

Datasheet

Delta-12G Family

Version 8.0



DELTA^ΔCAST

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1 TECHNICAL DESCRIPTION

1.1 DELTA-12G FAMILY OVERVIEW

1.1.1 DESCRIPTION

The DELTACAST's DELTA-12G-elp-h 1c / 2c / 20 / 4c / 40 / 04, DELTA-12G2c-asi8c-elp, DELTA-12G-e-h 4i2c and DELTA-12G-elp 4c cards are a set of high-end compact multi-channel 12G-SDI cards, with advanced performances, specially designed for professional UHD 4K 60p 10-bit/12-bit capture and playout applications.

These cards provide a gateway between up to or four 12G-SDI I/Os (ST 2082-10) or twelve 3G/HD/SD-SDI I/Os (ST 424M /ST 292M / ST 259M), depending on the chosen model, and a standard PC with 8-lane PCI Express Gen-3 bus.

DELTA-12G-elp-h 1c is the most versatile SDI PCIe card for a single 4K stream. It is available in the standard version with 4K60 support on a single-link 12G (ST 2082-10) interface or quad-link 3G interface (2-Sample Interleave ST 425-5 formats, or quadrant - Square Division mode). 4K30 formats are supported in single-link 6G (ST 2081-10) or Dual-Link 3G (ST 425-3) formats.

DELTA-12G-elp-h 2c is the most powerful SDI PCIe card, supporting up to 2x 4K60 streams (dual-input, 1-input + 1-output or dual-output) in 12G (2x bi-dir 12G I/Os) or 3G (8x bi-dir 3G I/Os) interfaces. We have also introduced a mixed SDI and ASI that has all the features of the 2c model, adding support for DVB-ASI input or output on any connectors in addition to SDI, this is the DELTA-12G2c-asi8c-elp-h model.

DELTA-12G-elp-h 2c, DELTA-12G2c-asi8c-elp-h, and DELTA-12G-elp-h 20 cards share the same hardware but provide different firmware features optimized for specific user applications. The 2c model provides all the flexibility of dynamic bi-dir I/Os control to match any 8-channel I/O needs, this is a direct evolution of the DELTA-3G-elp-d 8b model. The DELTA-12G-elp-h 20 is reserved for input-only applications, adding some more processing features on the incoming streams such as bad SDI signal correction, proxy scalers, color space converters, and planar packing support which are particularly useful to reduce CPU load in capture applications. See section 1.5 for the model-specific features table. One can reconfigure one of these three dual-channel 12G models into another.

DELTA-12G-elp-h 4c/40/04 are the highest throughput models of this family. They support up to 4x 12G SDI channels for 4x 4K60; or 1x 8K60. They are based on 8 I/O hardware, as the 20 and 2c models, with a new BoM and layout optimized for 4x 12G. The 40 model is for capture-only applications, with the same feature set as the 20. The 04 model is for SDI playout, output-only applications. They all three support 8K60 formats (UHDTV-2 and 8K-DCI) with a single buffer packing, using quad-link 12G (2-Sample Interleave ST 2081-12 or ST2082-12 formats; or quadrant - Square Division mode). The 4c model is a fully bi-dir model, with 8x I/Os, where four I/Os can be used for 12G capture or 12G playout, with the same feature set as the 2c model. One can reconfigure one of these three 4-channel 12G models into another.

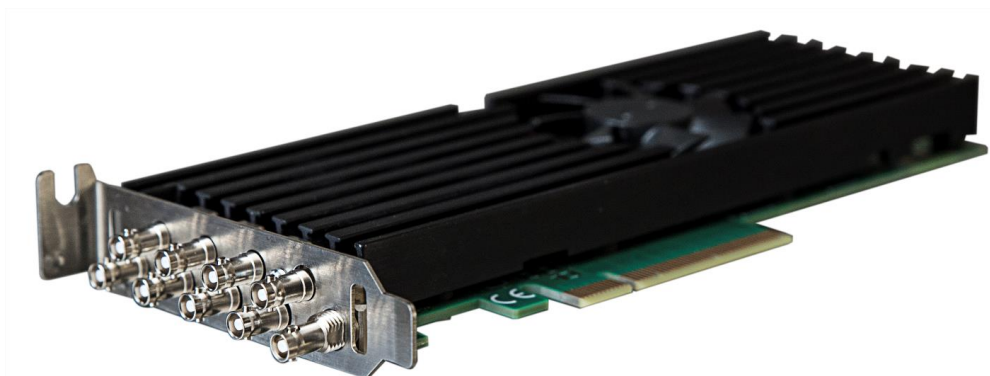


Figure 1 – Picture: DELTA-12G-elp-h 2c

The DELTA-12G-e-h 2i1c was the first 12-channel I/O card configuration of DELTACAST. It has 12x 3G-SDI ports, where 3 of them also support 12G-SDI. The max capacity of the board is 12x 1080p60 or 3x UHDTV, or intermediate configurations. It has the same base features set as the 1c/2c/4c HD-BNC models plus some advanced features specific to this model, including a genlock output (loopback of reference input, or native Black Burst/Tri-Level output), advanced

thumbnails parameters (programmable ratios, frame rate decimation, etc.), and new multi-card sync interface to pixel sync up to 4 boards in the same platform without any external cables. In 2024 DELTACAST introduced a new firmware configuration on the 12-channel card that now enables up to 6x 12G/6G (4-in plus 2 bidir) instead of 3x 12G/6G on this hardware, this is the DELTA-12G-e-h 4i2c. See PCN41723 for details on this '4i2c' upgrade.

The latest addition to the DELTA-12G family is the 4-channel BNC card. This unique proposal on the market offers 4 BNCs in low-profile form factors. Each port supports 12G-SDI, 4K60 video. Moreover, this is also the first DELTACAST card to support 4:4:4 10/12-bit SDI formats appreciated by the cinema industry for HDR production. This new model also features our Ultimate Low Latency DMA mode, color space converters, proxy scalers, NV12 semi-planar packing, and much more. A breakout cable can be added for genlock reference or LTC input. The reference input BNC can be mounted on the same bracket when using the Standard height bracket, or panel-mounted on a separate bracket or the chassis.

Finally, if you are looking for a both 12G SDI I/Os and HDMI capture solution, have a look at the DELTA-12G1c-hmi10-elp-h card which has a separate datasheet.

1.1.2 SUPPORTED IMAGE FORMATS

- **8K** UHDTV-2 (7680x4320) and 8K-DCI (8192x4320) capture (40, 4c models) and playback (04, 4c models)
 - Up to 60fps over Quad-Link 12G in 2-Sample Interleave (ST 2082-12) or quadrant (Square Division). (p60/59.94/50/48/47.952)
 - Up to 30fps over Quad-Link 6G in 2-Sample Interleave (ST 2081-12) or quadrant (Square Division). (p30/29.97/25/24/23.976)
- **4K** UHDTV-1 (3840x2160) and 4K-DCI (4096x2160) capture and playback.
 - Up to 60fps (p60/59.94/50/48/47.952) over Single-Link 12G (ST 2082-10).
 - Up to 60fps over Quad-Link 3G in 2-Sample Interleave (ST 425-5) or quadrant (Square Division).
 - Up to 30Hz (p30/29.97/25/24/23.976) over Single-Link 6G (ST 2081-10).
 - Up to 30Hz over Dual-Link 3G (ST 425-3) or 4x HD quadrant (Square Division).
- **2K** formats as per ST 2048-2
 - 2048x1080 in p60/59.94/50/48/47.952/30/29.97/25/24/23.976, PsF30/29.97/25/24/23.976.
- **HD** formats. ST 274M and ST 296M.
 - 1920x1080 p60/59.94/50 mapped in Dual Link HD (ST 372M) or 3G Level A or 3G Level B-DL (ST 425-1)
 - 1920x1080 p30/29.97/25/24/23.976, PsF30/29.97/25/24/23.976, i60/59.94/50 HD SDI (ST 292-1)
 - 1280x720 p60/59.94/50/30/29.97/25/24/23.976 HD SDI (ST 292-1)
- **SD** formats: NTSC 525i59.97, PAL 625i50.
- "RAW" streams (270Mb/s, 1485Mb/s, or 2970Mb/s) capture and playout.
(RAW mode not available in 12G, 6G, and 3G-B DL or DS).

1.1.3 FEATURES OVERVIEW

- 8-bit, 10-bit YUV 4:2:2 SDI formats support. Rec 601, Rec 709, BT.2020 colorimetry.
- 10-bit, 12-bit 4:4:4 RGB formats supported on DELTA-12G-elp 4c (BNC).
- HDR formats transport signaling (HLG / PQ / proprietary) and HDR metadata (de-)embedding.
- Input line CRC / EDH check and error count.
- SDI Input robustness diagnostic. Detection and reporting of input SDI signal errors on all models with inputs.

- Bad SDI signal correction*.
- Hardware **proxy down-scalers** for channel monitoring or reduced resolution capture (on input channels).
- Hardware **Color Space Converters** on input and output channels. Fully configurable matrices with default setup for (YUV(K) <-> RGB(A)) *.
- Planar buffer support for 4:2:0, 4:2:2 8/10b; and NV12 semi-planar support. *
- **Frame accuracy** feature for multi-channel output synchronization.
- Frame mode or field mode. Onboard field merging support. Buffer line padding capability.
- **Ultimate Low Latency*** DMA engine is available on some models (sub-frame, granularity as low as a few lines).
- Input frame timestamping: onboard high-resolution hardware timer, LTC input, or software clock. Allow easy alignment of frames captured on different channels, and of different cards.
- RX channel phase offset measurement. TX channel offset is adjustable independently per channel.
- **Fill & key generator**, playout of a YUVK 4:2:2:4 stream on two SDI outputs (F+K), following SMPTE RP 157.
- Ancillary data as per SMPTE ST 291M (Ancillary Data Packet and Space Formatting) and generic VBI data multiplexing and de-multiplexing.
- Audio (de-)embedding as per ST 299M & ST 272M up to 32 channels.
- Time code (VITC, LTC, ATC) (de-)embedding as per SMPTE RP188.
- HDR/WCG static and dynamic metadata (de-)embedding as per ST 2108-1.
- Video Payload Identification as per SMPTE ST 352.
- Flexible clocking (on models with SDI outputs):
 - Reference input for mixed Black Burst / Tri-Level or LTC (ST 12-1) sync usage (genlock).
 - Use of one SDI SD/HD/3G input as an alternate reference source.
 - Local clock for free-run output and failsafe support.
 - VCXO for SDI pixel clock dynamic rate control (around the default frequency) with fine precision through the software API. *
 - Concurrent playout of EU (integer frame rate) and US (fractional frame rate) clock formats on different TX ports is possible. (ex: TX0 1080i59 + TX 1 1080i60; TX0 PAL + TX1 NTSC).
- Genlock 'Tick' API event to allow user applications to sync with TX engine timings.
- 2 GB min. onboard DDR memory buffer.
- OEM dedicated features such as unique card ID and optional hardware security mechanisms to restrict application access to a specific series of cards.
- The half-length, low-profile PCIe 8-lane gen-3 add-in card form factor allows easy integration in a 2U platform with horizontal or vertical slots. Except for the 2i1c/4i2c models (12-channel cards) which is a standard height card.
- LTC capture companion card available (PN# A-LTC-1-cd) for analog LTC (Linear Timecode, ST12-1:2014) signal capture and input frame timestamping. Note that LTC capture is also available directly onboard without the companion card, using the reference HD-BNC input.
- Robust mechanical design with a large ruggedizing heatsink protecting the electronic, and BNC connectors (DELTA-12G-elp 4c) or dual-stacked HD-BNC connectors.

* See section 1.5 for model-specific features

Software Package

- Unified OEM [VideoMaster C/C++ SDK](#) (Windows®, macOS®, and Linux®) for quick system integration and compatibility with other DELTACAST products.
- Drivers for x86/x64 Windows, Linux & macOS (Apple Silicon and INTEL CPUs).
- Drivers for ARM64 (ARMv8), NVIDIA Jetson Xavier, NVIDIA Jetson Orin.
- Support of NVIDIA® GPUDirect® for Video and GPUDirect® RDMA for Video for efficient video transfers in and out of GPU memory (pinned memory mode or peer-to-peer modes available).
- DirectShow I/O filters for multi-channel ingest and playout in DirectShow-based applications.
- dCARE free application for easy testing and diagnostics.
- GXF codelet / operators for NVIDIA Holoscan SDK.
- Unreal Engine plug-in is available from UE Marketplace and DELTACAST's [GitHub page](#).

1.2 ORDERING INFORMATION

Ordering Part Numbers	PCIe	Height	CN Type	SDI Inputs	SDI Outputs	12G-SDI I/Os capable	DVB-ASI I/Os capable	Ref. input (Genlock or LTC)	Ref. output (Genlock source)	UHDTV channels	Heatsink
DELTA-12G-elp-h 1c	Gen-3 x8	Low profile ⁽¹⁾	5x HD-BNC	0 to 4	0 to 4	1x 12G (1x bi-dir)	N.A.	Yes	N.A.	1-ch	passive or active ⁽²⁾
DELTA-12G-elp-h 2c	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	0 to 8	0 to 8	2x 12G (2x bi-dir)	N.A.	Yes	N.A.	2-ch	passive or active ⁽²⁾
DELTA-12G2c-asi8c-elp-h	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	0 to 8	0 to 8	2x 12G (2x bi-dir)	8x bi-dir	Yes	N.A.	2-ch	passive or active ⁽²⁾
DELTA-12G-elp-h 20	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	8	0	2x 12G (2-in)	N.A.	Yes LTC only	N.A.	2-ch	passive or active ⁽²⁾
DELTA-12G-elp-h 40	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	8	0	4x 12G (4-in)	N.A.	Yes LTC only	N.A.	4-ch	passive or active ⁽²⁾
DELTA-12G-elp-h 04	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	0	8	4x 12G (4-out)	N.A.	Yes	N.A.	4-ch	passive or active ⁽²⁾
DELTA-12G-elp-h 4c	Gen-3 x8	Low profile ⁽¹⁾	9x HD-BNC	0 to 8	0 to 8	4x 12G (4x bi-dir)	N.A.	Yes	N.A.	4-ch	passive or active ⁽²⁾
DELTA-12G-e-h 2i1c	Gen-3 x8	Standard height	14x HD-BNC	8 to 12	0 to 4	3x 12G (2-in, 1x bi-dir)	N.A.	Yes	1	3-ch	passive or active ⁽²⁾
DELTA-12G-e-h 4i2c	Gen-3 x8	Standard height	14x HD-BNC	8 to 12	0 to 4	6x 12G (4-in, 2x bi-dir)	N.A.	Yes	1	6-ch	passive or active ⁽²⁾
DELTA-12G-elp 4c	Gen-3 x8	Low profile ⁽¹⁾	4x BNC	0 to 4	0 to 4	4x 12G (4x bi-dir)	N.A.	With breakout cable ⁽³⁾	N.A.	4-ch	passive or active ⁽²⁾
Accessories	Description										
A-HDB2BNC-0200	HD-BNC to BNC (f) 75 Ohm cable, 200mm length.										
A-LTC-1-cd	LTC companion capture card										
A-MCX2BNC-0230-LB	Separate low profile bracket with genlock breakout BNC cable (bulkhead BNC Jack to MCX plug, 230mm cable)										
A-MCSC-0100	Multicard Synchronization cable, 100mm										
	BNC (f) breakout cable for genlock/LTC reference input on DELTA-12G-elp 4c, 150mm length.										

(1) Cards are available with low profile PC bracket and/or standard height PC bracket.

(2) Fully passive heatsink option available. When passive user must ensure enough airflow over the heatsink in the final system enclosure.

(3) Genlock/LTC input breakout cable can be mounted on the card's standard height bracket or on separate Low profile bracket

Figure 2 – Ordering Table

1.3 SDI I/O CHARACTERISTICS

These cards provide coaxial cable-based serial transmission links compliant with either SMPTE ST 2082-10 (12G-SDI), ST 2081-10 (6G-SDI), ST 424M (3G-SDI), ST 292M (HD-SDI) “Bit-Serial Digital Interface for High-Definition Television Systems” or ST 259M (SD-SDI) standard “SDTV Digital Signal/Data — Serial Digital Interface”.

Features efficient adaptive cable equalization on input ports and cable drivers on output ports. High-frequency 75Ohm HD-BNC or BNC connectors.

Each bi-dir port can be configured dynamically (by software) and independently as an input or an output.

All channels are independent in terms of video formats and can work concurrently in 12G/6G/3G, HD, or SD speed.

- For input channels, there is no limitation in terms of mixing different clocks. (EU/US clock signals can be captured concurrently)
- For output channels,
 - SD formats (PAL and/or NTSC) can be played concurrently with HD and higher formats.
 - HD and higher formats must have the same ‘clock divisor’ at a time. All either “Integer FPS” (EU clock: 60/50/48/30/25/24 fps) or “Fractional FPS” (US clocks: 59.94/47.952/29.97/23.976).

Note that on HD-BNC models, when one channel (CHi) is working in 6G or 12G (4K capture/playout), the adjacent 3G port (CHi+1) is deactivated.

Dual-link HD format, 3G Level A, and 3G Level B Dual-Link are supported on all models.

All models support multi-link 3G interfaces for 4K in 2-Sample Interleave (ST 425-3 and ST 425-5) or Square Division (quadrant).

8K formats are supported on 4c, 40, and 04 models using 4x 6G or 12G links with 2-sample interleave (ST 2081-12, ST 2082-12) or Square Division (quadrant) mappings.

3G Level B Dual-Stream is supported on some models (see section 1.5 for details).

Note that there are some channel mapping constraints when using multi-link interfaces.

The default SDI cable mapping definition is 4:2:2, YCbCr, 10-bit.

The DELTA-12G-elp-4c (BNC) adds the support of 4:4:4 10-bit and 12-bit RGB SDI cable mappings in HD Dual-Link, 3G Level A, 3G Level B Dual-Link, and 12G-SDI. Standard Range and Full Range supported.

Up to 4K30 4:4:4 12-bit on a single 12G cable.

1.4 PCI EXPRESS CHARACTERISTICS

Eight-lane PCI Express Gen-3 adapters, compliant with PCI Express® Base Specification and Card Electromechanical Specification, Revision 3.x.

Compatible with PCIe Gen-1/-2/-3/-4 motherboards.

Support of legacy (INT#A) and MSI interrupts. Support of kernel logical (virtual) addresses translation.

Onboard full-duplex, scatter-gather, 64-bit master DMA engine to off-load host processor and support the high data rate required by simultaneous operation of up to twelve 3G-SDI streams or four 12G-SDI streams.

Peer-to-peer DMA Card <-> GPU memory transfers are supported in some contexts with NVIDIA GPUDirect RDMA technology. See **VideoMaster SDK**'s documentation for more information on NVIDIA GPUDirect RDMA requirements.

PCIe transfer bandwidth is around 6000-6500 MB/s per direction. Note that actual bandwidth will depend on the final PC hardware configuration and usage.

API functions are available in **VideoMaster SDK** to benchmark the actual PCIe performance of the system and test video channels and buffer packings target configurations.

1.5 PRODUCT FEATURES COMPARAISON

Models	SDI I/O	12G-SDI I/O support	UHD/TV channels	8K channels	4:4:4 SDI Formats	Color Space Converters	Proxy Scalers	Ultimate Low Latency	Planar or NV12 Packing	3G-B DS dual-stream	DVB-ASI capable	Genlock generator	Multi-Card Sync	Bad SDI Fix
DELTA-12G-elp-h 1c	4 bi-dir	1	1	✗	✗	✗	✓	✗	✗	✓	✗	✗	✗	✗
DELTA-12G-elp-h 2c	8 bi-dir	2	2	✗	✗	✗	✓	✗	✗	✓	✗	✗	✗	✗
DELTA-12G2c-asi8c-elp-h	8 bi-dir	2	2	✗	✗	✗	✓	✗	✓	✓	8x	✗	✗	✗
DELTA-12G-elp-h 20	8 input	2	2	✗	✗	✓	✓	✗	✓	✓	✗	✗	✗	✓
DELTA-12G-elp-h 4c	8 bi-dir	4	4	1	✗	✗	✓	✗	✗	✓	✗	✗	✗	✗
DELTA-12G-elp-h 40	8 input	4x	4	1	✗	✓	✓	✓	✓	✓	✗	✗	✗	✓
DELTA-12G-elp-h 04	8 output	4	4	1	✗	✓	N.A.	✓	✓	✓	✗	✗	✗	N.A.
DELTA-12G-e-h 2i1c	4 bi-dir & 8 in	3 (2-in + 1 bi-dir)	3	✗	✗	✗	✓ Advanced	✓	✗	✗	✗	✓	✓	✗
DELTA-12G-e-h 4i2c	4 bi-dir & 8 in	6 (4-in + 2 bi-dir)	6	✗	✗	✗	✓ Advanced	✓	✗	✗	✗	✓	✓	✗
DELTA-12G-elp 4c	4 bi-dir	4	4	1	✓	✓	✓ Advanced	✓	✓	✗	✗	✗	✓	✗

Figure 3 – Product features comparison Table

4:4:4 SDI mappings

The DELTA-12G-elp 4c, 4x bi-dir BNC low-profile card, is the first model of the DELTA-12G family to support SDI 4:4:4 RGB 10/12-bit mappings on cable, in addition to traditional 4:2:2 YUV 10-bit mapping.

These new 4:4:4 10/12-bit mappings are supported in Dual-Link HD, 3G-A; 3G-B DL; and 12G-SDI. Allow transport of up to 4K 30fps 4:4:4 12b RGB streams.

Color Space Converters (CSC)

Onboard hardware color-space converters for YUV(K) to RGB(A) conversion (input channels) and RGB(A) to YUV(K) conversion (output channels).

This allows RX-modify-TX applications in RGB(A) pixel buffer format.

Other CSC conversions (different matrix parameters) are available on request.

Proxy Scalers

Proxy Scalers, also called *Thumbnails*, enable the capture of downscaled (1/4 by 1/4 -> 1/16 image) copies of SDI input streams. A thumbnails stream and a full-resolution stream can be received simultaneously and independently, for each channel.

This feature is useful to have a preview of an incoming stream while saving some PCIe bandwidth and CPU resources (i.e. multi-viewer application, proxy recording, etc.).

Note that DELTA-12G-e-h 2i1c/4i2c and DELTA-12G-elp 4c models have some more advanced settings for their proxy scalers:

- Configurable ratios: ¼, ½, 1/6, 1/3 (per image dimension)
- UHD to HD downscaling
- Cropping of 2048 and 4096 pixel per line format to 1080 and 3840 respectively. Auto-cropping, no SW control.
- Proxy stream frame rate decimation control
- Clean 1080i to 640x320 progressive scaling (from a single field).

Ultimate Low Latency

From VideoMaster 6.17, the legacy “low latency” feature is deprecated and replaced by a new Ultimate Low Latency feature (ULL), available on 4c BNC, 40/04 HD-BNC, and 2i1c/4i2c models; which handles more efficiently multi-channel low latency sub-frame applications, offering even lower granularity access to data (as low as a few lines). See **VideoMaster SDK** documentation for more details on this advanced feature.

This new DMA mode allows very low latency processing of incoming video; and low end-to-end delay for capture, software processing, and playout. ULL is supported in all single-link formats and Dual or Quad-Links formats (4K and 8K) when in “2-sample interleave” mode. Quadrant (Square Division) mode is not supported in ULL. Field Merging and Line Padding features are not available in ULL mode.

Planar Packings

In addition to the standard ‘packed’ buffer packings (one buffer with Y/Cb/Cr), some planar buffer packings (3 different buffers for Y/Cb/Cr) are available on 20, 40/04, and 2c-asi8c models for ingest and playout. An onboard chroma resampler is used for 4:2:2 to 4:2:0 down color sampling.

- Planar 4:2:2, 8-bit or 10-bit, 3-buffer Y / Cb / Cr
- Planar 4:2:0, 8-bit or 10-bit, 3-buffer Y / Cb / Cr

Semi-planar NV12 packing (one Y buffer and one interleaved Cb/Cr buffer) is available on 20, 40/04, 2c-asi8c, and on DELTA-12G-elp 4c (BNC) model. An onboard chroma resampler is used for 4:2:2/4:4:4 to 4:2:0 down color sampling.

- NV12: 4:2:0, 8-bit semi-planar, 3-buffer Y / Cb-Cr

3G Level B Dual-Stream

All model supports SDI 3G Level A and 3G Level B Dual-Link formats.

In addition, some models support 3G Level B Dual-Stream (3G B DS) transport interface, which embeds two HD streams in a single 3G-SDI link. This transport is typically used in HFR camera interfacing: n multiple HD “phases” transported through n/2 3G-SDI connectors in 3G B DS. This transport mapping is also occasionally used for stereoscopic image transport (ST 425-2). Note that when working with 3G-B DS formats the card maximum stream number is still the same as with all single-link formats. Meaning that when two video streams are grouped in a single 3G-B DS port, another port will be deactivated.

Frame accuracy

All model supports frame accuracy features, which brings an intra-card and inter-cards (on the same platform or distant systems) synchronization mechanism that allows starting transmitting at the exact same time for each output, providing that all cards are genlocked to the same reference. This allows perfectly aligned and synced playout on multiple interfaces.

Bad SDI Diagnostic

Bad SDI Diagnostic (or “SDI Robustness”) feature allows you to retrieve detected SDI status errors like out-of-range YCbCr values, corrupted sync, missing sync, parasite sync, invalid line number, CRC/EDH error, corrupted ANC and ANC into the switching line.

This feature is present on all 12G card models with SDI inputs or bi-dir I/Os.

Bad SDI Fix

The Bad SDI Diagnostic (or “SDI Robustness Error Correction”) feature is a major improvement that allows fixing some SDI signal errors and continuing working without capture interruption in some cases of bad SDI signal. It improves the card tolerance to out-of-spec signals and provides greater interoperability. Once activated the card will fix the following

error conditions: out-of-range YCbCr values, corrupted sync, missing sync, parasite sync, and invalid line number.

Note that these errors will be reported through the Bad SDI Diagnostic feature described upper.

The Bad SDI Fix is present only on DELTA-12G-elp-h 20 and DELTA-12G-elp-h 40 models.

Genlock output

The DELTA-12G-e-h 2i1c/4i2c has a Black Burst/Tri-Level output that can be set in two modes:

- Loopback of genlock reference input – passive loop-thru, no onboard termination for easy daisy-chaining of genlock ref to another equipment.
- Genlock generator Black Burst/Tri-Level output – will generate a video genlock signal in the same format as the board master timing generator.
 - Black Burst: PAL (625i25) or NTSC (525i29)
 - Tri-Level: 720p 23/24/25/29/30/47/48/59/60; 1080i 50/59/60; 1080p 23/24/25/29/30; 1080psF23/24/25/29/30.

Multi-card Sync

The DELTA-12G-e-h 2i1c/4i2c and DELTA-12G-elp 4c (BNC) cards have onboard connectors for multi-card SDI sync in the same platform. One card as master sync can share its timings with another card. Daisy-chaining is possible to get up to 4 cards in sync with 3 internal cables (PN#: A-MCSC-0100 – 10cm cable accessory). Perfect pixel sync can be achieved this way for all outputs in the system without the need for external genlock cables.

External black-burst/Tri-Level genlock timings can also be propagated from one card to the others internally using this interface.

DVB-ASI input and output features (DELTA-12G2c-asi8c-elp-h only)

Each I/Os on DELTA-12G2c-asi8c-elp-h can be configured to capture or playout DVB-ASI streams following CENELEC/DVB standard EN50083-9: “Interfaces for CATV/SMATV Headends and similar professional equipment for DVB/MPEG-2 transport streams”.

ASI receiver features

- Support of inverted and non-inverted polarity ASI signals. (configurable or auto-detection)
- Support of bitrate up to 213,7263 Mbit/s
- Flexible buffering to maximize equipment interoperability (up to 32 MB/channel)
- Automatic 188/204 packet size detection. No RS error correction function.
- Framing error detection
- Bit rate measurement & monitoring
- PID filter managing up to 256 PID per receive channel
- Software-selectable option for FEC stripping
- Timestamping on the incoming packets
- Raw TS capture mode option where every incoming byte on a physical interface is captured (except K28.5 characters).

ASI transmitter features

- 188 and 204 bytes packets support.
Plus software-selectable option to remove the 16 bytes reserved for RS-coded data from the 204B packet and transmit 188B packets.
- Support of bitrate up to 213,7263 Mbit/s
- Support of “byte mode” and “packet mode” :



Figure 4 – ASI TX Byte Mode

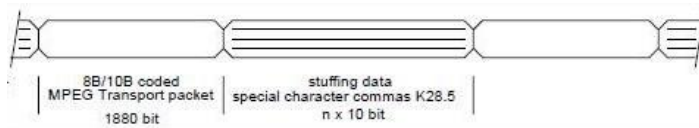


Figure 5 – ASI TX Packet Mode

- Transmit line rate precision:
 - Line rate of 270Mbaud +/- 25ppm.
- Advanced bitrate generation for transmission rate fine-tuning :
 - Output bitrate based on local phase accumulator or ASI input incoming bitrate.
 - Monitoring of the deviation between the outgoing bitrate and a reference (hardware phase accumulator) over a period from 1 ms to 1 s.
- Simple ASI data management (GetBuffer/SendBuffer)
- Raw TS transmit mode option where TX framer is bypassed, every byte of software buffer is passed through to the physical interface at the bit rate set.
(K28.5 characters automatically added to match the bit rate set)

Card reconfiguration to switch from one model to another

Some models can be reprogrammed using a **VideoMaster SDK** tool to switch from one model to another model of the same family group.

This allows users to buy and validate a single card and then have access to features optimized for different applications.

Family groups available:

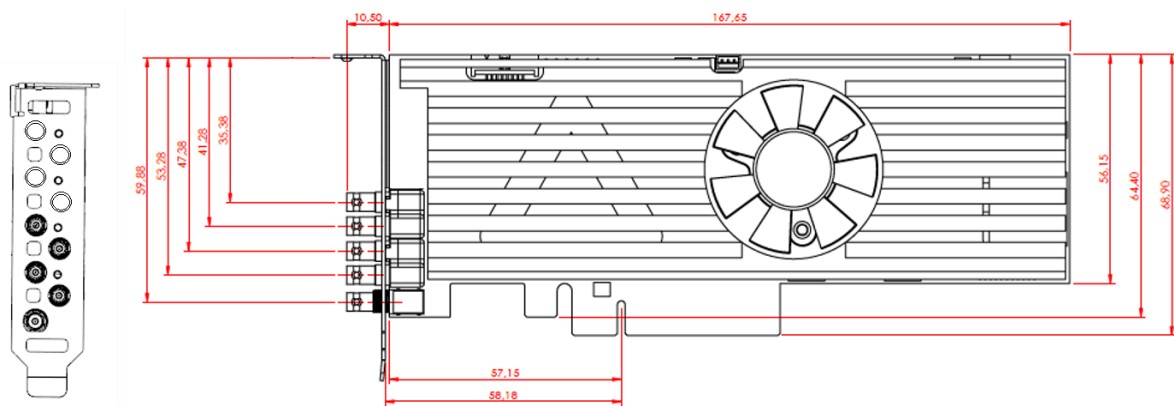
1. DELTA-12G-elp-h 1c;
2. DELTA-12G-elp-h 20; DELTA-12G-elp-h 2c; DELTA-12G2c-asi8celp-h;
3. DELTA-12G-elp-h 40; DELTA-12G-elp-h 04; DELTA-12G-elp-h 4c;
4. DELTA-12G-e-h 4i2c;
5. DELTA-12G-elp 4c (BNC);

HDMI support

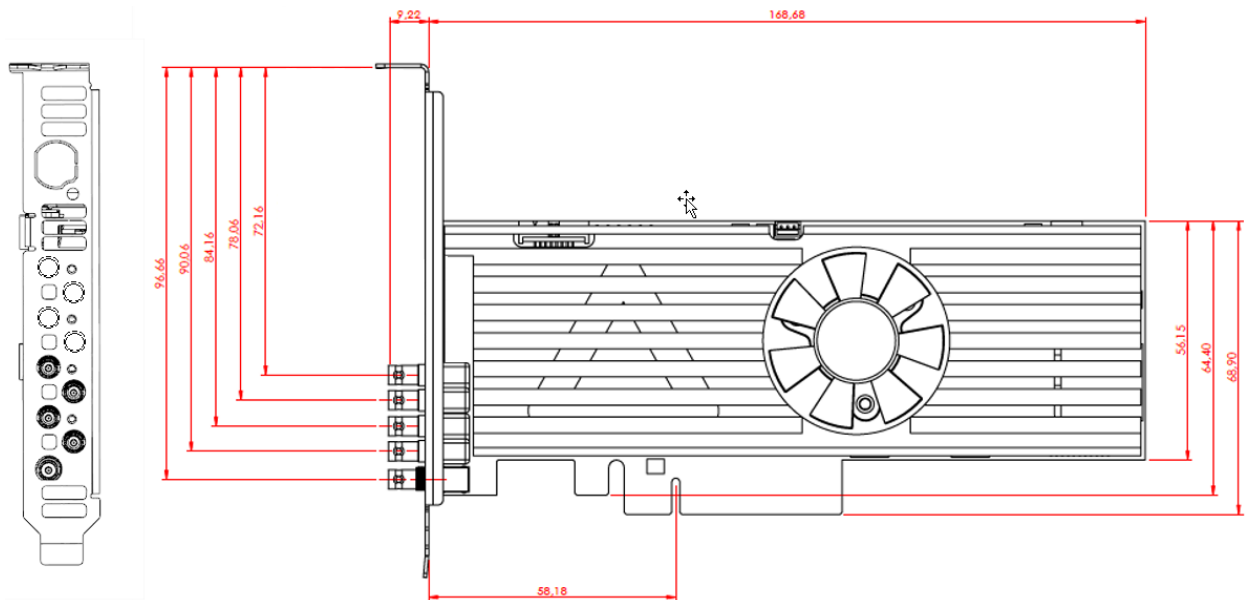
The models presented in this datasheet do not have HDMI I/Os, but some other 12G models from DELTACAST have mixed SDI and HDMI inputs. See the DELTA-12G1c-hmi10-elp datasheet for more details on this dual 4K channel card that has one HDMI 2.0 capture channel and 4 bi-dir SDI ports, one of which can support 12G-SDI.

1.6 MECHANICAL DRAWINGS

1.6.1 DELTA-12G-ELP-H 1C DRAWINGS



Card weight: ~210 g



Card weight: ~215 g

1.6.2 DELTA-12G-ELP-H 2C/20/4C/40/04 AND 12G2C-ASI8C DRAWINGS

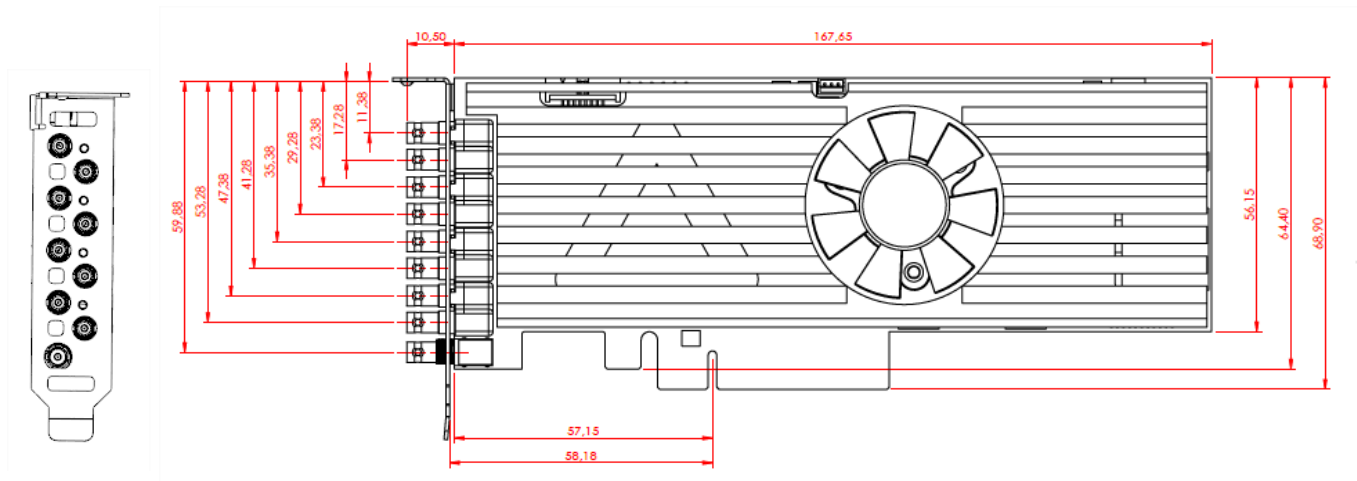


Figure 8 – Drawing: DELTA-12G-elp-h 2c/20/2c-asi8c/4c/40/04 with low-profile bracket (mm)

Card weight: ~230 g

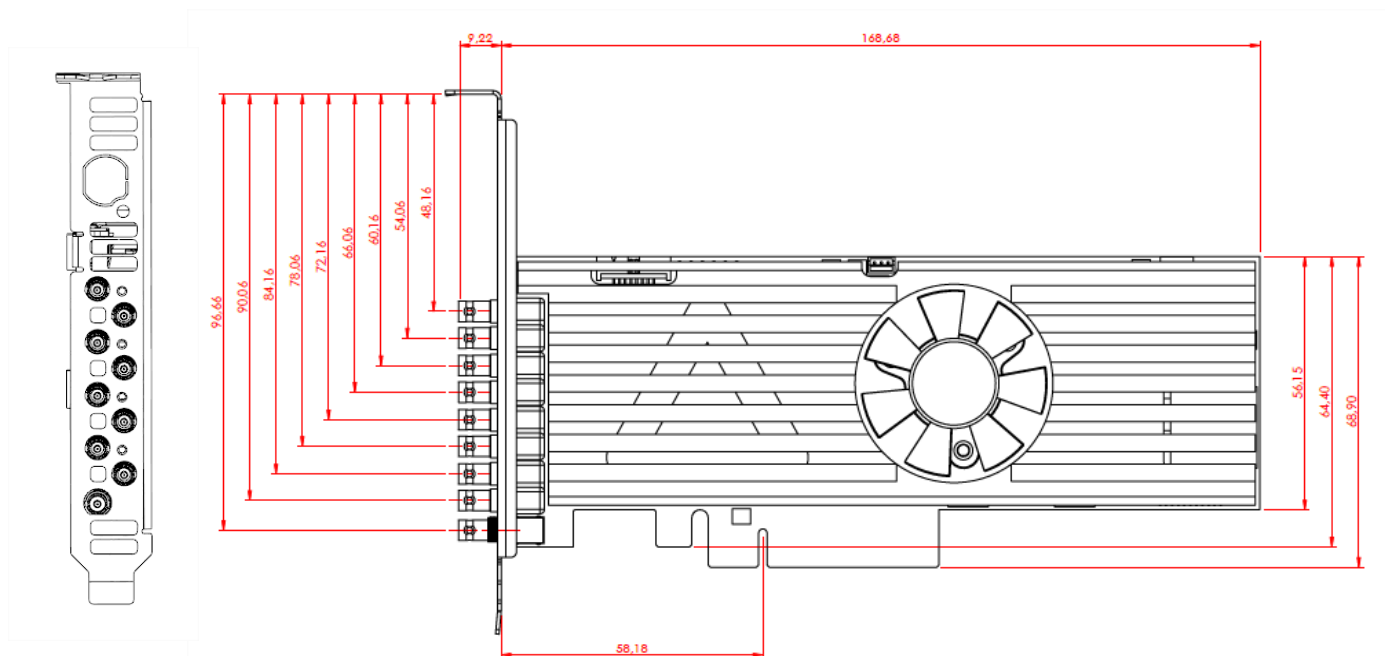
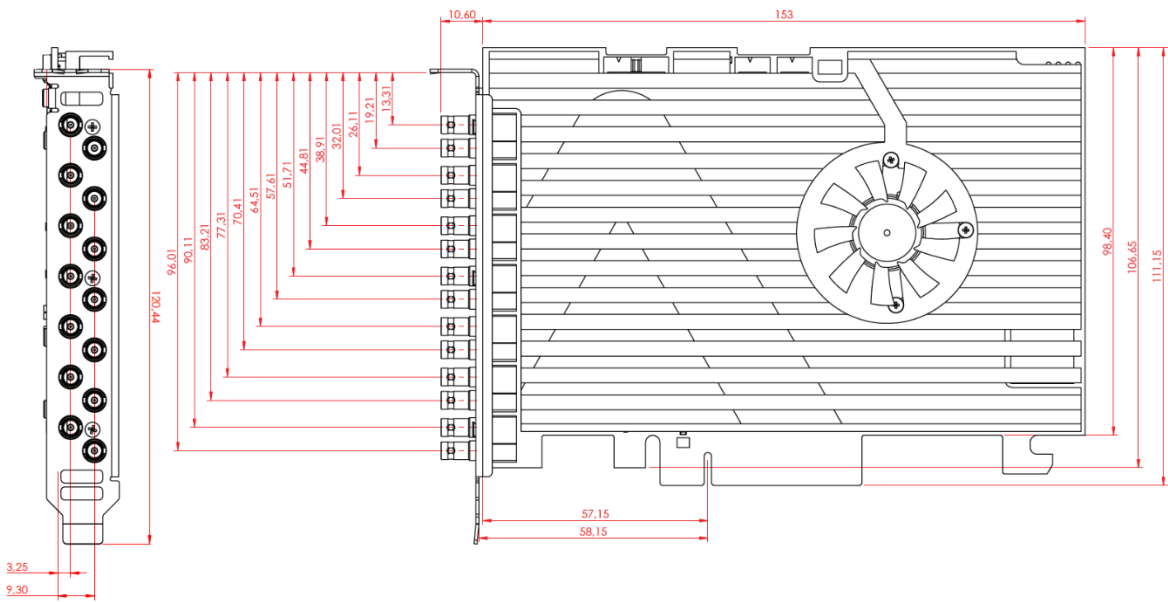


Figure 9 – Drawing: DELTA-12G-el-p-h 2c/20/2c-asi8c/4c/40/04 with standard height bracket (mm)

Card weight: ~235 g

1.6.3 DELTA-12G-E-H 4I2C/2I1C DRAWING



1.6.4 DELTA-12G-ELP 4C DRAWINGS

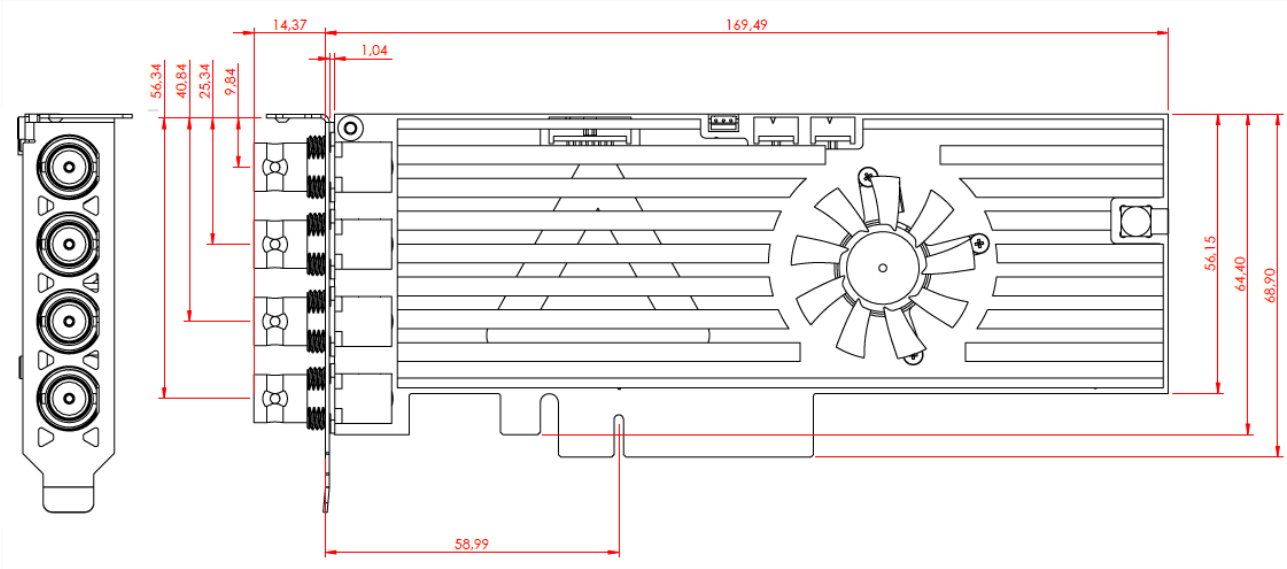


Figure 11 – Drawing: DELTA-12G-elp 4c with low-profile bracket (mm)

Card weight: ~230g

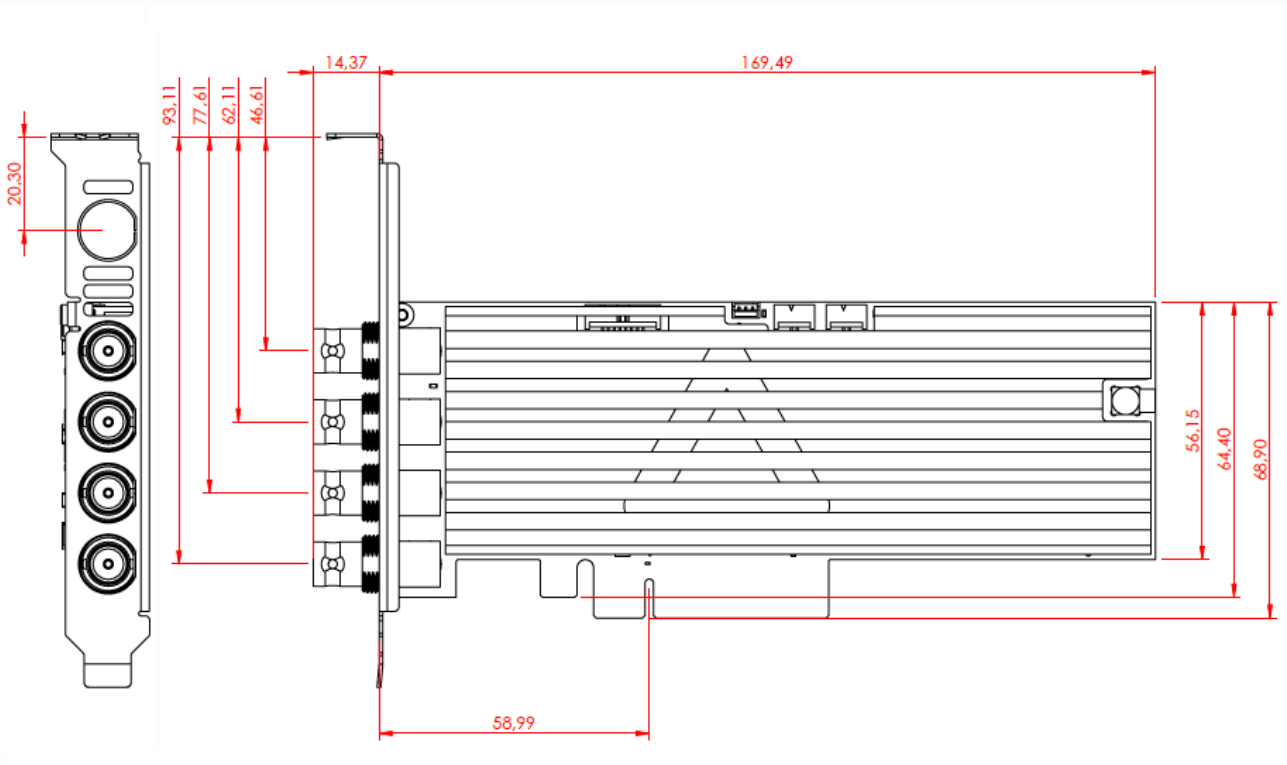


Figure 12 – Drawing: DELTA-12G-elp 4c with standard height bracket (mm) and in passive configuration (no fan)

Card weight: ~235g

1.7 CABLING GUIDE

1.7.1 DELTA-12G-ELP-H 1C/2C/20/2C-ASI8C

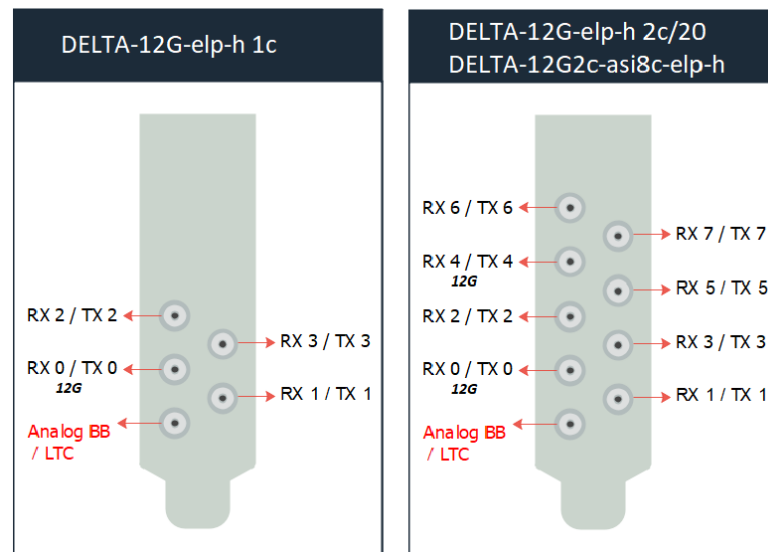


Figure 13 – Cabling Guide: 1c/2c/20/2c-asi8c

12G capable I/Os: (RX0/TX0) and (RX4/TX4).

When I/O #i (RXi/TXi) is running in 12G or 6G, the I/O #i+1 is deactivated.

1.7.2 DELTA-12G-ELP-H 4C/40/04

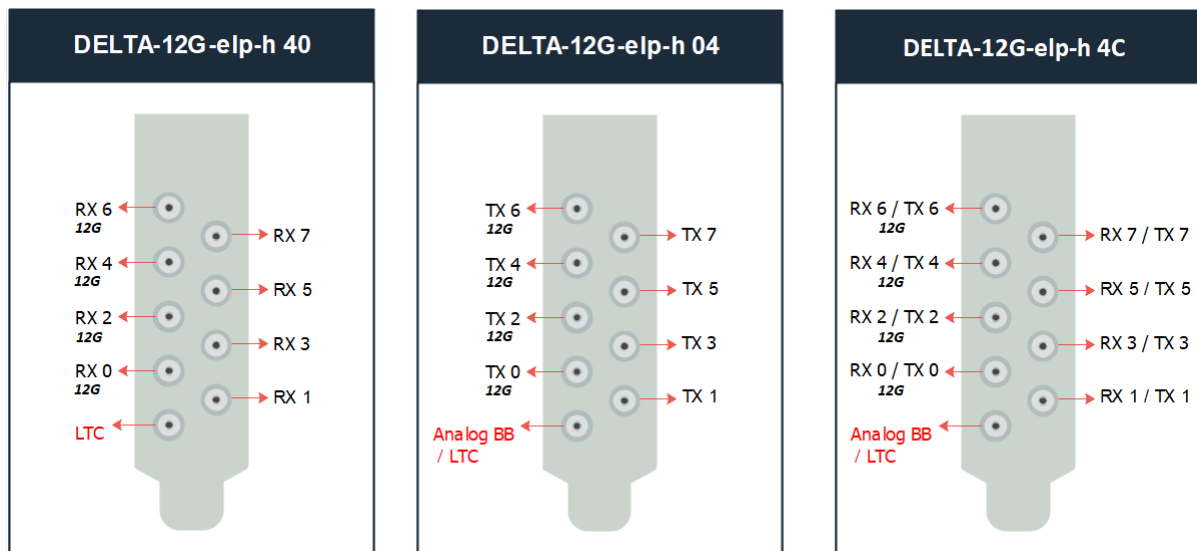


Figure 14 – Cabling Guide: 4c/40/04

12G capable I/Os: (RX0/TX0), (RX2/TX2), (RX4/TX4), (RX6/TX6).

When I/O #i (RXi/TXi) is running in 12G or 6G, the I/O #i+1 is deactivated.

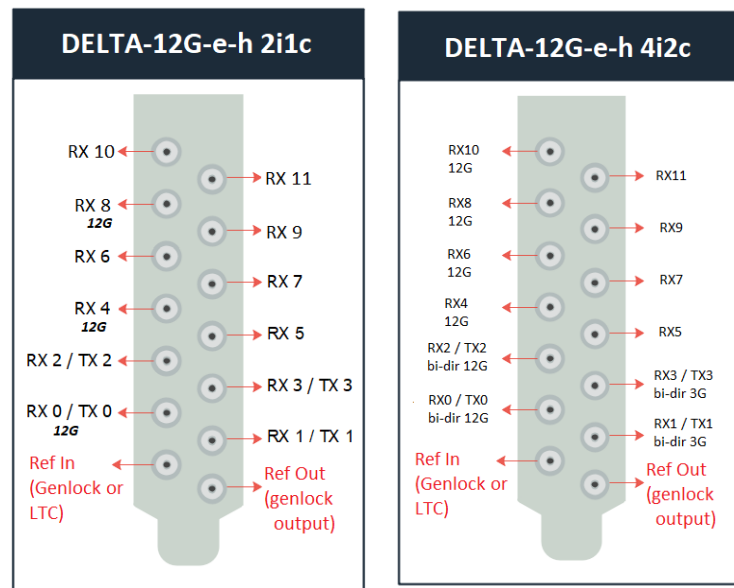


Figure 15 Cabling Guide: 2i1c / 4i2c

12G/6G capable I/Os on these models:

- DELTA-12G-e-h 2i1c:
 - 2x input 12G/6G capable: RX4 and RX8
 - 1x bi-dir 12G/6G capable : RX0/TX0
- DELTA-12G-e-h 4i2c:
 - 4x input 12G/6G capable: RX4 and RX8
 - 2x bi-dir 12G/6G capable : RX0/TX0

When I/O #i (RXi/TXi) is running in 12G or 6G, the I/O #i+1 cannot be used.

1.7.4 DELTA-12G-ELP 4C

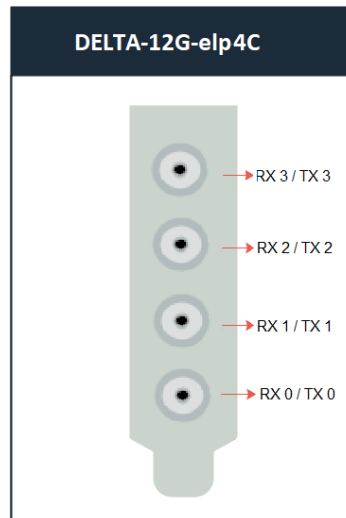


Figure 16 – Cabling Guide: DELTA-12G-elp 4c Low-Profile bracket

All BNC I/Os on DELTA-12G-elp 4c are 12G capable and can work simultaneously without restrictions.

Note that DELTA-12G-elp 4c can be ordered with –g mounting option. In that case it is shipped with a standard height bracket with a 5th BNC connectors for genlock/LTC reference input.

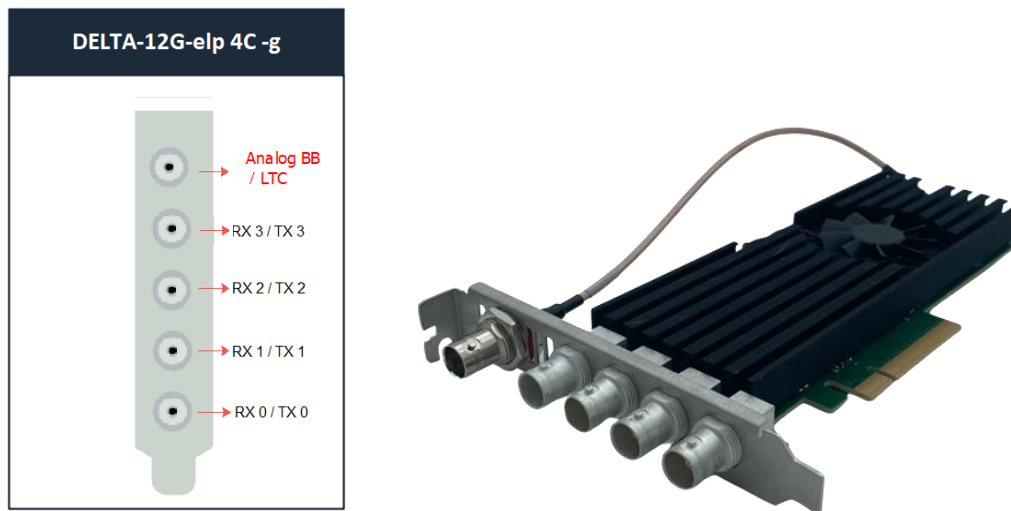


Figure 17 – Cabling Guide: DELTA-12G-elp 4c-g (Standard height Bracket with genlock/LTC reference input)

1.8 POWER SUPPLY/CONSUMPTION

Power supplies:

- 12V DC & 3.3V DC from the PCIe slot connector, no need for additional power cables.

Power consumption:

- ~16W for DELTA-12G-elp-h 1c at full load.
- ~18W for DELTA-12G-elp-h 20 at full load. (with active heatsink)
- ~19W for DELTA-12G-elp-h 2c at full load. (with active heatsink)
- ~20W for DELTA-12G2c-asi8c-elp-h at full load. (with active heatsink)
- ~21W for DELTA-12G-elp-h 4c at full load. (with active heatsink)
- ~18W for DELTA-12G-elp-h 40 at full load. (with active heatsink)
- ~19W for DELTA-12G-elp-h 04 at full load. (with active heatsink)
- ~21W for DELTA-12G-e-h 2i1c / 4i2c at full load. (with passive heatsink)
- ~20W for DELTA-12G-elp 4c (BNC) at full load. (with active heatsink)

Note that power consumption with the passive heatsink version may be 2-3W superior than with the active heatsink if enough airflow is not provided on the passive heatsink.

1.9 ENVIRONMENTAL

Operating temperature: 0 – 35°C.

Humidity: 20% to 80% non-condensing.

These cards are equipped by default with an active heatsink (with a fan). Different fan speed options are available through API settings.

A passive heatsink can be ordered, but this solution must be thermally validated by the user in its platform. In the case of passive heatsink configuration, the user must ensure adequate airflow over the heatsink inside the PC enclosure.

1.10 CERTIFICATIONS

CE (EMC, RoHS), FCC.

2 ELECTRICAL INTERFACES

2.1 SDI I/OS (PCIE BRACKET)

- Type: HD-BNC (also called Micro-BNC) – 75 Ohm – 12 GHz
- Number of connectors: 4, 8, or 12.
- Connector pitch on bracket: ~8 mm.
- Electrical standards: 12G-SDI (ST 2082-10), 6G-SDI (ST 2081-10), 3G-SDI (ST 424M), HD-SDI (ST 292M) or SD-SDI (ST 259M)

2.2 MIXED SDI/ASI I/OS (DELTA-12G2C-ASI8C-ELP-H ONLY)

- Type: HD-BNC (also called Micro-BNC) – 75 Ohm – 12 GHz
- Number of connectors: 8.
- Connector pitch on bracket: ~8 mm
- Electrical standards:
 - DVB-ASI (CENELEC/DVB EN50083-9)
 - 12G-SDI (ST 2082-10), 6G-SDI (ST 2081-10), 3G-SDI (ST 424M), HD-SDI (ST 292M) or SD-SDI (ST 259M).

2.3 GENLOCK OR LTC REFERENCE INPUT

- Type: HD-BNC (also called Micro-BNC) – 75 Ohm
- Number of connectors: 1.
- Connector pitch on bracket: ~8 mm.
- Electrical standards:
 - Analog Black Burst or Tri-Level sync input. (75 Ohm terminated when not in loop-thru)
 - LTC (ST 12-1) timecode input (High-impedance terminated)

2.4 GENLOCK OUTPUT (DELTA-12G-E-H 2I1C / 4I2C ONLY)

- Type: HD-BNC (also called Micro-BNC) – 75 Ohm
- Number of connectors: 1.
- Connector pitch on bracket: ~8 mm.
- Electrical standards: Analog Black Burst or Tri-Level sync.
- Mode of operation: passive loop-thru of reference input; or onboard active genlock signal generator
- Formats supported for genlock source mode :
 - Black Burst: PAL (625i25) or NTSC (525i29)
 - Tri-Level: 720p 23/24/25/29/30/47/48/59/60; 1080i 50/59/60; 1080p 23/24/25/29/30; 1080psF23/24/25/29/30.

2.5 GPIO CONNECTOR

- Type: 16-pin, 2x8, 1.27mm pitch, right angle.
- Electrical standard: LVCMOS33. 3.3V tolerant.
- LTC capture companion module available separately.
- 8x bi-directional GPIOs – reserved for specific requests.

2.6 MULTI-CARD SYNC I/OS

- Type: 2 headers of 4-pins, 2x2, 1.27mm pitch, straight.
- One header for sync input; one header for sync output.
- Electrical standard: LVCMOS33. 3.3V tolerant.
- Use to connect up to four DELTA-12G-e-h 2i1c/4i2c cards in a daisy chain (Sync_OUT Card#1 -> Sync_IN Card#2) to share video timings (internal genlocking) without external Black Burst/Tri-Level sync cables.
- Mating cables :
 - DELTACAST PN# A-MCSC-0100: Ribbon Cable Assembly, length 10cm.
 - SAMTEC Low-profile Tiger Eye™ IDC series : FFSD-02-D-xx.xx-01 (assembled length xx.xx in inch)
- Compatible models: DELTA-12G-e-h 2i1c, DELTA-12G-e-h 4i2c and DELTA-12G-elp 4c (BNC).

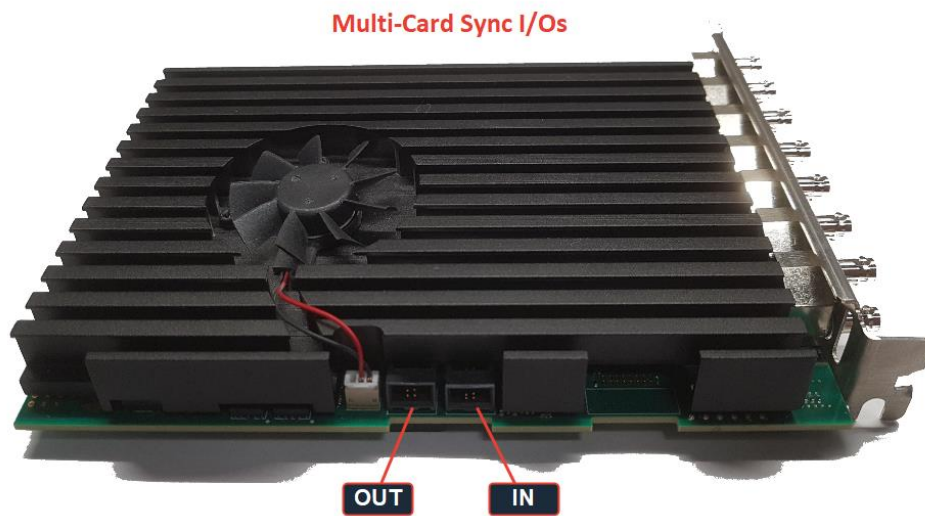


Figure 18 - Picture: Multi-Card Sync I/Os on DELTA-12G-e-h 2i1c/4i2c

3 ACCESSORIES

3.1 HD-BNC TO BNC PATCH CABLE

- Part Number: A-HDB2BNC-0200
- Type: Belden 1855A cable
- Connectors:
 - Side A: HD-BNC straight plug, 75 Ohm.
 - Side B: BNC female straight, 75 Ohm.
- Length: ~20 cm
- Frequency Range: 0-12GHz
- Weight: ~25 g
- Mating cycles: ~500 per side

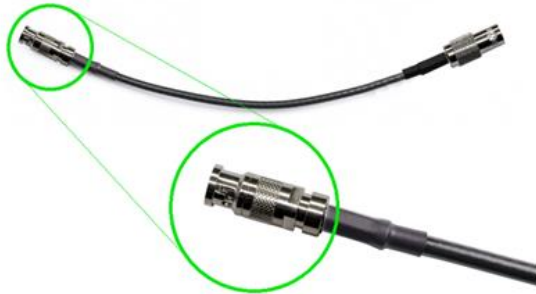


Figure 19 – Picture: A-HDB2BNC-0200

3.2 HD-BNC TO HD-BNC PANEL MOUNT PATCH CABLE

- Part Number: A-HDB2PM-0200
- Type: Belden 1855A cable
- Connectors:
 - Side A: HD-BNC straight plug, 75 Ohm.
 - Side B: HD-BNC straight jack, bulkhead, 75 Ohm. Panel mount jack with bulkhead screw.
- Length: ~20 cm
- Frequency Range: 0-12GHz



Figure 20 – Picture: A-HDB2PM-0200

3.3 MULTI-CARD SYNC CABLE

- Part Number: A-MCSC-0100
- Type : Type: SAMTEC Low-profile Tiger Eye™ series (ribbon cable assembly)
- Length: ~10 cm

3.4 LTC CAPTURE COMPANION CARD

LTC (Linear Timecode, ST12-1:2014) capture companion card.

This add-on module brings LTC capture capability to our video cards.

Note that LTC capture is already available on 12G cards, at the ref. genlock connector.

If one needs both genlock and LTC capture, then this module can be ordered to have a separate LTC capture interface.



Figure 21 – Picture: LTC companion card

LTC companion module description:

- BNC 75Ohm input connector.
- Support of 30, 29.97, 25, 24, and 23.98 Hz frame rates.
- 80-bit LTC extraction, frame rate detection, signal valid status.
- Dimension 30 x 60mm.
- 3V3 powered from host card.
- Recommended LTC input amplitude between 1 to 2 Vpp.

Ordering options:

- assembled on the standard height bracket of a low-profile host card: PN#: A-LTC-1-cd,
- with a separate standard bracket: PN#: A-LTC-1,
- with a separate low-profile bracket: PN#: A-LTC-1-lb

3.5 A-MCX2BNC-0230-LB

Low-profile bracket, with bulkhead BNC Jack to MSC plug cable, RG179, 230mm.

This companion bracket can be used along with DELTA-12G-elp 4c card for breakout of the genlock/LTC Reference input on a separate low-profile bracket, rather than having it mounted on the standard height bracket of the 4c card (ordering option -g for genlock cable mounted on the same standard height bracket as the card).



Figure 22 A-MCX2BNC-0230-LB low-profile companion bracket with genlock/LTC in for DELTA-12G-elp 4c.