

digital keying modular  
interface audio  
converters analogue video

# SYNAD-E

Embedded audio synchroniser with  
Dolby E processing

## USER MANUAL



# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
	Synchroniser and Delay Modes	4
	Video tracking	5
	TAD versus slew rate	5
	Predictive tracking	5
	Adjusting the audio delay	6
	De-embed - Embed pattern	6
	Freezing the picture	6
	SDI loss behaviour	7
	Vertical lock Mode	7
	Handling non-linear audio	7
	HANC Cleaning	7
	SYNAD-E HANC Cleaning	8
	Using the headphone monitor output	8
<b>2</b>	<b>Hardware installation</b>	<b>9</b>
2.1	Rear modules and signal I/O	9
	RM26	9
	RM30	10
2.2	Module Configuration	10
	Loop or terminate the external reference	10
	General Purpose Interface (GPI)	11
<b>3</b>	<b>Card edge operation</b>	<b>15</b>
3.1	Card edge switch settings	15
3.2	Card edge rotary controls	15
3.3	Reading card edge LEDs	16
3.4	Navigating card edge menus	16
	Card edge configuration	16

3.5	Card edge status operation	17
3.6	Using presets	19
3.7	Video and audio configuration.	19
	Selecting the video delay or offset	19
	Selecting the Freeze Mode	20
	Selecting the operating Mode	21
3.8	Audio selection and routing	23
	Selecting embed/de-embed audio groups	23
3.9	HANC Cleanup settings	26
3.10	Alarm configuration	29
	Engineering settings	30
<b>4</b>	<b>Statesman</b>	<b>31</b>
4.1	Installing Statesman	31
	Minimum pre-requisites:	31
	Installation:	31
	Running Statesman for the first time	31
4.2	Statesman operation	32
	Video properties	33
	Audio properties	35
	Video tracking	36
	Alarms, presets and headphone monitoring	36
	HANC cleanup	38
<b>5</b>	<b>Trouble Shooting</b>	<b>40</b>
5.1	Card edge monitoring	40
	Status LEDs	40
	Fault finding guide	40
<b>6</b>	<b>Specification</b>	<b>42</b>

# 1 Introduction

SYNAD-E is a video frame/line synchroniser with built-in tracking audio delay for up to two groups of embedded audio with special features designed for mixed Dolby E and standard AES.

Two independent de-embedders can each accept four audio channels from a selected incoming audio group, which is then re-sampled, delayed and re-embedded into any selected output audio group. In systems containing Dolby E encoded audio, individual stereo pairs within one of the audio groups can be set for processing without using the re-samplers and therefore maintaining the data integrity.

There are up to four SDI outputs, a SDI loop-through, and up to two composite video outputs from an internal monitoring encoder.

The serial digital output has virtually no output jitter, both when used as a synchroniser with a stable analogue reference, and when used as a delay line without a reference.

In Synchronisation Mode, the SDI output contains video that has been synchronised by the frame synchroniser function, plus a total of up to eight embedded signals, which have in the case of AES been de-embedded, re-sampled to 48 kHz and locked to the output SDI signal's video content.

This provides delayed audio that tracks the video delay, with selectable additional audio delay, as a fully synchronous embedded signal to SMPTE 272M.

When using 625-line video, picture disturbances on untimed input cuts are avoided by waiting until line 23 to re-lock. Interruptions to the embedded audio, or unusual methods of packing are automatically corrected.

The unit has a short minimum delay and a choice of black, blue or freeze on input failure.

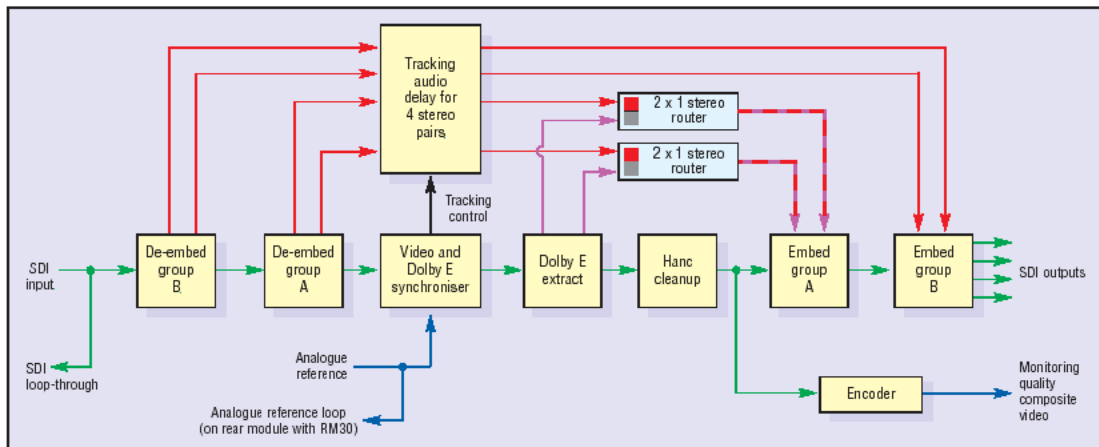
SYNAD-E is particularly suitable for placing after a routing switcher where the sources are several lines apart, or in installations using devices such as the Sony IMX VTRs which record up to two groups of embedded audio.

The main features are as follows:

- Frame or line synchroniser or use as a fixed delay line
- Handles mixed AES and Dolby E audio simultaneously
- Transparent audio follow video tracking built in
- Full vertical and horizontal adjustment from 0 to 2 fields in any mode
- Audio delay adjustment from 3 ms to 88 ms
- Fast lock after up-stream switch
- Corrects and/or masks audio corruption
- 24 bit input and output stages and dither enhanced 20 bit processing ensure high quality operation
- Selectable black, blue or freeze on input failure
- EDH generation
- Audio follow control output
- Composite monitor output
- Flexible control

SYNAD-E is a 100mm x 266mm module, which fits in Crystal Vision's four standard frame sizes and can be integrated with any boards from the company's full product range. 24 modules fit in 4U, 12 modules fit in 2U, six in 1U or two in a desktop box. It uses the RM26 and RM30 rear connectors.

The embedded audio is handled as two sets of four audio channels [two stereo signals] from each of two audio groups. Each selected audio group is handled by an independent processing path.



*SYNAD-E video and embedded audio synchroniser*

**Notes:** Audio can be routed between any input and output groups by SYNAD-E. Note that channels cannot be individually re-routed across multiple groups.

## Synchroniser and Delay Modes

SYNAD-E has two modes of operation - Synchronisation and Delay.

In Synchronisation Mode the unit takes its timing from the analogue external reference and will automatically synchronise sources with or without embedded audio between zero and two fields. Synchronisation Mode is ideal for external sources that are not timed to station references such as satellite or remote contribution feeds.

In Delay Mode, timing is derived only from the SDI input. Typical applications are where a source passes through a processor such as a DVE, Chroma keyer or standards converter where the delay can be a few microseconds, multiple lines or up to two fields.

In either mode the video delay remains fully adjustable over two complete fields. This allows the output of the SYNAD-E to be timed into any edit suite irrespective of the timing of the black and burst reference used in Synchronisation Mode.

Also in either mode the audio delay can be configured to track the video delay and provide an additional or offset delay to the video or to be configured for a fixed delay. There is also an external audio follow video pulse output, the duration of which reflects the current video delay. The AFV output can be used with external audio delay processors if required.

## Video tracking

When enabled, the built-in video tracking (strictly speaking Audio Follow Video tracking) helps to ensure that the audio delay matches the video delay to maintain lip sync. Although video tracking (AFV) can be used in both Synchronisation and Delay Modes, it operates dynamically in Synchronisation Mode as input/output timing changes.

When video tracking is on in Synchronisation Mode, the rate at which the audio delay tracks fast or abrupt changes in video delay is controlled by the tracking audio delay (TAD) rate.

The faster the TAD speed, the faster the audio delay will match the video delay, but at the expense of musical pitch.

Since the TAD speed can be audible as a pitch change the response time needs to be chosen with care. A sports event may well benefit from a fast TAD speed but classical music with piano and violins would require the slowest speed.

For example a TAD speed of 0.1% can cause a pitch change of the same value to be heard as the audio delay catches up with the video.

To put this in perspective, imagine a piano recital is in progress and a concert pitch A above middle C is heard. This has a fundamental frequency of 440Hz. A 0.1% change would produce 440.44Hz. A sharp or B flat is 466.16Hz so in this case the audio delay slew rate only causes a pitch change of the order of one sixtieth of a semitone.

The TAD speeds are 0.8%, 0.4%, 0.2%, 0.1% and 0.05%.

## TAD versus slew rate

A 40 ms change in video timing only takes five seconds at the 0.8% TAD speed. Each decreasing response step takes double the time to catch up, so a 0.05% rate means that the audio would take 80 seconds to catch up with the video.

The following table relates audio tracking response time to video changes for a range of TAD values:

Video timing change	T.A.D. 0.05%	T.A.D. 0.1%	T.A.D. 0.2%	T.A.D. 0.4%	T.A.D. 0.8%
40 ms	80 seconds	40 seconds	20 seconds	10 seconds	5 seconds
20 ms	40 seconds	20 seconds	10 seconds	5 seconds	2.5 seconds
10 ms	20 seconds	10 seconds	5 seconds	2.5 seconds	1.25 seconds
5 ms	10 seconds	5 seconds	2.5 seconds	1.25 seconds	0.6 seconds
1 ms	5 seconds	2.5 seconds	1.25 seconds	0.6 seconds	0.3 seconds

## Predictive tracking

In Synchronisation Mode, there are two situations when the video delay changes abruptly between zero and two fields: when the video delay increases to the point where it is about to jump from one full frame delay to zero and when it decreases to the point where it is about to reach zero and then jump to one full frame delay.

To avoid the need for large changes in audio delay or noticeable lip sync problems it may be better to change the audio delay in anticipation of the imminent jump in video delay.

If there is no predictive tracking (i.e. set to off) then only after the jump in video delay does the audio delay start changing. As a result, there is a short period of time just after the jump in video delay where the audio is offset from video by 40 ms (625 line systems - 33 ms for 525L).

When predictive tracking is on, then as the video delay jump approaches, the audio delay starts to change so that significant audio delay change has already been effected prior to the jump in video delay.

With predictive tracking on, the relative audio timing will always be within the recommended window (less than 16 ms ahead or 24 ms behind).

When the video delay or rate of change is small, the audio delay will track and remain very close to the value of video delay, until the point where predictive tracking function (if ON) will compute that predictive offset is required.

To ensure that lip sync errors are minimised during the necessary jumps in video timing with asynchronous inputs in Synchronisation Mode, make sure that the predictive tracking is on and that an appropriate TAD value for the programme material has been selected.

Predictive tracking is not available in Delay Mode.

## Adjusting the audio delay

The audio delay can be controlled independently of the video delay from 0 to 88 ms.

If video tracking is off the actual audio delay is set manually. If video tracking is on the audio delay is automatically controlled to match the video delay. However the offset timing between audio and video remains adjustable in any mode.

Audio delay	Description
Video tracking on	Audio delay controlled automatically to follow video delay Relative timing available
Video tracking off	Actual audio delay controlled manually

**Note:** Audio delay dynamically follows video delay in Synchronization Mode and when video delay is manually changed when video tracking is on in either Synchronization or Delay Mode.

## De-embed - Embed pattern

The SYNAD-E supports two different de-embedding formats - Sony or SMPTE. The Sony format embeds on every line of the SDI output, whereas the SMPTE format omits embedding from one line before the vertical interval switch point as defined in SMPTE RP168, through to three lines after - a total of a four line gap in each and every TV field.

The input format does not require setup as it is automatically detected.

The embedding format is fixed to be SMPTE.

## Freezing the picture

The type of picture freeze used when the freeze command is given may be selected from frame, field 1 and field 2. If there is movement between both fields a frame freeze may show movement judder. A field freeze works by repeating the same field to produce a

synthetic frame of video, without movement judder. However a field freeze is more likely to show jagged edges on near horizontal lines.

The audio output is always muted when the video is frozen. The embedded packet structure is maintained but the packets contain silence.

## SDI loss behaviour

The behaviour when the SDI input is lost may be selected to cut to black, cut to blue, freeze, or hold a freeze for approximately one second before outputting a blue or black screen. The picture freeze type selected will determine the freeze displayed.

## Vertical lock Mode

With 525 line sources the re-lock is timed from the field flag to accommodate different lengths of vertical blanking. Normally when operating with 625 line sources, SYNAD-E re-locks on the input at the start of active video. This means that if switch occurs between untimed sources there will be no disturbance in the active video if both the sources are in vertical blanking when the switch occurs. To allow operation with 625 line sources that have non-compliant vertical blanking lengths, it is possible to select a re-lock timed from the field flag.

## Handling non-linear audio

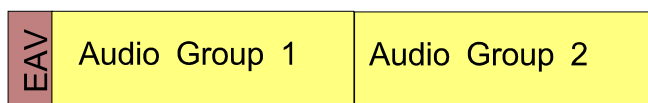
Embedded data that is not linear audio, such as Dolby E, can be passed by selecting Embedder C not to resample. Re-sampling can be applied selectively to channels pairs 1-2 and 3-4 so allowing mixed formats within a single group.

## HANC Cleaning

This offers the ability to remove unwanted embedded audio packets and will tidy up the Horizontal Ancillary data area (HANC).

An example would be -

An incoming SDI signal has two embedded audio groups within it (Group 1 and 2).



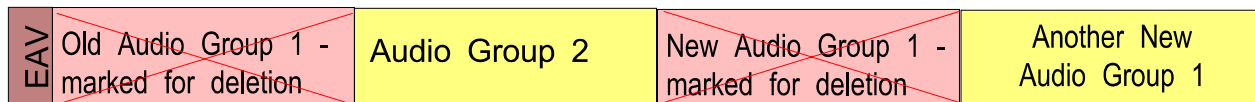
You then wish to embed new audio into group 1. You cannot blank the HANC area before embedding the new Group 1, as you do not want to lose Group 2. Currently most embedders will mark Group 1 for deletion (but not delete it) and then insert the new Group 1 after the Group 2.



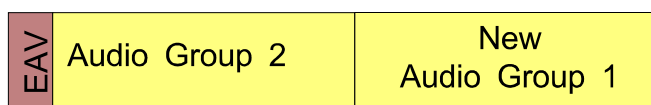


Audio de-embedders will ignore audio groups that are marked for deletion.

This works OK unless you do this many times and then you will then run out of HANC space.



HANC cleaning avoids the danger of running out of space by actually removing the audio which is marked for deletion. It will then move the remaining audio packets into the free space.



## SYNAD-E HANC Cleaning

The SYNAD-E can synchronise two groups of embedded audio. One of those groups can contain mixed linear audio and compressed Dolby E. In order to synchronise it is necessary to create (and embed) a new version of Group 1 (for example). Without HANC cleaning we would mark the old Group 1 for deletion but not delete it.

If the same signal were to pass through an SYNAD-E device two or three times then the HANC area would soon become full, as detailed above.

HANC cleaning within the SYNAD-E will resolve this issue. It may also have applications where there is other HANC data being used and therefore embedders cannot simply blank the HANC before embedding.

Once HANC cleaning is enabled the user can then choose to pass / blank different types of data packets which may be in the HANC area.

## Using the headphone monitor output

The card edge jack socket [3.5 mm, stereo] can be used to monitor the four stereo audio signals which have been selected for de-embedding from the four input audio groups by the A & B Channel de-embedders.

These analogue audio signals are only available through the headphone jack socket.

# 2 Hardware installation

The SYNAD-E single height module uses the RM26 and RM30 rear connectors and fits into all Crystal Vision rack frames. All modules can be plugged in and removed while the frame is powered without damage.

**Note:** The RM04, RM05 and RM07 can also be used, but with certain restrictions in output & frame configuration.

## 2.1 Rear modules and signal I/O

The Indigo 4 4U frame will house up to 24 single height modules with up to three power supplies. The FR2AV and Indigo 2 2U frames will house up to 12 single height modules and dual power supplies. The FR1AV and Indigo 1 1U frames will house six single height modules and a single power supply. The DTBAV and Indigo desk top boxes both have a built-in power supply and will house up to two single height modules.

**Note:** For details of fitting rear connectors please refer to the appropriate frame manual


### RM26

RM26 modular rear connector	Description
	<ul style="list-style-type: none"> <li>• <b>RM26 (ZLA00233 artwork)</b></li> <li>• 12 SYNAD-E modules per Indigo 4 frame</li> <li>• 6 per FR2AV or 2U Indigo frame</li> <li>• 3 per FR1AV or 1U Indigo frame</li> <li>• 1 per desk top box</li> </ul> <p>Odd number frame slots can not be used</p>

BNC	Function
SDI IN	Serial digital input
SDI LOOP	Serial digital input loop-through (active on board loop-through)
PAL/NTSC	Analogue composite video output
SYNC LOOP	Composite sync (B & B) input loop-through (active on board loop-through)
SDI OUT(1)	Serial digital output
SDI OUT(3)	Serial digital output
SYNC IN	Composite sync (B & B) input
PAL/NTSC	Analogue composite video output
SDI OUT(2)	Serial digital output
SDI OUT(4)	Serial digital output

The **RM26** 15 way D-Type female socket has no connections.

## RM30

RM30 modular rear connector	Description
 <p>PAL/NTSC   SDI OUT (2)   SDI OUT (1)   SYNC IN   SDI IN   SYNC LOOP</p> <p>RM30</p>	<ul style="list-style-type: none"> <li>• <b>RM30</b></li> <li>• 24 SYNAD-E modules per Indigo 4 frame</li> <li>• 12 per FR2AV or Indigo 2 frame</li> <li>• Six per FR1AV or Indigo 1 frame</li> </ul> <p>All frame slots can be used</p>

BNC	Function
SYNC LOOP	Composite sync (B & B) input loop-through
SDI IN	Serial digital input
SYNC IN	Composite sync (B & B) input
SDI OUT (1)	Serial digital output
SDI OUT (2)	Serial digital output
PAL/NTSC	Analogue composite video output

## 2.2 Module Configuration

### Loop or terminate the external reference

The external analogue reference may be terminated with  $75\Omega$  or left unterminated for when using the loop through output. Set jumper link PL7 at the bottom right hand corner of the module to its lower position to terminate the external reference. Set jumper PL7 to its upper position to unterminate the reference input.

Link	Position	Select loop through or termination of reference syncs
PL7	Bottom right hand corner	<p>Link in its upper position – ext syncs looped through</p> <p>Link in its lower position – ext syncs terminated on board</p>

## General Purpose Interface (GPI)

The SYNAD-E, like most Crystal Vision modules, is equipped with GPI control I/O.

GPI			Low (<1V)	High (+5V)
0	'a'	Recall preset bit 1	Active	Non-active
1	'b'	Recall preset bit 2	Active	Non-active
2	'c'	Recall preset bit 4	Active	Non-active
3	'd'	Recall preset bit 8	Active	Non-active
4	'e'	Audio follow pulse	Pulse width equal to audio delay	
5	'f'	Silence alarm/loss of input	Alarmed	Not alarmed

As supplied, each GPI output has a 330Ω resistor in series with its output. This allows for an external LED to be driven, connected to a DC voltage of +5V.

GPI	Bit 4	Bit 3	Bit 2	Bit 1
<b>Preset</b>				
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

**Note:** GPI presets are actioned upon a change in level.

**4U frame GPI connections**

GPI lines 'a' to 'f' of each card connect to one of eight rear remote connectors as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin	
Upper	1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
	2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
	3	8 (3)	9 (3)	18 (3)	26 (3)	19 (4)	20 (4)
	4	7 (3)	16 (3)	17 (3)	25 (3)	10 (4)	11 (4)
	5	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
	6	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
	7	5 (3)	6 (3)	15 (3)	24 (3)	1 (4)	2 (4)
	8	4 (3)	14 (3)	13 (3)	23 (3)	3 (4)	4 (4)
	9	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
	10	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)
	11	3 (3)	12 (3)	22 (3)	21 (3)	12 (4)	13 (4)
	12	10 (3)	11 (3)	19 (3)	20 (3)	21 (4)	22 (4)
Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin	
Lower	1	8 (5)	9 (5)	18 (5)	26 (5)	19 (6)	20 (6)
	2	7 (5)	16 (5)	17 (5)	25 (5)	10 (6)	11 (6)
	3	8 (7)	9 (7)	18 (7)	26 (7)	19 (8)	20 (8)
	4	7 (7)	16 (7)	17 (7)	25 (7)	10 (8)	11 (8)
	5	5 (5)	6 (5)	15 (5)	24 (5)	1 (6)	2 (6)
	6	4 (5)	14 (5)	13 (5)	23 (5)	3 (6)	4 (6)
	7	5 (7)	6 (7)	15 (7)	24 (7)	1 (8)	2 (8)
	8	4 (7)	14 (7)	13 (7)	23 (7)	3 (8)	4 (8)
	9	3 (5)	12 (5)	22 (5)	21 (5)	12 (6)	13 (6)
	10	10 (5)	11 (5)	19 (5)	20 (5)	21 (6)	22 (6)
	11	3 (7)	12 (7)	22 (7)	21 (7)	12 (8)	13 (8)
	12	10 (7)	11 (7)	19 (7)	20 (7)	21 (8)	22 (8)

*Table shows pin number (Remote number)*

**Note:** Remote 1, Remote 3, Remote 5 and Remote 7 are 26 way high-density D-Type female sockets and frame ground is pin 2 and +5V @500mA is pin 1 in each case.  
Remote 2 and Remote 4 are 26 way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15 in each case.

## 2U frame GPI connections

GPI lines 'a' to 'f' of each card connect to one of four rear remote connectors as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	8 (3)	9 (3)	18 (3)	26 (3)	19 (4)	20 (4)
4	7 (3)	16 (3)	17 (3)	25 (3)	10 (4)	11 (4)
5	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
6	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
7	5 (3)	6 (3)	15 (3)	24 (3)	1 (4)	2 (4)
8	4 (3)	14 (3)	13 (3)	23 (3)	3 (4)	4 (4)
9	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
10	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)
11	3 (3)	12 (3)	22 (3)	21 (3)	12 (4)	13 (4)
12	10 (3)	11 (3)	19 (3)	20 (3)	21 (4)	22 (4)

*Table shows pin number (remote number)*

**Note:** Remote 1 and Remote 3 are 26 way high-density D-Type female sockets and frame ground is pin 2 and +5V @500mA is pin 1 in each case.  
Remote 2 and Remote 4 are 26 way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15 in each case.

## 1U frame GPI connections

GPI lines 'a' to 'f' of each card connect to one of two rear remote connectors as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
4	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
5	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
6	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)

*Table shows pin number (remote number)*

**Note:** Remote 1: 26 way high-density D-type socket. Frame ground is pin 2 and +5V @500mA is pin 1.  
Remote 2: 26 way high-density D-Type plug. Frame ground is pin 6 and +5V @500mA is pin 15.

**DTB-AV desk top box GPI connections**

GPI lines 'a' to 'f' of each card connect to the rear remote connector as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	1	2	3	4	5	6
2	9	10	11	12	13	14

**Note:** Remote connector is 15 way normal density D-Type socket. Frame ground is pin 15.

**Indigo DT desk top box GPI connections**

GPI lines 'a' to 'f' of each card connect to the rear remote connector as follows:

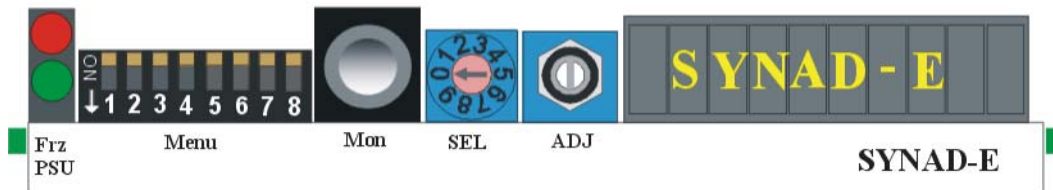
Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)

*Table shows pin number (remote number)*

**Note:** Remote 1: 26 way high-density D-Type socket. Frame ground is pin 2 and +5V @500mA is pin 1.  
Remote 2: 26 way high-density D-Type plug. Frame ground is pin 6 and +5V @500mA is pin 15.

## 3 Card edge operation

The hinged front panel of the case reveals user control of the card, LED indication of card status and the monitor headphone socket.



*SYNAD-E front view showing controls and LEDs*

### 3.1 Card edge switch settings

The eight way piano switch allows the operating modes and status options to be selected.

Lever	Function	Normal state Up, Action Down
0	Status	All levers up, SEL selects
1	Action	Normally UP, Set DOWN & back UP to action adjustments
2	Preset selection	Selects which preset 0-15 to be saved or recalled
3	Video and audio configuration	Allows the selection of the various video controls
4	Embedder and De-Embedder options	Allows the selection of the various audio controls
5	HANC cleanup settings	Normally UP, No customer functions
6	Alarms config	Allows the configuration of alarm reporting
7	Not used	Normally UP, No customer functions
8	Recall	Normally UP, Set DOWN & back UP to recall presets

*Eight way DIP switch functions*

### 3.2 Card edge rotary controls

Control	Function
SELECT	Rotary menu control. Rotate to select the various menus available and initially show the current status of that parameter or setting.
ADJUST	Used in conjunction with the SELECT control. When the SELECT control has selected the required menu, the ADJUST control is rotated to change the current setting to other options.

*Rotary control functions*

**Notes:** Rotary controls can access menus and parameter values by clockwise or anti-clockwise rotation.



### 3.3 Reading card edge LEDs

Card edge LEDs may be used in conjunction with status information from any connected remote status panel display or from Statesman if available.

Refer also to the trouble-shooting chapter for more help with solving problems and monitoring status information.

The following table summarises the card edge LED functions and colours:

Name	Led Colour	Function when ON
Freeze/Err	Red	Illuminates if: No SDI Input detected. No Reference input and Synchro Mode selected. Audio group selected to de-embed from is not present. Audio silence (<-50dB) has been present for greater than 1 second on any channel.
PSU	Green	Good power supply (PSU) rails. (Bottom LED)

### 3.4 Navigating card edge menus

To access the card edge menu system proceed as follows:

- Start with all of the DIP switch levers in the UP position
- Scroll through and select desired menu by rotating the SELECT control
- The current value assigned will be displayed
- To change the assigned value, rotate the ADJUST control
- Assign new value with DIP switch lever 1 if required (operational changes only)

The action required to save the new assigned value depends on the data type as shown in the following table:

Data Type	Down
Numeric value	Automatically updated as value is changed
Audio monitor source	New selection is active immediately
Operational mode change	DIP lever 1 ACT must be set DOWN and then UP

If the value to be changed is a numeric variable, it is automatically applied as soon as it is changed. Similarly, audio monitor source selection responds instantly to new selections.

Operational mode changes, such as selection of audio groups to be de-embedded or embedded, are not applied until the DIP switch lever 1 'ACTION' is set to DOWN & UP.

The displayed menu brightness will flash slowly if confirmation with the ACT lever is required.

### Card edge configuration

Menu order assumes clockwise rotation from the initial 0 (12 O'clock) position of the SEL rotary hex switch.

## 3.5 Card edge status operation

To enter the card edge status mode set all eight DIP switch levers UP.

Turn the SELECT control to show either the audio or video status display.

[SYNADE]

SELECT in position 0

Option: none

### Incoming SDI status

Shows the presence of a SDI input.

[SDI Ip Ok ]

Rotate SELECT for SDI input status (1)

Option: Ok SDI input present

Option: Abs SDI input not present

### Incoming reference status

Shows the presence of the reference input.

[Ref Ip Ok ]

Rotate SELECT for reference input status (2)

Option: Ok Reference input present

Option: Abs Reference input not present

### SDI input standard

Shows the presence of the SDI input.

[Ip 625 Ok ]

Rotate SELECT for SDI input standard (3)

Option: 625 SDI input line rate is 625 lines per frame

Option: 525 SDI input line rate is 525 lines per frame

Option: SDI Ip Abs No SDI input present

### Luma present on incoming SDI

Shows the presence or absence of Luma on the SDI input.

[Luma Ok ]

Rotate SELECT for reference input status (4)

Option: Ok Luma present on input

Option: Ads Luma not present on input

Option: SDI Ip Abs No SDI input present

**Chroma present on incoming SDI**

Shows the presence or absence of Chroma on the SDI input

**[Chroma Ok ]**

Rotate SELECT for reference input status (5)

Option:	Ok	Reference input present
Option:	Ads	Reference input not present
Option:	SDI Ip Abs	No SDI input present

**Video delay status**

Shows the current setting of the video delay.

**[VidDly xxx]**

Rotate SELECT to show video delay setting (6)

Option:	xxx	Where xxx is the delay in lines
---------	-----	---------------------------------

Example: [VidDly 37]

**Embedded audio input groups selected**

Shows which two of the four embedded audio groups are selected for de-embedding.

**[Ip Gp xxxx]**

Rotate SELECT to show which input group are selected (7)

Option:	xxxx	Where xxxx are the groups 1234 and where '-' not selected
---------	------	---

Example: [Ip Gp 1--4]

**Embedded audio output groups**

Shows which two of the 4 output groups are selected to receive the re-embedded audio.

**[Op Gp xxxx]**

Rotate SELECT to show which output groups are selected (8)

Option:	xxxx	Where xxxx are the groups 1234 and where '-' not selected
---------	------	---

Example: [Op Gp -2-4]

**Selected input audio group status**

Shows the status of the audio channels in the selected groups in the SYNAD-E A and B input channels.

**[A1234B1234]**

Rotate SELECT to show A and B Channel status (9)

Option:	Axxx	Where C is SYNAD-E144 Channel and x is group 1, 2, 3, 4 or s for silent
---------	------	---

Example: [A-23-B -2-4]

**Software version**

Shows the version level of the currently fitted software.

[Sware *n.nn*]

Rotate SELECT to show software version (A)

Option: *n.nn* where n.nn is the issue and level

Example: [Sware 2.02]

**Serial number**

Shows the SYNAD-E PCB's serial number.

[SerNonnnnn]

Rotate SELECT to show software version (B)

Option: *nnnnn* where nnnnn is a 5-digit number

Example: [SerNo78558]

## 3.6 Using presets

To enter the preset menu set DIP switch levers 2 DOWN.

Piano lever 2 **DOWN**, all others in the **UP** position: -

[Preset 01]

Function and card edge display examples (0-15)

Option: 0 to 15

These menus allow the saving and recall of user presets

To save the current SYNAD-E setup as a preset proceed as follows:

- Select the required pre-set 0 to 15 with the SELECT switch. Press Menu lever 1 DOWN then UP to save the preset

To recall a preset proceed as follows:

- Select the required pre-set 0 to 15 with the SELECT switch (SW 3)
- Press Menu lever 8 DOWN then UP to recall the preset

Example: [Preset 15]

## 3.7 Video and audio configuration.

To enter the Video and Audio configuration menu set DIP switch levers 3 DOWN.

Piano lever 3 DOWN, all others in the UP position: -

### Selecting the video delay or offset

This sets the number of lines or pixels to be delayed in Delay Mode, or the vertical timing offset with respect to the reference input in Synchronisation Mode.

### Setting the video delay in lines

To select the video frame synchroniser video delay or vertical offset in lines turn the SELECT control to display [**Line F 'nnn'**] or for a courser control [**Line C 'nnn'**], and then turn the ADJUST control to select the desired option.

#### [Line F 'nnn']

##### Rotate ADJUST for video delay or offset in lines (0)

**Option:** 'nnn' Required vertical timing or offset (video delay) in lines: where 'n' is 0 to 624 for 625 line systems, or 0 to 524 for 525 line systems

**Confirmation:** The new value is active the moment it is displayed

#### [Line C 'nnn']

##### Rotate ADJUST for video delay or offset in lines x 10 (1)

**Option:** 'nnn' Required vertical timing or offset (video delay) in lines x 10: where 'n' is 0 to 624 for 625 line systems, or 0 to 524 for 525 line systems

**Confirmation:** The new value is active the moment it is displayed

### Setting the fine video delay

This sets the number of pixels to be delayed by in the Delay Mode, or the horizontal timing offset with respect to the reference input in Synchronisation Mode.

To select the video frame synchroniser, video fine delay or horizontal offset, turn the SELECT control to display [**Smpl F 'nnnn'**] or for a coarse method of control [**Smpl C 'nnnn'**], and then turn the ADJUST control to select the desired option.

#### [Smpl F 'nnnn']

##### Rotate ADJUST control for fine video delay value (2)

**Option:** 'nnnn' Fine video delay in pixels or picture samples:  
where 'n' is 0~1727 for 625 line systems, or 0~1715 for 525 line systems

**Confirmation:** The new value is active the moment it is displayed

#### [Smpl C 'nnnn']

##### Rotate ADJUST for video delay or offset in lines x 10 (3)

**Option:** 'nnnn' Fine video delay in pixels or picture samples x10:  
where 'n' is 0~1727 for 625 line systems, or 0~1715 for 525 line systems

**Confirmation:** The new value is active the moment it is displayed

### Selecting the Freeze Mode

The type of freeze used when the freeze command is given may be selected from frame, field 1 and field 2. If there is movement between both fields a frame freeze may show movement judder. A field freeze works by repeating the same field to produce a synthetic frame of video, without movement judder. However a field freeze is more likely to show jagged edges on near horizontal lines.

### Forcing a picture freeze

To select the SYNAD-E forced video picture Freeze Mode, turn the SELECT control to display [**freeze 'option'**], then turn the ADJUST control to select the desired option.

**[Freeze ‘option’]****Rotate ADJUST for picture freeze on/off (4)**

<b>Option:</b>	<b>Dis</b>	Sets SYNAD-E into automatic Freeze Mode as determined by the Input loss menu.
	<b>En</b>	Sets SYNAD-E into forced Freeze Mode as determined by the Freeze Mode setting menu.
<b>Confirmation:</b>	The new value is active the moment it is displayed	

**Note:** When freeze is ON, audio output is MUTED. Freeze may be set to ON by manual control from edge of PCB (see above) or Statesman control

To select the SYNAD-E video picture Freeze Mode turn the SELECT control to display [Frz ‘option’], turn the ADJUST control to select the desired option.

**[Frz ‘option’]****Rotate ADJUST for Freeze Mode (5)**

<b>Option:</b>	<b>Frame</b>	Sets SYNAD-E into frame Freeze Mode, whenever freeze is ON
	<b>Field2</b>	Sets SYNAD-E into field 2 Freeze Mode, whenever freeze is ON
	<b>Field1</b>	sets SYNAD-E into field 1 Freeze Mode, whenever freeze is ON
<b>Confirmation:</b>	The new value is active the moment it is displayed	

**Selecting the operating Mode**

The SYNAD-E has two modes of operation, synchronisation and delay line. In Synchronisation Mode the unit takes its timing from the analogue external reference. In Delay Mode, timing is derived only from the SDI input.

To set the SYNAD-E to video frame synchroniser operation or variable SDI delay mode turn the SELECT control to display [**‘option’ Mode**], turn the ADJUST control to select the desired option and then confirm the new value.

**[‘option’ Mode]****Rotate ADJUST for operating mode (6)**

<b>Option:</b>	<b>Synch</b>	Sets SYNAD-E to frame synchroniser mode
	<b>Delay</b>	Sets SYNAD-E to variable SDI delay mode
<b>Confirmation:</b>	DIP lever 1 ACT must be set DOWN and then UP	

**Selecting the vertical lock Mode**

To optimise the handling of upstream switching of SDI sources that may not be correctly co-timed, the normal field lock of the framestore input can be replaced by vertical blanking lock.

The Vert Mode may help avoid picture position disturbances when switching between SDI sources that are not exactly co-timed, and may be offset by a few lines.

To select the video frame synchroniser vertical lock mode for the SDI input, turn the SELECT control to display [**Lock ‘option’**], and turn the ADJUST control to select the desired option.

**[Sync ‘option’]****Rotate ADJUST for vertical lock options (8)**

<b>Option:</b>	<b>Field</b>	Lock to field flag
	<b>Frame</b>	Lock to vertical blanking flag

**Confirmation:** The new value is active the moment it is displayed

**Notes:** This adjustment is only available in 625-line operation. 525-line operation automatically defaults to locking on the field flag.  
V blanking should be terminated in accordance with EBU 601 specifications for vblnk Mode. Some USA originated equipment may not comply, in which case ‘field’ lock Mode should be selected.

**Selecting SDI loss behaviour**

The SYNAD-E’s behaviour when the SDI input is lost may be selected from: cut to black, cut to blue, freeze or hold a freeze for approximately one second before outputting a blue or black screen.

To select the video frame synchroniser operation on lost SDI input, turn the SELECT control to display [**Ip Los ‘option’**], and turn the ADJUST control to select the desired option.

**[Ip Los ‘option’]****Rotate ADJUST for SDI loss options (9)**

<b>Option:</b>	<b>F1</b>	Set SDI output video content to frozen last good field 1 picture on loss of SDI input. (Repeat last good field twice as a frame output.)
	<b>Bk</b>	Set SDI output video content to black picture on loss of SDI input.
	<b>BI</b>	Set SDI output video content to black picture on loss of SDI input.
	<b>Dbk</b>	Set SDI output video content to frozen last good field picture for a brief time delay, and then switch to black picture on loss of SDI input.
	<b>DbI</b>	Set SDI output video content to frozen last good field picture for a brief time delay, and then switch to blue picture on loss of SDI input.

**Confirmation:** The new value is active the moment it is displayed.

**Selecting the tracking audio delay speed**

This sets the time the audio delay takes to track fast or abrupt changes in video delay, when video tracking is on.

The faster the rate of change, the quicker the audio delay will match changes in video delay so minimising lip sync errors, but at the expense of a matching change of musical pitch.

**Note:** Video tracking is turned on or off with the [**VTrack on/off**] menu.

Refer to the Introduction chapter for more help with TAD speed settings for different applications.

To select the tracking audio delay maximum rate of change (speed), turn the SELECT control to display [**Tad Sp ‘n%’**], then turn the ADJUST control to select the desired option.

[Tad sp 'n%']

Rotate ADJUST for TAD speed (B)

**Option:** 'n%' Maximum permitted rate of change in binary steps:  
where 'n%' = 0.8%, 0.4%, 0.2%, 0.1%, 0.05%

**Confirmation:** The new value is active the moment it is displayed

### Enabling video tracking

As explained in the previous section, when video tracking is enabled the audio delay can be made to match the video delay and so maintain lip sync.

To enable or disable video tracking turn the SELECT control to display [VTrack 'Off/On'], then turn the ADJUST control to select the desired option.

[VTrack 'On/Off']

Rotate ADJUST for video tracking options (C)

**Option:** **Off** Turns video tracking off

**On** Turns video tracking on

**Confirmation:** The new value is active the moment it is displayed

### Selecting predictive tracking

Predictive tracking is designed to be used in Synchronisation Mode with video tracking on, so that as the video delay changes, the rate of change of the audio delay is controlled.

To select the Predictive Tracking Audio Delay Mode turn the SELECT control to display [Pred Tk 'on/of'], turn the ADJUST control to select the desired option.

[Pred Tk 'On/Off']

Rotate ADJUST for predictive tracking options (D)

**Option:** **Off** Turns predictive tracking off

**On** Turns predictive tracking on

**Confirmation:** The new value is active the moment it is displayed

**Note:** Predictive tracking cannot be turned on if video tracking is off.

## 3.8 Audio selection and routing

To enter the audio selection and routing menu set DIP switch levers 4 DOWN.

Piano lever 4 DOWN, all others in the UP position: -

### Selecting embed/de-embed audio groups

The following steps are required to select up to two audio groups from the incoming audio to be embedded into the same or different groups in the SDI output stream.



**Selecting an audio group and assigning to 'A' de-embedder**

Turn the SELECT control to display [Group A 'n'], turn the ADJUST control to select the desired option and then confirm the new value.

[Group A 'n']

Rotate ADJUST to select audio group from 'A' de-embedder (0)

**Option:** 'n' Audio group number: 1 / 2 / 3 / 4, or - for OFF

**Confirmation:** DIP lever 1 ACT must be set DOWN and then UP

**Selecting an audio group and assigning to 'B' de-embedder**

Turn the SELECT control to display [Group B 'n'], turn the ADJUST control to select the desired option and then confirm the new value.

[Group B 'n']

Rotate ADJUST to select audio group from 'A' de-embedder (1)

**Option:** 'n' Audio group number: 1 / 2 / 3 / 4, or - for OFF

**Confirmation:** DIP lever 1 ACT must be set DOWN and then UP

**Monitoring embedded audio**

The 3.5 mm stereo jack socket is used to monitor the four possible stereo audio signals that can be de-embedded from the two selected audio groups by the A and B de-embedders in the incoming SDI input signal.

To select audio source for the headphone monitor jack socket turn the SELECT control to display [Mon Sr 'ch'] then turn the ADJUST control to select the desired option.

[Mon Sr 'Xch']

Rotate ADJUST for monitor source (2)

**Option:** X Where A, B, are the de-embedders.

ch Channel may be 12 for audio channels 1 and 2 or 34 for audio channels 3 and 4

**Confirmation:** The new value is active the moment it is displayed

**Selecting the additional audio delay**

This sets the time the audio is to be delayed in the Delay Mode, or in Synchronisation Mode, added to the tracking audio delay when that mode is switched on. When tracking delay is OFF, then this selects the actual audio delay.

To select the fine additional audio delay turn the SELECT control to display [A Del F 'n'], and then turn the ADJUST control to select the desired option.

[A Del F 'n']

Rotate ADJUST for additional audio delay (3)

**Option:** 'n' Additional delay in milliseconds:  
where 'n' = 0.0 to 88.0 in 1 millisecond steps

---

**Confirmation:** The new value is active the moment it is displayed

---

To select the coarse additional audio delay turn the SELECT control to display [A Del C 'n'], and then turn the ADJUST control to select the desired option.

**[A Del C 'n']** **Rotate ADJUST for additional audio delay (4)**

**Option:** 'n' Additional delay in milliseconds:  
where 'n' = 0.0 to 88.0 in 10 millisecond steps

---

**Confirmation:** The new value is active the moment it is displayed

---

### **Selecting an audio group in the output SDI stream and assigning to 'C' embedder**

Turn the SELECT control to display [Group C 'n'], turn the ADJUST control to select the desired option and then confirm the new value.

**[Group C 'n']** **Rotate ADJUST to select audio group for 'C' embedder (5)**

**Option:** 'n' Audio group number: 1 / 2 / 3 / 4, or - for OFF

---

**Confirmation:** DIP lever 1 ACT must be set DOWN and then UP

---

### **Selecting an audio group in the output SDI stream and assigning to 'D' embedder**

Turn the SELECT control to display [Group D 'n'], turn the ADJUST control to select the desired option and then confirm the new value.

**[Group D 'n']** **Rotate ADJUST to select audio group for 'D' embedder (6)**

**Option:** 'n' Audio group number: 1 / 2 / 3 / 4, or - for OFF

---

**Confirmation:** DIP lever 1 ACT must be set DOWN and then UP

---

### **Embedder C configuration**

The 'C' embedder of SYNAD-E can selectively be set to resample or not resample the assigned audio tracks. For the passage of Dolby E it is imperative that any signal processing is bypassed. Embedder C is capable of handling mixed AES and Dolby E signals

To select the re-sampling configuration turn the SELECT control to display [C12 'xxxxxx'], turn the ADJUST control to select the desired option and then confirm the new value.

**[C12 'xxxxxx']** **Rotate ADJUST to select audio group for 'C' embedder (7)**

**Option:** **rsmpld** Audio channels 1 & 2 of embedder 'C' set to resample

---

**dolbyE** Audio channels 1 & 2 of embedder 'C' set to not resample,

---

**Confirmation:** DIP lever 1 ACT must be set DOWN and then UP

---

To select the re-sampling configuration turn the SELECT control to display [C34 'xxxxxx'], turn the ADJUST control to select the desired option and then confirm the new value.

[C34 'xxxxxx']	<b>Rotate ADJUST to select audio group for 'C' embedder (8)</b>
<b>Option:</b> <i>rsmpld</i>	Audio channels 1 & 2 of embedder 'C' set to resample
<i>dolbyE</i>	Audio channels 1 & 2 of embedder 'C' set to not resample,
<b>Confirmation:</b>	DIP lever 1 ACT must be set DOWN and then UP

### 3.9 HANC Cleanup settings

To enter the HANC cleanup settings menu set DIP switch lever 5 DOWN.

#### **Extended groups (24-bit data)**

24-bit audio is carried by the use of extended group packets. These can be passed (Enabled) or blanked (Disabled). Each group can be enabled or disabled independently.

[PsExt1 'xxx']	<b>Rotate ADJUST to select group 1 function. (0)</b>
<b>Option:</b> <i>Dis</i>	Audio Group 1 set to not pass extended data packets
<i>Ena</i>	Audio Group 1 set to pass extended data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed
[PsExt2 'xxx']	<b>Rotate ADJUST to select group 2 function. (1)</b>
<b>Option:</b> <i>Dis</i>	Audio Group 2 set to not pass extended data packets
<i>Ena</i>	Audio Group 2 set to pass extended data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed
[PsExt3 'xxx']	<b>Rotate ADJUST to select group 3 function. (2)</b>
<b>Option:</b> <i>Dis</i>	Audio Group 3 set to not pass extended data packets
<i>Ena</i>	Audio Group 3 set to pass extended data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed
[PsExt4 'xxx']	<b>Rotate ADJUST to select group 4 function. (3)</b>
<b>Option:</b> <i>Dis</i>	Audio Group 4 set to not pass extended data packets
<i>Ena</i>	Audio Group 4 set to pass extended data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed

Note. SYNAD-E will not support processing/synchronising of 24-bit audio

**Passing groups unprocessed**

In certain circumstances it maybe desirable to be able pass data in the audio group from input to output without first de-embedding then re-embedding. Any delay between input and output of data will be commensurate with the video delay.

<b>[Pass 1 ‘xxx’]</b>	<b>Rotate ADJUST to select group 1 function. (4)</b>	
<b>Option:</b>	<b>Dis</b>	Audio Group 1 set to not pass 20-bit data packets
	<b>Ena</b>	Audio Group 1 set to pass 20-bit data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed	
<b>[Pass 2 ‘xxx’]</b>	<b>Rotate ADJUST to select group 2 function. (5)</b>	
<b>Option:</b>	<b>Dis</b>	Audio Group 1 set to not pass 20-bit data packets
	<b>Ena</b>	Audio Group 1 set to pass 20-bit data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed	
<b>[Pass 3 ‘xxx’]</b>	<b>Rotate ADJUST to select group 3 function. (6)</b>	
<b>Option:</b>	<b>Dis</b>	Audio Group 1 set to not pass 20-bit data packets
	<b>Ena</b>	Audio Group 1 set to pass 20-bit data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed	
<b>[Pass 4 ‘xxx’]</b>	<b>Rotate ADJUST to select group 4 function. (7)</b>	
<b>Option:</b>	<b>Dis</b>	Audio Group 1 set to not pass 20-bit data packets
	<b>Ena</b>	Audio Group 1 set to pass 20-bit data packets
<b>Confirmation:</b>	The new value is active the moment it is displayed	

**HANC clean bypass**

By default HANC cleaning is enabled. This means that all data in the HANC will be blanked. Where required HANC cleaning can be bypassed by disabling the blanking process.

<b>[Hc Cln ‘xxx’]</b>	<b>Rotate ADJUST to select function. (8)</b>	
<b>Option:</b>	<b>Dis</b>	Disable (Bypass) HANC cleaning
	<b>Ena</b>	Enable HANC cleaning
<b>Confirmation:</b>	The new value is active the moment it is displayed	

**Preserve other defined packets**

HANC cleaning will also remove valid non-audio data packets unless this option is selected. Although there is the capability to send non-audio data in the HANC it is rarely used, with the exception of EDH (Error Detection Handling). If however there is other SMPTE 272 defined data then this should be selected. One example might be timecode as defined in SMPTE RP 196.

**[PreOth ‘xxx’]****Rotate ADJUST to select function. (9)**

<b>Option:</b>	<b>Dis</b>	Disable preservation of other defined packets
	<b>Ena</b>	Enable preservation of other defined packets
<b>Confirmation:</b>		The new value is active the moment it is displayed

**Preserve Non Conforming packets**

Data packets that do not conform to the known formats defined in SMPTE 272 will be removed unless this option is selected. These “non-conforming” packets must conform to another standard (ITU-R BT.1364) to be passed correctly.

**[PreNCP ‘xxx’]****Rotate ADJUST to select function. (A)**

<b>Option:</b>	<b>Dis</b>	Disable preservation of non conforming packets
	<b>Ena</b>	Enable preservation of non conforming packets
<b>Confirmation:</b>		The new value is active the moment it is displayed

**Preserve marked for deletion**

As part of the HANC cleaning processing any audio packets that are marked for deletion (by an upstream embedder) will be deleted unless it is chosen to preserve them.

**[PreNCP ‘xxx’]****Rotate ADJUST to select function. (B)**

<b>Option:</b>	<b>Dis</b>	Disable preservation of audio packets previously marked for deletion
	<b>Ena</b>	Enable preservation of audio packets previously marked for deletion.
<b>Confirmation:</b>		The new value is active the moment it is displayed

**Restore Orphan packets**

Ideally HANC data packets should be placed immediately after the “End of Active Video” (EAV). Additional data is then added contiguously. It is possible that upstream equipment may place an HANC data packet in a later part of the ancillary data space and so not contiguous with the other HANC data. While this is still valid it may be that other equipment fails to delete this non-contiguous packet when it should do. The result is an orphaned packet. It is most likely that this should be deleted but if for some reason you need to keep it then this can be selected. Restoration is achieved by removing the errant data and re-packing it in a contiguous order.

**[Re Orp ‘xxx’]****Rotate ADJUST to select function. (C)**

<b>Option:</b>	<b>Dis</b>	Disable restoration of Orphan packets
	<b>Ena</b>	Contiguously restore Orphan packets
<b>Confirmation:</b>		The new value is active the moment it is displayed

## 3.10 Alarm configuration

To enter the alarm configuration menu set DIP switch lever 6 DOWN.

### Assigning GPI6 alarm reporting

A silence alarm may be triggered if the audio present in any one of the de-embedder channels remain below –50dBFS for longer than a period of time. Any of or all eight channels can set the common alarm, GPI6.

Turn the SELECT control to display **[Sil A ‘n’ ‘option’]**, turn the ADJUST control to select the desired option and then confirm the new value.

**[Sil A ‘n’ ‘option’]****Rotate ADJUST to select audio channel to report from De-embedder A (0-3)**

<b>Option:</b>	<b>Msk</b>	Mask silence detect for selected audio channel
	<b>Flg</b>	Flag silence detect for selected audio channel
	<b>n</b>	Audio channel 1 / 2 / 3 / 4 on embedder A
<b>Confirmation:</b>		The new value is active the moment it is displayed

Turn the SELECT control to display **[Sil B ‘n’ ‘option’]**, turn the ADJUST control to select the desired option and then confirm the new value.

**[Sil B ‘n’ ‘option’]****Rotate ADJUST to select audio channel to report from De-embedder B (4-7)**

<b>Option:</b>	<b>Msk</b>	Mask silence detect for selected audio channel
	<b>Flg</b>	Flag silence detect for selected audio channel
	<b>n</b>	Audio channel 1 / 2 / 3 / 4 on embedder D
<b>Confirmation:</b>		The new value is active the moment it is displayed

## Engineering settings

These adjustments will have been set during manufacture so would normally not require further adjustment. The three controls are; VCO, Monitoring Encoder gain and black level adjustment.

### Encoder Black level

The output black level of the monitoring encoder may be adjusted by approximately 22mV in steps of approximately 0.1mV.

Turn the SELECT control to display [Enc BI 'nnn'], turn the ADJUST control to select the desired option and then confirm the new value.

[Enc BI 'nnn']	Rotate ADJUST to select silence detect delay period (E)	
Option:	<i>Dis</i>	8-248 steps of approximately 0.1mV
Confirmation:	The new value is active the moment it is displayed	

### Monitoring Encoder

The overall output level of the monitoring encoder may be adjusted from approximately 850mV sync tip to peak Luma to approximately 1.3V in steps of just under 2mV.

Turn the SELECT control to display [Enc Ga 'nnn'], turn the ADJUST control to select the desired option and then confirm the new value.

[Enc Ga 'nnn']	Rotate ADJUST to calibrate the encoder output level (D)	
Option:	<i>nnn</i>	8-248 steps of approximately 2mV
Confirmation:	The new value is active the moment it is displayed	

### VCO

Turn the SELECT control to display [VCO 'nnn'], turn the ADJUST control to select the desired option and then confirm the new value.

[VCO 'nnn']	Rotate ADJUST to calibrate the audio VCO (C) (factory only)	
Option:	<i>nnn</i>	8-248 steps
Confirmation:	The new value is active the moment it is displayed	

## 4 Statesman

The Crystal Vision Statesman PC Control Software is designed to control a range of Crystal Vision modules via serial control from a PC.

The main Statesman application communicates with each module in a frame through an active control panel with or without a LCD display. Statesman will not be able to detect modules used in a frame with only a passive front panel.

### 4.1 Installing Statesman

#### Minimum pre-requisites:

- A PC running either Windows 2000 or Windows XP is recommended
- A parallel port dongle for Statesman PCs with attached Crystal Vision frames
- An RS422 serial connection from the host PC to the Control/422 RJ45 or Remote/RMT 2 connector on Crystal Vision frames
- An active or Statesman enabled control panel **MUST** be fitted to the frame with version 1.63 or above firmware – if it is an Indigo frame the firmware must be V1.04 or above
- An optional RS422 to RS232 converter if the PC has no RS422 ports

#### Installation:

- Refer to the readme and/or help file on the CD before proceeding
- To view all application windows, set graphics resolution to at least 1024 x 768
- Remove any previous version of the Statesman software using the Add/Remove Programs application in the Windows control panel
- Ensure that the Statesman dongle is fitted to the parallel port of the host PC
- Insert the Statesman CD and the installation should start immediately – if it does not, run the setup.exe file on the CD
- Obey any installation program prompts and restart the PC when prompted

#### Running Statesman for the first time

The Statesman PC Control System may be run from the Crystal Vision programs folder via the Start menu or by a double-click on the Crystal Vision.exe file in the installed program directory.

When the program runs it will require licence information and an administrator name and password. It will also need to know which computer port is being used to connect to a Crystal Vision frame(s).

**Note:** For further details of Statesman configuration please refer to the Statesman manual.



## 4.2 Statesman operation

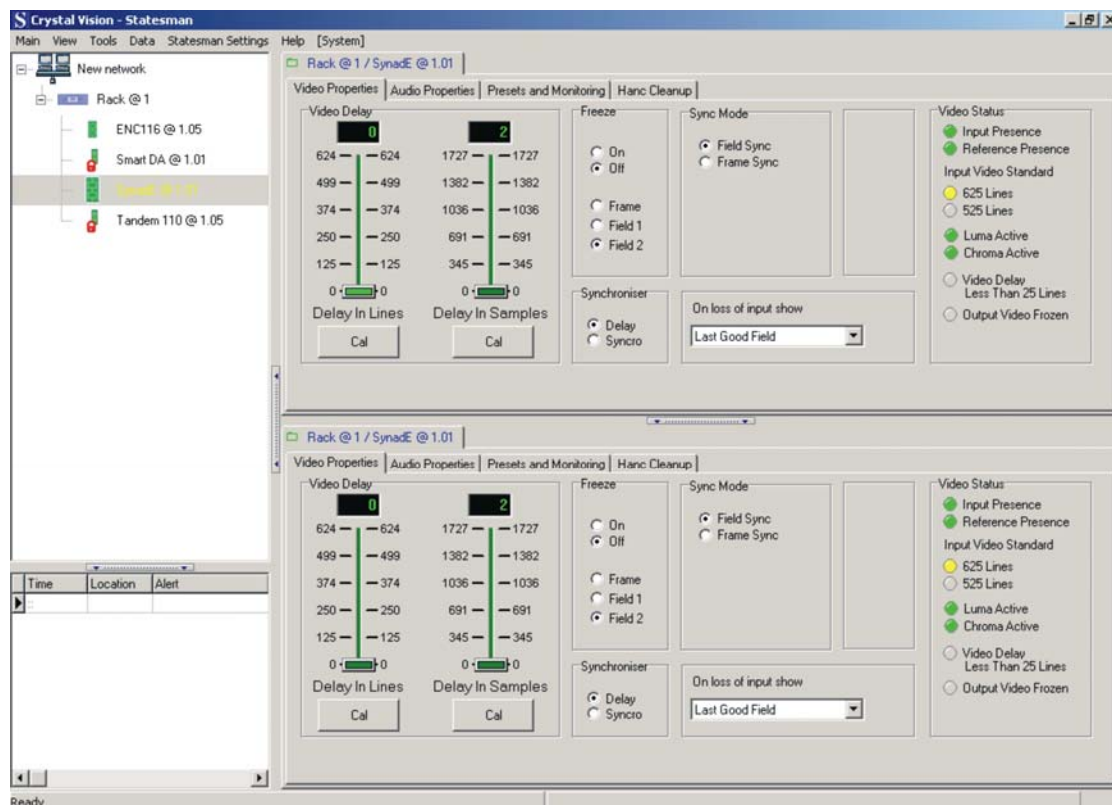
Once Statesman is configured it should automatically detect any Statesman compatible modules in the connected frame or frames and display them in the main application left hand explorer-style window.

Open any frame by clicking on the + sign or by double clicking on it. Installed modules should be shown with module icons. Frame and module icons can be named as desired by right clicking or using the edit menu and choosing rename.

To aid user recognition of module and frame status quickly, the following colour and size coding is used:

- A module is shown present by full colour and absent by greyed colour
- A module is shown open by large icon size and closed by small icon
- A module is the source of an active alarm if red and not alarmed if green

Double clicking on a module will enable the display of the main application menus.



*Statesman main application window*

The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower plane or drag the button to vary the size of the panes.

**Note:** For further details of Statesman configuration and operation please refer to the Statesman manual.

## Video properties

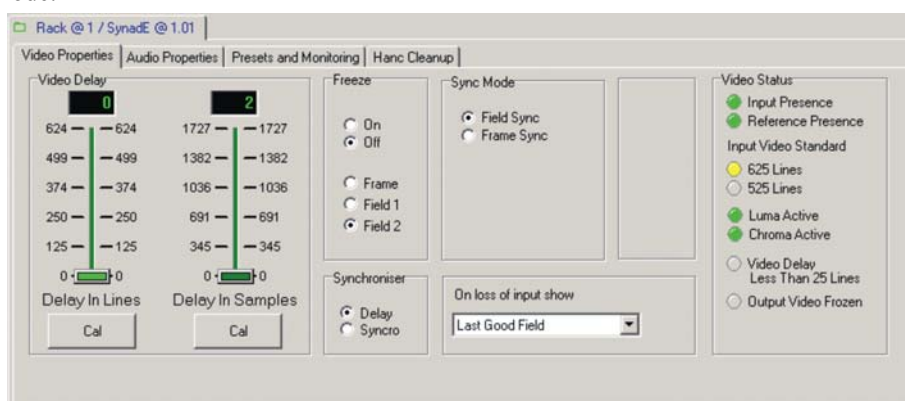
### Using Statesman status displays

Video and audio status is provided by simulated LEDs in both the video and audio panels.

### Selecting Synchronisation or Delay Mode

The SYNAD-E may be used in either Synchronisation or Delay Mode.

To select the desired mode click either Syncro for synchronisation or Delay for delay Mode.



*SYNAD-E video properties*

In Synchronisation Mode the unit takes its timing from the analogue external reference and will automatically synchronise sources with or without embedded audio between zero and two fields.

In Delay Mode, timing is derived only from the SDI input.

In each case the audio delay can be made to track the video delay and the audio always remains locked to video.

### Adjusting the video delay

The video delay may be adjusted from zero to two fields for both 525 and 625 inputs in either Synchronisation or Delay Mode. Use the Delay in Lines and Delay in Samples sliders to control the delay.

Delay control	625 range	525 range	Description
Delay in Lines	0 to 624	0 to 525	Number of lines of delay in Delay Mode or vertical timing offset with respect to reference in Synchronisation Mode
Delay in Samples	0 to 1727	0 to 1715	Fine delay or horizontal offset in pixels in Delay Mode or fine vertical timing offset with respect to reference in Synchronisation Mode

### ***Freezing the video***

The video signal may be frozen as a full frame (two fields) or single field. The field used may be field 1 or field 2. Make the selection by checking the Frame; Field 1 or Field 2 box then check the Freeze On box to freeze the input.

The audio output is always muted when the video is frozen. The embedded packet structure is maintained but the packets contain silence.

### ***Loss of input behaviour***

The video display options when the video input is lost may be selected from the following:

Loss of video option	Video behaviour
<b>Black</b>	Output goes immediately to black
<b>Blue</b>	Output goes immediately to blue
<b>Last good field</b>	Last good field is repeated to produce a frame output
<b>Last good frame</b>	Last frame including video at point of failure
<b>Delay then black</b>	Output goes to black after a period of frozen video
<b>Delay then blue</b>	Output goes to blue after a period of frozen video

### ***Vertical lock Mode***

With 525 line sources the re-lock is timed from the field flag to accommodate different lengths of vertical blanking. Normally when operating with 625 line sources SYNAD-E re-locks on the input at the start of active video. This means that if switch occurs between untimed sources there will be no disturbance in the active video if both the sources are in vertical blanking. To allow operation with 625 line sources that have non-compliant vertical blanking lengths, it is possible to select a re-lock timed from the field flag.

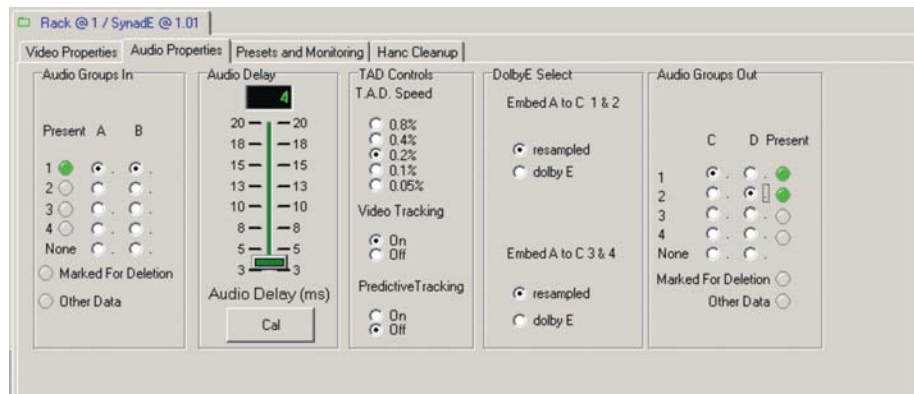
### ***Video status***

The Video Status panel allows the user a quick appraisal of parameters such as line rate, input and reference presence.

## Audio properties

A total of two of the four groups available on the SDI input stream could be selected for de-embedded, re-sampled, delayed and then re-embedded.

Both A and B Channels are independent audio de-embed > re-sample > delay > embed processors.



*Audio Controls*

### ***De-embed/ embed groups***

To select a group to de-embed for de-embedder A, check group 1, 2, 3, 4 or none.

To select a group to de-embed for de-embedder B, check group 1, 2, 3, 4 or none.

To select a group to embed into for embedder C, check group 1, 2, 3, 4 or none.

To select a group to embed into for embedder D, check group 1, 2, 3, 4 or none.

### ***Adjusting the audio delay***

The audio delay slider controls the actual delay if video tracking is off or the audio delay offset or additional delay if video tracking is on.

Use the audio delay sliders to control the delay from 0 to 20 ms

**Note:** When video tracking is on, audio delay dynamically follows video delay in Synchronisation Mode and when video delay is manually changed.

### ***Handling non-linear audio (Dolby E)***

Embedded data that is not linear audio, such as Dolby E, can be passed transparently through the video store with the SDI video.

To pass non-linear audio data such as Dolby E ensure that the Dolby E box is selected.

Note. Only Embedder A- De-embedder C path can be configured to transport Dolby E.

## Video tracking

When enabled, the built-in video tracking helps to ensure that the audio delay matches the video delay to maintain lip sync.

To enable video tracking, check the Video Tracking On box, to disable it check the Video Tracking Off box.

### *Tracking audio delay speed*

The tracking audio delay rate TAD speed determines the time taken for the audio delay to track fast or abrupt changes in video delay when video tracking is on. The faster the rate, the faster the audio delay will match the video delay, but at the expense of musical pitch.

To select the tracking audio delay maximum rate of change or speed click on the TAD spin box and select from the available rates. The current rates are 0.8%, 0.4%, 0.2%, 0.1% and 0.05%.

### *Using predictive tracking*

In Synchronisation Mode, the video delay control processor has to add a frame of video when an asynchronous input video lags behind the reference timing by two fields or delete a frame of video when the input overtakes the reference. All video synchronisers have to work in a similar fashion, which means that when the video delay abruptly changes from zero delay to two fields delay.

The SYNAD-E does this with a predictive circuit that 'knows' when the timing jump is about to occur so that the audio delay can be slowly changed to maintain lip sync within close limits. The TAD setting controls any change in audio pitch.

To ensure that lip sync errors are minimised during the necessary jumps in video timing with asynchronous inputs in Synchronisation Mode, make sure that the Predictive Tracking On box is checked.

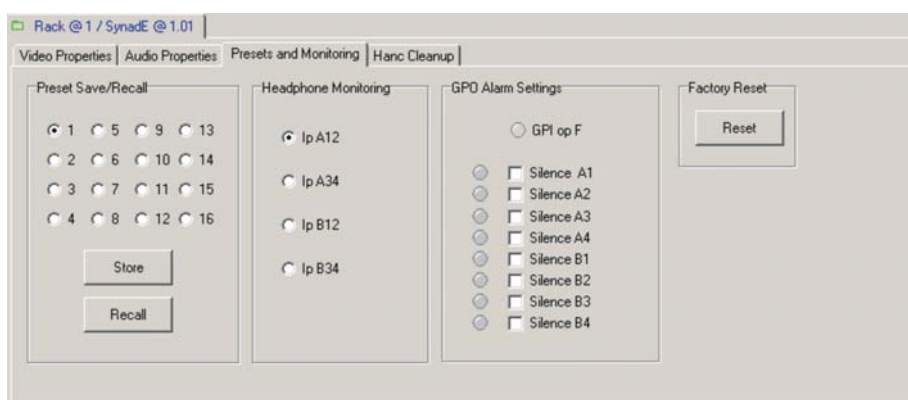
Remember to select a TAD value appropriate for the programme material.

## Alarms, presets and headphone monitoring

### *Saving and recalling presets*

The current board settings (i.e. routing and delay) can be saved in one of 16 locations to be recalled as desired. Therefore this allows the user to store and recall up to 16 different configurations for later use.

To save the current settings, tick the selected preset location and click on Store. This will write the current settings into this location.



*Alarms, presets and headphone monitoring*

To recall previously stored settings information, again tick the selected location and click Recall.

**Note:** If the selected location contains previously saved setting information it will be overwritten by the new setting data.

### **Using the headphone monitor**

The card edge jack socket [3.5 mm, stereo] is used to monitor the four stereo audio signals A & B de-embedders have extracted from the incoming SDI stream.

Select the desired audio pair to listen to from the Headphone Monitoring box.

These analogue audio signals are only available through the headphone jack socket.

**Note:** There are no outputs to the rear connectors.

**Tip:** The headphone output will not drive non-amplified speakers. Use with active loudspeakers, or a pair of headphones.

### **Assigning GPI6 alarm reporting**

A silence alarm may be triggered if the audio present in any one of the output channels remain below  $-50\text{dBFS}$  for longer than a period of time. Any of or all eight channels can set the common alarm, GPI6.

Tick the appropriate box or boxes to select which channels are required to flag an alarm when silence is detected.

## Recalling factory defaults

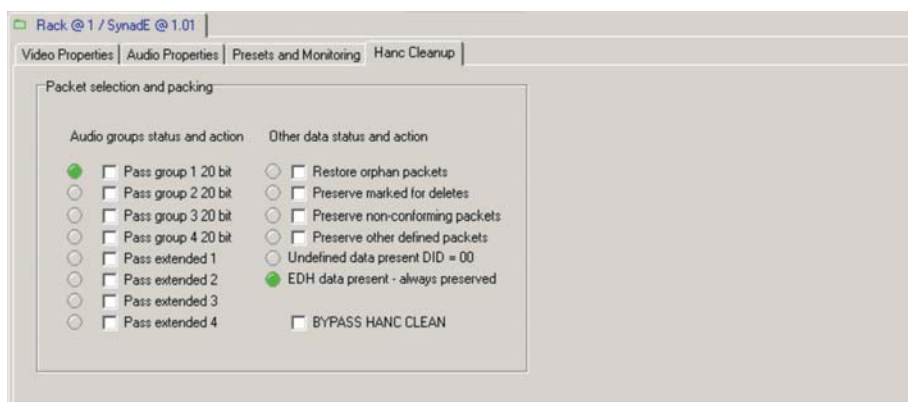
To recall the factory default settings, click reset.

The following table shows the default values for each parameter affected:

Parameter	Default value
<b>De-embedder A</b>	Group 1
<b>De-embedder B</b>	Group 1
<b>Embedder C</b>	Group 1
<b>Embedder D</b>	Off
<b>Audio delay</b>	4 ms - minimum measured delay through board
<b>Dolby E</b>	Off
<b>Headphone select</b>	De-embedder A input Channels 1 and 2
<b>Fail Mode</b>	Freeze then blue
<b>Synchronisation Mode</b>	Synchronisation
<b>Freeze</b>	Off
<b>Freeze Mode</b>	Frame
<b>TAD Speed</b>	0.2
<b>Video tracking</b>	On
<b>Predictive tracking</b>	Off
<b>Video standard</b>	PAL
<b>Delay in lines</b>	0
<b>Delay in samples</b>	0 - minimum through board
<b>Lock</b>	Vertical blanking
<b>Alarms</b>	Deselected

## HANC cleanup

By default HANC cleaning is enabled. This control-pane allows the user to configure the HANC cleaning to suit their individual requirement.



*HANC Cleanup*

### ***Passing groups unprocessed***

In certain circumstances it may be desirable to be able pass data in the audio group from input to output without first de-embedding then re-embedding. Any delay between input and output of data will be commensurate with the video delay.

### ***Extended groups (24-bit data)***

24-bit audio is carried by the use of extended group packets. These can be passed (Enabled) or blanked (Disabled). Each group can be enabled or disabled independently.

Note. SYNAD-E will not support processing/synchronising of 24-bit audio

### ***Restore Orphan packets***

Ideally HANC data packets should be placed immediately after the “End of Active Video” (EAV). Additional data is then added contiguously. It is possible that upstream equipment may place an HANC data packet in a later part of the ancillary data space and so not contiguous with the other HANC data. While this is still valid it may be that other equipment fails to delete this non-contiguous packet when it should do. The result is an orphaned packet. It is most likely that this should be deleted but if for some reason you need to keep it then this can be selected. Restoration is achieved by removing the errant data and re-packing it in a contiguous order.

### ***Preserve marked for deletion***

As part of the HANC cleaning processing any audio packets that are marked for deletion (by an upstream embedder) will be deleted unless it is chosen to preserve them.

### ***Preserve Non Conforming packets***

Data packets that do not conform to the known formats defined in SMPTE 272 will be removed unless this option is selected. These “non-conforming” packets must conform to another standard (ITU-R BT.1364) to be passed correctly.

### ***Preserve other defined packets***

HANC cleaning will also remove valid non-audio data packets unless this option is selected. Although there is the capability to send non-audio data in the HANC it is rarely used, with the exception of EDH (Error Detection Handling). If however there is other SMPTE 272 defined data then this should be selected. One example might be timecode as defined in SMPTE RP 196.

### ***HANC clean bypass***

By default HANC cleaning is enabled. This means that all data in the HANC will be blanked. Where required HANC cleaning can be bypassed by disabling the blanking process.



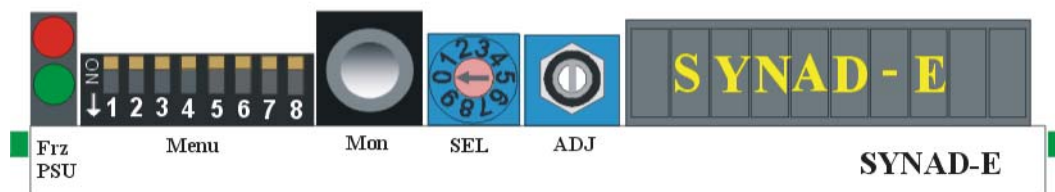
# 5 Trouble Shooting

## 5.1 Card edge monitoring

Once the start-up initialisation procedure is complete, the SYNAD-E can be controlled or configured from the card edge or the Statesman PC interface. This chapter will concentrate on the card edge monitoring LEDs.

### Status LEDs

Board edge LEDs provide status reporting and may be useful when fault finding.



*SYNAD-E front view showing controls and LEDs*

The following table summarises the card edge LED functions and colours:

LED Colour	Position	Description
Red	Freeze/Err	Illuminates if: No SDI Input detected. No Reference input and Synchro Mode selected. Audio group selected to de-embed from is not present. Freeze selected.
Green	+5V	Illuminates when the board is powered

### Fault finding guide

#### The Power OK LED is not illuminated

Check that the frame PSU is functioning – refer to the appropriate frame manual for detailed information.

#### There is no video output

Check that a valid SDI is present and that any cabling is intact.

#### The video output exhibits jitter

Check that the input SDI stability is within normal limits and that the maximum cable length has not been exceeded

**There are no audio outputs**

Check that valid audio data is embedded in the incoming SDI stream

Try connecting a pair of headphones to the 3.5-mm jack socket on the card edge to verify that incoming audio is available and that it is being routed to the output embedders.

**The video output is not synchronous with other station sources**

If the input SDI stream is not synchronous with station sources, ensure that SYNAD-E is in Synchronisation Mode and that an appropriate analogue composite video signal such as station Black and Burst is used as a reference.

Check the video offset timing (delay) is correct for your application.

**The video output is not synchronised with the embedded audio output**

Check that the incoming audio is not already out of sync with the incoming video

Check if video tracking is on or off.

Check if predictive tracking is on or off.

If the problem slowly corrects itself with predictive tracking on, try changing the TAD speed to a higher value.

**Changes in pitch can be heard with certain sections of music**

Ensure that video tracking and predictive tracking are on.

Try changing the TAD speed to a lower value.

**I need to synchronise video with more than eight channels of audio**

Connect the AFV output to an external audio delay processor and use external de-embedders and embedders.

**Why are non-selected audio channels absent from the embedded output?**

The SYNAD-E blanks the entire HANC space before embedding and so only passes the embedded audio groups selected for embedding.

**Why can't individual audio channels be selected or routed to the embedders?**

More advanced audio shuffling features are provided by the TANDEM series of modules.

**The card no longer responds to Statesman or front panel control**

Check that the card is seated correctly and that the power OK LEDs are lit.

Check any active control panel cabling.

Check if the control panel can control another card in the same rack.

If necessary re-set the card by simply removing the rack power and re-applying power after a few seconds or by removing the card from the rack and then re-inserting the card.

It is safe to re-insert the card whilst the rack is powered.

**Re-setting the card**

The card can be reset to its factory default from Statesman. The card may also be reset by removing it from the frame, then re-inserting it. (Previous settings will be retained). It is usually safe to re-insert the card whilst the rack is powered.

# 6 Specification

## General

Dimensions	100 mm x 266 mm module with DIN 41612 connector
Weight	200 g
Power consumption	11 W

## Inputs

SDI input	<p>270 Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M (auto 625/525 line selection).</p> <p>Cable equalisation &gt;200m Belden 8281 or equivalent.</p> <p>Input return loss &gt; -15dB 0 to 270MHz.</p> <p>Active reclocked loop-through on selected back connector module.</p>
Analogue reference	<p>Analogue Black and Burst, mixed syncs or video.</p> <p>Amplitude of syncs 150mV to 4V.</p> <p>Link on PCB selects 75Ω termination or high impedance for loop through.</p>

## Outputs

Video output	<p><b>Digital video</b></p> <p>Up to 4 times 270Mb/s serial digital to EBU Tech 3267-E and SMPTE-259M with EDH checksum insertion as per SMPTE RP165.</p> <p>Less than 500ps 1kHz jitter and less than 800ps broadband jitter from a stable 300mV Black and Burst reference.</p> <p>Less than 500ps 1 kHz jitter in Delay Mode.</p> <p>(Low frequency jitter follows SDI input in Delay Mode only.)</p> <p><b>Monitoring analogue composite output</b></p> <p>2 times PAL/NTSC composite signal.</p> <p>Frequency response: +/- 0.3dB 0 to 5MHz.</p> <p>Noise: &lt; -54dB weighted luminance or chrominance.</p>
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## Timing

Video timing	<p><b>Synchronisation Mode</b></p> <p>The timing of the output (with respect to Ref in) may be adjusted by any number of lines up to a whole video frame. Horizontal timing adjustment is also possible in 37ns steps.</p> <p><b>Delay Mode</b></p> <p>When in Delay Mode the Ref is not used and delay through for the SDI is set by the same timing adjustments.</p>
Audio timing	<p>The audio is delayed by the same amount as the video but an additional delay can be added to the audio of up to 20 ms.</p>

**Audio follow output** A TTL level output is available from a frame D-Type GPI output. This pulse is output every frame and the length of the pulse (the time between the rising and falling edge) is the same as the delay through the synchroniser. Note: The output signal has a greater drive capability than normal TTL in order to drive low impedance loads.

### Control and status

**Control** Board edge control using 10 character alphanumeric display or Statesman PC control software.

**GPI control** **GPI inputs:** 4 off  
1,2, 3 & 4. Recall presets 0 to 15.  
**GPI outputs**  
5 Audio follow output pulse.  
6 Indicates that an audio channel has been silent for longer than the silence delay period.  
Electrically: Open drain FET 30V, 220Ω current limit resistors. Pulled up to +5V through 10kΩ.

**LEDs** PSU okay, output frozen or error.

### Ordering information

**SYNAD-E** Synchroniser module with embed/ de-embed function. Dolby E compatible

### Rear Connectors

RM26 Double height rear connector

RM30 Single height rear connector

### Frames

Indigo 4 4U frame with passive front panel for up to 24 modules

Indigo 2 2U frame with passive front panel for up to 12 modules

Indigo 1 1U frame with passive front panel for up to 6 modules

Indigo DT Desk top box with passive front panel for up to 2 modules

Indigo 2A 2U frame, Statesman enabled with active control panel for up to 12 modules

Indigo 1A 1U frame, Statesman enabled with active control panel for up to 6 modules

Indigo DTA Desk top box, Statesman enabled with active control panel for up to 2 modules

Indigo 4S 4U frame with passive front panel fitted with Statesman CPU for up to 24 modules

Indigo 2S 2U frame with passive front panel fitted with Statesman CPU for up to 12 modules

Indigo 1S 1U frame with passive front panel fitted with Statesman CPU for up to 6 modules

Indigo DTS Desk top box with passive front panel fitted with Statesman CPU for up to 2

	modules
Indigo 2-48V	48V 2U frame with passive front panel for up to 12 modules
Indigo 1-48V	48V 1U frame with passive front panel for up to 6 modules
Indigo 2A-48V	48V 2U frame, Statesman enabled, with active control panel for up to 12 modules
Indigo 1A-48V	48V 1U frame, Statesman enabled, with active control panel for up to 6 modules
Indigo 2S-48V	48V 2U frame with passive front panel fitted with Statesman CPU for up to 12 modules
Indigo 1S-48V	48V 1U frame with passive front panel fitted with Statesman CPU for up to 6 modules