Crystal Vision

SYNNER

Synchroniser, Tracking Audio Delay and Embedder/De-embedder

The flexibility of SYNNER144 is guaranteed to simplify your system design.

You can use it in three different ways.

1 Without any piggyback fitted, SYNNER144 becomes a synchroniser with tracking audio delay for video containing embedded audio, and allows audio shuffling.
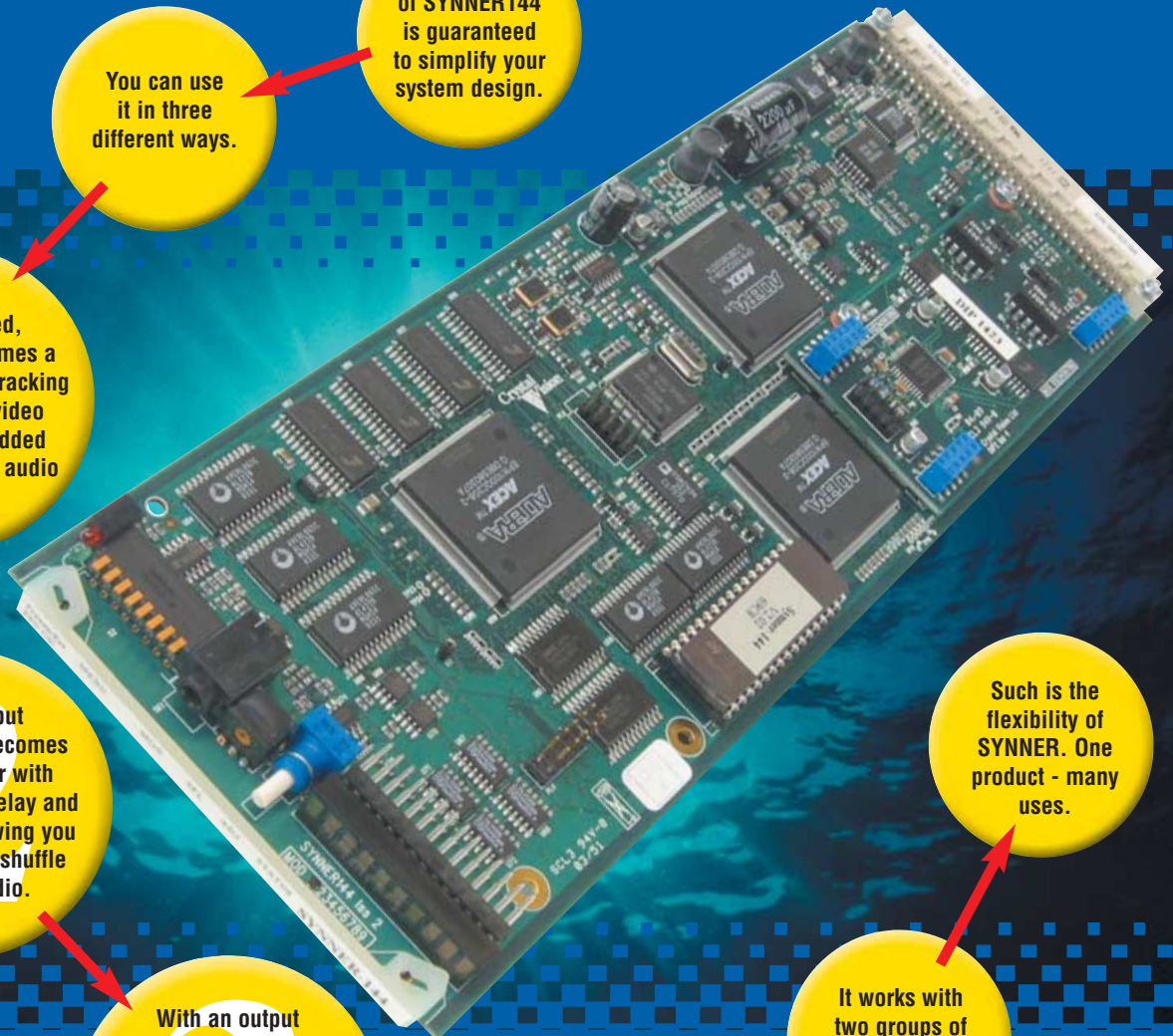
2 With an input piggyback, it becomes a synchroniser with tracking audio delay and embedder, allowing you to overwrite or shuffle existing audio.

3 With an output piggyback, it becomes a synchroniser with tracking audio delay and de-embedder, allowing you de-embed audio timed to your system.

The audio you embed or de-embed can be analogue or digital.

It works with two groups of embedded audio, too.

Such is the flexibility of SYNNER. One product - many uses.

SYNNER144 combines a video synchroniser with tracking of two audio groups, embedder or de-embedder and audio routing.

The logical combination of Crystal Vision's famous embedder and synchroniser technology, SYNNER144 provides many functions in one product, reducing the number of boards you need to buy and saving you rack space and money.

The increasing use of embedded audio, especially multiple group operation, combined with the board's flexibility makes SYNNER ideal for a very broad range of applications. The flexibility comes as a result of being able to use SYNNER in three different ways: without a piggyback, with an input piggyback or with an output piggyback. SYNNER can be used in a wide variety of places within a broadcast system such as on the station input or output, after a routing switch where the sources are several lines apart, or in installations using the latest generation of broadcast VTRs which can record up to two groups of embedded audio.

WHAT DO I NEED?

Buy the basic 100mm x 266mm SYNNER144 motherboard and then select one piggyback providing an external input or output from a choice of six to suit your application.

DIP2	Digital audio input piggyback	For embedding 48kHz AES/EBU synchronous to SDI input
DIP2-RS	Digital audio input piggyback with resampler	For embedding any 30-108kHz AES/EBU
DOP2-110	110Ohm balanced digital audio output piggyback	For de-embedding 110Ohm AES/EBU
DOP2-75	75Ohm unbalanced digital audio output piggyback	For de-embedding 75Ohm AES/EBU
AIP2	Analogue audio input piggyback	For embedding analogue audio
AOP2	Analogue audio output piggyback	For de-embedding analogue audio

If you're embedding or de-embedding analogue audio you must also fit a DCDCV18 PSU.

USING SYNNER: WITHOUT A PIGGYBACK

Without any piggyback, SYNNER144 can accept an untimed feed of video containing up to four stereo pairs (two groups) of embedded audio. It will time the video and embedded audio to your system and can also change the way the stereo pairs are arranged in the embedded audio, providing a 4 x 4 stereo router.
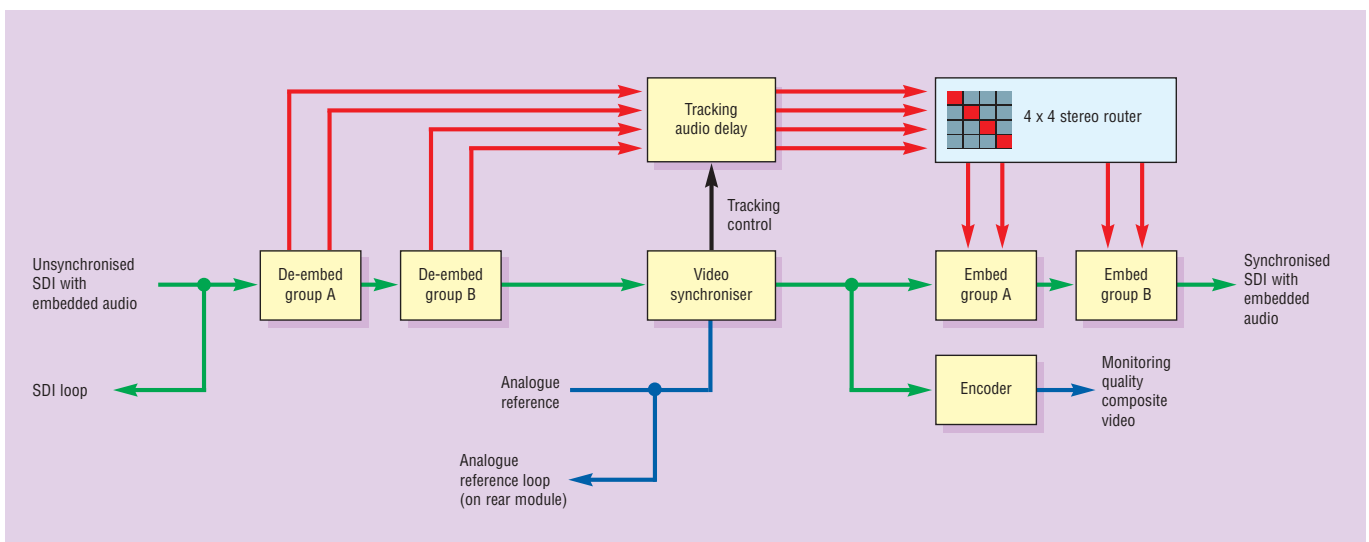
By fitting an input piggyback (AIP2, DIP2 and DIP2-RS), SYNNER144 can accept an untimed feed of video and separate analogue or digital audio and produce timed video and embedded audio, with channel swap and replace.

The input audio can be timed to the station or timed to the incoming video. Tracking audio delay can be applied to the input audio to track the delay of the video synchroniser although this can be bypassed if the audio is timed to the station reference.

In addition to audio shuffling, SYNNER144 allows the overwriting of individual stereo pairs, and can create a new group of embedded audio or overwrite some or all of what is already present. (If you need to split the stereo pairs, you should additionally use the TANDEM range of products.)

Used in this way, SYNNER offers a complete input stage for asynchronous SDI and analogue or digital audio into an embedded audio system.
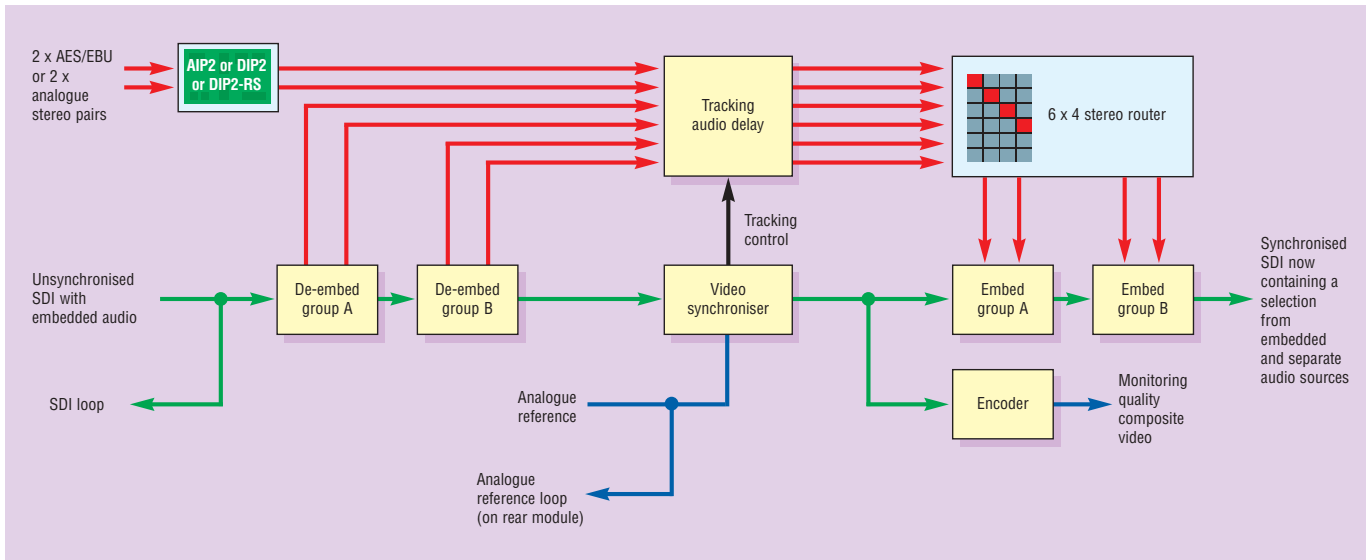
With an output piggyback fitted (AOP2, DOP2-75 and DOP2-110) SYNNER can take an untimed feed of video and embedded audio and produce video and separate analogue or digital audio timed to station syncs. A 4 x 6 stereo router allows you to select which stereo pairs you wish to de-embed.
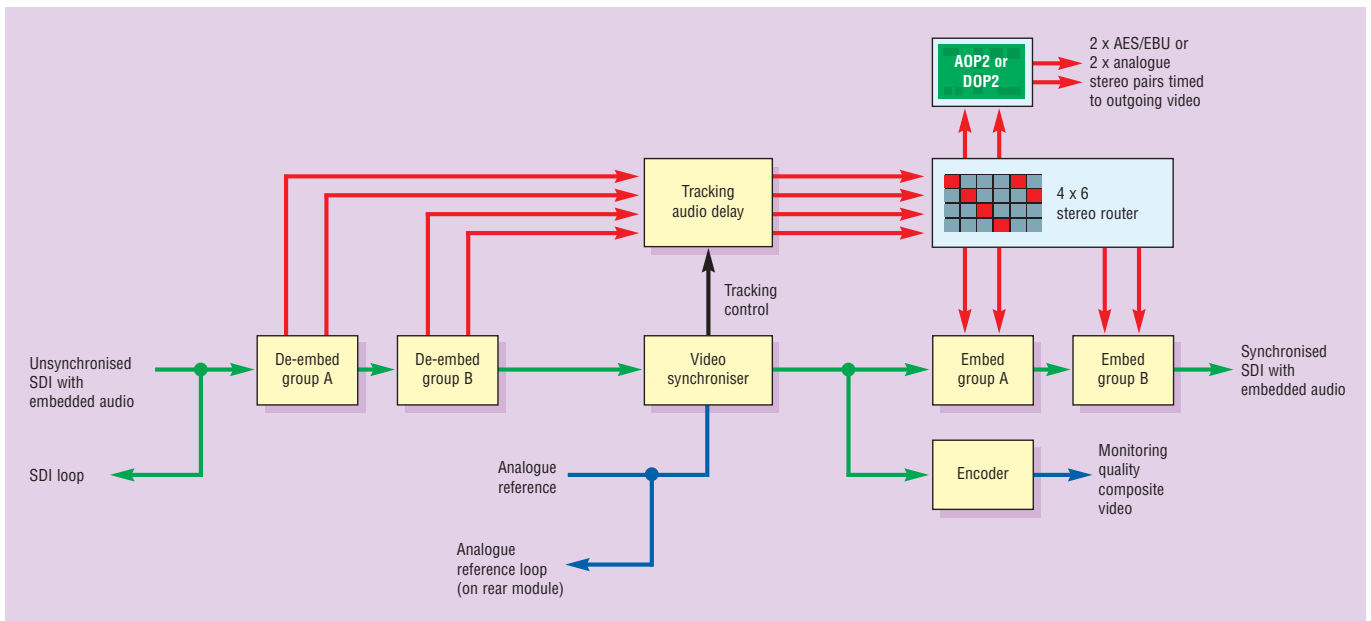
SYNCHRONISER

The excellent synchroniser features include a short minimum delay of 3.8us and the avoidance of picture disturbance by fast locking after an up-stream switch.

SYNNER144 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 with or without embedded audio between 0 and 2 fields. 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.

Automatic freeze is available when input fails through loss of signal. The user 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. It can also be selected to freeze the picture for one second and then go to black or blue. Manual freeze allows SYNNER144 to be used as a simple still store.

The current board settings including routing and delay can be saved in one of 16 locations, allowing the user to store and recall up to 16 different configurations for later use.

TRACKING AUDIO DELAY

The internal audio delay tracks the video delay, running the audio fast or slow to ensure the video and audio stay correctly timed and to avoid lip sync errors. The user can also add 20ms of fixed audio delay on top of tracking to compensate for early audio. 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 to be used with an external tracking audio delay.

DOLBY E

SYNNER can be switched to Dolby E mode to preserve Dolby E encoded audio embedded in the SDI input through the synchronisation process, allowing it to pass transparently through the board. Dolby E in AES form cannot be embedded using SYNNER144 - use one of the TANDEM models instead.

MONITORING

SYNNER 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.

QUALITY CONTROL

SYNNER144 features Crystal Vision's robust embedded audio protection. Sophisticated audio error masking and contiguous packing of audio data ensures correct transport of multiple audio groups. A variety of sophisticated techniques are employed to protect and minimise the effects of cuts to untimed and asynchronous SDI, SDI corruption and TRS loss in the SDI signal. The selected audio groups are not affected by the frame drops or repeats of video synchronisation.
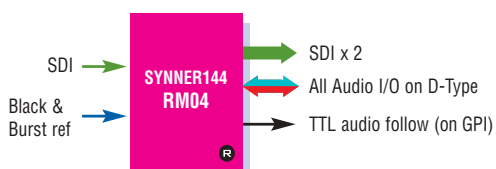
CONTROL

Control is as flexible as SYNNER itself. Adjustments can be made from the board edge, an active front panel on the frame, a remote control panel located in a different room or the Statesman PC Control System. Statesman's user-friendly GUI makes it very easy to configure the board to your requirements with, for example, audio routing set by simply clicking the squares on a grid.
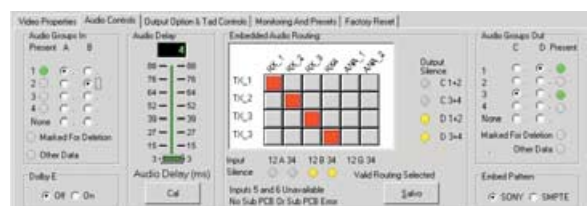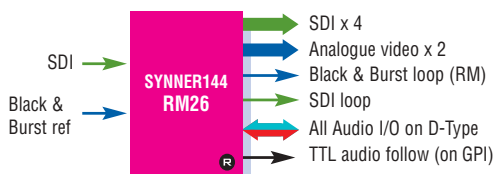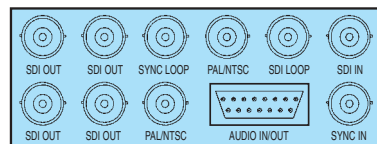
INPUTS AND OUTPUTS

SYNNER144's flexibility is further increased by being able to use the board with five different frame rear modules, to obtain the exact configuration required. These are the RM04, RM05, RM07, RM26 and RM30. SYNNER fits in the standard Crystal Vision frames allowing it to be combined with any other interface product from the range.

RM04

RM04

SYNNER144 RM04

- SDI →
- Black & Burst ref →
- → SDI x 2
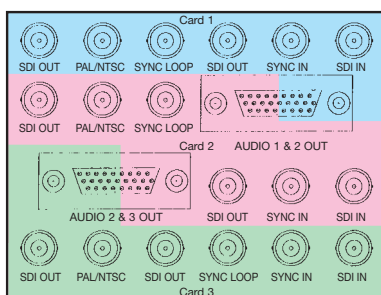- ← All Audio I/O on D-Type
- → TTL audio follow (on GPI)

The single slot RM04 allows the maximum number of boards in a frame and can be used with either analogue audio or 110Ohm AES. It is the favourite rear module for input/output piggyback configurations where monitoring is not a requirement.

RM05

RM05

SYNNER144 RM05

- SDI →
- Black & Burst ref →
- → SDI x 2
- → Analogue video
- → Black & Burst loop
- ← All Audio I/O on D-Type
- → TTL audio follow (on GPI)

The four slot RM05 fits in the 2U and 4U frames only and can be used with either analogue audio or 110Ohm AES. It should be used for applications requiring composite video monitoring and a large number of boards in a frame.

RM07

RM07

SYNNER144 RM07

- SDI →
- Black & Burst ref →
- → SDI x 2
- → Analogue video x 2
- → Black & Burst loop
- → SDI loop
- ← AES 2 in or 2 x 2 out (BNC)
- → TTL audio follow (on GPI)

The two slot RM07 should be used for 75Ohm AES applications.

RM26

RM26

SYNNER144 RM26

- SDI →
- Black & Burst ref →
- → SDI x 4
- → Analogue video x 2
- → Black & Burst loop (RM)
- → SDI loop
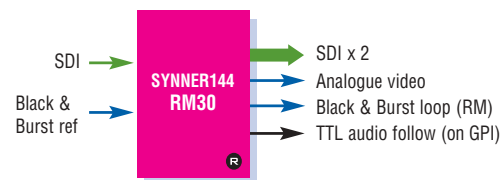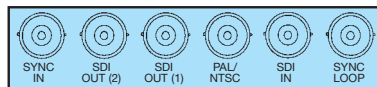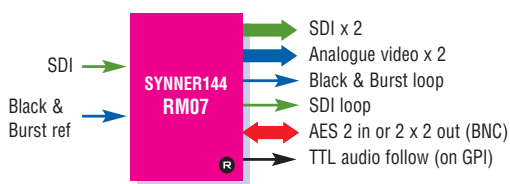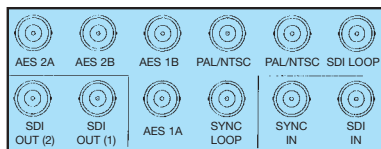- ← All Audio I/O on D-Type
- → TTL audio follow (on GPI)

The two slot RM26 can be used with either analogue audio or 110Ohm AES. It fits less boards in a frame than the RM04 and RM05, but gives composite video monitoring and both Black and Burst and SDI loop-throughs. It can be used for applications with no piggyback, an input piggyback or an output piggyback.

RM30

RM30

SYNNER144 RM30

- SDI →
- Black & Burst ref →
- → SDI x 2
- → Analogue video
- → Black & Burst loop (RM)
- → TTL audio follow (on GPI)

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

The single slot RM30 has no audio connections and is the default rear module for applications without a piggyback. If the extra SDI and analogue outputs and the SDI loop-through are required, the RM26 should be used instead.

NB. All Audio I/O = 2 x stereo analogue audio in or out, or 2 x AES in, or 2 x 2 AES out

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SYNNER144 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

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 reclocked SDI loop-through available on RM07 and RM26 rear modules - loop needs SYNNER144 to be fitted

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 SYNNER144 to be fitted as rear module has passive circuitry required
Reference active loop-through available on RM05 and RM07 - loop needs SYNNER144 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 37nS 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 SYNNER144 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

AUDIO INPUTS AND OUTPUTS (OPTIONAL)
Two groups of audio in and out
One piggyback can be added to the main board to enable either input or output of 2 x AES or 2 x analogue stereo pairs
Use AIP2, DIP2 or DIP2-RS piggybacks to input analogue, synchronous AES or asynchronous AES audio
Use AOP2, DOP2-75 or DOP2-110 to output analogue, 75Ohm AES or 110Ohm 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

AUDIO PROTECTION IN DE-EMBEDDERS
A variety of sophisticated techniques are employed to protect and minimise the effects of cuts to untimed and asynchronous SDI

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

EDH
EDH insertion on output

AUDIO FOLLOW OUTPUT
TTL output is provided on the same D-Type as GPIs 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 10KOhm

GPI OUTPUT LEVELS
Electrically: Open collector transistors 30V, 330Ohm current limit resistors. Pulled up to +5V through 10KOhm

GPI INPUTS
Recall presets 0 to 15

GPI OUTPUTS
SDI input present or audio on input group is present but silent
Audio follow output

LOCAL CONTROL
Board edge with 10 character alphanumeric display

REMOTE CONTROL
RS422/485
19200 baud, 8 bits, 1 stop no parity
Control from frame active front panel and remote panel
Statesman allows control from any PC on a network

AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

AUDIO INPUT
Two analogue stereo pairs or four mono channels. 20 bit quantising A to Ds. High input impedance (20KOhm) balanced

INPUT LEVEL RANGE
0dBFS = +28dBu max / 0dBFS = +12dBu min
Factory set default: 0dBFS = +18dBu or +24dBu by on board link

SIGNAL TO NOISE
-80dBu / -98dBFS (+18dBu) rms., 22Hz to 22kHz typ.

TOTAL HARMONIC DISTORTION
0.006% THD+N rms., 22Hz to 22kHz typ.

INTERCHANNEL CROSSTALK
-98dB at 1kHz, -90dB at 20kHz, rms., typ.

DIP2 AND DIP2-RS DUAL DIGITAL AUDIO INPUT PIGGYBACKS

AUDIO INPUT
Two 20 bit stereo pairs. AES3 110Ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 75Ohm BNC. Set by on board jumper links
Synchronous audio to video 48kHz
Asynchronous audio to video 48kHz + or - 50ppm
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
0.00017%

AOP2 DUAL ANALOGUE AUDIO OUTPUT PIGGYBACK

AUDIO OUTPUTS
Two analogue stereo pairs or four mono channels. 20 bit quantising D to As. Low output impedance (66Ohm) balanced

INPUT LEVEL RANGE
0dBFS = +28dBu max / 0dBFS = +12dBu min
Factory set default: 0dBFS = +18dBu or +24dBu by on board link

SIGNAL TO NOISE
-81dBu / -99dBFS (+18dBu) rms., 22Hz to 22kHz typ.

TOTAL HARMONIC DISTORTION
0.003% THD+N rms., 22Hz to 22kHz typ.

INTERCHANNEL CROSSTALK
-94dB at 1kHz, -90dB at 20kHz, rms., typ.

DOP2-110 AND DOP2-75 DUAL DIGITAL AUDIO OUTPUT PIGGYBACKS

AUDIO OUTPUT
Two 20 bit AES/EBU stereo pairs (two buffered outputs of each on some frame rear modules)
AES: DOP2-110 110Ohm balanced D-Type or DOP2-75 75Ohm unbalanced BNC

ORDERING INFORMATION

SYNNER144	Synchroniser, tracking audio delay and embedder/de-embedder (allows fitting of one audio I/O piggyback)
AIP2	Analogue audio (two stereo pairs) input piggyback
AOP2	Analogue audio (two stereo pairs) output piggyback
DIP2	75Ohm, 110Ohm, HiZ AES/EBU (two stereo pairs) input piggyback. 48kHz only, synchronous to SDI input
DIP2-RS	Resampling version of DIP2. 30-108kHz AES/EBU
DOP2-110	110Ohm AES/EBU balanced (two stereo pairs) output piggyback
DOP2-75	75Ohm AES/EBU unbalanced (two stereo pairs) output piggyback
DCDCV18	PSU 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 4S	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 2A	2U frame with active front panel for up to 12 Crystal Vision modules
Indigo 2S	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
Indigo 1A	1U frame with active front panel for up to six Crystal Vision modules
Indigo 1S	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTA	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTS	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 SYNNER144s in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Suitable for analogue or 110Ohm digital audio. Gives access to all audio connections and two SDI outputs. The default rear module for applications using an input or output piggyback where monitoring is not required
RM05	Four slot frame rear module. One rear module used for three SYNNER144s, allowing 18 SYNNER144s in 4U and nine in 2U. Suitable for analogue or 110Ohm digital audio. Gives access to all audio connections, two SDI outputs, one PAL/NTSC output and a Black and Burst loop-through
RM07	Two slot frame rear module. Allows 12 SYNNER144s in 4U, six in 2U, three in 1U and one in desk top box. Suitable for 75Ohm digital audio. Gives access to all audio connections, two SDI outputs, two PAL/NTSC outputs and SDI and Black and Burst loop-throughs
RM26	Two slot frame rear module. Allows 12 SYNNER144s in 4U, six in 2U, three in 1U and one in desk top box. Suitable for analogue or 110Ohm digital audio. Gives access to all audio connections, 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 SYNNER144s in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Gives access to two SDI outputs, one PAL/NTSC output and a Black and Burst rear module loop-through. Does not have any audio connections. The default rear module for applications which do not use a piggyback
REMIND	19" remote control panel
Statesman	PC Control System