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IQUCP50

Universal Compute Processor for 50 GbE IP Systems

The IQUCP50 is a user-configurable multichannel video-over-IP transceiver developed for use within low latency and high bandwidth Ethernet IP networks. It can encapsulate or de-capsulate up to 16 SDI signals (depending on format) using either SMPTE ST 2110 or SMPTE ST 2022-6 encapsulation standards and transport them over redundant 50 GbE links (SMPTE ST 2022-7) with either dual or single port options providing "hitless" redundancy switching.

The IQUCP50 is a Universal Compute Processor offering low-latency, high-bandwidth multichannel broadcast processing/routing for SDI and IP applications. Delivering up 16 channels of 3G or four channels of UHD, this flexible powerhouse can adopt different Software Cores while seamlessly integrating with Grass Valley's broadcast-centric IP routing and management solution GV Orbit to offer, fast, clean and quiet switching.

IQUCP-EP is the Essence Processing core and acts as a high-performance, versatile gateway which can encapsulate or de-capsulate multiple channels of SDI to/from uncompressed SMPTE ST 2110 and/or SMPTE 2022-6. Various modes of operation are available offering SDI to IP, IP to SDI or combinations of the two. UHD support is provided via Single Stream and/or Quad Stream for both SDI and SMPTE ST 2110, enabling a seamless transition from SDI<>IP for all system architectures. Multiple SMPTE ST 2110-30 audio flows per channel can be configured to support 1x16 channels, 2x8 channels or 4x4 channels embedding/de-embedding to/from SDI.

The IQUCP50 is fully compatible with Grass Valley's new broadcast-centric SDI/IP routing and network management solution GV Orbit, designed to migrate broadcasters from a traditional baseband routing and control environment to a new hybrid SDI and IP workflows.

Why should you choose this module?

- Re-purpose existing hardware modules for alternate tasks as network needs and requirements evolve
- Using a 50 GbE transport allows many more signals to be sent over a single fiber, thereby reducing the required link count and minimizing dark fiber leasing cost
- Generate signal transport efficiency by running multiple SDI signals over a single Ethernet link and provide the link between existing SDI equipment and future IP network architectures
- Using IGMPv3 source specific multicast allows fast configuration of network routes and provides the basis for clean switching at the destination unit
- Full GV Orbit compatibility provides an all-inclusive remote configuration, control and monitoring solution
- Comprehensive SNMP support combined with compliance to IP Open Standards (AMWA NMOS) allows easy integration with third-party Network Management Systems

IQH4B Frame

4 RU

10x IQUCP50 = 160 HD/3G Channels or 40 x UHD (12G) Channels

The IQUCP50 module is installed in the high-density IQH4B modular frame giving flexibility to configure up to 10 cards for a density of 160 HD/3G or 40 12G UHD channels in a 4 RU frame. The IQUCP50 can also be installed in the IQH3B 3 RU modular frame.

KEY FEATURES

General Features

- Handles up to 16 SDI signals over dual 50 GbE IP links with dual and single port rear panel options (number of channels dependent on SDI signal format)

- SDI embed/de-embed of up to 4 audio flows per channels

- Multiple SDI standards and formats supported, including 12G Single-link & 2SI 1080p (3G) modes over Single-stream or Quad Stream SMPTE ST 2110

- Supports configuration of Ethernet links for maximum signal transport using both SFPs or for dual-link mode to provide link redundancy as per SMPTE ST 2022-7, and when operating as a receiver will dynamically adapt to any stream presented to it

- Supports IGMPv3 source-specific multicast, allowing transmission in multicast groups

- Supports frame-synchronized SDI inputs and outputs, with audio rate adaption, referenced to either SMPTE ST 2059-2 PTP or via the IQH4B frame analog reference bus for black-burst/trilevel syncs

- Fast, clean and quiet switching via make-before-break or break-before-make

- Low delay mode and independent H & V offset available for each channel along with up to two frames of video, and up to 255 ms of audio delay

- Seamless integration with GV Orbit Control, Configuration & Monitoring software, including logging and reporting

Essence Processing (EP) Features

- SMPTE ST 2110-20 video including UHD Single-stream

- SMPTE ST 2110-21 Wide/Narrow profile receivers and Narrow senders

- SMPTE ST 2110-30 PCM audio

- SMPTE ST 2110-40 metadata associated with SMPTE ST 2110-20 video stream

- SMPTE ST 2022-6 Transport of High Bit Rate Media Signals (HBRMT) (SDI) over IP Networks

- SMPTE ST 2022-7 Class A & D seamless protection switching

- SMPTE ST 2059-1 & -2 precision time protocol

- NMOS IS-04 discovery and registration with group hints tag support

- NMOS IS-05 device connection management

- In-band or out-of-band control of NMOS

- Support of DHCP, LLDP and DNS-SD for easy IP configuration

- Both FC-FEC (Fire Code) and RS-FEC (Reed Solomon IEEE) Forward Error Correction are supported

IQUCP50 Configurations

SD/HD/3G Mode of Operation			
SDI > IP	**IP > SDI**	**Format**	**Capabilities**
8	0	480i59.94, 576i50 720p50/59.94 1080i50/59.94 1080p23.98/25/29.97/50/59.94	1x SDI Frame Sync, 1x 2110-20/30(x4)/40 1x SDI Frame Sync, 1x 2022-6, 1x 2110-30(x4)/40
16	0		1x SDI, 1x 2110-20/30(x4)/40 1x SDI, 1x 2022-6, 1x 2110-30(x4)/40
12	4		1x SDI, 1x 2022-6(RX), 1x 2110-20/30(x4)/40 1x SDI, 1x 2022-6, 1x 2110-20(RX)/30(x4)/40(RX)
8	8		1x SDI, 1x 2022-6(RX), 1x 2110-20/30(x4)/40
4	12		1x SDI, 1x 2022-6, 1x 2110-20(RX)/30(x4)/40 1xS DI, 1x 2022-6(RX), 1x 2110-20/30(x4)/40
0	16		1x SDI, 1x 2022-6, 1x 2110-20/30(x4)/40
UHD/12G Mode of Operation			
4	0	720p50/59.94 1080i50/59.94 1080p23.98/25/29.97/50/59.94	1x SDI, 1x 2110-20/30(x4)/40
2	2		
0	4		
4	0	2160p50/59.94	4x SDI (Quad Link 3G 2SI), 1x 2110-20/30(x4)/40 1x SDI (12G), 1x 2110-20/30(x4)/40 1x SDI (12G), Quad Stream 2110-20/30(x4)/40
2	2		
0	4		
4	0	2160p23.98,25/29.97	4x SDI (Quad Link HD 2SI), 1x 2110-20/30(x4)/40
2	2		
0	4		

IQUCP50 UHD Modes

Inputs \ Outputs		UHD Single Stream		UHD Quad Stream (2SI)			UHD Quad Stream (SDQS)		
		1x 12G SDI	1x SMPTE ST 2110-20	4x 3G SDI	4x SMPTE ST 2022-6	4x SMPTE ST 2110-20	4x 3G SDI	4x SMPTE ST 2022-6	4x SMPTE ST 2110-20
UHD Single Stream	1x 12G SDI	▨	●		●	●			
	1x SMPTE ST 2110-20	●	▨	●					
UHD Quad Stream (2SI)	4x 3G SDI		●	▨	●	●			
	4x SMPTE ST 2022-6	●		●	▨				
	4x SMPTE ST 2110-20	●		●		▨			
UHD Quad Stream (SDQS)	4x 3G SDI						▨	●	●
	4x SMPTE ST 2022-6						●	▨	
	4x SMPTE ST 2110-20						●		▨

Mode	Formats	Density	Max Channels	Channel Order	SD/HD/3G	BNC Location
1:1 / 4:4*	SD – 3G	High	16x 3G	1-16	1-16	1-16 / 1-4, 5-8, 9-12, 13-16
1:1	SD – UHD	Low	4x UHD	1, 5, 9, 13	1, 5, 9, 13	1, 2, 3, 4
1:4**	SD – UHD	Low	4x UHD	1, 5, 9, 13	1, 5, 9, 13	1, 2, 3, 4
4:1*	SD – UHD	Low	4x UHD	1, 5, 9, 13	1, 5, 9, 13	1-4, 5-8, 9-12, 13-16

* 4:4 can be managed in quad groups using Link Control. In this mode, max. channels is reduced to 4.
** Quad groups occupy 4 channels, single stream (SDI or IP) will occupy master (1, 5, 9, 13) with slave controls/logging.

Bandwidth Considerations

Rx IP Format	Video Format	Max IP Rx Channels (static routing)	MBB Routing	BBM Routing
1x SMPTE ST 2110	1080p50	16	Max Rx reduced by 1 for each simultaneous MBB route	No loss of Rx channels
1x SMPTE ST 2110	1080p59	13		
1x SMPTE ST 2022-6	1080p50	14		
1x SMPTE ST 2022-6	1080p59	12		
1x SMPTE ST 2110	2160p50	4		Max Rx reduced by 1 for each simultaneous BBM route
1x SMPTE ST 2110	2160p59	4		
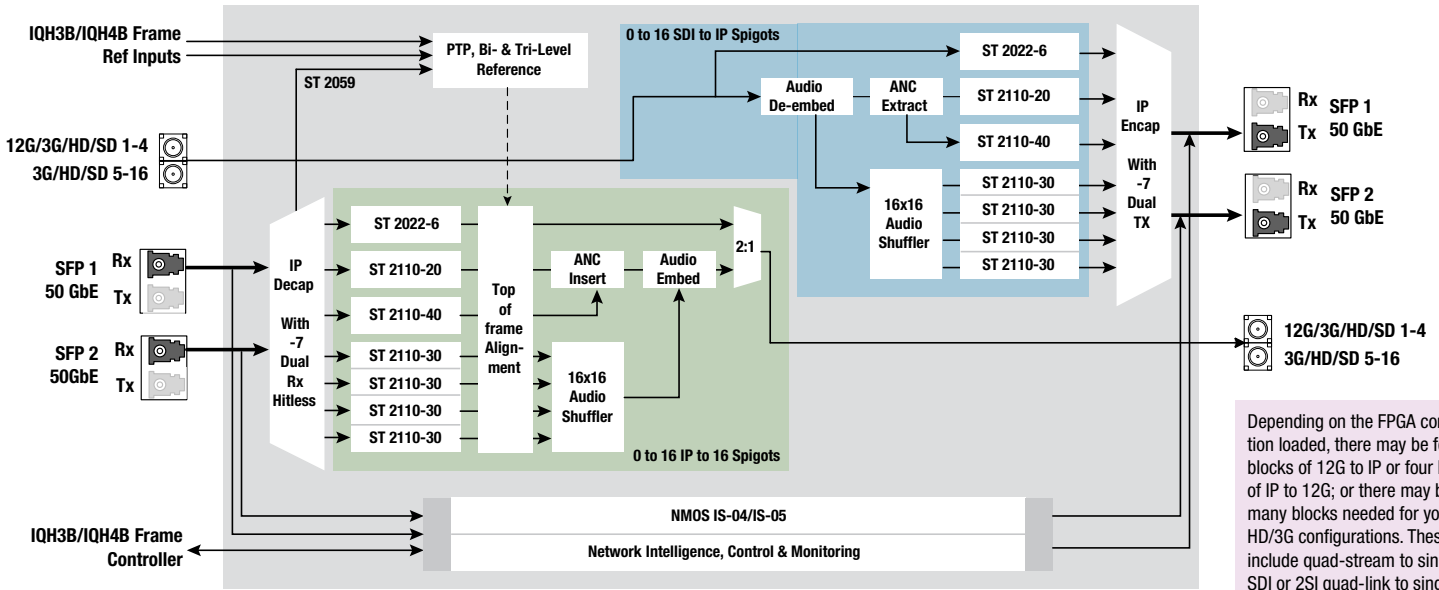
IQUCP5000-EP Essence Processing Block Diagram

IQH3B/IQH4B Frame Ref Inputs

12G/3G/HD/SD 1-4
3G/HD/SD 5-16

SFP 1 50 GbE Rx Tx

SFP 2 50GbE Rx Tx

IQH3B/IQH4B Frame Controller

PTP, Bi- & Tri-Level Reference

ST 2059

0 to 16 SDI to IP Spigots

Audio De-embed · ANC Extract

ST 2022-6
ST 2110-20
ST 2110-40
ST 2110-30
ST 2110-30
ST 2110-30
ST 2110-30

16x16 Audio Shuffler

IP Encap With -7 Dual TX

Rx Tx SFP 1 50 GbE
Rx Tx SFP 2 50 GbE

IP Decap With -7 Dual Rx Hitless

ST 2022-6
ST 2110-20
ST 2110-40
ST 2110-30
ST 2110-30
ST 2110-30
ST 2110-30

Top of frame Alignment

ANC Insert · Audio Embed

2:1

16x16 Audio Shuffler

0 to 16 IP to 16 Spigots

12G/3G/HD/SD 1-4
3G/HD/SD 5-16

NMOS IS-04/IS-05

Network Intelligence, Control & Monitoring

Depending on the FPGA configuration loaded, there may be four blocks of 12G to IP or four blocks of IP to 12G; or there may be as many blocks needed for your HD/3G configurations. These will include quad-stream to single 12G SDI or 2SI quad-link to single stream UHD. Single stream UHD only supported in SMPTE ST 2110.
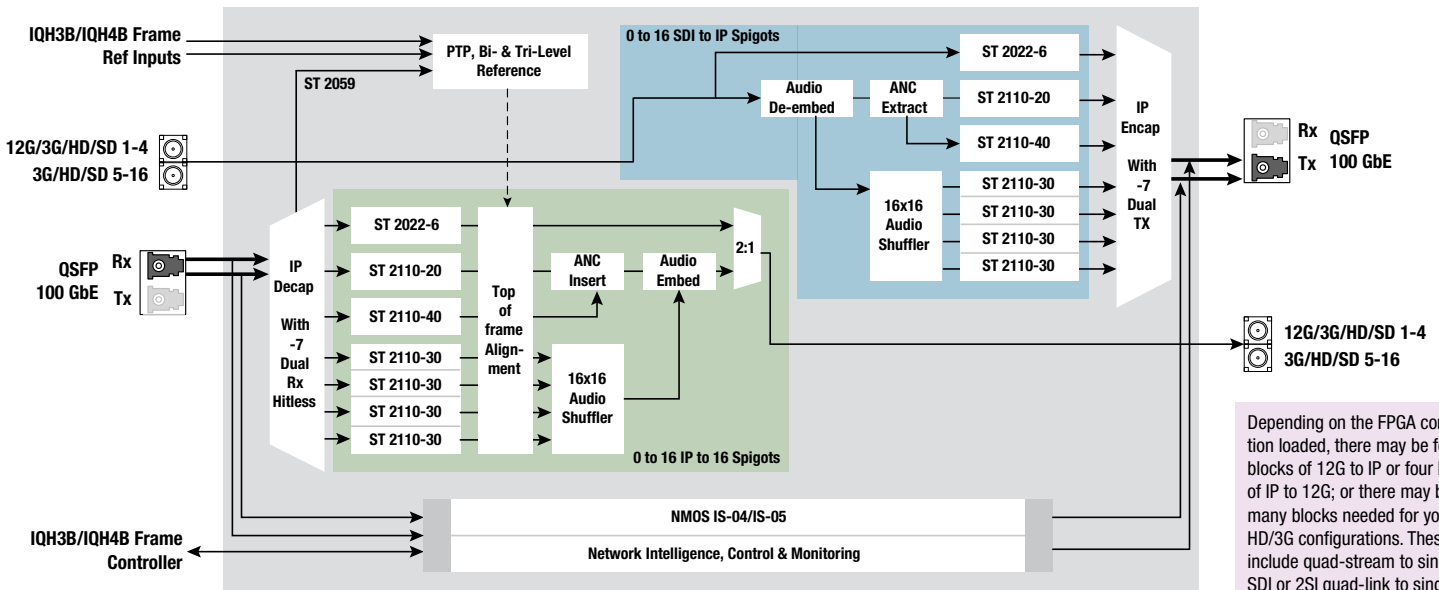
IQUCP5002-EP Essence Processing Block Diagram

(Same block diagram with QSFP 100 GbE input/output)

QSFP 100 GbE

SPECIFICATIONS

Inputs and Outputs

Signal Inputs/Outputs

SDI: 16x bidirectional, see configuration table

SDI Standards:

SMPTE ST 259M-C (270 Mb/s)

SMPTE ST 292 (1.485, 1.485/1.001 Gb/s)

SMPTE ST 424 (2.970, 2.970/1.001 Gb/s)

SMPTE ST 2082-1:2015 (BNCs 1, 2, 3 & 4)

Supported Formats:

SD: 480i59.94, 576i50

HD: SMPTE ST 274: 1080p23.98, 1080p29.97, 1080i59.94, 1080i50

HD: SMPTE ST 296: 720p59.94, 720p50 3G: SMPTE ST 425 level A (mapping 1)

UHD: Quad Link 2SI 1080p (1.5G) SMPTE ST 274: 1080p23.98, 1080p29.97

UHD: Quad Link 2SI 1080p (3G) SMPTE ST 425-5: 1080p59.94, 1080p50

12G: SMPTE ST 2082-10: 2160p59.94, 2160p50

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

Ethernet Signal

SFP+ Optical: 2x 25G Ethernet
Conforms to: IEEE 802.3cd – 50 Gigabit Ethernet over fiber

SFP+ connected cable: 2x 25G Ethernet
Conforms to: IEEE 802.3 – 50 Gigabit Ethernet over twinaxial cables

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

Controls

Indicators

Power: OK (Green)

CPU: OK (Flashing)

Content Status

Summary:

OK (Green)

Warning (Yellow)

Error (Red)

Power Consumption

Module Power Consumption: 45.5 PR (B Frames)

ORDERING

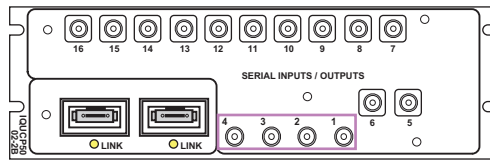### Order Codes for IQH Enclosures*

IQUCP5000-2B3

Universal Compute Processor. 16 SDI I/O, 2 50 GbE I/O on single 100 GbE QSFP connector. Suitable for IQH4B frames.
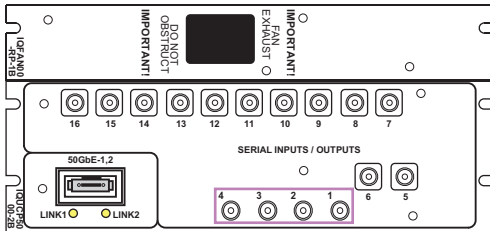

IQUCP5001-3B3

Universal Compute Processor. 16 SDI I/O, 2 50 GbE I/O on single 100 GbE QSFP connector. Includes IQFAN rear panel for additional cooling in IQH3B frame.

IQUCP5002-2B3

Universal Compute Processor. 16 SDI I/O, 2 50 GbE I/O on QSFP connectors. Suitable for IQH4B frames.

IQUCP5003-3B3

Universal Compute Processor. 16 SDI I/O, 2 50 GbE I/O on QSFP connectors. Includes IQFAN rear panel for additional cooling in IQH3B frame.
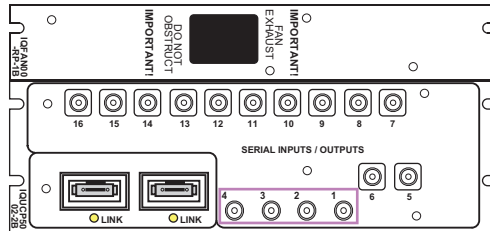
Software Defined Core Licenses

IQUCP-EP

Essence processing license for SDI to/from IP with synchronization and audio rate adaption

SFP Options

FCQ-100GE-SR4

100GBASE-SR short range SFP for MMF

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

These BNCs support SD/HD/3G/12G-SDI, all other BNCs support SD/HD/3G-SDI

* Although IQ modules are interchangeable between enclosures, their rear panels are enclosure specific. Order codes 'A' or 'B' may be used when installing modules in a 'B' enclosure. However, order code 'A' must be used when installing modules in an 'A' enclosure. Please take time to ensure that the compatible order code is selected to match the chosen enclosure.

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