SYNNER144

SDI synchroniser, tracking audio delay and embedder/de-embedder

USER MANUAL

Crystal Vision

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1 Introduction

SYNNER144 is a video frame/line synchroniser with tracking audio delay built-in for up to two groups of embedded audio.

Two independent de-embedders can each accept four audio channels from a selected incoming audio group, which is then re-sampled, delayed, re-routed and re-embedded into any selected output audio group.

In addition, with the use of sub PCBs the SYNNER144 is able to accept up to four digital or analogue channels and embed them as part of the selected two output groups. Likewise four audio channels of either digital or analogue can be output, de-embedded from the selected audio groups of the SDI input stream.

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 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.

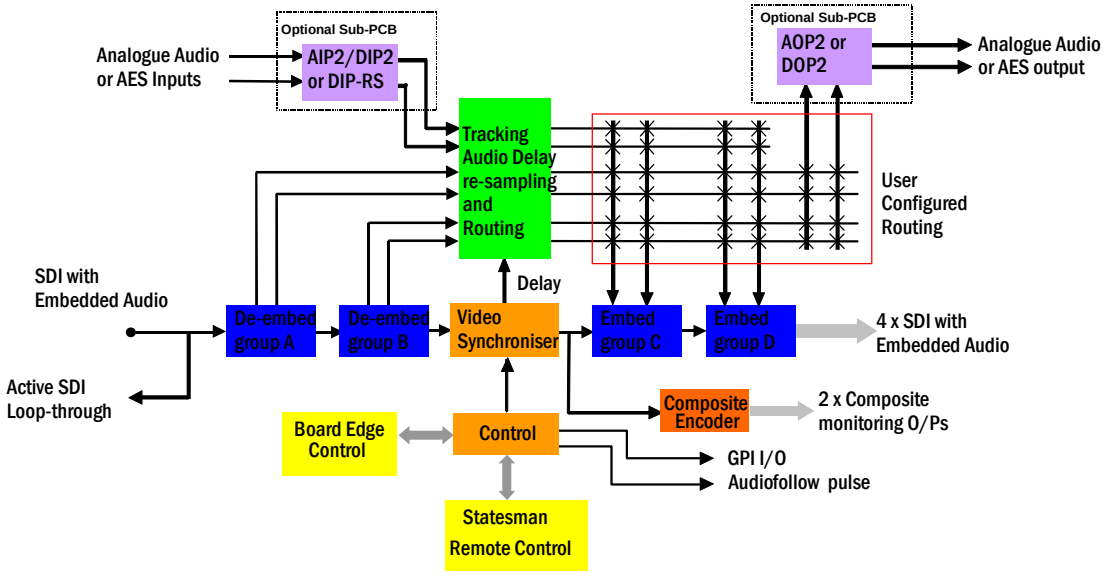
SYNNER144 is particularly suitable for placing after a routing switcher where the sources are several lines apart, or in installations using devices such as the Sony IMX VTRs which record up to two groups of embedded audio.

The main features are as follows:

- Frame or line synchroniser or use as a fixed delay line
- 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
- 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
- Option to pass or block non-linear data (Dolby E)
- Audio follow control output
- Analogue/AES audio in or out with an optional sub PCB fitted
- Composite monitor output
- Flexible control

SYNNER144 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.



SYNNER144 video and embedded audio synchroniser

Notes: Audio can be routed between any input and output groups by SYNNER144, the only limitation being that all channels are treated in groups of two i.e. as stereo pairs.

Only re-embedded audio will be present in the SDI output stream, since the entire HANC space is always blanked prior to the embedding process, except in the case of Dolby E mode.

Synchroniser and Delay Modes

SYNNER144 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 SYNNER144 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 delay 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 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 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 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 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.

Selecting the embed pattern

The SYNNER144 supports two different 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 format chosen should match the most common format in use, or set to SMPTE if in any doubt.

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 SYNNER144 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 SYNNER144 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 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 blocked or passed transparently through the video store with the SDI video.

Using the analogue video monitor output

Data in the VBI (vertical blanking interval) of the analogue composite monitor output can be blanked or passed. 7.5% IRE setup may be applied to active video when a 525 standard SDI signal is used (composite monitor output will be NTSC).

Using the headphone monitor output

The card edge jack socket (3.5mm, 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. Also to monitor the four possible stereo audio signals that can be re-embedded on two of the output audio groups by the C & D Channel embedders.

It can also be used to monitor the two stereo channels present when an optional sub PCB is fitted.

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

Note: There are no outputs to the rear connectors, as there are with TANDEMs, TAD202 and Demon.

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

Optional input and output sub PCBs

With the addition of an optional audio sub PCB of the type fitted to the TANDEM range of cards, it is possible to greatly increase the flexibility of the SYNNER144.

Provision is made to fit one audio sub PCB. This can be either an analogue or AES input type or an output type.

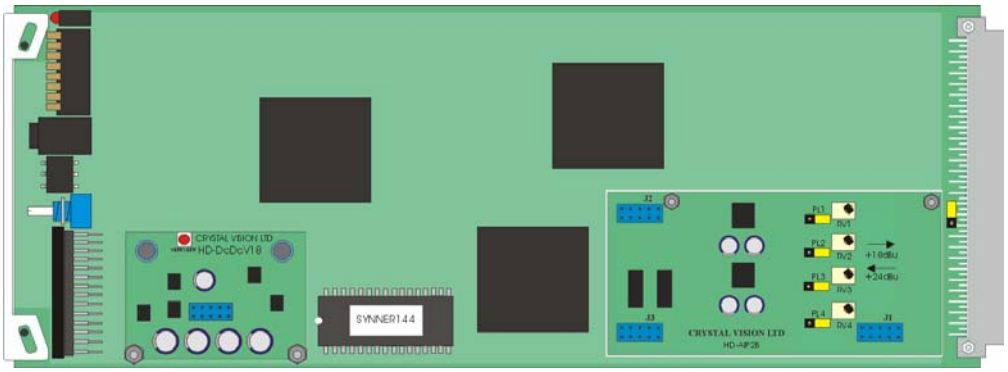
By the fitting of an input sub PCB, the user is able to embed up to two stereo pairs of input audio and insert them into the SDI output stream along with the second embedder programme.

By substituting the input sub PCB for an output card it then becomes possible to extract audio from the input SDI stream that may have been mistimed to the video, once it has been through the synchroniser and the timing corrected.

Note: It will be necessary to also fit a HD-DCDC18 PSU sub PCB when any of the analogue sub PCBs are used.

1.1 Fitting audio sub-modules

As of 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 either can be use on the SYNNER144.



SYNNER144 card showing analogue audio sub-modules and PSU sub-module fitted

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 SYNNER144 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 SYNNER144 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

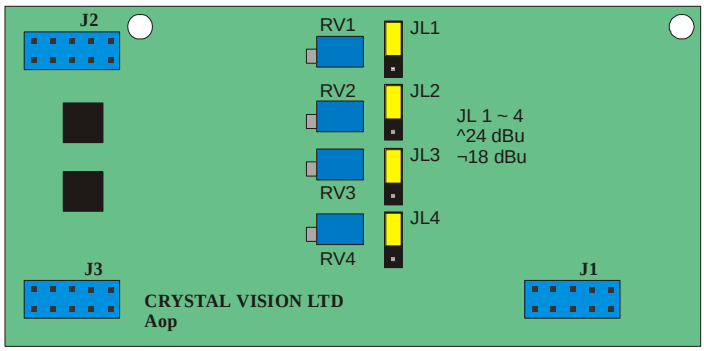
Removal is the reverse of the above procedure.

Notes: All items are supplied with the SYNNER144 module.
All sub-modules must be fitted with the component side uppermost and flat (track side) down, facing the SYNNER144 PCB. Fitting sub-modules with the component face downwards may result in fatal damage.
To check which modules are fitted when a SYNNER144 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.

1.2 Sub-module link settings

AOP2

The analogue audio output module provides two stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals. Link jumpers are provided to allow 0dBFS to be set to +18dBu or +24dBu. The variable adjustments on the card are set at the factory and should not require re-adjustment. Set channel 1 with JL1/RV1, channel 2 with JL2/RV2, channel 3 with JL3/RV3 and channel 4 with JL4/RV4.

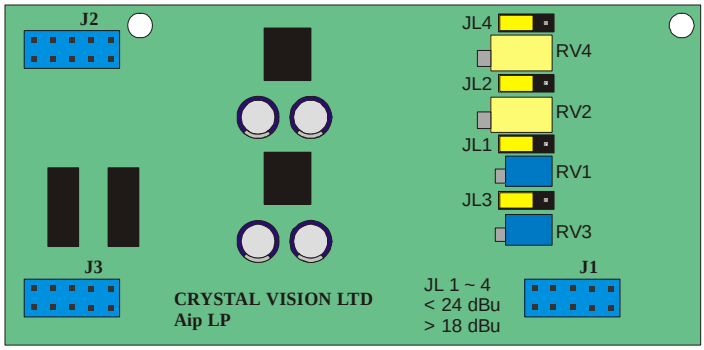


AOP2

Selectable jumper links are provided to change input and reference terminations and pre-set levels, depending on sub-module features.

AIP2

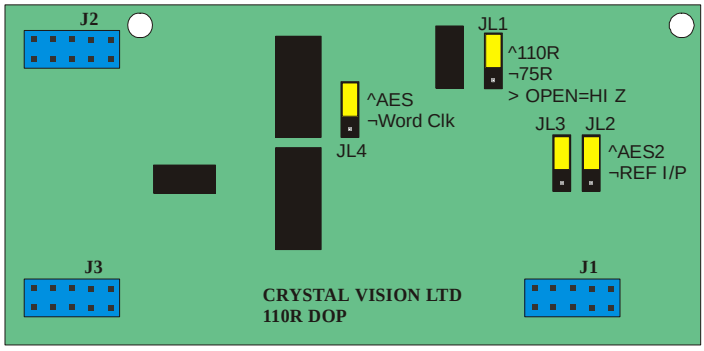
The AIP2 is identified on the silkscreen as the AIP2-LP to indicate its lower power consumption. The analogue audio input module provides two stereo pairs or four mono signals that may be used as a source in subsequent embedding. Link jumpers are provided to allow 0dBFS to be set to +18dBu (rearwards, 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 JL4/RV4, channel 2 with JL2/RV2, channel 3 with JL1/RV1 and channel 4 with JL3/RV3. *Take care to note the adjustment and channel numbering on this sub-board.*



AIP2

DOP2-110

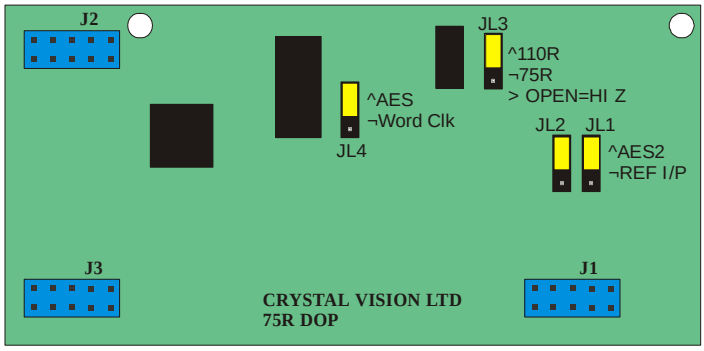
This digital audio output module provides two 110 Ohm AES stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals.



DOP2-110

DOP2-75

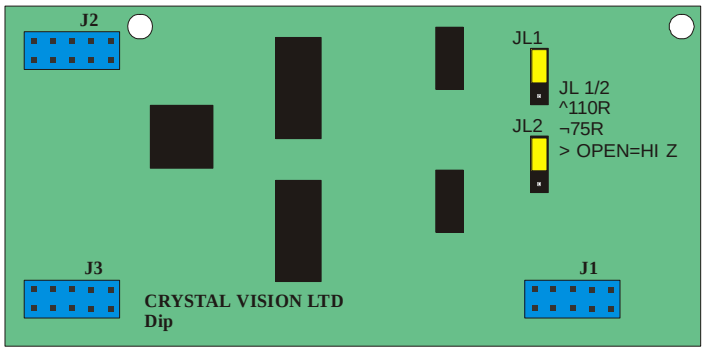
This digital audio output module provides two 75 Ohm AES stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals.



DOP2-75

DIP2

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

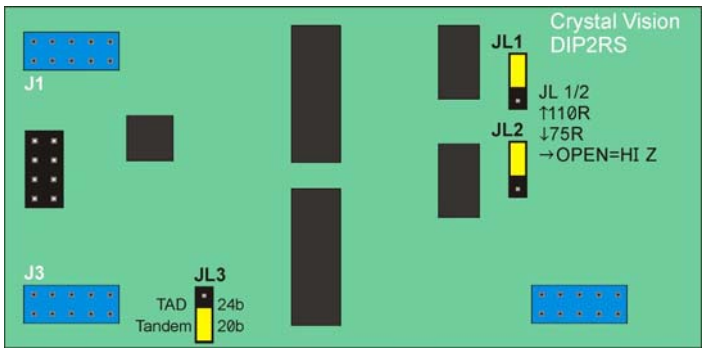


DIP2

Link jumpers are provided to select between 110 Ohm (upper 2 pins), HiZ (balanced – centre pins only) or 75 Ohm (unbalanced – lower 2 pins).

DIP2RS

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 48 kHz.



DIP2-RS

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

The signal output from the DIP2-RS to the SYNNER144 is at 48 kHz derived from the video content of the SDI signal into which it is to be embedded.

Because of the processing of the audio wave form, 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.

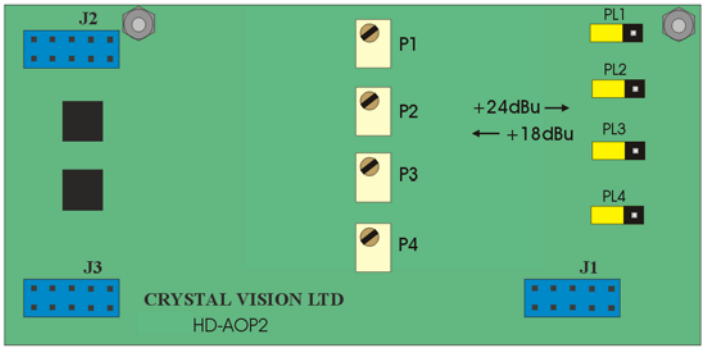
If the V-bit is consistently high, to indicate continuous error states, or to indicate non audio data, then the processor will give a silent output. All other cards pass audio data unaltered even when V-bit is set or held high.

Link jumpers are provided to select between 110 Ohm (upper 2 pins), HiZ (balanced – centre pins only) or 75 Ohm (unbalanced – lower 2 pins). Jumper JL3 must be in the Tandem position.

Notes: 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.

HD-AOP2

The analogue audio output module provides two stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals. Link jumpers are provided to allow 0dBFS to be set to +18dBu or +24dBu. The variable adjustments on the card are set at the factory and should not require re-adjustment. Set channel 1 with PL1/P1, channel 2 with PL2/P2, channel 3 with PL3/P3 and channel 4 with PL4/P4.

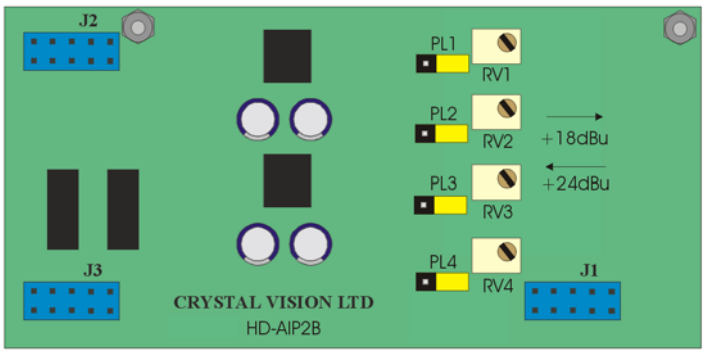


HD-AOP2

Selectable jumper links are provided to change input and reference terminations and pre-set levels, depending on sub-module features.

HD-AIP2

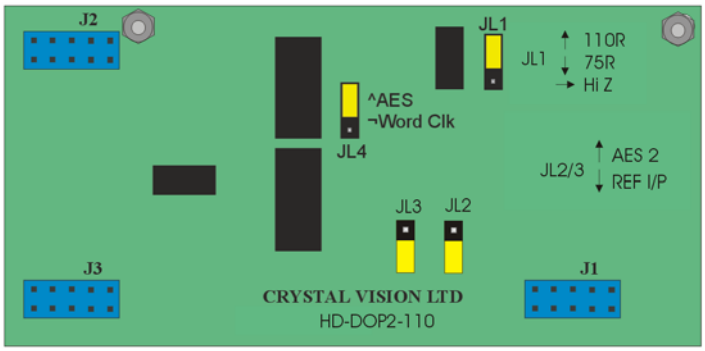
The analogue audio input module provides two stereo pairs or four mono signals that may be used as a source in subsequent embedding. Link jumpers are provided to allow 0dBFS to be set to +18dBu (rearwards, towards J1) or +24dBu (forwards, towards J2/3). The variable adjustments on the card are set at 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-DOP2-110

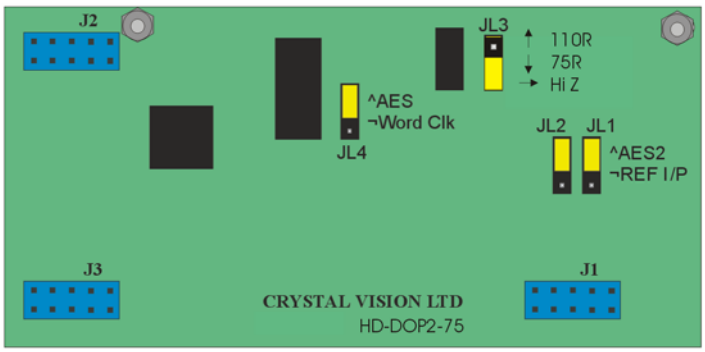
This digital audio output module provides two 110 Ohm AES stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals.



HD-DOP2-110

HD-DOP2-75

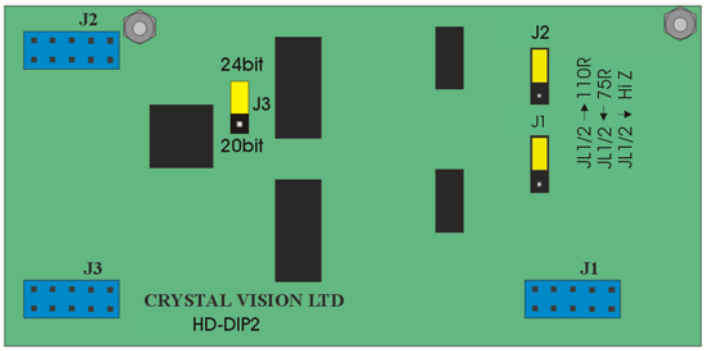
This digital audio output module provides two 75 Ohm AES stereo pairs or four mono outputs that may be used as destinations when routing de-embedded signals.



HD-DOP2-75

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.

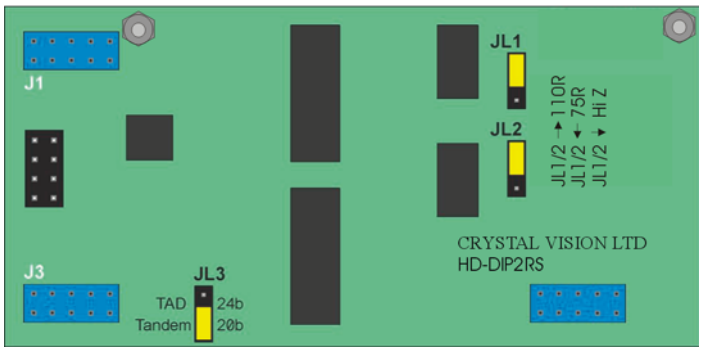


HD-DIP2

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 48 kHz.



HD-DIP2RS

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

The signal output from the HD-DIP2-RS to the SYNNER144 is at 48 kHz 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.

2 Hardware installation

The SYNNER144 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.

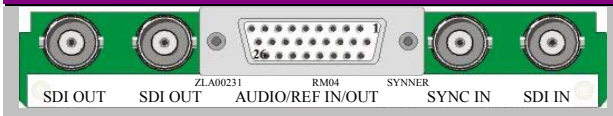
Note: The RM05 can only be used in the Indigo 2 and Indigo 4 frames.

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 DT desk top box has 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.

RM04

RM04 modular rear connector	Description
	**RM04 (ZLA00231 artwork)** • 24 SYNNER modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT desk top box • All frame slots can be used

Note: One SYNNER144 card can be fitted to each RM04 rear module.

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

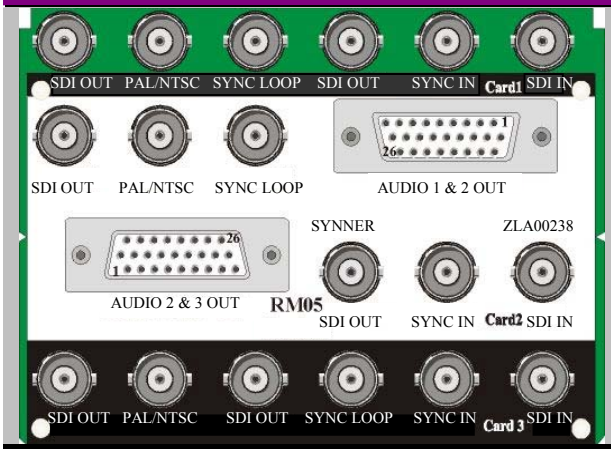
The RM04 high density 26 way D-Type female socket has the following pin assignments for each fitted audio option card:

AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	pin-out
GND	GND	GND	GND	1
No connect	No connect	No connect	No connect	2
No connect	No connect	No connect	No connect	3
No connect	No connect	No connect	No connect	5
No connect	No connect	No connect	No connect	7
No connect	No connect	No connect	No connect	8
No connect	No connect	No connect	No connect	18
GND	GND	GND	GND	9
Analogue audio 1L+	AES1+	AES1a+	AES1a	14
Analogue audio 1L-	AES1-	AES1a-	GND	15
Analogue audio 1R+	AES1scrn	AES1b+	AES1b	10
Analogue audio 1R-	NC	AES1b-	GND	11
Analogue audio 2L+	AES2+	AES2a+	AES2a+	16
Analogue audio 2L-	AES2-	AES2a-	AES2a-	17
Analogue audio 2R+	AES2scrn	AES2b+	AES2b	12
Analogue audio 2R-	NC	AES2b-	GND	13
Common Monitoring Connections				
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 modules per Indigo 4 frame • 9 per Indigo 2 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

AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	Pin-out
GND	GND	GND	GND	1
No connect	No connect	No connect	No connect	2, 3, 5, 7, 8, 18
Composite video OPA				4
Composite video OPB				6
GND	GND	GND	GND	9
Analogue audio 1L+	AES1+	AES1a+	AES1a	14
Analogue audio 1L-	AES1-	AES1a-	GND	15
Analogue audio 1R+	AES1scrn	AES1b+	AES1b	10
Analogue audio 1R-	No connect	AES1b-	GND	11
Analogue audio 2L+	AES2+	AES2a+	AES2a+	16
Analogue audio 2L-	AES2-	AES2a-	AES2a-	17
Analogue audio 2R+	AES2scrn	AES2b+	AES2b	12
Analogue audio 2R-	NC	AES2b-	GND	13

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

AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	Pin-out
GND	GND	GND	GND	1
No connect	No connect	No connect	No connect	2, 3, 5, 7, 8, 18
GND	GND	GND	GND	9
Analogue audio 1L+	AES1+	AES1a+	AES1a	14
Analogue audio 1L-	AES1-	AES1a-	GND	15
Analogue audio 1R+	AES1scrn	AES1b+	AES1b	10
Analogue audio 1R-	No connect	AES1b-	GND	11
Analogue audio 2L+	AES2+	AES2a+	AES2a+	16
Analogue audio 2L-	AES2-	AES2a-	AES2a-	17
Analogue audio 2R+	AES2scrn	AES2b+	AES2b	12
Analogue audio 2R-	No connect	AES2b-	GND	13

The second SYNNER144 card uses pins 19 to 26 of both the upper and lower high-density 26-way D-Type female connectors.

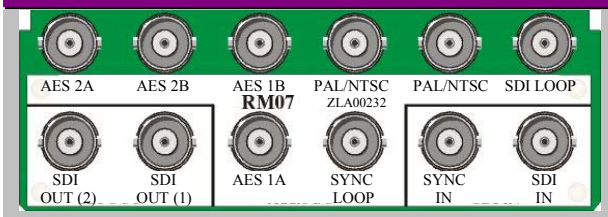
RM05 – upper high-density 26-way D-Type female connector – card 2

AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	Pin-out
No connect	**No connect**	**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

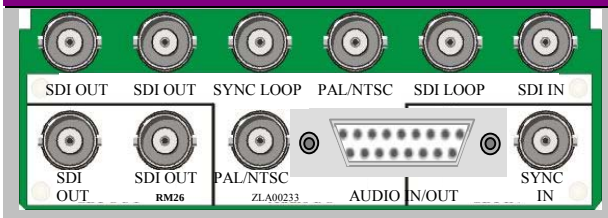
AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	Pin-out
Analogue audio 1L+	**AES1+**	**AES1a+**	**AES1a**	21
Analogue audio 1L-	**AES1-**	**AES1a-**	**GND**	22
Analogue audio 1R+	**AES1scrn**	**AES1b+**	**AES1b**	19
Analogue audio 1R-	**No connect**	**AES1b-**	**GND**	20
Analogue audio 2L+	**AES2+**	**AES2a+**	**AES2a+**	25
Analogue audio 2L-	**AES2-**	**AES2a-**	**AES2a-**	26
Analogue audio 2R+	**AES2scrn**	**AES2b+**	**AES2b**	23
Analogue audio 2R-	**No connect**	**AES2b-**	**GND**	24

RM07

RM07 modular rear connector	Description
	**RM07 (ZLA00232 artwork)** • 12 SYNNER modules per Indigo 4 frame • 6 per Indigo 2 frame • 3 per Indigo 1 frame • 1 per Indigo DT desk top box 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	2 channel (stereo) serial digital audio I/O
AES 2B	2 channel (stereo) serial digital audio I/O
AES 2A	2 channel (stereo) serial digital audio I/O
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	2 channel (stereo) serial digital audio I/O
SDI OUT(1)	Serial digital output
SDI OUT(2)	Serial digital output

RM26

RM26 modular rear connector	Description
	• **RM26 (ZLA00233 artwork)** • 12 SYNNER modules per Indigo 4 frame • 6 per Indigo 2 frame • 3 per Indigo 1 frame • 1 per Indigo DT desk top box Odd number frame slots cannot be used

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 the following pin assignments for each fitted audio option card:

AIP2/AOP2 HD-AIP2/HD-AOP2	DIP2/DIP2-RS HD-DIP2/HD-DIP2-RS	DOP2-110 HD-DOP2-110	DOP2-75 HD-DOP2-75	pin-out
GND	GND	GND	GND	1, 6, 13, 14
Analogue audio 1L-	AES1-	AES1a-	GND	2
Analogue audio 1L+	AES1+	AES1a+	AES1a	3
Analogue audio 1R-	NC	AES1b-	GND	4
Analogue audio 1R+	AES1scrn	AES1b+	AES1b	5
No connect	No connect	No connect	No connect	7, 8, 15
Analogue audio 2L-	AES2-	AES2a-	AES2a-	9
Analogue audio 2L+	AES2+	AES2a+	AES2a+	10
Analogue audio 2R-	NC	AES2b-	GND	11
Analogue audio 2R+	AES2scrn	AES2b+	AES2b	12

RM30

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

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

2.2 Module Configuration

Loop or terminate the external reference

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

General Purpose Interface (GPI)

The SYNNER144, 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 bit4**	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 Preset	Bit 4	Bit 3	Bit 2	Bit 1
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 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 and frame ground is pin 2 and +5V @500mA is pin 1 in each case.

Remote 2, Remote 4, Remote 6 and Remote 8 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 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 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 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)

Indigo DT desk top box GPI connections

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

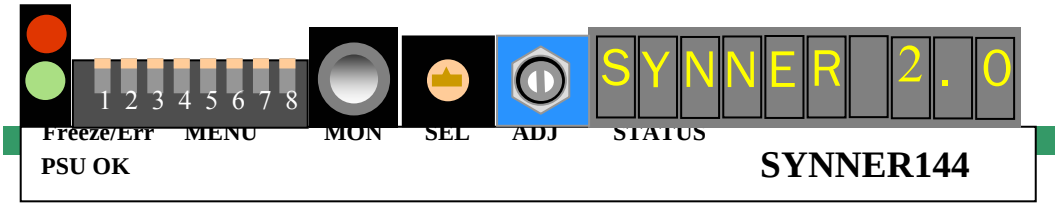
Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)

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.

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.



SYNNER144 front view showing controls and LEDs

3.1 Card edge switch settings

The 8-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	Audio selection and routing	Allows the selection of the various audio controls
5	Not used	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

8-way DIL 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. Freeze selected.
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 DIL 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 DIL switch lever 1 if required (operational changes only)

The action required to save the new assignment 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	DIL 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 DIL 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 DIL switch levers UP.

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

Selected output audio group status

Shows the status of the audio channels in the selected groups in the SYNNER144 C and D output Channels.

[C1234D1234]		**Rotate SELECT to show C and B Channel status (0)**
Option:	**C*xxxx***	Where C is SYNNER144 Channel and *x* is group 1, 2, 3, 4 or s for silent
Option:	**SDI Ip Abs**	No SDI input present
Option:	**Ref Ip Abs**	No external reference present

Example: **[C12ssDss34]**

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:	**Ads**	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:	**Ads**	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 Luma 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 chroma 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 four 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: [Ip Gp -2-4]

Selected input audio group status

Shows the status of the audio channels in the selected groups in the SYNNER144 A and B input channels.

[A1234B1234]		Rotate SELECT to show A and B Channel status (9)
Option:	***Axxxx***	Where C is SYNNER144 Channel and *x* is group 1, 2, 3, 4 or s for silent

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

Selected output audio group status

Shows the status of the audio channels in the selected groups in the SYNNER144 C and D output channels.

[C1234D1234]		Rotate SELECT to show C and D Channel status (A)
Option:	***Cxxxx***	Where C is SYNNER144 Channel and *x* is group 1, 2, 3, 4 or s for silent

Example: **[C1-3-D -2-4]**

AES Reference present

Shows the status of the AES reference.

[Aes Ref Ok]		Rotate SELECT to show AES reference input status (B)
Option:	**Ok**	AES reference present
Option:	**abs**	AES reference not present
Option:	**Na**	Not applicable, no DIP fitted

Example: **[Aes Ref Na]**

Alarm Status

Shows the alarm status in order of priority. If enabled GPO6 will show an alarm condition.

[Gpo6 Clear]		Rotate SELECT for GPO6 status (C)
Option:	**Clear**	GPO6 is not in an alarm condition
Option:	**Dl<25**	Video to Ref Delay less than 25 lines
Option:	**IpAbs**	Input Video absent
Option:	**Frozn**	Output Video frozen
Option:	**NoGrA**	No audio on channel assigned to de-embedder A
Option:	**NoGrB**	No audio on channel assigned to de-embedder B
Option:	**NoRef**	Reference input absent

Software version

Shows the version level of the currently fitted software.

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

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

Example: **[Sware 2.02]**

Serial number

Shows the SYNNER PCB's serial number.

[SerNo*nnnnn*] — **Rotate SELECT to show board serial number (E)**

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

Example: **[SerNo78558]**

Sub PCBs

Shows the type of sub PCBs currently fitted to the SYNNER.

[PCB *type*] — **Rotate SELECT to show sub PCBs fitted (F)**

	type	
Option:	**AIP2**	Analogue audio input PCB
Option:	**AOP2**	Analogue audio output PCB
Option:	**DIP2**	Digital AES input card
Option:	**DIP2RS**	Digital AES input card with resampling
Option:	**DOP2-75**	Digital AES output card 75Ω
Option:	**DOP2-110**	Digital AES output card 110Ω
Option:	**DCDCV18**	DC-DC converter required by the AIP2, HD-AIP2, AOP2 & HD-AOP2

Note: SYNNER144 does not distinguish between HD and previous types on sub PCB

3.6 Using presets

To enter the preset menu set DIL 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: 0 to 15	These menus allow the saving and recall of user presets To save the current SYNNER 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 DIL 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 coarser 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 SYNNER144 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 SYNNER144 into automatic Freeze Mode as determined by the Input loss menu.
	En	Sets SYNNER144 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 SYNNER144 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 SYNNER144 into frame Freeze Mode, whenever freeze is ON
	Field2	Sets SYNNER144 into field 2 Freeze Mode, whenever freeze is ON
	Field1	Sets SYNNER144 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 SYNNER144 has two modes of operation, synchronisation and delay line. In Synchronisation Mode the unit takes its timing from the analogue external reference and will automatically synchronise sources with or without embedded audio between 0 and 2 fields. In Delay Mode, timing is derived only from the SDI input.

To set the SYNNER144 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 SYNNER144 to frame synchroniser mode
	Delay	Sets SYNNER144 to variable SDI delay mode
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Enabling NTSC setup (pedestal)

When a 525 SDI signal is used, pedestal may be applied to the SYNNER144 analogue NTSC video picture output. Turn the SELECT control to display **[Setup 'option']**, then turn the ADJUST control to select the desired option.

[IRE 'option']		**Rotate ADJUST for NTSC pedestal on/off (7)**
Option:	**Dis**	Sets SYNNER144 analogue video picture output for zero NTSC setup
	En	Sets SYNNER144 analogue video picture output for +7.5% IRE setup
	N/A	SYNNER144 with a 625 line input
Confirmation:		The new value is active the moment it is displayed

Selecting the synchroniser lock mode

To optimise the handling of upstream switching of SDI sources that may not be correctly co-timed, the normal frame lock of the framestore input can be replaced by 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 lock mode for the SDI input, turn the SELECT control to display **[Sync 'option']**, and turn the ADJUST control to select the desired option.

[Sync 'option']		**Rotate ADJUST for vertical lock options (8)**
Option:	**Field**	Lock to field flag
	Frame	Lock to field blanking flag
	N/A	SYNNER144 with a 525 line input
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 SYNNER144 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.

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)**
Option:	**Fr**	Set SDI output video content to frozen last frame picture on loss of SDI input. (Used for diagnostics, as it includes last field where input was lost.)
	F1	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.)
	F2	Set SDI output video content to frozen last good field 2 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 frozen 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 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.

Enabling blanking of the vertical interval

The VBI content of the analogue video picture output may be blanked or passed, turn the SELECT control to display **[VBI 'option']**, then turn the ADJUST control to select the desired option.

[VBI 'option']		**Rotate ADJUST for VBI on/off (A)**
Option:	**Blank**	Sets analogue video picture output VBI content to be blanked
	Passed	Sets analogue video picture output VBI content to be passed
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.

[VidTrk '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.

Serial digital input loop-through (SDI loop)

When the SYNNER144 is used with both the RM07 and RM26 it is possible to loop-through the SDI input.

To select the SDI loop-through turn the SELECT control to display **[SDI Loop 'ed/of']**, turn the ADJUST control to select the desired option.

[SDI Loop 'ed/of']		**Rotate ADJUST for SDI loop-through options (F)**
Option:	**of**	Turns SDI loop-through off
	ed	Turns SDI loop-through on
Confirmation:		The new value is active the moment it is displayed

Note: The SDI signal from the loop-through will be interrupted if the SYNNER144 is removed.

3.8 Audio selection and routing

To enter the audio selection and routing menu set DIL 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 '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:		DIL 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 'B' de-embedder (1)**
Option:	**'*n*'**	Audio group number: 1 / 2 / 3 / 4, or - for OFF
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Handling non-linear audio (Dolby E)

Non-linear data embedded in the SDI video output may be blanked or passed. Turn the SELECT control to display **[Dolby *'option'*]**, then turn the ADJUST control to select the desired option.

[DolbyE *'option'*]		**Rotate ADJUST for Dolby E on/off (2)**
Option:	**Off**	Framestore does not pass non-linear data (Dolby E)
	On	Framestore passes non-linear data (Dolby E)
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

Audio Routing

Selecting an audio stereo pair for the 'C' embedder

Turn the SELECT control to display **[*'option'* > C12]**, turn the ADJUST control to select the desired option and then confirm the new value.

[*'option'* > C12]		**Rotate ADJUST to select channel pair for channel 1-2 of 'C' embedder (5)**
Option:	**A12**	Audio channel 1 / 2 from de-embedder A
	A34	Audio channel 3 / 4 from de-embedder A
	B12	Audio channel 1 / 2 from de-embedder B
	B34	Audio channel 3 / 4 from de-embedder B
	G12	Audio channel 1 / 2 from input sub PCB
	G34	Audio channel 3 / 4 from input sub PCB
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Selecting an audio stereo pair for the 'C' embedder

Turn the SELECT control to display **['*option*' > C34]**, turn the ADJUST control to select the desired option and then confirm the new value.

['*option*' > C34]		**Rotate ADJUST to select channel pair for channel 3-4 of 'C' embedder (6)**
Option:	**A12**	Audio channel 1 / 2 from de-embedder A
	A34	Audio channel 3 / 4 from de-embedder A
	B12	Audio channel 1 / 2 from de-embedder B
	B34	Audio channel 3 / 4 from de-embedder B
	G12	Audio channel 1 / 2 from input sub PCB
	G34	Audio channel 3 / 4 from input sub PCB
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Selecting an audio stereo pair for the 'D' embedder

Turn the SELECT control to display **['*option*' > D12]**, turn the ADJUST control to select the desired option and then confirm the new value.

['*option*' > D12]		**Rotate ADJUST to select channel pair for channel 1-2 of 'D' embedder (7)**
Option:	**A12**	Audio channel 1 / 2 from de-embedder A
	A34	Audio channel 3 / 4 from de-embedder A
	B12	Audio channel 1 / 2 from de-embedder B
	B34	Audio channel 3 / 4 from de-embedder B
	G12	Audio channel 1 / 2 from input sub PCB
	G34	Audio channel 3 / 4 from input sub PCB
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Selecting an audio stereo pair for the 'D' embedder

Turn the SELECT control to display **['*option*' > D34]**, turn the ADJUST control to select the desired option and then confirm the new value.

['*option*' > D34]		**Rotate ADJUST to select channel pair for channel 3-4 of 'D' embedder (8)**
Option:	**A12**	Audio channel 1 / 2 from de-embedder A
	A34	Audio channel 3 / 4 from de-embedder A
	B12	Audio channel 1 / 2 from de-embedder B
	B34	Audio channel 3 / 4 from de-embedder B
	G12	Audio channel 1 / 2 from input sub PCB
	G34	Audio channel 3 / 4 from input sub PCB
Confirmation:		DIL 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 (9)**
Option:	**'*n*'**	Audio group number: 1 / 2 / 3 / 4, or - for OFF
Confirmation:		DIL 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 (A)**
Option:	**'*n*'**	Audio group number: 1 / 2 / 3 / 4, or - for OFF
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Choosing the embedding format

The SYNNER144 supports two different 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.

To select audio embedding format for the SDI output turn the SELECT control to display **[Em Pat '*format*']**, turn the ADJUST control to select the desired option and then confirm the new value.

[Em Pat '*format*']		Rotate ADJUST for embedding format (B)
Option:	**Sny**	Embed all lines
	Smp	Leave four line gap in vertical blanking
Confirmation:		The new value is active the moment it is displayed

Notes: The input format does not require setup as it is automatically detected.
The output format chosen should match the most common format in use - set to SMPTE if in any doubt.

Choosing delayed audio groups to output from a sub PCB

Selecting a stereo channel from the router delayed output and assigning to channel 1 and 2 of an output sub PCB

Turn the SELECT control to display **['*option*' > i12]**, turn the ADJUST control to select the desired option and then confirm the new value.

['*option*' > i12]		Rotate ADJUST to select stereo pair to output on channel 1/2 of output sub PCB (C)
Option:	**Ad12**	Audio channel: 1 / 2 of de-embedder A
	Ad34	Audio channel: 3 / 4 of de-embedder A
	Bd12	Audio channel: 1 / 2 of de-embedder B
	Bd34	Audio channel: 3 / 4 of de-embedder B
Confirmation:		DIL lever 1 ACT must be set DOWN and then UP

Selecting a stereo channel from the router delayed output and assigning to channel 3 and 4 of an output sub PCB

Turn the SELECT control to display **['*option*' > i34]**, turn the ADJUST control to select the desired option and then confirm the new value.

['*option*' > i34]		Rotate ADJUST to select stereo pair to output on channel 3/4 of output sub PCB (D)
Option:	**Ad12**	Audio channel: 1 / 2 of de-embedder A
	Ad34	Audio channel: 3 / 4 of de-embedder A
	Bd12	Audio channel: 1 / 2 of de-embedder B
	Bd34	Audio channel: 3 / 4 of de-embedder B
Confirmation:		DIL 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 two selected audio groups by the A and B de-embedders in the incoming SDI input signal. The two stereo signals from an input HD-AIP/HD-DIP sub PCB where fitted can also be selected for monitoring.

It also can be used to monitor the four possible stereo audio signals that can be embedded in two audio groups by the C and D channel embedders in the SDI output signal. The two stereo signals routed to an HD-AOP/HD-DOP output sub PCB where fitted can also be selected for monitoring.

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 (E)**
Option:	***X***	Where A, B, are the SYNNER144s de-embedders, C, D is the embed/delay path, G is an input sub PCB and I an output 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

Alarm configuration

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

Piano lever 6 DOWN, all others in the UP position: -

Assigning GPI6 alarm reporting

A silence alarm may be triggered if the audio present in any one of the output channels remains below -50dBFS for longer than a period of time set by the silence detect delay control. Any of or all eight channels can set the common alarm, GPI6.

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

[Sill Cn '*option*']		**Rotate ADJUST to select audio channel to report from embedder C (0-3)**
Option:	**Msk**	Mask silence detect for selected audio channel
	Flg	Flag silence detect for selected audio channel
	n	Audio channel 1 / 2 / 3 / 4 on embedder C
Confirmation:		The new value is active the moment it is displayed

Turn the SELECT control to display **[Sill D*NA* ‘*option*’]**, turn the ADJUST control to select the desired option and then confirm the new value.

[Sill D*n* ‘*option*’]		**Rotate ADJUST to select audio channel to report from embedder D (4-7)**
Option:	**Msk**	Mask silence detect for selected audio channel
	Flg	Flag silence detect for selected audio channel
	n	Audio channel 1 / 2 / 3 / 4 on embedder D
Confirmation:		The new value is active the moment it is displayed

Setting silence detect delay

A silence alarm may be triggered if the audio present in any one of the output channels remains below -50dBFS for longer than a period of time set by the silence detect delay control.

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

[Sil Dl ‘n*nn.*’]		**Rotate ADJUST to select silence detect delay period (A)**
Option:	***nnn.***	1.5 seconds, 8 seconds and then every 8 seconds up to a maximum of 120 seconds
Confirmation:		The new value is active the moment it is displayed

GPI6 configuring

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

[GPI ‘*option*’]		**Rotate ADJUST to enable/disable GPI6 (B)**
Option:	***dis***	GPI is disabled
	Ena	GPI is enabled
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.

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:	***nnn***	8-248 steps
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 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 (D)**
Option:	***nnn***	8-248 steps of approximately 2mV
Confirmation:		The new value is active the moment it is displayed

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 silence detect delay period (E)**
Option:	***Dis***	8-248 steps of approximately 0.1mV
Confirmation:		The new value is active the moment it is displayed

4 Using the active front panel

An active control panel can be located on the frame front or remotely. The active front panel allows full control of all card functions.

4.1 Module selected

This operational guide assumes that the panel has been set up according to the Panel setup procedure described in the Crystal Vision Control Panel manual.

Note: It is **ESSENTIAL** that the Panel setup procedure is followed and any old or unknown passwords cleared prior to using the panel for the first time.

At power up, the two line 20-character screen will display ‘Crystal Vision’ followed by the firmware version number for the control panel. All eight control panel keys LEDs will illuminate.

The Crystal Vision control panel start up display

'Control Panel' then briefly replaces the version number display.

If the control panel firmware has been updated for Statesman control (version 1.5.0 or higher), Statesman Mode will be entered and the message, ‘Press CAL to Exit’ will be displayed and the CAL LED will light.

Statesman mode is entered by default

To continue with control panel operation or configuration, press the CAL key once. A second press of the CAL key will return to Statesman control.

The control panel will display the name of the card that first responds to the polling request together with its location number.

The location number consists of the frame number plus the card position in the frame.

Navigating the display

The functions assigned to control panel keys are:

- DEVICE – enters Device menu to select a card or show cards available / enters Panel setup when held down during power up / shows frame status when pressed from Statesman mode
- CAL – enters or leaves Statesman mode / enters panel diagnostics mode when held down during power up / updates the display
- Asterisk – enters board rename menu from the Device menu
- F1 to F4 – soft keys, function assigned within each menu
- HOME – moves the display to the home menu
- ENTER – accept current selection
- Upward arrow – used to move up the menu structure / enter lock panel menu from the Device menu
- Rotary control – shaft encoder used to select options or variable data

Note: Please refer to the Crystal Vision Control Panel manual for details of the Panel Setup, Lock Panel and Diagnostic menus.

Selecting SYNNER144

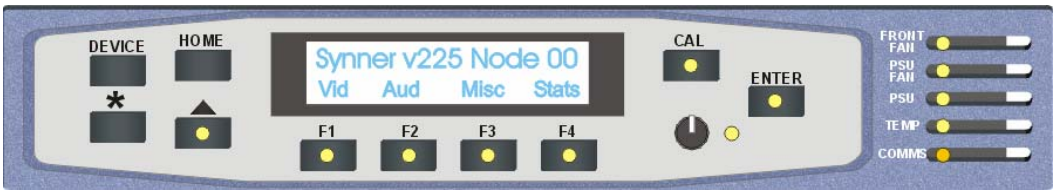
To select a particular card in a frame, press the DEVICE key to go to the Device menu. The top line of the display will show 'Available Cards X', where X is the number of cards that have responded so far to the polling request.

The available cards menu

Rotate the shaft encoder and the bottom row will display the successfully polled cards by name and location or slot number.

In the example above, the card displayed is located in the first frame in slot number 1. When the desired card is selected press the ENTER key to access that card's HOME menu.

The message shows that a SYNNER144 has been selected.



The SYNNER144 home menu

Updating the display

The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If mode changes occur through the use of Statesman, card edge controls or through automatic response to the input video signal, the text displayed on the active front panel will not be updated immediately. If necessary, press CAL to update the display.

4.2 The SYNNER144 menu structure

At any time the main top-level menu (Home) is obtained by pressing the HOME key. From the home menu further selections can be made. Their integrated LEDs illuminating will indicate active function keys.

When a sub menu has been selected, further options may be obtained by using the Shaft control to scroll through them. Once the desired option has been located a selection or value change can be made by either toggling the appropriate function key or by selecting and using the shaft control to alter a numerical value. A configuration change or value will be activated as the shaft control is rotated or function button is toggled. The variable being adjusted will appear in brackets. Pressing Enter will fix the new value.

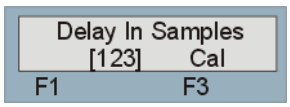
The following chart shows the available SYNNER144 menus. The actual menus available may vary slightly as software is updated.

Example: To adjust the delay in pixel steps (samples).

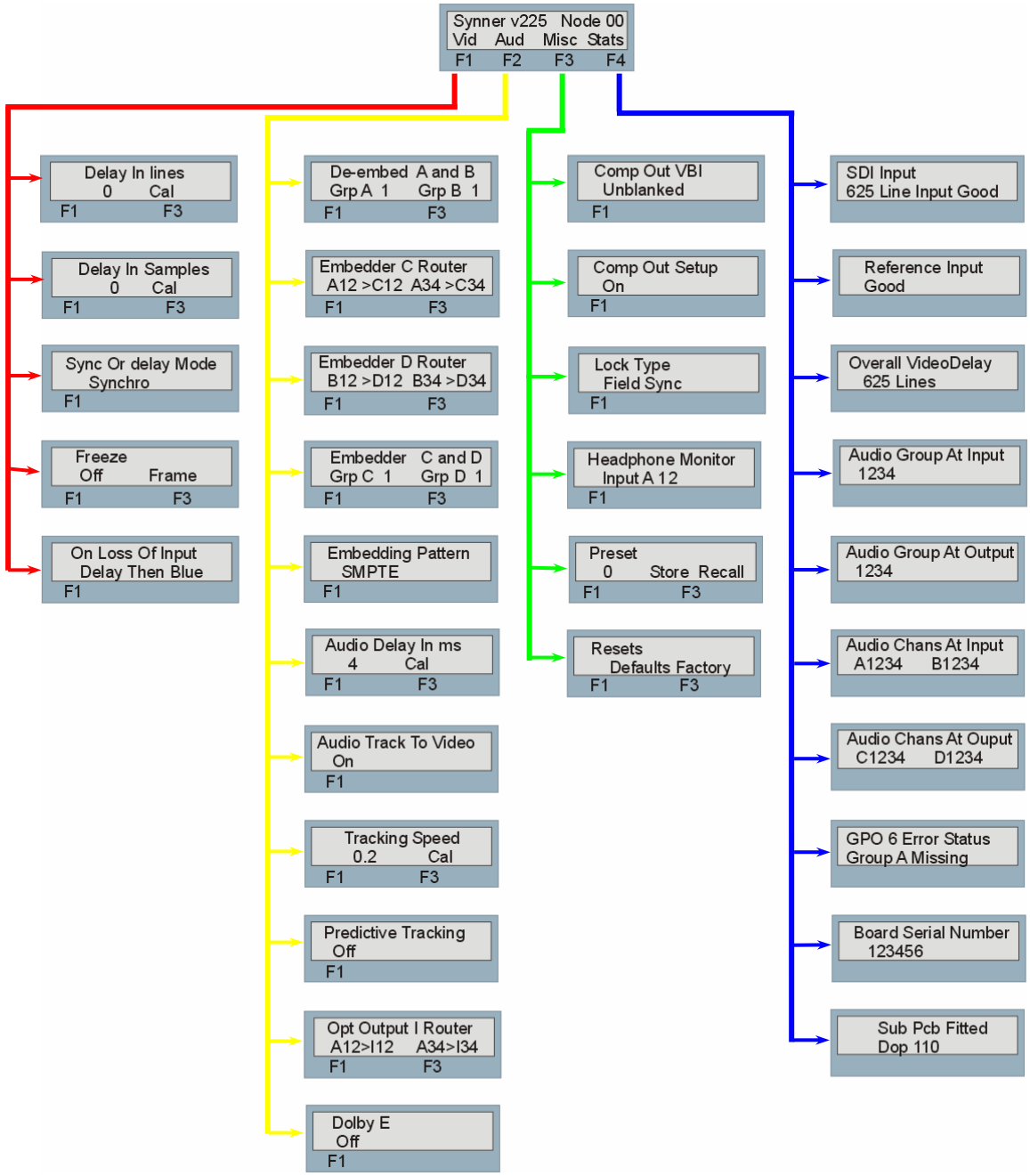
From the Home menu select the Video sub-menu by pressing F1. Rotate the shaft control to display the ‘Delay in Samples’ sub-menu. Press F1 and note that the sample value now appears in square brackets. Rotating the shaft control will now increment the sample value. Once the required value has been reached it can be fixed by pressing the Enter button. Pressing F3 at any time will zero the value.

Note: If the value change is not fixed by pressing the Enter button the value will revert to its previous fixed value on exiting from the menu.

Press F1



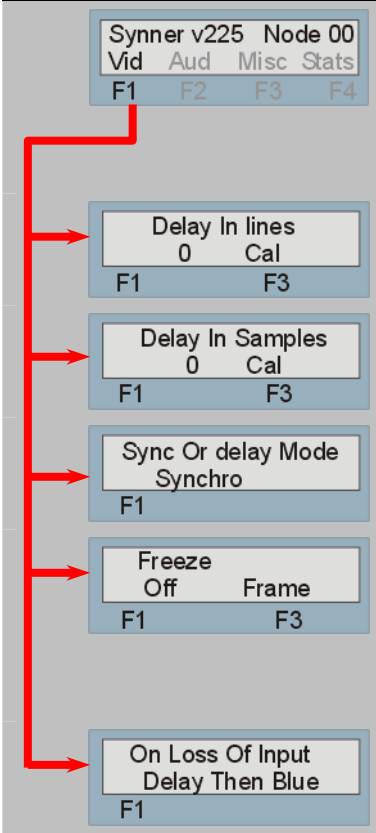
Press F1 and rotate shaft control



SYNNER144 menu tree

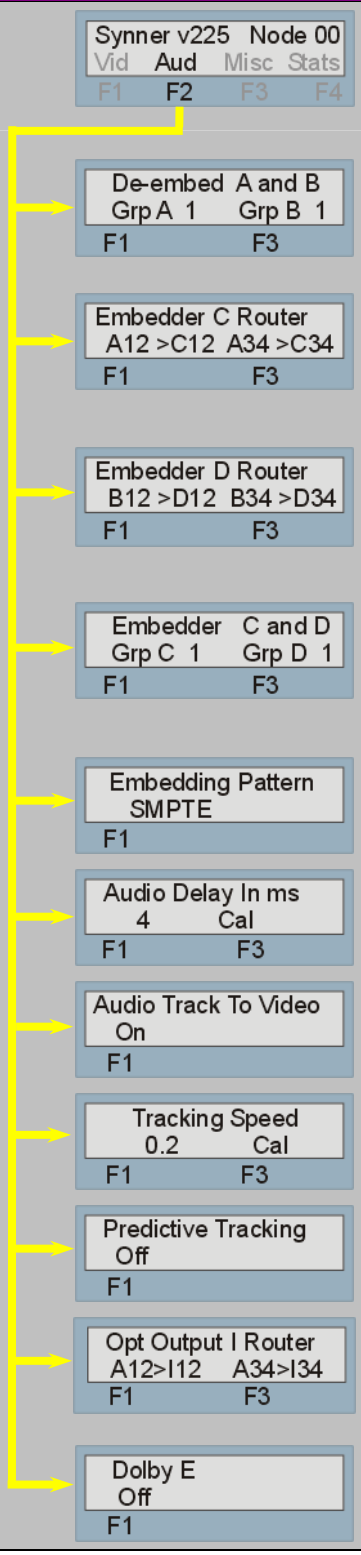
4.3 Video Configuration Menu

The video configuration menu allows the user to tailor the various video functions to suit their specific application.

Video Configuration menu	Description
	Pressing the appropriate function key will access the four sub menus. These sub menus are then be traversed by rotating shaft control. Press **F1** key to select, and adjust the shaft control to increment the Delay in lines, 0-624 in 625 line standard and 0-524 in 525 line standard Press **F1** key to select and adjust the shaft control to increment the Delay in pixels, 0-1727 in 625, 0-1715 in 525 Press **F1** to select and adjust the shaft control to select synchronisation or Delay mode. Press **F1** to select and rotate the shaft control to enable the freeze function. Press **F3** to select and rotate the shaft control to select Frame freeze Field 1 freeze Field 2 freeze Press **F1** to select and rotate the shaft control to select Delay then Blue Frame Field 1 Field 2 Black Blue Delay then Black

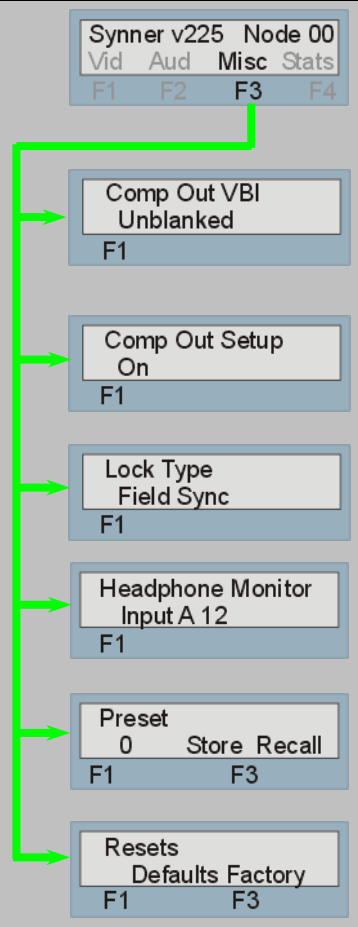
4.4 Audio Configuration Menu

The Audio configuration menu allows the user control over the various audio functions.

Audio Configuration menu	Description
	Pressing the appropriate function key will access the four sub menus. These sub menus are then be traversed by rotating shaft control. Press **F1** key to select and rotate the shaft control to assign an input group to De-embedder A. Press **F3** key to select and rotate the shaft control to assign an input group to De-embedder B. Press **F1** key to select and rotate the shaft control to assign an audio pair to channel 1 & 2 of embedder C. Press **F3** key to select and rotate the shaft control to assign an audio pair to channel 3 & 4 of embedder C. Press **F1** key to select and rotate the shaft control to assign an audio pair to channel 1 & 2 of embedder D. Press **F3** key to select and rotate the shaft control to assign an audio pair to channel 3 & 4 of embedder D. Press **F1** key to select and rotate the shaft control to assign embedder C to an audio group in the SDI output. Press **F3** key to select and rotate the shaft control to assign embedder D to an audio group in the SDI output. Press **F1** key to select and rotate the shaft control to select either SMPTE or Sony embedding formats. Press **F1** key to select and adjust shaft control to increment the Audio Delay in delay mode or offset in synchro mode. Adjustment 4 to 20 ms. Press **F1** key to select and rotate the shaft control to select Audio tracking video either On or Off. Press **F2** key to select and adjust shaft control to increment the TAD speed. The current rates are 0.8%, 0.4%, 0.2%, 0.1% and 0.05%. **F3** Cal set the TAD speed to 0.2% Press **F1** key to select and rotate the shaft control to select Predictive Tracking either On or Off. Press **F1** key to select and rotate the shaft control to select a stereo channel from the router delayed output and assign to channel 1 & 2 of an output sub PCB. Press **F3** to assign channel 3 & 4. Press **F1** key to select and rotate the shaft control to pass (On) or block (Off) non-linear data (Dolby E).

4.5 Misc Configuration Menu

The Misc configuration menu contains Preset control, engineering and monitoring menus.

Video Configuration menu	Description
	Pressing the appropriate function key will access the four sub menus. These sub menus are then be traversed by rotating the shaft control. Press **F1** key to select and rotate the shaft control to pass (Unblanked) or block (Blank) VBI content. Press **F1** key to select and rotate the shaft control to insert a 7.5% IRE black level pedestal. (NTSC only) Press **F1** key to select and rotate the shaft control to select the video frame synchroniser lock mode for the SDI input. See note. Press **F1** key to select and adjust the shaft control to set the card edge headphone socket to monitor the input channel pairs 12, 34 or output channel pairs 12, 34. Press **F2** key and adjust shaft the control to increment the Preset Store location 0-16. Press Enter to Save. Press **F4** key and adjust the shaft control to increment the Preset Recall location 0-16. Press Enter to Recall. Press **F1** to return the card settings to their default values. Note all stored preset configurations will be retained. Press **F3** to return the card settings to their factory set values. Note all stored preset configurations will be erased. See the table for default values.

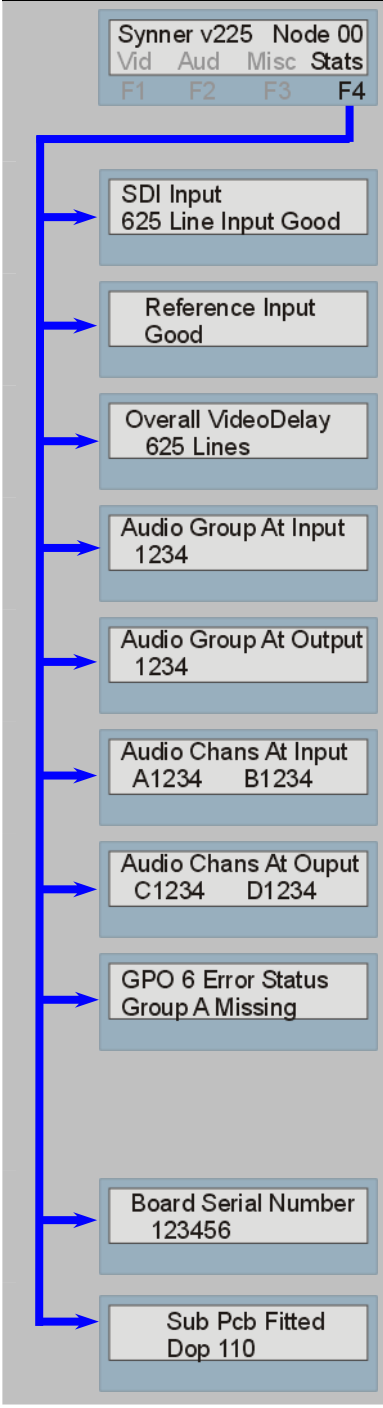
Notes: This adjustment is only available in 625-line operation. 525-line operation automatically defaults to locking on the field flag.

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

Parameter	Default value
De-embedder A	Group 1
De-embedder B	Group 1
Embedder C	Group 1
Embedder D	Off
Embed pattern	SMPTE
Audio delay	4ms - minimum measured delay through board
Dolby E	Off
Headphone select	De-embedder A input Channels 1 and 2
Fail Mode	Freeze then blue
Synchronisation Mode	Synchronisation
Freeze	Off
Freeze Mode	Frame
TAD Speed	0.2
Video tracking	On
Predictive tracking	Off
Video standard	PAL
Delay in lines	0
Delay in samples	0 - minimum through board
Lock	Frame sync
VBI	Unblanked
Routing	Channel 1-1, 2-2, 3-3, 4-4.
Alarms	Deselected
Silence detect delay	1 second

4.6 Stats Menu

The stats menu allows the user to check the card status.

Video Configuration menu	Description
	Pressing the appropriate function key will access the four sub menus. These sub menus are then be traversed by rotating the shaft control. Indicates the presence or absence of an input signal. Indicates the line standard of the incoming video. 625 or 525 lines Indicates the presence or absence/poor quality of an external reference signal. Indicates the current video delay offset. Indicates which two of the four available audio groups have been chosen for de-embedding. Indicates which two of the four available audio groups have been chosen for re-embedding. Indicates the presence or absence (silence) of audio channels on the input de-embedders A & B. Indicates the presence or absence (silence) of audio channels on the output embedders C & D. Error Status: Dly < than 25 lines Video Missing Video Frozen Group A Missing Group B Missing No Reference Shows the card serial number. Shows the type of piggyback sub PCB fitted. AIP, DIP etc. Note: SYNNER144 does not distinguish between HD and previous types of sub PCB.

5 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.

5.1 Statesman operation

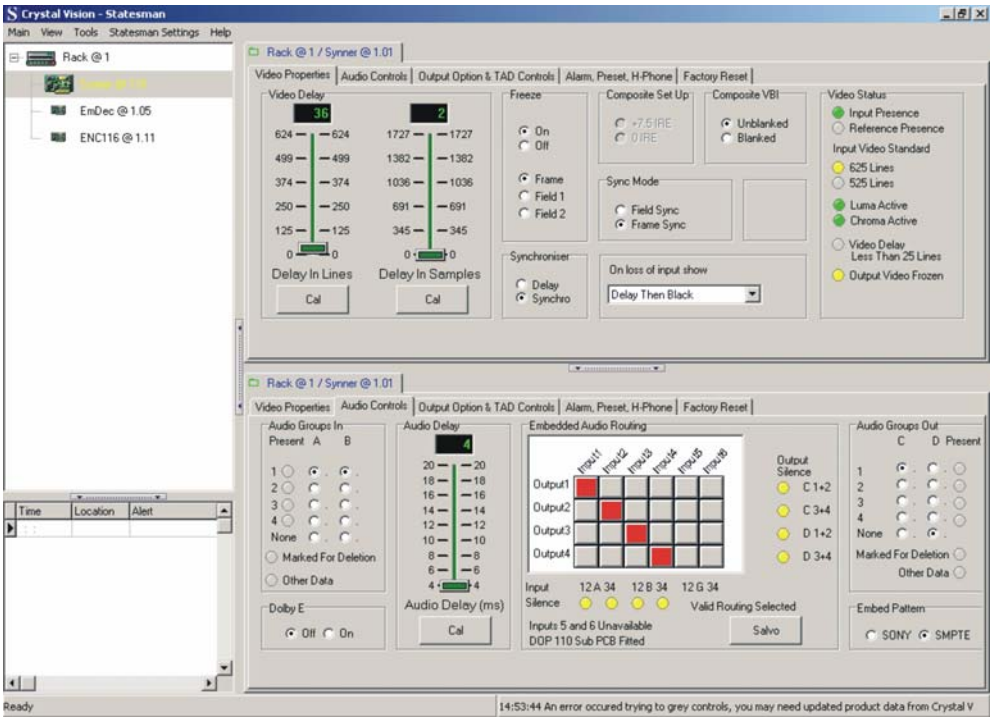
Once Statesman is configured it should automatically detect any Statesman compatible modules in the connected frame or frames and display them in the main application left hand Explorer-style window.

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.

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

Video properties

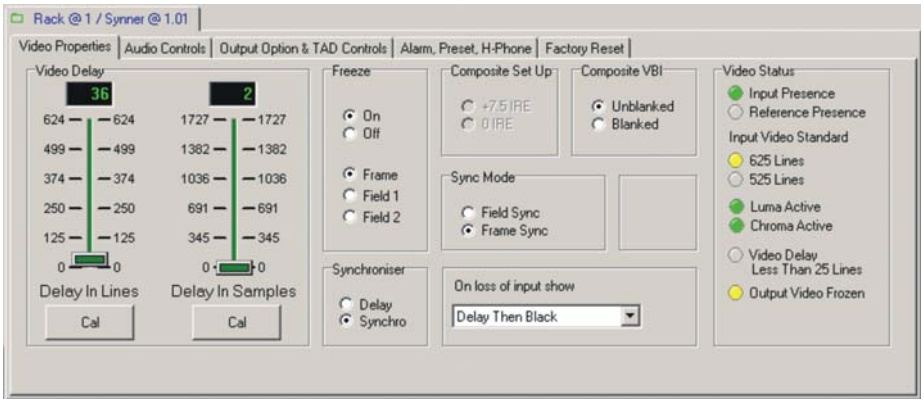
Using Statesman status displays

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

Selecting Synchronisation or Delay Mode

The SYNNER144 may be used in either Synchronisation or Delay Mode.

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



SYNNER 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
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 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 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 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.

Monitor output options

Data in the VBI (vertical blanking interval) of the analogue composite monitor output can be blanked or passed. Click the VBI blanked or unblanked box as required.

7.5% IRE setup may be applied when a 525 standard SDI signal is used (composite monitor output will be NTSC). Check the 0% or +7.5% IRE box as required.

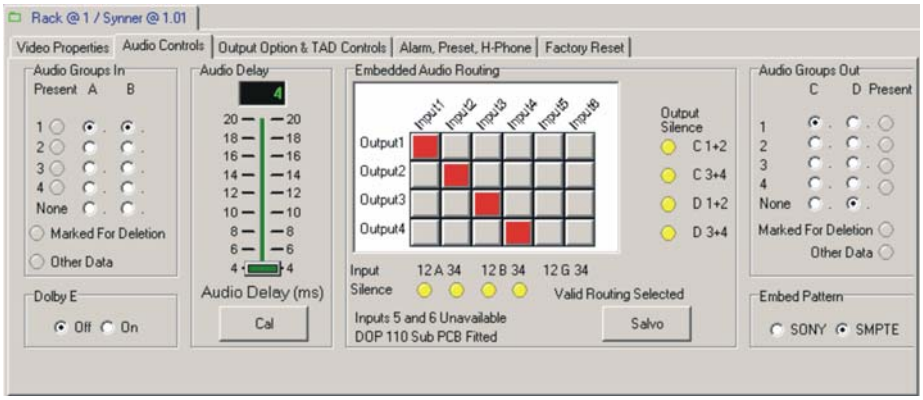
Video status

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

Audio selection and routing

A total of two of the four groups available on the SDI input stream could be selected to be 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

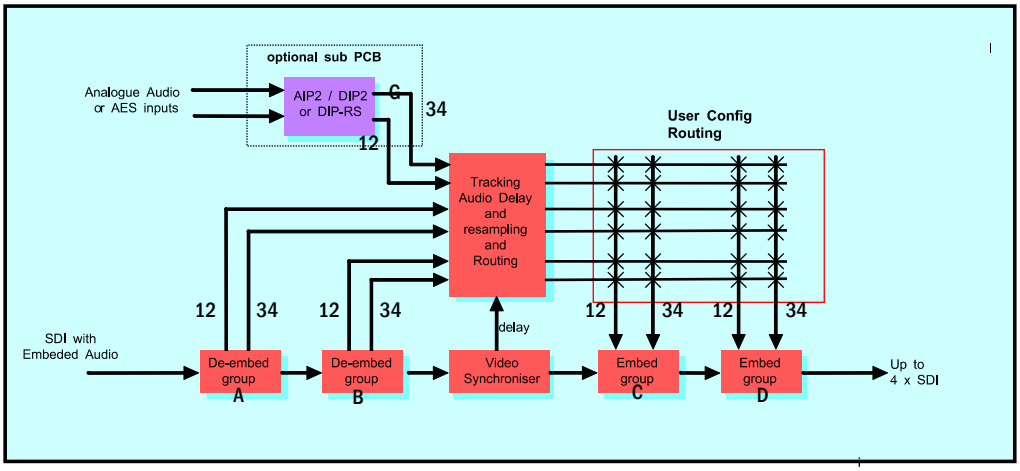
The audio delay slider controls the actual delay if video tracking is off, or the audio delay offset or additional delay if video tracking is on.

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

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

Audio Routing

Once the selection of the two groups from the SDI input stream has been decided, the user can then decide which to retain and what their distribution will be in the output stream. At this point the decision is made whether to retain or delete channels or to substitute with channels from an input sub PCB, if fitted. An indication by a simulated LED, of a silent channel, is also given to aid the user.



Note: The SYNNER144's internal router handles channels in stereo pairs. These are designated as 12 and 34.

A routing selection is made by clicking on the appropriate routing tile; the tile then changes colour to indicate that it has been selected. At this point no routing has been actioned. Once the selection is complete it is implemented by clicking the Salvo button.

Selecting the embed pattern

The SYNNER144 supports two different 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 output format chosen should match the most common format in use, or be set to SMPTE if in any doubt.

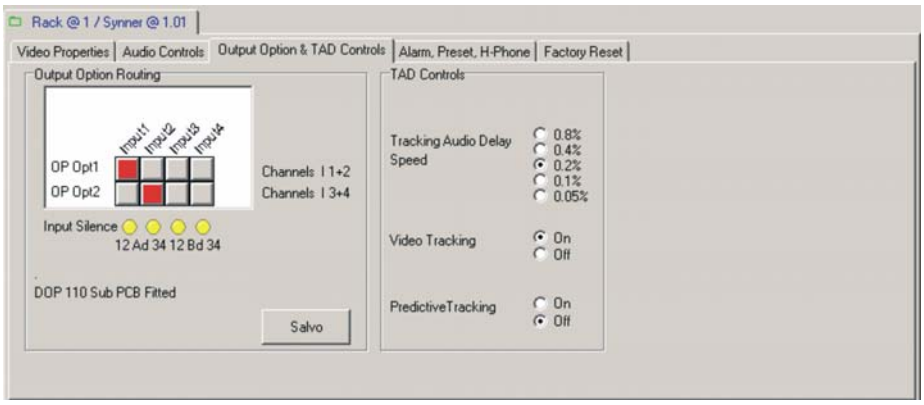
To select the desired embedding format, check either the Sony or SMPTE box.

Handling non-linear audio

Embedded data that is not linear audio, such as Dolby E, can be blocked or 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 On box is selected. To block non-linear audio data, click the Dolby E Off box.

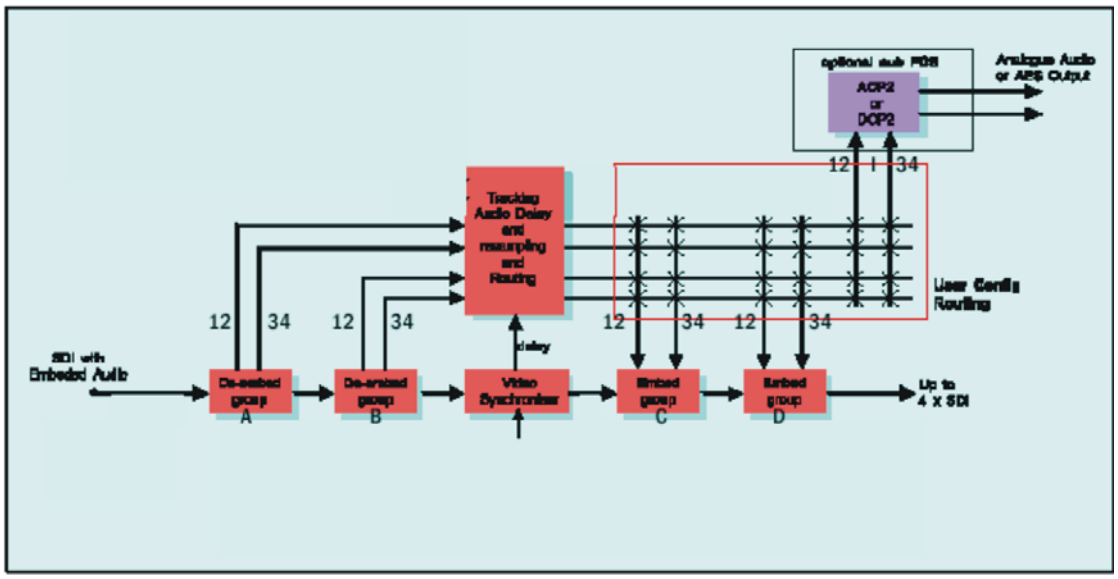
Tracking delay and O/P sub PCB router



Tracking and O/P PCB routing controls

O/P sub PCB routing selection

The two stereo pairs from the output sub PCB, if fitted, can be routed to output the delayed audio signals.



Note: The SYNNER144's internal router handles channels in stereo pairs. These are designated as 12 and 34.

A routing selection is made by clicking on the appropriate routing tile; the tile then changes colour to indicate that it has been selected. At this point no routing has been actioned. Once the selection is complete it is implemented by clicking the Salvo button.

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

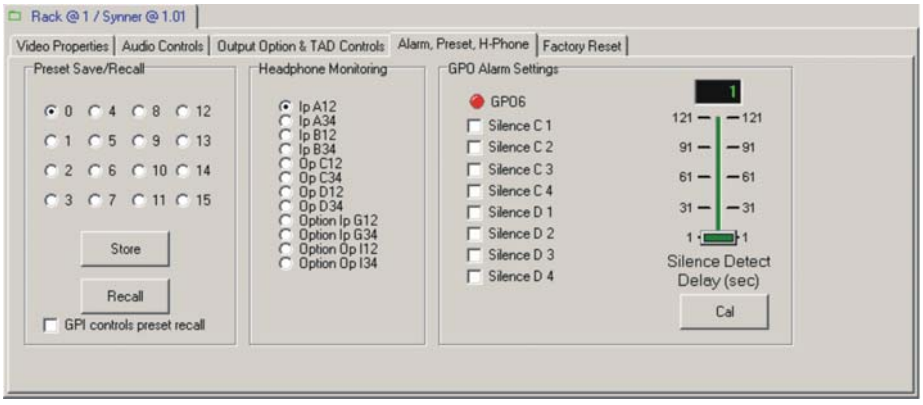
In Synchronisation Mode, the video delay control processor has to add a frame of video when an asynchronous input video lags behind the reference timing by two fields or delete a frame of video when the input overtakes the reference. All video synchronisers have to work in a similar fashion, which means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

The SYNNER144 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



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.

Note: If the selected location contains previously saved setting information it will be over-written by the new setting data.

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

The recalling of previously stored presets can also be implemented externally via the GPI port. To sanction this facility, tick the GPI controls preset recall box.

Using the headphone monitor

The card edge jack socket (3.5mm, stereo) is used to monitor the four stereo audio signals that the A & B de-embedders have extracted from the incoming SDI stream. The two stereo signals from an input sub PCB if fitted can also be monitored.

It can also be used to monitor the four delayed stereo audio signals that are to be inserted into the outgoing SDI stream by the C & D embedders. The two stereo signals routed to an output sub PCB if fitted can also be monitored.

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 remains below -50dBFS for longer than a period of time set by the Silence Detect Delay control. Any of or all eight channels can set the common alarm, GPI6.

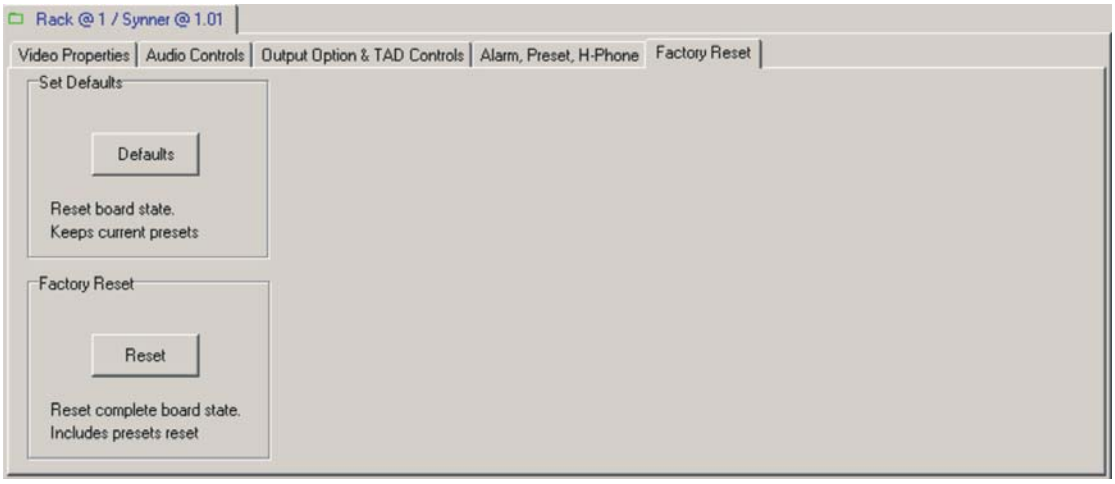
Tick the appropriate box or boxes to select which channels are required to flag an alarm when silence is detected.

Setting silence detect delay

A silence alarm will be triggered if the audio present in any one of the output channels remains below -50dBFS for longer than a period of time set by the Silence Detect Delay control. The detect delay range is variable in one second steps from a minimum of one second to a maximum of 121 seconds.

There is a ‘calibrate’ default of 33 seconds.

Recalling factory defaults



To recall factory defaults click Reset.
The following table shows the default values for each parameter affected:

Parameter	Default value
De-embedder A	Group 1
De-embedder B	Group 1
Embedder C	Group 1
Embedder D	Off
Embed pattern	SMPTE
Audio delay	4ms - minimum measured delay through board
Dolby E	Off
Headphone select	De-embedder A input Channels 1 and 2
Fail Mode	Freeze then blue
Synchronisation Mode	Synchronisation
Freeze	Off
Freeze Mode	Frame
TAD Speed	0.2
Video tracking	On
Predictive tracking	Off
Video standard	PAL
Delay in lines	0
Delay in samples	0 - minimum through board
Lock	Vertical blanking
VBI	Unblanked
Routing	Channel 1-1, 2-2, 3-3, 4-4.
Alarms	Deselected
Silence detect delay	1 second

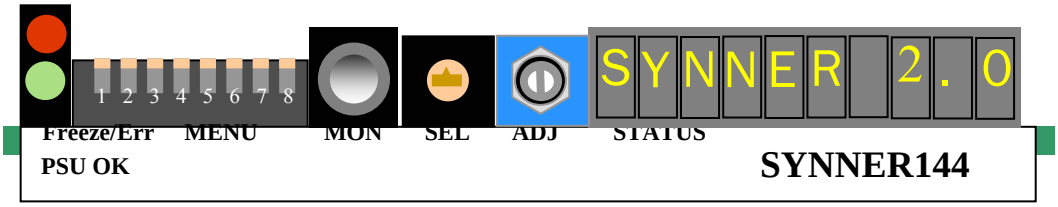
6 Trouble Shooting

6.1 Card edge monitoring

Once the start-up initialisation procedure is complete, the SYNNER144 can be controlled or configured from the card edge, from an active control panel 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.



SYNNER144 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 3.5mm 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 SYNNER144 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 SYNNER144 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 may be reset by simply removing the frame power and re-applying power after a few seconds or by removing the card from the frame then re-inserting it. It is usually safe to re-insert the card whilst the rack is powered.

7 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector
Weight	200g
Power consumption	12.5W

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 modules.
Audio in/out	**Main audio in/out (option)** One sub PCB can be added onto the main board to enable either input or output of 4 analogue audio or 2 AES serial digital audio signals. **Monitoring audio output** The monitoring output may be set to either analogue or digital. For analogue, 2 balanced line level signals are provided (left and right). For digital, 4 single ended AES outputs (limited drive capability into 75 or 110Ω).
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 20ms.
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.