Synapse

GAD100
HAD100
SAD100

3Gb/s, HD, SD embedded domain audio description and voice-over processor

Installation and Operation manual

Committed.

AXON

AXON

Synapse

TECHNICAL MANUAL

GAD100
HAD100
SAD100

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WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE

● ALWAYS disconnect your entire system from the AC mains before cleaning any component. The product frame (SFR18 or SFR04) must be terminated with three-conductor AC mains power cord that includes an earth ground connection. To prevent shock hazard, all three connections must always be used.
● NEVER use flammable or combustible chemicals for cleaning components.
● NEVER operate this product if any cover is removed.
● NEVER wet the inside of this product with any liquid.
● NEVER pour or spill liquids directly onto this unit.
● NEVER block airflow through ventilation slots.
● NEVER bypass any fuse.
● NEVER replace any fuse with a value or type other than those specified.
● NEVER attempt to repair this product. If a problem occurs, contact your local Axon distributor.
● NEVER expose this product to extremely high or low temperatures.
● NEVER operate this product in an explosive atmosphere.

Warranty: Axon warrants their products according to the warranty policy as described in the general terms. That means that Axon Digital Design BV can only warrant the products as long as the serial numbers are not removed.

Date created: 03-10-2011
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This product complies with the requirements of the product family standards for audio, video, audio-visual entertainment lighting control apparatus for professional use as mentioned below.

CE	EN60950	Safety
	EN55103-1: 1996	Emission
	EN55103-2: 1996	Immunity

Axon Digital Design GED130 HED130 FC Tested To Comply With FCC Standards FOR HOME OR OFFICE USE	This device complies with part 15 of the FCC Rules Operation is subject to the following two conditions: (1) This device may cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Table of Contents

1 Introduction to Synapse

An Introduction to Synapse

Synapse is a modular system designed for the broadcast industry. High density, intuitive operation and high quality processing are key features of this system. Synapse offers a full range of converters and processing modules. Please visit the AXON Digital Design Website at www.axon.tv to obtain the latest information on our new products and updates.

Local Control Panel

The local control panel gives access to all adjustable parameters and provides status information for any of the cards in the Synapse frame, including the Synapse rack controller. The local control panel is also used to back-up and restore card settings. Please refer to the rack controller manuals for a detailed description of the local control panel, the way to set-up remote control over IP and for frame related settings and status information.

Remote Control Capabilities

The remote control options are explained in the rack controller manual. The method of connection to a computer using Ethernet is described in the ERC/ERS/RRC/RRS manual.

! **CHECK-OUT:** "AXON CORTEX" SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Synapse Cortex installed, as this increases the ease of use and understanding of the modules.

2 Unpacking and Placement

Unpacking

The Axon Synapse card must be unpacked in an anti-static environment. Care must be taken NOT to touch components on the card – always handle the card carefully by the edges. The card must be stored and shipped in anti-static packaging. Ensuring that these precautions are followed will prevent premature failure from components mounted on the board.

Placing the card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR04 and SFR08 frame. Locate the two guide slots to be used, slide in the mounted circuit board, and push it firmly to locate the connectors.

Correct insertion of card is essential as a card that is not located properly may show valid indicators, but does not function correctly.

NOTE: On power up all LED's will light for a few seconds, this is the time it takes to initialise the card.

3 A Quick Start

When Powering-up

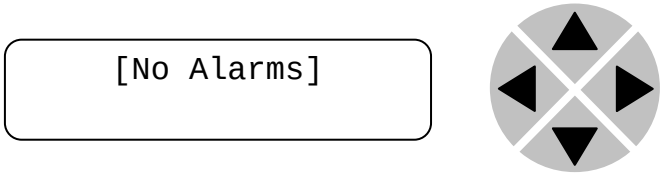
On powering up the Synapse frame, the card set will use basic data and default initialisation settings. All LED's will light during this process. After initialisation, several LED's will remain lit – the exact number and configuration is dependent upon the number of inputs connected and the status of the inputs.

Changing settings and parameters

The front panel controls or the Axon Cortex can be used to change settings. An overview of the settings can be found in chapter 5, 6 and 7 of this manual.

Front Panel Control

Front Panel Display and Cursor



Settings are displayed and changed as follows;

Use the cursor 'arrows' on the front panel to select the menu and parameter to be displayed and/or changed.

Press ►	To go forward through the menu structure.
Press ◄	To go back through the menu structure.
Press ▲	To move up within a menu or increase the value of a parameter.
Press ▼	To move down through a menu or decrease the value of a parameter.

NOTE: Whilst editing a setting, pressing ► twice will reset the value to its default.

Example of changing parameters using front panel control

With the display as shown below

```
RRC18 [Select Card]
>S01=SFS10
```

Pressing the ► selects the SFS10 in frame slot 01.

The display changes to indicate that the SFS10 has been selected. In this example the `Settings` menu item is indicated.

```
SFS10 [Select Menu]
>Settings
```

Pressing the ► selects the menu item shown, in this example `Settings`.

(Pressing ▲ or ▼ will change to a different menu eg `Status, Events`).

The display changes to indicate that the SFS10 `Settings` menu item `SDI-Format` has been selected and shows that it current setting is `Auto`.

```
SFS10 [Settings]
>SDI-Format=Auto
```

Pressing the ► selects the settings item shown, in this example `SDI-Format.`

(Pressing ▲ or ▼ will change to a different setting, eg `Mode, H-Delay`).

The display changes to indicate that the SFS10 `Edit Setting` menu item `SDI-Format` has been selected.

```
SFS10 Edit Setting]
SDI-Format>Auto
```

To edit the setting of the menu item press ▲ or ▼.

All menu items can be monitored and/or changed in this way. Changing a setting has an immediate effect.

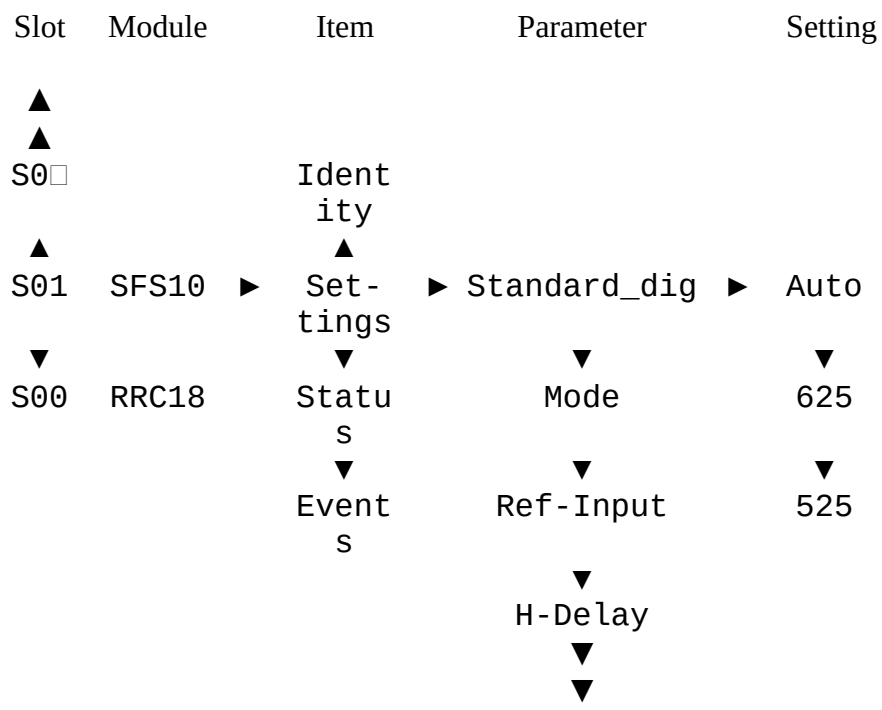
Axon Cortex Software

Axon Cortex can be used to change the settings of Synapse modules from a PC, either locally or remotely. The software enables communication based on TCP/IP between the Setup PC and Synapse frames/modules.

Each Synapse frame is addressed through its rack controller's unique IP address, giving access to each module, its menus and adjustment items. Axon Cortex has access to data contained within the Synapse module and displays it on a GUI. The software has an intuitive structure following that of the module that it is controlling.

For operation of Axon Cortex, please refer to the Cortex help files.

Menu Structure Example



NOTE: Further information about Front Panel Control and Axon Cortex can be obtained from the ERC, ERS, RRC and RRS operational manuals and the Cortex help files.

4 The GAD / HAD / SAD100 card

Introduction

The GAD100, HAD100 and SAD100 are embedded domain Audio Description processors with a Voice-Over mode. This processor uses a stereo track as main program (input 1-2 of the AD processor) and mixes the AD track triggered by the mix enable track (input 3-4 of the AD processor).
The output of the AD processor can be routed to PCM channels of the 16 channel embedder or Quad Speed Bus.

The Quad Speed audio bus allows for implementation of 'in between' audio processing. This means that we can stream the de-embedded audio channels or audio described (mixed) channels to a Quad Speed Audio ADD-ON card like the DLA44, DSF66 or any of the other available Quad Speed Bus enabled cards, process this audio and send it back to the G/H/SAD100 for The ADD-ON card does not need a connector panel and all audio routing is performed inside the Synapse frame by just placing these cards in adjacent slots.

The SAD100 and HAD100 can be future upgraded to GAD100. This allows for staged implementation of SD to HD infrastructures and spread the cost over multiple budget years.

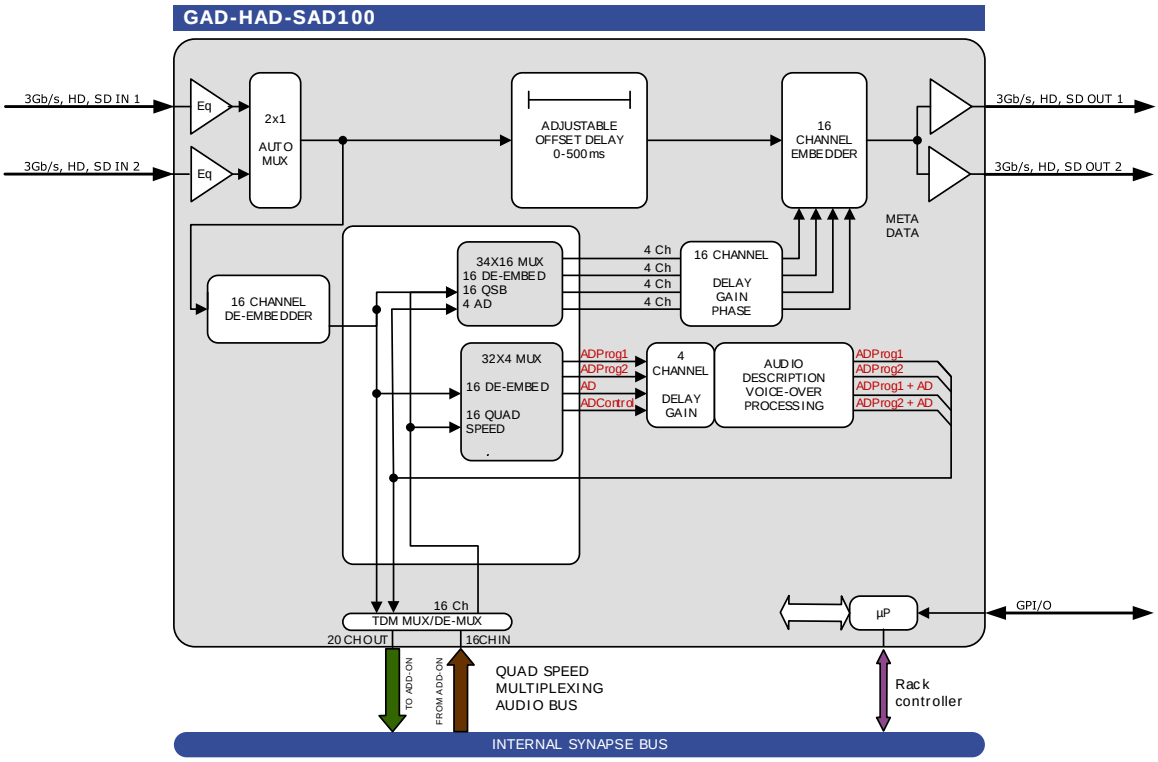
Features

- Audio Description processor with free routable I/O
- 2 SDI inputs (with auto switch on carrier loss, and switch back function)
- Compatible with the following input formats (auto selecting) (1080p only for GAD):
  - 1080p/59.94
  - 1080p/50
  - 1080i/59.94
  - 1080i/50
  - 1080p/29.97
  - 1080p25
  - 1080p/23.98
  - 1080psf/23.98
  - 720p/59.94
  - 720p50
  - SD525
  - SD625
- Offset video delay adjustable between 0 and 1000ms
- Quad Speed Audio ADD-ON bus for bidirectional audio processing
- 2 SDI + embedded audio outputs
- 7 presets that configure all 16 output channels at once, controlled by GPI or ACP (Cortex)
- Append and overwrite modes
- Audio level and phase control
- Audio offset delay up to 5000 ms
- Peak detection 0dBFS
- Silence detection with threshold (-100 to -20dBFS) and time control (1 to 255 sec)
- Transparent for ATC time code RP188, RP196, RP215
- Built-in linesync (autophaser)
- Locks to Tri-level, Bi-level syncs or input
- Full control and status monitoring through the front panel of the SFR04/SFR08/SFR18 frame and the Ethernet port (ACP)
- Optional 1 or 2 fiber inputs, 1 or 2 fiber outputs or a fiber in and output (replacing 1 SDI in and output) on the I/O panel
- Optional relay bypass (BHX18D)

Applications

- 3Gb/s, HD, SD embedded domain audio description and voice-over processor
- Preset based 16 channel audio/bitsream shuffling

Block schematic



Quad speed bus layout

The GAD/HAD/SAD100 puts all audio on the quad speed audio bus by default in the following way:

Addon bus channel	Source
1 till 16	SDI de-embedder outputs 1 till 16
17 till 18	AudioDescription Output 1 till 2

5 Settings Menu

Introduction

The settings menu displays the current state of each GED-HED setting and allows you to change or adjust it. Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or with Cortex. Also the SCP08 control can be used. Please refer to chapter 3 for information on the Synapse front panel control and Cortex.

VIDEO

Input-Select

With this setting you can select which SDI input you would like to use for Dolby processing. You can choose between `SDI1` or `SDI2`. Can also be set to `auto`, which automatically chooses the valid SDI input (with SDI 1 as priority)

Switch-Back

When `Input-Select` is set to `Auto` and SDI1 fails, the card will automatically switch to SDI2. When the setting `Switch-Back` is set to `On`, the selected input is set back to SDI1 when SDI1 is valid again. When set to `off`, it will remain on SDI2 until it is changed manually or when SDI2 fails.

Lock-Mode

With this setting you select to what the card should lock itself to: `SDI1`, `SDI2`, `Ref1` or `Ref2`. When set to `Ref1` or `Ref2` (meaning one of the frame's reference inputs), there will be an autophaser active for the audio, but not a framesynch for the video! Can also be set to `Auto-SDI`, which locks to the currently selected SDI input. Default is `SDI1`.

Out-Frmt

With `Out-Frmt` you can set what the output should be. This setting is only used for the delay options. This will not up/down/cross convert your input signal. Possible settings are:

- `1080i60`, `1080i50`
- `1080p30`, `1080p25`, `1080p24`
- `720p60`, `720p50`
- `SD525`, `SD625`
- `1080p50`, `1080p60` (GED only)
- `Auto` (default, automatically sets the input format as `Out-Frmt`)

Phaser1-Offset

The timing or offset of the autophaser of SDI Input 1 can be tuned with `Phaser1-Offset` (see block schematic) between 0 and 4124px. Default is 0px.

A correct function of the autophaser can be checked using status-items `Phaser1_H_Pos` and `Phaser1_Stat`. When `Phaser1_Stat` shows `Safe`, the autophaser is working in its `Safe`-region. When `Phaser1_Stat` shows `Warning` or `Critical`, the setting `Phaser1_Offset` can be used to tune the autophaser into its `Safe` -region.

The autophaser is enabled when the setting `Lock-Mode` is set to `Ref1` or `Ref2` and when a Ref is present, shown by the status-item `Ref-Format`.

Phaser2-Offset

The timing or offset of the autophaser of SDI Input 2 can be tuned with `Phaser2-Offset` (see block schematic) between 0 and 4124px. Default is 0px.

A correct function of the autophaser can be checked using status-items `Phaser2_H_Pos` and `Phaser2_Stat`. When `Phaser2_Stat` shows `Safe`, the autophaser is working in its `Safe`-region. When `Phaser2_Stat` shows `Warning` or `Critical`, the setting `Phaser2_Offset` can be used to tune the autophaser into its `Safe` -region.

The autophaser is enabled when the setting `Lock-Mode` is set to `Ref1` or `Ref2` and when a Ref is present, shown by the status-item `Ref-Format`.

Phaser-status

It is possible to display the function of the autophasers in the status menu of the card. This setting enables or disables the status-items: `Phaser1_H_Pos`, `Phaser2_H_Pos`, `Phaser1_Stat` and `Phaser2_Stat`. Default setting is `Off`.

DELAY

Delay-Bypass

You can bypass the delay block entirely by setting this to `on`. By default it is switched `off`.

Delay-mode_1

With this setting you decide whether the card should apply delay by means of `time` in milliseconds (defined with `Time-Delay_1`) or to apply delay by means of frames, lines and pixels (`Fr-Ln-Px`).
Default is `Fr-Ln-Px`.

Time-Delay_1

This setting is only used when `Delay-mode_1` is set to `Time`. It defines the delay that should be applied to the video in milliseconds between 0 and 10000ms.

F-delay_1

`F-Delay_1` sets the amount of delayed Frames. The available range is from 0 to 250 frames (dependent on the input format). When Out-Frmt is SD, the maximum is 250 frames, when it is 720p50/60 the maximum is 120 frames. All other HD formats can be delayed a maximum of 60 frames.

V-delay_1

`V-Delay_1` setting allows adjustment of the vertical phase of the output signal with respect to the selected reference input.

The `V-Delay_1` setting gives a delay in addition to the reference timing. For example: if the `V-Delay_1` is set to 10 TV HD lines, the output signal will be delayed by reference timing + 10 TV HD lines. The signal is delayed (advanced) with respect to the phase of the reference signal. The available range is from 0 to a maximum of 1124 lines (dependent on input format). The default setting is `0ln`.

H-delay_1

The `H-Delay_1` setting allows adjustment of the Horizontal phase of the output signal with respect to the selected reference input.

The `H-Delay_1` setting gives a delay in addition to the reference timing. For example: if the `H-Delay_1` is set to 10 pixels, the output signal will be delayed by reference timing + 10 pixels. The signal is delayed (advanced) with respect to the phase of the reference signal. The available range is from 0 to a maximum of 4124 pixels (dependant on input format). The default setting is `0px`.

Delay-Status

It is possible to display (in the status menu `IODelay1`) the processing time of the card in the status menu. This setting allows you to switch this function `ON` or `OFF`. Default setting is `OFF`

PRESET

Control

With this setting you decide whether you want to manually change the presets, change preset via the GPI contacts or change it by signal loss detection (see setting `LossDetect`). A combination of GPI contact overrides together with loss detection is also possible.
`GPI+LossDetect` only works in non-latch mode. Default is `manual`.

GPI-Ctrl

The GAD/HAD/SAD1030 has several physical GPI contacts to control the card's presets (if presets are set to be GPI controlled)

`Latch`: Latching GPI mode. When a contact is closed momentarily (edge triggered).

`Non-Latch`: Non-latching GPI mode. When a contact is closed all the time (level triggered).

`BCD`: Binary GPI mode. GPI contacts work work viewed in the following table:

GPI 3	GPI 2	GPI 1	Activate preset
0	0	0	No change
0	0	1	Preset 1
0	1	0	Preset 2
0	1	1	Preset 3
1	0	0	Preset 4
1	0	1	Preset 5
1	1	0	Preset 6
1	1	1	Preset 7

ExtMode

With this item you set the purpose of pins 5 till 8 of the RJ45 connector on the backpanel. The pupose IS can be either additional `GPIO` contacts (resulting in 7 GPI contacts instead of 3) Default is `GPIO`.

LossDetect

With this setting you can set which source should be checked for the `LossDetect` function (see settings `Control`). When the here-set-source is lost, the card will switch to the preset set with the `Loss` setting. When the source returns, the card will switch to the preset set with the `Detect` setting.

Sources which can be checked on are `ADControl`, `ADProg1/2-Present`,. Default is `ADControl`.

Note: , `ADProg1/2-Present` and `AD-Present` is detected as a loss when the corresponding status items are `NA` or `Silence`

Note: If `LossDetect` is being used settings `#Emb-Mode`, `#Emb_A_Sel` ~ `#Emb_D_Sel` need to have the same values for both "loss" and "detect" presets to circumvent 'reset' of the embedders. This can result in Dolby and/or PCM CRC errors at the output of the embedders. If one of these values change a reset is needed to guarantee audio-phase-alignment for all embedder outputs!

Loss

Here you select to which of the 7 preset the card should switch in case the source set with `LossDetect` is lost. When set to `off` the card will not switch presets when a loss is detected. Default is `off`.

Detect

Here you set a preset to which the card should switch in case a lost source (set with `LossDetect`) has returned

LossDetect_2

With this setting you can set which source should be checked for the `LossDetect_2` function. This second loss-detect function comes into effect when *`LossDetect`* functionality is enabled in the `Config` setting, a loss is detected according to the first loss-detect function (`LossDetect` setting) and the `LossDetect_2` function is enabled (i.e. not set to `off`).

When the here-set-source is lost, the card will switch to the preset set with the `Loss_2` setting. When the source returns, the card will switch to the preset set with the `Detect_2` setting.

Sources which can be checked on are `ADControl`, `ADProg1/2-Present`,. Default is `ADControl`.

Note: , `ADProg1/2-Present` and `AD-Present` is detected as a loss when the corresponding status items are `NA` or `Silence`

Note: If `LossDetect` is being used settings `#Emb-Mode`, `#Emb_A_Sel` ~ `#Emb_D_Sel` need to have the same values for both "loss" and "detect" presets to circumvent 'reset' of the embedders.

This can result in Dolby and/or PCM CRC errors at the output of the embedders. If one of these values change a reset is needed to guarantee audio-phase-alignment for all embedder outputs!

Loss_2

Here you select to which preset the card should switch when the `LossDetect_2` function is in effect and the source set in the `LossDetect_2` setting is lost. Can be presets 1 to 7 (`Preset 1` ~ `Preset 7`) or `off` When set to `off` the card will not switch presets when a loss is detected. Default is `off`.

Detect_2

With this setting you select to which preset the card should switch when the `LossDetect_2` function is in effect and the source set in the `LossDetect_2` setting is detected. Besides the preset 1 to 7 (`Preset 1` ~ `Preset 7`), you can set it to `S2020-SDID`, `ProgramConfig`, `Previous` (previous active preset before the signal was lost) or `off` (don't switch presets when signal returns, default).

Active-Preset

With this item you can manually change the currently active preset . Can be any preset between 1 and 7. By default it is set to 1. All menu settings that are preceded with a '#'-prefix are part of the preset.

Edit-Preset

Here you can select which of the 7 selectable presets you want to edit. Changing this will not change the active preset, unless the currently active preset is the same you are going to edit. All menu settings that are preceded with a '#'-prefix are part of the preset.

#Preset_Name

Sets/displays the name of the currently displayed preset.

PrstEditView

With this setting set to `Follow Active`, the edit preset settings will follow the active preset when the active preset is changed. This to avoid confusion when changing the active. Set to `Independent` the edit preset will not automatically follow active preset changes. By default set to `Follow Active`.

AUDIO DESCRIPTION

The audio description block has 4 input and 4 outputs. The inputs are:

- `ADProg1`: The first actual program audio channel which will be mixed with the audio description.
- `ADProg2`: The second actual program audio channel which will be mixed with the audio description.
- `AD`: the audio description or voice-over audio channel
- `ADControl`: a non-audio signal, which contains Gain and Pan information about how the mix the audio description signal with audio description programs.

The following schematic displays how the audio description block works:

AD-Loss

If `AD-Loss` setting is set to `off` and the `ADLoss` input (see above schematic) loses its AD control signal, the `AD` and `ADControl` inputs are transparently routed to audio description outputs Ch3 and Ch4.

If `AD-Loss` is set to `ADProg1/2` and the `ADControl` input (see above schematic) loses its AD control signal, the program material present on the ADProg1 and ADProg2 inputs will also be copied to audio description outputs Ch1 and Ch2. This is the default setting.

If `AD-Loss` is set to `Mute` and the `ADControl` input (see above schematic) loses its AD control signal, output channels 1 and 2 will be muted

SourceADProg1

Here you set the source of the ADProg1 input (see above schematic). Can be SDI (de-embedder output), Addon01/16 (quadspeed add-on bus inputs 1 till 16) or Addon17/32 (quadspeed add-on bus inputs 17 till 32). Default is SDI.

ADProg1

Here you select one out of the 16 channels of the above selected source which will be your ADProg1 input. Can be set to off, in which case there will be no audio on ADProg1. Default is Ch_1.

SourceADProg2

Here you set the source of the ADProg2 input (see above schematic). Can be SDI (de-embedder output), Addon01/16 (quadspeed add-on bus inputs 1 till 16) or Addon17/32 (quadspeed add-on bus inputs 17 till 32). Default is SDI.

ADProg2

Here you select one out of the 16 channels of the above selected source which will be your ADProg1 input. Can be set to off, in which case there will be no audio on ADProg1. Default is Ch_2.

SourceAD

Here you set the source of the AD input (see audio description block schematic). Can be SDI (de-embedder output), Addon01/16 (quadspeed add-on bus inputs 1 till 16) or Addon17/32 (quadspeed add-on bus inputs 17 till 32). Default is SDI.

AD

Here you select one out of the 16 channels of the above selected source which will be your AD input. Can be set to off, in which case there will be no audio on ADProg1. Default is Off.

SourceADControl

Here you set the source of the ADControl input (see audio description block schematic). Can be SDI (de-embedder output), Addon01/16 (quadspeed add-on bus inputs 1 till 16) or Addon17/32 (quadspeed add-on bus inputs 17 till 32). Default is SDI.

ADControl

Here you select one out of the 16 channels of the above selected source which will be your ADControl input. Can be set to off, in which case there will be no audio on ADProg1. Default is Off.

ADProg1_Gain

With this setting you can separately gain the ADProg1 input between -999dB and 12dB. Default is 0dB

ADProg2_Gain

With this setting you can separately gain the ADProg2 input between -999dB and 12dB. Default is 0dB

AD_Gain	With this setting you can separately gain the AD input between -999dB and 12dB. Default is 0dB
ADProg1_Delay	With this setting you can separately delay the ADProg1 input between 0ms and 5000ms. Default is 0ms.
ADProg2_Delay	With this setting you can separately delay the ADProg2 input between 0ms and 5000ms. Default is 0ms.
AD_Delay	With this setting you can separately delay the AD input between 0ms and 5000ms. Default is 0ms.
ADControl_Delay	With this setting you can separately delay the ADControl input between 0ms and 5000ms. Default is 0ms.
	EMBEDDING
#Emb- Mode	With `Emb-Mode` you select how the audio in should be embedded into the video: `overwrite` the existing audio, or `Append`. Can also be set to `off` (switching off embedding entirely). Default is `overwrite`.
#Emb_A_Sel ~ #Emb_D_Sel	With these setting you select into which audio group (= 4 audio channels) you want embedders A to D to embed the forwarded audio channels coming from the audio inputs/add-on bus. Can be `group1`, `group2`, `group3` or `group4`. You can also choose to not use the forwarded audio channels for anything by setting this item to `off`. By default it is set to `Group1`.
	EMB AUDIO OUT
#SourceEmb-A1 ~ #SourceEmb-A4	With these settings you can select where the corresponding audio channels (channel A1 till channel A4) of embedder A are coming from: ■ `SDI`: Audio comes from the SDI input ■ `AddOn01/16`: Audio comes from addon bus (first 16 ch) ■ `AddOn17/32`: Audio comes from addon bus (second 16 ch) ■ `AudioDescrOut`: Audio comes from audio description block
#Emb-A1 ~ #Emb_A4	With this setting you decide which audio channel out of the above selected source is used for embedder A channels 1 till 4. Can be any of the available 16 channels or set to `off`.

#SourceEmb-B1 ~ #SourceEmb-B4	With these settings you can select where the corresponding audio channels (channel B1 till channel B4) of embedder B are coming from: ■ `SDI`: Audio comes from the SDI input ■ `AddOn01/16`: Audio comes from addon bus (first 16 ch) ■ `AddOn17/32`: Audio comes from addon bus (second 16 ch) ■ `AudioDescrOut`: Audio comes from audio description block
#Emb-B1 ~ #Emb_B4	With this setting you decide which audio channel out of the above selected source is used for embedder B channels 1 till 4. Can be any of the available 16 channels or set to `off`.
#SourceEmb-C1 ~ #SourceEmb-C4	With these settings you can select where the corresponding audio channels (channel C1 till channel C4) of embedder C are coming from: ■ `SDI`: Audio comes from the SDI input ■ `AddOn01/16`: Audio comes from addon bus (first 16 ch) ■ `AddOn17/32`: Audio comes from addon bus (second 16 ch) ■ `AudioDescrOut`: Audio comes from audio description block
#Emb-C1 ~ #Emb_C4	With this setting you decide which audio channel out of the above selected source is used for embedder C channels 1 till 4. Can be any of the available 16 channels or set to `off`.
#SourceEmb-D1 ~ #SourceEmb-D4	With these settings you can select where the corresponding audio channels (channel D1 till channel D4) of embedder D are coming from: ■ `SDI`: Audio comes from the SDI input ■ `AddOn01/16`: Audio comes from addon bus (first 16 ch) ■ `AddOn17/32`: Audio comes from addon bus (second 16 ch) ■ `AudioDescrOut`: Audio comes from audio description block
#Emb-D1 ~ #Emb_D4	With this setting you decide which audio channel out of the above selected source is used for embedder D channels 1 till 4. Can be any of the available 16 channels or set to `off`.
#EmbA1_Gain ~ #EmbD4_Gain	Adjusts the gain for the corresponding incoming audio input between -60 and 12dB. Everything below -60 is indicated as -999dB and means the audio will be muted.
#EmbA1_Phase ~ #EmbD4_Phase	Adjusts the audio phase of the corresponding individual input to 0 degrees or 180 degrees.
#EmbA1_Delay ~ #EmbD4_Delay	Adjusts the delay of the corresponding audio channel between 0 and 5000ms.

	MISC
NonPCM-Bypass	With this setting you can switch to bypass audio processing for all non-PCM audio `on` or `off`.
Fade-Time	Fade/time is locked to 2 parameters: channel-switch and gain-change. It is used as the fade-in/out time of the channel-switch of audio channels. The old channel will be fade-out and the new channel will be fade in according to the time chosen with fade-time. Fade-Time is also used for smooth transitions when gain-values or presets are changed. These smooth transitions are triggered by a change in Gain settings or a Preset change. With this setting you can manually set this fade time between `100ms` and `10.000ms`. The default is `400ms`.
Audio-Phase	If this setting is set to *Align*, the card ensures audio-phase alignment between multiple audio channels and audio groups, which is necessary for multi-channel (surround) purposes. If errors in the signal-chain occur the de-embedder blocks reset synchronously to maintain audio-phase-alignment. If this setting is set to *Off*, the card *eats-all* audio including errors. Even if there are DBN/ANC/ECC or channel-sequence errors, the de-embedder will pass them. Be aware that audio-phase-alignment between multiple audio channels and audio groups can not be maintained if this setting is set to *Off*. **Note:** This setting can be helpful to solve problems in the field using equipment which doesn't follow the standards correctly.
AudioStatusBits	With this setting you select whether the audio status bits should be `Transparant` (same status bit on the outputs as on the inputs) or to `overwrite` them with new status bits.
Silence-Level	Here you set the threshold of the audio level when an audio signal will be reported as silent. Can be set between -100dBFS and -20dBFS. Default is -60dBFS.
Silence-Time	Here you can set the threshold in time when an audio signal will be reported as silent. Can be set between 1 and 255 seconds. Default is 10 seconds.

6 Status Menu

Introduction

The status menu indicates the current status of each item listed below.

SDI-Input_1

This status item indicates the presence and format of a valid signal in input 1. This is displayed as:

- 1080p60
- 1080p50
- 1080p30
- 1080p25
- 1080p24
- 1080i60
- 1080i50
- 720p60
- 720p50
- SD625
- SD525
- NA

SDI-Input_2

This status item indicates the presence and format of a valid signal in input 2. Displayed the same as described under SDI-Input_1.

SDI-Map_1

Displays whether the 3Gb/s input on input 1 is mapped as Level A or Level B. If the input is not 3Gb/s (1080p50 or 1080p60) this item indicates NA.

SDI-Map_2

Displays whether the 3Gb/s input on input 2 is mapped as Level A or Level B. If the input is not 3Gb/s (1080p50 or 1080p60) this item indicates NA.

SDI-Freq_1

Indicates the frequency of SDI input 1. Can be 1:1, 1:1.001 or NA.

SDI-Freq_2

Indicates the frequency of SDI input 2. Can be 1:1, 1:1.001 or NA.

CRC-Stat_1

Displays if there are CRC errors on input 1.

CRC-Stat_2

Displays if there are CRC errors on input 2.

Ref-Format

Displays the reference format. Can be one of the following:

- NA
- NTSC/480i
- PAL/576i
- 480p
- 576p
- 720p
- 1080i
- 1080p

Phaser1_H_Pos

This item shows the distance of SDI-Input1 to REF timing (write-read timing) of the autophaser. It is directly related to a correct function of the autophaser. When the SDI-Input1 to REF-timing is close, the function of the autophaser gets critical. The setting Phaser1-Offset can be used to tune the Phaser1_H_Pos.

When Phaser-Status setting is set to Off, or when Lock Mode is set to SDI1, SDI2 or Auto-SDI, or when Lock-Mode is set to Ref1 or Ref2 and status-item Ref-Format shows NA, then Phaser1_H_Pos will show: 0px.

Phaser2_H_Pos

This item shows the distance of SDI-Input2 to REF timing (write-read timing) of the autophaser. It is directly related to a correct function of the autophaser. When the SDI-Input2 to REF-timing is close, the function of the autophaser gets critical. The setting Phaser2-Offset can be used to tune the Phaser2_H_Pos.

When Phaser-Status setting is set to Off, or when Lock Mode is set to SDI1, SDI2 or Auto-SDI, or when Lock-Mode is set to Ref1 or Ref2 and status-item Ref-Format shows NA, then Phaser2_H_Pos will show: 0px.

Phaser1_Stat

This item shows the status of the autophaser. It uses the value shown in Phaser1_H_Pos to calculate 3 working regions for the autophaser: Safe, Warning and Critical.

Safe: Phaser1_H_Pos shows a value > 50px
Warning: Phaser1_H_Pos shows a value > 20px and < 50px
Critical: Phaser1_H_Pos shows a value < 20px

When Phaser-Status setting is set to Off, or when Lock Mode is set to SDI1, SDI2 or Auto-SDI, or when Lock-Mode is set to Ref1 or Ref2 and status-item Ref-Format shows NA, then Phaser1_Stat will show: NA.

Phaser2_Stat	This item shows the status of the autophaser. It uses the value shown in `Phaser2_H_Pos` to calculate 3 working regions for the autophaser: `Safe`, `Warning` and `Critical`. `Safe:` `Phaser2_H_Pos` shows a value > 50px `Warning:` `Phaser2_H_Pos` shows a value > 20px and < 50px `Critical:` `Phaser2_H_Pos` shows a value < 20px When `Phaser-Status` setting is set to `Off`, or when `Lock Mode` is set to `SDI1`, `SDI2` or `Auto-SDI`, or when `Lock-Mode` is set to `Ref1` or `Ref2` and status-item `Ref-Format` shows `NA`, then `Phaser2_Stat` will show: `NA`.
SDI1-Ref_Offset	This item indicates the offset between SDI1 and the reference (if present).
SDI2-Ref_Offset	This item indicates the offset between SDI2 and the reference (if present).
Locked-To	Displays to what the card is locked: `Ref`, `SDI1`, `SDI2`, or `Not Locked`.
Active-Out1	Displays what the current active output is on SDI output 1. Can be `SDI1` or `SDI2`
Active-Out2	Displays what the current active output is on SDI output 2. Can be `SDI1` or `SDI2`
IO-Delay_1	Displays the I/O delay between the input and the output. Only indicated when `Delay-Status` is set to `on`.
GPI	Displays the currently active GPI value (1 to 7). 0 indicates there's no GPI input active.
ATC_Stat	Detects a `present` ATC timecode signal. When no ATC signal is detected, `NA` is indicated. When a invalid ATC signal is detected, this item indicates `Error`.
ANC_Stat	Shows the status of the ancillary data. Can be NA, OK or error.
GrpInUse	Displays which groups are in use on the active input. Displayed as for instance 1_3_ when groups 1 and 3 contain audio and for instance _234 when groups 2, 3 and 4 contain audio.

EmbFrmtIn01/02 ~ EmbFrmtIn15/16	Displays the format of the corresponding embedder input channels (source dependant from #SourceEmb setting). Same formats can be detected as displayed under DecInFrmt01/02.
AddOnFrmtIn01/02 ~ AddOnFrmtIn31/32	Displays the format of the corresponding addon input channels. Same formats can be detected as displayed under DecInFrmt01/02.
ADProg1-Stat~ ADProg2-Stat	Display the status of the program input of the Audio Description processor. Can be OK, NA, Clipped (meaning the audio is clipping) or Silence.
AD-Stat	Display the status of the audio description input of the Audio Description processor. Can be OK, NA, Clipped (meaning the audio is clipping) or Silence.
ADControl-Stat	Display the status of the control ("Warble Tone") of the Audio Description processor. Can be OK, NA, or Error.
EmbStatOutA1 ~ EmbStatOutD4	Display the status of each individual embedder output channels. Can be OK, NA or Clipped (meaning the audio is clipping).
EmbFrmtOutA1/2 ~ EmbFrmtOutD3/4	Indicates the format of the outputs of the embedders. Can indicate the Same formats as displayed under DecInFrmt01/02.
FPGA-Stat	Displays the status of the FPGA chip. Can be error or OK.
DM-A_Type	Displays which type of input or output board is currently detected on circuit A. Can be NA, Digital Input, Digital Output, Analog Input, or Analog Output.
DM-A_Status	Indicates the status of I/O board A, can be OK, NA or Error.
DM-B_Type	Displays which type of input or output board is currently detected on circuit B. Can be NA, Digital Input, Digital Output, Analog Input, or Analog Output.
DM-B_Status	Indicates the status of I/O board B, can be OK, NA or Error.

7 Events Menu

Introduction

An event is a special message that is generated on the card asynchronously. This means that it is not the response to a request to the card, but a spontaneous message.

What is the Goal of an event?

The goal of events is to inform the environment about a changing condition on the card. A message may be broadcast to mark the change in status. The message is volatile and cannot be retrieved from the system after it has been broadcast. There are several means by which the message can be filtered.

Events

The events reported by the card are as follows;

Announcements

`Announcements` is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on

Input_A

Input_A can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

Input_B

Input_B can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

CRC-Status1

CRC-status1 can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

CRC-Status2

CRC-status2 can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

Ref-Status

Reference can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

Lock-Status

Lock status can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.

What information is available in an event?

The message consists of the following items;

1) A message string to show what has happened in text, for example: “INP_LOSS”, “REF_LOSS”, “INP_RETURN”.
2) A tag that also shows what happens, but with a predefined number: e.g. 1 (= loss of input), 2 (= loss of reference), 129(= 1+128 = return of input). For a list of these predefined tags see the table on the next page.
3) A priority that marks the importance of an event. This value is defined by the user and can have any value between 1 and 255, or 0 when disabled.
4) A slot number of the source of this event.

The Message String

The message string is defined in the card and is therefore fixed. It may be used in controlling software like Synapse Set-up to show the event.

The Tag

The tag is also defined in the card. The tag has a fixed meaning. When controlling or monitoring software should make decisions based on events, it is easier to use the tag instead of interpreting a string. The first implementation is the tag controlled switch in the GPI16.

In cases where the event marks a change to fault status (e.g. 1 for Loss of Input) the complement is marked by the tag increased by 128 (80_{hex}) (e.g. 129 (81_{hex}) for Return of Input).

Defining Tags

The tags defined for the card are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcement of report and control values
Input_A	01_{hex}=INPA_LOSS	81_{hex}=INPA_RETURN	input A lost or returned
Input_B	12_{hex}=INPB_LOSS	92_{hex}= INPB_RETURN	input B lost or returned
CRC-Status1	03_{hex}=CRC1_ERROR	83_{hex}=CRC1_OK	CRC1 error or OK
CRC-Status2	43_{hex}=CRC2_ERROR	$c3_{hex}$=CRC2_OK	CRC2 error or OK
Ref-Stats	02_{hex}=REF_LOSS	82_{hex}=REF_RETURN	Reference lost or returned
Lock-Status	11_{hex}=INP_NO_LOCK	91_{hex}=INP_LOCK	Input not locked or input locked

The Priority

The priority is a user-defined value. The higher the priority of the alarm, the higher this value. Setting the priority to Zero disables the announcement of this alarm. Alarms with priorities equal or higher than the Error Threshold setting of the RRC will cause the error LED on the Synapse rack front panel to light.

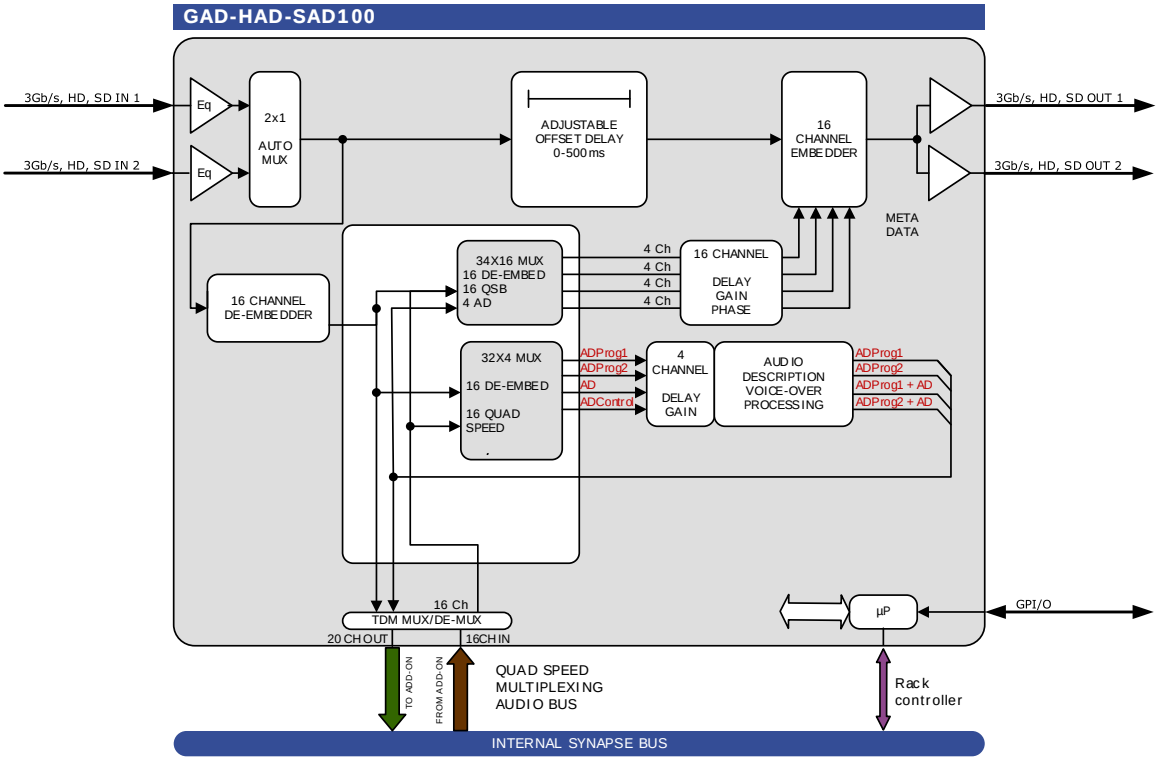
The Address

Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.

8 LED Indication

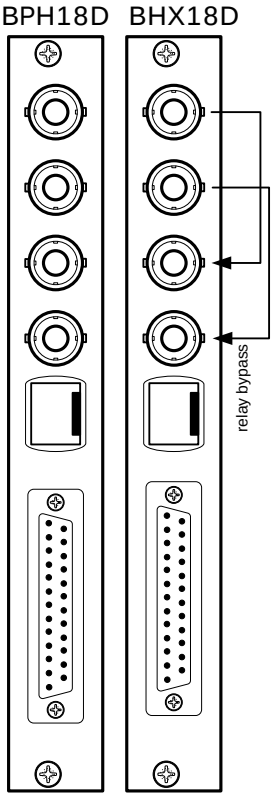
Error LED	The error LED indicates an error if the internal logic of the GED/HED130 card is not configured correctly or has a hardware failure.
Input_1 LED	This LED indicated the presence of a valid SDI video signal on input 1.
Input_2 LED	This LED indicated the presence of a valid SDI video signal on input 2.
ANC Data_1 LED	Indicates the presence of embedded audio within input 1.
ANC Data_2 LED	Indicates the presence of embedded audio within input 2.
Reference LED	Indicated the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2).
Data Error_1 LED	This LED indicates a CRC error on input 1.
Data Error_2 LED	This LED indicates a CRC error on input 2.
Connection LED	This LED illuminates after the card has initialized. The LED lights for 0.5 seconds every time a connection is made to the card.
Error LED	The error LED indicates an error if the internal logic of the card is not configured correctly or has a hardware failure.
DM_1 Pres	Indicates if an I/O board is detected on position 1
DM_2 Pres	Indicates if an I/O board is detected on position 2
DM_1 Error	Indicates if there is an error on I/O board 1
DM_2 Error	Indicates if there is an error on I/O board 2

9 Block Schematic



10 Connector Panels

The GED-HED130 can be used with the BPH18, the BHX18D or the bypass relay equivallents. The following table displays the pinout of these backpanels in combination with the card.

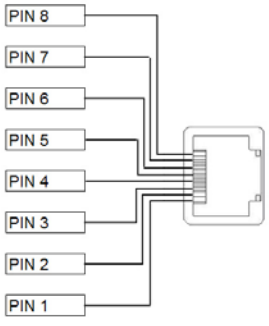


3Gb/s, HD, SD SDI INPUT 1 (OPTIONAL FIBER INPUT)	
3Gb/s, HD, SD SDI INPUT 2 (OPTIONAL FIBER INPUT)	
3Gb/s, HD, SD SDI OUT 1 (OPTIONAL FIBER OUTPUT)	
3Gb/s, HD, SD SDI OUT 2 (OPTIONAL FIBER OUTPUT)	
GPI	
NOT CONNECTED	

!Unused inputs and outputs must be terminated with the correct impedance!

GPI pinning

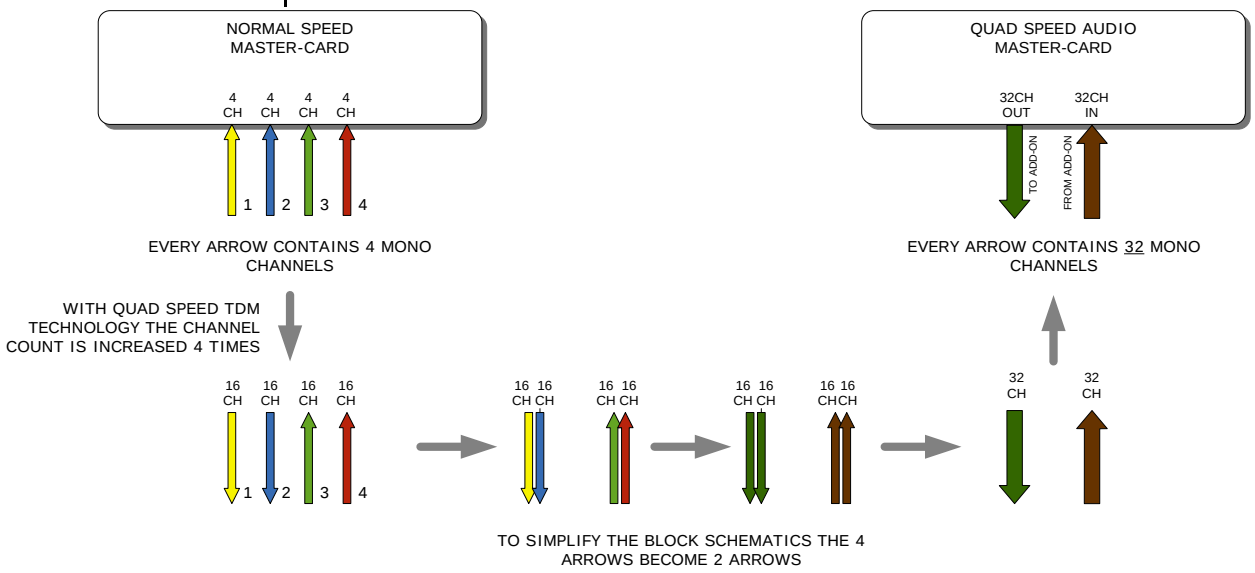
Pin	Function
1	Ground
2	GPI 1
3	GPI 2
4	GPI 3
5	TXA asynchronous data out + / GPI 4
6	TXB asynchronous data out - / GPI 5
7	RXA asynchronous data in + / GPI 6
8	RXB asynchronous data in - / GPI 7



Appendix 1: Quad speed bus explained

The internal audio ADD-ON bus needed an upgrade for some applications. We wanted more channels (32 per video stream seem possible in the near future). And we want the bus to be bidirectional, so 32 channels in and 32 channels out at the same time.

The new interface needed to be compatible with all existing hardware (frames) and in the implementation of the master card it sometimes needed to be backward compatible with the original ADD-ON bus.



So the MASTER-CARD is now firmware enhanced to run 32 channels in either direction (64 channels total) instead of 16 channels in one direction

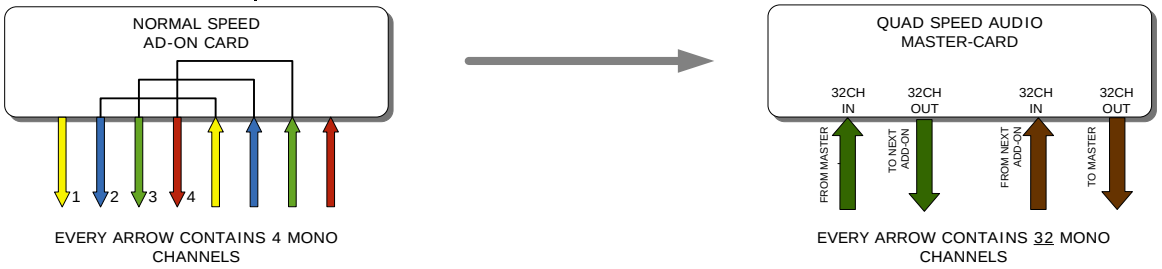
Some MASTER-CARD's will have two modes and some MASTER-CARD's will only have the Quad Speed mode [where the logical ADD-ON cards are only available in Quad Speed mode:

Dual mode MASTER-CARD's have a menu item to select the appropriate mode are. If a mode is selected all ADD-ON cards to that Master need to be in the same mode.

The following features and rules will apply:

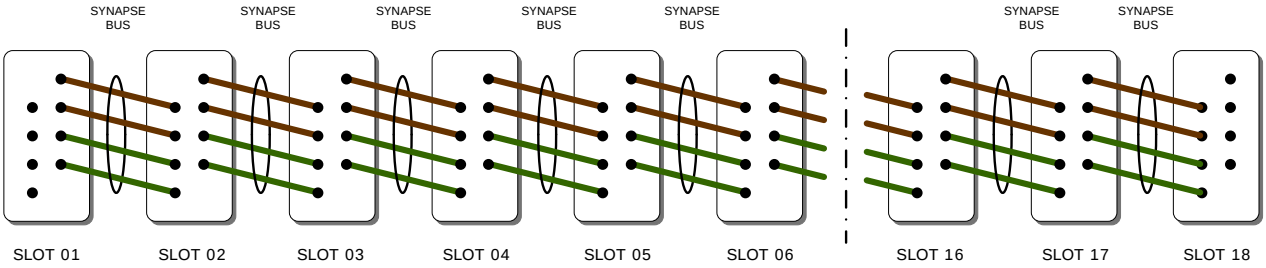
- Up to 32 channels output from the master card with looping to up to 3 ADD-ON cards
  - The ADD-ON card just picks the channels it wants to process
  - Some ADD-ON cards will have the possibility to re-inject processed audio onto the next ADD-ON card
- Up to 32 channels input on the master card
  - If the master card can handle less than 32 channels, the lowest channel numbers will be used, as the ADD-ON card will always generate 32 channels (where some channels can be empty or silent)
- Channel shuffling is done in the ADD-ON card
  - The Master Card has only one setting to enable the quad speed audio bus

- Every Quad-Speed ADD-ON card takes 32 channels from the 'right hand ADD-ON card' and adds (or overwrites) the local processed channels.
  - This can be done for any of the channels that are processed in the ADD-ON card
- Some Master Cards are switchable between normal and quad-speed bus
- Channel designations on the block schematics:
  - Channel 1-32 (or less) are injected into the dark green large arrow from Master Card to ADD-ON card and looped on to the next ADD-ON card via the dark green arrow
  - The ADD-ON card injects up to 32 channels into the brown large arrow
  - An ADD-ON card will also actively loop extra processed channels into the next ADD-ON card, and finally into the Master Card
- The cross looping of the original design is now a straight loop
- The quad speed bus can also work in one direction
  - You can use a Quad Speed audio bus to de-embed audio from the master and present on the ADD-ON card as AES/EBU, Bitstream (like Dolby) or analog audio
  - If applicable the ADD-ON card can also be used as in injection point of physical audio streams



The ADD-ON cards also provide a looping function from one ADD-ON to the next ADD-ON card. This is however a more intelligent looping with optional re-insertion and multiplexing of signals.

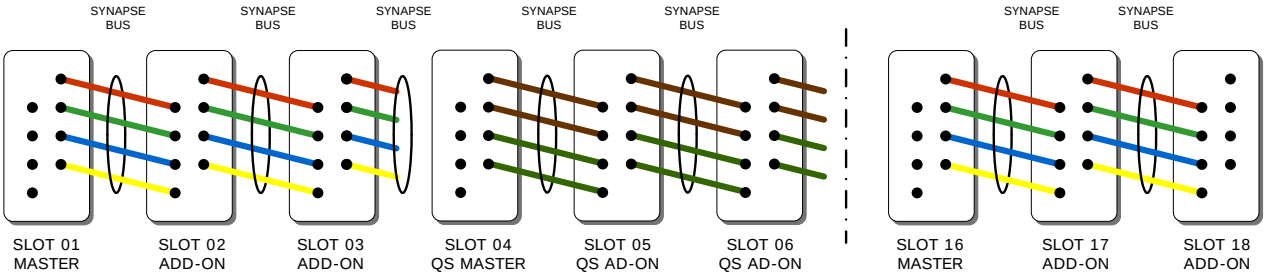
Cascading of Quad Speed cards works identical to normal add-on cards. Every connection in the example below transports 16 mono audio channels (= 32 channels per color). It shows the inter slot connections 'in quad Speed mode' as part of the frame bus PCB.



The system makes use of the same passive copper traces on the internal bus PCB as normal add-on bus cards.

The maximum amount of ADD-ON cards in Quad Speed mode is 3. These 3 ADD-ON cards will run all on the same clock in the same phase as the MASTER-CARD. This guarantees that audio channels that are processed in different ADD-ON cards will still operate in the same phase, something very important when processing multiple discrete surround channels.

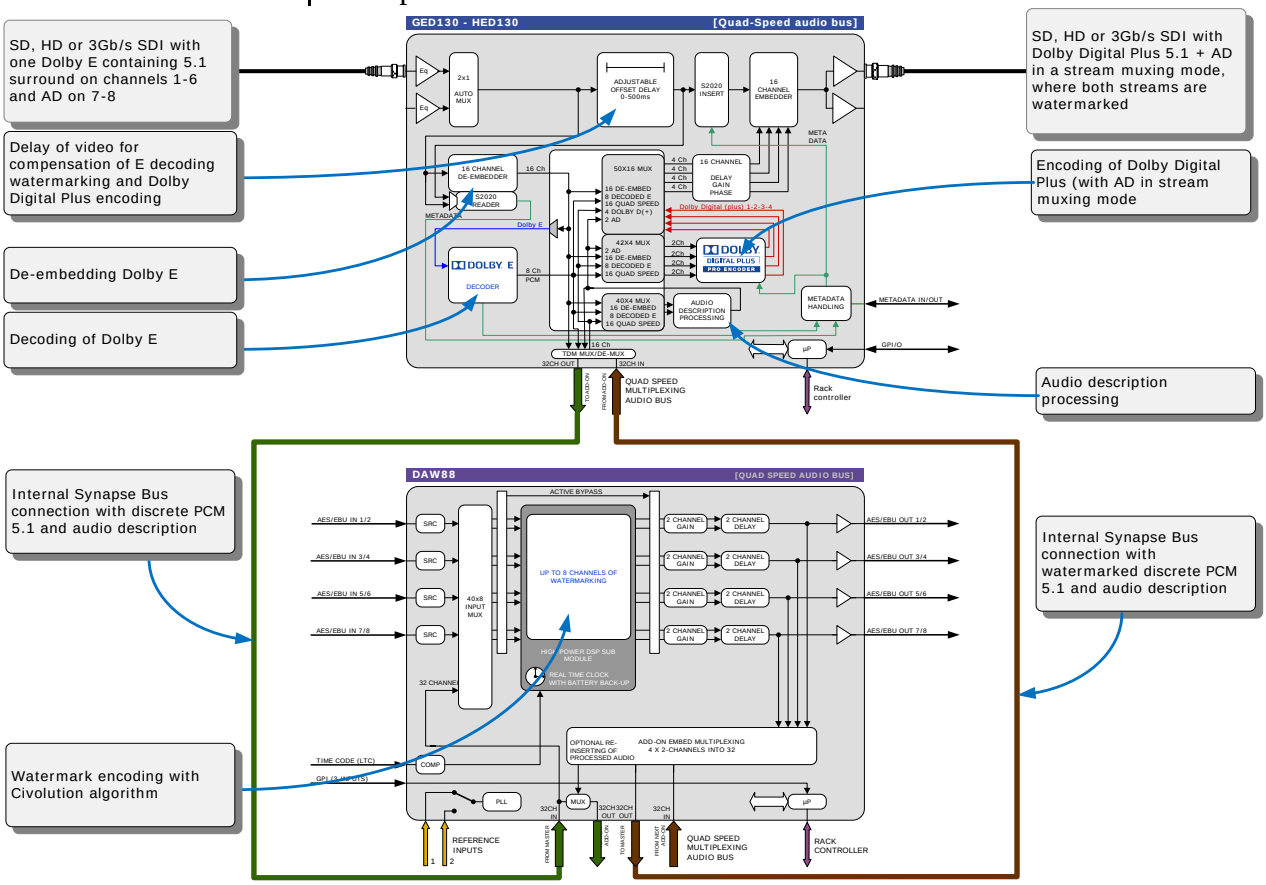
You can mix normal speed Master-Cards with Quad Speed MASTER-Cards in one frame as the MASTER-CARD breaks the connection to the left hand card. All cards to the right of the master must be in the same mode as the master.



Mixing normal ADD-ON with Quad Speed ADD-ON combo's in one frame is allowed

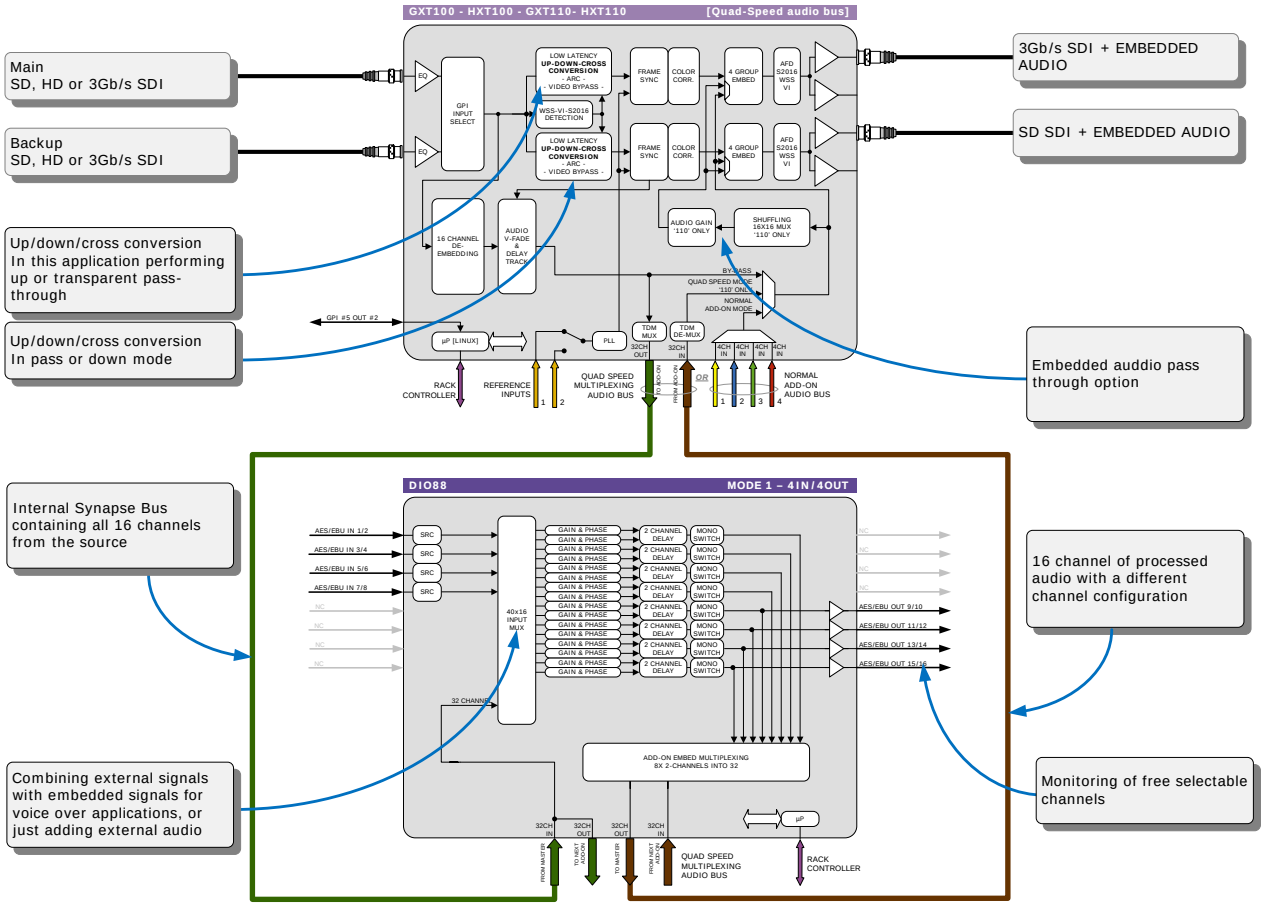
Some examples

This is an Example where we combine a MASTER-CARD that performs embedded domain Dolby E to Dolby Digital Plus encoding. Between the E-decoding and Dolby Digital Plus encoding we want to watermark the left, right and center channel of a the decoded discrete 5.1 surround channels and watermark a PCM channel used as a voice over for audio description.



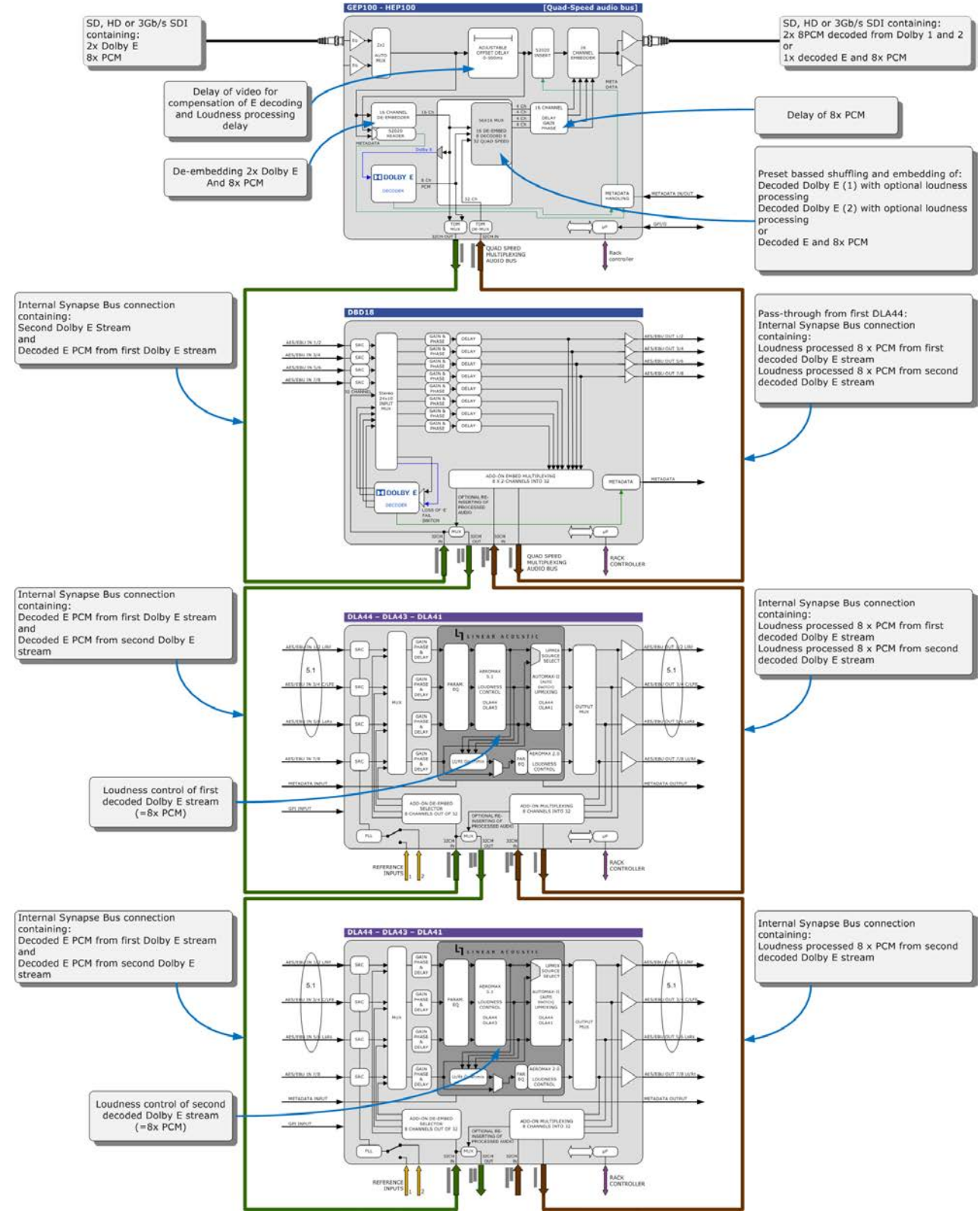
Embedded domain Dolby E to Dolby Digital Plus with Watermarking. The only connection to the outside world are two BNC cables.

Another example of the Quad-Speed audio ADD-ON bus shows a transmission application where a dual up/down/cross output card is connected to a DIO88 in a setup where the embedded audio combined with external audio and a convenient PCM monitoring is available.



In the following example (next page) you will see a 4 card application that performs a massive amount of processing divided over 1 MASTER-CARD and 3 ADD-ON cards. This is a typical ‘ingest’ configuration and is used where the infrastructure does not use Dolby E (two in this example) but PCM+s2020. The input is a SD, HD or 3Gb/s SDI containing 2 Dolby E streams and 8 mono PCM streams. The output is the same SDI stream but with a selection of 16 channels selected out 8 original PCM channels and 16 PCM channels that are decoded from the Dolby E streams. The combo performs the following processing:

- De-embedding of 8x PCM and 2x Dolby E
- Decoding of two independent Dolby E streams
- Loudness processing of up to 16 channels sourced by any of the 8x PCM or decoded Dolby E streams
- Upmixing of a 2.0 to 5.1 if a Dolby E stream is not available
- Physical monitoring of all processed PCM streams
- Preset based shuffling of all source channels into 16 channels with the appropriate offset delays
- S2020 metadata insertion sourced from the E decoders, embedded s2020, generated presets or an external feed
- Video delay to compensate for audio propagation delay
- Embedding of up to 16 channels


GEP100 - HEP100
[Quad-Speed audio bus]
SD, HD or 3Gb/s SDI containing:
2x Dolby E
8x PCM
Delay of video for compensation of E decoding and Loudness processing delay
De-embedding 2x Dolby E And 8x PCM
SD, HD or 3Gb/s SDI containing:
2x 8PCM decoded from Dolby 1 and 2
or
1x decoded E and 8x PCM
Delay of 8x PCM
Preset bassed shuffling and embedding of:
Decoded Dolby E (1) with optional loudness processing
Decoded Dolby E (2) with optional loudness processing
or
Decoded E and 8x PCM
QUAD SPEED MULTIPLEXING AUDIO BUS
Rack controller
Internal Synapse Bus connection containing:
Second Dolby E Stream
and
Decoded E PCM from first Dolby E stream
DBD18
Pass-through from first DLA44:
Internal Synapse Bus connection containing:
Loudness processed 8 x PCM from first decoded Dolby E stream
Loudness processed 8 x PCM from second decoded Dolby E stream
Internal Synapse Bus connection containing:
Decoded E PCM from first Dolby E stream
and
Decoded E PCM from second Dolby E stream
DLA44 - DLA43 - DLA41
Internal Synapse Bus connection containing:
Loudness processed 8 x PCM from first decoded Dolby E stream
Loudness processed 8 x PCM from second decoded Dolby E stream
Loudness control of first decoded Dolby E stream (=8x PCM)
Internal Synapse Bus connection containing:
Decoded E PCM from first Dolby E stream
and
Decoded E PCM from second Dolby E stream
DLA44 - DLA43 - DLA41
Internal Synapse Bus connection containing:
Loudness processed 8 x PCM from second decoded Dolby E stream
Loudness control of second decoded Dolby E stream (=8x PCM)

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