

IQMDA40

4K UHD SDI Downconverter & Distribution Amplifier

The IQMDA40 is a 4K UHD quad- or single-link high-quality downconverter and distribution amplifier able to distribute a 12G SDI input to three outputs, while converting it for HD/SD simulcast or monitoring applications.

The IQMDA40 from Grass Valley also includes a 12G/quad-link SDI 4K UHD frame synchronizer and processing for the downconverted channels with powerful picture enhancement tools. High Dynamic Range and Wide Color Gamut support allows S-Log3, HLG or PQ 4K UHD feeds to be integrated into an SDR workflow.

A variable aspect ratio converter with reading and writing of WSS, VI and 2016 AFD signaling, video processor and legalizer are also included.

Audio handling includes channel routing, delay adjustment and level controls. Video metadata such as timecode, SMPTE ST 2020 Dolby®, closed captions and teletext captions can also be passed through the module or processed according to the required output standard.

Why should you choose this module?

- 4K UHD/HD input flexibility allows distribution of HD-SDI signals or distribution and downconversion of 4K UHD-SDI signals without the need for separate hardware
- Extremely compact solution for downconversion of 4K UHD picture sources for simulcast applications, or monitoring on inexpensive HD equipment
- Full RollCall and SNMP compatibility allows easy integration with Grass Valley or third-party network management systems providing an all-inclusive monitoring and control solution
- Conversion between 12G 4K UHD single link to 3G quad link output mode (2SI or square division format selection)

KEY FEATURES

- High-quality downconversion for 12G-SDI quad-link 4K video inputs with conversion aperture control
- 12G single-link to 3G quad-link output mode with 2SI or square division format selection (also applies to quad-link inputs for SQD <-> 2SI translation)
- Frame synchronizer with HD tri-sync/SD bi-level reference input, and input loss detection with default output of black/pattern
- Aspect ratio conversion including preset ARC maps relative to conversion modes, pan, tilt and size input crop adjustments
- Aspect ratio control (signaling reading and writing) using ETSI WSS and AFD Video Index signaling (RP186, SMPTE ST 2016)
- Video proc features include: gain, offset, hue, horizontal and vertical picture enhancement and RGB gamut legalization
- Wide color gamut support with BT2020 and BT709 color space conversion including manual and automatic operation
- High Dynamic Range support including scene-referred and display-referred conversions for SDR & HDR (PQ, HLG, S-Log3) mapping to SDR
- 3D user LUT loading with full support for BBC type I, II & III 1.4 version LUTs
- Metadata support — Closed caption passing or processing for CEA608/708 and OP42/OP47/WST captions, SMPTE ST 2020 handling, VITC or SMPTE ST 12 timecode translation and SID passing including an ancillary data bridge to allow transfer of up to seven different ANC packet types around the converter
- Processing for 16 channels of embedded audio present on the incoming SDI stream with audio proc features including: channel routing, gain, invert, channel delay and internal tone generator
- 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
- Integrated fiber I/O support via SFP module
- Built-in test pattern generator and 16 user configurable memories
- RollCall control and monitoring compatible with standard logging and reporting features
- RollTrack triggers available for detected module states including input loss

SPECIFICATIONS

Inputs & Outputs

SDI bidirectional inputs/outputs:

4 (12G/3G/1.5G/SMPTE ST 270)

4 (3G/1.5G/SMPTE ST 270)

Input cable length:

Up to 44m Belden 1694A @ 12 Gb/s

Up to 150m Belden 1694A @ 3 Gb/s

Up to 180m Belden 1694A @ 1.5 Gb/s

>350m Belden 1694A @ 270 Mb/s

Standards:

SD: 525, 625, 270 Mb/s SD-SDI SMPTE ST 259

HD: 720 50/59.94/60p, 1080 25/29/30i, 1.5 Gb/s HD-SDI SMPTE ST 292/SMPTE ST 299

3G: 1080/2160 (quad) 50/59.94/60p, 3 Gb/s HD-SDI, SMPTE ST 425 level A, dual-link level B

12G: 2160 50/59.94/60p (2SI) (input on BNC 1 only), 12 Gb/s UHD-4K SDI, SMPTE ST 2082-10

UHDTV1 video interfaces:

Square division (4x 1.5 Gb/s links) for ≤30 fps

Square division (4x 3 Gb/s links) for > 30 fps

Sample interleaved SMPTE ST 425-3 (2x 3 Gb/s links) for ≤30 fps

Sample interleaved SMPTE ST 425-5 (4x 3 Gb/s links) for > 30 fps

Analog reference:

1x analog reference

Black (HD tri-level and SD bi-level) and blackburst (SD bi-level) selectable from IQH3B frame reference connections or external BNC

Fiber Signal Input

Inputs: Up to 2

Optical: 12 Gb/s UHD-SDI, 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

Fiber Signal Output

Outputs: Up to 2

Optical: 12 Gb/s UHD-SDI, 3 Gb/s HD-SDI, 1.485 Gb/s HD-SDI or 270 Mb/s SD-SDI

Connector/format: LC singlemode

Conforms to: SMPTE ST 297-2006

Video Functions

Input source select: SD/HD/4K UHD-SL BNC1, SD/HD BNC5, UHD-QL, SFP1

Input 4K UHD interface: Auto, 2SI, SDQ

Output format: 1080p, 1080i, 720p, 625i, 525i

3G output format: Level A/B

Output UHD Interface: 2SI, SQD

Output SI PID: 4K UHD, 3G/HD

Output 4K UHD ANC embed: Link 1, all links

Output legalization: Off, 700 mV, 721 mV, 735 mV, 746 mV

Colorimetry: Auto, BT709, BT2020

SDR gamma: 2.0, 2.4

Test patterns: Off, black, ramp, bars

Default output: Black, Mute

HDR bypass support

Conversion type: Scene referred/display referred

Downconvert SDR/HDR input format: SDR, HLG, PQ, S-Log3

SDR/HDR clip: Hard/soft

PQ level: 1K, 2K, 4K, 10K

User LUT loading (33-cube 3D LUT), 32 entries with full BBC Type I, II & III LUT loading support

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

Enhancement

Filter: Vertical and horizontal filters with preset normal, narrow or wide settings

Nonlinear enhancer:

Frequency band selection: med, high

Six preset enhancement modes

Color corrector

RGB lift: +200 to -200 mV in 0.8 mV steps

RGB gain: +6.0 to -6.0 dB in 0.2 mV steps

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

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

Auto zoom: On/off

Manual zoom: Zoom ±20%

Audio Shuffle

Input channel 1-16: Disembed 1-16

Output channels 1-16: Processed channels 1-16, tone, silence

Invert phase: Channels 1-16

Audio Control

Channel 1 to 16 gain: +18 dB to -18 dB in 0.1 dB steps

Channel 1 to 16 manual delay: -40 to +200 ms in 1 ms steps

Global manual delay: -40 to +200 ms in 1 ms steps

Tone

Frequency: 100 Hz to 10 kHz in 100 Hz steps

Genlock

Selection: Frame A, frame B, external, input, freerun

Timing: Horizontal and vertical adjustment

Timecode

Source: LTC, VITC

Processing: Follow input, generate

Timecode loss: Freeze, freerun

Metadata:

Closed caption CE608 <> CE708

Teletext subtitles WST/RDD8/2031 conversion

ST 2020 output line selection

Ancillary data bridge to allow transfer of up to seven different ANC packet types around the converter

Other Controls

Logging:

Input 1-4 name, type, state

Genlock state

Output standard

RollTrack Index: Up to 32 RollTrack destinations

RollTrack Sources: unused, input present, input loss, 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, temperature

General Specifications

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 SMPTE ST 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

Input standard:

(Auto detect) 525, 625

720 50/59.94/60p

1080 50/59.94/60i

1080 50/59.94/60p (levels A and B)

720/1080/2160 23/24/25/29.97/30p

1080 23/24/25/29.97/30 PsF, with film detection and processing

2160 50/59.94/60p (levels A and B)

Output standard:

525, 625

720 50/59.94/60p

1080 50/59.94/60i

1080 50/59.94/60p (levels A and B)

720/1080/2160 23/24/25/29.97/30p

1080 23/24/25/29.97 PsF, with film detection and processing

2160 50/59.94/60p (levels A and B)

Power Consumption

Module power consumption:

17 PR Max

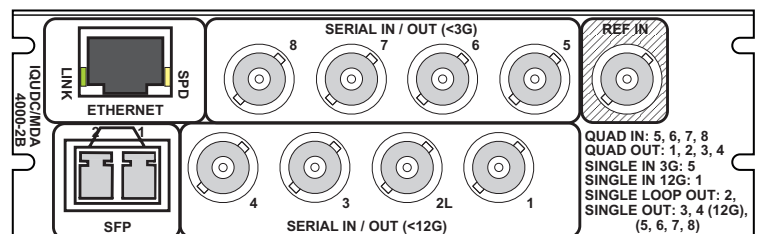
18 PR Max with SFP fitted

ORDERING

IQMDA4000-2B4

4K UHD downconverter and DA with HDR support for 12G/QL-SDI signals. SDI input and output configurations based on processing mode selection, external or frame reference, single 12G capable fiber Tx/Rx

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



IQMDA40 INTERFACE OPERATION

Note: The I/O is mode dependent.

- Inputs shown in **BLUE**
- Processed outputs shown in **GREEN**
- Loop output shown in **ORANGE**

Mode 1 – SD/HD/3G up/down/crossconversion

Output Connection	SD	HD 720P (23-60) 1080i (50-60) 1080p (≤ 30)	3G 1080p-A 1080p-B (>30)	6G 2160p (≤ 30)	12G 2160p (>30)	Dual Link 2160p 2SI (≤ 30)	Quad Link 2160p 2SI (>30) SQD (23-60)
BNC 1							
BNC 2		BNC 1 Loop Output					
BNC 3		BNC 1 Loop Output					
BNC 4		BNC 1 Loop Output					
BNC 5							
BNC 6							
BNC 7							
BNC 8							
SFP 1 (Rx)							
SFP 1 (Tx)		BNC 1 Loop Output					
SFP 2 (Tx)		BNC 1 Loop Output					

Mode 2 – 4K UHD-QL to SD/HD/3G

Output Connection	SD	HD 720P (23-60) 1080i (50-60) 1080p (≤ 30)	3G 1080p-A 1080p-B (>30)	6G 2160p (≤ 30)	12G 2160p (>30)	Dual Link 2160p 2SI (≤ 30)	Quad Link 2160p 2SI (>30) SQD (23-60)
BNC 1							
BNC 2							
BNC 3							
BNC 4							
BNC 5						Channel 1	Channel 1
BNC 6						Channel 2	Channel 2
BNC 7							Channel 3
BNC 8							Channel 4
SFP 1 (Rx)							
SFP 1 (Tx)							
SFP 2 (Tx)							

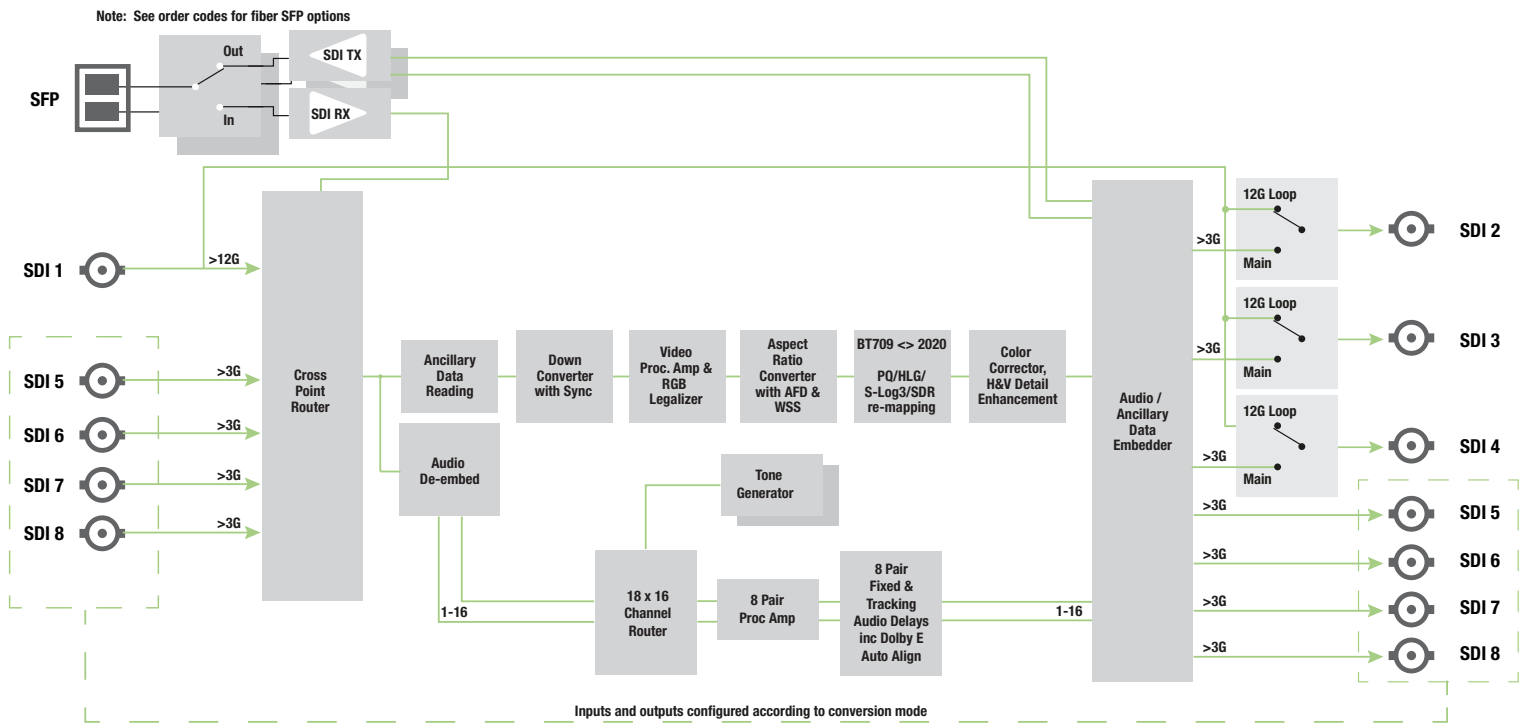
Mode 3 – 4K UHD-SL to SD/HD/3G

Output Connection	SD	HD 720P (23-60) 1080i (50-60) 1080p (≤ 30)	3G 1080p-A 1080p-B (>30)	6G 2160p (≤ 30)	12G 2160p (>30)	Dual Link 2160p 2SI (≤ 30)	Quad Link 2160p 2SI (>30) SQD (23-60)
BNC 1							
BNC 2				BNC 1 Loop Output			
BNC 3				BNC 1 Loop Output			
BNC 4				BNC 1 Loop Output			
BNC 5							
BNC 6							
BNC 7							
BNC 8							
SFP 1 (Rx)							
SFP 1 (Tx)				BNC 1 Loop Output			
SFP 2 (Tx)				BNC 1 Loop Output			

IQMDA40 INTERFACE OPERATION (CONT.)

Mode 4 – 4K UHD-SL to 4K UHD-QL

Output Connection	SD	HD 720P (23-60) 1080i (50-60) 1080p (≤30)	3G 1080p-A 1080p-B (>30)	6G 2160p (≤30)	12G 2160p (>30)	Dual Link 2160p 2SI (≤30)	Quad Link 2160p 2SI (>30) SQD (23-60)
BNC 1							
BNC 2				BNC 1 Loop Output			
BNC 3				BNC 1 Loop Output			
BNC 4				BNC 1 Loop Output			
BNC 5						Channel 1	Channel 1
BNC 6						Channel 2	Channel 2
BNC 7							Channel 3
BNC 8							Channel 4
SFP 1 (Rx)							
SFP 1 (Tx)				BNC 1 Loop Output			
SFP 2 (Tx)				BNC 1 Loop Output			



Block Diagram for IQMDA40 Range.



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