

*Synapse*

HES20

**Dolby-E aligner and frame synchronizer**

**HD**  
High Definition

*Synapse*

**TECHNICAL MANUAL**

**HES20**

**Dolby-E aligner and frame synchronizer**



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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

<p>Axon Digital Design HES20</p> <p>Tested To Comply With FCC Standards</p> <p>FOR HOME OR OFFICE USE</p>	<p>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.</p>
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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](http://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, RRS18, RRC10 RRC04 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/RRS18/RRC10/RRC04/RRS04) manual. The method of connection to a computer using Ethernet is described in the RRC manual.



**CHECK-OUT: “SYNAPSE SET-UP” SOFTWARE WILL INCREASE SYSTEM FLEXIBILITY OF ONE OR MORE SYNAPSE FRAMES**

Although not required to set up a Synapse frame, you are strongly advised to use a remote personal computer or laptop PC with the Synapse set up software 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 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.

### SDI / HD CARDS

HD or SDI cards can be mixed and matched in the SFR18 and SFR04 frames.

REMARK: On power up all LEDs will light for a few seconds, this is the time it takes to initialize 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 LEDs will light during this process. After initialisation, 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

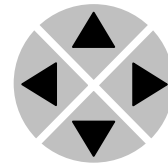
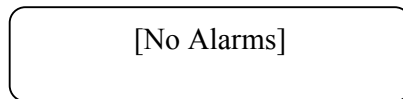
In its default condition, the HES20 will act as a Dolby E Aligner and frame synchroniser.

#### Changing settings and parameters

The front panel controls or the Synapse Set-Up Software 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.

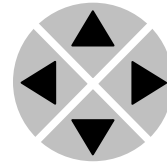
- Press ► To go forward through the menu structure.
- Press ◀ To go back through the menu structure.
- Press ▲ To move up within a menu or increase the value of a parameter.
- Press ▼ To move down through a menu or decrease the value of a parameter.

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

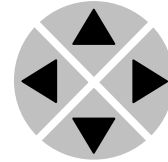
RRC18 [Select Card]  
>S01=HES20



Pressing the ► selects the HES20 in frame slot 01.

The display changes to indicate that the HES20 has been selected. In this example the Settings menu item is indicated.

HES20 [Select Menu]  
>Settings

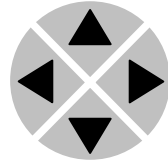


Pressing the ► selects the menu item shown, in this example Settings.

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

The display changes to indicate that the HES20 Settings menu item SDI-Format has been selected and shows that its current setting is Auto.

HES20 [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 HES20 Edit Setting menu item SDI-Format has been selected.

HES20[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.

## Synapse Set-Up Software

Synapse SetUp Software 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



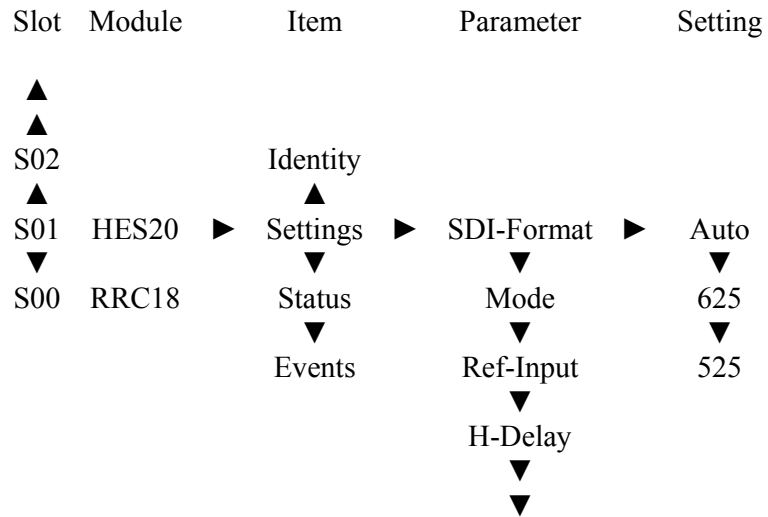
frames/modules.

Each Synapse frame is addressed through its rack controller's unique IP address, giving access to each module, its menus and adjustment items. The Synapse SetUp software 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.

Having selected the desired Frame and Module from the GUI Synapse Network View, select the menu item that you wish to open. Opening the menu item gives a complete list of available properties with their associated Value.

For example to change a setting e.g. SDI-Format, select SDI-Format from the list of settings by 'double clicking' to open a dialogue box. The dialogue box allows parameters to be changed or set to default value. On completion close the dialogue box.

**Menu Structure Example**



REMARK: Further information about Front Panel Control and Synapse Set Up Software can be obtained from the RRC18 and RRC04 operational manuals.

## 4 The HES20 Card

### Introduction

The HES20 is a Dolby-E aligner + frame synchronizer. The use of Dolby E in modern SD and HD SDI embedded infrastructures becomes more and more common. Dolby E has a guard-band that ideally sits exactly on top of the frame boundaries of the SDI video stream. Unfortunately this is not always the case. Individual audio and video propagation delay problems can cause a time shift of the Dolby E stream with respect to the SDI carrier, even when it is embedded. A common cause is an MPEG encoder – decoder configuration in a contribution environment. The shift in guard-band **removes** the feature within Dolby E to drop or rewrite a video-frame without audible clicks. Beside the compression this is one of the main reasons Dolby E is used.

The HES20 is the answer to this problem. The card automatically detects Dolby E and a possible offset of the guard band is measured.

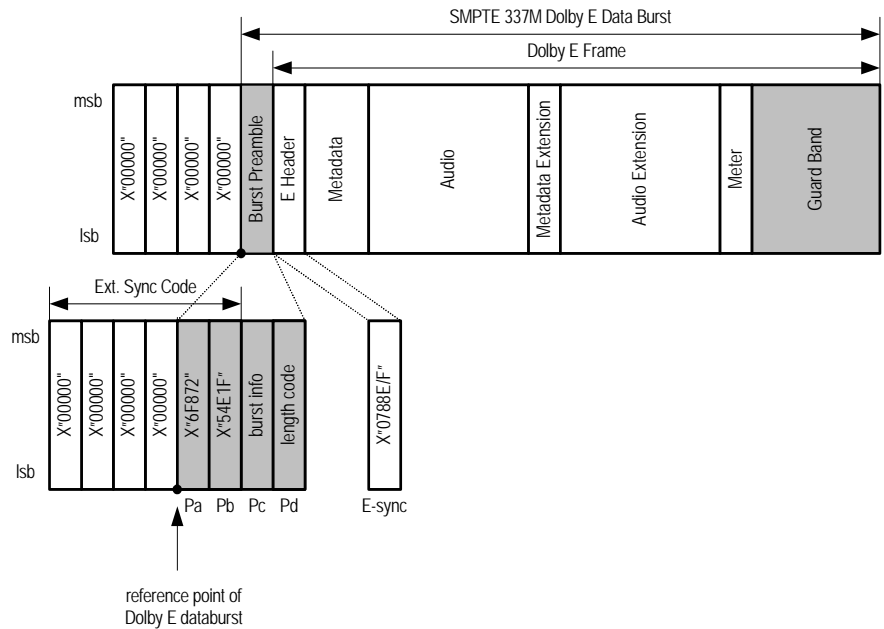
Any offset of up to +/- 0.5 Frame will be corrected automatically by delaying the Dolby E between 0.5 and 1.5 Frame (The video part of the SDI stream is delayed by one frame as default)

A free selection of four stereo pairs, out of the full embedded audio domain can be chosen. If a PCM channel is detected it will get an automatic offset delay of 1 Frame, equal to the video delay.

### Dolby\_E frames

Dolby E frames are carried in the AES3 interface using a packetized structure. The packets (data bursts) are based on the coded Dolby E frame which is illustrated in the Figure below.

Dolby E Frame with SMPTE 337M Transport Header



Each Dolby E frame consist of a synchronization field, metadata field, coded audio field, and a meter field. The metadata field contains a complete set of parameters so that each Dolby E frame can be decoded independently. The

Dolby E frames are embedded into the AES3 interface by mapping the Dolby E data into the audio sample word bits of the AES3 frames utilizing both channels within the signal. Currently only 16 and 20-bit modes are supported for Dolby E.

**Dolby E Phase alignment**

The reference point occurs in the AES3 interface at the first AES3 frame occurring after the start of the defined video line of an analog composite reference signal corresponding to the Dolby E frame rate:

	START:	END:	Switch-LINE:
SD625:	line 10	line 604	line 6/319
SD525:	line 14	line 513	line 10/273
HD1080i50/60:	line 20	line	line 7/569
HD1080p25/30:	line 20	line	line 7
HD720p60/50	line 20	line	line 7
HD720p30/25/24	NA	NA	NA

The guard band takes up approximately 5% of the available AES3 data space.

**TRI/BI-Level sync.**

The card is able to lock on to a HD sync 600mV nominal TRI-level. as described in the SMPTE 274M and 296m spec.

A SD sync 300 mV nominal BI-level sync can also be used.

## 5 Settings Menu

<b>Introduction</b>	<p>The settings menu displays the current state of each HES20 setting and allows you to change these.</p> <p>Settings can be changed by using the front panel of the Synapse frame (SFR18 or SFR04) or Synapse Set-Up software. The SCP08 control can also be used.</p> <p>Please refer to chapter 3 for information on Synapse front panel control and Synapse Set-Up software.</p>
<b>SDI-Format</b>	<p>The format menu item selects the input video standard.</p> <p>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.</p> <ul style="list-style-type: none"><li>▪ 1080i-60/50</li><li>▪ 1080p-30/25/24</li><li>▪ 1035i-60,</li><li>▪ 720p-60/50/30/25/24</li><li>▪ SD525</li><li>▪ SD625</li></ul> <p>SD is standard definition.</p> <p>The default setting is set to AUTO.</p>
<b>Field-Freq</b>	<p>1:1 or 1:1.001 are the values that can be selected</p> <p>1:1 is the right field frequency for 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</p> <p>There is also an AUTO mode, the HES20 will detect the format and switch then to the according field-frequency.</p> <p>Default is AUTO.</p>
<b>Mode</b>	<p>Synchronize and Delay mode can be selected within the Mode menu. In Synchronize mode, the Autophaser/Line synchroniser is active. In Delay mode a reference is not required, the output timing is derived from the input signal. The default setting is Synchronize.</p> <p>Synchronizing Mode: When Mode is set to Synchronize and the card is locked to a reference, the card is in synchronizing mode, and the following timing is of importance. The minimum delay between input and output signal (output advanced) is 5 lines.</p>

(NOTE that it is referred to the output signal so it takes the H-V-delay into account) The maximum delay between input and output signal (output advanced) is '1frame' + 5 lines. Due to a hysteresis, when the timing between in- and output is from 4 lines to 5 lines, it is not say whether the card is in a frame delay or not. The maximum delay between the input and output signal (output advanced) to ensure that the card has a frame delay are '1frame' + 4 lines.

Delay Mode: When Mode is set to Delay, the card is in Delay Mode. In this mode the delay between input and output is 4 lines. The H-Delay and V-Delay settings give a delay in addition of this. Synchronize and Delay mode can be selected within the mode menu. In Synchronize mode, the Autophaser/Line synchroniser is active. In Delay mode a reference is not required, the output timing is derived from the Input

### **Ref-Input**

This setting allows the user to determine which reference input is used to lock the HES20. Input 1 is the uppermost input of the RRC18 rack controller connector panel at the back of the SFR18. The SFR04 has one reference input.

The available settings for Ref-Input are 1, 2 and Auto. The default setting of Ref-Input is 1.

Auto: automatically selects the reference of the selected standard.

Ref\_1 is the 50Hz standard,

REF\_2 is the 60 Hz standard.

The default setting is 1.

### **Ref-Type**

REF-TYPE sets the type of reference TRI-level or BI-level.

The default setting is BI-level

### **H-Delay**

The H-Delay setting allows adjustment of the horizontal phase of the output signal with respect to the selected reference input.

The H-Delay setting gives a delay in addition to the reference timing. For example in 625/50: if the H-Delay is set to 10 samples, the output signal will be delayed by the reference timing + 10 samples of 37ns. Therefore the delay = Ref timing+ 37ns x10. The signal is delayed (advanced) with respect to the phase of the reference signal.

In 625/50 the adjustment range of H-Delay is 0-863 samples, 0..64  $\mu$ s (one PAL TV line).

In 525/60 the adjustment range of H-Delay is 0-857 samples, 0..63.556  $\mu$ s (one NTSC TV line).

The default setting is 0 samples.

The delay of the card is indicated by the tracking pulse on the

BNC output. This can be used, for example, to track an audio delay.

Note: Please refer to the following description of Ref input for synchronization and timing information.

HD resolutions 1 pix = 13.5nsec

1080i-60	Range 0-2199 pix
1080i-50	Range 0-2639 pix
1080p-30	Range 0-2199 pix
1080p-25	Range 0-2199 pix
1080p-24	Range 0-2749 pix
1035i-60	Range 0-2199 pix
720p-60	Range 0-1649pix
720p-50	Range 0-1979 pix
720p-30	Range 0-3299 pix
720p-25	Range 0-3959 pix
720p-24	Range 0-4124 pix

SD resolution

525i-60	Range 0-857
625i-60	Range 0-863

**V-Delay**

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

The V-Delay setting gives a delay in addition to the reference timing. For example, if the V-Delay is set to 10 TV lines, the output signal will be delayed by the reference timing + 10 TV lines. The signal is delayed (advanced) with respect to the phase of the reference signal.

In 625/50 the adjustment range of V-Delay is 0-624 lines (one TV frame).

In 525/60 the adjustment range is 0-524 lines (one TV frame).

The default setting is 0 lines.

The delay of the card is indicated by the tracking pulse on the BNC output. This can be used, for example, to track an audio delay.

Note: Please refer to the description of Ref input for

synchronization and timing information.

525i60	Range 0-524 lines
625i60	Range 0-624
720p	Range 0-749
1080i	Range 0-1124
1080p	Range 0-1124

**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 input Off

**Ext-Frz** Ext-Freeze enables the external freeze input (GPI contact closure J9 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

	<p>processing amplifier. The control range is between 0% and 199.8%**.</p> <p>The default setting of Cb-Gain is 100%.</p>
<b>Y-Black</b>	<p>This item controls the Luminance black level adjustment between -128.....+127 (10 bit digital value)</p> <p>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</p>
<b>Cb-Black</b>	<p>This item controls the Colour Difference (Cb) black level adjustment.</p>
<b>Cr-Black</b>	<p>This item controls the Colour Difference (Cr) black level adjustment.</p>
<b>Line-lock</b>	<p>Line lock is only available in HD.</p> <p>In the line data, a line number is interwoven. The line number can be locked to the reference.</p> <p>Enabled indicates that it is active.</p> <p>Disabled indicates that it is not active.</p> <p>The default setting is Disabled.</p> <p>This function is de-activated for SD formats.</p>
<b>ANC-Blank</b>	<p>ANC-Blank allows you to blank the ancillary data in the horizontal and/or in the vertical interval.</p> <p>H – ancillary data in the Horizontal interval blanked.</p> <p>V – ancillary data in the Vertical interval blanked.</p> <p>H+V – ancillary data in the Horizontal and Vertical interval blanked.</p> <p>Off – The ancillary data is passed.</p> <p>The default setting is OFF.</p>
<b>OSD-Enable</b>	<p>The HES20 has the option to display an on screen text at a fixed position ( left corner) in the HD_output. Off nothing is displayed. Transp, the OSD is displayed transparent. Masked, the OSD is displayed in a black box. In the next item it is possible to set the text. With a maximum of ten characters.</p> <p>Default is OFF</p>



<b>OSD_text</b>	This is an empty field where it is possible to fill in the OSD text. With a maximum of ten characters.
<b>Delay-Status</b>	In the status menu it is possible to display (IO_delay item) the processing time of the HES20. This setting enables you to switch this function ON or OFF. Default setting is OFF.
<b>Switch-Status</b>	In the status menu it is possible to display (switch-Det) the switching time in the selected line (7 for 50Hz) of the HES20. This setting enables you to switch this function ON or OFF. Default setting is OFF.
<b>Dolby-E-Mode</b>	Dolby E mode sets the Alignment function on or off. When Align is selected the HES10 will perform the Alignment function automatically. OFF means the alignment function is disabled. Default setting is Align. Note: it is only possible to detect the starting line of Dolby_E, PCM or other formats are displayed as 0ln
<b>Source-A1/2</b>	Source-A1/2, Makes the selection of all embedded channels in pairs off two channels. These channels can be later aligned with the setting SOF-E-Off_A1/2. Ch_1/2 .. Ch_15/16. Default setting is Ch_1/2.
<b>Source-A3/4</b>	Source-A3/4, Makes the selection of all embedded channels in pairs off two channels. These channels can be later aligned with the setting SOF-E-Off_A3/4. Ch_1/2 .. Ch_15/16. Defaults setting is Ch_3/4
<b>Source-B1/2</b>	Source-B1/2, Makes the selection of all embedded channels in pairs off two channels. These channels can be later aligned with the setting SOF-E-Off_B1/2. Ch_1/2 .. Ch_15/16. Defaults setting is Ch_5/6
<b>Source-B3/4</b>	Source-B3/4, Makes the selection of all embedded channels in pairs off two channels. These channels can be later aligned with the setting SOF-E-Off_B3/4. Ch_1/2 .. Ch_15/16. Defaults setting is Ch_7/8

<b>SOF-E-Off_A1/2</b>	<p>SOF-E-Off_A1/2, Allows to change to starting line of the Dolby_E this can be done in a range from –10 to +10 lines. The starting lines of the embedded audio can be found on page 9.</p> <p>Default is line 0.</p> <p>In the status menu item SOF-E_A1/2 is displayed the starting line of the incoming Dolby_E</p>
<b>SOF-E-Off_A3/4</b>	<p>SOF-E-Off_A3/4, Allows to change to starting line of the Dolby_E this can be done in a range from –10 to +10 lines. The starting lines of the embedded audio can be found on page 9.</p> <p>Default is line 0.</p> <p>In the status menu item SOF-E_A3/4 is displayed the starting line of the incoming Dolby_E.</p>
<b>SOF-E-Off_B1/2</b>	<p>SOF-E-Off_B1/2, Allows to change to starting line of the Dolby_E this can be done in a range from –10 to +10 lines. The starting lines of the embedded audio can be found on page 9.</p> <p>Default is line 0.</p> <p>In the status menu item SOF-E_B1/2 is displayed the starting line of the incoming Dolby_E.</p>
<b>SOF-E-Off_B3/4</b>	<p>SOF-E-Off_A3/4, Allows to change to starting line of the Dolby_E this can be done in a range from –10 to +10 lines. The starting lines of the embedded audio can be found on page 9.</p> <p>Default is line 0.</p> <p>In the status menu item SOF-E_B3/4 is displayed the starting line of the incoming Dolby_E</p>
<b>Emb-Mode</b>	<p>Emb-Mode enables additional audio channels to be added to the existing audio-groups in the ancillary data space of the HD stream Emb-Mode has three settings, Off, Append, and Overwrite. The default setting is Overwrite.</p> <p>In Off mode the card will relock the input.</p> <p>In Overwrite mode all existing audio groups will be overwritten and the processes group is inserted.</p> <p>In Append mode additional audio channels will be added.</p> <p>In order to blank the ancillary data space of the HD-SDI stream, set Emb-Mode to Overwrite and set Emb-Sel to Off</p>
<b>Emb-A-Sel</b>	<p>Emb-A-Sel determines which of the four groups of audio</p>

available on the Synapse bus will be embedded by embedder A of the HES20 into the HD SDI stream. The settings of Emb-A-Sel are Off, Group\_1, Group\_2, Group\_3, Group\_4.

The default setting is Group\_1.

**Emb-B-Sel**

Emb-B-Sel determines which of the four groups of audio available on the Synapse bus will be embedded by embedder B of the HES20 into the HD SDI stream. The settings of Emb-B-Sel are Off, Group\_1, Group\_2, Group\_3, Group\_4.

The default setting is Group\_2.

**ATC-Transp**

ATC-Transp: this setting allows to set the time code back back in the horizontal interval. The standards that are supported are RP188, RP196 and RP215. Its I possible to select one of these standards or Select then ALL. Or switch this functionality OFF in this case the time code is blanked.

## 6 Status Menu

<b>Introduction</b>	The status menu indicates the current status of each item listed below.
<b>SDI-Input</b>	<p>This status item indicates the presence and format of a valid HD/SD serial in input_1.</p> <p>This is displayed as:</p> <ul style="list-style-type: none"><li>▪ 1080i/60/50</li><li>▪ 1080p/30/25/24</li><li>▪ 1035i/60</li><li>▪ 720p/60/50/30/25/24</li><li>▪ SD525</li><li>▪ SD625</li></ul> <p>NA is used when no valid input signal is available or if the selected format doesn't match the input signal.</p>
<b>Ref-Det</b>	<p>This status item recognizes a valid reference in the genlock input. NA indicates that no valid reference is present.</p> <p>Present indicates that a valid reference is present.</p> <p>No status feedback indicates that there is no SD/HD input.</p>
<b>Lock-Det</b>	Lock-Det indicates if there is a valid clock presented in the output. It shows whether the right ref-type is selected, and whether the internal PLL is locked to the signal. This is then displayed as LOCKED. Unlocked the above described criteria are not present.
<b>GrpInUse</b>	<p>Detects the embedded audio groups that are used within the HD/SD data stream.</p> <p>If no groups are detected, the display indicates ----</p> <p>A single group is detected as 1---</p> <p>All groups are represented by 1234</p>
<b>Grp-ins</b>	In the case the same two groups selected for re-insertion in the setting. Grp-A-Sel and Grp-B-Sel. Then is there a Error diplsyrd in this status item. OK no problems with re-inserting.

<b>FrmtStat_A1/2</b>	Format Status displays the kind of audio that is detected. The formats that are detected are conform SMPTE 338 non PCM audio and data in AES3.
<b>FrmtStat_A3/4</b>	Format Status displays the kind of audio that is detected. The formats that are detected are conform SMPTE 338 non PCM audio and data in AES3.
<b>FrmtStat_B1/2</b>	Format Status displays the kind of audio that is detected. The formats that are detected are conform SMPTE 338 non PCM audio and data in AES3.
<b>FrmtStat_B3/4</b>	Format Status displays the kind of audio that is detected. The formats that are detected are conform SMPTE 338 non PCM audio and data in AES3.
<b>SOF-E_A1/2</b>	SOF-E_A1/2 Displays in which line the first package of non PCM audio and data is detected for channels A_1/2
<b>SOF-E_A3/4</b>	SOF-E_A3/4 Displays in which line the first package of non PCM audio and data is detected for channels A_3/4
<b>SOF-E_B1/2</b>	SOF-E_B1/2 Displays in which line the first package of non PCM audio and data is detected for channels B_1/2
<b>SOF-E_B3/4</b>	SOF-E_B3/4 Displays in which line the first package of non PCM audio and data is detected for channels B_3/4
<b>Audio-A-Clk</b>	<p>HD-AudioLock determines whether the card is locked to the HD input (HD-SYNC) or to the CARD that is locked to the AUDIO CLOCK as is present in the embedded audio group_1 (Audio-Clk_A)</p> <p>The status can be Out-of-range, 48KHz-ASYNCR or 48KHZ-SYNCR</p>
<b>Audio-B-Clk</b>	<p>HD-AudioLock determines whether the card is locked to the HD input (HD-SYNC) or to the CARD that is locked to the AUDIO CLOCK as is present in the embedded audio group_1 (Audio-Clk_B)</p> <p>The status can be Out-of-range, 48KHz-ASYNCR or 48KHZ-SYNCR</p>

<b>ANC-Stat</b>	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.
<b>ATC-Det</b>	ATC-Det, Ancillary Time Code detects if there is a timecode present in the horizontal interval.
<b>ATC-Stat</b>	ATC-Stat, Ancillary Time Code Status, displays if there are valid timecode packages present in the horizontal interval.
<b>CRC-Stat</b>	CRC Stat gives the status of the incoming HD/SDI signal CRC Error Luma_CRC Chroma_CRC
<b>IO_delay</b>	IO-Delay displays the processing time of the card in milli seconds (ms). It is necessary to enable this function in the settings menu under Delay status.
<b>Switch-Det</b>	Switch-Det displays the switching time of the card in milli seconds (ms). It is necessary to enable this function in the settings menu under Switch status.

## 7 Events Menu

<b>Introduction</b>	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.
<b>What is the Goal of an event?</b>	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.
<b>HES20 Events</b>	The events reported by the HES20 are as follows;
<b>Announcements</b>	Announcements is not an event. This item is only used for switching the announcement of status changes on/off. 0=off, other =on
<b>Input</b>	Input can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.
<b>Ref-Status</b>	Reference can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.
<b>Lock-Status</b>	If the card is locked can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.
<b>CRC-Status</b>	EDH status can be selected between 0 .. 255. 0= no event, 1..255 is the priority setting.  This information is only needed when the GPI16 card is used or when software is implemented.
<b>What information is available in an event?</b>	The message consists of the following items; <ol style="list-style-type: none"><li>1) A message string to show what has happened in text, for example: "INP_LOSS", "REF_LOSS", "INP_RETURN".</li><li>2) A tag that also shows what happens, but with a predefined number: e.g. 1 (= loss of input), 2 (= loss of reference), 129(=</li></ol>

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<sub>hex</sub>) (e.g. 129 (81<sub>hex</sub>) for Return of Input).

**Defining Tags**

The tags defined for the HES20 are:

Event Menu Item	Tag		Description
Announcements	0 or NA	0 or NA	Announcing of report and control values
Input	01 <sub>hex</sub> =INP_LOSS	81 <sub>hex</sub> =INP_RETURN	primary input lost or returned
Reference	02 <sub>hex</sub> =REF_LOSS	82 <sub>hex</sub> =REF_RETURN	reference lost or returned
EDH-Status	03 <sub>hex</sub> =EDH_ERROR	83 <sub>hex</sub> =EDH_OK	EDH error occurred
ANC-Status	04 <sub>hex</sub> =ANC_ERROR	84 <sub>hex</sub> =ANC_OK	ANC status error

**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**

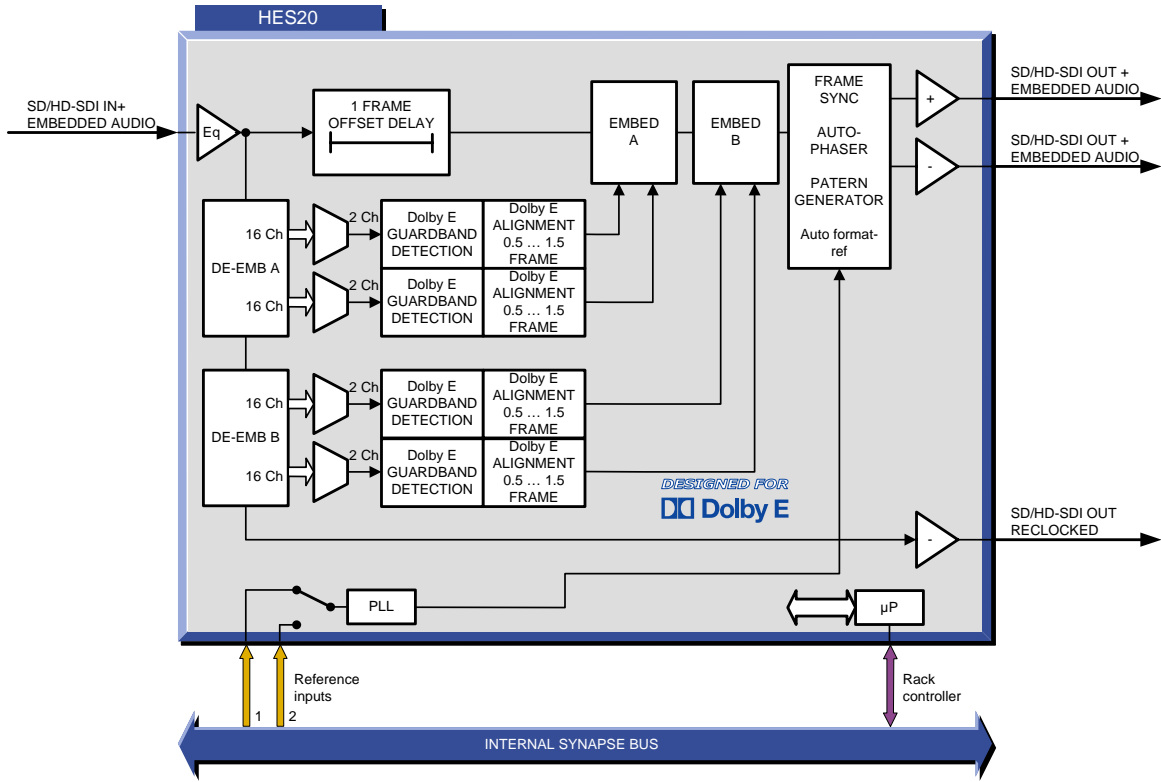
Together with the message string or the tag, the slot number or address of the card is relevant to be able to assign the event to a certain card.



## 8 LED Indication

<b>Error LED</b>	The error LED indicates an error if the internal logic of the HES20 card is not configured correctly or has a hardware failure.
<b>Input LED</b>	This LED indicated the presence of a valid SDI video signal on the input.
<b>Reference LED</b>	Indicated the presence of a valid reference signal on the selected reference input connector (ref-1 or ref-2).
<b>Data Error LED</b>	This LED indicate two different types of error: <ul style="list-style-type: none"><li>- ANC (embedded audio) checksum error.</li><li>- EDH error</li></ul>
<b>Connection LED</b>	This LED illuminates after the card has initialised. The LED lights for 0.5 seconds every time a connection is made to the card.

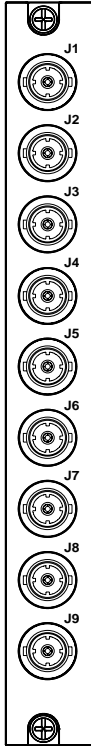
# 9 Block Schematic



## 10 Connector Panel

The HES20 can be used with the following backplane  
BPH01

Compatible with fiber backplanes: BPH01T\_FC/PC,  
BPH01T\_SC, BPH01R\_FC/PC, BPH01R\_SC



J1 = HD/SDI INPUT

J2 = HD/SDI RECLOCKED OUTPUT

J3 = HD/SDI PROCESSED OUTPUT

J4 = HD/SDI PROCESSED OUTPUT

J7 = FREEZE GPI INPUT

J8 = TRACKING TTL OUTPUT

## 11 Specifications

### Serial Digital Video Input

Data format	SMPTE 259M/272M
Data rate	270Mb/s. 1.485Gb/s on 1.485/1.001 Gb/s
Levels	800mV p-p
Return loss	>15dB
Max cable length	250m for SDI , 120m for HD on belden 1694

### Serial Digital Video Outputs – reclocked

Data format	SMPTE 259M/272M
Data rate	270Mb/s. 1.485Gb/s on 1.485/1.001 Gb/s
Levels	800mV p-p
DC offset	<500mV
Jitter	<120ps(HD) <400ps(HD)
Rise & Fall time	<200ps(HD) <520ps (SD)
Return Loss	>18dB

### Serial Digital Video Outputs – processed

Data format	SMPTE 259M/272M
Data rate	270Mb/s. 1.485Gb/s on 1.485/1.001 Gb/s
Levels	800mV p-p
DC offset	<500mV
Jitter	<120ps(HD) <400ps(HD)
Rise & Fall time	<200ps(HD) <520ps (SD)
Return Loss	>18dB

### Processing

Video	Y Cr Cb gain
Embedded Audio	
Propagation delay	Max 1 frame +5 H , min 4H
Hysteresis	1H
H-phase adjustment accuracy	6.7ns (HD), 37ns(SD)

### Miscellaneous

Supply Voltage	25 to 32VDC
Power Consumption	8 w
Weight	250g
Operating temperature	0 °C to 50 °C
Dimensions	20 x 137 x 296 mm

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