

Synapse

HVD05

HD/SD video delay (32 frames)

Installation and Operation manual

SynLite

HD
High definition

Committed.

AXON



Synapse

TECHNICAL MANUAL

HVD05



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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.

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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
HVD05



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 RRC18, RRC10, RRC04, RRS18 and RRS04 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 (RRC18/RRC10/RRC04/RRS18/RRS04) manual. The method of connection to a computer using Ethernet is described in the 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 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.

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

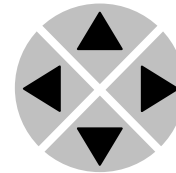
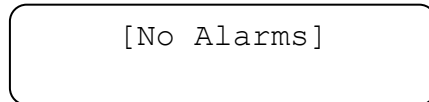
On powering up the Synapse frame, the card set will use basic data and default initialisation settings. All LED's will light during this process. After initialisation, several LED's will remain lit – the exact number and configuration is dependent upon the number of inputs connected and the status of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

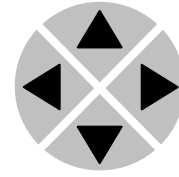
- Press ► To go forward through the menu structure.
- Press ◀ To go back through the menu structure.
- Press ▲ To move up within a menu or increase the value of a parameter.
- Press ▼ To move down through a menu or decrease the value of a parameter.

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

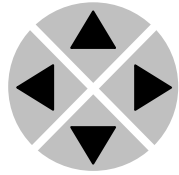
```
RRC18 [Select Card]  
>S01=SFS10
```



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 its current setting is Auto.

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

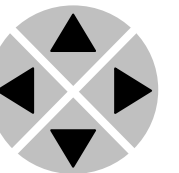


Pressing the ► selects the settings item shown, in this example SDI-Format.

(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]  
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**

| Slot | Module | Item | Parameter | Setting |
|------|--------|-------------|----------------|---------|
| ▲ | | | | |
| ▲ | | | | |
| S02 | | Identity | | |
| ▲ | | ▲ | | |
| S01 | SFS10 | ▶ Set-tings | ▶ Standard_dig | ▶ Auto |
| ▼ | | ▼ | ▼ | ▼ |
| S00 | RRC18 | Status | Mode | 625 |
| | | ▼ | ▼ | ▼ |
| | | Events | Ref-Input | 525 |
| | | | ▼ | |
| | | | H-Delay | |
| | | | ▼ | |
| | | | ▼ | |

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

4 The HVD05 Card

Introduction

The HVD05 is an HD-SDI video offset delay of up to 32 frames (adjustable in frames, lines and pixels). The unit has a Serial Digital (HD-SDI) component input at 1.485 Gb/s, 1 re-clocked HD-SDI output and 2 delayed HD-SDI outputs.

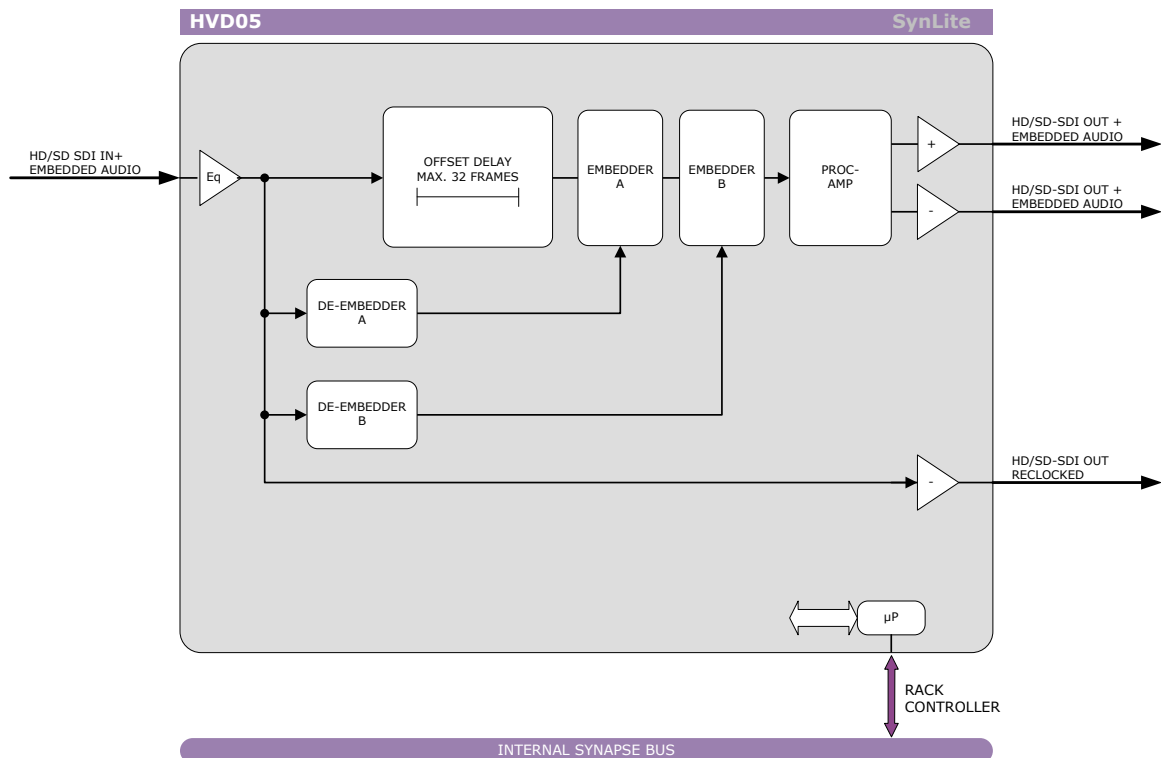
Features

- Adjustable offset delay up to 32 frames
- Adjustable delay setting per format i.e. 1080, 720 and SD
- Adjustment in frames, lines and pixels
- ProcAmp
- Full transparent delay for video and audio
- 2 Groups of audio can be processed with minimum delay (or matching video delay)
- ANC H + V blanking
- Locks to SDI input
- Full control and status monitoring through the front panel of the SFR04/SFR08/SFR18 frame and the Ethernet port (ACP)
- Optional 1 fiber input (replacing 1 SDI input) or 1 fiber output (replacing 1 SDI output) on I/O panel

Applications

- Timing correction in HD virtual studios
- 'Late' embedded audio correction

Block schematic



5 Settings Menu

Introduction

The settings menu displays the current state of each HVD05 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.

Note: All items preceded with a #-sign are part of the presets.

SDI-Format

The Input format setting allows you to set input format. The selectable formats are:

- Auto: the unit recognize format is presented at the input and automatically sets that format. It will take more time for the card to lock.
- 1080i60, 1080i50
- 1080p24, 1080p24, 1080p24
- 1035i60
- 720p60, 720p50, 720p30, 720p25, 720p24
- 525i
- 625i

The default setting is AUTO. Please note that the functionality of the card will be affected, if the correct input format is not selected.

Field Freq

1:1, 1:1.001 or AUTO are the values that can be selected. 1:1 is the right field frequency for for instance 1080i-50.

Because the actual field frequency of 1080i-60 is 59.97 and not 60 is it necessary when 1080i-60 is selected as input format to adjust the field frequency to 1:1.001

There is also an AUTO mode, the HVD05 will detect the format and switch then to the according field-frequency. Auto mode also supports 1080p-23,976. For real 1080p-24 you should set the Field-Freq to 1:1 manually. Default is AUTO.

1080-H-Delay

The 1080-H-Delay setting allows adjustment of the horizontal phase of 1080i60, 1080i50, 1080p30, 1080p25, 1080p24 and 1035i60 signals. The default setting is 0 px (in HD resolutions 1 pix = 13.5nsec). These are the possible settings:

| | |
|---------|------------------|
| 1080i60 | Range 0-2199 pix |
| 1080i50 | Range 0-2639 pix |
| 1080p30 | Range 0-2199 pix |
| 1080p25 | Range 0-2199 pix |
| 1080p24 | Range 0-2749 pix |
| 1035i60 | Range 0-2199 pix |

1080-V-Delay

The 1080-V-Delay setting allows adjustment of the vertical phase of 1080i60, 1080i50, 1080p30, 1080p25, 1080p24 and 1035i60 signals. You can adjust the delay of these signals in lines ranging from 0 to 1124. The default setting is 0 lines.

1080-F-Delay

This setting sets the frame delay of 1080i60, 1080i50, 1080p30, 1080p25, 1080p24 and 1035i60 signals, in a range from 0 to 31 frames. By default this is set to 1 frame.

720p-H-Delay

The 720p-H-Delay setting allows adjustment of the horizontal phase of 720p60 and 720p50 signals. The default setting is 0 px (in HD resolutions 1 pix = 13.5nsec). These are the other possible settings:

| | |
|--------|------------------|
| 720p60 | Range 0-1649 pix |
| 720p50 | Range 0-1979 pix |

720p-V-Delay

The 720p-V-Delay setting allows adjustment of the vertical phase of 720p60 and 720p50 signals. You can adjust the delay of these signals in lines ranging from 0 to 749. The default setting is 0 lines.

720p-F-Delay

This setting sets the frame delay of 720p60 and 720p50 signals, in a range from 0 to 63 frames. By default this is set to 1 frame.

Freeze

FRZ enables the capture of one Video Field or Frame (depending on the setting of Frz-Mode). The settings of Freeze are On or Off. The default setting is Off.

| | |
|------------------|--|
| Frz-Mode | Frz-mode allows you to choose between storing a complete Video Frame or Field (double written) for the above Freeze Menu and the external freeze input. The default setting is Field |
| Panic-Frz | Panic-Frz enables the capture of the last video information when the input signal is lost. Panic freeze always uses Field mode irrespective of the settings of the Freeze-mode menu item. The settings of Panic-Frz are On or Off. The default setting is Off. |
| Ext-Frz | Ext-Freeze enables the external freeze input (GPI contact closure of the BPH01). Disabled means that this feature is not active. Enabled means that this feature is active. The default setting is Disabled. |
| Y-Gain | Y-Gain controls the Luminance gain of the built-in processing amplifier. The control range is between 0% and 199.8%. The default setting of Y-Gain is 100%. |
| Cb-Gain | Cb-Gain controls the Colour Difference gain of the built-in processing amplifier. The control range is between 0% and 199.8%. The default setting of Cb-Gain is 100%. |
| Cr-Gain | Cr-Gain controls the Colour Difference gain of the built-in processing amplifier. The control range is between 0% and 199.8%. The default setting of Cb-Gain is 100%. |
| Y-Black | This item controls the Luminance black level adjustment between -128 and +127 (10 bit digital value). The black level can be aligned by +/- 100mV(analog video). 64 (10 bit digital value) represents the nominal black level value for all digital video standards |
| Cb-Black | This item controls the Colour Difference (Cb) black level adjustments between -128 and +127 (10 bit digital value). The black level can be aligned by +/- 100mV(analog video). 64 (10 bit digital value) represents the nominal black level value for all digital video standards. |
| Cr-Black | This item controls the Colour Difference (Cr) black level adjustment between -128 and +127 (10 bit digital value). The black level can be aligned by +/- 100mV(analog video). 64 (10 bit digital value) represents the nominal black level value for all digital video standards. |

| | |
|------------------------------|--|
| Audio | <p>The setting Audio allows you to Blank the embedded audio, or to follow the video delay (VID-Delay). To set a minimum delay of less than 1 millisecond, use the Min-Delay setting. The default setting is Vid-delay.</p> |
| Emb-A-Sel ~ Emb_B-Sel | <p>The card is equipped to handle two groups of embedded audio. The Emb-A-Sel and Emb-B-Sel settings each allow you to select any of the 4 available groups. Group 1, 2, 3, 4 can be selected. The off-setting disables this function. The default setting for Emb-A-Sel is group_1 and for Emb-B-Sel it is group_2.</p> |
| HD-AudioLock | <p>HD-SYNC is the default setting that is used under the assumption that all audio present in the video stream is synchronously embedded.</p> <p>The setting HD-AudioLock can be useful if the audio is asynchronously embedded into the HD video stream. The HVD05 can be locked to embedded Audio-Clk_A or Audio-Clk_B.</p> <p>HD-AudioLock determines whether the card is locked on to the HD input (HD-SYNC) or to the AUDIO CLOCK as present in embedded audio group_1 (Audio-Clk_A) or embedded audio group_2 (Audio-Clk_B).</p> |
| ANC-Blank | <p>ANC-Blank allows you to blank the ancillary data in the horizontal and/or in the vertical interval.</p> <ul style="list-style-type: none"> ▪ H – Ancillary data in the Horizontal interval is blanked. ▪ V – Ancillary data in the Vertical interval is blanked. ▪ H+V – Ancillary data in the Horizontal and Vertical interval are blanked. ▪ Off – The ancillary data is passed. <p>The default setting is OFF.</p> |
| Delay-Status | <p>In the status menu it is possible to display (IO_delay item) the processing time of the HVD05. This setting enables you to switch this function ON or OFF. Default setting is OFF.</p> |
| ATC-Transp | <p>With this setting you can select which ATC standard should be copied to the output. Can choose for standards RP188, RP196 or RP215. You can also choose to copy all ATC standards present on the input with the All (1pkt/ln) setting. If you don't want to use ATC transparency, set this item to off.</p> |

6 Status Menu

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

SDI-Input This status item indicates the presence of a valid serial digital video signal. It indicates if an input signal is NA (not available), or the following formats;

- 1080i-60
- 1080i-50
- 1080p-30
- 1080p-25
- 1080p-24
- 1035i-60
- 720p-60
- 720p-50
- 720p-30
- 720p-25
- 720p-24
- SD525
- SD625

Audio-Ch_A1 ~ Audio-Ch_B4 These items indicate the status of the audio-data of each individual channel that is assigned to output Out-A1 till Out-B4. When a specific channel does not contain audio, it will indicate NA. If embedded audio is present and not clipped it will indicate Ok.

Audio-Clk_A HD-AudioLock indicates whether the card is locked to the HD input (HD-Sync) or to the Audio Clock as present in embedded audio group_1 (Audio-Clk_A). The status can be Out-of-range, 48KHz-ASync or 48KHz-Sync

Audio-Clk_B HD-AudioLock indicates whether the card is locked to the HD input (HD-Sync) or to the Audio Clock as present in embedded audio group_2 (Audio-Clk_B). The status can be Out-of-range, 48KHz-ASync or 48KHz-Sync

CRC-Stat CRC Stat presents the status of the incoming HD/SDI signal CRC as: Error, Luma_CRC or Chroma_CRC.

ANC-Stat ANC-stat, Ancillary Status, indicates that embedded audio is present and valid. ANC-stat indicates if an input signal is OK, NA (not available) or Error.

| | |
|-----------------|---|
| IO_delay | IO-Delay displays the processing time of the card in milli seconds (ms) up to 1500ms. This will only indicate a value when setting Delay-Status is set to on. |
| ATC-Det | This item indicates whether a valid ATC signal is Present on the input, or not (NA). |
| ATC-Stat | This indicates the status of the above detected ATC signal. Can be OK, Error or NA. |

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 HVD05 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 | Input can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting. |
| CRC-Status | EDH status can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting. |
| What information is available in an event? | <p>The message consists of the following items;</p> <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 Cortex 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 | 01 _{hex} =INP_LOSS | 81 _{hex} =INP_RETURN | primary input lost or returned |
| CRC-Status | 03 _{hex} =CRC_ERROR | 83 _{hex} =CRC_OK | CRC error or OK |

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.

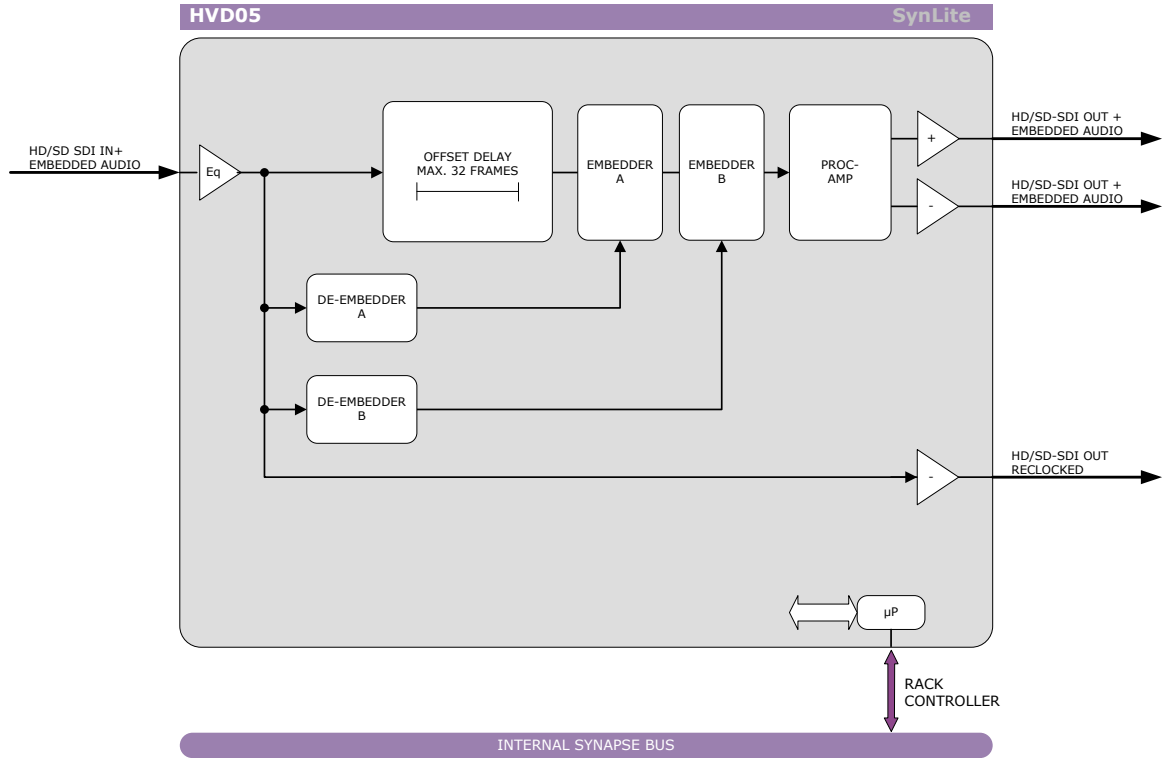
The Address

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 HVD05 card is not configured correctly or has a hardware failure. |
| Input LED | This LED indicated the presence of a valid SDI video signal on the input. |
| Reference LED | Indicated the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2). |
| Data Error LED | This LED indicate two different types of error: <ul style="list-style-type: none">- ANC (embedded audio) checksum error.- EDH error |
| Connection LED | This LED illuminates after the card has initialised. The LED lights for 0.5 seconds every time a connection is made to the card. |

9 Block Schematic



10 Connector Panels

The HVD05 can be used with the BPH01 and BHX01a. The following table displays the pinout of these backpanels.

| | BPH01 | BHX01a |
|--|---|---|
| HD/SD SDI INPUT (OPTIONAL FIBER INPUT) |  |  |
| HD/SD SDI RECLOCKED INPUT |  |  |
| HD/SD SDI PROCESSED OUTPUT 1 |  |  |
| HD/SD SDI PROCESSED OUTPUT 2 (OPTIONAL FIBER OUTPUT) |  |  |
| |  |  |
| |  |  |
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relay bypass

For fiber connectivity see www.axon.tv