)

AES Per-Pair Direction Control

AES Tx

AES Rx

SRC (Per-Pair auto-detect bypass for Dolby pair)

Audio Channel Routing/Control

Audio Embed

Ethernet 10/100/1000 (On Frame)

DashBoard/OGCP Monitor/Control

3G/HD/SD-SDI Out

SDI Tx/ Driver

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**9433-EMDE-75/110-OE**
9433-EMDE-75/110-0E » 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

#### 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

### Ordering Information

**9433-EMDE-75/110-0E** 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)
The Cobalt® 9433-EMDE-ADDA-EOOE 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-EOOE offers the flexibility of SDI/Fiber EO – OE transceive as well as providing fully flexible AES and analog audio embedding/de-embedding.

The 9433-EMDE-ADDA-EOOE 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-EOOE 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
- Five year warranty
# 9433-EMDE-ADDA-EOOE 3G/HD/SD-SDI Fiber-Optic Transceiver 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
2. 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

### 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-3d; 75Ω) with per-pair port direction controls
- (8) Balanced Analog Audio with per-pair port direction controls

### Ordering Information

#### 9433-EMDE-ADDA-EOOE 3G/HD/SD-SDI Fiber-Optic Transceiver with 16-Channel AES / 8-Channel Analog Audio Embed / De-Embed

#### 9433-EMDE-ADDA-EOOE-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, 1500, 1520, 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-EOOE-27 has 1270 nm FIBER OUT wavelength)

#### 9433-EMDE-ADDA-EOOE-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)

#### 9433-EMDE-ADDA-EOOE-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)

#### 9433-EMDE-ADDA-EOOE-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)
**FIBER OPTIC TRANSPORT AND ROUTING**

**FIBER EO / OE CONVERTERS WITH AUDIO EMBED / DE-EMBED OPENGEAR CARDS**

**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 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 just 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**
- **Five year warranty**

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**3G/HD/SD-SDI In**

- **SDI Rx/ Audio De-Emp**
- **Unbalanced AES I/O (16-Ch max)**
- **Balanced AN-AUD I/O (8-Ch max)**

**AES Per-Pair Direction Control**

- **AES Per-Pair Direction Control**
- **AES Tx**
- **AES Rx**
- **SRC** (Per-Pair auto-detect bypass for Dolby pair)

**Analog Per-Pair Direction**

- **DIP Switch**
- **Audio 24-Bit ADC**
- **Audio 24-Bit DAC**

**Audio Channel Routing/Control**

- **Ethernet 10/100/1000 (On Frame)**
- **Dashboard/OGCP Monitor/Control**

**3G/HD/SD-SDI Out**

- **SDI Tx/ Driver**
- **Fiber E-O**
- **Coax**
- **Fiber**
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

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, 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)
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

- Five year warranty
**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

**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)
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
### 9410DA-EO

**3G/HD/SD-SDI / ASI / MADI Fiber EO Transport/Distribution Amplifier**

with Full-Flexibility Crosspoint

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**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

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**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)

RM20-9410DA-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).

RM20-9410DA-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).
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**

### 3G/HD/SD-SDI / ASI / MADI Primary I/O

- Coax-A I/O
- Coax-B I/O
- Fiber In
- Ethernet 10/100 (On Frame)

### 3G/HD/SD-SDI / ASI / MADI DA Outputs

- DA 1A
- DA 1B
- DA 2A
- DA 2B
- DA 3A
- DA 3B
- DA 4A
- DA 4B

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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

RM20-9410-0E-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).

RM20-9410-0E-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).
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 relocking 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

**Diagram:**

- 3G/HD/SD-SDI / ASI / MADI Primary I/O
- DashBoard™/OGCP Monitor/Control
- Ethernet 10/100 (On Frame)
- 3G/HD/SD-SDI / ASI / MADI DA Outputs
- SFP EO Tx
- Optical Tx Power Meters
- Fiber Out 1
- Fiber Out 2
- Reclock
- Output Crosspoint
- Coax-A I/O
- Coax-B I/O
- Tx/Rx
- DA 1A 1B
- DA 2A 2B
- DA 3A 3B
- DA 4A 4B
- SFP EO Tx
## Specifications

**Note:** Inputs/outputs are a function of rear I/O module used. Specifications subject to change.

### Power

| Power | < 10 Watts |

### 3G/HD/SD-SDI / ASI / MADI Inputs/Outputs (Coaxial Primary)

<table>
<thead>
<tr>
<th>(2) 75Ω BNC input/outputs max (A-I/O and B-I/O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDI Formats Supported: SMPTE 259M, SMPTE 292M, SMPTE 424M</td>
</tr>
</tbody>
</table>

### Coaxial Receive Performance (Cable Length; Belden 1694A)

| SDI Receive Cable Length (1694A): 110m/180m/360m (3G/HD/SD) |

### Fiber Transmit Output

<table>
<thead>
<tr>
<th>(2) Fiber outputs (independent paths from card crosspoint); LC connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber Wavelength, Tx: 1310 nm</td>
</tr>
<tr>
<td>Tx Power: -5.0 dBm (min)</td>
</tr>
</tbody>
</table>

### 3G/HD/SD-SDI / ASI / MADI Outputs (DA Outputs)

<table>
<thead>
<tr>
<th>Four, 1x2 75Ω BNC outputs (8 total, max). Each DA pair can receive any primary or opposite-channel DA signal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Level: 800 mV nominal</td>
</tr>
<tr>
<td>Alignment Jitter: 3G/HD/SD: &lt; 0.3/0.2/0.2 UI</td>
</tr>
<tr>
<td>Timing Jitter: 3G/HD/SD: &lt; 2.0/1.0/0.2 UI</td>
</tr>
</tbody>
</table>

### 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)

**RM20-9410DA-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), (6) DA coaxial outputs (connections are per card; coaxial connectors are DIN1.0/2.3) (Note: This rear module supersedes -B model (which is discontinued)).

**RM20-9410DA-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), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (Note: This rear module supersedes -B 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, (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, (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (Note: This rear module supersedes -C/S model (which is discontinued)).
**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 reclocking 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

**3G/HD/SD-SDI / ASI / MADI Fiber Dual OE Transport/Distribution Amplifier with Full-Flexibility Crosspoint**

The Cobalt® 9410DA-2OE 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-2OE 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.
9410DA-2OE 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 295M, 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

RM20-9410DA-2OE-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).

RM20-9410DA-2OE-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; coaxial connectors are DIN1.0/2.3) (Note: Mates to card in odd frame slot.) (Note: This rear module supersedes -B/S model (which is discontinued).
The Cobalt® 9410DA-EOOE 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-EOOE 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
9410DA-EOOE 3G/HD/SD-SDI / ASI / MADI Fiber EOOE 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/output max (A-I/O and B-I/O)
SDI Formats Supported: SMPTE 292M, 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.
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-EOOE 3G/HD/SD-SDI / ASI / MADI Fiber EOOE Transport/Distribution Amplifier with Full-Flexibility Crosspoint

RM20-9410DA-EOOE-D/S-DIN/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; coaxial connectors are HD-BNC) (Note: This rear module supersedes -C/S model (which is discontinued).

RM20-9410DA-EOOE-E/S-DIN/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).

RM20-9410DA-EOOE-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).

RM20-9410DA-EOOE-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-EOOE-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-EOOE-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 HD-BNC) (Note: This rear module supersedes -C/S model (which is discontinued).

RM20-9410DA-EOOE-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), (6) DA coaxial outputs (connections are per card; coaxial connectors are HD-BNC) (Note: This rear module supersedes -C/S model (which is discontinued).

RM20-9410DA-EOOE-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-EOOE-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.
- 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 cabled power adapter. USB power and cabled adapter can be simultaneously used to provide redundant power sourcing.
- Rugged construction backed with a five-year warranty.
**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) 75 Ω 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) 75 Ω 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
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.
- SFP-based OE converter provides state-of-the-art fiber performance, power consumption, and compactness
- Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio
- Available with ST, LC, or FC fiber termination
- Input lock status indicator. Optical Rx power meter field allows optical Rx confidence assessment
- Dual buffered/reclocked coax BNC outputs
- Error-free pathological support. Full compatibility with other BlueBox™ Coax/Fiber units and Cobalt 9400-series openGear® frame-installed fiber cards
- Powers directly from host equipment USB or standard cabled power adapter. USB power and cabled adapter can be simultaneously used to provide redundant power sourcing.
- 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.
- rugged construction backed with a five-year warranty
## 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: -23 dBm

#### 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)

**Note:** Specifications subject to change.

### ORDERING INFORMATION

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<th>Part Number</th>
<th>Description</th>
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<tr>
<td>BBG-OE-MK2-FC</td>
<td>3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type FC fiber connector)</td>
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<td>BBG-OE-MK2-ST</td>
<td>3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type ST fiber connector)</td>
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<td>BBG-OE-MK2-LC</td>
<td>3G/HD/SD-SDI / ASI / MADI Fiber Optic Transport Receiver (Type LC fiber connector)</td>
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<td>BBG-MB</td>
<td>Mounting Bracket</td>
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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
- Full support of 5Mbps thru 3Gbps transport conversions, with seamless auto-mode EQ/reclocking. No switches to set for different payloads.
- Dual-channel input lock status indicators. Optical Tx power meter fields allow 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.
- Available with ST, LC, or FC fiber termination
- Compatible with SMPTE 424M, 292M, 259M, 310M, M2S, DVB-ASI, and MADI audio
- USB remote control/status in addition to device indicator and switches
- SFP-based EO 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-2EO-MK2 ➤ 3G/HD-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

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<th>Description</th>
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<td>BBG-2EO-MK2-ST</td>
<td>3G/HD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter (Type ST fiber connectors)</td>
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<td>BBG-2EO-MK2-LC</td>
<td>3G/HD-SDI / ASI / MADI Fiber Optic Dual Transport Transmitter (Type LC fiber connectors)</td>
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<tr>
<td>BBG-MB</td>
<td>Mounting Bracket</td>
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</tbody>
</table>
BBG-2OE-MK2 » 3G/HD/SD-SDI / ASI / MADI FIBER OPTIC DUAL TRANSPORT RECEIVER

The Blue Box BBG-2OE-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-2OE-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.
- 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

**Diagram:**

```
+----------------+        +----------------+        +----------------+
| Fiber In 1     |        | Auto-Mode      |        | SDI / ASI / MADI Coax Out 1 |
| Opto-Elect     |        | Reclock        |        | USB  | DIP SW |
| Converter      |        | Reclock Enb/Disable |    |      |
| Status/Rx Power Display (Rx1) |        | Local/Remote Control |    |      |
| Fiber In 2     |        | Auto-Mode      |        | SDI / ASI / MADI Coax Out 2 |
| Opto-Elect     |        | Reclock        |        |      |
| Converter      |        |                |        |      |
| Single-Source/Redundant Power |        |                |        |      |
| USB Adapter    |        |                |        |      |
```

335
BBG-2OE-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) 75 Ω 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-2OE-MK2-FC  3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type FC fiber connectors)
BBG-2OE-MK2-ST  3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type ST fiber connectors)
BBG-2OE-MK2-LC  3G/HD/SD-SDI / ASI / MADI Fiber Optic Dual Transport Receiver (Type LC fiber connectors)

BBG-MB  Mounting Bracket
The Blue Box BBG-EOOE-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-EOOE-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-EOOE-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**
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.
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 relock 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

![BBG-SFP-SXH Diagram](image)
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 (SFP 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, 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-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-2110 SFP Software License; Single-Channel De-Encapsulator IP-2110-to-2SDI
  +ADD-SFP-IP-TO-SDI-2022-6 SFP Software License; Single-Channel Encapsulator SDI-to-IP-2022-6
  +ADD-SFP-IP-TO-SDI-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
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.

### SCHEMATIC DIAGRAM

![Schematic Diagram](image-url)
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
**Blue Box™ BBG F-TO-H Fiber-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.**
- **Single-mode 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
SMPT 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 SMPT HD formats).
(1) Stereo analog audio out (L/R unbalanced pair via 3.5mm TRS jack)

Audio Conversion Format
48 kHz sampling, 24-bit
5-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
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.

**Diagram**

- HDMI In -> HDMI Decode Video, Audio
- Analog Audio Embed In -> 24-Bit ADC L/R
- Single-Source/Redundant Power USB Adapter
- User Config/System Control
- SDI Drivers 3G/HD/SD-SDI Out A
- 3G/HD/SD-SDI Out B
- Audio Embed
BBG-H-TO-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-TO-S**  
HDMI-to-HD/SD-SDI with Audio Embedder Converter Unit

**BBG-MB**  
Mounting Bracket
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 Diagram](image_url)
### 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 relocked 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

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>BBG-S-TO-H</td>
<td>HD/SD-SDI-to-HDMI with Audio De-Embedder Converter Unit</td>
</tr>
<tr>
<td>BBG-MB</td>
<td>Mounting Bracket</td>
</tr>
</tbody>
</table>
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
- Dual LC Optical Connection. Blindmate connections with no active components on rear I/O module.
- Low-power, high-density design; <8 Watts
- Internal GigE midplane connection (with OG3-FR frame only)
- CWDM models available in 16 different wavelength divisions, offering up to 64 channels of discrete Ethernet port muxing

**SNMP compliant**

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

**Five year warranty**

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**9450GT** • Fiber Ethernet Switch Transceivers
## 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

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<tr>
<td>9450GT-20KM-LC</td>
<td>Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, 1310nm Tx/Rx. Includes Rear I/O Module (LC connectors only)</td>
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<td>9450GT-40KM-LC</td>
<td>Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 40km, 1310nm Tx/Rx. Includes Rear I/O Module (LC connectors only)</td>
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<tr>
<td>9450GT-80KM-LC</td>
<td>Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 80km, 1550nm Tx/Rx. Includes Rear I/O Module (LC connectors only)</td>
</tr>
<tr>
<td>9450GT-NF</td>
<td>4-Port Ethernet Switch (omits fiber I/O interfaces). Includes Rear I/O Module.</td>
</tr>
<tr>
<td>9450GT-CWDM-XX-LC</td>
<td>Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, CWDM Tx/Rx. Includes Rear I/O Module (LC connectors only). Replace &quot;XX&quot; with desired CWDM wavelength when ordering. See table below for available CWDM wavelengths.</td>
</tr>
<tr>
<td>9450GT-CWDM-XXH-LC</td>
<td>Single-Link Ethernet/Fiber Transceiver. Dual-Fiber 20km, CWDM Tx/Rx with high-sensitivity Rx. Includes Rear I/O Module (LC connectors only). Replace &quot;XX&quot; with desired CWDM wavelength when ordering. See table below for available CWDM wavelengths.</td>
</tr>
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<table>
<thead>
<tr>
<th>CWDM Wavelength</th>
<th>Range</th>
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<tbody>
<tr>
<td>-27: 1270nm</td>
<td>-29: 1290nm</td>
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<tr>
<td>-33: 1330nm</td>
<td>-35: 1350nm</td>
</tr>
<tr>
<td>-43: 1430nm</td>
<td>-45: 1450nm</td>
</tr>
<tr>
<td>-49: 1490nm</td>
<td>-51: 1510nm</td>
</tr>
<tr>
<td>-55: 1550nm</td>
<td>-57: 1570nm</td>
</tr>
<tr>
<td>-61: 1610nm</td>
<td>-63: 1630nm</td>
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</table>
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
• 94900S-1X2-LC Optical 1x2 Splitter (LC connectors)
• 94900S-D1X2-LC Dual Optical 1x2 Splitter (LC connectors)
• 94900S-1X4-LC Optical 1x4 Splitter (LC connectors)
• 94900S-D1X4-LC Dual Optical 1x4 Splitter (LC connectors)
• 94900S-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

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Wavelength Range</th>
<th>1260nm to 1650nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return Loss (minimum)</td>
<td>50 dB</td>
</tr>
<tr>
<td>Insertion Loss (maximum)</td>
<td>94900S-1x2, 94900S-D1x2: 4 dB, 94900S-1x4, 94900S-D1x4: 8 dB, 94900S-1x8: 11 dB</td>
</tr>
<tr>
<td>Uniformity</td>
<td>94900S-1x2, 94900S-D1x2: 0.4 dB, 94900S-1x4, 94900S-D1x4: 0.6 dB, 94900S-1x8: 0.8 dB</td>
</tr>
<tr>
<td>Directivity</td>
<td>55 dB</td>
</tr>
<tr>
<td>Slots required per device</td>
<td>2</td>
</tr>
<tr>
<td>Connector Type</td>
<td>Single Mode, LC/UPC</td>
</tr>
</tbody>
</table>

ORDERING INFORMATION

94900S-1x2-LC Optical 1x2 Splitter (LC connectors only). Includes type LC connector Rear I/O Module
94900S-D1x2-LC Dual Optical 1x2 Splitter (LC connectors only). Includes type LC connector Rear I/O Module
94900S-1x4-LC Optical 1x4 Splitter (LC connectors only). Includes type LC connector Rear I/O Module
94900S-D1x4-LC Dual Optical 1x4 Splitter (LC connectors only). Includes type LC connector Rear I/O Module
94900S-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 demux unit (two units are required for a complete mux/de-mux setup).

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

<table>
<thead>
<tr>
<th>Modular design allows use as a standalone or rack-mounted without a frame</th>
<th>Same models can be used either as mux or demux unit - fully bidirectional</th>
<th>Fully passive design using low-loss filters. Requires no power or communications.</th>
<th>Epoxy-free optical paths help ensure reliability over a wide range of operating conditions</th>
<th>Five year warranty</th>
</tr>
</thead>
</table>

### 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.

### 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

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-16

### BBG-4490-CWDM-18

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BBG-4490-CWDM » MODULAR MULTI-CHANNEL FIBER OPTICAL MULTIPLEXERS/DE-MULTIPLEXERS

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

<table>
<thead>
<tr>
<th>Specification</th>
<th>BBG-4490-CWDM-8 (as Mux)</th>
<th>BBG-4490-CWDM-8 (as De-Mux)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Filter Wavelengths</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See Ordering Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Central Wavelength Accuracy</strong></td>
<td>&lt; ± 1nm</td>
<td></td>
</tr>
<tr>
<td><strong>In-band Ripple</strong></td>
<td>0.5 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Passband Width @ 0.5 dB</strong></td>
<td>&gt;13nm</td>
<td></td>
</tr>
<tr>
<td><strong>Insertion Loss</strong></td>
<td>&lt;= 3.6 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Adjacent Channel Isolation</strong></td>
<td>&gt;= 15 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Non-adjacent Channel Isolation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;= 40 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uniformity</strong></td>
<td>3 dB (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Polarization-dependent Loss</strong></td>
<td>0.15 dB (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Polarization Mode Dispersion</strong></td>
<td>0.1 ps (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Return Loss</strong></td>
<td>50 dB (min)</td>
<td></td>
</tr>
<tr>
<td><strong>Directivity</strong></td>
<td>50 dB (min)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Stability</strong></td>
<td>0.007 dB/°C (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Wavelength Drift</strong></td>
<td>0.005 nm/°C (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Power Handling</strong></td>
<td>300 mW (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Tensile Load</strong></td>
<td>5N (max)</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Range</strong></td>
<td>0-70°C (operating)</td>
<td>-40 to +85°C (storage)</td>
</tr>
</tbody>
</table>

**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-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

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.

**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 interpreters
- 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 with Multiple-Protocol Data Payload SDI/HDMI Display and Fault Detection/Forwarding

**9978-ANC-MON**

**3G/HD/SD-SDI Ancillary Data Monitoring Probe**

- **Per-input SDI/CVBS Auto-Select**
- **De-serialize**
- **HANC/VANC Extract**
- **ANC Text Burn-In/Formatting**
- **Audio Level Meter Bars**
- **LKF5 Display**
- **CC/Timecode/ANC Data Payload Parse**
- **Status Manager**
- **Metadata Interpreters**
- **Ethernet 10/100/1000 (on frame)**
- **DashBoard™/OGCP Monitor/Control**

**Specifications Subject to Change Without Notice. E. & O. E. ©2020 Cobalt Digital Inc.**
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-SDI-SDI Input BNCs, (2) 3G/HD-SDI Output BNCs, Ethernet Port

RM20-9978-C-DIN 20-Slot Frame Rear I/O Module (Standard Width) (5) 3G/HD-SDI/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-SDI/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-SDI-SDI Input BNCs, (1) 3G/HD-SDI Output BNC, Ethernet Port

RM20-9978-E 20-Slot Frame Rear I/O Module (Standard Width) (4) 3G/HD-SDI-SDI Input BNCs, (2) 3G/HD-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 Output BNC with 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-SDI/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-SDI/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)
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).

### 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

**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)
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® 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. 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
## 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 SMR: 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.

**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)
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 rater 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/analogue 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-capturing 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 rater 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

![Diagram of BBG-1060-TG2-REF1 Test Signal Generation](image-url)
BBG-1060-TG2-REF1  3G/HD-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 test 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-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)
The highly flexible 9363 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 highly stable 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
- Outputs can be independently set for frame rate and delay relative from input/internal reference, or from each other
- Remote control/monitoring via DashBoard™ software
- Genlock to output rates of 1:1, 1:2, or 2:1 relationship with clock source. Field Lock for interfaced format outputs from progressive clock sources.
- AES/Word Clock output synchronized to any of the four card reference outputs
- Five-year warranty

### Specifications

**Electrical**
- **Power:** 6 watts
- **Reference Input Impedance:** 75 Ω
- **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)
- **Signal Level:** 1 Vp-p
- **Impedance:** 75 Ω
- **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:** ±0.25 ppm (0°C to 70°C)

**AES/Word Clock Output**
- **Signal Level:** 1 Vp-p
- **Impedance:** 75 Ω
- **Return Loss:** >25 dB to 10 MHz
- **AES Sample Rate:** 48 kHz

### Ordering Information

- **R/M20-9363-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
- **R/M20-9363-A/S** 20-Slot Frame Rear I/O Module (Split) Dual BNC Analog Reference Input or AES/Word Clock Output (configurable), 4 BNC Analog Reference Outputs 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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