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**DATASHEET**

# **IQUDC32**

## **3G/HD/SD-SDI Up/down/ crossconverter with AES I/O**

The IQUDC32 provides multirate format conversion and AES embedding and de-embedding for 3G/HD/SD-SDI signals.

Using high-quality motion adaptive de-interlacing and flexible scaling technology, the IQUDC32 from Grass Valley is a broadcast-quality conversion module able to handle a wide variety of common applications such as upconversion for SD content repurposing on HD channels, or downconversion to maintain SD output feeds.

The IQUDC32 includes a frame synchronizer, capable of referencing to a SD bi-level or HD tri-level reference and a variable aspect ratio converter with reading and writing of WSS, VI and 2016 AFD signaling. Audio handling includes eight user-configurable AES inputs or outputs, audio channel routing, delay adjustment and level controls. Video metadata such as timecode, closed captions and teletext captions can also be passed through the module or processed according to the required output standard.

To allow the module to be further tailored to system requirements software options are available to provide

noise reduction and versions are available with SFP cages enabling fiber conversion or additional electrical outputs on HD-BNCs.

### **Why should you choose this module?**

- High-quality video conversion and frame synchronization allows fully flexible multiformat working and provides a future-proof migration path as digital workflows evolve
- Comprehensive audio I/O and processing allows complete control over audio signals for embedding and de-embedding, and where channel routing, gain control or delay is required
- Full GV Orbit compatibility provides an all-inclusive remote configuration, control and monitoring solution
- Comprehensive SNMP support allows easy integration with third-party Network Management Systems

### **Key Features**

- High-quality up/down/crossconversion including conversion aperture control
- Frame synchronizer with HD tri-sync/SD bi-level reference input and input loss detection
- Aspect ratio conversion including preset ARC maps relative to conversion modes, selectable pan, tilt, aspect, size, and output crop adjustments
- Aspect ratio control (signaling reading and writing) using ETSI WSS and AFD Video Index signaling (RP186, SMPTE ST 2016)
- Video processing features include: gain, offset, hue, horizontal and vertical picture enhancement, and RGB gamut legalization
- Metadata support – Closed caption passing or processing for CEA608/708 and OP42/OP47/WST captions, VITC or SMPTE ST 12 timecode translation, and ancillary data bridge for seven blocks of ANC data passing
- Additional processing options including noise reduction (adaptive spatial and recursive) and linear frame rate conversion
- Eight AES audio I/O, balanced or unbalanced, available to/from any processed internal pair, and audio processing features including: channel routing, gain, invert, delay and eight internal tone generators
- Processing for 16 channels of embedded audio present on the incoming SDI stream with no disturbance during video synchronizer frame wraps or drops
- Non-PCM processing features pair level routing and delay compensation. Dolby-E data is passed with a delay to match the video and with co-timed audio frame drop or repeat
- Dolby E support – detection of PCM/non-PCM audio to SMPTE ST 337/338, pair routing and Dolby E header re-alignment
- Built-in test pattern generator and 19 character scrolling caption generator
- Integrated fiber I/O support via SFP module
- 16x user memories and two GPI/O ports
- GV Orbit control and monitoring compatible with standard logging and reporting features

# Specifications

## Inputs & Outputs

### Video Signal Inputs

SDI inputs :2x

Input cable length:

Up to 80m Belden 1694A @ 3 Gb/s

Up to 120m Belden 1694A @ 1.5 Gb/s

100m typical (with output set to 1080p rates),  
Belden 1694A @ 270 Mb/s

Input standard (auto detect):

625(576)/25i, 525(480)/29i

720 50/59p/1080 50/59i

1080 50/59p level A/B

1080 25/29psf

Analog reference:

1x analog reference with passive loop-through

Black (HD tri-level and SD bi-level) and blackburst  
(SD bi-level)

SD bi-level – RS170A

HD tri-level – SMPTE ST 240, 274

### Fiber Signal Input

Inputs: Up to 2

Optical: 3 Gb/s HD-SDI, 1.485 Gb/s HD-SDI or  
270 Mb/s SD-SDI

Connector/format: LC singlemode

Standard: SMPTE ST 297-2006

### Video Signal Outputs

SDI outputs: Up to 4

Output standard:

625(576)/25i, 525(480)/29i

720 50/59p, 1080 50/59i

1080 50/59p level A/B

### Fiber Signal Output

Optical: 3 Gb/s HD-SDI, 1.485 Gb/s HD-SDI or  
270 Mb/s SD-SDI

Connector/format: LC singlemode

Conforms to: SMPTE 297-2006

Outputs: Up to 2

### Audio Signal Inputs/Outputs

AES/EBU I/O (software selectable):

8 unbalanced (BNC)

8 balanced (25D Type)

### Control Interface

GPI: 2x closing contact I/O interface (ST) (rear panel  
dependent)

### Conversion Functions

Modes:

Up/down/crossconversion

Aspect ratio conversion synchronization

Conversion processing:

Still process: Detects still images and applies an  
aperture with full (progressive) vertical frequency  
response

Enhanced still: Adds field motion detection to still  
process. Prevents artifacts on moving repetitive  
patterns

Aspect ratio conversion (manual or auto): AFD  
(SMPTE ST 2016), VI (RP186), WSS (L23)

SD input format: Normal 4:3, Anamorphic 16:9,  
Letterbox 14:9, Letterbox 16:9

SD output format: Normal 4:3, Anamorphic 16:9,  
Letterbox 14:9, Letterbox 16:9

Metadata:

Closed caption CE608 <> CE708

Timecode conversions

Teletext subtitles WST/RDD8 conversion

### Audio Functions

Embedded audio:

16-channel embedded audio processing

PCM audio processing includes channel level gain  
and delay compensation, as well as channel level  
routing with L/R swap and phase invert feature

Non-PCM processing features pair level routing  
and delay compensation. Dolby E data is passed  
with a delay to match the video and with co-timed  
audio frame drop or repeat

Embedded audio: Enable/Blank

### Audio Routing

Processed pair 1-8: Disembled 1-8, AES 1-8, Analog  
1-2

Embedded output channels 1-16: Processed pair 1-8,  
Tone, Silence

AES 1-8: Processed pair 1-8, Tone, Silence

### Processed Audio Control

Invert phase: Channels 1-16

Pair 1 to 8 Gain L/R: +18 dB to -18 dB in 0.1 dB steps

Pair 1-8 Manual Delay: -40 to +200 ms in 1 ms steps

Global Manual Delay: -40 to +200 ms in 1 ms steps

### Dolby-E

Dolby-E auto alignment: ±10 line offset in 1 line steps

### Tone

Frequency 100 Hz to 10 kHz in 100 Hz steps

### Processing Functions

Ancillary data: Pass/Strip

Freeze: On/Off

Legalizer: On/Off

Genlock: Reference lock (Ext, Int A, Int B), Input lock  
(same format), Free run

Memories: 16 user memories

Pattern: Off, Black, Ramp, Bars

Caption: On/Off, Scrolling

Edit Caption: 19 characters available

### Proc amp

Black Level: +100 to -100 mV (0) in 0.8 mV steps

Contrast: -6 dB to +6 dB (0) in 0.2 dB steps

Saturation: -6 dB to +6 dB (0) in 0.2 dB steps

Y Gamma: 0.4 to 1.7 (1) in 0.1 steps

YC Offset: -20 to 20 (0) in 2 Luma pixel steps

Note: Defaults shown in brackets

### Enhancement

Nonlinear enhancer

Frequency band selection: Low, Med, High

Four preset enhancement modes: Low, Med, High,  
Super

Manual enhancement mode with H Gain and H  
Noise rejection levels

### Conversion Aperture

Vertical:

Frequency band selection: Low, Med, High

Five vertical preset enhancement levels: Soft 2,  
Soft 1, Normal, Sharp 1, Sharp 2

Horizontal:

Five horizontal preset sharpness levels: Low 2, Low  
1, Normal, High 1, High 2

Five horizontal preset detail levels: Soft 2, Soft 1,  
Normal, Sharp 1, Sharp 2

\*Note: Optical I/O and control dependant on type of SFP module fitted

Map of input to output standards			Output							
			25		50		29.97		59.94	
			576i	1080i	720P	1080P	480i	1080i	720P	1080P
Input	25	576i	✓	✓	✓	✓	✗	✗	✗	✗
		1080i	✓	✓	✓	✓	✗	✗	✗	✗
	50	720P	✓	✓	✓	✓	✗	✗	✗	✗
		1080P	✓	✓	✓	✓	✗	✗	✗	✗
29.97	480i	✗	✗	✗	✗	✓	✓	✓	✓	
	1080i	✗	✗	✗	✗	✓	✓	✓	✓	
59.94	720P	✗	✗	✗	✗	✓	✓	✓	✓	
	1080P	✗	✗	✗	✗	✓	✓	✓	✓	

Format Conversion I/O Grid

## Specifications (cont.)

### Other Controls

GPI input low/high select: Black, Freeze, Pattern, User Memories 1-16

GPI output source: Black, Freeze, Pattern

User memories: 16 x Save, Recall, Rename

Memory naming: User configurable naming of memories 1 – 16

RollTrack index: Up to 50 RollTrack destinations

Optical logging\*:

Tx Laser Bias High Warning

Tx Power Low Warning

Tx Power High Warning

Laser wavelength:

Input 1 (2) Rx Power High Warning

Input 1 (2) Rx Power Low Warning

Input 1 (2) Rx Power Measurement

RollTrack sources: Unused, Input Present (1&2, Fiber 1 & 2), Input Loss (1&2, Fiber 1 & 2), Reference OK & Loss

Information window: Video Input Status, Reference Status

Factory default: Resets all module settings to factory specified default values and clears memories

Default settings: Resets all module settings to factory-specified defaults but does not clear memories

Module information:

Reports following module information: Software version, Serial number, Rear Panel ID, Frame Slot

\* Dependent upon the SFP variant inserted

### General Specifications

Electrical: 3 Gb/s SDI, SMPTE ST 424 1.5 Gb/s HD-SDI, SMPTE ST 292 270 Mb/s SDI, SMPTE ST 259-C

Connector/format: BNC/75Ω panel jack on standard IQ connector panel

Return loss: >-15 dB (270 Mb/s, 1.5 Gb/s) >-10 dB (3 Gb/s)

Output jitter: SD-SDI 0.2 UI (10 Hz) / 0.2 UI (1 kHz), 3G/HD-SDI 1.0 UI (10 Hz) / 0.2 UI (100 kHz)

Reference source: External – HD tri-level/SD bi-level/ input video syncs

Electrical:

Black (HD tri-level and SD bi-level) and blackburst (SD bi-level)

SD bi-level – RS170A

HD tri-level – SMPTE ST 240 and 274

Connector/format: BNC/75Ω panel jack on standard IQ connector panel

Embedded audio handling:

HD – 24-bit synchronous 48 kHz to SMPTE ST 299

SD – 20-bit synchronous 48 kHz to SMPTE ST 272-A

### Digital Audio Input (Unbalanced)

Connector/format: BNC

Sample frequency:

PCM: 25 – 96 kHz

Non-PCM: 48 kHz

Input cable length: >500 m of RG59 cable

Impedance: 75Ω

Standard: AES3id

### Digital Audio Input (Balanced)

Connector/format: 25-way D-type

Sample frequency:

PCM: 25 – 96 kHz

Non-PCM: 48 kHz

Input cable length: >150 m of AES3 cable

Impedance: 110Ω

Standard: AES3

### Digital Audio Output (Unbalanced)

Connector/format: BNC

Level: 1 Vp-p typical into 75Ω

Standard: AES3id

### Digital Audio Output (Balanced)

Connector/format: 25-way D-type

Level: 3 Vp-p typical into 110Ω

Standard: AES3

### Optical 1310 nm Tx

Wavelength: 1310 nm

Spectral width (FWHM): >1.5 nm (typ.)

Output power: 0 to -5 dBm typical (-2 dBm typ.)

Extinction ratio: >7.5:1 (typ.)

Link distance:

Up to 30 km @ 270 Mb/s

Up to 21 km @ 1.5 Gb/s

Up to 10 km @ 3 Gb/s

### Optical Rx

Input wavelength range: Min. 1260 nm, Max. 1620 nm

Optical power input range: > -0 dBm, < -20 dBm

Link distance: Up to 30 km

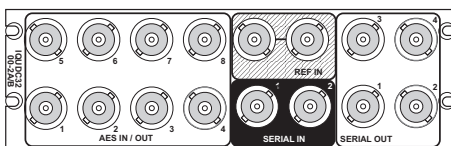
### Power Consumption

Module power consumption with fiber: 13PR (B frames)

## Ordering

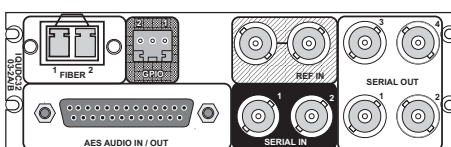
### IQDC3200-2B3

Up, down and cross converter with AES I/O. 2 SDI inputs, External & Frame reference inputs, 4 SDI outputs, 8 unbalanced AES inputs or outputs



### IQDC3203-2B3

Up, down and cross converter with AES I/O. 2 SDI inputs, External & Frame reference inputs, 4 SDI outputs, 8 balanced AES inputs or outputs, 2 x GPI, 1 Fiber SFP cage. Includes rear but not SFP module



For more details on enclosure types please refer to the IQ Modular Enclosures datasheet.

### Software Options

#### IQOPTM-NR

Software option to add noise reduction

#### IQOPTM-LC

Software option to upgrade with linear frame rate conversion

### SFP Options

#### FC1-13T1

Single 1310 nm fiber Tx

#### FC1-13T2

Dual 1310 nm fiber Tx

#### FC1-R1

Single fiber Rx

#### FC1-R2

Dual fiber Rx

#### FC1-13TR

Fiber transceiver 1310 nm Tx/Rx

#### FC1-HDBT2

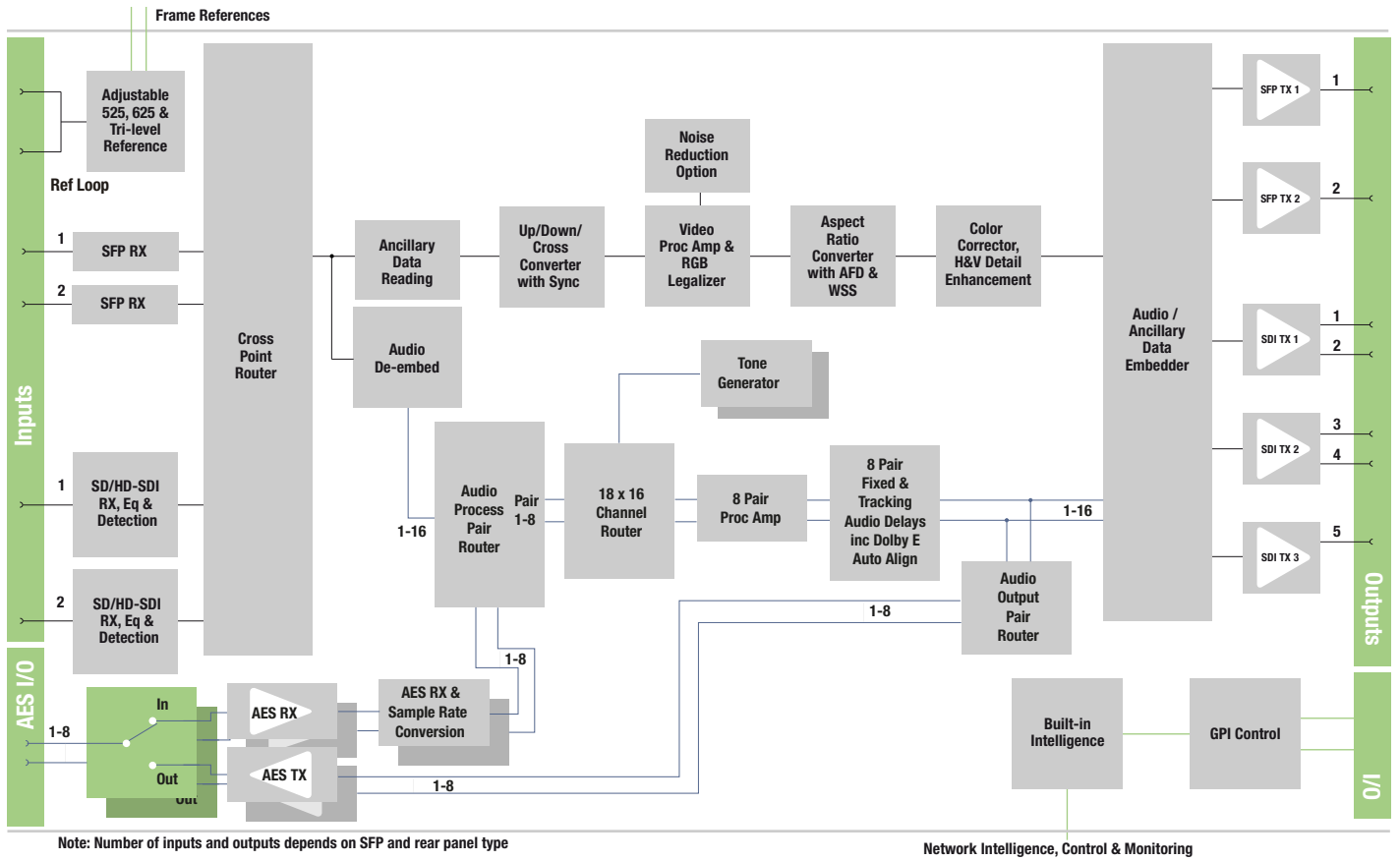
HD-BNC Dual Tx

#### FC1-HDBR2

HD-BNC Dual Rx

Fiber CWDM Tx – Wavelengths available on request

Note: SFP type must be ordered in addition to the module.



Block Diagram for IQUDC32 Range

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

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