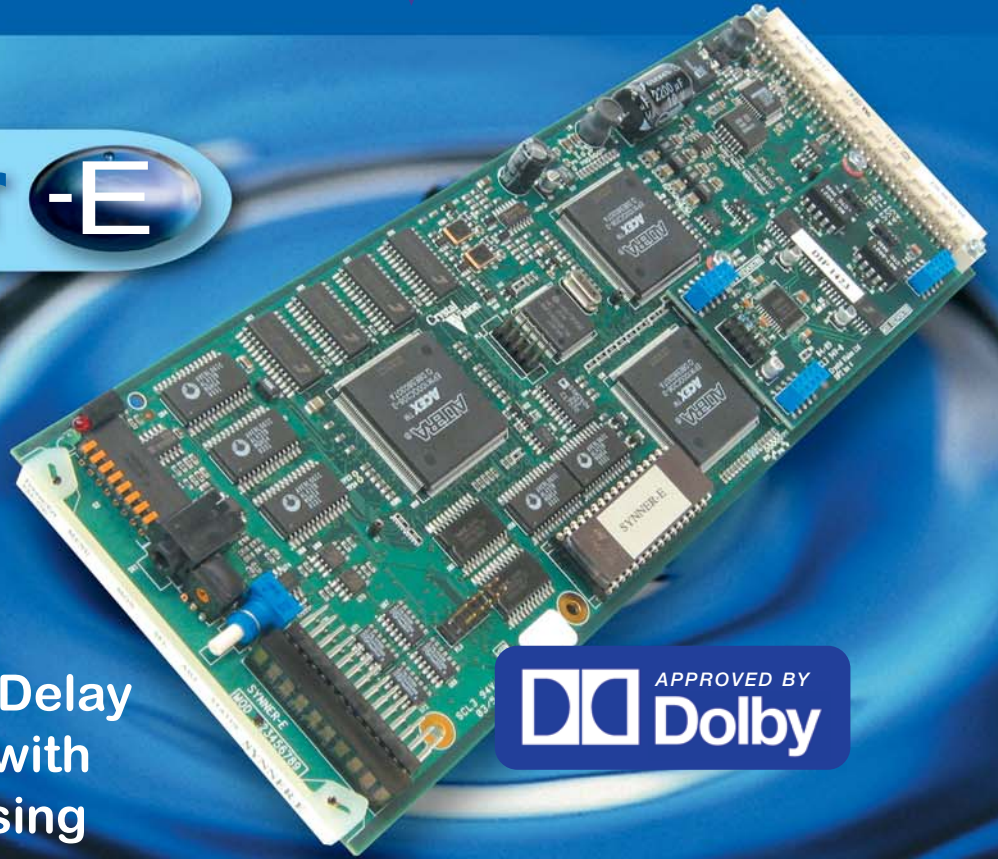


# Crystal Vision

## Synner -E



### Synchroniser, Tracking Audio Delay and Embedder with Dolby E processing

SYNNER-E is the perfect video synchroniser for you if you're working in a mixed Dolby E and standard AES environment.

This truly innovative frame/line synchroniser includes a built-in tracking audio delay and embedder and allows a mixture of Dolby E and standard AES within a single audio group – making it the natural choice for systems containing Dolby E encoded audio.

Surround sound programmes have their 5.1 channels encoded in a single AES stream of Dolby E, with a second AES feed containing a standard audio stereo pair for end users without a surround sound decoder and to make it easier for the broadcaster to monitor the audio. Most current broadcast infrastructures will only accept a single audio group, and embedding these two types of audio into one group makes synchronising them difficult because Dolby E data is processed differently to standard audio. SYNNER-E has the solution: it separates the Dolby E and standard audio, synchronising both types in the appropriate way and then recreates the audio with the delay matching the video – causing no disturbance to either the Dolby E data or the standard audio.

SYNNER-E offers a complete input stage for asynchronous SDI and analogue, digital or Dolby E audio into an embedded audio system – on one space-saving board.

- SDI synchroniser, tracking audio delay and embedder
- Allows a mixture of Dolby E and standard AES within a single audio group by separating and synchronising both types in the appropriate way
- Ideal for any applications involving Dolby E, especially surround sound and multiple languages
- Delays and resamples up to two groups of embedded audio – one group from the SDI input and optionally a second group from an input piggyback
- Allows embedding of AES or analogue audio
- Full vertical and horizontal adjustment (0-2 fields)
- Can be used as fixed delay of up to two fields
- Minimum video delay of 3.8µs
- Fast locking after an upstream switch
- Selectable black, blue or freeze on input failure
- Includes PAL/NTSC monitoring encoder
- Detects presence of Dolby E which can be used to trigger a GPI
- Overwrite or shuffle existing audio
- HANC cleaning and management
- Audio follow output control
- Space-saving: 100mm x 266mm module allows 12 SYNNER-E in 2U (24 in 4U, six in 1U and two in desk top box)
- Control from board edge or PC software



## Synchroniser, Tracking Audio

SYNNER-E has two modes of operation, synchroniser and delay line. In synchroniser mode it will sort out any incorrect frame rates plus any delays by taking its timing from the external analogue reference and will automatically synchronise sources between 0 and 2 fields. This mode is ideal for external sources that are not timed to station references. Delay mode is ideal for when the frame rate is correct but the source has been passed through equipment and therefore been delayed for a few lines, with timing derived from the SDI input. In either mode the video delay remains fully adjustable over two complete fields. SYNNER-E has a short minimum delay of 3.8us, while in 625 line applications picture disturbances on untimed input cuts are avoided by waiting until line 23 to relock.

Automatic freeze is available when input fails through loss of signal. You can specify to show the last good field repeated before picture failure, the whole frame in which failure happened (useful for diagnostic purposes) or a black or blue screen. You can also select to freeze the picture for one second and then go black or blue. Manual freeze allows SYNNER-E to be used as a simple still store. The current board settings can be saved in one of 16 locations, allowing you to store and recall up to 16 different configurations for later use.

Tracking audio delay can be applied to the input audio to track the delay of the video synchroniser, running the audio fast or slow to ensure the video and non-Dolby E audio stay correctly timed and to avoid lip sync errors. 20ms of fixed audio delay can be added on top of the tracking to compensate for early audio. In Synchronisation mode predictive tracking can be used to minimise the offset between audio and video delay when video frames are dropped or repeated. An audio follow output pulse also allows SYNNER-E to be used with an external tracking audio delay. Any Dolby E encoded audio bypasses this stage within SYNNER-E to ensure its integrity.

Any one of the four audio groups available on the SDI input can be selected for de-embedding, and are then resampled, delayed and re-embedded. Any Dolby E encoded audio channels can also be selected for re-embedding – but are handled by an independent processing path, bypassing the resamplers to protect the integrity of the Dolby E data. An input piggyback can be fitted to the SYNNER-E motherboard to embed external analogue or digital audio, with a choice of three: the HD-AIP2 (for analogue audio), HD-DIP2 (for 48kHz AES synchronous to the SDI input) and the resampling HD-DIP2-RS (for any 30-108kHz AES). Those embedding analogue audio must also fit an HD-DCDCV18 18 Volt regulator.

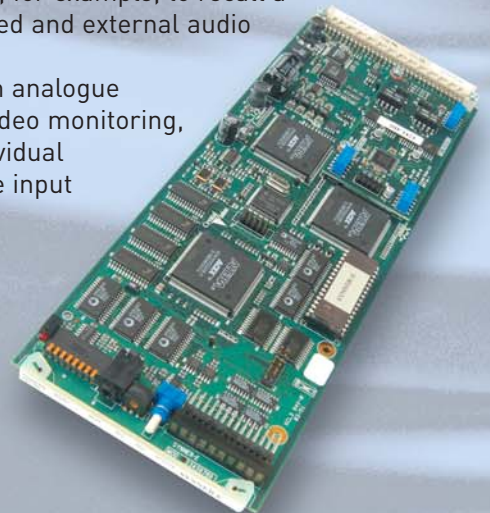
The audio routing of the stereo pairs is performed with three switching matrixes. Standard AES is routed from the de-embedder and piggyback (if fitted) by the main 4 x 4 routing matrix, while Dolby E is transported to the output embedder by two stereo switches. One embedder can be used for standard AES only, whereas the other may be used for AES, Dolby E or a mix of both AES and Dolby E. SYNNER-E allows both audio shuffling and the overwriting of individual stereo pairs. It gives the option to mute any of the standard AES stereo pairs, while the audio output is automatically muted when the video is frozen.

SYNNER-E can detect the presence of Dolby E encoded audio in either channel of a selected audio group. This can be used to trigger a GPI – allowing the engineer, for example, to recall a user defined preset to automatically select how the incoming embedded and external audio is processed.

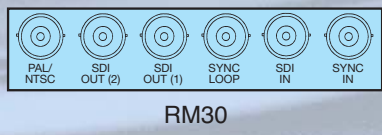
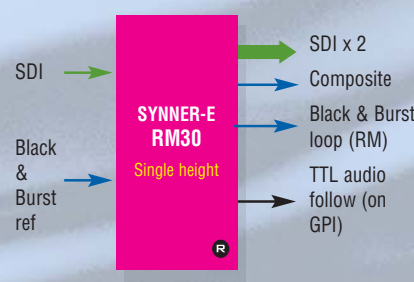
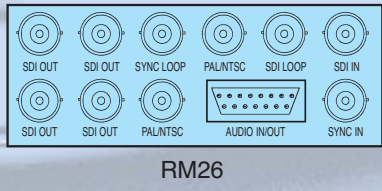
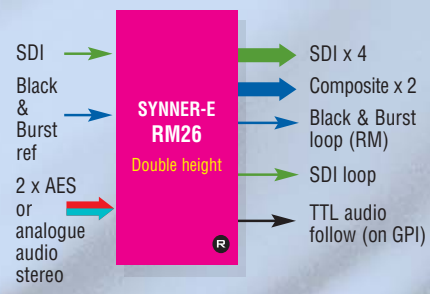
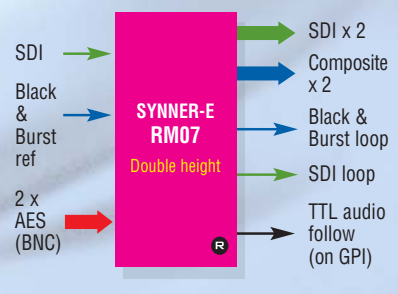
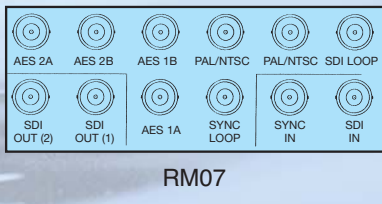
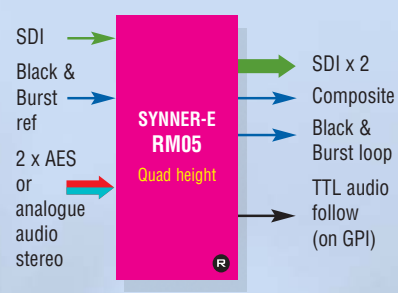
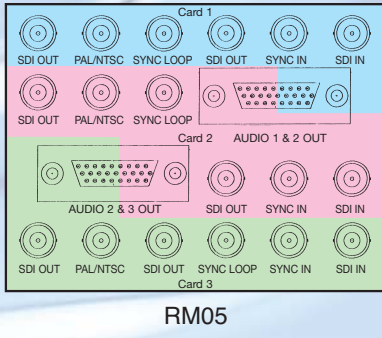
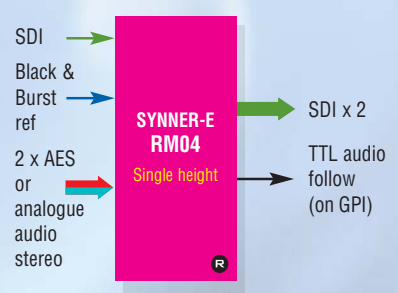
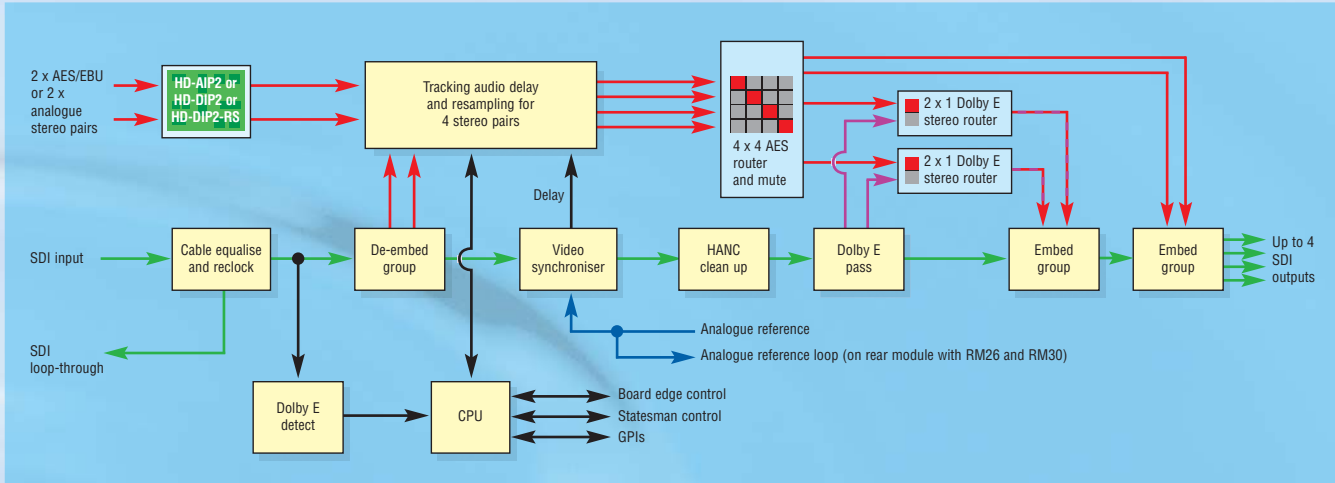
SYNNER-E makes it easy for you to check your various sources. An analogue PAL/NTSC composite output, timed to the reference, is available for video monitoring, while a headphone socket on the board allows you to listen to the individual analogue audio stereo pairs from the incoming SDI stream or from the input piggyback if fitted.

HANC cleaning allows the removing of unwanted embedded audio packets and will tidy up the Horizontal Ancillary data area.

The 100mm x 266mm module fits in the standard Crystal Vision frames allowing it to be combined with any other interface products from the range. The board can be used with five different frame rear modules to obtain the exact configuration required, while adjustments can be made from the board edge or the Statesman PC Control System.



# Delay and Embedder with Dolby E processing



RM30 has no Audio I/O. Only use if no piggyback fitted

## SPECIFICATION

### SYNNER-E MOTHERBOARD

#### MECHANICAL

Standard Crystal Vision module 266mm x 100mm  
Weight: 210g without piggyback; 250g with piggyback fitted  
Power consumption: 11 Watts

#### VIDEO INPUTS

SDI 270Mbit to EBU 3267-E and SMPTE 259M  
Cable equalisation >200m Belden 8281 or equivalent  
Auto 625/525 line selection  
The board can accept up to two groups of embedded audio. One of these groups of embedded audio can contain one or two channels of Dolby E

#### SDI OUTPUTS

SDI 270Mbit to EBU 3267-E and SMPTE 259M with inserted EDH  
Maximum of four SDI outputs (two outputs with frame rear module RM04, RM05, RM07 and RM30 and four with RM26)  
<500ps 1kHz jitter and <800ps broadband jitter from stable 300mV Black and Burst reference  
<500ps 1kHz jitter in delay mode (low frequency jitter follows SDI input in delay mode only)  
Active relocked SDI loop-through available on RM07 and RM26 rear modules - loop needs SYNNER-E to be fitted  
The board can embed up to two groups of audio data. Remaining non-conflicting groups in the HANC space can be bypassed through the HANC cleaner  
All external audio inputs are linear audio only. They are subject to the same tracking delay process as the de-embedded group audio

#### ANALOGUE VIDEO OUTPUTS

Maximum of two PAL/NTSC composite outputs. One output with frame rear modules RM05 and RM30 and two with RM07 and RM26. (NB. No composite outputs with RM04)  
Frequency response: +/-0.3dB 0 to 5MHz  
Noise: <-54dB weighted luminance or chrominance

#### ANALOGUE REFERENCE

Analogue Black and Burst, mixed syncs or video  
Amplitude of syncs 150mV to 4V  
Optimum jitter performance is from analogue Black and Burst plus 300mV syncs to EBU N14-1988  
Reference rear module loop-through available on RM26 and RM30 - loop does not need SYNNER-E to be fitted as rear module has passive circuitry required  
Reference active loop-through available on RM05 and RM07 - loop needs SYNNER-E to be fitted

#### VIDEO TIMING ADJUSTMENTS

In synchroniser mode the timing of the output (with respect to the reference in) may be adjusted by any number of lines up to a whole video frame. Horizontal timing adjustment is also possible in 37.5 steps  
In delay mode the reference is not used and the delay through for the SDI is set by the same timing adjustments

#### DELAY THROUGH BOARD

3.8us min - 2 fields max

#### FREEZE FUNCTIONS

Automatic freeze is available when input fails through loss of signal. Can show last good field before picture failure, whole frame in which failure happened or black or blue screen. Can also freeze picture for one second and then go to black or blue  
Manual freeze allows SYNNER-E to be used as a simple still store. Selecting single field output can counteract any flicker caused by the interlacing of two fields. Either field can be selected

#### HANC CLEAN UP

SYNNER-E can make best use of the available HANC data space by removing "marked for deletion" audio groups and repacking the useful audio data

#### AUDIO INPUTS (OPTIONAL)

One piggyback can be added to the main board to enable input of 2 x AES or 2 x analogue stereo pairs  
Use HD-AIP2, HD-DIP2 or HD-DIP2-RS piggybacks to input analogue, synchronous AES or asynchronous AES audio

#### AUDIO TIMING ADJUSTMENTS

The audio is normally delayed by the same amount as the video but an additional delay can be added to the audio of up to 20ms  
Tracking delay auto or off

#### AUDIO REPLACE

Embedder can replace audio stereo pairs already present on SDI input with audio from the input piggyback

#### EMBEDDER TIMING PERFORMANCE

Interchannel: <1 clock cycle  
Audio to video: Min 320us for AES audio input. Min 1ms for analogue audio input  
De-embedder automatically handles asynchronous and synchronous audio

#### AUDIO MONITORING

One miniature front mounted audio jack and switch selects individual stereo audio analogue monitoring on both embedder and de-embedder  
Please note that you cannot hear valid audio on the Dolby E channel

#### EDH

EDH insertion on output

#### AUDIO FOLLOW OUTPUT

TTL output is provided on the same D-Type as GPLs to indicate the video delay through the synchroniser. The length of the pulse is equal to the length of the video delay

#### LED INDICATION OF:

SDI input present  
Analogue reference present  
Power supplies okay  
Delay less than 24 lines  
Store frozen  
Selected audio group missing from input

#### GPI INPUT LEVELS

Electrically: Will tolerate 0V to 30V, pulled up to +5V through 10 kohm

#### GPI OUTPUT LEVELS

Electrically: Open collector transistors 30V, 330 ohm current limit resistors. Pulled up to +5V through 10 kohm

#### GPI INPUTS

Recall presets 1 to 16

#### GPI OUTPUTS

Audio follow output  
Dolby E present in selected group

#### LOCAL CONTROL

Board edge with 10 character alphanumeric display

#### REMOTE CONTROL

RS422/485  
19200 baud, 8 bits, 1 stop no parity  
Statesman allows control from any PC on a network  
NB. SYNNER-E does not have front panel control

### HD-AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

#### AUDIO INPUT

Two analogue stereo pairs or four mono channels. 24 bit quantising A to Ds (20 bit embedded). High input impedance (20 kohm) balanced

#### INPUT LEVEL RANGE

0dBFS = +28dBu max / 0dBFS = +12dBu min  
Factory set default: 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

-110dB at 1kHz, -90dB at 20kHz, rms., typ.

### HD-DIP2 AND HD-DIP2-RS DUAL DIGITAL AUDIO INPUT PIGGYBACKS

#### AUDIO INPUT

Two stereo pairs. AES3 110 ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 75 ohm BNC. Set by on board jumper links  
Synchronous audio to video 48kHz  
Asynchronous audio to video 48kHz + or - 50ppm  
HD-DIP2-RS is used for asynchronous AES inputs or AES at different sample rates (30kHz to 108kHz eg. 44.1kHz CD players or 96kHz DVD players)

#### TOTAL HARMONIC DISTORTION

0.0002%

## ORDERING INFORMATION

SYNNER-E	Synchroniser, tracking audio delay and embedder with Dolby E processing
HD-AIP2	Analogue audio (two stereo pairs) input piggyback
HD-DIP2	75 ohm, 110 ohm, HiZ AES/EBU (two stereo pairs) input piggyback. 48kHz only, synchronous to video input
HD-DIP2-RS	Resampling version of HD-DIP2. 30-108kHz AES/EBU
HD-DCDCV18	18 Volt regulator for analogue audio configurations (one required if analogue audio piggyback fitted)
Indigo 4	4U frame with passive front panel for up to 24 Crystal Vision modules
Indigo 4SE	4U frame with passive front panel fitted with Statesman CPU for up to 24 Crystal Vision modules
Indigo 2	2U frame with passive front panel for up to 12 Crystal Vision modules
Indigo 2AE	2U frame with active front panel for up to 12 Crystal Vision modules
Indigo 2SE	2U frame with passive front panel fitted with Statesman CPU for up to 12 Crystal Vision modules
Indigo 1	1U frame with passive front panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1-DP
Indigo 1AE	1U frame with active front panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1AE-DP
Indigo 1SE	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1SE-DP
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTAE	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTSE	Desk top box with passive front panel fitted with Statesman CPU for up to two Crystal Vision modules
RM04	Single slot frame rear module. Allows maximum number of SYNNER-E in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Suitable for analogue or 110 ohm digital audio. Gives access to two SDI outputs
RM05	Four slot frame rear module. One rear module used for three SYNNER-E, allowing 18 SYNNER-E in 4U and nine in 2U. Suitable for analogue or 110 ohm digital audio. Gives access to two SDI outputs, one PAL/NTSC output and a Black and Burst loop-through
RM07	Two slot frame rear module. Allows 12 SYNNER-E in 4U, six in 2U, three in 1U and one in desk top box. Suitable for 75 ohm digital audio. Gives access to two SDI outputs, two PAL/NTSC outputs and both SDI and Black and Burst loop-throughs
RM26	Two slot frame rear module. Allows 12 SYNNER-E in 4U, six in 2U, three in 1U and one in desk top box. Suitable for analogue or 110 ohm digital audio. Gives access to four SDI outputs, two PAL/NTSC outputs, an SDI loop-through and a Black and Burst rear module loop-through
RM30	Single slot frame rear module. Allows maximum number of SYNNER-E in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Does not have any audio connections, making it the default rear module for applications which do not use a piggyback. Gives access to two SDI outputs, one PAL/NTSC output and a Black and Burst rear module loop-through.
Statesman	PC Control System