SYNNER-E

SDI synchroniser, tracking audio delay and embedder

USER MANUAL

Crystal Vision

Crystal Vision Ltd., Lion Technology Park, Station Road East, Whittlesford, Cambridge, CB22 4WL, England.
E-mail: sales@crystalvision.tv Website: www.crystalvision.tv Tel: +44(0) 1223 497049 Fax: +44(0) 1223 497059

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Revision 2	Block diagram on page 6 revised	11-04-07
Revision 3	DOP piggyback connection information removed from rear module details.	17-12-07
	RM07 connection information corrected.	17-12-07

1 Introduction

1.1 SYNNER-E

SYNNER-E is a video frame/line synchroniser with built-in tracking audio delay that can de-embed a single group of standard AES embedded audio and simultaneously handle a second embedded group containing Dolby E encoded audio.

The de-embedder can 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 channels, which have in the case of AES been de-embedded, re-sampled to 48kHz 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.

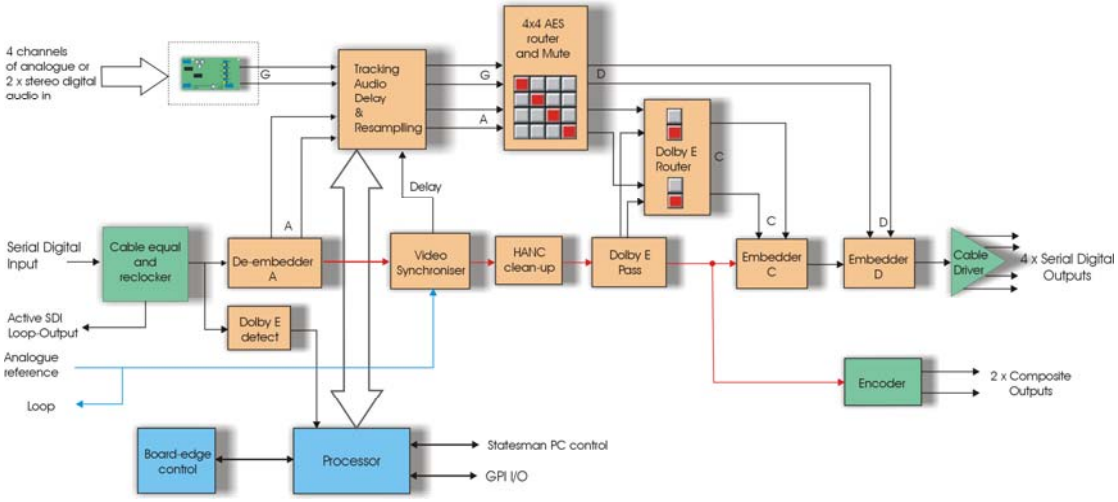
SYNNER-E is particularly suitable for placing after a routing switcher where the sources are several lines apart, or in installations using devices such as the Sony IMX VTRs which record up to two groups of embedded audio.

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 3ms to 20ms
- Fast lock after up-stream switch
- Selectable black, blue or freeze on input failure
- EDH generation
- Audio follow control output
- Composite monitor output
- Flexible control

SYNNER-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 desk top box. It uses the RM04, RM05, RM07, 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 to protect the integrity of the Dolby E data.



SYNNER-E video and embedded audio synchroniser

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

Synchroniser and Delay Modes

SYNNER-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 SYNNER-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 for the non-Dolby E audio 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

Note: The following discussion relates only to the de-embedded audio or audio inputted via a sub PCB. Any Dolby E encoded audio bypasses these blocks within the SYNNER-E to ensure its integrity.

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 40ms 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%
40ms	80 seconds	40 seconds	20 seconds	10 seconds	5 seconds
20ms	40 seconds	20 seconds	10 seconds	5 seconds	2.5 seconds
10ms	20 seconds	10 seconds	5 seconds	2.5 seconds	1.25 seconds
5ms	10 seconds	5 seconds	2.5 seconds	1.25 seconds	0.6 seconds
1ms	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 40ms (625 line systems - 33ms 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 affected prior to the jump in video delay.

With predictive tracking on, the relative audio timing will always be within the recommended window (less than 16ms ahead or 24ms 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 the 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 20ms.

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 Synchronisation Mode and when video delay is manually changed when video tracking is on in either Synchronisation or Delay Mode.

De-embed - Embed pattern

The SYNNER-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.

Synchroniser 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, SYNNER-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

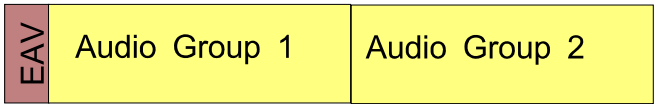
Embedded data that is not linear audio, such as Dolby E, can be passed by selecting Embedder C not to resample. Channel pairs 1-2 and 3-4 can be individually elected to allow Dolby E embedding so allowing mixed formats within a single group.

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 -

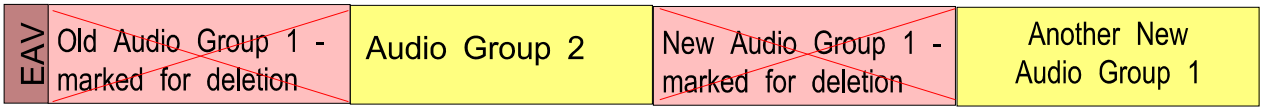
An incoming SDI signal has two embedded audio groups within it (Group 1 and 2).



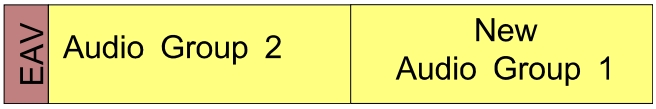
You then wish to embed new audio into group 1. You cannot blank the HANC area before embedding the new Group 1, as you do not want to lose Group 2. Currently most embedders will mark Group 1 for deletion (but not delete it) and then insert the new Group 1 after the Group 2.

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.



SYNNER-E HANC Cleaning

The SYNNER-E can synchronise two groups of embedded audio of which one of these 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 SYNNER-E device two or three times then the HANC area would soon become full, as detailed above.

HANC cleaning within the SYNNER-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 (3.5mm, stereo) can be used to monitor the input audio either from the de-embedder or input sub PCB if present.

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

2 Hardware Installation

The SYNNER-E single height module uses the RM04, RM05, RM07, 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.

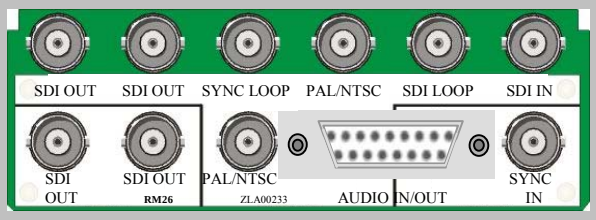
Note: The RM04, RM05 and RM07 if used will have certain restrictions in output and frame configuration.

2.1 Rear modules and signal I/O

The Indigo 4 4U frames will house up to 24 single height modules with up to three power supplies. The Indigo 2 2U frames will house up to 12 single height modules and dual power supplies. The Indigo 1 1U frames will house six single height modules and a single or dual power supply. The Indigo desk top boxes 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
	• **RM26 (ZLA00233 artwork)** • 12 SYNNER-E modules per Indigo 4 frame • 6 per 2U Indigo frame • 3 per 1U Indigo frame • 1 per Indigo DT Odd number frame slots cannot be used

Video connections

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

Audio connections

HD-AIP2	HD-DIP2 / HD-DIP2-RS	Pin-out
GND	**GND**	1, 6, 13, 14
Analogue audio 1L+	**AES1+**	3
Analogue audio 1L-	**AES1-**	2
Analogue audio 1R+	**AES1scrn**	5
Analogue audio 1R-	**NC**	4
Analogue audio 2L+	**AES2+**	10
Analogue audio 2L-	**AES2-**	9
Analogue audio 2R+	**AES2scrn**	12
Analogue audio 2R-	**NC**	11
NC		7, 8, 15

RM30

RM30 modular rear connector	Description
	• **RM30** • 24 SYNNER-E modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • 1 per Indigo DT All frame slots can be used

Video connections

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

RM04

RM04 modular rear connector	Description
	**RM04 (ZLA00231 artwork)** • 24 SYNNER-E modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • 1 per Indigo DT

Video connections

BNC	Function
SDI IN	Serial digital input
SYNC IN	Composite sync (B & B) input
SDI OUT	Serial digital output
SDI OUT	Serial digital output

The RM04 high density 26-way D-Type female socket has the following pin assignments for each fitted audio option card:

Note: This rear module does not allow access to the composite monitoring outputs

Audio connections

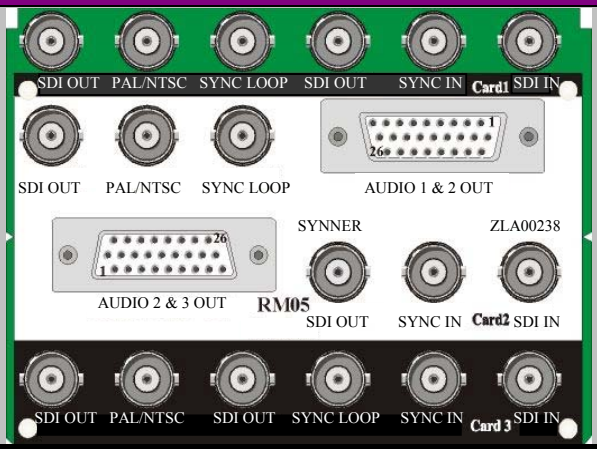
HD-AIP2	HD-DIP2 / HD-DIP2-RS	Pin-out
GND	**GND**	1
No connect	**No connect**	2
No connect	**No connect**	3
No connect	**No connect**	5
No connect	**No connect**	7
No connect	**No connect**	8
No connect	**No connect**	18
GND	**GND**	9
Analogue audio 1L+	**AES1+**	14
Analogue audio 1L-	**AES1-**	15
Analogue audio 1R+	**AES1scrn**	10
Analogue audio 1R-	**NC**	11
Analogue audio 2L+	**AES2+**	16
Analogue audio 2L-	**AES2-**	17
Analogue audio 2R+	**AES2scrn**	12
Analogue audio 2R-	**NC**	13

Common Monitoring Connections	Pin-out
Composite video OPA	4
Composite video OPB	6
GND	19
GND	20
No connect	21
No connect	22
GND	23
GND	24
No connect	25
No connect	26

The monitoring connections are the same for all fitted option cards.

The RM04 rear module allows cards to be placed in all frame slots.

RM05

RM05 modular rear connector	Description
	**RM05 (ZLA00238 artwork)** • 18 SYNNER-E modules per Indigo 4 frame • 9 per 2U Indigo frame • Card 1 fits in slots 1, 5 and 9 • Card 2 fits in slots 2, 6 and 10 • Card 3 fits in slots 3, 7 or 11 • No card fits in 4, 8 or 12

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

BNC Card 2	Function
SDI IN	Serial digital input
SYNC IN	Composite sync (B & B) input
SDI OUT	Serial digital output
SYNC LOOP	Composite sync (B & B) loop-through
PAL/NTSC	Monitoring composite video output
SDI OUT	Serial digital output
BNC Card 3	**Function**
SDI IN	Serial digital input
SYNC IN	Composite sync (B & B) input
SYNC LOOP	Composite sync (B & B) loop-through
SDI OUT	Serial digital output
PAL/NTSC	Monitoring composite video output
SDI OUT	Serial digital output

The RM05 high density 26-way D-Type female socket has the following pin assignments for each fitted audio option card:

RM05 – upper high-density 26-way D-Type female connector – card 1

HD-AIP2	HD-DIP2 / HD-DIP2-RS	Pin out
GND	**GND**	1
No connect	**No connect**	2, 3, 5, 7, 8, 18
Composite video OPA		4
Composite video OPB		6
GND	**GND**	9
Analogue audio 1L+	**AES1+**	14
Analogue audio 1L-	**AES1-**	15
Analogue audio 1R+	**AES1scrn**	10
Analogue audio 1R-	**No connect**	11
Analogue audio 2L+	**AES2+**	16
Analogue audio 2L-	**AES2-**	17
Analogue audio 2R+	**AES2scrn**	12
Analogue audio 2R-	**NC**	13

RM05 – lower high-density 26-way D-Type female connector – card 3

HD-AIP2	HD-DIP2 / HD-DIP2-RS	Pin-out
GND	GND	1
No connect	No connect	2, 3, 5, 7, 8, 18
GND	GND	9
Analogue audio 1L+	AES1+	14
Analogue audio 1L-	AES1-	15
Analogue audio 1R+	AES1scrn	10
Analogue audio 1R-	No connect	11
Analogue audio 2L+	AES2+	16
Analogue audio 2L-	AES2-	17
Analogue audio 2R+	AES2scrn	12
Analogue audio 2R-	No connect	13

The second SYNNER-E card uses pins 19 to 26 of both the upper and lower high-density 26-way D-Type female connectors.

RM05 – upper high-density 26-way D-Type female connector – card 2

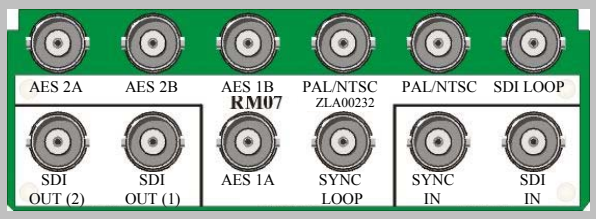
HD-AIP2	HD-DIP2 / HD-DIP2RS	Pin-out
No connect	No connect	19, 20, 22, 24, 25, 26
Composite video OPA		21
Composite video OPB		23

RM05 – lower high-density 26-way D-Type female connector – card 2

HD-AIP2	HD-DIP2 / HD-DIP2-RS	Pin-out
Analogue audio 1L+	AES1+	21
Analogue audio 1L-	AES1-	22
Analogue audio 1R+	AES1scrn	19
Analogue audio 1R-	No connect	20
Analogue audio 2L+	AES2+	25
Analogue audio 2L-	AES2-	26
Analogue audio 2R+	AES2scrn	23
Analogue audio 2R-	No connect	24

The RM05 rear module allows cards to be placed as follows: card 1 fits in slot 1, 5 and 9, card 2 fits in slots 2, 6 and 10 whilst card 3 fits in slots 3, 7 and 11. No cards are fitted in slot positions 4, 8 and 12.

RM07

RM07 modular rear connector	Description
	**RM07 (ZLA00232 artwork)** • 12 SYNNER-E modules per Indigo 4 frame • 6 per Indigo 2 frame • 3 per Indigo 1 frame • 1 per Indigo DT Odd number frame slots cannot be used

BNC	Function
SDI LOOP	Serial digital input loop-through (active on board loop-through)
PAL/NTSC	Analogue composite video output
PAL/NTSC	Analogue composite video output
AES 1B	No connection
AES 2B	No connection
AES 2A	AES2 digital audio input
SDI IN	Serial digital input
SYNC IN	Composite sync (B & B) input
SYNC LOOP	Composite sync (B & B) input loop-through (active on board loop-through)
AES 1A	AES1 digital audio input
SDI OUT(1)	Serial digital output
SDI OUT(2)	Serial digital output

2.2 Module Configuration

Loop or terminate the external reference

The external analogue reference may be terminated with 75Ω or be 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	Link in its upper position – ext. syncs looped through Link in its lower position – ext. syncs terminated on board

General Purpose Interface (GPI)

The SYNNER-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'**	**Dolby E present on selected group (enabled)**	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 Preset	Bit 4	Bit 3	Bit 2	Bit 1
1	0	0	0	0
2	0	0	0	1
3	0	0	1	0
4	0	0	1	1
5	0	1	0	0
6	0	1	0	1
7	0	1	1	0
8	0	1	1	1
9	1	0	0	0
10	1	0	0	1
11	1	0	1	0
12	1	0	1	1
13	1	1	0	0
14	1	1	0	1
15	1	1	1	0
16	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 two of eight 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)
Slot no.	**'a' pin**	**'b' pin**	**'c' pin**	**'d' pin**	**'e' pin**	**'f' pin**
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)

Upper

Lower

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. 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. 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 two 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. 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. 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 the 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.

Indigo DT desk top box GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to the 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)

Table shows pin number (remote number)

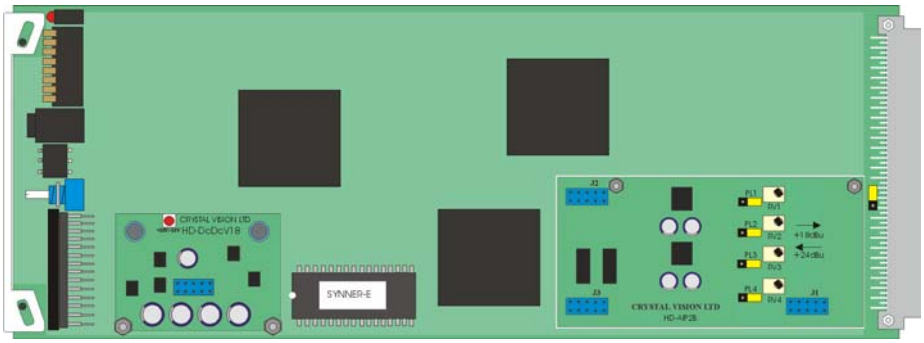
Note: Remote 1: 26 way high-density D-Type socket. Frame ground is pin 2 and +5V @500mA is pin 1.

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

2.3 Fitting audio sub-modules

The SYNNER-E card can take any of the three available audio input sub-modules. Each sub-module plugs via headers on the main card and is retained by screws and nuts. If an analogue audio sub-module is used an additional +/- 18V DC PSU sub-module is also fitted.

Since late 2006 the full range of I/O sub PCBs were supplemented with the new HD range of I/O sub PCBs. Both ranges of sub PCB are fully compatible and can be mixed in use on the SYNNER-E.



SYNNER-E showing audio sub-module and PSU sub-module positions

To fit a sub-module proceed as follows:

- ensure that all static electricity precautions have been taken
- fit two module retaining screws (3x10mm) from below the main PCB, and add a nylon spacer (3x3mm) on top of the SYNNER-E PCB to each screw for each sub-module location – hold screws firmly in place
- offer up the chosen sub-module to its intended position on the SYNNER-E main card

- check that the orientation is correct and that retaining holes and header sockets line up with the corresponding holes and header plugs on the main card
- push the sub-module in place firmly taking care not to bend any pins
- fit the retaining fibre washers, internal serrated washers and nuts to the two retaining screws

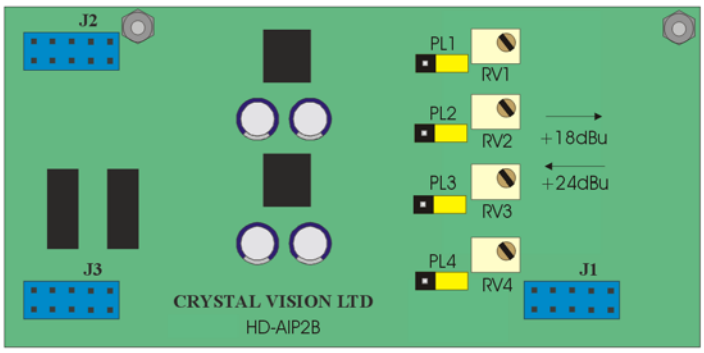
Removal is the reverse of the above procedure.

Notes: All items are supplied with the SYNNER-E module.
All sub-modules must be fitted with the component side uppermost and flat (track side) down, facing the SYNNER-E PCB. Fitting sub-modules with the component face downwards may result in fatal damage.
To check which modules are fitted when an SYNNER-E is already in place in its frame, use the option status check (menu 5) at the card edge or the active control panel status menu or the Statesman status screen.

2.4 Sub-module link settings

HD-AIP2

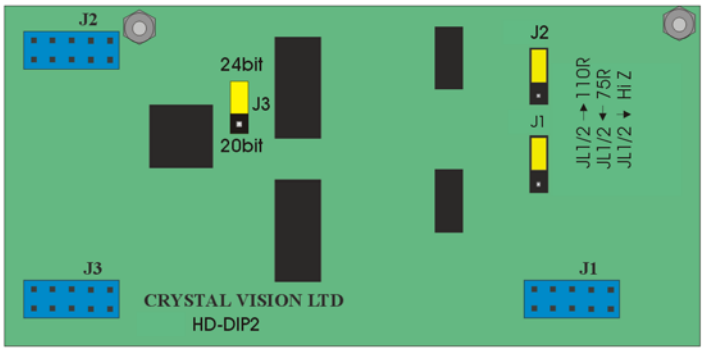
The analogue audio input module provides two stereo pairs or four mono signals that may be used as a source in subsequent embedding. Link jumpers are provided to allow 0dBFS to be set to +18dBu (rearwards, towards J1) or +24dBu (forwards, towards J2/3). The variable adjustments on the card are set at the factory and should not require re-adjustment. Set channel 1 with PL2/RV2, channel 2 with PL1/RV1, channel 3 with PL4/RV4 and channel 4 with PL3/RV3. *Take care to note the adjustment and channel numbering on this sub-board.*



HD-AIP2

HD-DIP2

This digital audio input module provides two AES stereo pairs or four mono channels that may be used as sources in subsequent embedding.

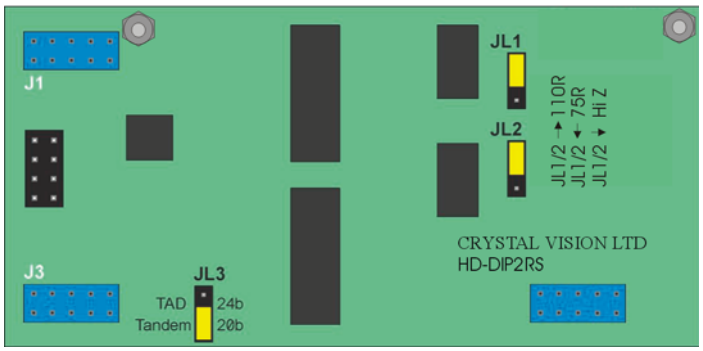


HD-DIP2

Link jumpers are provided to select between 110 Ohm (upper 2 pins), HiZ (balanced – centre pins only) or 75 Ohm (unbalanced – lower 2 pins). **J3 must be selected for 20-bit.**

HD-DIP2-RS

This digital audio input module provides two AES stereo pairs or four mono channels with an integral re-sampler for use when the AES input is either asynchronous, or at a sample rate other than 48kHz.



HD-DIP2-RS

The sample rate inputs can work with signals from less than 30kHz to 108kHz. It is particularly useful for asynchronous 48kHz inputs, and other sample rate inputs such as 44.1kHz and 96kHz.

The signal output from the HD-DIP2-RS to the SYNNER-E is at 48kHz derived from the video content of the SDI signal into which it is to be embedded.

Because of the processing of the audio waveform, error words indicated by V-bit set high are ignored. Occasional errors marked by V-bit high such as would be the case with a noisy or too long AES input path, are masked out by the processing.

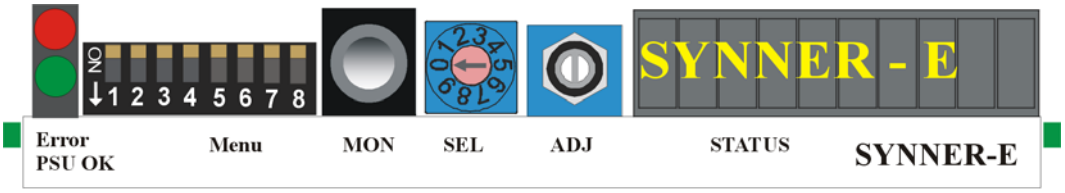
If the V-bit is consistently high, to indicate continuous error states, or to indicate non-audio data, then the processor will give a silent output. All other cards pass audio data unaltered even when V bit is set or held high.

Link jumpers are provided to select between 110 Ohm (upper two pins), HiZ (balanced – centre pins only) or 75 Ohm (unbalanced – lower two pins).

Notes: In general, balanced outputs require the use of rear modules with a D-Type connector and unbalanced outputs are for use with BNCs.
HiZ is achieved by removing termination jumpers – they can be parked for safe keeping by replacing them using only one pin.

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.



SYNNER-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 to UP to action adjustments
2	Preset selection	Selects which preset 0-15 to be saved or recalled
3	Video configuration	Allows the selection of the various video controls
4	Embedder, De-Embedder and audio routing options	Allows the configuration of De-embedder, Embedders and the selection of the various audio controls
5	HANC cleanup settings	HANC configuration
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
Error	Red	Flashes if: No SDI Input detected. No Reference input and Synchro Mode selected. Freeze is selected.
PSU Ok	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.

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.

[SYNNER-E]		SELECT in position 0
Option:	none	SYNNER-E

Incoming SDI status

Shows the presence of 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

Video delay status

Shows the current setting of the video delay.

[VidDly *xxx*]		Rotate SELECT to show video delay setting (4)
Option:	*xxx*	Where *xxx* is the delay in lines

Example: **[VidDly 37]**

Embedded audio input groups present

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 (5)**

Option: ***xxxx*** Where *xxxx* are the groups 1234 and where '–' not present

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 (6)**

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 group of the SYNNER-E's De-embedder.

[Dbed 1234] **Rotate SELECT to show De-embedder Channel status (7)**

Option: **Dbed *xxxx*** Where *x* is channel 1, 2, 3, 4 or s for silent

Example: **[Dbed -2-4]**

Sub PCB Channel status

Shows the status of the sub PCB audio channels.

[Sub 1234] **Rotate SELECT to show Sub PCB Channel status (8)**

Option: **Sub *xxxx*** Where *x* is channel 1, 2, 3, 4 or s for silent

Example: **[Sub 12--]**

Software version

Shows the version level of the currently fitted software.

[Sware *n.nn*] **Rotate SELECT to show software version (9)**

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

Example: **[Sware 2.01]**

Serial number

Shows the SYNNER-E PCB's serial number.

[SerNo*nnnnn*]	**Rotate SELECT to show serial number (A)**
Option: ***nnnnn***	where nnnnn is a 5-digit number

Example: **[SerNo78558]**

Sub PCB fitted

Shows the version level of the currently fitted software.

[PCB 'xxx']	**Rotate SELECT to show software version (B)**
Option: ***Aip***	4-channel analogue input sub PCB
Dip	2 x stereo AES input sub PCB
Dip2rs	2 x stereo AES input sub PCB for asynchronous or non 48kHz sample rate

Example: **[PCB Aip]**

3.6 Using presets

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

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

[Preset 01]	Function and card edge display examples (0-15)
Option: 1 to 16	These menus allow the saving and recall of user presets To save the current SYNNER-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]**

Note: This function requires enabling. See Alarm configuration section 3.10.

3.7 Video and audio configuration

To enter the Video and Audio configuration menu set DIP switch lever 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 coarser 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 '*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 SYNNER-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)**
Option:	**Dis**	Sets SYNNER-E into automatic Freeze Mode as determined by the Input loss menu.
	En	Sets SYNNER-E into forced Freeze Mode as determined by the Freeze Mode setting menu.
Confirmation:		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 SYNNER-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)**
Option:	**Frame**	Sets SYNNER-E into frame Freeze Mode, whenever freeze is ON
	Field2	Sets SYNNER-E into field 2 Freeze Mode, whenever freeze is ON
	Field1	sets SYNNER-E into field 1 Freeze Mode, whenever freeze is ON
Confirmation:		The new value is active the moment it is displayed

Selecting the operating mode

The SYNNER-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 SYNNER-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)**
Option:	**Synch**	Sets SYNNER-E to frame synchroniser mode
	Delay	Sets SYNNER-E to variable SDI delay mode
Confirmation:		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 a field blanking lock.

Field 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 (7)**
Option:	**Field**	Lock to field flag
	Frame	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.

Selecting SDI loss behaviour

The SYNNER-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 (8)**
Option:	**F1**	Set SDI output video content to freeze last good field 1 picture on loss of SDI input. (Repeat last good field twice as a frame output.)
	Bk	Set SDI output video content to black picture on loss of SDI input.
	Bl	Set SDI output video content to blue picture on loss of SDI input.
	Dbk	Set SDI output video content to freeze last good field picture for a brief time delay, and then switch to black picture on loss of SDI input.
	Dbl	Set SDI output video content to freeze 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 (9)**
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 (A)**
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 (B)**
Option:	**Of**	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 lever 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 the de-embedder

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

[DeEmbed 'n']		**Rotate ADJUST to select audio group for 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 a Dolby E encoded audio group and assigning to pass

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

[Dol Pas 'n']		**Rotate ADJUST to select audio group (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

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 (2)**
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 (3)**
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 the additional audio delay

An audio delay that is in addition to the delay introduced by the tracking delay, may be added. In synchroniser mode the total audio delay will the combined tracking delay plus the additional delay. In delay mode the additional audio delay will be the total delay.

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

[Aud Del '*n*']		**Rotate ADJUST for additional audio delay (4)**
Option:	**'*n*'**	Additional delay in milliseconds: where '*n*' = 4 to 20 in 1 millisecond steps
Confirmation:		The new value is active the moment it is displayed

Audio Routing

The audio routing configuration within the SYNNER-E is performed with three switching matrixes. Linear audio is routed from the de-embedder and sub PCB, if fitted, by the main 4x4 routing matrix. Any non-linear audio such as Dolby E is switched to the output embedder by two stereo switches. Although linear audio can be routed to either of the output embedders Dolby E can only be routed to the dedicated C embedder. Embedder C is capable of handling mixed AES and Dolby E signals.

Embedder C routing

To configure the audio routing to embedder C turn the SELECT control to display **['*xnn*' > C12]** and then turn the ADJUST control to select the desired input option.

['*xnn*' > *C12*]		**Rotate ADJUST for Embedder C channel 12 (5)**
Option:	**'A12'**	Select input de-embedder channels 1 & 2
	'A34'	Select input de-embedder channels 3 & 4
	'G12'	Select sub PCB channels 1 & 2
	'G34'	Select sub PCB channels 3 & 4
	'DolbyE'	Dolby E has been selected from Embed/Dolby E menu
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

Note: If no sub PCB is fitted the option to select will not appear.

To configure the audio routing to embedder C turn the SELECT control to display **['*xnn*' > C34]** and then turn the ADJUST control to select the desired input option.

['*xnn*' > *C34*]		**Rotate ADJUST for Embedder C channel 12 (6)**
Option:	**'A12'**	Select input de-embedder channels 1 & 2
	'A34'	Select input de-embedder channels 3 & 4
	'G12'	Select sub PCB channels 1 & 2
	'G34'	Select sub PCB channels 3 & 4
	'DolbyE'	Dolby E has been selected from Embed/Dolby E menu
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

Note. Should no sub PCB is fitted the option to select will not appear.

Embedder D routing

To configure the audio routing to embedder D turn the SELECT control to display **['*xnn*' > D12]** and then turn the ADJUST control to select the desired input option.

['*xnn*' > *D12*]		**Rotate ADJUST for Embedder D channel 12 (7)**
Option:	**'A12'**	Select input de-embedder channels 1 & 2
	'A34'	Select input de-embedder channels 3 & 4
	'G12'	Select sub PCB channels 1 & 2
	'G34'	Select sub PCB channels 3 & 4
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

Note: If no sub PCB is fitted the option to select will not appear.

To configure the audio routing to embedder D turn the SELECT control to display **['*xnn*' > D34]** and then turn the ADJUST control to select the desired input option.

['*xnn*' > *D34*]		**Rotate ADJUST for Embedder D channel 12 (8)**
Option:	**'A12'**	Select input de-embedder channels 1 & 2
	'A34'	Select input de-embedder channels 3 & 4
	'G12'	Select sub PCB channels 1 & 2
	'G34'	Select sub PCB channels 3 & 4
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

Note: If no sub PCB is fitted the option to select will not appear.

Channel pair muting

Each of the output channel pairs can be muted by selecting SEL positions 9, A, B & C. Rotate the select control to display **[*'xxxx' channel pair*]** and turn adjust to set to mute or pass.

['*xxxx*' C12]	**Rotate ADJUST set channels C1 & C2 to be muted (9)**
Option: 'Pass'	Channels C1 & C2 are active
'Mute'	Channels C1 & C2 are muted
Confirmation:	DIP lever 1 ACT must be set DOWN and then UP

['*xxxx*' C34]	**Rotate ADJUST set channels C3 & C4 to be muted (A)**
Option: 'Pass'	Channels C3 & C4 are active
'Mute'	Channels C3 & C4 are muted
Confirmation:	DIP lever 1 ACT must be set DOWN and then UP

['*xxxx*' D12]	**Rotate ADJUST set channels D1 & D2 to be muted (B)**
Option: 'Pass'	Channels D1 & D2 are active
'Mute'	Channels D1 & D2 are muted
Confirmation:	DIP lever 1 ACT must be set DOWN and then UP

['*xxxx*' D34]	**Rotate ADJUST set channels D3 & D4 to be muted (C)**
Option: 'Pass'	Channels D3 & D4 are active
'Mute'	Channels D3 & D4 are muted
Confirmation:	DIP lever 1 ACT must be set DOWN and then UP

Configuring Embedder C for Dolby E

Embedder C being the default embedder for transporting Dolby E can be configured to either reinsert Dolby E or embed linear audio from the AES router. It can also be used in situations where mixed Dolby E and linear audio is required.

['*xxxxxx*' C12]	**Rotate ADJUST set Embedder C1 & C2 Dolby E (D)**
Option: 'Embed'	Channels C1 & C2 are configured to embed from the AES router
'DolbyE'	Channels C1 & C2 are configured to insert Dolby E
Confirmation:	DIP lever 1 ACT must be set DOWN and then UP

[‘*xxxxxx*’ C34]		Rotate ADJUST set Embedder C3 & C4 Dolby E (E)
Option:	**‘Embed’**	Channels C3 & C4 are configured to embed from the AES router
	‘DolbyE’	Channels C3 & C4 are configured to insert Dolby E
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

Monitoring embedded audio

The 3.5mm stereo jack socket is used to monitor the four possible stereo audio signals that can be de-embedded from the incoming SDI input signal and the sub PCB when fitted.

To select the 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 (F)
Option:	***X***	Where A is the input de-embedder and G the sub PCB.
	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

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.

[PsExtl ‘*xxx*’]		Rotate ADJUST to select group 1 function (0)
Option:	***Dis***	Audio Group 1 set to not pass extended data packets
	Ena	Audio Group 1 set to pass extended data packets
Confirmation:		The new value is active the moment it is displayed

[PsExt2 ‘*xxx*’]		Rotate ADJUST to select group 2 function (1)
Option:	***Dis***	Audio Group 2 set to not pass extended data packets
	Ena	Audio Group 2 set to pass extended data packets
Confirmation:		The new value is active the moment it is displayed

[PsExt3 '*xxx*']		**Rotate ADJUST to select group 3 function (2)**
Option:	***Dis***	Audio Group 3 set to not pass extended data packets
	Ena	Audio Group 3 set to pass extended data packets
Confirmation:		The new value is active the moment it is displayed

[PsExt4 '*xxx*']		**Rotate ADJUST to select group 4 function (3)**
Option:	***Dis***	Audio Group 4 set to not pass extended data packets
	Ena	Audio Group 4 set to pass extended data packets
Confirmation:		The new value is active the moment it is displayed

Note: SYNNER-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.

[Pass 1 '*xxx*']		**Rotate ADJUST to select group 1 function (4)**
Option:	***Dis***	Audio Group 1 set to not pass 20-bit data packets
	Ena	Audio Group 1 set to pass 20-bit data packets
Confirmation:		The new value is active the moment it is displayed

[Pass 2 '*xxx*']		**Rotate ADJUST to select group 2 function (5)**
Option:	***Dis***	Audio Group 2 set to not pass 20-bit data packets
	Ena	Audio Group 2 set to pass 20-bit data packets
Confirmation:		The new value is active the moment it is displayed

[Pass 3 '*xxx*']		**Rotate ADJUST to select group 3 function (6)**
Option:	***Dis***	Audio Group 3 set to not pass 20-bit data packets
	Ena	Audio Group 3 set to pass 20-bit data packets
Confirmation:		The new value is active the moment it is displayed

[Pass 4 '*xxx*']		**Rotate ADJUST to select group 4 function (7)**
Option:	***Dis***	Audio Group 4 set to not pass 20-bit data packets
	Ena	Audio Group 4 set to pass 20-bit data packets
Confirmation:		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.

[Hc Cln '*xxx*']		Rotate ADJUST to select function (8)
Option:	***Dis***	Disable (Bypass) HANC cleaning
	Ena	Enable HANC cleaning
Confirmation:		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 RP196.

[PreOth '*xxx*']		Rotate ADJUST to select function (9)
Option:	***Dis***	Disable preservation of other defined packets
	Ena	Enable preservation of other defined packets
Confirmation:		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)
Option:	***Dis***	Disable preservation of non conforming packets
	Ena	Enable preservation of non conforming packets
Confirmation:		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.

[PreMfD '*xxx*']		Rotate ADJUST to select function (B)
Option:	***Dis***	Disable preservation of audio packets previously marked for deletion
	Ena	Enable preservation of audio packets previously marked for deletion
Confirmation:		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 a HANC data packet in a later part of the ancillary data space and so not be 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)**
Option:	***Dis***	Disable restoration of Orphan packets
	Ena	Contiguously restore Orphan packets
Confirmation:		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

SYNNER-E can detect the presence of Dolby E on the incoming video signal. The user may then elect to trigger a GPI output to indicate this presence, perhaps for the purpose of calling a previously saved user defined preset.

Turn the SELECT control to display **[Dol Pr *'option'*]**, turn the ADJUST control to select the desired option.

[Dol Pr '*option*']		**Rotate ADJUST to select Dolby E present to report on GPO6 (0)**
Option:	**Msk**	Mask silence detect for selected audio channel
	Flg	Flag silence detect for selected audio channel
Confirmation:		The new value is active the moment it is displayed

GPI enable/disable

Turn the SELECT control to display **[GPI *'option'*]**, turn the ADJUST control to select the desired option.

[GPI '*option*']		**Rotate ADJUST to select GPI control enable/disable**
Option:	**Dis**	Disable GPI calling of user defined presets
	Ena	Enable GPI calling of user defined presets
Confirmation:		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 Bl '*nnn*']**, turn the ADJUST control to select the desired option and then confirm the new value.

[Enc Bl '*nnn*']		**Rotate ADJUST to select Encoder black level adjustment (2)**
Option:	***nnn***	8-248 steps of approximately 0.1mV
Confirmation:		The new value is active the moment it is displayed

Monitoring Encoder gain

The overall output level of the monitoring encoder may be adjusted from approximately 850mV from 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 (3)**
Option:	***nnn***	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 (4)** **(factory only)**
Option:	***nnn***	8-248 steps
Confirmation:		The new value is active the moment it is displayed

Factory Reset

Turn the SELECT control to display **[Fact Res N]**, turn the ADJUST control to select Yes and then confirm the new value.

[Fact Res N]		**Rotate ADJUST to calibrate the audio VCO (5)**
Option:	***Y***	Returns all settings to their default setting and erases all user stored presets
Confirmation:		DIP lever 1 ACT must be set DOWN and then UP

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

Parameter	Default value
De-embed	Group 1
Dolby Pass	Group 1
Embedder C	Group 1
Embedder D	Off
Audio delay	4ms - minimum measured delay through board
Headphone select	Sub PCB G input Channels 1 and 2
Fail Mode	Delay then blue
Synchronisation Mode	Synchronisation
Freeze	Off
Freeze Mode	Frame
TAD Speed	0.2
Video tracking	On
Predictive tracking	Off
Preset selected	Preset 1
Delay in lines	0
Delay in samples	0 - minimum through board
Sync Mode	Frame sync
HANC cleanup	Pass group 1 selected, all others deselected
Routing and Mute	Unchanged
Alarm	Deselected
GPI Preset recall enable	Unchanged

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 an LCD display. Statesman will not be able to detect modules used in a frame with only a passive front panel unless it is part of an active/passive combination.

Note: For details of Statesman installation and configuration please refer to the Statesman manual.

4.1 Statesman operation

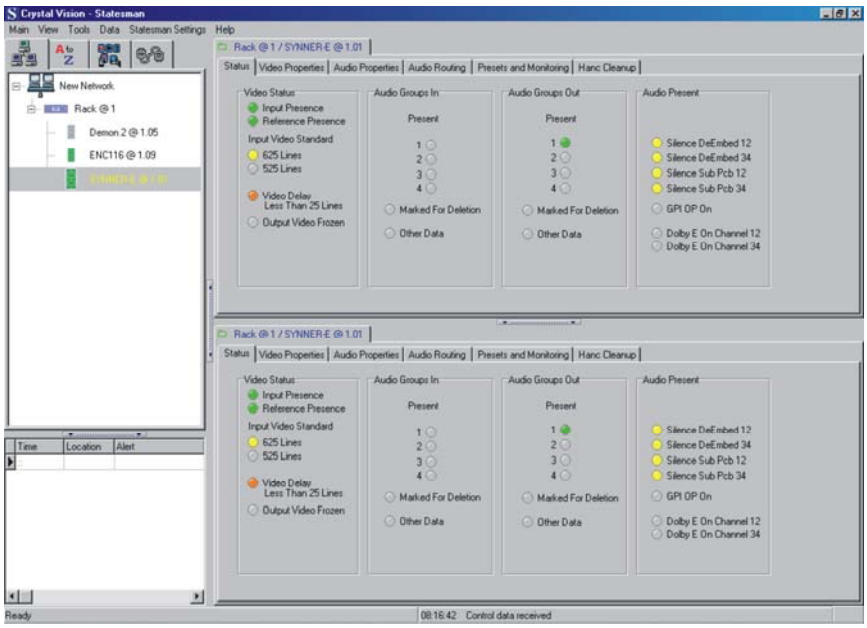
Once Statesman is configured it should automatically detect any Statesman compatible modules in the connected frame or frames and display them in the main application left hand Explorer-style window.

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.

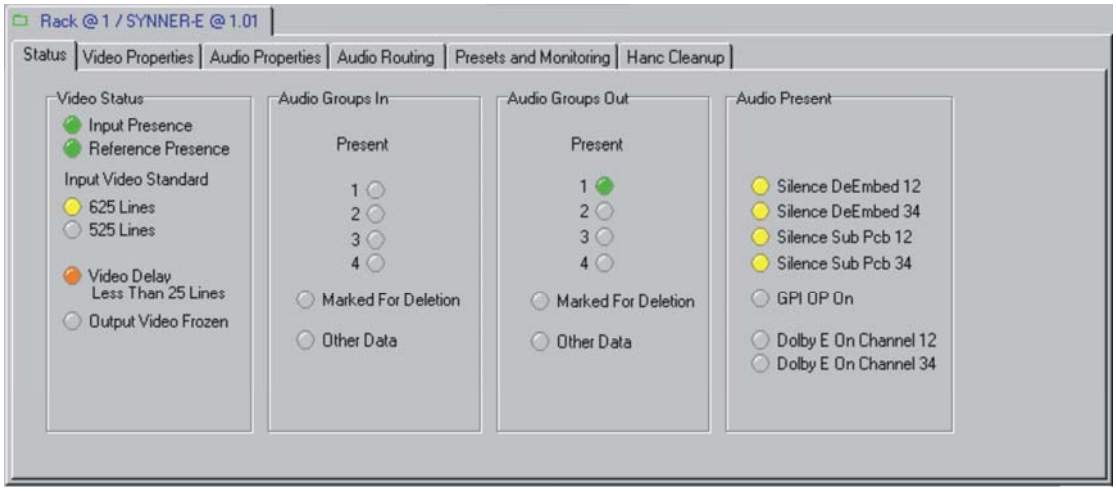


Statesman main application window

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 pane or drag the button to vary the size of the panes.

4.2 Status

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



SYNNER-E Status

SYNNER-E status is divided into four easy to appraise groups.

Video status

Video status is the first group. This pane shows if both an input and reference are present and the line standard of the input video. Note: both input video and reference must be the same line rate. Indication of short video delay and if the output video has been set to frozen is also given.

Audio input group information

This pane indicates which of the four embedded groups are present by illuminating the appropriate LED. Indication is also given if any of the groups are flagged as other data and or marked for deletion.

Audio output group information

This pane is similar to the previous in that it will show which of the four groups in the output video contain data and if any group is marked for deletion or flagged as other data.

Note: Should the Audio Output Group Present LED flash, this is due to an invalid Dolby E routing selection being made such as a group selected containing no encoded data.

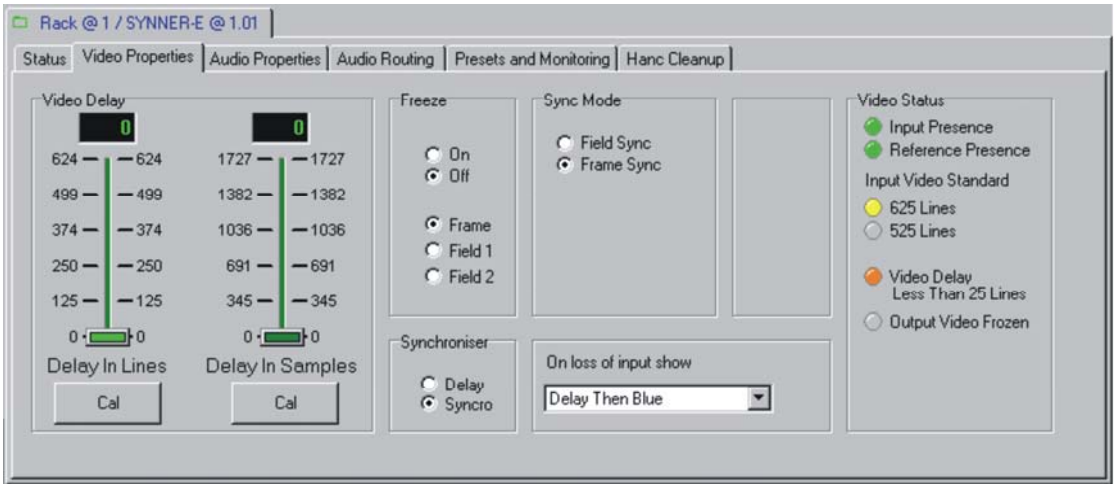
Audio Present

Here the state of the audio is presented. If any channel of a stereo pair from either the de-embedder or input sub PCB is silent the corresponding LED will be illuminated. The presence of Dolby E on the group pointed at by the Dolby E detector is also indicated along with the state of the GPO output if set to indicate Dolby E present.

Note: A silence indication is given if the audio level remains below -66dBFS for greater than 1 second.

4.3 Video Properties

The video configuration menus are found here. This tab is divided into six panes giving control over various aspects such as delay and mode of operation.



Video controls

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.

Selecting Synchronisation or Delay Mode

The SYNNER-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.

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.

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
Black	Output goes immediately to black
Blue	Output goes immediately to blue
Last good field	Last good field is repeated to produce a frame output
Last good frame	Last frame including video at point of failure
Delay then black	Output goes to black after a period of frozen video
Delay then blue	Output goes to blue after a period of frozen video

Vertical lock modes

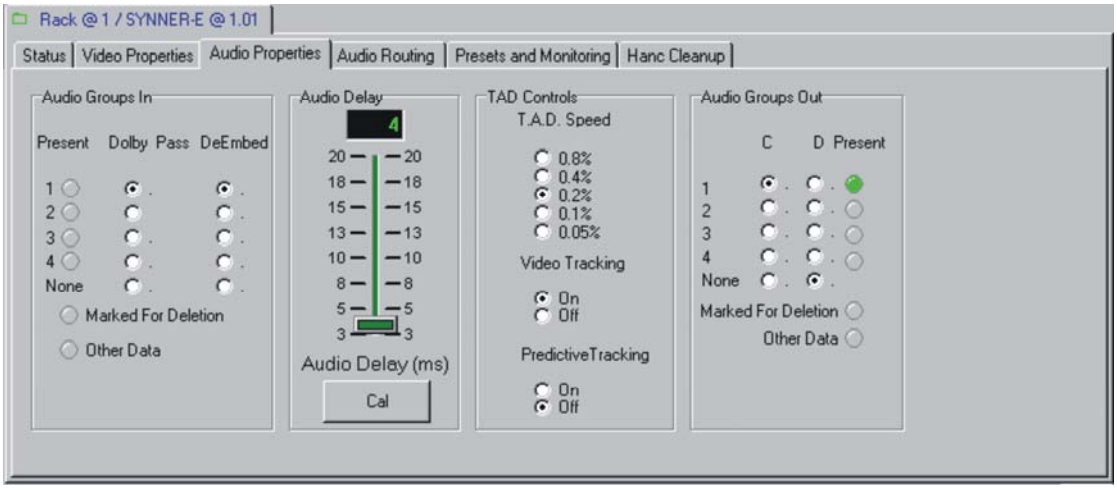
The two options are frame sync where locking occurs shortly after the normal switching point or field sync which sets the drop/repeat to occur at the end of blanking. With 525 line sources the re-lock is timed from the field flag to accommodate different lengths of vertical blanking. Normally when operating with 625 line sources SYNNER-E re-locks on the input at the start of active video. This means that if a switch occurs between untimed sources there will be no disturbance in the active video if both the sources are switched during 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.

4.4 Audio Properties

Any of the four groups available on the SDI input stream might be selected for de-embedding, re-sampled, delayed and then re-embedded. Any Dolby E encoded audio channels can also be selected for re-embedding.



Audio controls

De-embed/ embed groups

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

To select a group that contains Dolby E for Dolby Pass, 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.

Note: The default embedder for Dolby E is embedder C.

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 Pass radio button has been selected for the group containing the encoded audio.

Note: Only the Embedder C path can be configured to transport Dolby E.

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 20ms.

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

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 radio button to select from the available rates. The available 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 of delay a disruption in the audio will occur. The SYNNER-E can prevent this disruption.

The SYNNER-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.

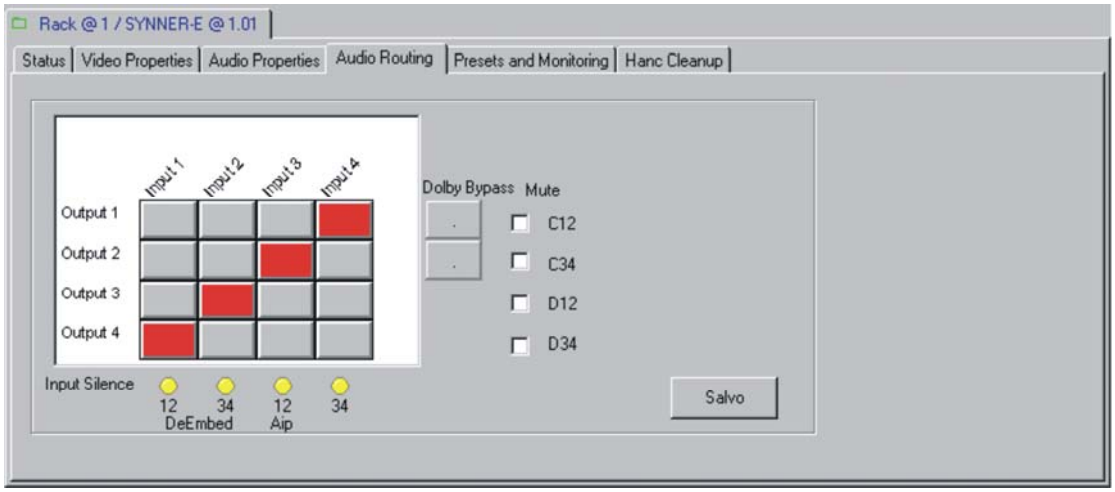
Output embedder group selection

After the required audio routing configuration has been determined the output embedders can be set to the required groups within the output video. Embedder D can be used for linear audio only whereas Embedder C may be used for linear audio, non-linear audio or a mix of both linear and non-linear simultaneously.

Note: If a Dolby E routing is selected from a group that does not contain Dolby E encoded audio the associated Audio Out Group Present LED will flash.

4.5 Audio Routing

The routing from the input embedder and sub PCB when fitted is configured here.



Audio routing

Once de-embedding and embedding groups have been chosen, routing can be selected with the router.

Route sources to destinations by clicking on the crosspoint squares in the matrix. Any selections made will turn dark red. Invalid selections will be rejected and returned to the last valid selection. Click on the Salvo button when finished. Valid selections will turn bright red and new source-destination assignments will be loaded into the routing table.

The default Dolby E embedder is embedder C. Dolby E is routed by selecting the Dolby Bypass buttons. As embedder C is the default Dolby E embedder any Dolby Pass selection will remove any previous embedder C selection and remove the switching matrix option.

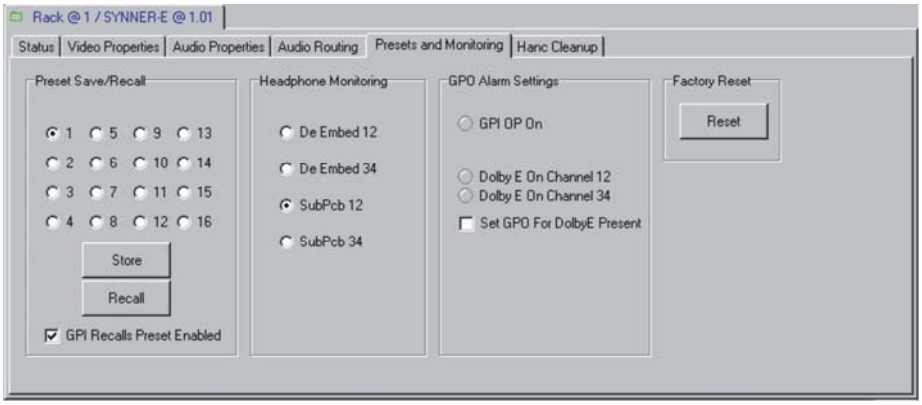
The option is also available to mute any of the linear audio stereo pairs presented to the embedders.

4.6 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 over-written by the new setting data.

Using the headphone monitor

The card edge jack socket (3.5mm, stereo) is used to monitor the stereo audio signals either extracted from the incoming SDI stream or from the input sub PCB if fitted.

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.

GPO alarm reporting

If the Set GPO for Dolby E box is ticked any Dolby E encoded audio detected by the Dolby E detectors will cause the GPI output GPI6 to pull low. <0.6V to frame 0V.

The Dolby E on channel LEDs will also illuminate along with the GPI OP On LED.

Recalling factory defaults

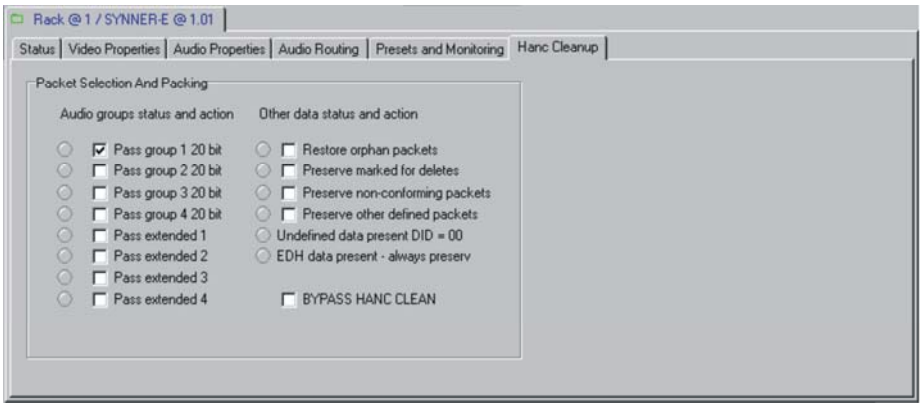
To recall the factory default settings, click reset.

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

Parameter	Default value
De-embed	Group 1
Dolby Pass	Group 1
Embedder C	Group 1
Embedder D	Off
Audio delay	4ms - minimum measured delay through board
Headphone select	Sub PCB G input Channels 1 and 2
Fail Mode	Delay then blue
Synchronisation Mode	Synchronisation
Freeze	Off
Freeze Mode	Frame
TAD Speed	0.2
Video tracking	On
Predictive tracking	Off
Preset selected	Preset 1
Delay in lines	0
Delay in samples	0 - minimum through board
Sync Mode	Frame sync
HANC cleanup	Pass group 1 selected, all others deselected
Routing and Mute	Unchanged
Alarm	Deselected
GPI Preset recall enable	Unchanged

4.7 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 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.

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: SYNNER-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 a HANC data packet in a later part of the ancillary data space and so not be 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 RP196.

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.

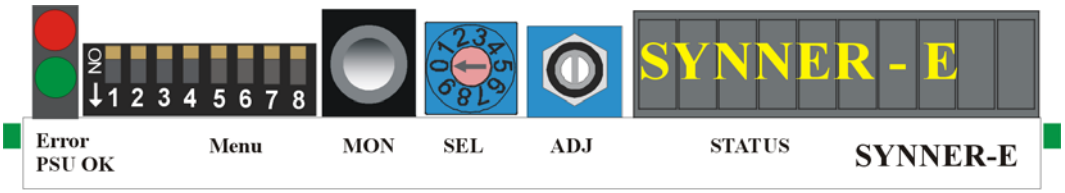
5 Trouble Shooting

Card edge monitoring

Once the start-up initialisation procedure is complete, the SYNNER-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.



SYNNER-E front view showing controls and LEDs

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

LED Colour	Position	Description
Red	Error	Will flash if: No SDI Input detected. No Reference input and Synchro Mode selected. 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 and from the sub PCB if fitted

Try connecting a pair of headphones to the 3.5mm 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 SYNNER-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 SYNNER-E blanks the entire HANC space before embedding and so only passes the embedded audio groups selected for embedding. Selectively deselect HANC blanking.

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

Inputs

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

Outputs

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

Timing

Video timing	**Synchronisation Mode** 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. **Delay Mode** When in Delay Mode the Ref is not used and delay through for the SDI is set by the same timing adjustments.
Audio timing	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.

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 1 to 16. **GPI outputs** 5 audio follow output pulse. 6 Dolby E present on the selected group. Electrically: Open drain FET 30V, 220Ω current limit resistors. Pulled up to +5V through 10kΩ.
LEDs	PSU okay, output frozen or error.