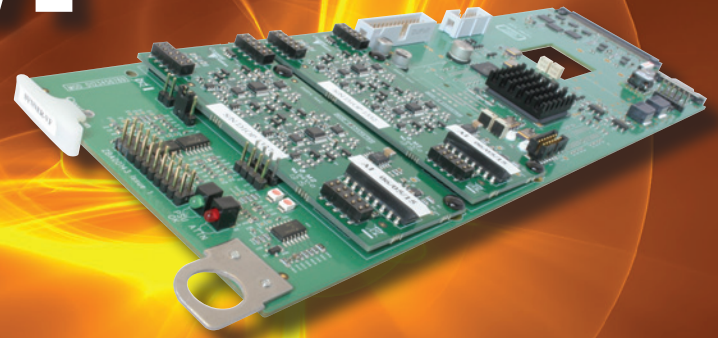# Crystal Vision

Vision SYSTEM

SYNNER-VF

3G/HD/SD video synchroniser, tracking audio delay and embedder/de-embedder

SYNNER-VF combines multiple functions on one card to simplify system designs and save broadcast engineers money and rack space.

The powerful SYNNER-VF combines a video synchroniser, tracking audio delay, embedder, de-embedder, audio processor and video proc-amp. It also includes delay compensation, advanced handling of Dolby E and optional integrated fibre input/output.
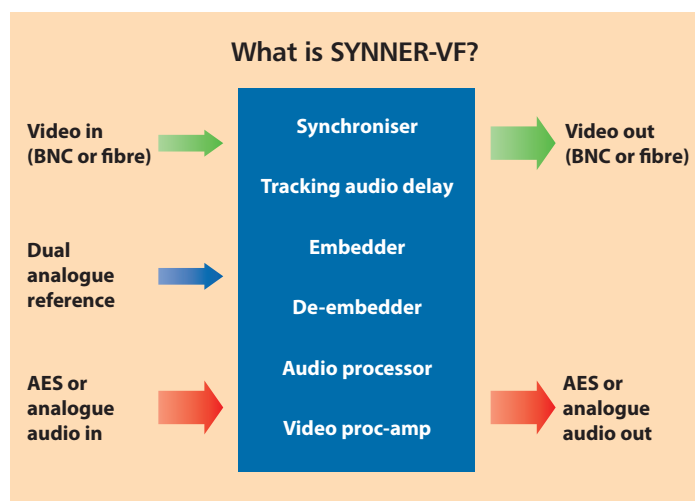
SYNNER-VF's combination of features make it the best solution for any embedding, de-embedding and timing requirements. SYNNER-VF is ideal for any signal timing applications where you need to embed or de-embed external audio – such as on the station output, station input or before a studio mixer.

SYNNER-VF provides flexible embedding and de-embedding of external audio. Using piggybacks SYNNER-VF can input and output a mixture of up to eight AES stereo pairs and four analogue audio stereo pairs (or eight mono channels) – with this external audio easily combined with audio embedded in the incoming video input using the powerful audio routers.

SYNNER-VF gives you more video outputs than Crystal Vision has offered before, and takes advantage of the dual reference syncs distributed from the Vision frame, resulting in easier wiring and the option of a backup reference.

With up to 20 cards fitting in the Vision 3 frame, SYNNER-VF saves you rack space and can be housed alongside any other interface or IP cards from the Vision range.

- Simplify your system design with multiple functionality on one card

- Works with 3Gb/s, HD and SD video and both AES and analogue audio

- Use it as a synchroniser or fixed delay line: synchronise incoming video signals not locked to the local reference or compensate for timing delays within the video system

- Flexible embedding and de-embedding of external audio: use piggybacks to input and output up to eight AES stereo pairs and four analogue audio stereo pairs (or eight mono channels)

- Powerful audio routing: full channel shuffling and overwriting

- Easy to match all your signals: with flexible video and audio delays

- Ideal for Dolby E users: synchronise video containing mixture of Dolby E and linear AES within same audio group and auto-correct timing errors with the guardband

- Optimise the audio: with extensive audio processing

- Optimise the video: with video proc-amp including RGB and YUV lift and gain controls

- Optional integrated fibre input/output connectivity means you won't be limited by cable lengths

- Get peace of mind by knowing the status of your signal: easily monitor a large number of video and audio alarms

- Flexible remote control and monitoring using frame integrated control panel, VisionPanel remote control panel, SBB-4 smart button box, ASCII and JSON protocols, SNMP and the web browser-based VisionWeb Control

- Save rack space: 96mm x 325mm card allows up to 20 SYNNER-VF in 3U

What is SYNNER-VF?

Video in
(BNC or fibre) → Synchroniser → **Video out**
(BNC or fibre)

Tracking audio delay

Dual
analogue → Embedder
reference

De-embedder

AES or
analogue → Audio processor → **AES or**
audio in   **analogue**
Video proc-amp   **audio out**

USE IT WITH DIFFERENT SIGNALS

SYNNER-VF can be used with a variety of signals. It works with 3Gb/s, HD and SD video and with synchronous or asynchronous 48kHz AES, synchronous Dolby E and analogue audio.

SYNNER-VF is designed to accept an untimed feed of video and embed up to eight stereo pairs of external audio, producing timed video and embedded audio – or alternatively to take an untimed feed of video containing embedded audio and produce video and separate audio, timed to station syncs.

THE IDEAL SYNCHRONISER FOR DOLBY E USERS

SYNNER-VF is ideal for Dolby E users. It allows very flexible handling of Dolby E, with Dolby E data automatically detected and processed appropriately – ensuring it is routed in such a way that you can't destroy the data.

SYNNER-VF can embed or de-embed Dolby E and will synchronise video containing Dolby E, linear audio or both – allowing a mixture of Dolby E and linear AES within a single audio group. How? It separates the Dolby E and linear audio and synchronises both types in the appropriate way before re-embedding the audio. When transporting Dolby E, any Dolby E stream must be treated as a stereo pair and no audio processing applied to ensure integrity of the audio.

It is important to ensure that when Dolby E data is embedded, the guardband is in the correct place. SYNNER-VF has the ability to auto-correct timing errors with the guardband, aligning it correctly with the output video switching point. SYNNER-VF can also use incoming Ancillary Timecode (ATC) or an interlaced reference signal to determine the field sequence of a High Definition progressive video output, which helps to ensure that Dolby E has its guardband correctly positioned. The invert output sequence control allows the Dolby E output to be timed in anti-phase to the ATC or interlaced reference, if required, to allow for subsequent processing.

SYNNER-VF's additional video delay can be used to compensate for the one frame of delay introduced when converting to or from Dolby E.

SYNCHRONISE THE VIDEO

SYNNER-VF can both synchronise incoming video signals which are not locked to the local reference and compensate for timing delays within the video system.

It has two operational modes: synchroniser and delay line. Synchroniser mode is ideal for external sources that are not timed to station references such as satellite or remote contribution feeds. In synchroniser mode SYNNER-VF takes its timing from either of the two references connected via the Vision frame and will automatically synchronise sources that are up to one frame apart, fixing any incorrect frame rates plus any delays. Audio signals can optionally be made to track this dynamic video delay to maintain lip-sync. Further fixed delays can be added for matching purposes.

The ability to cross-lock allows SYNNER-VF to conveniently use any existing timing signals, with a 3Gb/s, HD or SD input referenced to either HD tri-level syncs or SD Black and Burst. There are ten options for the reference selection, selectable via VisionWeb. (See the Specification for full details.) If the reference and video frame rate become incompatible, the card will attempt to use the other listed reference source and if that is not compatible, lock to the input video.

Delay mode takes its timing from the video input and is ideal for when the frame rate is correct but the source has been passed through equipment such as a chroma keyer, DVE or standards converter and therefore been delayed for a few lines. In delay mode the synchroniser is bypassed and just the bulk delays are active. (See next section.) Delay mode is activated either manually by selecting the Video>Freerun option or automatically if the selected references fail.

Both manual and automatic freeze are available. You can choose to show the last good frame or alternatively a black or blue screen.

EASY TO MATCH ALL YOUR SIGNALS

As well as featuring short minimum delays for both the audio and video to help prevent system lip-sync complications, SYNNER-VF offers a flexible range of video and audio delays to help match all your signals and ensure Dolby alignment. Some of these delays are of fixed length, while others are dynamic.
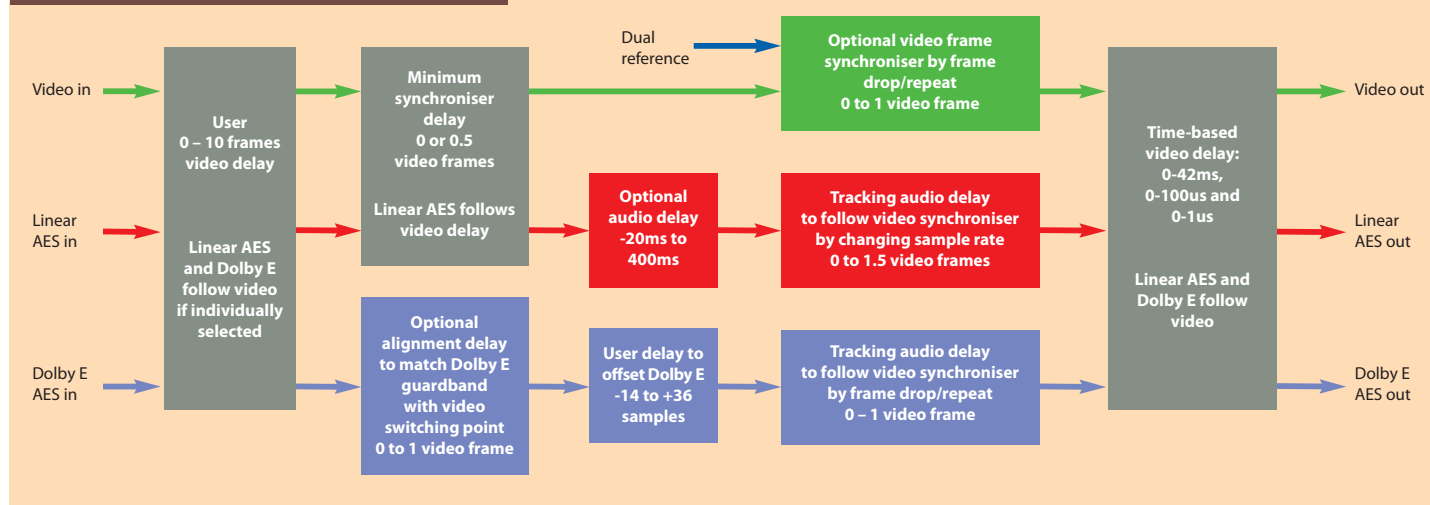
For the video…
In synchroniser mode the synchroniser delay automatically adjusts over a range of 0 to 1 frame to provide the desired output timing. SYNNER-VF makes it easy to compensate for mistimed sources elsewhere in your system. The output timing can be fully adjusted with respect to the reference using three time-based controls (0 - 42ms adjustable in 0.1ms steps, 0 - 100us adjustable in 1us steps and 0 - 1us adjustable in 5ns steps), while an additional ten frames of video delay (adjustable in one frame steps) allows compensation for any big system delays – such as those created by Dolby E encoding and decoding or transcoding to AC3 and re-embedding. Each supported video format can have independent timing adjustments. The Minimum synchroniser delay allows a further 0.5 frame delay to be added to the video (and linear audio) to ensure correct Dolby E alignment.

In delay mode the video delay can be adjusted using up to ten frames of video delay (adjustable in one frame steps) plus the three time-based controls (0 - 42ms, 0 - 100us and 0 - 1us), with independent timing adjustments for each supported video format.

For the audio…
An internal tracking audio delay (TAD) 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. There are two tracking audio delays: one for the linear audio and the other for Dolby E. The linear audio TAD will be between 0 and 1.5 frames and have the same value as the video synchroniser delay plus the 0.5 frame video

Understanding the video and audio delays

Video in → **User 0 – 10 frames video delay** / **Linear AES and Dolby E follow video if individually selected** → **Minimum synchroniser delay 0 or 0.5 video frames** / **Linear AES follows video delay** → **Dual reference** → **Optional video frame synchroniser by frame drop/repeat 0 to 1 video frame** → **Time-based video delay: 0-42ms, 0-100us and 0-1us** / **Linear AES and Dolby E follow video** → **Video out**

Linear AES in → **Optional audio delay -20ms to 400ms** → **Tracking audio delay to follow video synchroniser by changing sample rate 0 to 1.5 video frames** → **Linear AES out**

Dolby E AES in → **Optional alignment delay to match Dolby E guardband with video switching point 0 to 1 video frame** → **User delay to offset Dolby E -14 to +36 samples** → **Tracking audio delay to follow video synchroniser by frame drop/repeat 0 – 1 video frame** → **Dolby E AES out**

delay. The Dolby E TAD will be between 0 and 1 frame and have the same value as the video synchroniser delay.

The audio is normally delayed by the same amount as the video but an adjustable audio delay of up to 400ms on each stereo pair of linear AES will compensate for any delay between the incoming video and audio signals. Alternatively the audio can be set to be less than the video delay to compensate for audio that is late.

A fixed audio delay of up to ten frames can be added to both the linear AES and Dolby E to match the equivalent video delay.

The linear AES will follow the Minimum synchroniser delay set for the video.

If a Dolby E channel is set for automatic alignment an audio delay of 0 to 1 video frame automatically delays the Dolby E signal so that the guardband is correctly aligned with the video timing.

The -14 to +36 Dolby E samples adjustable delay in the Dolby E path allows the position of the Dolby E frame relative to the video to be nudged, deliberately offsetting the Dolby E from its correct position to compensate for processing further downstream.

EMBED AND DE-EMBED ANALOGUE OR DIGITAL AUDIO (OR BOTH)

SYNNER-VF embeds and de-embeds external audio by fitting up to two audio piggybacks to the main card. These external channels can be routed to or from any of the four audio groups processed by SYNNER-VF.

Three different piggybacks are available. The 3G-AIP2 is used for inputting two stereo pairs or four mono channels of external analogue audio. The 3G-AOP2 is used for outputting two stereo pairs or four mono channels of analogue audio. The DIOP4 is used for inputting or outputting four stereo pairs of external digital audio; four bi-directional AES ports allow each stereo pair to be independently configured as input or output.

It is possible to fit two of the same piggybacks or to fit two different piggybacks to create the product required. For example, analogue and digital piggybacks can be mixed to create a hybrid system – ideal for those using analogue microphones with digital audio mixers in the studio. SYNNER-VF is aware of which piggybacks are fitted and adjusts the menus and audio routers to reflect the options available.

The following table shows the combinations of piggybacks allowed:

Front position (nearest handle)	Rear position (nearest edge connector)	This allows you to...
None	None	Shuffle or process audio from your input video
DIOP4	None	Input and/or output four external AES stereo pairs (each stereo pair configured independently as input or output)
3G-AIP2	None	Input two external analogue stereo pairs (or four mono channels)
3G-AOP2	None	Output two analogue stereo pairs (or four mono channels) externally
DIOP4	DIOP4	Input and/or output eight external AES stereo pairs (each stereo pair configured independently as input or output)
DIOP4	3G-AIP2	Input and/or output four external AES stereo pairs (each stereo pair configured independently as input or output) and input two external analogue stereo pairs (or four mono channels)
DIOP4	3G-AOP2	Input and/or output four external AES stereo pairs (each stereo pair configured independently as input or output) and output two analogue stereo pairs (or four mono channels) externally
3G-AIP2	3G-AIP2	Input four external analogue stereo pairs (or eight mono channels)
3G-AIP2	3G-AOP2	Input two external analogue stereo pairs (or four mono channels) and output two analogue stereo pairs (or four mono channels) externally
3G-AOP2	3G-AOP2	Output four analogue stereo pairs (or eight mono channels) externally
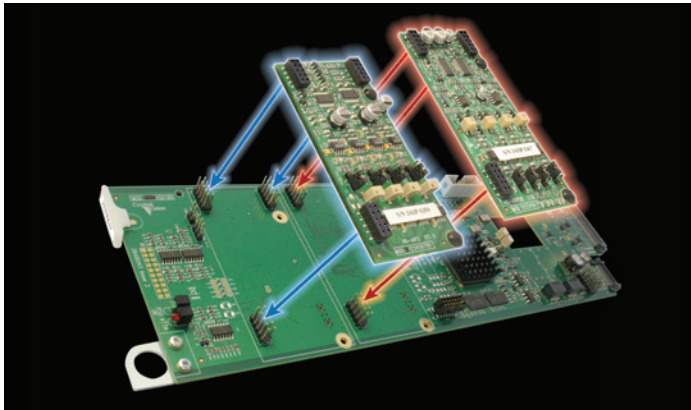
POWERFUL AUDIO ROUTING

SYNNER-VF includes powerful audio routing, allowing full shuffling and overwriting of the mono channels taken from the incoming video input and input piggybacks.

At the heart of SYNNER-VF are two mono audio routing matrices. The first is the Embedded output router which is used to select which of up to 32 audio input channels (16 channels de-embedded from the input video and 16 channels from two input piggybacks) should be embedded into up to four groups on the output video. HANC cleaning removes the original version of old groups. The second is the Discrete output router and is used to select which of up to 32 audio input channels should be output as external AES or analogue audio.

OPTIMISE THE AUDIO

SYNNER-VF includes audio processing of the linear AES.

The audio levels can be increased or decreased to match the rest of your system, or even be muted to silence. There are 32 audio gain controls, one for each of the available input channels. Each gain control is independently adjustable between +18dB and -18dB in 0.1dB steps.

Each of the audio input channels can also be individually inverted – allowing you to correct for any reversed wiring of differential pairs. Stereo to mono conversion is available to help those broadcasting a multi-language service.

Audio resampling is set by default (except for Dolby E) and is used to seamlessly match the timing of audio signals when the user-controlled delay is altered.

OPTIMISE THE VIDEO

SYNNER-VF includes a video proc-amp for picture optimisation, with adjustment of the video gain, black level and independent RGB and YUV gains.

FIBRE CONNECTIVITY – ON THE CARD

With SYNNER-VF you can have fibre input or output straight into the card – ideal when you need to send and receive signals beyond the local equipment bay and giving you even more functionality on a single card. You can come in on fibre, embed, de-embed, synchronise. Or you can go out on fibre once you've synchronised and embedded. Just order either the FIP-VF fibre input option, FOP-VF fibre output option or FIO-VF fibre input and output option.

Designed for SMPTE 297-2006 short-haul applications, the FIP-VF is used to receive an optical input and the FOP-VF to transmit an optical output using a Class 1 laser. The FIO-VF can do both – giving you simultaneous fibre input and output.

With a FIP-VF or FIO-VF fitted you can select your video input source to be taken either from the input BNC or the optical input.

Having the fibre integral to the board reduces the need to use up additional rack space for separate fibre optic transmitters and receivers – as well as saving you money.

SYNNER-VF can also support a CWDM laser if required.

REMOTE CONTROL

All control is done remotely. The control and monitoring options for SYNNER-VF include an integrated control panel on the Vision 3 frame, the VisionPanel remote control panel, the SBB-4 smart button box, our ASCII and JSON protocols, SNMP and the VisionWeb web browser control.

SYNNER-VF is very straightforward to operate. See the REMOTE CONTROL section of the Specification for the extensive list of features that can be controlled and monitored.

The interactive VisionWeb GUIs for SYNNER-VF are available at www.crystalvision.tv and allow you to explore the full functionality of the product.
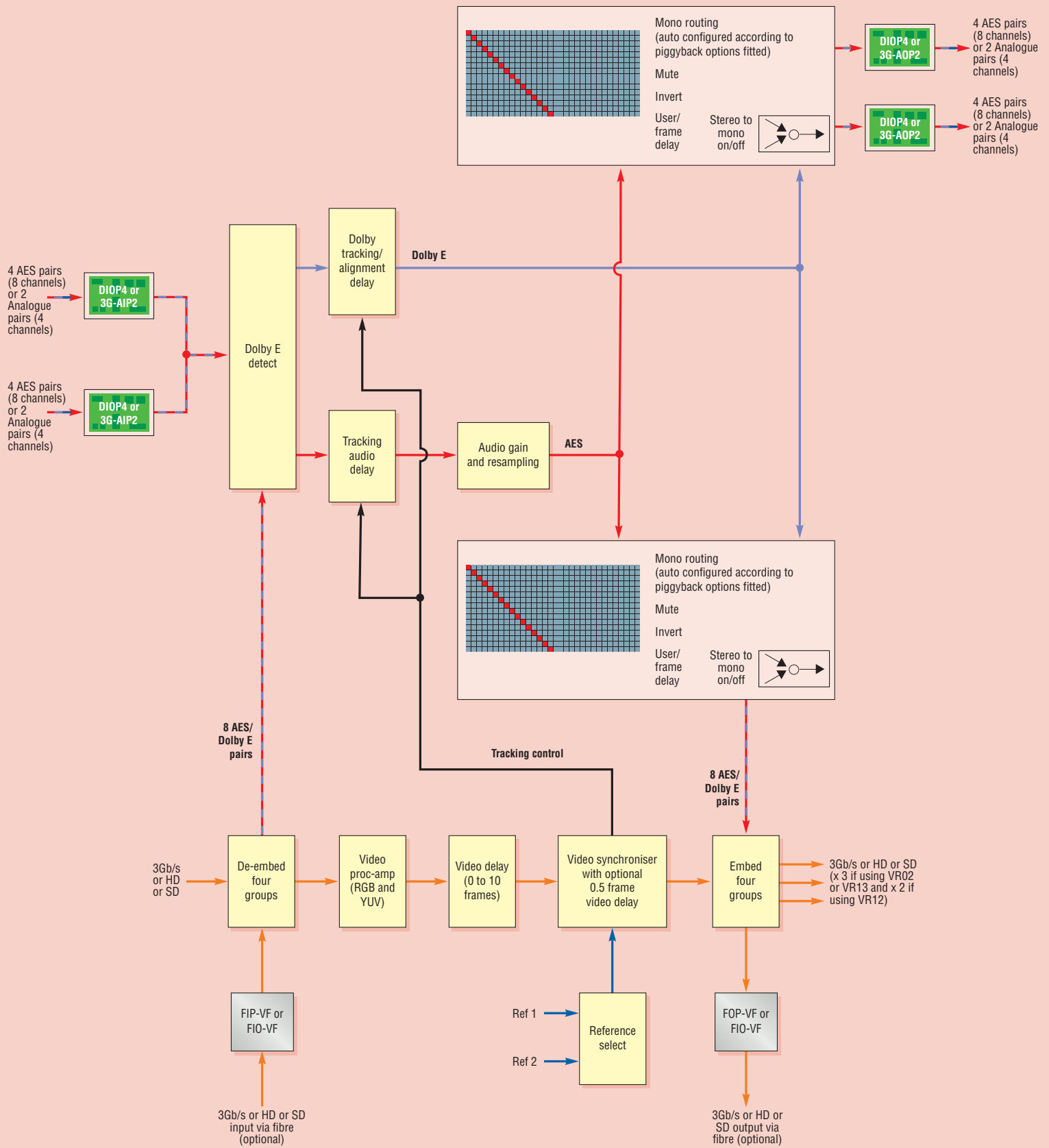

SAVE RACK SPACE

Housed in the Vision frames, SYNNER-VF is a space-saving 96mm x 325mm card that sits in one frame slot – allowing up to 20 synchronisers in 3U, depending on the rear module fitted.

SYNNER-VF can be used with three different frame rear modules to access the inputs and outputs. The single slot VR02 is used for 110 ohm AES or analogue audio applications which use BNCs for the SDI and provides three video outputs. The single slot VR12 is designed for those using 110 ohm AES or analogue audio with a fibre input or output option. It provides two BNC video outputs with the FIP-VF fibre input option fitted, and three video outputs (one on fibre and two on BNC) with either the FOP-VF fibre output option or the FIO-VF fibre input and output option fitted. The double slot VR13 is designed for all 75 ohm AES applications, including those using a fibre input or output option. It provides three BNC video outputs with the FIP-VF or when no fibre option is fitted, and four video outputs (one on fibre and three on BNC) with either the FOP-VF or the FIO-VF.
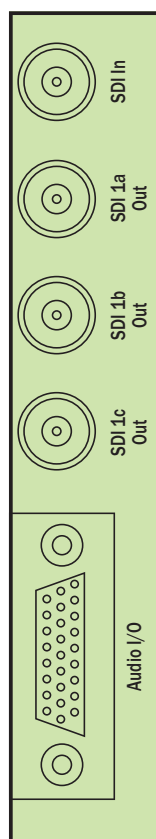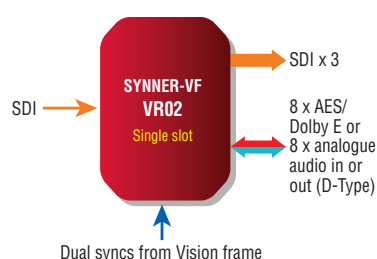
Mono routing
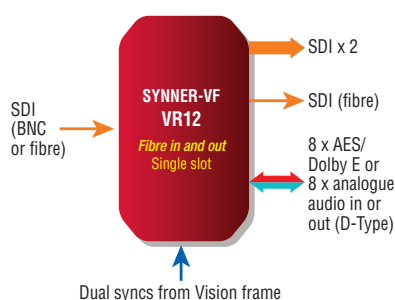(auto configured according to
piggyback options fitted)

Mute

Invert

User/
frame
delay

Stereo to
mono
on/off

DIOP4 or
3G-AOP2

4 AES pairs
(8 channels)
or 2 Analogue
pairs (4
channels)

DIOP4 or
3G-AOP2

4 AES pairs
(8 channels)
or 2 Analogue
pairs (4
channels)

Dolby
tracking/
alignment
delay

Dolby E

4 AES pairs
(8 channels)
or 2
Analogue
pairs (4
channels)

DIOP4 or
3G-AIP2

Dolby E
detect

4 AES pairs
(8 channels)
or 2
Analogue
pairs (4
channels)

DIOP4 or
3G-AIP2

Tracking
audio
delay

Audio gain
and resampling

AES

Mono routing
(auto configured according to
piggyback options fitted)

Mute

Invert

User/
frame
delay

Stereo to
mono
on/off

**8 AES/
Dolby E
pairs**

Tracking control

**8 AES/
Dolby E
pairs**

3Gb/s
or HD
or SD

De-embed
four
groups

Video
proc-amp
(RGB and
YUV)

Video delay
(0 to 10
frames)

Video synchroniser
with optional
0.5 frame
video delay

Embed
four
groups

3Gb/s or HD or SD
(x 3 if using VR02
or VR13 and x 2 if
using VR12)

FIP-VF or
FIO-VF

Ref 1

Ref 2

Reference
select

FOP-VF or
FIO-VF

3Gb/s or HD or SD
input via fibre
(optional)

3Gb/s or HD or
SD output via
fibre (optional)

For 110 ohm AES or analogue audio applications (BNC SDI):

SDI →

SYNNER-VF VR02 Single slot

→ SDI x 3

→ 8 x AES/ Dolby E or 8 x analogue audio in or out (D-Type)

↑ Dual syncs from Vision frame

SDI In
SDI 1a Out
SDI 1b Out
SDI 1c Out
Audio I/O

VR02

For 110 ohm AES or analogue audio applications (fibre SDI):

SDI (BNC or fibre) →

SYNNER-VF VR12 *Fibre in and out* Single slot

→ SDI x 2

→ SDI (fibre)

→ 8 x AES/ Dolby E or 8 x analogue audio in or out (D-Type)

↑ Dual syncs from Vision frame

NB. Select FIP-VF option for fibre in, FOP-VF option for fibre out and FIO-VF option for fibre in and out

SDI In 1
SDI 1a Out
SDI 2 In / SDI 1 Out
SDI 1b Out
Audio I/O
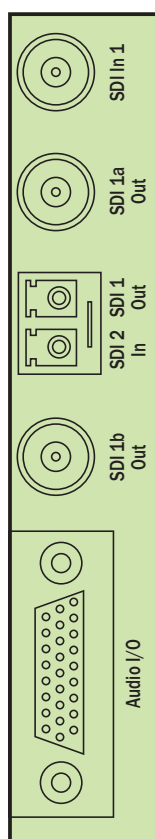
VR12

For all 75 ohm AES applications (BNC and fibre SDI):

SDI (BNC or fibre) →

SYNNER-VF VR13 *Fibre in and out* Double slot

→ SDI x 3

→ SDI (fibre)

→ 8 x AES/ Dolby E in or out (BNC)

↑ Dual syncs from Vision frame
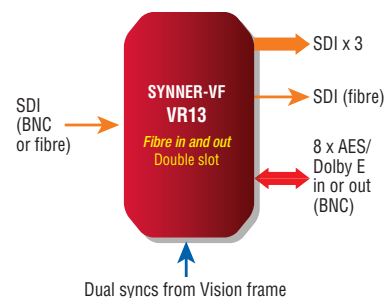
NB. Select no fibre option for BNC SDI 75 ohm AES applications, FIP-VF option for fibre in, FOP-VF option for fibre out and FIO-VF option for fibre in and out

SDI In | AES 2 I/O
SDI 1a Out | AES 3 I/O
SDI In / SDI Out | AES 4 I/O
| AES 5 I/O
SDI 1b Out | AES 6 I/O
SDI 1c Out | AES 7 I/O
AES 1 I/O | AES 8 I/O
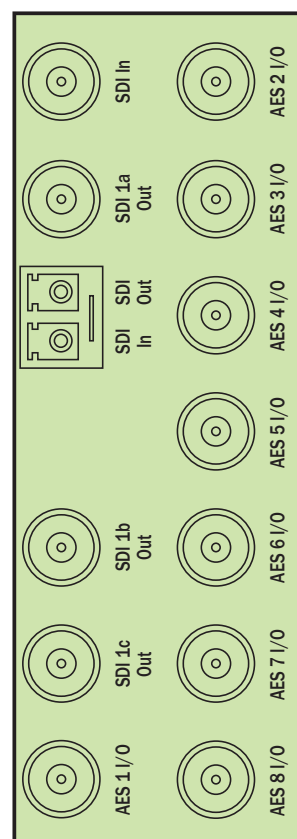
VR13

SYNNER-VF

MECHANICAL

Standard Vision card 96mm x 303mm (96mm x 325mm including finger pull)

Weight: 180g (with no piggybacks); 220g (with two piggybacks)

Power consumption: 10 Watts (SYNNER-VF); 1.6 Watts (3G-AIP2); 1.5 Watts (3G-AOP2); 1 Watt (DIOP4); 0.6 Watts (FIP-VF and FOP-VF); 1 Watt (FIO-VF)

VIDEO INPUT

One 3Gb/s or HD or SD input

When using FIP-VF or FIO-VF fibre input options allows selection between one optical and one electrical input

270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A
The video formats supported are 625, 525, 720p50, 720p59.94, 1080PsF23.98, 1080PsF24, 1080i50, 1080i59.94, 1080p50 and 1080p59.94
3Gb/s cable equalisation up to 100m using Belden 1694A. HD cable equalisation up to 140m with Belden 1694A or equivalent (approx. 100m with

Belden 8281). SD cable equalisation >250m Belden 8281 or equivalent

Automatic de-embedding to SMPTE 272 or SMPTE 299-1

INTEGRATED FIBRE OPTIONS

SYNNER-VF can be given integrated fibre connectivity by fitting the FIP-VF fibre input option, FOP-VF fibre output option or FIO-VF fibre input and output option. The chosen option should be fitted at the factory

To access the optical inputs or outputs a VR12 (for 110 ohm AES or analogue audio) or VR13 (for 75 ohm AES) frame rear module must be used
FIP-VF, FOP-VF and FIO-VF meet the SMPTE 297-2006 short-haul specification, allowing operation with single-mode and multi-mode fibre
Connector type: LC

FIP-VF or FIO-VF input:

Optical wavelength: 1260-1620nm

Input level maximum: -1dBm

Input level minimum: Typical -20dBm (-18dBm 3Gb/s pathological)

FOP-VF or FIO-VF output:

Optical power: Max 0.0dBm, min -5.0dBm

Fibre pigtail: Single-mode 9/125uM

Optical wavelength: 1290-1330nm (1310 typical)

Extinction ratio: 7.5dB

Laser safety classification: Class 1 FDA and IEC60825-1 Laser Safety compliant

Loss of input will automatically disable the laser output. The output can also be manually enabled and disabled

CWDM laser can be fitted on request. The 18 output wavelengths defined by the ITU are 1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451, 1471, 1491, 1511, 1531, 1551, 1571, 1591 and 1611nm. For CWDM, order the FOP-CWDM-VF and specify the wavelength required

VIDEO OUTPUTS

Up to three 3Gb/s, HD or SD outputs depending on audio impedance and frame rear module used
Using single slot VR02 rear module (110 ohm AES or analogue audio): Three BNC video outputs
Using single slot VR12 (110 ohm AES or analogue audio):

- With FIP-VF fibre input option: Two BNC video outputs
- With FOP-VF fibre output option: Three video outputs (one on fibre and two on BNC)
- With FIO-VF fibre input and output option: Three video outputs (one on fibre and two on BNC)
Using double slot VR13 (75 ohm AES):
- With no fibre option: Three BNC video outputs
- With FIP-VF fibre input option: Three BNC video outputs
- With FOP-VF fibre output option: Four video outputs (one on fibre and three on BNC)
- With FIO-VF fibre input and output option: Four video outputs (one on fibre and three on BNC)

Serial output: 270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A. Output follows the input format
Audio is embedded to SMPTE 272 or SMPTE 299-1
Automatic freeze is available when input fails through loss of signal. The user can specify to show the last good frame or alternatively a black or blue screen or 100% colour bars (with or without an

initial delay of three seconds). No output can also be selected

A test pattern output can be selected to replace the normal video output, with the options including 'Freeze frame' which allows SYNNER-VF to be used as a simple still store

AUDIO INPUTS AND OUTPUTS

Up to two piggybacks can be added to the main card. Each piggyback allows either input or output of four external AES stereo pairs or two external analogue stereo pairs (four mono channels). These channels can be routed to or from any of the four audio groups processed by SYNNER-VF

Use 3G-AIP2 to input analogue audio. Fit one piggyback for two stereo pairs (four mono channels) or two piggybacks for four stereo pairs (eight mono channels)

Use 3G-AOP2 to output analogue audio. Fit one piggyback for two stereo pairs (four mono channels) or two piggybacks for four stereo pairs (eight mono channels)

Use bi-directional DIOP4 to input or output 75 ohm or 110 ohm AES audio. Select one piggyback for four stereo pairs or two piggybacks for eight stereo pairs (with each stereo pair configured independently as either 24 bit AES input or output)

Different piggybacks can be used together, allowing embedding and de-embedding at same time and mixture of analogue and digital audio

There are rules regarding which piggybacks can be fitted in the front and rear positions

SYNNER-VF can embed or de-embed analogue audio, synchronous 48kHz AES, asynchronous 48kHz AES and synchronous Dolby E. Linear AES can be resampled. Dolby E cannot be resampled. A manual resampler on/off control allows SYNNER-VF to embed synchronous compressed audio such as AC3

DOLBY E HANDLING

Dolby E data will be automatically detected and processed appropriately

Any of the audio sources can contain Dolby E SYNNER-VF allows a mixture of Dolby E and linear AES within a single audio group, separating the Dolby E and linear audio and synchronising both types in the appropriate way before re-embedding the audio

When routing Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied

SYNNER-VF can auto-correct timing errors with the guardband. Dolby E will be delayed by the same amount as the video, except for any change required to align it correctly with the output video switching point

SYNNER-VF can use incoming ancillary data timecode (ATC) or an interlaced reference signal to determine the field sequence of a High Definition progressive video output, which helps to ensure that Dolby E has its guardband correctly positioned

The invert output sequence control allows the Dolby E output to be timed in anti-phase to the ATC or interlaced reference, if required, to allow for subsequent processing

SYNCHRONISER TIMING ADJUSTMENTS AND REFERENCES

Two tri-level syncs or analogue Black and Burst references (Reference 1 and Reference 2), connected via the Vision frame

3Gb/s, HD or SD source can use either type of reference. When cross-locking it is necessary for both the video input and reference to share the same frame rate

There are ten options for the reference selection, selectable via VisionWeb. The hierarchy runs from left to right: if the reference and video frame rate become incompatible, the card will attempt to use the other listed reference source and if that is not compatible, lock to the input video:

- Ref1>Ref2>Video>Freerun: Will attempt to use Reference 1 initially, then Reference 2, then video, then will freerun
- Ref1>Video>Freerun: Will attempt to use Reference 1 initially, then video, then will freerun

- Ref1>Ref2>Freerun: Will attempt to use Reference 1 initially, then Reference 2, then will freerun
- Ref1>Freerun: Will attempt to use Reference 1 initially, then will freerun
- Ref2>Ref1>Video>Freerun: Will attempt to use Reference 2 initially, then Reference 1, then video, then will freerun
- Ref2>Video>Freerun: Will attempt to use Reference 2 initially, then video, then will freerun
- Ref2>Ref1>Freerun: Will attempt to use Reference 2 initially, then Reference 1, then will freerun
- Ref2>Freerun: Will attempt to use Reference 2 initially, then will freerun
- Video>Freerun: Will attempt to use video initially, then will freerun
- Freerun: Will freerun

When Auto relock enable is selected, the card will automatically relock when a lost reference is restored. Selecting Force lock (with Auto relock disabled) will force the synchroniser to relock after a reference is restored, and can be activated at a non-critical time to avoid video disturbance

In synchroniser mode SYNNER-VF takes its timing from the selected reference and will automatically synchronise sources that are up to a frame apart. Further fixed delays can be added for matching purposes (see VIDEO DELAY section)

In delay mode timing is derived from the 3Gb/s, HD or SD input, with further fixed delays added for matching purposes (see VIDEO DELAY section). Delay mode is activated either manually by selecting the Video>Freerun option or automatically if the selected references fail

DELAY THROUGH CARD

Minimum video in to out delay: <1 line
Minimum embedding audio delay: <200us

VIDEO DELAY

Synchroniser mode:

0 to 1 frame video synchroniser delay

In synchroniser mode the output timing can be fully adjusted with respect to the reference using three time-based controls: 0 - 42ms adjustable in 0.1ms steps, 0 - 100us adjustable in 1us steps and 0 - 1us adjustable in 5ns steps. Independent timing adjustments for each supported video format

An additional ten frames of video delay (adjustable in one frame steps) allows compensation for any big system delays. Independent timing adjustments for each supported video format

Fixed Minimum synchroniser delay of 0 or 0.5 video frames can change the Dolby E timing by +/- 0.5 frames relative to the video and allows repeated embed/de-embed cycles with less risk of the Dolby E getting progressively later relative to the video

Delay mode:

In delay mode the video delay can be adjusted using up to ten frames of video delay (adjustable in one frame steps) plus the three time-based controls (0 - 42ms in 0.1ms steps, 0 - 100us in 1us steps and 0 - 1us in 5ns steps). Independent timing adjustments for each supported video format

AUDIO TIMING ADJUSTMENTS

Audio is routed through a tracking audio delay (TAD). It tracks the video delay, running the audio fast or slow to ensure the video and linear audio stay correctly timed and to avoid lip sync errors. The linear audio TAD will be between 0 and 1.5 frames and have the same value as the video synchroniser delay plus the 0.5 frame video delay. The Dolby E TAD will be between 0 and 1 frame and have the same value as the video synchroniser delay

The audio is normally delayed by the same amount as the video but an adjustable audio delay of between -20ms to 400ms on each stereo pair of linear AES will compensate for any delay between the incoming video and audio signals. Alternatively the audio can be set to be less than the video delay to compensate for audio that is late. Delay is either on or off for any given stereo pair

A fixed audio delay for both linear AES and Dolby E of up to ten frames is available to match the equivalent video delay

If a Dolby E channel is set for automatic alignment an audio delay of 0 to 1 video frame automatically

delays the Dolby E signal so that the guardband is correctly aligned with the video timing

The -14 to +36 Dolby E samples adjustable delay in the Dolby E path allows the position of the Dolby E frame relative to the video to be nudged, deliberately offsetting the Dolby E from its correct position to compensate for processing further downstream

AUDIO REPLACE

SYNNER-VF has two input/output mono audio routing matrices. The first is the Embedded output router, the second is the Discrete output router. This second router will not be shown if neither 3G-AOP2 nor DIOP4 piggybacks are fitted

These audio routers are auto configured according to the piggyback options fitted to the motherboard, to a maximum of 32 x 16 for each router

HANC cleaning removes the original version of old groups

AUDIO PROCESSING

Audio processing can be applied to linear AES only. It cannot be applied to Dolby E

Gain level adjustment on each channel between -18dB and +18dB in 0.1dB steps with 0dB calibration. There are a total of 32 audio gain controls, for the 16 channels of audio de-embedded from the video audio and 16 channels of external AES audio

Mute

Inversion

Stereo to mono conversion

VIDEO PROCESSING

Video proc-amp for picture optimisation, with adjustment for the video gain, black level and independent RGB and YUV gains

Video gain: Modify the gain of the whole video signal from 0 to +200%

RGB lift: Offset the colour component by +/- 10%

RGB gain: Modify the gain of the colour component from +80% to +120%

YUV lift: Offset the luminance, U or Y component by +/- 10%

YUV gain: Modify the luminance, U or Y component gain from 0 to +200%

ANCILLARY DATA

Ancillary data passed unless set to blank (by enabling VANC blanking)

AUDIO SILENCE

An audio level check is performed. The audio silence level setting can be selected from -48dBFS, -54dBFS, -60dBFS, -66dBFS, -72dBFS, -78dBFS, -84dBFS and -90dBFS. If the audio signal level falls below the selected level for a period of time from 2 to 120 seconds, then an alarm is triggered. The audio on the channels must be continuously silent for the full period – a single non-silent sample restarts the delay period

LED INDICATION OF:

Power okay

PRESETS

The current card settings can be saved in one of 16 locations to be recalled as required

Presets can be backed up and restored using the Vision frame

REMOTE CONTROL

Software:

VisionWeb Control is available via the web server on the frame and allows control and monitoring using a standard web browser on a computer, tablet or phone

SNMP monitoring and control available as standard

Control using ASCII and JSON protocols

Hardware:

Control from integrated control panel on Vision 3 frame

Control from VisionPanel 3U remote panel

SBB-4 smart button box connects to the frame via Ethernet and provides four programmable LCD switches (which are configured for each order). The SBB-4 uses information from VisionWeb for settings. Uses Power over Ethernet so must be used with PoE enabled switch

Checks can be performed on video and audio parameters (see below), with warnings of any problems provided via SNMP traps. The video black and video frozen parameters can be delayed by up to 60 seconds before an alarm is asserted to prevent false alarming during brief video pauses. The audio parameters can be delayed by up to 120 seconds before an alarm is asserted to prevent false alarming during quiet audio periods

Remote control of minimum synchroniser delay (0 or 0.5 frames), video format to delay, video delay setting, reference source, auto relock enable and force relock, Reference 1 type, Reference 2 type, what to show on video input loss, test pattern and test pattern format, RGB proc-amp, YUV proc-amp, VANC blank enable, lock output to ATC input, invert output sequence, laser input or output enable, video black time delay, video frozen time delay, AES I/O configuration and termination, audio silence indication time delay and threshold, inversion of any of the individual embedded and discrete audio channels, resampling of any of the embedded and discrete audio channel pairs, mono any of the embedded and discrete audio channel pairs, muting any of the embedded and discrete audio channel pairs, audio gain, user audio delay (-20ms to 400ms), matching the audio delay to the video delay on any of the channel pairs from the embedded and discrete audio, selecting the user audio delay for any of the channel pairs from the embedded and discrete audio, selecting the tracking audio delay for any of the channel pairs from the embedded and discrete audio, Dolby E alignment for any of the channel pairs from the embedded and discrete audio, embedded output router, discrete output router, audio groups to output, embedder mode (SMPTE or Sony), card defaults and presets save and recall

Remote monitoring of the following:

As standard:

Video present
Video black
Video frozen
Video format
Reference 1 present
Reference 1 format
Reference 1 incompatible
Reference 2 present
Reference 2 format
Reference 2 incompatible
Input group 1 present
Input group 2 present
Input group 3 present
Input group 4 present
Output group 1 present
Output group 2 present
Output group 3 present
Output group 4 present
All audio silent
Front and rear piggyback types
Current delay between video input and reference in video lines and pixels
Active reference source
Input ATC present
Audio present on input group 1 channel 1
Audio present on input group 1 channel 2
Audio present on input group 1 channel 3
Audio present on input group 1 channel 4
Audio present on input group 2 channel 5
Audio present on input group 2 channel 6
Audio present on input group 2 channel 7
Audio present on input group 2 channel 8
Audio present on input group 3 channel 9
Audio present on input group 3 channel 10
Audio present on input group 3 channel 11
Audio present on input group 3 channel 12
Audio present on input group 4 channel 13
Audio present on input group 4 channel 14
Audio present on input group 4 channel 15
Audio present on input group 4 channel 16
Silence group 1 channel 1
Silence group 1 channel 2

Silence group 1 channel 3
Silence group 1 channel 4
Silence group 2 channel 5
Silence group 2 channel 6
Silence group 2 channel 7
Silence group 2 channel 8
Silence group 3 channel 9
Silence group 3 channel 10
Silence group 3 channel 11
Silence group 3 channel 12
Silence group 4 channel 13
Silence group 4 channel 14
Silence group 4 channel 15
Silence group 4 channel 16
Dolby E on input group 1 channels 1 and 2
Dolby E on input group 1 channels 3 and 4
Dolby E on input group 2 channels 5 and 6
Dolby E on input group 2 channels 7 and 8
Dolby E on input group 3 channels 9 and 10
Dolby E on input group 3 channels 11 and 12
Dolby E on input group 4 channels 13 and 14
Dolby E on input group 4 channels 15 and 16

With front DIOP4 fitted:
AES 1 present
AES 2 present
AES 3 present
AES 4 present
Silence AES 1
Silence AES 2
Silence AES 3

Silence AES 4
Dolby E on AES 1
Dolby E on AES 2
Dolby E on AES 3
Dolby E on AES 4

With rear DIOP4 fitted:
AES 5 present
AES 6 present
AES 7 present
AES 8 present
Silence AES 5
Silence AES 6
Silence AES 7
Silence AES 8
Dolby E on AES 5
Dolby E on AES 6
Dolby E on AES 7
Dolby E on AES 8

With front 3G-AIP2 fitted:
Silence analogue audio channels 1 and 2
Silence analogue audio channels 3 and 4

With rear 3G-AIP2 fitted:
Silence analogue audio channels 9 and 10
Silence analogue audio channels 11 and 12

With fibre input option fitted:
Received power (-25dBm to 0dBm in 1dBm steps)
Optical input power level (Overload, High, Good, Low or Too low)

With fibre output option fitted:
Laser level
Laser bias

3G-AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

MECHANICAL
Power consumption: 1.6 Watts

AUDIO INPUTS
Two analogue stereo pairs or four mono channels. 24 bit quantising A to Ds. 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.

3G-AOP2 DUAL ANALOGUE AUDIO OUTPUT PIGGYBACK

MECHANICAL
Power consumption: 1.5 Watts

AUDIO OUTPUTS
Two analogue stereo pairs or four mono channels. 24 bit quantising D to As. Low output impedance (66 ohm) 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
0.002% THD+N rms., 22Hz to 22kHz typ.

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

DIOP4 QUAD DIGITAL AUDIO INPUT AND OUTPUT PIGGYBACK

MECHANICAL
Power consumption: 1 Watt

AUDIO INPUTS AND OUTPUTS
Four 24 bit stereo pairs
Software selectable as 110 ohm AES/EBU balanced or 75 ohm AES3-id unbalanced on a per-DIOP4 basis (all four connections have the same impedance)
Individually configurable as inputs or outputs
Asynchronous audio to video 48kHz + or - 50ppm

TOTAL HARMONIC DISTORTION
With asynchronous inputs: < 0.0001% (-120dB)

ORDERING INFORMATION

SYNNER-VF	3G/HD/SD video synchroniser, tracking audio delay and four group embedder/de-embedder (allows fitting of up to two audio piggybacks for input and output of external AES and analogue audio)
3G-AIP2	Analogue audio input piggyback. Select one piggyback for two stereo pairs (four mono channels) or two piggybacks for four stereo pairs (eight mono channels)
3G-AOP2	Analogue audio output piggyback. Select one piggyback for two stereo pairs (four mono channels) or two piggybacks for four stereo pairs (eight mono channels)
DIOP4	Digital audio input or output piggyback. Select one piggyback for four stereo pairs or two piggybacks for eight stereo pairs (with each stereo pair configured independently as input or output)
FIP-VF	Fibre input option for SYNNER-VF card
FOP-VF	Fibre output option for SYNNER-VF card. For CWDM laser options, contact Crystal Vision
FIO-VF	Fibre input and output option for SYNNER-VF card
Vision 3	3U frame with integrated control panel and smart CPU for up to 20 Crystal Vision cards from the Vision range
VR02	Single slot frame rear module. Allows 20 SYNNER-VF in 3U. Suitable for 110 ohm AES or analogue audio. Gives access to one 3Gb/s, HD or SD input, three 3Gb/s, HD or SD outputs and all audio inputs or outputs
VR12	Single slot frame rear module. Allows 20 SYNNER-VF in 3U. Suitable for 110 ohm AES or analogue audio. Designed for applications using fibre inputs and/or outputs. **When using FIP-VF fibre input**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input and gives out two 3Gb/s, HD or SD outputs (on BNC) and all audio inputs or outputs. **When using FOP-VF fibre output**, gives access to one 3Gb/s, HD or SD input, three 3Gb/s, HD or SD outputs (one on fibre and two on BNC) and all audio inputs or outputs. **When using FIO-VF fibre input and output**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input and gives out three 3Gb/s, HD or SD outputs (one on fibre and two on BNC) and all audio inputs or outputs
VR13	Two slot frame rear module. Allows ten SYNNER-VF in 3U. Suitable for 75 ohm AES. Designed for 75 ohm AES applications using either BNC SDI or fibre inputs and/or outputs. **When not using a fibre option**, gives access to one 3Gb/s, HD or SD input, three 3Gb/s, HD or SD outputs (on BNC) and all audio inputs or outputs. **When using FIP-VF fibre input**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input and gives out three 3Gb/s, HD or SD outputs (on BNC) and all audio inputs or outputs. **When using FOP-VF fibre output**, gives access to one 3Gb/s, HD or SD input, four 3Gb/s, HD or SD outputs (one on fibre and three on BNC) and all audio inputs or outputs. **When using FIO-VF fibre input and output**, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input and gives out four 3Gb/s, HD or SD outputs (one on fibre and three on BNC) and all audio inputs or outputs
VisionPanel	3U Ethernet remote control panel with touch screen
SBB-4	Smart button box with four programmable LCD switches. It is powered by PoE (Power over Ethernet) and therefore needs to be connected to a PoE enabled switch
VisionWeb Control	VisionWeb web browser control included within frame software
SNMP	SNMP monitoring and control included in frame