SYNNER HD

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

USER MANUAL

Crystal Vision

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Revision 1.	Link position information corrected, page 11. Preset table renumbered, page 19.	21-11-07
Revision 2.	Notes on pages 29, 39 and 52 concerning output sub-PCBs amended.	04-02-08
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Revision 4.	Note regarding link positions added, page 10.	06-07-09
Revision 5.	Error LED in table pages 23 and 58 amended.	04-10-10

1 Introduction

The SYNNER HD is a High Definition video synchroniser and 24-bit audio twin analogue or digital embedder/de-embedder with tracking audio delay. It can be configured with two sub PCB option cards to provide any number of possible functions at the same time - de-embed digital audio from video, re-route and re-embed, embed external analogue or digital audio into video and de-embed output analogue or digital audio from the input video.

In addition to dual embedding and de-embedding, SYNNER HD incorporates a number of powerful features. For example, a built-in audio delay is provided to compensate for video processing, analogue monitoring can be used to preview sources and audio quality is ensured with forward error correction.

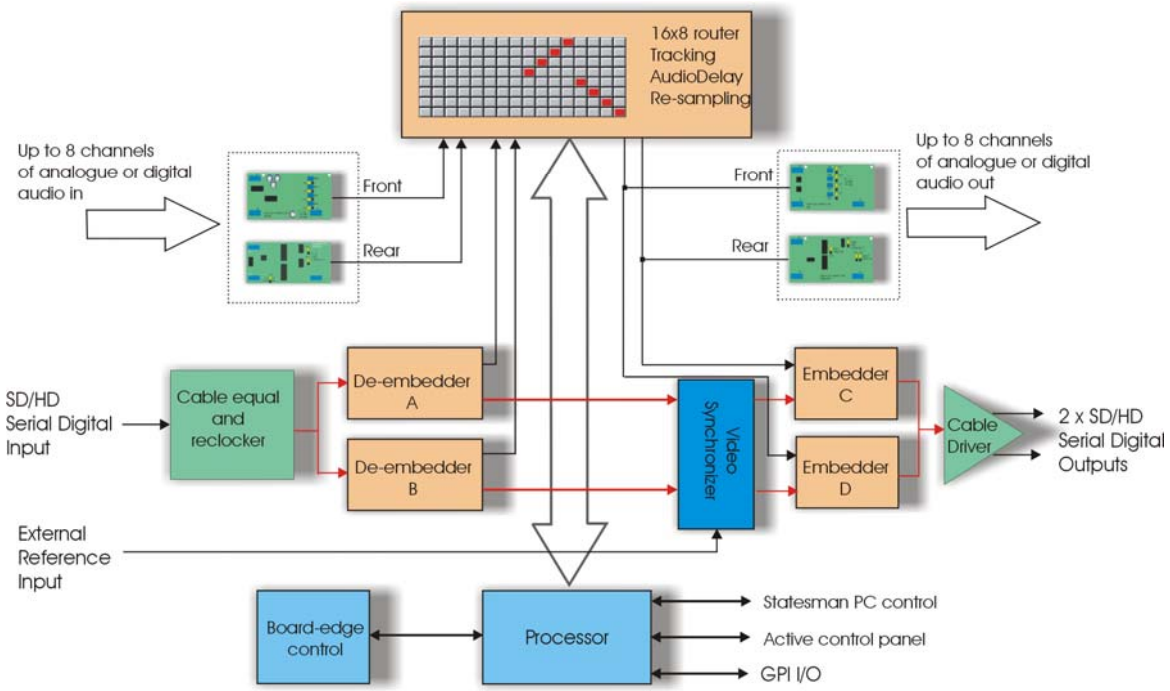
Control is available from the card edge, active control panels or by serial control from Statesman, a dedicated software application.

SYNNER HD can also handle standard definition 625 and 525 line digital video.

The main features are as follows:

- HD/SD capable
- Dual de-embedders and dual embedders
- Built-in multi-channel digital audio delay
- Full vertical and horizontal adjustment from 0 to 2 fields in any mode
- Independent Audio Gain controls
- HANC blanking option
- Audio source preview monitoring
- EDH insertion
- Audio replacement
- Channel swapping/shuffling
- Stereo to mono conversion
- Control and status monitoring via board edge or frame/remote control panel or Statesman
- Analogue and AES audio input/output sub PCBs
- Audio forward error correction protection in de-embedders – handles untimed or asynchronous SDI with minimum corruption
- GPI control of configuration set-ups

SYNNER HD has a single video signal path with two de-embedders and two embedders, which allow the extraction and insertion of up to two groups (eight channels) of audio. Additional sub-PCBs further increase the number of audio channels available for selection to re-embed to 16. EDH information is automatically inserted on its SDI output. HANC blanking is also implemented either automatically or by selection.



SYNNER HD block diagram.

Functions include audio shuffling, video delay, gain compensation and audio replace.

There are two positions available on the SYNNER HD for fitting optional sub-PCBs. The rear position 1 is associated with inputs 9-12 and outputs 1-4. The front position 2 with inputs 13-16 and outputs 5-8.

An 18-Volt regulator option card is also required when using analogue input or output cards.

The available option cards are:

- HD-DIP2-RS – 2 x AES/EBU inputs with re-sampler for asynchronous audio (30 to 108kHz), 75 Ohm, 110 Ohm, HiZ (used for most applications)
- HD-DIP2 – 2 x AES/EBU inputs for synchronous 48kHz audio, 75 Ohm, 110 Ohm, HiZ (only used when you wish to bypass the tracking audio delay)
- HD-DOP2-110 – 2 x AES/EBU outputs, 110 Ohm balanced
- HD-DOP2-75 – 2 x AES/EBU outputs, 75 Ohm unbalanced
- HD-AIP2 – Analogue dual stereo audio input
- HD-AOP2 – Analogue dual stereo audio output

Synchroniser and Delay Modes

SYNNER HD 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 frames. 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 frames.

In either mode the video delay remains fully adjustable over two whole frames. This allows the output of the SYNNER HD to be timed into any edit suite irrespective of the timing of the black and burst reference used in Synchronisation Mode.

Also in either mode the audio delay can be configured to track the video delay and provide an additional or offset delay to the video or 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 changes 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.

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

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

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

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

Predictive tracking is not available in Delay Mode.

Adjusting the audio delay

The audio delay can be controlled independently of the video delay from 0 to 20ms.

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

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

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

Standard Definition de-embed-embed pattern

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

The input format does not require setup as it is automatically detected. The embedding format is fixed to be SMPTE.

Picture Freeze

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

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

SDI loss behaviour

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

Synchroniser lock mode

With 525 line sources the re-lock is timed from the field flag to accommodate different lengths of vertical blanking. Normally when operating with 625 line sources, SYNNER HD 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.

Dolby E

SYNNER HD will embed Dolby E timed to the output video stream, when fitted with an HD-DIP2 sub PCB. This would allow either two streams of Dolby E or a mixed stream of Dolby E and AES to be embedded. An additional sub PCB will allow up to four streams to be embedded into two output groups. To facilitate the handling of Dolby E, delay is not applied and any routing must constitute a stereo pair. Failure to do so will result in corrupted signals.

Using the headphone monitor output

The card edge jack socket (3.5mm, stereo) can be used to monitor the input audio either from the de-embedder or input sub PCB if present.

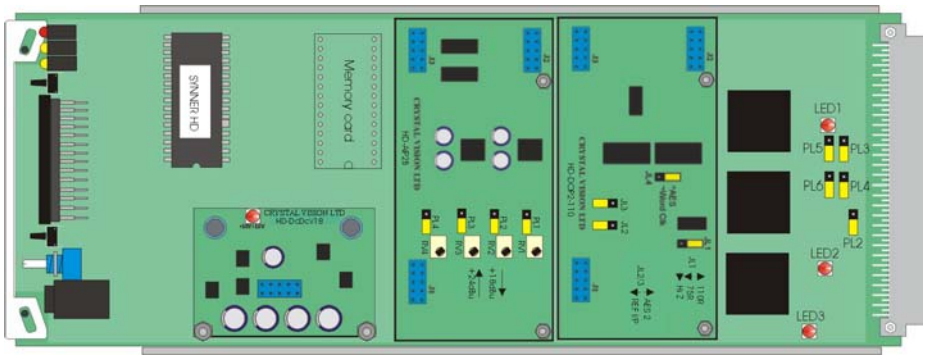
These analogue audio signals are only available through the headphone jack socket.

2 Hardware installation

The SYNNER HD single height module uses the RM33 and RM39 rear connectors that will fit into all Crystal Vision rack frames. All modules can be plugged in and removed while the frame is powered without damage.

2.1 Module configuration

The SYNNER HD has positions available for mounting 3 sub-PCBs. Two of these can be any of the six available audio PCBs. The third position is for the ±18v regulator needed when any analogue sub-PCB is fitted.



DcDcV18 Front sub PCB Rear sub PCB

SYNNER HD

Link configuration and LEDs

There are five jumper links and three surface-mounted LEDs on the SYNNER HD motherboard. The surface-mounted LEDs are not visible from the front of the frame and are included for diagnostic purposes only.

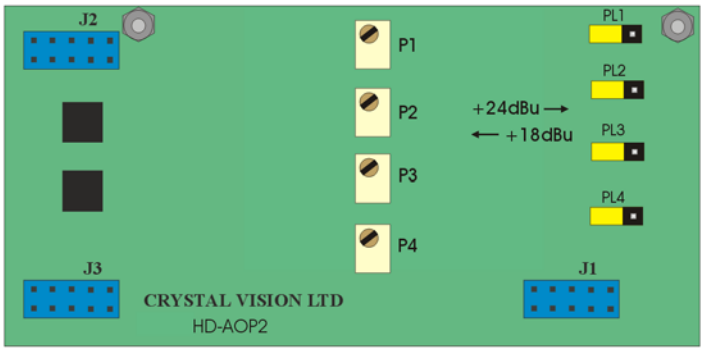
Note: Boards issue 5 and above. PL3, 4 & 5 are renumbered PL 8, 9 & 10. These links are to be left in position 2-3 (lower position) and have no user configuration.

Jumper link	Comment
PL3, PL4, PL5, PL6 (issue 4 and below)	GPI/RS422 comms. GP1 pins 2-3 (upper position). RS422 pins 1-2 (lower position). Factory set for GPI
PL2	External reference termination. Linked 75R, Unlinked HiZ
LED1	Output serialiser locked
LED2	Input deserialiser locked
LED3	Input deserialiser carrier detect

2.2 Sub-module link settings

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.

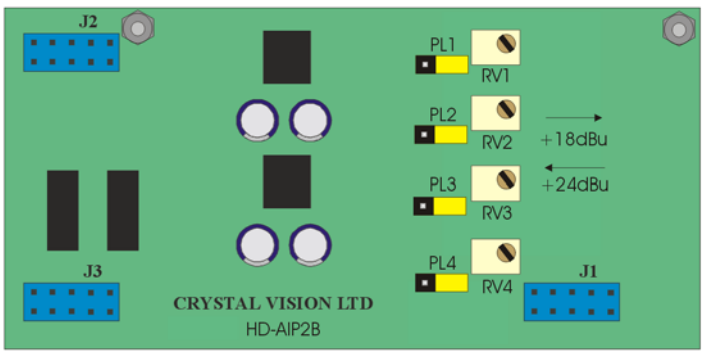


HD-AOP2

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

HD-AIP2

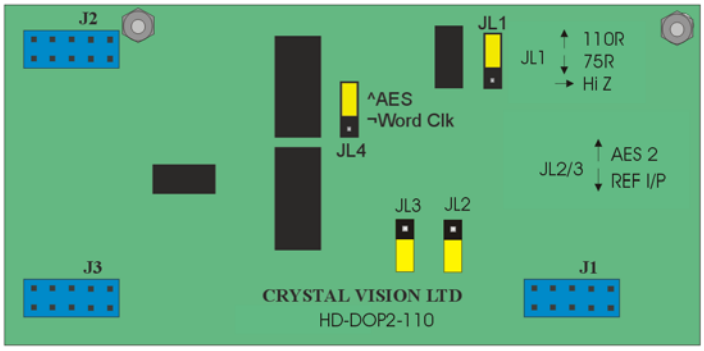
The analogue audio input module provides two stereo pairs or four mono signals that may be used as a source in subsequent embedding. Link jumpers are provided to allow 0dBFS to be set to +18dBu (rearwards, towards J1) or +24dBu (forwards, towards J2/3). The variable adjustments on the card are set at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

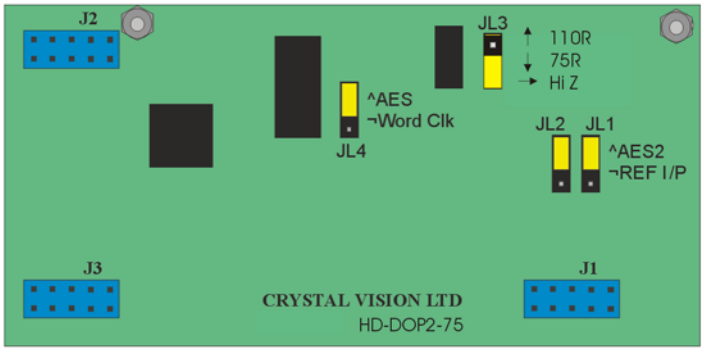


HD-DOP2-110

SYNNER HD does not support an external reference. JL2 will normally be left in its upper position so giving the second AES2 output. JL3 and JL4 have no function.

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.

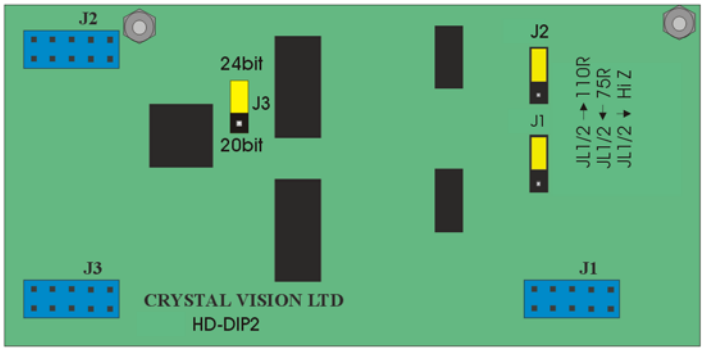


HD-DOP2-75

SYNNER HD does not support an external reference. JL2 will normally be left in its upper position so giving the second AES2 output. JL3 and JL4 have no function.

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. Connecting up to two channels of Dolby E is also possible. However, the HD-DIP2 is rarely used and only for applications avoiding the tracking audio delay.

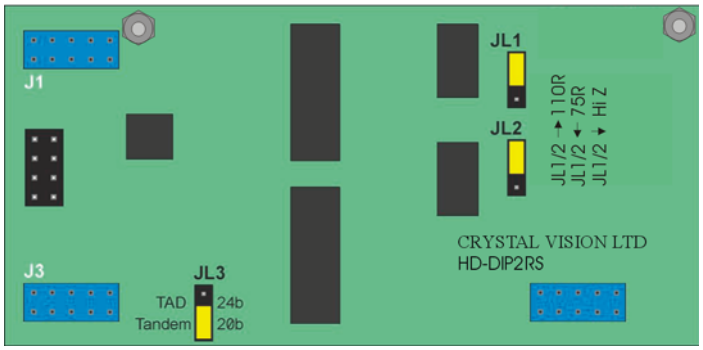


HD-DIP2

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 24-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-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 HD-DIP2-RS to the SYNNER HD 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 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, except RS4, 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). For SYNNER HD Jumper JL3 must be in the 24-bit (TAD) position.

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.

2.3 Rear modules and signal I/O

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

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

RM33 rear module connections

The RM33 being a single height module will allow maximum packing density with the maximum number of outputs available.

RM33 rear module connector	Description
	**RM33** • 24 SYNNER HD modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • 2 per Indigo DT • All frame slots can be used

BNC	I/O assignment
HD SDI OUT	Serial digital output
HD SDI OUT	Serial digital output
SYNC IN	Reference input
HD SDI IN	Serial digital input

Input sub PCBs

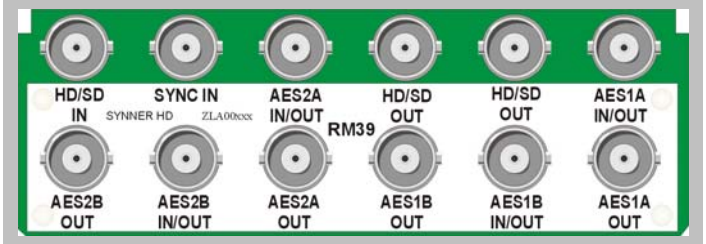
HD-AIP2		HD-DIP2		HD-DIP2-RS		Pin-out
	GND		GND		GND	1
Input 9 (Rear 1)	1L+	Input 9-10 (Rear 1-2)	AES1+	Input 9-10 (Rear 1-2)	AES1+	2
	1L-		AES1-		AES1-	3
Input 10 (Rear 2)	1R+		AES1scrn		AES1scrn	4
	1R-		NC		NC	5
Input 11 (Rear 3)	2L+	Input 11-12 (Rear 3-4)	AES2+	Input 11-12 (Rear 3-4)	AES2+	6
	2L-		AES2-		AES2-	7
Input 12 (Rear 4)	2R+		AES2scrn		AES2scrn	8
	2R-		NC		NC	18
	GND		GND		GND	9
Input 13 (Front 1)	3L+	Input 13-14 (Front 1-2)	AES3+	Input 13-14 (Front 1-2)	AES3+	14
	3L-		AES3-		AES3-	15
Input 14 (Front 2)	3R+		AES1scrn		AES3scrn	10
	3R-		NC		NC	11
Input 15 (Front 3)	4L+	Input 15-16 (Front 3-4)	AES4+	Input 15-16 (Front 3-4)	AES4+	16
	4L-		AES4-		AES4-	17
Input 16 (Front 4)	4R+		AES4scrn		AES4scrn	12
	4R-		NC		NC	13
	GND					19, 20, 23 ,24
	NC					21, 22, 25, 26

Output sub PCBs

HD-A0P2		HD-DOP2-110		HD-DOP2-75		Pin-out
GND		GND		GND		1
Output 1 (Rear 1)	1L+	Output 1-2	AES1a+	Output 1-2	AES1a	2
	1L-		AES1a-		GND	3
Output 2 (Rear 2)	1R+	Output 1-2 (duplicate)	AES1b+	Output 1-2 (duplicate)	AES1b	4
	1R-		AES1b-		GND	5
Output 3 (Rear 3)	2L+	Output 3-4	AES2a+	Output 3-4	AES2a	6
	2L-		AES2a-		GND	7
Output 4 (Rear 4)	2R+	Output 3-4 (duplicate)	AES2b+	Output 3-4 (duplicate)	AES2b	8
	2R-		AES2b-		GND	18
GND		GND		GND		9
Output 5 (Front 1)	3L+	Output 5-6	AES3a+	Output 5-6	AES3a	14
	3L-		AES3a-		GND	15
Output 6 (Front 2)	3R+	Output 5-6 (duplicate)	AES3b+	Output 5-6 (duplicate)	AES3b	10
	3R-		AES3b-		GND	11
Output 7 (Front 3)	4L+	Output 7-8	AES4a+	Output 7-8	AES4a	16
	4L-		AES4a-		GND	17
Output 8 (Front 4)	4R+	Output 7-8 (duplicate)	AES4b+	Output 7-8 (duplicate)	AES4b	12
	4R-		AES4b-		GND	13
GND						19, 20, 23, 24
NC						21, 22, 25, 26

RM39 rear module connections

The RM39 dual height rear module is designed for 75 Ohm unbalanced AES operation. As this is a dual height module two frame slots are required with the SYNNER HD fitted in the top slot position.

RM39 rear module connector	Description
	**RM39** • 12 SYNNER HD modules per Indigo 4 frame • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Only top frame slots of each pair can be used

BNC	HD-DIP2	HD-DOP2-75
AES1A IN/OUT	AES1 input 9-10 (Rear 1-2)	AES1 output 1-2 (Rear 1-2)
HD/SD OUT	HD/SD Serial digital output	HD/SD Serial digital output
HD/SD OUT	HD/SD Serial digital output	HD/SD Serial digital output
AES2A IN/OUT	AES3 input 13-14 (Front 5-6)	AES3 output 5-6 (Front 5-6)
SYNC IN	External reference input	External reference input
HD SDI IN	HD/SD Serial digital input	HD/SD Serial digital input
AES1A OUT	No user connection	AES1 output 1-2 (duplicate)
AES1B IN/OUT	AES2 input 11-12 (Rear 3-4)	AES2 output 3-4 (duplicate)
AES1B OUT	No user connection	AES2 output 3-4 (Rear 3-4)
AES2A OUT	No user connection	AES3 output 5-6 (duplicate)
AES2B IN/OUT	AES4 input 15-16 (Front 7-8)	AES4 output 7-8 (Front 7-8)
AES2B OUT	No user connection	AES4 output 7-8 (duplicate)

2.4 General Purpose Interface (GPI)

Each frame slot has up to six connections ‘a-f ‘for GPI control and monitoring. These connections are available at the rear of the frame on the 26-way D-Type Remote connectors.

GPI			Low (<1V)	High (+5V)
1	‘a’	Recall preset bit 1	See following table for user preset control	
2	‘b’	Recall preset bit 2		
3	‘c’	Recall preset bit4		
4	‘d’	Recall preset bit 8		
5	‘e’	Tracking Audio Delay pulse	Frame rate audio tracking delay pulse, TTL level	
6	‘f’	Input missing/Ref missing, video frozen, Audio Silence (selectable)	Selected Alarms asserted after set delay	No alarm

As supplied, each GPI output has a 270Ω resistor in series with its output. This allows for an external LED to be driven, connected to a DC voltage of +5V.

Each General Purpose Input (GPI) is fitted with a 6800Ω resistor connected to the internal +5V.

The 16 user preset configurations can be recalled using binary notation.

GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1
1	0	0	0	0
2	0	0	0	1
3	0	0	1	0
4	0	0	1	1
5	0	1	0	0
6	0	1	0	1
7	0	1	1	0
8	0	1	1	1
9	1	0	0	0
10	1	0	0	1
11	1	0	1	0
12	1	0	1	1
13	1	1	0	0
14	1	1	0	1
15	1	1	1	0
16	1	1	1	1

4U frame GPI connections

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

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
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)

Table shows pin number (Remote number)

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

Remote 2, Remote 4, Remote 6 and Remote 8 are 26-way high-density D-Type male plugs and frame ground is pin 6 in each case and +5V @500mA is pin 15 on Remote 2 and Remote 6.

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1 amp. Remotes 5-8 are similarly protected.

2U frame GPI connections

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

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

Table shows pin number (remote number)

Note: Remote 1 and Remote 3 are 26-way high-density D-Type female sockets. 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 in each case and +5V @500mA is pin 15 on Remote 2.

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1A.

1U frame GPI connections

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

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

Table shows pin number (remote number)

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

Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

Indigo DT desk top box GPI connections

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

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

Table shows pin number (remote number)

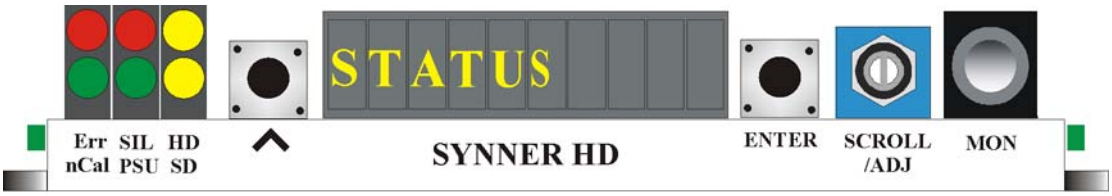
Note: Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.

Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

3 Card edge operation

3.1 Card edge controls



SYNNER HD board edge

3.2 Card edge buttons

The two tactile push button switches allow the operator to navigate within the menu structure.

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Button	Function	Normal state Up, Action Down
⌑	Up Menu	Push to jump up a menu level or cancel a selection
ENTER	Select/Action	Push to select a menu and to action and confirm a change

3.3 Card edge rotary control

The board edge rotary encoder is used to navigate through the menu categories and adjust parameter values.

Control	Function
SCROLL /ADJUST	Rotate SCROLL to identify a menu category. In combination with the ENTER button select and ADJUST to change the current level or select a further option.

Notes: The rotary control can access menus and parameter values by clockwise or anti-clockwise rotation.

3.4 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	Function when Off
HD	Yellow	Video input standard is HD (High Definition)	Input not present
SD	Yellow	Video input standard is SD (Standard Definition)	
Silent	Red	One or more flagged audio channel contains silence	All channels active or masked
PSU	Green	Good power supply (PSU) rails.	One or more of the monitor supplies is out of specification
Error	Red	No Video input present, No Ref present, store frozen	
nCal	Green	One or more Audio channel gains have been adjusted away from unity	All gains set to unity

3.5 Navigating card edge menus

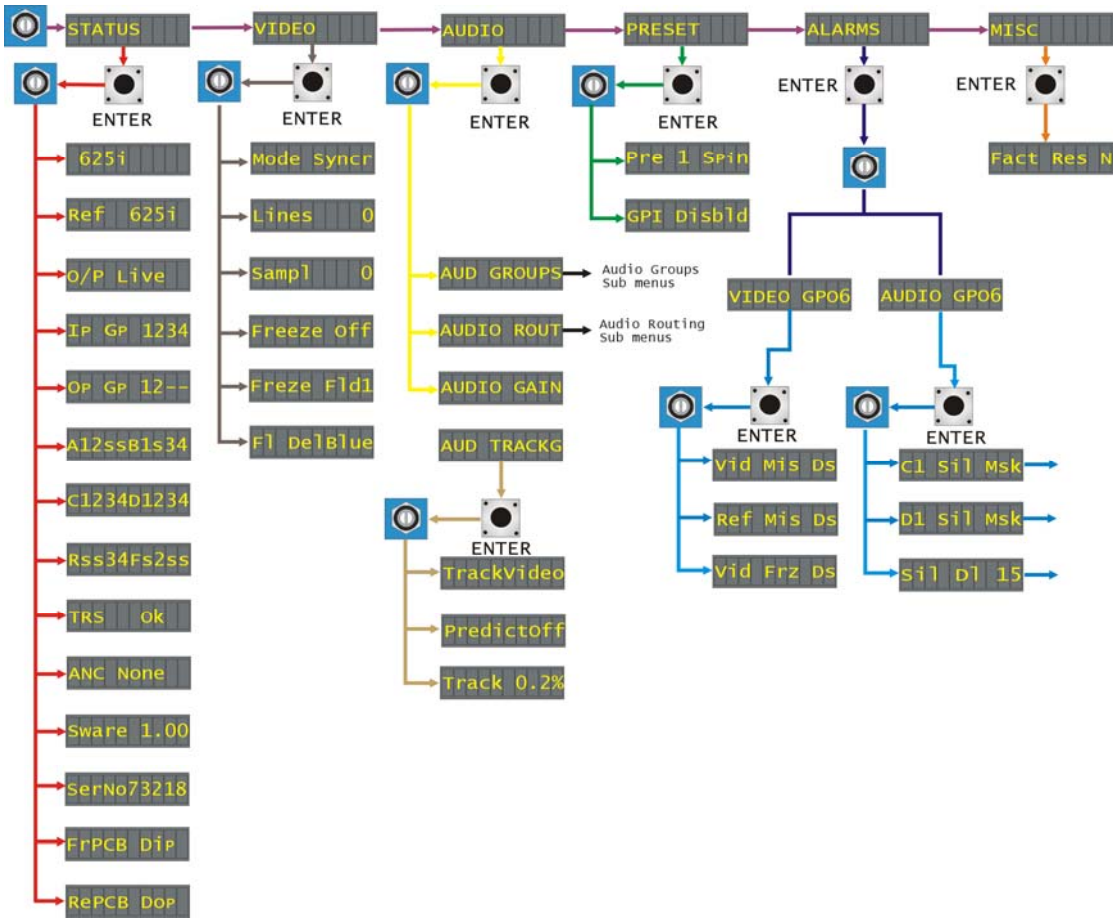
To access the card edge menu system proceed as follows:

- Press the up-arrow [⮌] until a top menu category is reached
- Rotate the SCROLL control until the desired menu category is found
- Push ENTER to enter the sub menus of that category
- Rotate SCROLL to select a sub menu
- Push ENTER to select the desired function. Selection will be indicated by the text being displayed in ***italic*** text
- Rotate ADJUST to make the desired change to the selected parameter. The display brightness will flash slowly to indicate that a change has been made and requires confirmation
- Push ENTER to action the change. The display will cease flashing
- Use the up-arrow [⮌] and SCROLL control to navigate to further menus

Note: The displayed menu brightness will flash slowly if confirmation of a change is required.

3.6 Card edge configuration

Menu tree



SYNNER HD Board edge menu structure

Tip: To reach the top menu push the ⊏ button repeatedly until a top menu is reached. Rotate the SCROLL control anti-clockwise until the STATUS menu appears.

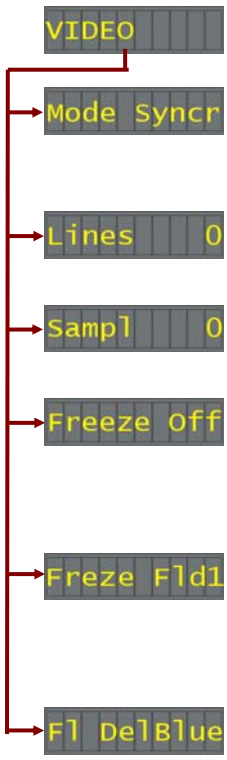
Status menu

From the STATUS top menu press ENTER then SCROLL to access the status menu options.

Menu	Comment
STATUS	
625i	Input/Output line Standard	The Input video line standard is shown. ***625, 525i, 1080i 50/59.94/60, 1035 59.94/60, 720p 50/59.94/60***
Ref 625i	Reference input status	Shows the reference input status. ***625, 525i, 1080i 50/59.94/60, 1035 59.94/60, 720p 50/59.94/60***
O/P Live	Output Video status	Shows if the video framestore is set to frozen. ***Live, Frozen***
Ip Gp 1234	Input audio groups present	Groups containing audio data present on the input video. ***1234*** groups contain audio. '-' no audio present.
Op Gp 12--	Output audio groups present	Groups containing audio data present on the output video. ***1234*** groups contain audio. '-' no audio present.
A12ssB1s34	De-embedder channel status	Channel status of the input de-embedder A and de-embedder B. ***1234*** channels active. ***s*** channel silent.
Rss34Fs2ss	Sub-PCB channel status	Channel statuses of any fitted sub PCB. ***1234*** channels active. ***s*** channel silent, *Na* not fitted
C1234D1234	Embedder channel status	Channel status of the output embedder C and embedder C. ***1234*** channels active. ***s*** channel silent.
TRS Ok	Timing reference status	Four-word composite timing reference signal is present and correct. ***Ok, Err***
ANC None	Ancillary data presence	Ancillary data present or not within the video blanking intervals. ***Presn, None.***
FrPCB Dip	Front sub-PCB type	Type of sub PCB fitted in the forward position. ***Dip, DipR, Aip, Aop, Dop7, Dop1, None.***
RePCB Dop	Rear sub-PCB type	Type of sub PCB fitted in the rear position. ***Dip, DipR, Aip, Aop, Dop7, Dop1, None.***
Sware 1.00	Software version fitted	The version number of the currently installed software.
SerNo73218	PCB serial number	The electronically stored PCB serial number. This should correspond with the serial number label affixed to the PCB connector.

Video menu

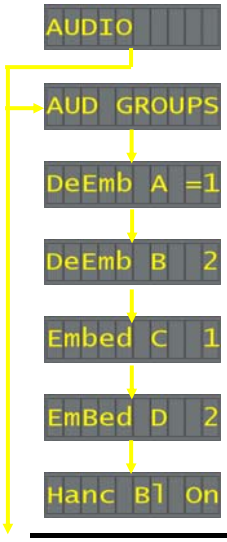
From the STATUS top menu press ENTER then SCROLL to access the video menu options.



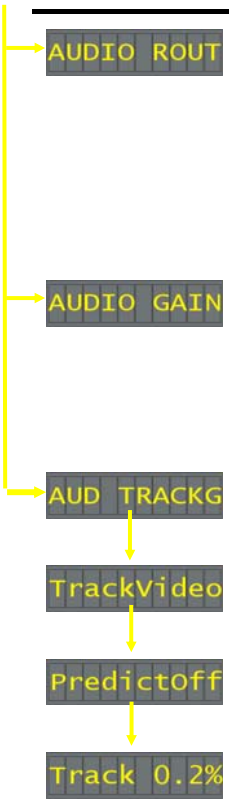
Menu	Comment
Syncro/Delay mode	Rotate the Scroll/Adj. control to show Mode selected. Press ENTER and rotate Scroll/Adj. to select. Press ENTER to select. ***Mode Syncr, Mode Delay.***
Video delay in lines	Rotate the Scroll/Adj. control to show the delay in lines menu. Press ENTER and rotate Adj. to set the delay in lines.
Video delay in samples	Groups containing audio data present on the input video. ***1234*** groups contain audio. '-' no audio present.
Output Freeze	Rotate the Scroll/Adj. control to the Output Freeze menu. Press ENTER and rotate Scroll/Adj. to select. Press ENTER to force the output to be frozen. ***Freeze Off, Freeze On***.
Output freeze selection	Rotate the Scroll/Adj. control to show freeze preference menu. Press ENTER to select and rotate Scroll/Adj. to select. Press ENTER to action. ***Freeze Fld1, Freeze Fld2, Freze Frme.***
Output on Input fail	Rotate the Scroll/Adj. control to show the Output on fail menu. Press ENTER and rotate Scroll/Adj. to select. Press ENTER to select. ***Fail Blue, Fail Black, Fl DelBlue, Fl DelBlck, Fail Frame***

Audio menu

From the Audio top menu press ENTER then SCROLL to access the audio menu options.



Menu	Comment
De-Embedder /Embedder group selection	The audio groups for de-embedding and embedding are selected here. Press ENTER to select this menu. Rotate SCROLL to find the required de-embedder/embedder. Press ENTER to select and SCROLL to select group. Hanc Blanking On/Off appears at the end of this menu. = Input group present. ***1,2,3,4 –*** none selected. **Note:** Embedders C and D cannot be made to embed to the same output group.



Channel routing for the embedders	Each channel of embedder C and D can be selected from any of the eight de-embedded channels plus four or eight audio inputs depending on fitted sub-PCBs. Delay, Mute and Mono can also be selected. **See the audio routing sub menu for further details**. **Note:** The delay time globally affects all channels selected for delay.
Embedder channel gain controls	The gain of the four channels of embedder C and D can be independently varied by ± 3.0dB. ADJUST to increment value. **Note:** If any channel gains are moved away from their cal position it will be indicated by the board edge cal LED illuminating.
Audio tracking menu	Press ENTER to access the audio tracking menus. The sub menus are reached by rotating the SCROLL control.
Video tracking	Press ENTER and rotate the SCROLL control to select video tracking on or off. ***Trackvideo, Track Off.***
Predictive tracking	Press ENTER and rotate the SCROLL control to select predictive tracking on or off. ***PredictOff, Predict On.***
Tracking audio delay speed	Press ENTER and rotate the SCROLL control to set the delay speed. ***0.8%, 0.4%, 0.2%, 0.1%, 0.05%***

Enabling video tracking

When video tracking is enabled the audio delay can be made to match the video delay and so maintain lip sync.

Note: Any HD-DIP2 sub PCB fitted will ignore any delay to prevent the corruption of any Dolby E signals present.

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.

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

Selecting the tracking audio delay speed

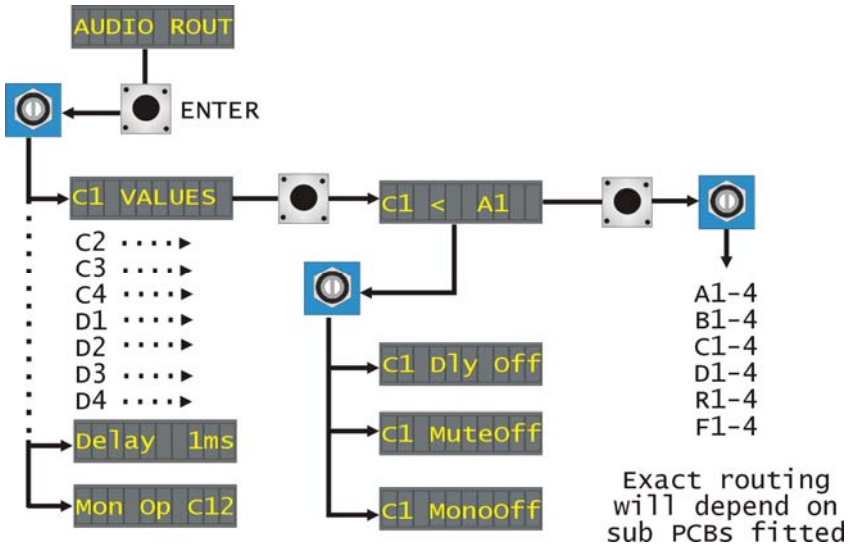
This sets the time the audio delay takes to track fast or abrupt changes in video delay, when video tracking is on.

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.

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

Audio routing sub menus

The audio routing menus are where the SYNNER HD's 16x8 routing matrix is configured.



Audio routing sub menu

16x8 routing matrix

At the heart of SYNNER HD is the sixteen input, eight output routing matrix. This will allow any of the sixteen possible inputs, eight embedded channels and up to eight analogue or digital audio inputs to be routed to any of the eight outputs for embedding or via output sub-PCBs. The final configuration will depend on the number and type of sub-PCBs fitted.

Note: Front and Rear describes the position of the sub-PCB when fitted to the SYNNER HD. Front is nearest the board edge controls and extractor handle. Rear is nearest the board connector.

Note: If an output sub-PCB is fitted to the front position its output will always follow Embedder D routing. Similarly a rear fitted output sub-PCB will always follow Embedder C routing.

Stereo to Mono conversion

For the purposes of this discussion it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair, etc.

The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of selecting will cause that channel to output the mono sum of itself and its associated channel. The associated channel output will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

Example: Selecting channel 1 for mono conversion will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly deselecting channel 1 and selecting channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Delay control

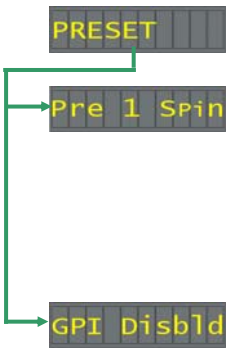
This control can be used to delay the audio with respect to the video by up to 20ms and compensate for any small delay between the incoming video and audio signals. The delay is applied at the output of the 16x8 router and is a single global control. The delay can be added individually to any output channel.

Individual channels can also be selected to mute.

Preset menu

Up to sixteen set ups may be stored for the board and recalled either from the board control, active front panel, Statesman or through the use of external GPIs. Presets store board setup data including operating mode and option card status. If at any time a sub-PCB is changed for a different type, i.e. from an input type to output type, any previously saved preset configurations will become invalid. The presets are numbered 1-16.

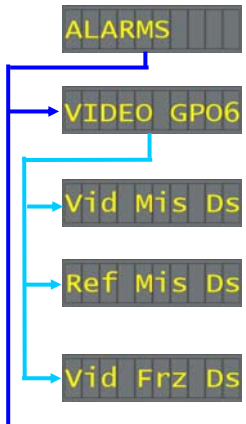
Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.



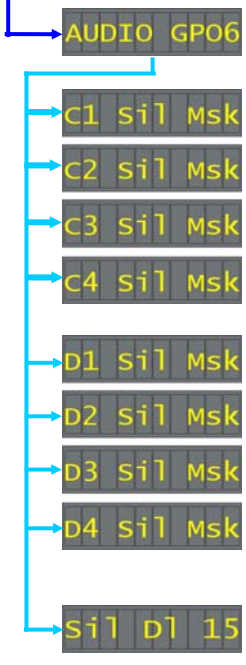
Menu	Comment
Save and recall Presets 1-16	To save a user configuration from the board edge. Press ENTER to select the preset menu. Rotate SCROLL to find the required preset location. Press ENTER to access the location and SCROLL to select save or recall. Press ENTER to action.
Enable GPI control of presets	Rotate SCROLL to select Enable Selecting Enable allows the recall of previously saved user configurations via GPI inputs 0-3.

Alarm menu

The alarm menu allows the user to customise the alarm reporting from the SYNNER HD to suit their individual needs. SYNNER HD has one alarm output, GPO6. This GPI output in its non-alarm condition is held to the internal +5V via a 6800Ohm resistor. An alarm condition will force the GPI output to less than 0.5V of frame 0V through a 270Ohm resistor. This makes the GPI outputs capable of driving an external LED or logic circuit as required. For ease the configurable alarms have been divided into two groups: the video alarms appear on GPO5 and the audio alarms on GPO6. The alarm option menus then allow the user to configure the alarm reporting by either flagging or masking individual alarms.



Menu	Comment
Video Alarms	Press ENTER to access the video alarms menu. SCROLL to view sub menus.
Video missing	Press ENTER to access menu. Rotate ADJUST to enable or disable reporting. Press ENTER to action command. ***Ds*** disable, ***En*** enable
Reference missing	
Output video set to freeze	



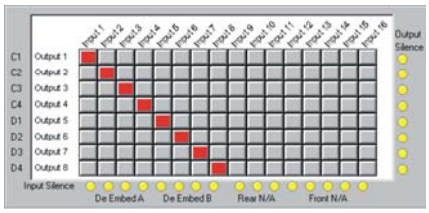
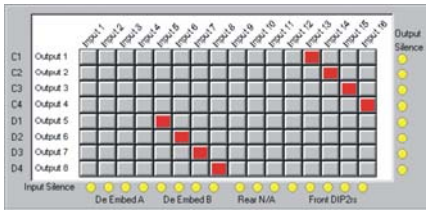
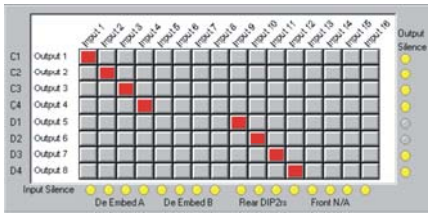
Menu	Comment
Embedder C silence detect	Each output channel can be monitored independently. Rotate SCROLL to find the channel silence alarm to be configured. Press ENTER to access the selected channel. Rotate ADJUST to flag or mask reporting. Press ENTER to action command. ***Msk*** disable, ***Flg*** enable
Embedder D silence detect	Rotate SCROLL to find the channel silence alarm to be configured. Press ENTER to access the selected channel. Rotate ADJUST to flag or mask reporting. Press ENTER to action command. ***Msk*** disable, ***Flg*** enable
Silence Delay	The delay before a silence alarm is reported can be varied from 1-120 seconds. **Note**: this is a global control and will similarly affect all flagged channel silence alarms.

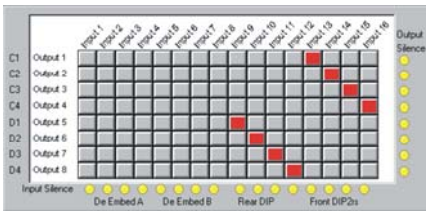
Miscellaneous menu (Factory Reset)

At present, the only control available in the miscellaneous menu is the Factory Reset. This control can be used to return the SYNNER HD to its default condition. Note the default conditions will be dependent on any sub-PCBs fitted.

	Menu	Comment
MISC		
Fact Res N	Factory Reset	Press ENTER to access factory-reset menu. SCROLL to select yes (Y). Press ENTER to assert.

The following table is a list of the possible defaults The following table

Parameter	Default value
De-embedder A	Group 1
De-embedder B	Group 2
Embedder C	Group 1
Embedder D	Group 2
HANC blank	Set to Auto
No or Output Sub-PCBs fitted **(Statesman representation)**	
Input Sub-PCB in the front position **No or Output Sub-PCB fitted in the rear position** **(Statesman representation)**	
Input Sub-PCB in the rear position. **No or Output Sub-PCB fitted in the front position** **(Statesman representation)**	

Input Sub-PCBs fitted in both front and rear positions **(Statesman representation)**	
Delay, Mono, Mute	Unchecked
Audio Delay	Zero
Audio Gains	Unity
Mode	Synchronise
Output on fail	Delay then Blue
Output Freeze	Off
Output on freeze	Field 1
Video Delay	0 lines, 2 samples
Selected Preset	Unchanged, contents of all saved presets are erased
GPI controls preset recall	Unchanged
Headphone monitoring	C1 and C2
GPO6	Unchecked
Silence Alarm delay	Zero delay

4 Using the front control panel

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 set up 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 the SYNNER HD

To select a particular card in a frame, press the DEVICE key to go to the Device menu.
Note: there may be a delay whilst the frame is interrogated during which time the 'No cards Found' could be displayed.

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 SYNNER HD has been selected.

The SYNNER HD 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 changes occur through the use of card edge controls or other remote control, the text displayed on the active front panel will not be updated immediately. If necessary, use the upward arrow to leave and then re-enter a menu to update the display.

The SYNNER HD active panel 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. Active function keys are indicated by illuminated, integrated LEDs.

The main top-level menus for the SYNNER HD are obtained by pressing the F1- F4 keys from the Home menu. Menu keys are illuminated when active and when further menus are available. The top-level menus are:

Status – Press F1 (Input/Ref Std, Input/Output groups present, Audio channels present, TRS status, sub PCBs fitted and board software and serial number)

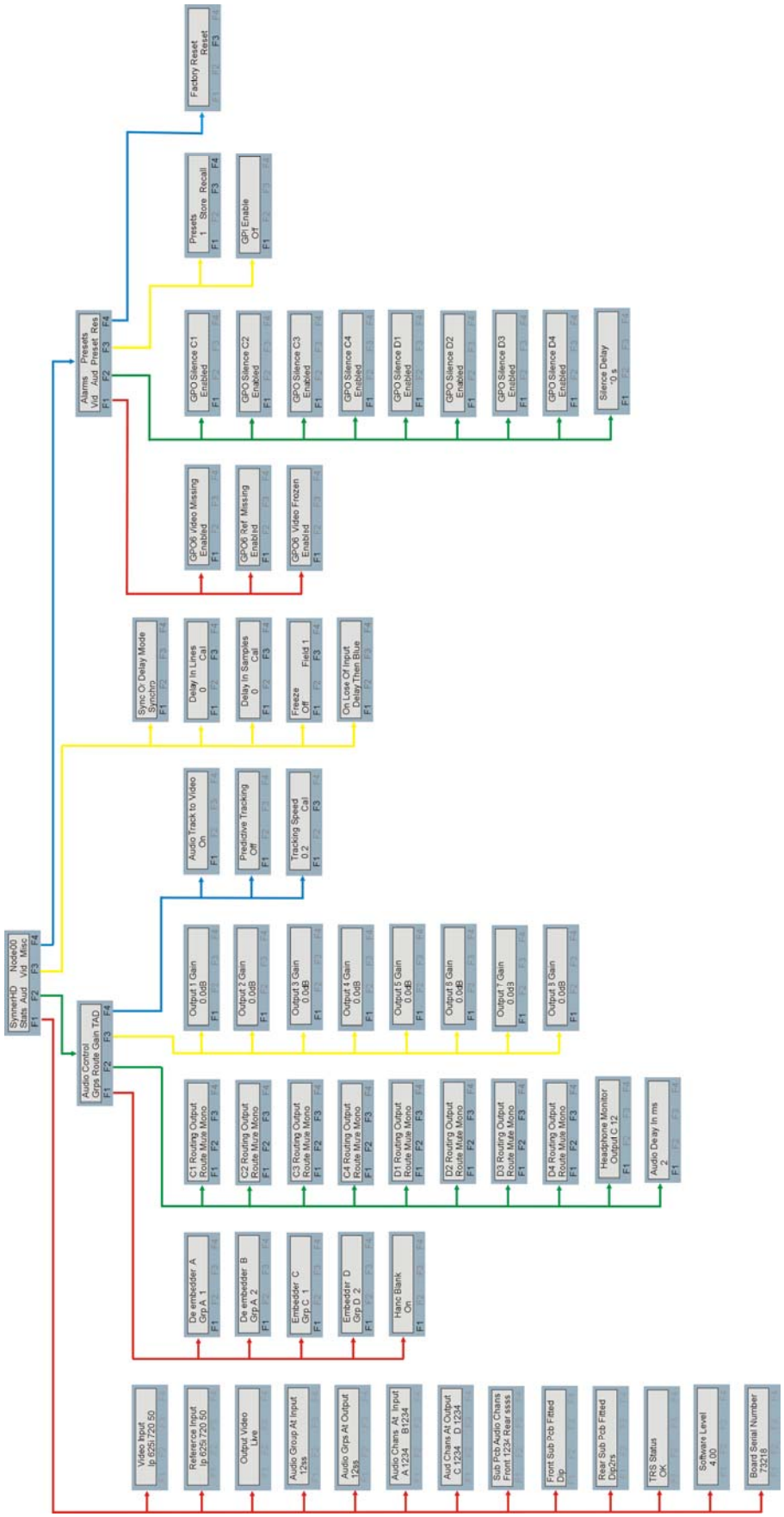
Audio controls – Press F2 (De-embedder/Embedder config, Audio channel routing, Audio output gains, TAD settings, Headphone monitoring router and audio delay)

Video – Press F3 (Mode, Video delay, freeze settings)

Misc - Press F4 (GPO config, channel silence etc, User preset save/recall, factory reset)

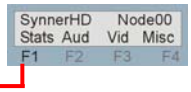
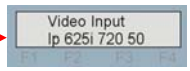
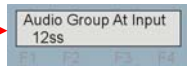
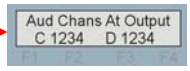
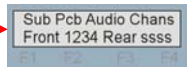
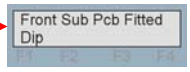
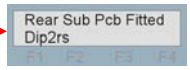
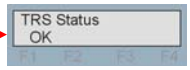
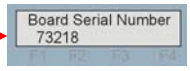
When a sub menu has been selected, further options may be obtained by using the shaft control to scroll through them. Once the desired option has been located a selection or value change can be made by either toggling the appropriate function key or by selecting and using the shaft control to alter a 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 SYNNER HD menus. The actual menus available may vary slightly as software is updated.


Factory Reset
Reset
Presets
1 Store Recall
GPI Enable
Off
Alarms Presets
Vid Aud Preset Res
GPO Silence C1
Enabled
GPO Silence C2
Enabled
GPO Silence C3
Enabled
GPO Silence C4
Enabled
GPO Silence D1
Enabled
GPO Silence D2
Enabled
GPO Silence D3
Enabled
GPO Silence D4
Enabled
Silence Delay
0 s
GPO6 Video Missing
Enabled
GPO6 Ref Missing
Enabled
GPO6 Video Frozen
Enabled
Sync O Delay Mode
Synchro
Delay In Lines
0 Cal
Delay In Samples
0 Cal
Freeze
Off Field 1
On Loss Of Input
Delay Then Blue
Audio Track to Video
On
Predictive Tracking
Off
Tracking Speed
0.2 Cal
SynnerHD Node00
Stats Aud Vid Misc
Audio Control
Grps Route Gain TAD
Output 1 Gain
0.0dB
Output 2 Gain
0.0dB
Output 3 Gain
0.0dB
Output 4 Gain
0.0dB
Output 5 Gain
0.0dB
Output 6 Gain
0.0dB
Output 7 Gain
0.0d3
Output 8 Gain
0.0dB
C1 Routing Output
Route Mute Mono
C2 Routing Output
Route Mute Mono
C3 Routing Output
Route Mute Mono
C4 Routing Output
Route Mute Mono
D1 Routing Output
Route Mute Mono
D2 Routing Output
Route Mute Mono
D3 Routing Output
Route Mute Mono
D4 Routing Output
Route Mute Mono
Headphone Monitor
Output C 12
Audio Delay In ms
2
De embedder A
Grp A 1
De embedder B
Grp A 2
Embedder C
Grp C 1
Embedder D
Grp D 2
Hanc Blank
On
Video Input
Ip 625i 720 50
Reference Input
Ip 625i 720 50
Output Video
Live
Audio Group A Input
12ss
Audio Grps A Output
12ss
Audio Chans At Input
A 1234 B 1234
Aud Chans At Output
C 1234 D 1234
Sub Pcb Audio Chans
Front 1234 Rear ssss
Front Sub Pcb Fitted
Dip
Rear Sub Pcb Fitted
Dip2ts
TRS Status
OK
Software Level
4.00
Board Serial Number
73218

4.2 Board status

From the STATUS top menu press F1 then SCROLL to access the status menu options.

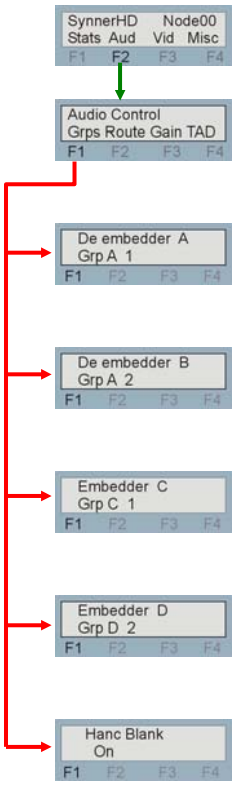
	Menu	Comment
		
	Input/Output line Standard	The Input video line standard is shown. ***625i, 525i, 1080i 50/59.94/60, 1035 59.94/60, 720p 50/59.94/60***
	Reference Input	The reference input and line rate. ***625i, 525i, ,Reference Missing***
	Output video status	Shows if the video framestore is set to frozen. ***Live, Frozen***
	Input audio groups present	Groups containing audio data present on the input video. ***1234*** groups contain audio. '***s***' no audio present.
	Output audio groups present	Groups containing audio data present on the output video. ***1234*** groups contain audio. '***s***' no audio present.
	De-embedder channel status	Channel status of the input de-embedder A and de-embedder B. ***1234*** channels active. '***s***' channel silent.
	Embedder channel status	Channel status of the output embedder C and embedder C. ***1234*** channels active. '***s***' channel silent.
	Sub-PCB channel status	Channel statuses of any fitted sub-PCB. ***1234*** channels active. '***s***' channel silent, ***Na*** not fitted
	Front sub-PCB type	Type of sub PCB fitted in the forward position. ***Dip, DipR, Aip, Aop, Dop7, Dop1, None***
	Rear sub-PCB type	Type of sub PCB fitted in the rear position. ***Dip, DipR, Aip, Aop, Dop7, Dop1, None***
	Timing reference status	Four-word Composite timing reference signal is present and correct. ***Ok, Err***
	Software version	The software version currently fitted.
	PCB serial number	The electronically stored PCB serial number. This should correspond with the serial number label affixed to the PCB connector.

Audio menu

From the Home menu press F2 to enter the Audio Control menu. F1-4 selects further options.

Groups

This menu gives control of both the de-embedder and embedder configurations.



Menu	Comment
De-embedder / Embedder group selection	The audio groups for de-embedding and embedding are selected here. Press F1 to select this menu. Rotate SCROLL to find the required de-embedder/embedder. Press F1 to select.
De-embedder A group selection	To select a group to de-embed from the incoming video, press F1 and rotate SCROLL. ***1, 2, 3, 4 or - none***
De-embedder B group selection	To select a group to de-embed from the incoming video, press F1 and rotate SCROLL. ***1, 2, 3, 4 or - none***
Embedder C group selection	To select a group to embed to in the outgoing video, press F1 and rotate SCROLL. ***1, 2, 3, 4 or - none*** = denotes a current selected group
Embedder D group selection	To select a group to de-embed from the incoming video, press F1 and rotate SCROLL. ***1, 2, 3, 4 or - none*** = denotes a current selected group
HANC blanking control	Setting the HANC control to ON will cause automatic blanking of the HANC space before embedding

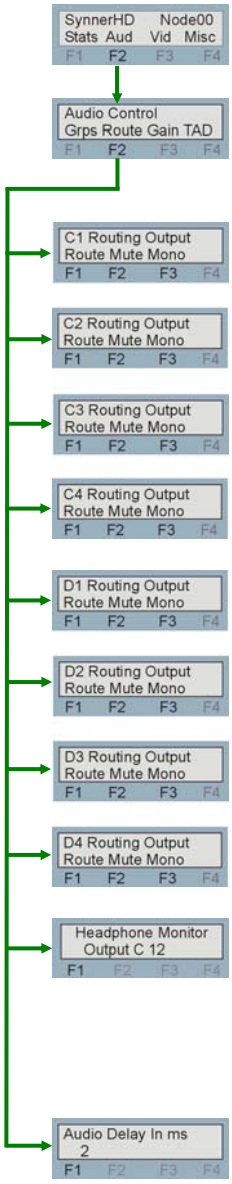
Note: Embedders C and D cannot be made to embed to the same output group.

Audio Routing, monitoring and delay

At the heart of SYNNER HD is the sixteen input, eight output routing matrix. This will allow any of the sixteen possible inputs, eight embedded channels and up to eight analogue or digital audio inputs to be routed to any of the eight outputs for embedding or via output sub-PCBs. The final configuration will depend on the number and type of sub PCBs fitted.

Note: Front and Rear describes the position of the sub-PCB when fitted to the SYNNER HD. The front position is nearest to the board edge controls and extraction handle and the rear position is nearest to the board connector.

Note: If an output sub-PCB is fitted to the front position its output will always follow Embedder D routing. Similarly a rear fitted output sub-PCB will always follow Embedder C routing.



Menu	Comment
Audio routing to output embedders	The audio channel routing for embedding onto the output video is selected here. Press F2 to select this menu. Rotate SCROLL to find the embedder channel to be routed. F1-4 give further options.
Embedder C channel selection	Press F1 to set routing. SCROLL to select. ***A1-4, B1-4, R1-4, F1-4 > C1 etc.*** Press F2 to select Audio delay. SCROLL to select. ***On, Off.*** Press F3 to select Mute. SCROLL to select. ***On, Off.*** Press F4 to select Mono conversion. SCROLL to select. ***On, Off.***
Embedder D channel selection	Press F1 to set routing. SCROLL to select. ***A1-4, B1-4, R1-4, F1-4 > D1 etc.*** Press F2 to select Audio delay. SCROLL to select. ***On, Off.*** Press F3 to select Mute. SCROLL to select. ***On, Off.*** Press F4 to select Mono conversion. SCROLL to select. ***On, Off.***
Card edge stereo headphone routing	The monitoring outputs for the board edge headphone socket are selected in stereo pairs. ***A12, A34, B12, B34, R12, R34, F12, F34, C12, C34, D12 & D34*** Note: If output sub-PCBs are fitted B-F will copy C-D**.**
Audio Delay	This control can be used to delay the audio with respect to the video by up to 20ms and compensate for any small delay between the incoming video and audio signals. The delay is applied at the output of the 16x8 router and is a single global control. ***0-20ms.***

Headphone monitoring

A powerful 12-source stereo monitoring bus provides audio monitoring at the card edge headphone socket.

Note: Odd channel numbers will appear in the left headphone with the corresponding even channels appearing in the right.

F (front) and R (rear) indicate a sub-PCB and its location when fitted to the SYNNER HD motherboard.

Stereo to mono conversion

For the purposes of this discussion it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair etc.

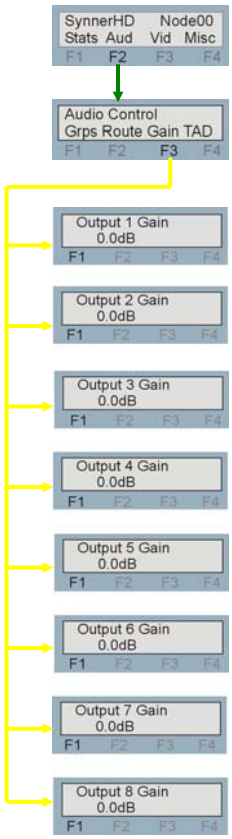
The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of selecting will cause that channel to output the mono sum of itself and its associated channel. The associated channel output will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

Example: Selecting channel 1 for mono conversion will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly deselecting channel 1 and selecting channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Output channel gain adjustment

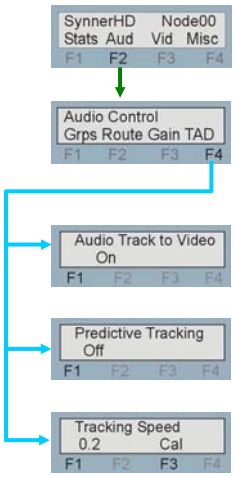
The eight audio channels from the router can have their gains varied by ± 3dB from unity gain. This allows the user a certain amount of adjustment to compensate for variations between channels.



Menu	Comment
Output channel gains	Press F3 to enter the Gain menu. SCROLL to select output channel gain.
	Press F1 to select and SCROLL to adjust Outputs 1-8.

Tracking audio delay

The delay between the video output and output audio can be minimised by enabling the onboard tracking audio delay. The tracking audio delay menu (TAD) is reach via the Audio menu - F2 Home then F4.

	Menu	Comment
	Tracking audio delay (TAD) menu	Press F4 to enter the tracking audio delay menu. Rotate SCROLL to select.
	Enable video tracking	Press F1 to select and rotate SCROLL to enable or disable audio tracking. ***On, Off***
	Enable predictive tracking	Press F1 to select and rotate SCROLL to enable or disable predictive tracking. ***On, Off***
	Tracking speed	Press F1 and rotate the rotate SCROLL control to set the delay speed. ***0.8%, 0.4%, 0.2%, 0.1%, 0.05%*** Press F3 at any time to return to the default value (0.2%)

Video tracking enabled

When video tracking is enabled the audio delay can be made to match the video delay and so maintain lip sync.

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.

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

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.

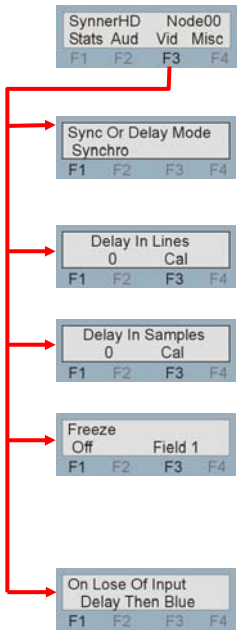
The faster the rate of change, the quicker the audio delay will match changes in video delay so minimising lip sync errors, but at the expense of a matching change of musical pitch.

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

Note: Any HD-DIP2 sub PCB fitted will ignore all delay settings.

Video Menu

The Video menu is where the synchroniser and delay mode controls can be found. Press F3 from the Home menu then rotate SCROLL to access mode, video delay and freeze options.



Menu	Comment
Mode	Press F1 to select and rotate SCROLL to select synchroniser or delay mode of operation. Press ENTER to select. ***Synchro, Delay***
Output Delay in Lines	Press F1 to select and rotate SCROLL to select the video delay in whole lines. Press ENTER to accept selection. Press Cal to zero.
Output Delay in Samples	Press F1 to select and rotate SCROLL to select the video delay in samples. Press ENTER to accept selection. Press Cal to zero.
Freeze options	Press F1 to select and rotate SCROLL to set output video to frozen. ***On, Off*** Press F3 to select and rotate SCROLL to select freeze mode. Press ENTER to fix selection. ***Field 1, Field 2, Frame***
On Lose of Input options	Press F1 to select and rotate SCROLL to select lose of input reaction. Press ENTER to fix selection. ***Blue, Black, Delay then Blue, Delay then Black, Freeze***

Note: The video delay is adjustable in lines and sample up to a maximum delay of two fields. The number of lines and samples will depend upon the input standard.

Miscellaneous menu

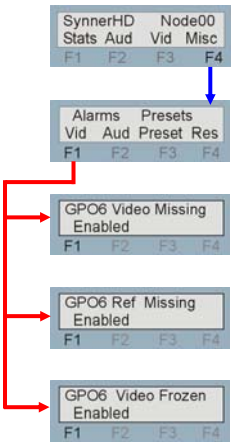
The Miscellaneous menu contains the alarms and user configured presets. Factory reset is also found here. For ease of navigation this menu is subdivided into four sub menus.

Video and silence alarms

These two sub menus allow the user to customise the alarm reporting from the SYNNER HD to suit their individual needs. SYNNER HD has a single alarm output GPO6. This GPI output in its non-alarm condition is held to the internal +5V via a 6800Ohm resistor. An alarm condition will force the GPI output to less than 0.5V through a series 270Ohm resistor. This makes the GPI outputs capable of driving an external LED or logic circuit as required.

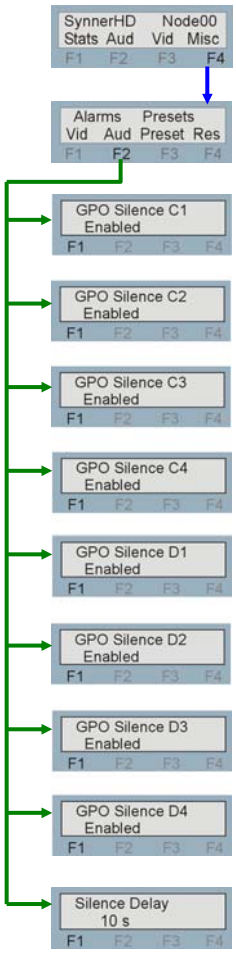
Alarm reporting is configured by either flagging or masking individual alarms. A time delay before reporting a silence detection is also set here. The silence detect delay control is global to all silence detectors.

Video alarms



Menu	Comment
Misc menu (video alarm)	From the Home menu press F4 to access the Misc menu. Press F1 to select the Video Alarms (GPO6) menu.
Input video missing	Press F1 to activate. SCROLL to enable or disable and press ENTER to accept.
Ext reference missing	Press F1 to activate. SCROLL to enable or disable and press ENTER to accept.
Output video frozen	Press F1 to activate. SCROLL to enable or disable and press ENTER to accept.

Silence alarms

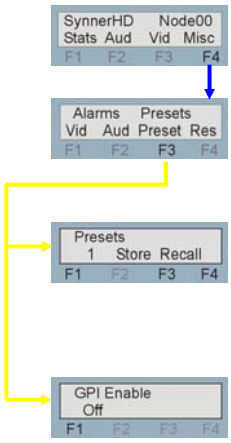


Menu	Comment
Misc menu	From the Home menu press F4 to access the Misc menu. Press F2 to select the GPO6 (Audio Alarms) menu.
Output channel silence detect (Embedders C & D)	Rotate SCROLL to find the channel silence alarm to be configured. Press F1 to activate. SCROLL to enable or disable and press ENTER to accept.
Silence Delay	The delay before a silence alarm is reported can be varied from 1-120 seconds. Note this is a global control.

Preset menu

Up to sixteen set ups may be stored for the board and recalled either from the board control, active front panel, Statesman or through the use of external GPIs. Presets store board set up data including operating mode and option card status. If at any time a sub-PCB is changed for a different type, i.e. from an input type to output type, any previously saved preset configurations will become invalid. The presets are numbered 1-16.

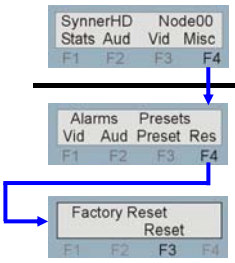
Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.



Menu	Comment
Presets (User stored configurations)	From the Home menu press F4 to access the Misc menu. Press F3 to access the Presets menu.
Save and recall Presets 1-16	To save a user configuration from the active control panel. Press F1 and rotate SCROLL to find the required preset location. Press F3 the save the current board set up. Press F4 to recall a previously save board set up.
Enable GPI control of presets	Selecting Enable allows the recall of previously saved user configurations via GPI inputs 0-3. To enable GPI control press F1 to toggle between On and Off. Press ENTER to select.

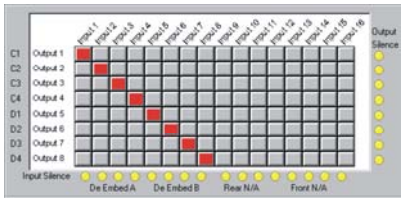
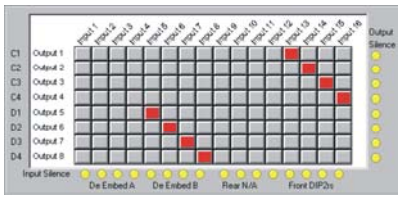
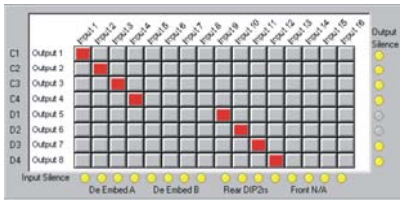
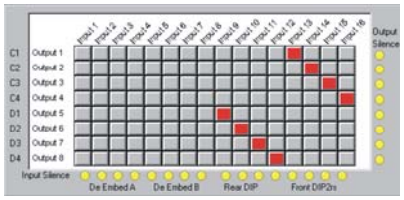
Factory Reset

The factory reset can be used to return the SYNNER HD to it default condition. It should be noted that if a factory reset is carried out the final routing will depend on any sub-PCBs fitted and all preset configurations will be erased.



Menu	Comment
Misc menu	From the Home menu press F4 to access the Misc menu. Press F4 to select the factory reset menu.
Factory Reset	Press F3 to reset. The display will acknowledge that a factory reset has been completed.

The following table is a list of the possible defaults.

Parameter	Default value
De-embedder A	Group 1
De-embedder B	Group 2
Embedder C	Group 1
Embedder D	Group 2
HANC blank	Set to Auto
No Sub-PCB or Output Sub-PCBs fitted **(Statesman representation)**	
Input Sub-PCB in the front position **No Sub-PCB or Output Sub-PCB fitted in the rear position** **(Statesman representation)**	
Input Sub-PCB in the rear position. **No Sub-PCB or Output Sub-PCB fitted in the front position** **(Statesman representation)**	
Input Sub-PCBs fitted in both front and rear positions **(Statesman representation)**	
Delay, Mono, Mute	Unchecked
Audio Delay	Zero
Audio Gains	Unity
Mode	Synchronise
Output on fail	Delay then Blue
Output Freeze	Off
Output on freeze	Field 1
Video Delay	0 lines, 2 samples
Selected Preset	Unchanged, contents of all saved presets are erased
GPI controls preset recall	Unchanged
Headphone monitoring	C1 and C2
GPO6	Unchecked
Silence Alarm delay	Zero delay

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. Statesman provides a user friendly means of configuring and operating the SYNNER HD with the benefit of see-at-a-glance status monitoring.

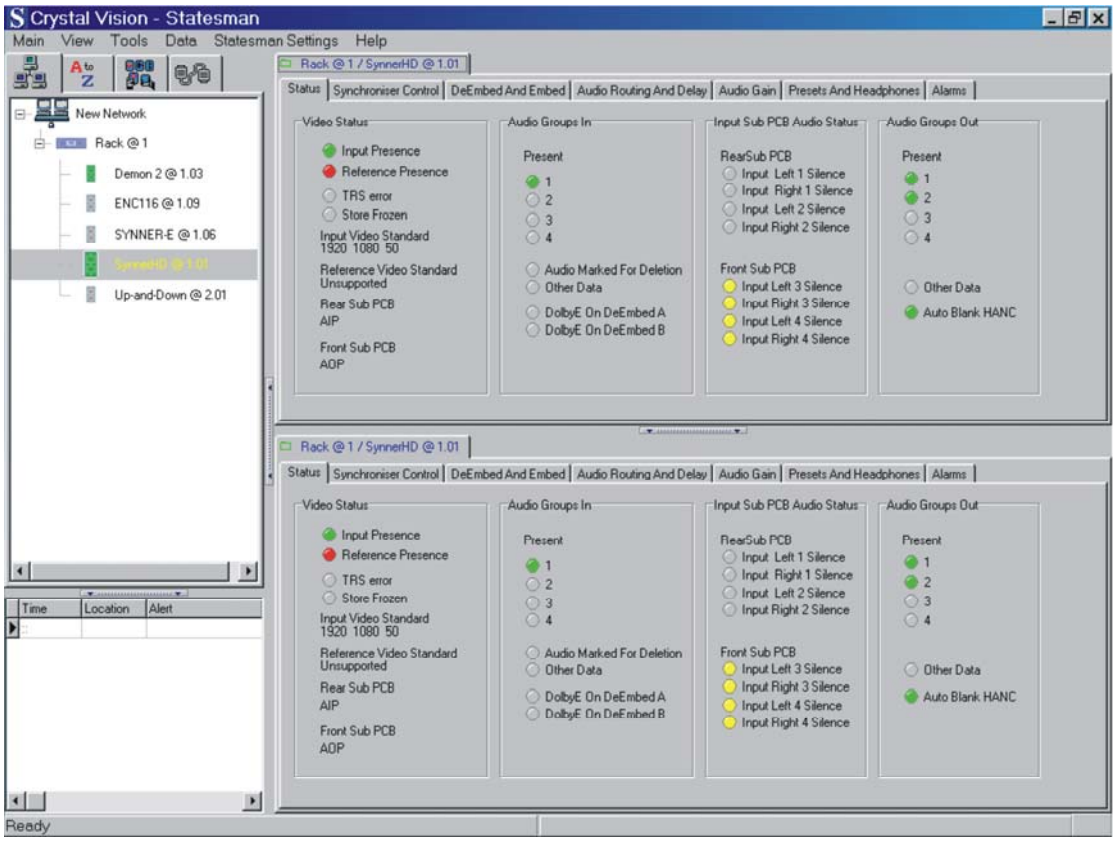
The main Statesman application communicates with each module in a frame through an active front panel. A frame or frame pair must have an active panel fitted to allow for Statesman control.

For details on installing Statesman on your PC refer to the Statesman installation manual.

5.1 Statesman operation

The initial screen will show an Explorer style view of the connected frames and modules. Double-click on a module to display the main application control panes.

Initially two views of the first pane will be shown. Clicking any of the menu tabs will cause an alternate pane to appear.



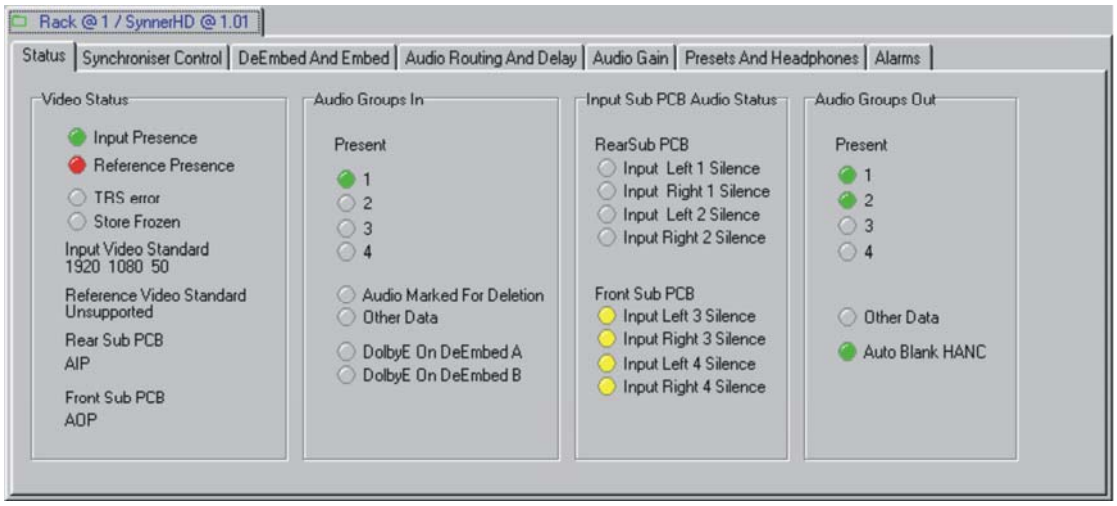
SYNNER HD Statesman main application screen

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.

SYNNER HD has seven Statesman menu tabs that provide: Status information, Synchroniser control, De-embedder and embedder configuration, Audio routing, Channel gain control, Preset controls as well as headphone routing and Alarm configurations.

Status

The Status menu pane is made up of four group boxes. The information displayed here has been drawn together from the various other tabs to give a general overview of SYNNER HD's configuration and signal monitoring. The information is presented as either text or by simulated LED. The colour of the LED will depend on the type and priority of the information being conveyed, red will indicate a high priority such as lack of input video, amber gives a warning and green will indicate a signal presence. An LED will be blank when no error or warning is present and to help convey routing information.



SYNNER HD Statesman Status menu

Video Status

Indication is given here of video input present, external reference present, video input timing reference signal (TRS) being correct and video store frozen. The input video and external reference standard is also given as text along with the type of sub-PCB if fitted in both the forward and rear positions.

Audio Groups In

This group box will show which of the four available audio groups are present in the incoming serial video. It also indicates if any of the incoming audio has been marked for deletion or if any non-audio data is present. A warning is also given if the incoming embedded audio contains Dolby E.

Input Sub-PCB Audio Status

If audio silence is detected on any of the sub-PCB channels for a length of time greater than that set by the Audio delay control (Audio Routing and Delay menu) it will be shown by the affected channel LED illuminating amber.

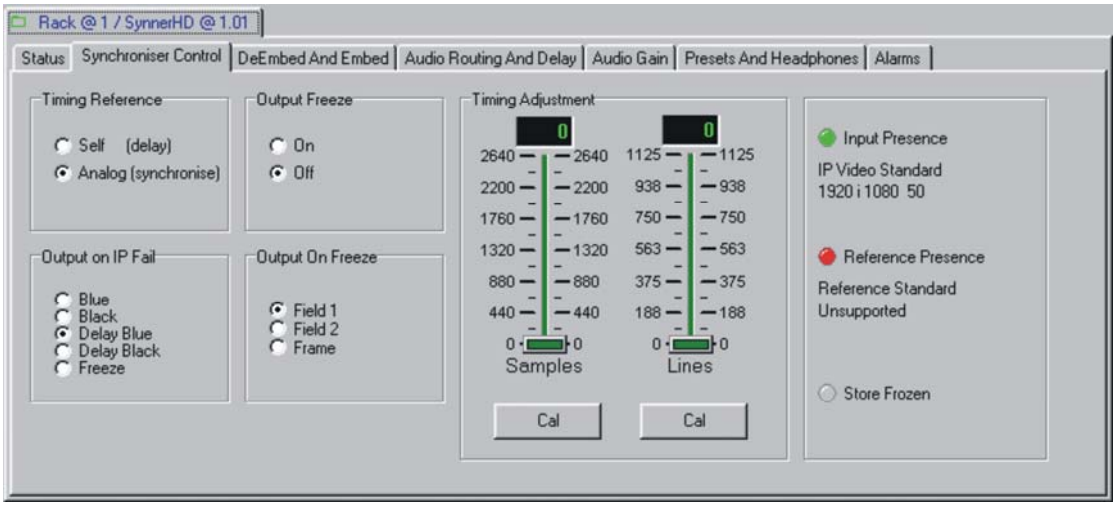
Audio Groups Out

This group box indicates by simulated LED, which two of the four available audio groups the C and D embedders are set to embed to. Indication is also given as to whether the auto HANC blank has been set.

Should the auto HANC blank not be set and there is non-audio data present on the input, it will be passed to the output unimpeded and the other data LED will indicate its presence.

Synchroniser control

The synchroniser control menu contains the various controls associated with the SYNNER HD's operating modes.



SYNNER HD Statesman Synchroniser Control menu

Selecting the operating Mode

The SYNNER HD 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 between 0 and 2 fields. In delay mode, timing is derived only from the SDI input.

Output on Input Failure

Behaviour after a loss of input can be selected from the Output on input fail group box. The selections are Blue, Black, delay then Blue, delay then Black or Freeze frame. Freeze Frame

will show the last good whole frame before the error occurred (useful for diagnostic purposes). Frame, field 1 or 2 can then be selected in the Output Freeze group box.

Output Freeze

The output can be set to frozen by selecting the Output Freeze to ON. The frozen output condition can then be selected from the output on freeze list. Check the appropriate radio button, to make the selection between Frame, Field 1 or Field 2.

The field selections can be useful when there is movement between both fields where a frame freeze will 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.

Timing Adjustment

The Samples and Lines slider controls are used to adjust the picture horizontal and vertical timing. The minimum delay through the SYNNER HD with both controls set to zero will be about 2µs, while with both controls set to maximum the delay available be one complete frame plus 2µs. The maximum setting for each slider control is determined by the input video standard. Should a value be set that is beyond this maximum the video delay will be limited to this maximum and the slide control will automatically return to this maximum value.

Horizontal position timing

The Samples control (Horizontal Position) sets the number of samples/pixels of delay in Delay Mode, or the vertical timing offset with respect to the reference input in Synchro Mode.

Standard	Samples
PAL	0-863
NTSC	0-857
720p 50	0-1979
720p 59.94 / 60	0-1649
1035i 59.94 / 60	0-2199
1080i 50	0-2639
1080i 59.94 / 60	0-2199

Vertical position timing

The Lines control (Vertical Position) sets the number of whole lines the video is delayed in Delay Mode, or the vertical timing offset with respect to the reference input in Synchro Mode.

Standard	Lines
PAL	0-624
NTSC	0-524
720p 50	0-749

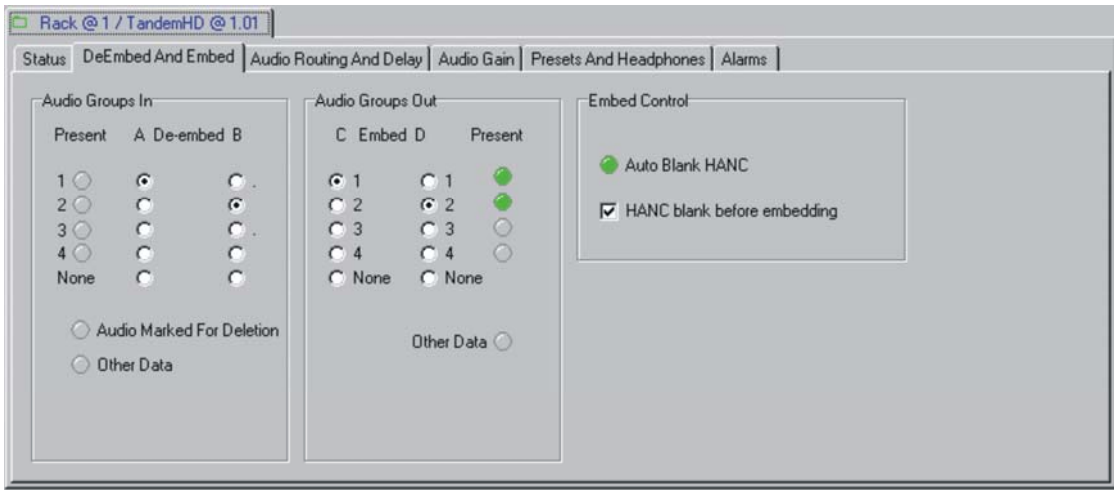
720p 59.94 / 60	0-749
1035i 59.94 / 60	0-1124
1080i 50	0-1124
1080i 59.94 / 60	0-1124

Video Status

Indication is given here of video input present, external reference present and store frozen. The input video and external reference standard is also given as text. This information is also repeated in the status menu.

De-embed and Embed

The De-embed and Embed menu is where SYNNER HD's two de-embedders and two embedders are configured.



SYNNER HD Statesman De-embedder and Embedder menu

Audio Groups In

Here the input groups for the A and B de-embedders are selected. Selection is by checking the appropriate radio button. This group box also shows which of the four available audio groups are present in the incoming serial video. It also indicates if any of the incoming audio has been marked for deletion or if any non-audio data is present.

Audio Group Out

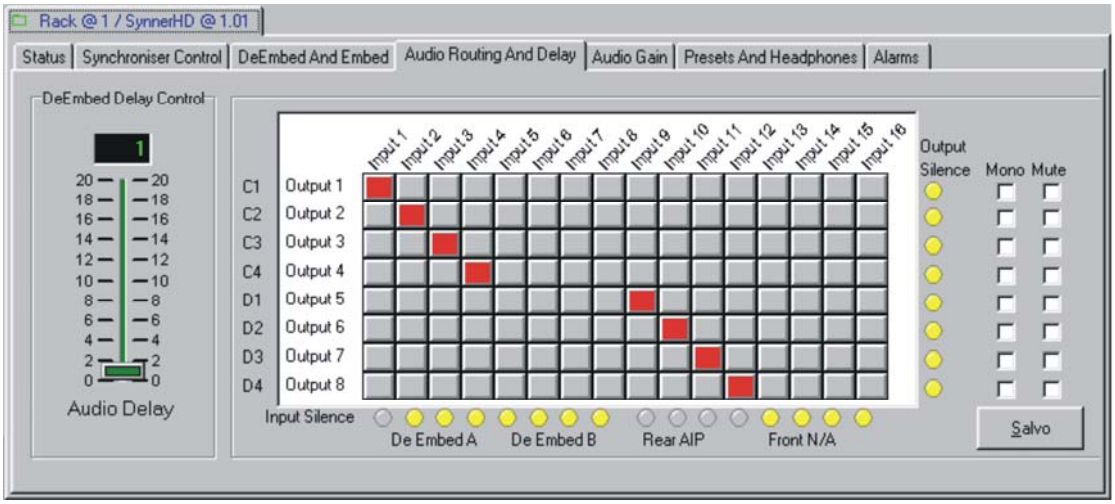
This group box is used to select which two of the four available audio groups you wish the C and D embedders to embed to. Selection is by checking the appropriate radio button. The presence of active output groups is also given and if any group contains non-audio data.

Embed control

HANC blanking is set here to automatically blank the HANC space by ticking the check box.

Audio routing and Delay

The 16x8 output router and audio delay control is accessed here.



SYNNER HD Statesman Audio Routing and Delay menu

16x8 routing matrix

At the heart of SYNNER HD is the 16 input, 8 output routing matrix. This will allow any of the sixteen possible inputs, eight embedded channels and up to eight external analogue or digital audio inputs to be routed to any of the eight outputs for embedding or re-embedding after channel shuffling. The final configuration will depend on the number and type of sub-PCBs fitted. The routing of any output sub-PCBs if fitted, will follow the embedder routing.

An output may also be muted by selecting the appropriate tick box.

Note: Front and Rear describes the position of the sub-PCB when fitted to the SYNNER HD. Front is the position nearest the board edge controls and extraction handle. Rear is nearest the board connector.

Routing Selection

An input to output routing selection is applied by clicking on the crosspoint squares in the matrix. Any selections made will turn dark red. Invalid selections will be rejected and returned to the last valid selection. Once a routing selection is finished it will require the Salvo button to be pressed, until this point no changes to the original routing will have been made. Valid selections will turn bright red and new source-destination assignments will be loaded into the routing table.

Note: If an output sub-PCB is fitted to the front position its output will always follow embedder D routing. Similarly a rear fitted output sub-PCB will always follow embedder C routing.

Stereo to Mono conversion

For the purposes of this discussion, it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair, etc.

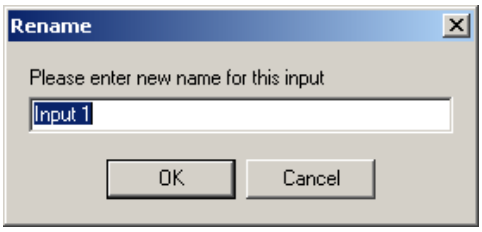
The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of ticking a check box will cause that channel to output the mono sum of itself and its associated channel. The associated channel will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

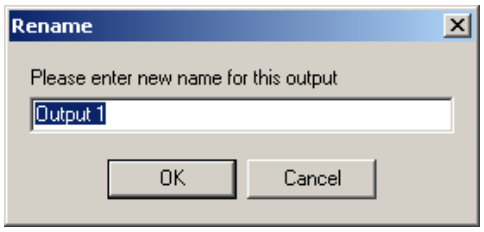
Example: Ticking channel 1 mono check box will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly un-ticking channel 1 and ticking channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Editing router input and output names

Each of the input and output names may be edited for both embed and output routers.



Changing router input name



Changing router output name

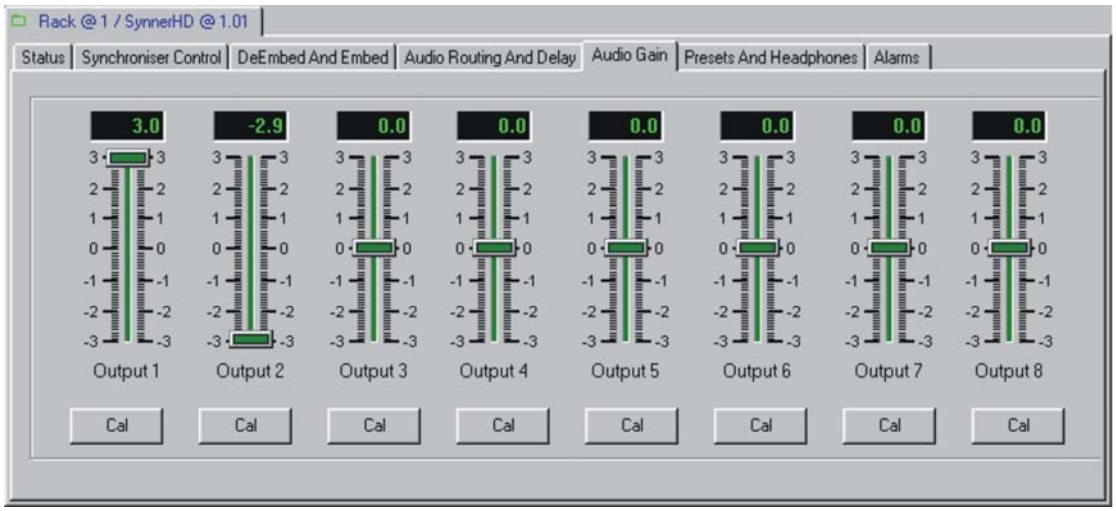
To edit a source or destination name click on the Input or Output text, and a Rename menu will appear. Enter the desired names in the box provided and click OK. The new name will be stored in the host PC, and appear each time Statesman is used.

Delay control

This control can be used to delay the audio with respect to the video by up to 20ms and compensate for any small delay between the incoming video and audio signals. The delay is applied at the output of the 16x8 router and is a single global control.

Audio Gain

The gain of the eight audio output channels feeding the SDI output stream embedders can be varied from unity gain by ±3.0dB.



SYNNER HD Statesman Audio Gain menu

To adjust a channel gain click on the appropriate slider and drag it up or down whilst holding the left mouse button down. The gain applied will be shown in the read-out display above the slider. The readout may also be edited directly by clicking on it to enter edit mode and pressing ↵ (Enter) to accept. To recalibrate a channel to exactly unity gain click on the CAL button beneath the appropriate slider or right click the slider and choose 'calibrate'.

To 'gang' gain slider controls together to move them as one, right click on the slider chosen as the master with the CTRL key held down and then, whilst continuing to hold the CTRL key, right click on one or more further gain sliders to use as slaves.

To clear ganged gain controls and restore them to individual use, select 'Clear Ganged Controls' in the Tools menu.

Presets and Headphones

The Presets and Headphones tab gives access to the Preset save/recall and headphone monitor routing.

SYNNER HD Statesman Presets and Headphones menu

Using Presets

Up to sixteen set ups may be stored and recalled from Statesman, the card edge control or by external GPIs. Presets store board setup data including operating configurations and option card status. It is not possible to recall a preset if the option card configuration is different to that established when the preset was created. The presets are numbered 1-16.

To store a preset proceed as follows:

- Ensure ‘GPI controls preset recall’ is unchecked
- Select appropriate preset by checking the Preset Number radio button
- Click on ‘Store’ to save setup data into the selected preset

To recall a preset proceed as follows:

- Select appropriate preset by checking the Preset Number radio button
- Click on ‘Recall’ to recall setup data from the selected preset

‘GPI controls preset recall’ should not be checked whilst presets are being created or recalled by this menu to prevent inadvertent GPI operation. If required enable ‘GPI controls preset recall’ when finished.

Headphone Monitoring

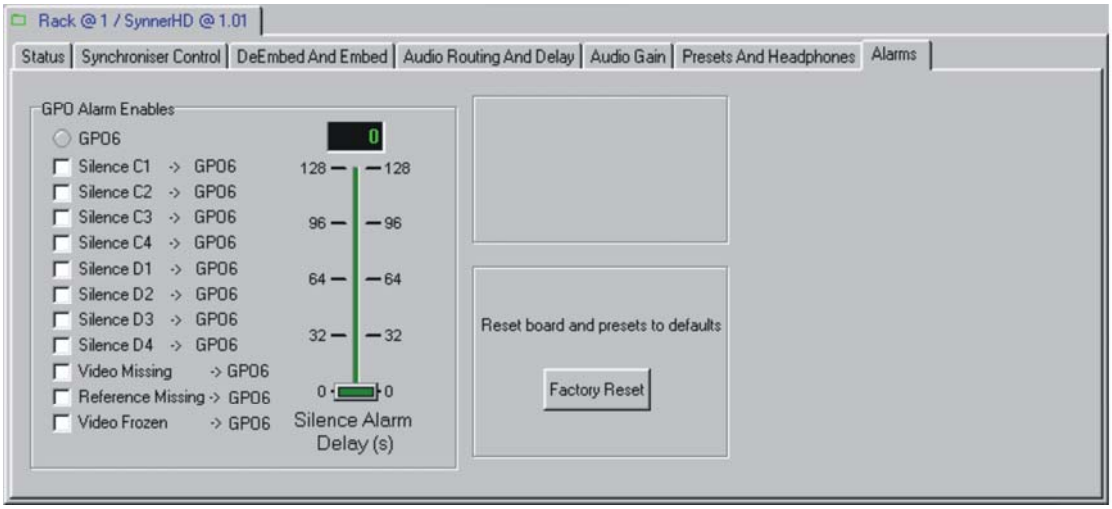
A powerful 12-source stereo monitoring bus provides audio monitoring at the card edge headphone socket. Select any valid stereo signal to be monitored by checking the appropriate radio button.

Notes: Odd channel numbers will appear in the left headphone with the corresponding even channel appearing in the right.

F (front) and R (rear) indicate a sub-PCB and its location when fitted to the SYNNER HD motherboard.

Alarms

The Alarms menu gives access to the GPO assignment, Silence Alarm Delay and Factory Reset.



SYNNER HD Statesman Alarm menu

Using the GPI output

There is one GPI output reserved for alarm indication - GPO6, which may have assigned to it the eight output silence and three video alarms. If silence is sustained for more than the 'silence detect delay', if assigned GPO6 will be asserted low. An alarm is enabled when its associated check box is ticked. Any number of alarms may be flagged.

Where more than one alarm is flagged and an alarm condition is asserted use the various status indicators to determine the exact cause

Visual indication of GPO6 status is also provided.

See Section 2.4 for further discussion of GPIs and pinout details.

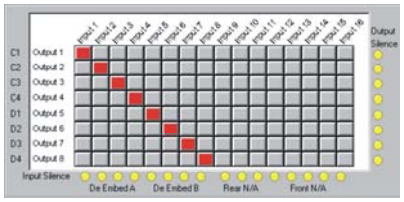
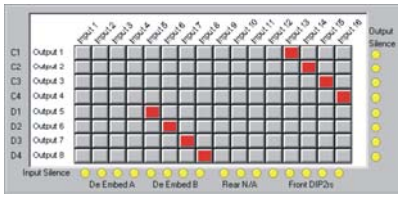
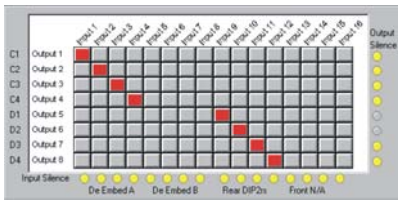
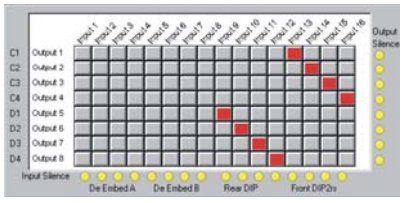
Silence detect delay

Silence detect or threshold delay can be set at the card edge or via Statesman. The control slider sets the silence detect delay from 0 to 128 seconds for the amount of time a signal is allowed to remain below -50dB with respect to Full Scale before a silence error is flagged. To prevent false alarms during quiet passages there is a minimum delay period of approximately four seconds in which silence must be maintained before the delay timer is initiated.

Note: This minimum delay will become significant at short delay settings and it may be necessary to take it into consideration when using a short delay setting.

Factory Reset

The factory reset can be used to return the SYNNER HD to it default condition. It should be noted that if a factory reset is carried out the final routing will depend on any sub-PCBs fitted and all preset configurations will be erased.

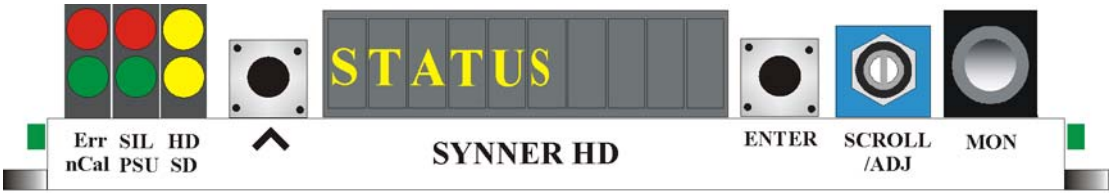
Parameter	Default value
De-embedder A	Group 1
De-embedder B	Group 2
Embedder C	Group 1
Embedder D	Group 2
HANC blank	Set to Auto
No or Output Sub-PCBs fitted **(Statesman representation)**	
Input Sub-PCB in the front position **No or Output Sub-PCB fitted in the rear position** **(Statesman representation)**	
Input Sub-PCB in the rear position. **No or Output Sub-PCB fitted in the front position** **(Statesman representation)**	
Input Sub-PCBs fitted in both front and rear positions **(Statesman representation)**	

Delay, Mono, Mute	Unchecked
Audio Delay	Zero
Audio Gains	Unity
Mode	Synchronise
Output on fail	Delay then Blue
Output Freeze	Off
Output on freeze	Field 1
Video Delay	0 lines, 2 samples
Selected Preset	Unchanged, contents of all saved presets are erased
GPI controls preset recall	Unchanged
Headphone monitoring	C1 and C2
GPO6	Unchecked
Silence Alarm delay	Zero delay

6 Trouble shooting

Simple trouble shooting can be performed by using either the card edge or a remote status panel display.

Card edge monitoring



SYNNER HD's card edge LEDs will give a quick overview of current status.

Name	Led Colour	Function when ON	Function when Off
HD	Yellow	Video input standard is HD (High Definition)	Input not present
SD	Yellow	Video input standard is SD (Standard Definition)	
Silent	Red	One or more flagged audio channel contains silence	All channels active or masked
PSU	Green	Good power supply (PSU) rails	One or more of the monitor supplies is out of specification
Error	Red	No Video input present, No Ref present, store frozen	
nCal	Green	One or more audio channel gains have been adjusted away from unity	All gains set to unity

The board–edge display may also give some useful information when trouble shooting.

Fault finding guide

The Power OK LEDs are 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 input is present and that all cabling is intact.

There are no audio outputs

Check for audio signals using headphones connected to the front PCB mini jack.

Check that functioning analogue or digital audio output cards are fitted securely.
Check that any audio cabling is intact.

The digital audio output produces clicks and pops in downstream equipment

Check that the embedded audio is synchronous with the same source as the video content of the SDI signals.
Check that the downstream equipment is properly referenced to the system audio reference.

The digital audio is not timed with the video (lip sync error)

SYNNER HD can make adjustment to the timing of the audio to the incoming video.
See Tracking audio delay for details.

Audio has been selected for embedding but fails to be inserted

Check that there is sufficient valid HANC space for the insertion to take place.

The card no longer responds to Statesman/front panel control

Check that the card is seated correctly and that the Power OK LED is lit.

Check that the Comms LED in an Indigo frame flashes when Statesman communication control is attempted.

Check any active control panel/Statesman cabling.

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

If necessary re-set the card.

Statesman settings change unexpectedly

Active control panel or card edge control settings may have overridden Statesman settings if they were changed more recently.

Card edge settings have changed unexpectedly

Statesman or active control panel settings may have overridden card edge control settings if they were changed more recently.

Active control panel settings change unexpectedly

Statesman or card edge control settings may have overridden control panel settings if they were changed more recently.

Re-setting the card

If required, the card may be reset by simply removing the card from the rack and re-inserting. It is safe to re-insert the card whilst the rack is powered.

Default setting may be re-loaded into the card if required – see Factory Reset.

7 Specification

SYNNER HD motherboard

General

Dimensions	100mm x 266 mm module with DIN 41612 connector
Weight	260g with two sub PCBs fitted
Power consumption	12 W max, dependent on sub PCBs fitted.

Inputs

Video	HD or SD SDI 270Mb/s or 1.485Gb/s serial digital compliant to SMPTE 259M and SMPTE 292M
Cable equalisation	>200m Belden 8281 or equivalent (video)
	HD (1.485Gb/s) – 100 metres
	SD (270Mb/s) >250 metres
Standard selection	625, 525, 1080i 50/59.94/60., 1035 59.94/60., 720p 50/59.94/60 automatic selection. Output always follows input standard
Input return loss	-15dB for 5MHz to 1.5GHz
Audio inputs	SD embedded to SMPTE 272M
	HD embedded to SMPTE 299M
	Analogue or AES dependent on sub-modules fitted
External Reference	Black and burst or tri level syncs

Processing

Operating modes	Synchronising or Delay mode
Video delay	Maximum two whole frames delay in steps of samples and lines

Outputs

Video	1 channel HD or SD SDI 270Mb/s to 1.485Gb/s serial digital compliant to SMPTE 259M and SMPTE 292M with two buffered outputs
Jitter	Typically SDI 0.2UI @ 1kHz, HD 0.2UI @ 100kHz
Audio	SD embedded to SMPTE 272M
	HD embedded to SMPTE 299M
	Analogue or AES dependent on sub-modules fitted
Monitoring	1 x miniature front mounted audio jack and switch selects individual stereo audio analogue monitoring on both embedder and de-embedder

Embed/de-embed timing	Inter-channel: <1 clock cycle Audio to video: SD approx. 800us, HD approx. 90us
De-embedding format	Automatic de-embedding to SMPTE 272M or SMPTE 299M
EDH	EDH insertion on video output
Video/Audio Delay	Global audio delay - OFF or pre-settable in 1ms steps from 1 – 20ms.
Minimum delay through board	Less than one line

Audio processing

Audio	SD embedded to SMPTE 272M HD embedded to SMPTE 299M Analogue or AES dependent on sub-modules fitted
Audio gain	Gain level adjustment on each channel between +3dB and –3dB in 0.1dB steps. 0dB calibration.
Monitoring	1 x miniature front mounted audio jack and switch selects individual stereo audio analogue monitoring on both embedder and de-embedder
Audio Replace	Routing of input sub-PCB audio together with audio or Dolby E from up to two de-embedded groups present on video input to any channel of up to two output embedder groups
Silence detect delay	Silence detect delay for both sides is adjustable for the time a signal is allowed to remain below –50dB wrt Full Scale before a silence error is flagged. Variable steps from 4 seconds plus 0-128 seconds
Audio delay	0-20ms adjustable with audio tracking of video
Audio protection	Full support for data recovery using SMPTE 299M error correction codes

Presets	Sixteen presets are available to store board configurations. They may be recalled either from the board control or through the use of external GPIs
GPIs	Four GPIs are available for external recall of presets, one is available to provide alarm monitoring and one tracking delay pulse.
Status monitoring	Front card edge visual monitoring with alphanumeric and LED indicators. Remote control panel and Statesman PC control also available Maskable GPI output of Input present, Ref missing, Store frozen and Audio silence.

HD-AIP2: Dual analogue audio input sub-module

Audio input	2 analogue stereo pairs or 4 mono channels, 24 bit quantising A to Ds, High input impedance (20K Ohm) balanced
Level range	0dBFS = +28dBu max / 0dBFS = +12dBu max Default level: 0dBFS = +18dBu or +24dBu by on-board link
Signal to noise	99dB (+18dBu) rms., 22Hz to 22kHz typ.
Total harmonic distortion	0.004% THD+N rms. 22Hz to 22kHz typ.
Interchannel crosstalk	-110 dB @ 1kHz, -90 dB @ 20 kHz, rms. typ.

Synchronisation	Digitised output of analogue A to D is automatically locked to video

HD-AOP2: Dual analogue audio output sub-module

Audio output	2 analogue stereo pairs or 4 mono channels, 24 bit quantising A to Ds, Low output impedance (66 Ohm) balanced
Level range	0dBFS = +28dBu max / 0dBFS = +12dBu max Default level: 0dBFS = +18dBu or +24dBu by on-board link
Signal to noise	99dB (+18 dBu) rms. 22Hz to 22kHz typ.
Total harmonic distortion	0.002% THD+N rms., 22Hz to 22kHz typ.
Interchannel crosstalk	-110 dB @ 1kHz, -90 dB @ 20 kHz, rms. typ.

HD-DIP2: Dual digital audio input sub-module

Audio input	2 x 24 bit stereo pairs. AES3 110 Ohm or HiZ (balanced) D Type, or AES3-id (unbalanced) 75 Ohm BNC. Set by on-board links
Synchronisation	Synchronous audio to video 48kHz

Note: only used when you wish to bypass the tracking audio delay.

HD-DIP2-RS: Dual digital audio input re-sampler sub-module

Audio input	2 x 24 bit stereo pairs. AES3 110 Ohm or HiZ (balanced) D Type, or AES3-id (unbalanced) 75 Ohm BNC. Set by on-board links.
Synchronisation	Asynchronous audio to video 30kHz to 108kHz sample rates
Total harmonic distortion	0.0002% THD+N rms.

Note: used for most applications

HD-DOP2-110 and HD-DOP2-75: Dual digital audio output sub-modules

Audio output	2 x 24 bit AES/EBU stereo pairs. HD-DOP2-110, 110 Ohm or HD-DOP2-75 (unbalanced) 75 Ohm BNC. Factory configuration only Each of the two AES signal outputs has a second buffered output, which may be available dependent on the rear module fitted.