



DBD28

Multi format Dolby stream decoder with
Quad-Speed audio bus and voice over module

Installation and Operation manual



Synapse

TECHNICAL MANUAL

DBD28

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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, SFR08 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.

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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.



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

Axon Digital Design DBD28



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.

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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 those manuals as well.



CHECK-OUT: “AXON CORTEX” SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES

Although not required to use Axon Cortex with a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with Axon 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.

Locating the card

The Synapse card can be placed vertically in an SFR18 frame or horizontally in an SFR08 or SFR04 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 LEDs 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 initialization settings. All LEDs will light during this process. After initialization, several LEDs will remain lit – the exact number and configuration is dependant upon the number of inputs connected and the status of the inputs.

Default settings

In the default condition, the DBD28 acts as a Dolby Digital Plus encoder locked to AES input 1, encoding AES 1/2 till AES 7/8 into a 5.1+2 Dolby digital plus output, using external incoming meta data program streams.

Changing settings and parameters

The front panel controls or 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.

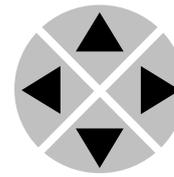
- Press ► To go forward through the menu structure.
- Press ◀ To go back through the menu structure.
- Press ▲ To move up within a menu or increase the value of a parameter.
- Press ▼ To move down through a menu or decrease the value of a parameter.

REMARK: 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

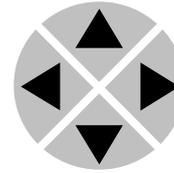
```
RRC18 [Select Card]
>S01=SFS10
```



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
```

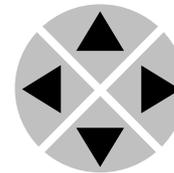


Pressing the ► selects the menu item shown, in this example Settings.

(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 its current setting is Auto.

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

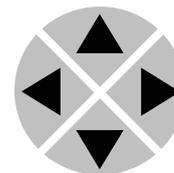


Pressing the ► selects the settings item shown, in this example SDI-Format.

(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]
```



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

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 Axon Cortex help files (press F1 in any window).

Menu Structure Example

Slot	Module	Item	Parameter	Setting
▲				
▲				
S02		Identity		
▲		▲		
S01	SFS10	Settings	SDI-Format	Auto
▼		▼	▼	▼
S00	RRC18	Status	Mode	625
		▼	▼	▼
		Events	Ref-Input	525
			▼	
			H-Delay	
			▼	
			▼	

REMARK: Further information about Front Panel Control and Axon Cortex can be obtained from the rack controller manual and Axon Cortex help files.

4 The DBD28 Card

Introduction

The DBD28 is a next generation Dolby multi format decoder with quad speed ADD-ON audio bus. Based on the Dolby's new Cat. No. 1100sub module it is capable of decoding **Dolby E**, **Dolby Digital** and **Dolby Digital Plus**. The enhanced feature set includes the capability of decoding 7.1-channel Dolby Digital Plus or 5.1-ch Dolby Digital 5.1 with audio description, carried in a single bitstream (Single PID), or as two bitstreams (Dual PID). In addition to the extensive Dolby Decoding capabilities this card can add a voice activated (or triggered by GPI) Voice Over signal to any of the decoded streams or plain PCM streams that could enter the unit.

Individual delay and gain controls are available for all decoded or plain PCM streams that entered the card. A dual mode I/O configuration is possible with physical 2x AES/EBU in and 6x AES/EBU out or 4x AES/EBU in and 4x AES/EBU out.

- Multi format ADD-ON or stand alone Dolby stream decoder
 - Dolby E
 - Dolby Digital
 - Dolby Digital Plus
- 16 channel PCM processing capabilities
- Quad speed audio bus for convenient routing of ADD-ON channels
- Optional re-inserting of processed audio for downstream post-processing (DLAxx)
- 2 or 4 physical stereo AES/EBU inputs and 16 stereo bus inputs. 4 or 6 physical stereo AES/EBU (can contain Dolby Bit streams) outputs and 8 stereo (into 16 stereo) bus outputs
- E decoding with automatic source selection on loss of E
- Voice activated Voice Over engine that can be applied to any of the 16 internal streams
 - GPI trigger of VO is included
 - GPI can be used as 'cough button' to mute unwanted voice activated mixing
- Physical metadata output
- Individual offset delay per channel
- Individual gain control per channel (except bitstream input)
- Able to handle all AES/EBU input formats (optional SRC on inputs)
- Full audio channel shuffling
- Loudness measurement according to ITU BS.1770 and ITU BS,1770-2 (CALM and R128)
 - A tone generator is included that can be controlled by the loudness measurement.
 - It will generate a -20dBFS sine wave when the loudness measurement reads and measures -20LUFS so a normal peak/VU/dBFS meter can be used to read loudness

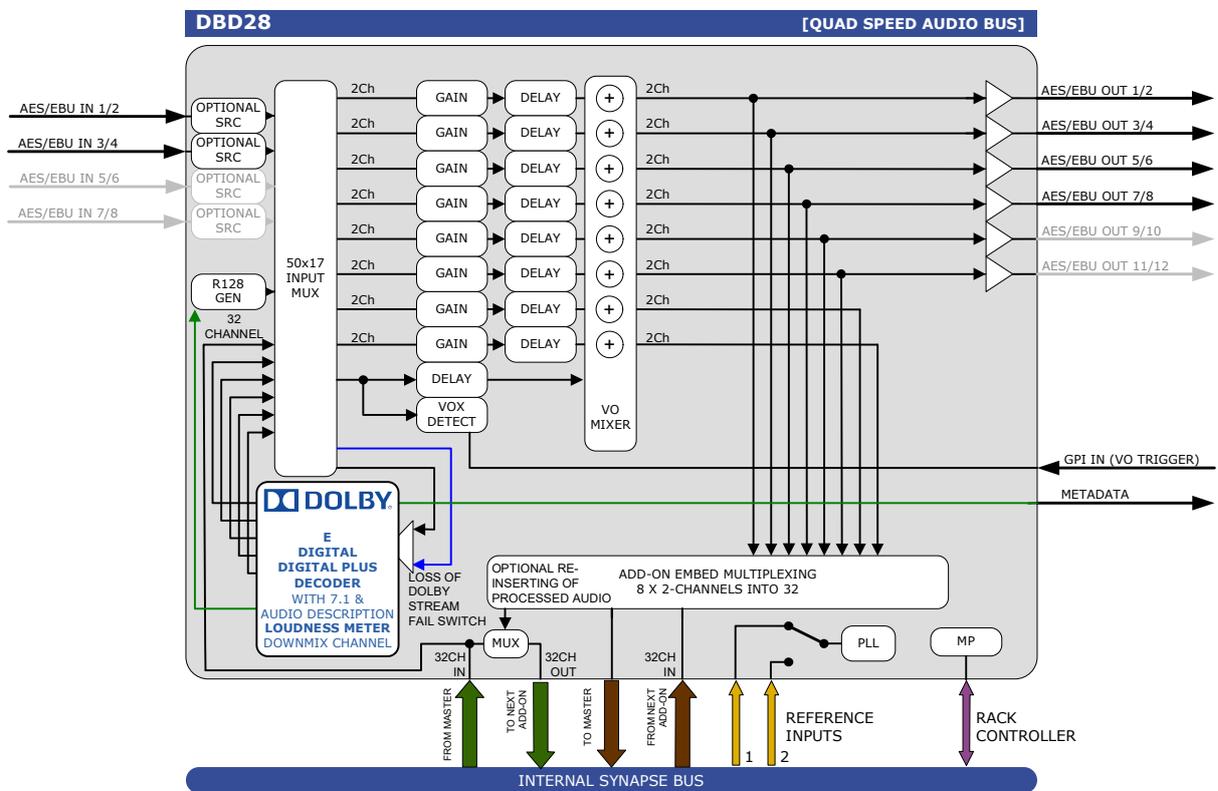
Applications

- Multi format Dolby Stream monitoring decoder
- Efficient Dolby stream processing to Quad Speed audio Master Cards.
- Extra Dolby channel processing next to G/HEP100, G/HPD100 and G/HED100

Program Procedure

This card can be updated with new firmware when new firmware versions are released by Axon. You can download the .spf file from our website when new releases are announced. To upgrade the DBD28 you can follow the instructions as described in the 'reprogramming cards quick-guide', downloadable via our website.

Block schematics



5 Settings Menu

Introduction

The settings menu displays the current state of each setting within the DBD28 and enables the item to be changed or adjusted.

Settings can be changed using the front panel of the Synapse frame (SFR18, SFR08 or SFR04) or Axon Cortex.

Please refer to chapter 3 for information on the Synapse front panel control and Axon Cortex.

SYSTEM CONTROL

SRC

The AES/EBU inputs are connected to a Sample Rate Converter. This enables the input to use audio sample rates that are non-synchronous to video of the master card (setting `On`). For Non PCM audio data (Dolby Digital, Dolby E, etc.) the SRC can be bypassed and the data is inserted in the card transparently (`Trans`). The default setting is `On`.

Lock-Mode

The DDP24/94 can be used as an ADD_ON card (in combination with an embedder/de-embedder card). In this case you are referred to the setting `MasterCard`, which will extract the reference from the master card. It is also possible to use an external signal to lock to. In that case you are referred to the setting:

`AES1` = Locks to the AES/EBU signal on input 1 (default)

`AES4` = Locks to the AES/EBU signal on input 4

`Ref1` = The B&B reference input of the rack controller

`Ref2` = The second B&B reference input of the rack controller (if available)

`Mastercard` = Locks to the ADD-ON bus input (always use this setting when using quad speed add-on bus functionality).

Backup

This is the backup input enable/disable for the Dolby decoder. Set to `on` will switch the decoder outputs to the assigned backup channels when dolby is lost. Which channel will be the backup channel is set with `Dolby_PCM_backup` and `Ch_Backup`. The delay compensation of the backup is always 1 frame (equal to Dolby E decoding).

In_Out

In the block schematic you can see that 2 of the 4 AES inputs and 2 of the 6 AES outputs are colored grey. With this setting you decide which inputs and outputs are active. There's two possible settings:

- `4In-4Out`: 4 AES/EBU input and 4 AES/EBU outputs

- `2In-6Out`: 2 AES/EBU input and 6 AES/EBU outputs

Refer to the block schematic for more details on the difference modes.

Note: when using the DBD28 with a relay back panel (BPX11), only the `4In-4Out` mode will have the proper relay I/O.

Dolby_firmware

Classic view only setting. When set to update the card will update the Dolby cat board when a new SPF is applied. Set to No_Update will **skip** the cat board update when applying new SPF firmware. Please only change to No_Update when told so by Axon Support.

INPUT CONTROL

Dolby_E_in

Here you select where the Dolby E comes from: from the local AES/EBU inputs, or from the master card via the add-on bus. Default is local.

Ch_E_in

With this setting you appoint specific channels within the input source set with `Dolby_E_in`, which should contain Dolby E. Dependant on the source, you can choose any of the following audio pairs:

- 1/2 AES/EBU input 1 when source is local, Add-on bus channels 1/2 when source is master
- 3/4 AES/EBU input 2 when source is local, Add-on bus channels 3/4 when source is master
- 5/6 AES/EBU input 3 when source is local, Add-on bus channels 5/6 when source is master
- 7/8 AES/EBU input 4 when source is local, Add-on bus channels 7/8 when source is master
- 9/10 only available when source is master
- 11/12 only available when source is master
- 13/14 only available when source is master
- 15/16 only available when source is master
- 17/18 only available when source is master
- 19/20 only available when source is master
- 21/22 only available when source is master
- 23/24 only available when source is master
- 25/26 only available when source is master
- 27/28 only available when source is master
- 29/30 only available when source is master
- 31/32 only available when source is master

Dolby_PCM_backup

With `Dolby_PCM_backup` you select which source is your backup input for the Dolby decoder (only used when Backup is set to on). Can be set to local (the physical AES/EBU inputs) or to master (audio coming from master card, via add-on bus). Default is local.

Ch_backup

With this setting you appoint specific channels within the input source set with `Dolby_PCM_backup`, which should contain Dolby E. Dependant on the source, you can choose any of the audio pairs listed under `Ch_E_in`.

Sel_Ch1 ~ Sel_Ch16

With these settings you set a source for the corresponding output channel. You can set each individual channel to source:

- Local: physical AES/EBU inputs
- Master: audio coming from master card via add-on
- Decoded_PCM: audio coming from the Dolby decoder
- Monitor: this is the monitoring output of the decoder. This channel contains for instance a downmix or audio description.
- LoudnessLVL: this is a representation of the loudness level as a PCM signal (a 1Khz sine). This signal can be put on a normal audio level meter to represent the loudness measurement.

Channels 1 till 8 (dependant on the In_Out setting) are the physical AES/EBU outputs as well as outputs towards the add-on bus and are by default set to Decoded_PCM. Channels 9 and 10 are default set to Monitor. Channels 11 till 16 are add-on bus only (dependant on the In_Out setting) and by default set to Master.

Ch_1 ~ Ch_16

With these settings you select the actual source channel in the above selected source. Default Ch_1 till Ch_16 are set to respectively 1 till 16.

Note: When Local is selected, you can choose channel 1 till channel 8. When Master is selected, you can choose channel 1 till channel 32.

PROCESS CONTROL

Gain-CH_1 ~ Gain-CH_16

These items allow you to gain the audio for each individual channel in a range from -60dB to 12 dB in steps of 0.25 dB. -999dB mutes this channel. Default is 0dB.

Phase-CH_1 ~ Phase-CH_16

These items allow you to gain the audio for each individual channel with 180 degrees. Default is 0 degree.

Stereo-CH_1/2 ~ Stereo-CH_15/16

With these settings you can configure the corresponding channels (channels 1/2, channels 3/4, channels 5/6, etc.) as being mono channels (In which case for instance channel 1 and 2 will both contain a mix of channel 1 + channel 2) or combined stereo channels.

Delay_CH_1/2 ~ Delay_CH_15/16

These settings allow you to delay the audio of each pair of channels in a range of 0 to 1300 ms. In steps of 0.01 ms. Default is 0ms.

IN BUS CONTROL

Override 17/24

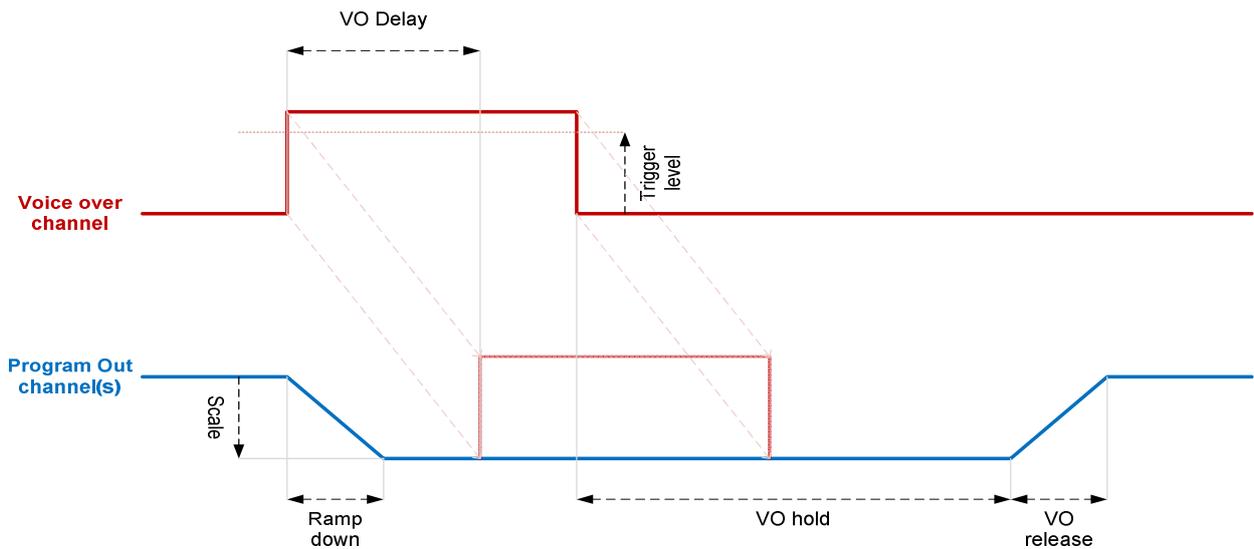
If you want to pass processed audio from one quad speed add-on card to the other (for instance if you want to pass decoded Dolby E audio from this card to for instance a Loudness Control or Dolby D encoder add-on card next to this card) you have to use this setting. You can choose to override input channels 17/24 on the add-on bus of the next card (right side) with output channels 1 to 8 or pass the master-card audio.

Override 25/32

With this setting you can choose whether you want to override input channels 25/32 on the add-on bus of the next add-on card (right side) with output channels 9 to 16 or pass the master-card audio.

VO CONTROL

The DBD handles Voice Over channels. With the following settings you can set how the involved program out channels should react to a voice over signal and how everything is triggered. The following graphic gives a visualisation of the settings.



VO_Trigger

With this setting you set how a voice over trigger is generated. Can be set to off (in which case a voice over is never triggered), GPI_0 (voice over processing is triggered by GPI contact 0) or Auto (voice over processing is triggered when the voice over channels reaches the trigger level volume set with VO_Trgrlvl). Default is Off.

VO_Sel

Here you set a source which contains the voice over channel. Can be set to Local (physical AES/EBU inputs), Master (audio coming from master card via add-on) or Decoded_PCM (audio coming from the Dolby decoder). Default is Local.

VO_Ch	Here you select which channel in the above selected source contains the voice over content. Default is channel 7.
VO_Scale	With this setting you set a scale in dB with which the program out channels should be decreased in volume when a voice over is triggered. Can be between -95dB and 0dB. Default is -60dB.
VO_Trgrlvl	This setting is used when VO_Trigger is set to auto. You set a threshold in dBFS between -95 and 0dBFS. When the voice over channel reaches this threshold, voice over processing is triggered.
VO_Delay	This is the delay in ms (up to 1000 ms) with which the voice over channel is delayed. This is the time between the trigger and the actual insertion (see graphic in VO control header). Default is 256ms.
VO_Hold	This is the time between the end of the voice over (audio goes below the VO_Trgrlvl threshold or GPI_0 is released, depending on what is set in VO_Trigger) and the start of the voice over release (see graphic in VO control header). Default is 256ms.
VO_Release	This is the “release” time. The time between the end of the VO hold and the point where the program out channels are at their full volume level again (see graphic in VO control header). Default is 256ms.
VO_Rampdown	This is the “ramp down” time. The time between the VO trigger and the point where the program out channels have reached the volume level set with VO_scal (see graphic in VO control header). Default is 256ms.
VO_Ch_1 ~ VO_Ch_16	With these settings you set which program out channels should be affected by VO settings. You can set channels to VO (affected by the voice over like indicted in the graph), Duck_Only (only ramp down the program out channel, but don't mix in the voice over) or No_VO (channel unaffected by voice over). Default is No_VO for all channels.

OUTPUT CONTROL

Slot1/2 ~ Slot31/32	These menu items are to fill the Quad speed audio bus with the appropriate outputs. You can fill any of the 16 audio pairs (32 channels in total) with the audio that is set to Out1/2, Out3/4, etc till Out15/16. You can also switch the concerning pair to off, making the concerning audio pair empty.
----------------------------	--

Meta_BUS The DBD28 can output the dolby metadata to the ADD-ON bus. This metadata signal is always put onto slots 25 till 32. When this setting is switched on, the setting Slot25/26 till Slot31/32 will not be used anymore. This function must be supported by the master can you send it to.

DOLBY GENERAL

Mon_out_program With this setting you select which output program you want to monitor in the status tab. You can choose any available program (up to 8 depending on the program configuration: 7.1, 5.1+2, 5.1, 4x2, 3x2, 2+2, 8x1, etc.).

Backup_out12 With the DBD28 you can decide which of the decoder outputs contains the backup audio channel (set with settings `backup`, `Dolby_PCM_backup` and `back_ch`). With `Backup_out12` set to on, decoder outputs 1 and 2 will contain the assigned backup channel in case the back switch is activated.

Backup_out34 With `Backup_out34` set to on, decoder outputs 3 and 4 will contain the assigned backup channels in case the backup switch is activated.

Backup_out56 With `Backup_out56` set to on, decoder outputs 5 and 6 will contain the assigned backup channels in case the backup switch is activated.

Backup_out78 With `Backup_out78` set to on, decoder outputs 7 and 8 will contain the assigned backup channels in case the backup switch is activated.

Downmix Here you can set the downmix mode of the downmix output of the Dolby Decoder. Can be `Lt/Rt` (Left total/right total, a downmix suitable for decoding with a Dolby Pro Logic upmixer to obtain 5.1 channels again), `Lr/Ro` (Left only/right only, a downmix suitable when mono compatibility is required), or `Auto` (`Lt/Rt` or `Lo/Ro` is chosen dependant on the whether or not there's a 5.1 program config or not). Default is `Auto`.

PCM_metadata With this setting you decide whether you want to keep generating metadata in case the Dolby E is lost. Default is off.

PCM_latency Here you define the delay in case the Dolby signal is lost. Can be set to `SingleFrame` (equal to Dolby E decoding) or to `minimum`.

VIDEO SYNC CONTROL

Dolby E decoders generally require a valid video sync input signal when operating. This signal must be aligned and matched to the timing and rate of the incoming Dolby E signal. Many facilities use a Vsync signal as a reference for timing throughout a larger broadcast chain.

VsyncREQ When decoding Dolby E, the DBD28 can operate with or without the presence of a Vsync signal, depending on whether the user chooses to enable the Vsync option (`vsyncREQ`), which confirms that the Vsync signal is aligned and properly matched to the Dolby E stream. If it is not, then the output is silence.

VsyncALIGN If the Vsync signal is present and properly matched, the CAT1100 can then attempt to perfect the alignment. This option (`vsyncALIGN`) enables latency adjustment of the decoded audio so that the Dolby E stream is aligned exactly to the Vsync signal. The latency adjustment amount is up to plus or minus half the guard band length listed in the following table.

Guard Band Length	Frame Rate
360 samples	23.98 Hz
360 samples	24 Hz
192 samples	25 Hz
160 samples	29.97 Hz
160 samples	30 Hz

VsyncINP Here you set the input for the vsync. Can be either `ref1` or `ref2`.

VsyncENA If the option (`vsyncALIGN`) to align a Vsync signal when decoding Dolby E is set, and the signal is not aligned (within the tolerance window), the CAT1100 can then attempt to reconstruct the alignment. This option (`VsyncENA`) adjusts the latency of the decoded audio so that the Vsync signal is aligned exactly to the Dolby E stream. The amount of latency added for the alignment is limited by the corresponding video frame length.

DOLBY D+ DEC

(refer to appendix 2 for decoded Dolby Digital channel mapping)

Ad_mix If the decoder receives an input stream with AD program content, mixing occurs according to the input stream mixing metadata. The user has the option of routing the `mixed` audio, `main` audio (`Main_only`), or associated audio to the main output (`AD_only`).

Ad_2ch_mix	Same as Ad_mix, but for the 2ch monitoring output of the decoder. Here you can set the audio description as your monitoring output.
Operating_mode	The content of the dual-substream inputs (including 7.1 and 5.1+AD) has to be set manually with this setting.

MONITORING

Meta_Prgm_Sel	Here you select which set to metadata you want to monitor in the status menu (all items with an MD prefix).
Loudness_type	<p>Here you set the loudness measure type of the loudness level output sine. Possible are:</p> <ul style="list-style-type: none"> ▪ 1770-2+Dial: ITU-R BS.1770-2 standard including dialogue normalization ▪ 1770-1+Dial: ITU-R BS.1770-1 standard including dialogue normalization ▪ 1770-2: ITU-R BS.1770-2 standard without dialogue normalization ▪ Leq (A) : A-weighting standard ▪ Off: no loudness monitoring

The loudness measurement standard EBU R 128 [2] was released in 2010, primarily for European audiences. This specification builds upon ITU-R BS.1770-1 [1] by defining three standard measurement windows: momentary (400 ms), short term (3 s), and integrated (entire program).

R 128 also introduced the concept of level gating. Level gating is an alternative gating strategy to speech gating (the method performed by [Dialogue Intelligence](#)) that utilizes a two-stage approach: an absolute gate, followed by a relative gate. Level gating makes no attempt to base loudness measurements on a dialogue anchor element, but instead bases its measurement on energy.

R 128 introduces new terminology for the units of loudness measurement: LUFS (loudness units relative to full scale). LUFS is functionally equivalent to LKFS, but represents a confusing discrepancy between the ITU and EBU.

Another new concept introduced by R 128 is the Loudness Range (LRA) descriptor. Loudness Range is essentially a measure of the spread of loudness measurements throughout a program, measured in Loudness Units (LU). Loudness Range is intended to determine the amount of preencoding compression required, for broadcasters that do not use metadata-based DRC (for example, for MPEG-1 Layer II audio). Dolby formats such as Dolby Digital and Dolby Digital Plus use Metadata based DRC, and therefore, LRA is irrelevant for these formats.

Loud_Prgm	Here you select of which dolby program you want to monitor the loudness level of.
Loud-ext_RST	With this setting you reset the loudness measurements for all loudness parameters.
Ld_Emph_Filt	Loudness emphasis filter. This filter can be enabled or disabled.
Ld_DC_Filt	Loudness DC filter. This filter can be enabled or disabled.
Ld_PCM_Select	<p>Here you select which loudness parameter you want to monitor (which parameter you want to have as PCM output sine). The following are the parameters included in the loudness packed structure:</p> <p>Int_UGTD (Integrated un gated loudness) This parameter provides the loudness measurement for the entire program since the last reset, and does not use any gating for the measurement.</p> <p>Int_SPCHGTD (integrated speech gated loudness) This parameter provides the loudness measurement for the entire program since the last reset, and uses Dialogue Intelligence to speech gate the measurement.</p> <p>Int_LVLGTD (integrated level gated loudness) This parameter provides the loudness measurement for the entire program since the last reset, and uses level gating per ITU-R BS.1770-2 to gate the measurement.</p> <p>Int_10sUGTD (ten_second_ungated_loudness) This parameter provides the loudness measurement for the last ten seconds, and does not use any gating for the measurement.</p> <p>Int_10sSPCHGTD (ten second speech gated loudness) This parameter provides the loudness measurement for the last ten seconds, and uses Dialogue Intelligence to speech-gate the measurement.</p> <p>Int_3sUNGTD (three second un gated loudness) This parameter provides the loudness measurement for the last three seconds, and does not use any gating for the measurement.</p> <p>MOM (momentary loudness)</p>

This parameter provides the loudness measurement for the last 400 milliseconds, and does not use any gating for the measurement.

INT (integrated loudness)

This parameter provides a single, simplified measurement value for the loudness over the entire program. It automatically sets the value to be either the ungated, speech-gated, or level-gated result based on the loudness estimation mode, configured speech threshold, and amount of speech detected. It follows these guidelines:

- If the loudness estimation mode is set to 0 (ITU-R BS.1770-2 plus Dialogue Intelligence), 1 (ITU-R BS.1770-1 plus Dialogue Intelligence), or 3 (Leq(A) plus Dialogue Intelligence), and the percentage of speech detected exceeds the configured speech threshold (defaulted to 20%), the value displays the speech-gated result.
- If the loudness estimation mode is set to 2 (ITU-R BS.1770-2) , the value displays the level-gated result.
- Otherwise, the value displays the ungated result.

S10s (ten second loudness)

This parameter provides a single, simplified measurement value for the loudness over the last ten seconds.. It automatically sets the value to be either the ungated or speech-gated result based on the following rules:

- The value is set to –120dB until dialogue is detected.
- If ten seconds elapse from the beginning of the program without any dialogue detected, the value is set to the ungated ten- second loudness.
- Once dialogue is detected:
 - The value is set to the ten-second speech-gated loudness result.
 - When the Dialogue Intelligence algorithm detects that speech has ceased, this value holds the last active speech-gated result until speech becomes active again or the program is reset.

The loudness packed structure provides program loudness information for the last 0.5 seconds and is updated twice each second. The values in this output are dependent on the loudness metering mode as defined by the Loudness_type control parameter. The following table lists valid parameters by mode.

Parameter	1770-2 +Dial	1770-2 +Dial	1770-2	Leq(A)
Integrated ungated loudness		X		X
Integrated speech-gated loudness	X	X		X

Integrated level-gated loudness	X		X	
10s ungated loudness	X	X		X
10s speech-gated loudness	X	X		X
3s ungated loudness	X		X	
Momentary loudness	X		X	
Integrated loudness	X	X	X	X
10s loudness	X	X		X

6 Status Menu

Introduction	The status menu indicates the current status of each item listed below.
Lock	This status item indicates whether the card is locked to the, with setting <code>Lock-mode</code> selected, source. Can be (OK) or not locked (NA)
AES_Inp_1 ~ AES_Inp_4	These items display the status of the 4 AES/EBU inputs. If there is an input, this is displayed as OK. When there's no input, it is displays as NA.
Ch_1_Val ~ Ch_16_Val	If a valid signal is present on the corresponding audio channel, these items indicate OK. If the signal is between -1 and 0 dBFS, it is displayed as > -1 dBFS. NA indicates that no signal present.
Main_In	This item indicates the status of the main input (set with setting <code>Dolby_E_in</code>). Can be PCM, DolbyE, DolbyD, DolbyDplus or NA (none of the former 2, or no audio at all).
Backup_In	This item indicates the status of the decoder back-up input (set with setting <code>Dolby_PCM_backup</code>). Can be PCM, DolbyE, DolbyD, DolbyDplus or NA (none of the former 2, or no audio at all).
Decoder_In	This item indicates the status of the decoder input (set with setting <code>Dolby_E_In</code>). Can be PCM, DolbyE, DolbyD, DolbyDplus or NA (none of the former 2, or no audio at all).
Ref_Input	This status item indicates the framerate of the reference input. Can be 23.98, 24, 25, 29.97 or 30. NA when there's no reference input detected.
Nr_programs	This status item indicates the number of programs that are available in the Dolby decoder. This dependant on the program config.

(MD) Program	<p>This status indicates the program config as present on the metadata preset selected with <code>Meta_Prgm_Sel</code>. Possible values are:</p> <ul style="list-style-type: none"> ▪ 0 = 5.1+2 ▪ 1 = 5.1+1+1 ▪ 2 = 4+4 ▪ 3 = 4+2+2 ▪ 4 = 4+2+1+1 ▪ 5 = 4+1+1+1+1 ▪ 6 = 2+2+2+2 ▪ 7 = 2+2+2+1+1 ▪ 8 = 2+2+1+1+1+1 ▪ 9 = 2+1+1+1+1+1+1 ▪ 10 = 1+1+1+1+1+1+1+1 ▪ 11 = 5.1 ▪ 12 = 4+2 ▪ 13 = 4+1+1 ▪ 14 = 2+2+2 ▪ 15 = 2+2+1+1 ▪ 16 = 2+1+1+1+1 ▪ 17 = 1+1+1+1+1+1 ▪ 18 = 4 ▪ 19 = 2+2 ▪ 20 = 2+1+1 ▪ 21 = 1+1+1+1 ▪ 22 = 7.1 ▪ 23 = 7.1 (screen) <p>How these program configurations are mapped to the output channels is explained in appendix 2.</p>
(MD) Bit_Depth	Indicates the value of the bit depth metadata parameter.
(MD) Dialogue_Lev	Indicates the value of the dialogue level metadata parameter.
(MD) Datarate	Indicates the value of the bitrate metadata parameter.
(MD) Bitstream	Indicates the value of the bitstream mode metadata parameter.
(MD) Channel_Mode	Indicates the value of the channel mode metadata parameter.
(MD) LFE	Indicates the value of the LFE channel metadata parameter.
(MD) Pref_Dwn_Mix	Indicates the value of the preferred downmix metadata parameter.
(MD) Center_mix_lvl	Indicates the value of the Center downmix level metadata parameter.
(MD) Surr_mix_lvl	Indicates the value of the surround downmix level metadata parameter.
(MD) Lt/Rt_center	Indicates the value of the Lt/Rt center downmix metadata parameter.
(MD) Lt/Rt_surr	Indicates the value of the Lt/Rt surround downmix metadata parameter.
(MD) Lo/Ro_center	Indicates the value of the Lo/Ro center downmix metadata parameter.
(MD) Lo/Ro_surr	Indicates the value of the Lo/Ro surround downmix metadata parameter.

(MD) DC_highpass	Indicates the value of the DC highpass filter metadata parameter.
(MD) BW_lowpass	Indicates the value of the bandwidth lowpass filter metadata parameter.
(MD) LFE_lowpass	Indicates the value of the LFE lowpass filter metadata parameter.
(MD) Surr_90	Indicates the value of the surround channel 90-degree phase shift filter metadata parameter
(MD) Surr_3dB	Indicates the value of the surround channel 3dB attenuation metadata parameter.
(MD) Dynamic_compr	Indicates the value of the Dynamic Range Line Mode Compression metadata parameter.
(MD) RF_compr	Indicates the value of the RF compression metadata parameter.
(MD) Surr_mode	Indicates the value the Dolby surround mode metadata parameter.
(MD) Surr_ex_mode	Indicates the Dolby Digital surround EX mode metadata parameter.
(MD) Mix_meta	Indicates the value of the mixing parameters for individual channel scaling exists metadata parameter.
(MD) Mix_Control	Indicates the value of the mixing control metadata parameter.
(MD) Pscale_Ena	Indicates the value of the program scale factor exists metadata parameter
(MD) EXT_prgmscale	Indicates the value of the external program scale factor metadata parameter.
(MD) Pscale_L_Ena	Indicates the value of the external program left channel scale factor exists metadata parameter.
(MD) Pscale_L	Indicates the value of the external program left channel scale factor metadata parameter.

(MD) Pscale_C_Ena	Indicates the value of the external program center channel scale factor exists metadata parameter.
(MD) Pscale_C	Indicates the value of the external program left channel scale factor metadata parameter.
(MD) Pscale_R_Ena	Indicates the value of the external program right channel scale factor exists metadata parameter.
(MD) Pscale_R	Indicates the value of the external program left channel scale factor metadata parameter.
(MD) Pscale_Ls_Ena	Indicates the value of the external program left surround channel scale factor exists metadata parameter.
(MD) Pscale_Ls	Indicates the value of the external program left surround channel scale factor metadata parameter.
(MD) Pscale_Rs_Ena	Indicates the value of the external program right surround channel scale factor exists metadata parameter.
(MD) Pscale_Rs	Indicates the value of the external program right surround channel scale factor metadata parameter.
(MD) Pscale_LFE_Ena	Indicates the value of the external program LFE channel scale factor exists metadata parameter.
(MD) Pscale_LFE	Indicates the value of the external program LFE channel scale factor metadata parameter.
(MD) PanMean_Ena	Indicates the value of the pan information exists metadata parameter.
(MD) PanMean	Indicates the value of the pan mean direction index metadata parameter.

LOUDNESS MONITORING

Int_UGTD_Id	This indicates the value of the integrated ungated loudness parameter.
Int_SPCHGTD_Id	This indicates the value of the integrated speech-gated loudness parameter.

Int_LVLGTD_Id	This indicates the value of the integrated level-gated loudness parameter.
Int_10sUGT_Id	This indicates the value of the 10 seconds integrated ungated loudness parameter.
Int_10sSPCHGTD_Id	This indicates the value of the 10 seconds integrated speech-gated loudness parameter.
Int_3sUNGTD_Id	This indicates the value of the 3 seconds integrated ungated loudness parameter.
MOM_Id	This indicates the value of the momentary loudness parameter.
S10s_Id	This indicates the value of the 10 seconds loudness parameter.
INT_SPCH_Id	This indicates the integrated speech percentage parameter.
INT_LD_range	This indicates the integrated loudness range parameter.
SMPL_PEAK_0 ~ SMPL_PEAK_7	These items provide the maximum sample peak, in dBFS, per channel.
TRUE_PEAK_0 ~ TRUE_PEAK_7	These items provide the maximum true peak, in dBFS, per channel.
DDpRATE	This indicates the Dolby Digital plus bitrate

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.
DBD28 Events	The events reported by the DBD28 are as follows;
Announcements	<code>Announcements</code> is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on
Audio-Data	<code>Error in Audio Data</code> can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. In case of a Dolby data ERROR an Event will be generated at the priority, or the audio carrier is falling away, or audio data is in the range of 0 dBFS and -1 dBFS, or the Encoder status is in error.
Reference	<code>Reference</code> can be selected between 0 .. 255. 0= no event, 1..255 are the priority setting. If the reference is lost an Event will be generated at the priority.
What information is available in an event?	The message consists of the following items; <ol style="list-style-type: none">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 DBD28 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcing of report and control values
Audio-Data	01 _{hex} =AUDIO_ERROR	81 _{hex} =AUDIO_OK	
Reference-Status	02 _{hex} =REF_LOSS	82 _{hex} =REF_RETURN	reference lost or returned

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/RRS will cause the Error LED on the Synapse rack front panel to light.

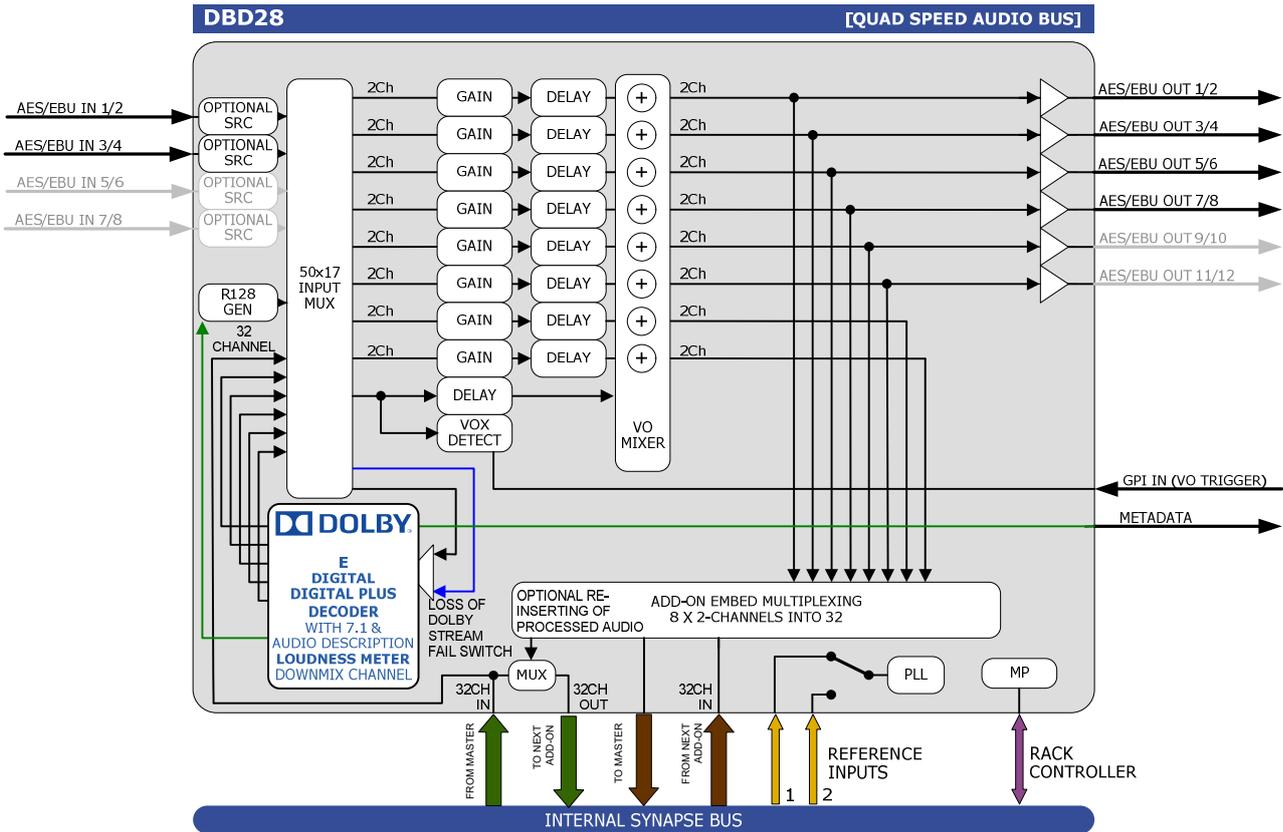
The Address Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.

8 LED Indication

ERROR	The error LED indicates an error if the internal logic of the DBD28 card is not configured correctly or has a hardware failure.
INPUT 1 ~ INPUT 8	These LEDs indicated the presence of a valid AES/EBU signal on the inputs 1 till 5.
REFERENCE	This LED indicates the presence of a valid reference signal and that the DBD28 is locked to the master card.
DATA ERROR	This led indicates different types of errors if there is an error in the Dolby encoding, or the audio carrier is falling away, or audio data is in the range of 0 dBFS and -1 dBFS.
CONNECTION	This LED illuminates after the card has initialized. The LED lights for 0.5 seconds every time a connection is made to the card.

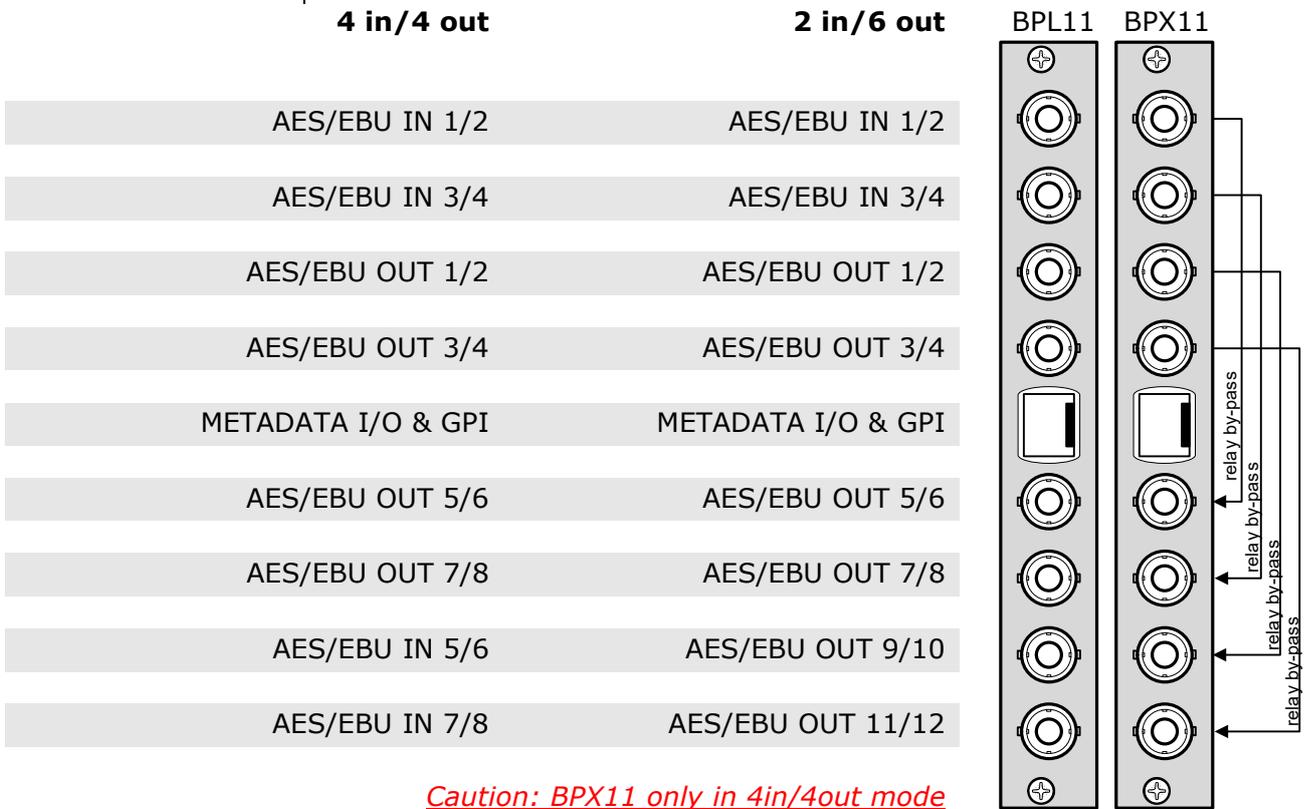
Note: When LEDS are blinking constantly, the card is still programming.

9 Block Schematics

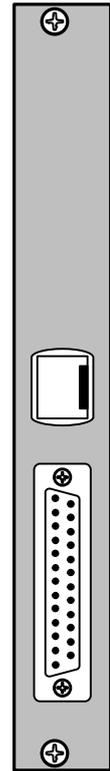


10 Connector Panel

The DBD28 can be used with the BPL11 or BPX11 I/O panel:



BPL11D

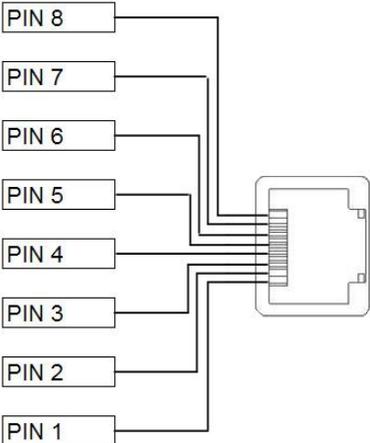


METADATA I/O & GPI

BALANCED AES/EBU IN/OUT
OUTPUT LEVEL MAX. 1.7V

		D-SUB		
4 in/4 out	2 in/6 out	+	-	GND
AES/EBU IN 1/2	AES/EBU IN 1/2	PIN_1	PIN_14	PIN_2
AES/EBU IN 3/4	AES/EBU IN 3/4	PIN_15	PIN_3	PIN_16
AES/EBU IN 5/6	AES/EBU OUT 9/10	PIN_4	PIN_17	PIN_5
AES/EBU IN 7/8	AES/EBU OUT 11/12	PIN_18	PIN_6	PIN_19
METADATA I/O & GPI	METADATA I/O & GPI			
AES/EBU OUT 1/2	AES/EBU OUT 5/6	PIN_7	PIN_20	PIN_8
AES/EBU OUT 3/4	AES/EBU OUT 7/8	PIN_21	PIN_9	PIN_22
AES/EBU OUT 5/6	AES/EBU OUT 1/2	PIN_10	PIN_23	PIN_11
AES/EBU OUT 7/8	AES/EBU OUT 3/4	PIN_24	PIN_12	PIN_25

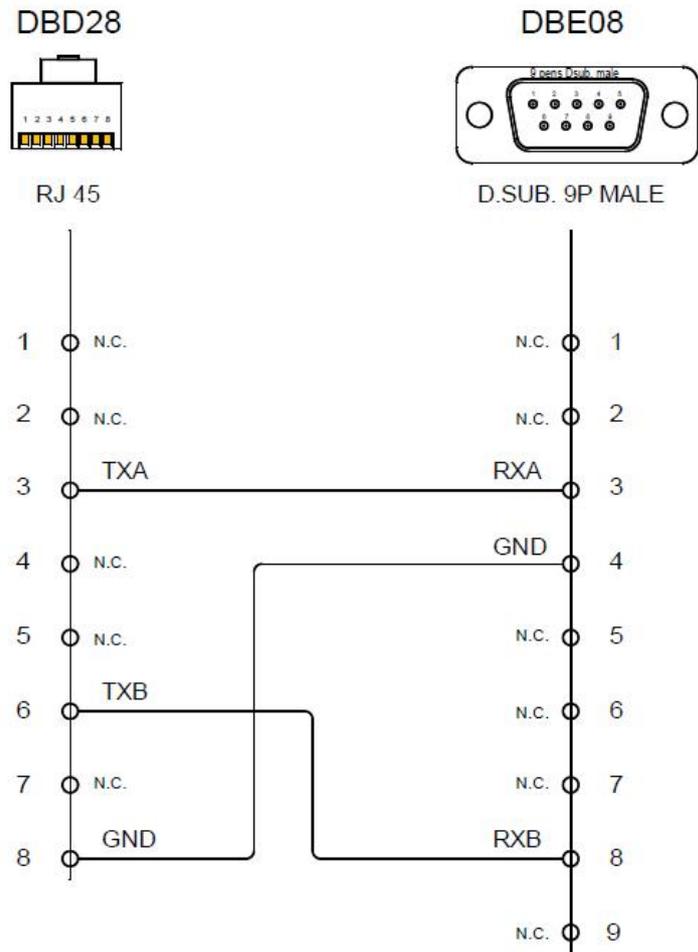
Pin description



Pin	Purpose
1	GPI 1
2	GPI 2
3	TXA(+)
4	RXA(+)
5	RXB(-)
6	TXB(-)
7	GPI3
8	GND

Metadata cable DBD28/DBE08

When using the DBD28 together with a card that has a 9 pins D-sub as metadata connector (for instance the DBE08), the following cable has to be made

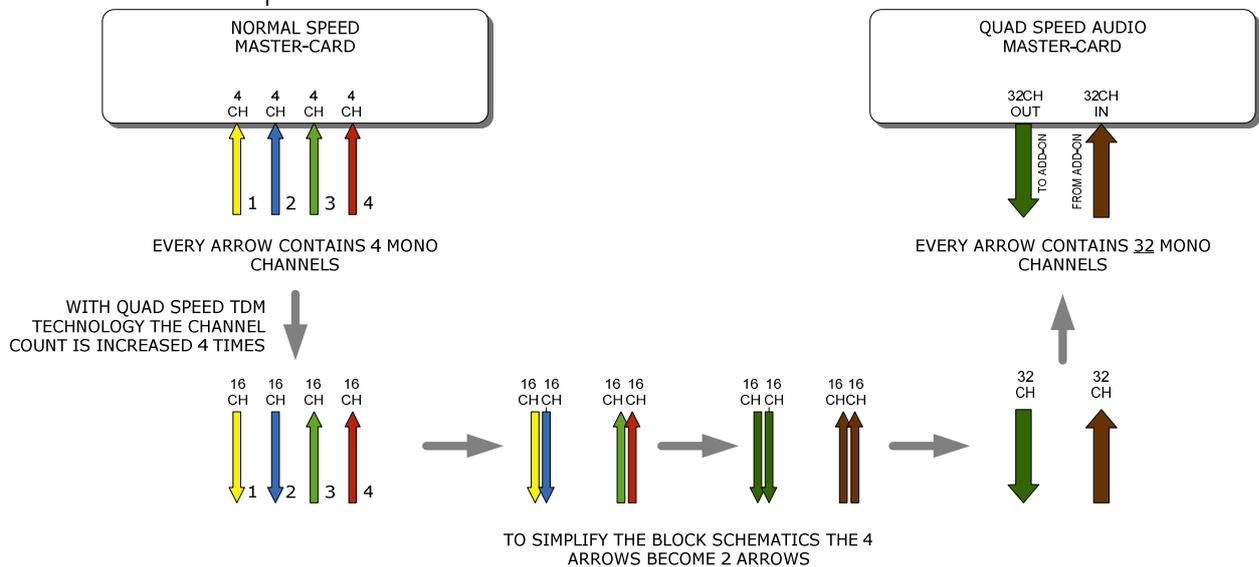


Appendix 1 Quad speed ADD-ON bus

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]:

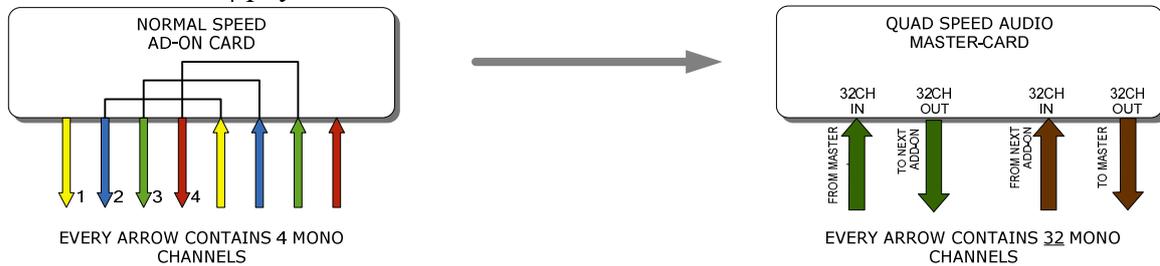
Dual mode MASTER-CARD's have a menu item to select the appropriate mode are. If a mode is selected all ADD-ON cards to that Master need to be in the same mode.

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

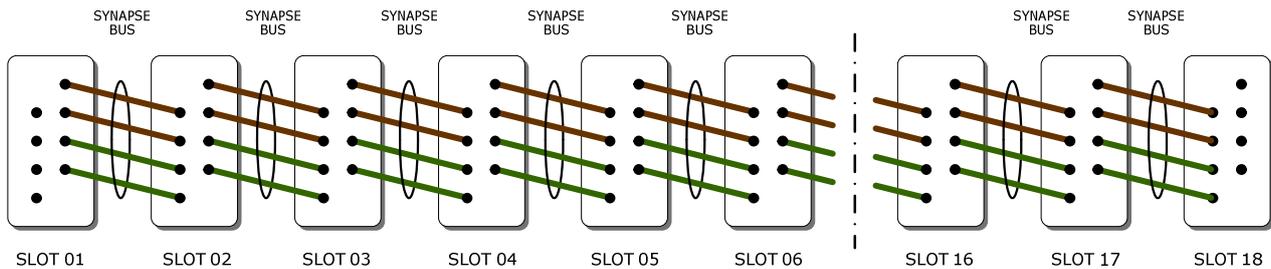
- Some Master Cards are switchable between normal and quad-speed bus
- Channel designations on the block schematics:
 - Channel 1-32 (or less) are injected into the dark green large arrow from Master Card to ADD-ON card and looped on to the next ADD-ON card via the dark green arrow
 - The ADD-ON card 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.

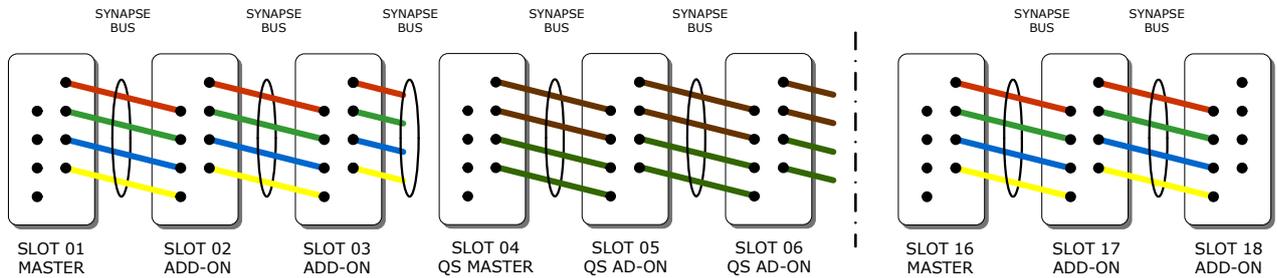


The system makes use of the same passive copper traces on the internal bus PCB as normal add-on bus cards.

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.

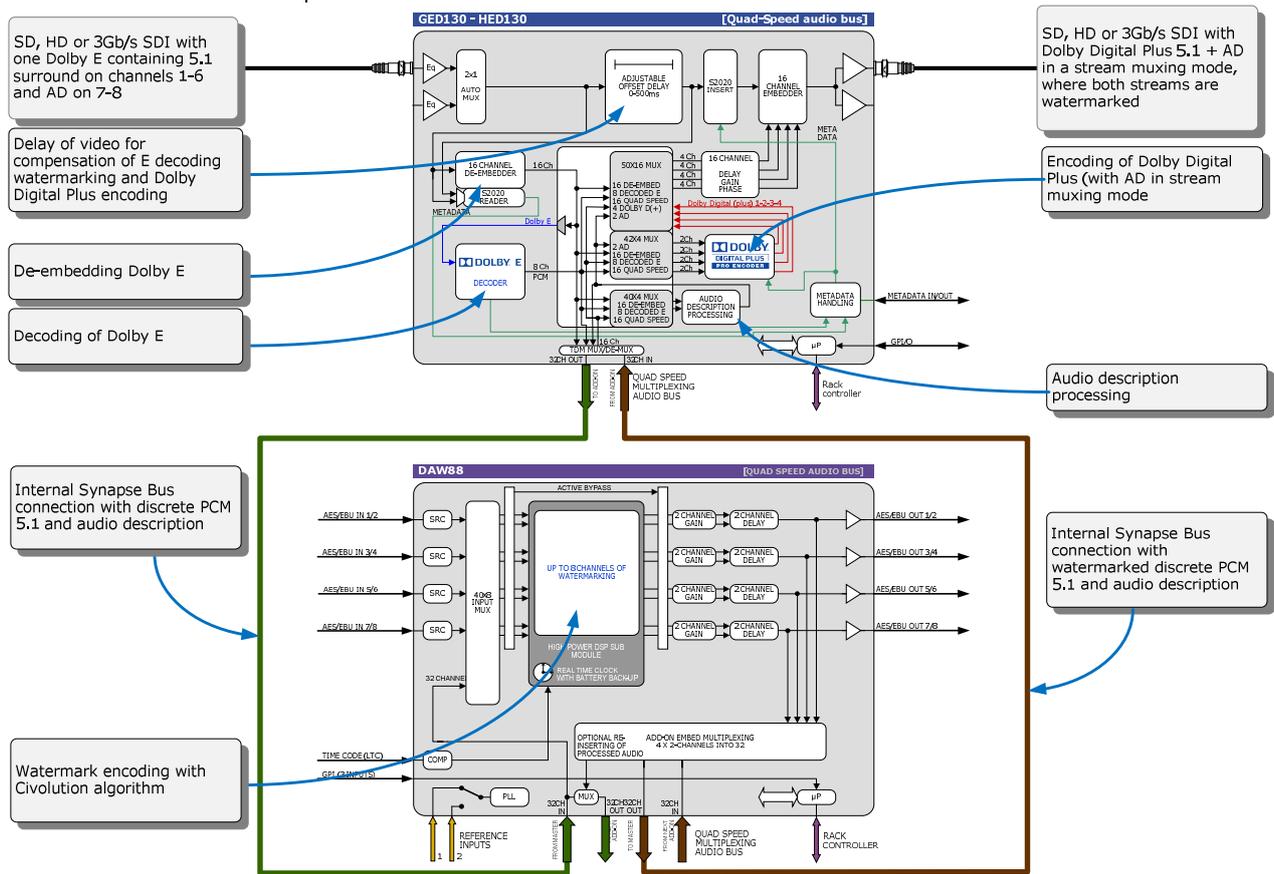
You can mix normal speed Master-Cards with Quad Speed MASTER-Cards in one frame as the MASTER-CARD breaks the connection to the left hand card. All cards to the right of the master must be in the same mode as the master.



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

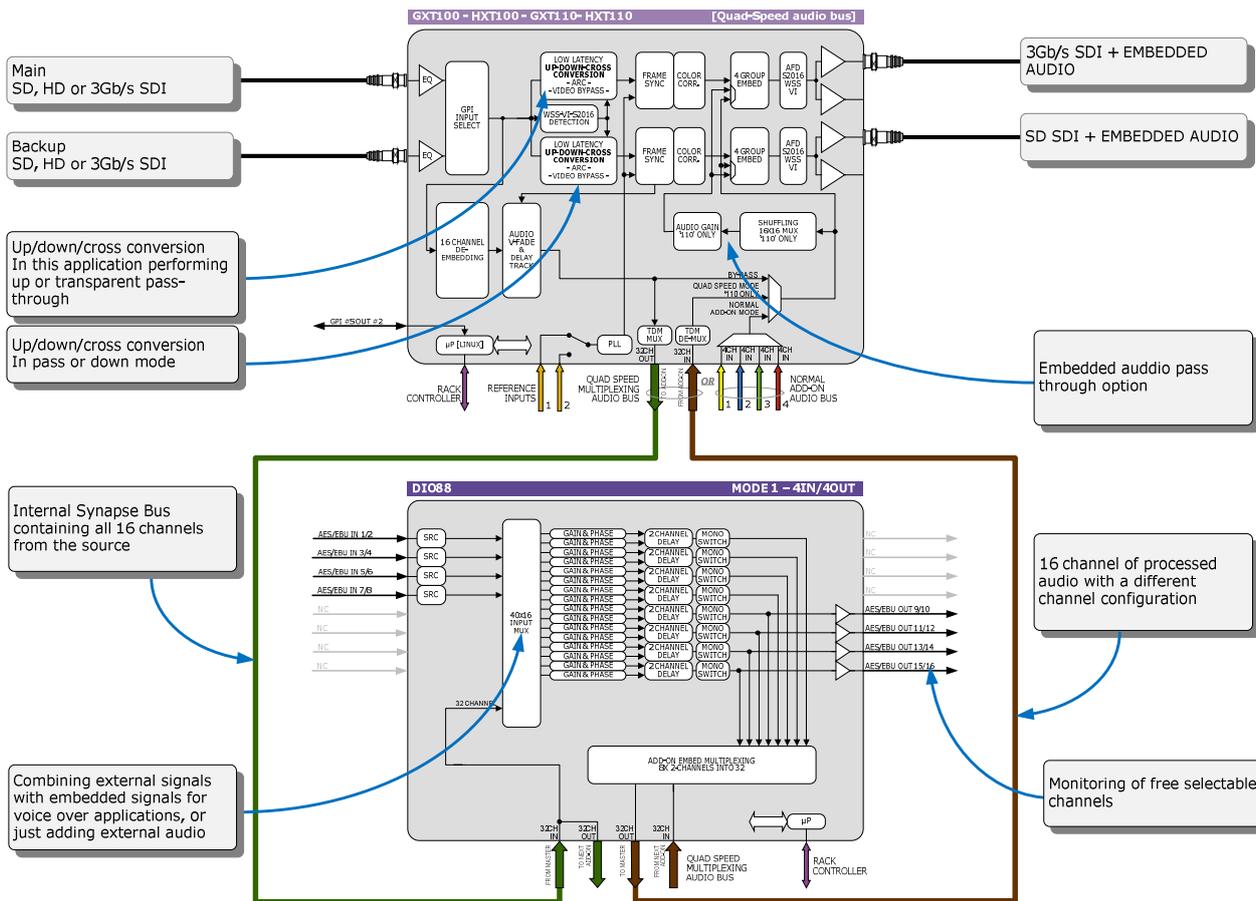
Some examples

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

Appendix 2 Dolby E program config I/O channel mapping

With the Program Configuration setting in this card's menu (Pgrm) it is possible to set the program configuration of the Dolby E encoder. Possible configurations are:

- 5.1+2 (1x L/R/Ls/Rs/C/LFE and 1x stereo audio)
- 5.1+1+1 (1x L/R/Ls/Rs/C/LFE and 2x mono audio)
- 4+4 (2x L/R/S/C (surround))
- 2+2+2+2 (4x stereo audio)
- 5.1 (1x L/R/Ls/Rs/C/LFE)
- 2+2 (2x stereo audio)

These configurations have a default mapping of each audio channel to specific output channels in the card. They are as follows:

Program config	Channels 1/2	Channels 3/4	Channels 5/6	Channels 7/8
5.1+2	5.1 L/R	5.1 C/LFE	5.1 Ls/Rs	Stereo L/R
5.1+1+1	5.1 L/R	5.1 C/LFE	5.1 Ls/Rs	2x Mono Ch
4+4	Surround 1 L/R	Surround 1 C/S	Surround 2 L/R	Surround 2 C/S
2+2+2+2	Stereo 1 L/R	Stereo 2 L/R	Stereo 3 L/R	Stereo 4 L/R
5.1	5.1 L/R	5.1 C/LFE	5.1 Ls/Rs	-/-
2+2	Stereo 1 L/R	-/-	-/-	Stereo 2 L/R

When the source is Dolby Digital or Dolby Digital Plus, the signals will be decoded and mapped to the following channels:

AC mode	Channels 1/2	Channels 3/4	Channels 5/6	Channels 7/8
1 (1/0)	-/-	C/-	-/-	-/-
2 (2/0)	L/R	-/-	-/-	-/-
3 (3/0)	L/R	C/LFE	-/-	-/-
4 (2/1)	L/R	-/LFE	Surr/surr (duplic)	-/-
5 (3/1)	L/R	C/LFE	Surr/surr (duplic)	-/-
6 (2/2)	L/R	-/LFE	Ls/Rs	-/-
7 (3/2)	L/R	C/LFE	Ls/Rs	-/-
8 (3/4)	L/R	C/LFE	Ls/Rs	Ls/Rs