

Crystal Vision

SYNNER –310–

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

SYNNER 310 combines multiple functions on one board to simplify system designs and save broadcast engineers money and rack space.

Working with 3Gb/s, HD and SD sources and both AES and analogue audio, SYNNER 310 combines a video synchroniser, tracking audio delay, embedder, de-embedder – all on one 100mm x 266mm board. It can embed and de-embed a mixture of up to two groups of analogue audio and four groups of AES at the same time, and includes audio and video processing, integrated fibre connectivity, advanced handling of Dolby E and flexible delay compensation.

SYNNER 310's combination of features make it the best solution for any embedding, de-embedding and timing requirements.



- Simplify your system design with multiple functionality on one board: combines video synchroniser with tracking audio delay and embedder/de-embedder
- Use it with a variety of sources: 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 configure it as a two group analogue audio embedder/de-embedder or a four group AES embedder/de-embedder – or mix analogue and digital piggybacks
- 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 and video: with full audio processing and video proc-amp
- 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
- Save rack space: 100mm x 266mm module allows 12 SYNNER 310 in 2U (six in 1U and two in desk top box)
- Flexible control: select from board edge, front and remote panels, GPIs, SNMP, PC software and your web browser

WHY USE SYNNER 310?

The powerful SYNNER 310 combines a video synchroniser, tracking audio delay, embedder, de-embedder, audio processor and video proc-amp – all on one 100mm x 266mm board to save engineers money and rack space.

SYNNER 310 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 or asynchronous Dolby E and analogue audio. SYNNER 310 is designed to accept an untimed feed of video and embed up to four groups 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.

SYNNER 310 can embed and de-embed external audio: a mixture of up to eight AES stereo pairs and four analogue stereo pairs (or eight mono channels) at the same time. It includes video and audio processing, delay compensation, advanced handling of Dolby E and integrated fibre input/output.

SYNNER 310 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.

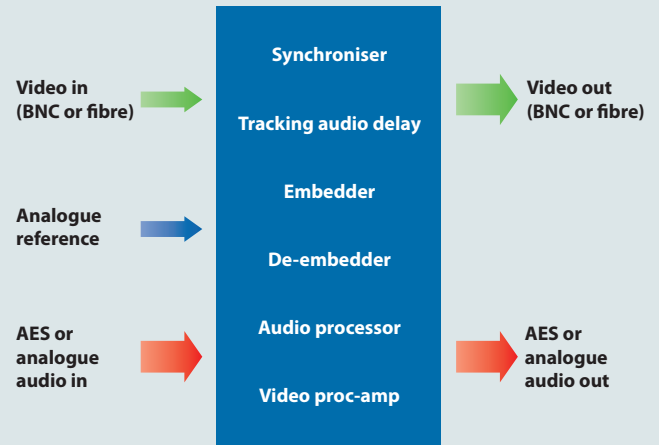
SYNCHRONISE THE VIDEO

SYNNER 310 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 310 takes its timing from the external analogue reference 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.

The ability to cross-lock allows SYNNER 310 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. The reference loop-through on the RM70 rear module allows you to

What is SYNNER 310?



loop the analogue reference through a number of boards in a single frame – saving a DA and making cabling easy.

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. The delay is adjustable in samples, lines and whole frame steps. Should the reference be removed or the board powered without a connected reference, SYNNER 310 will revert to delay mode.

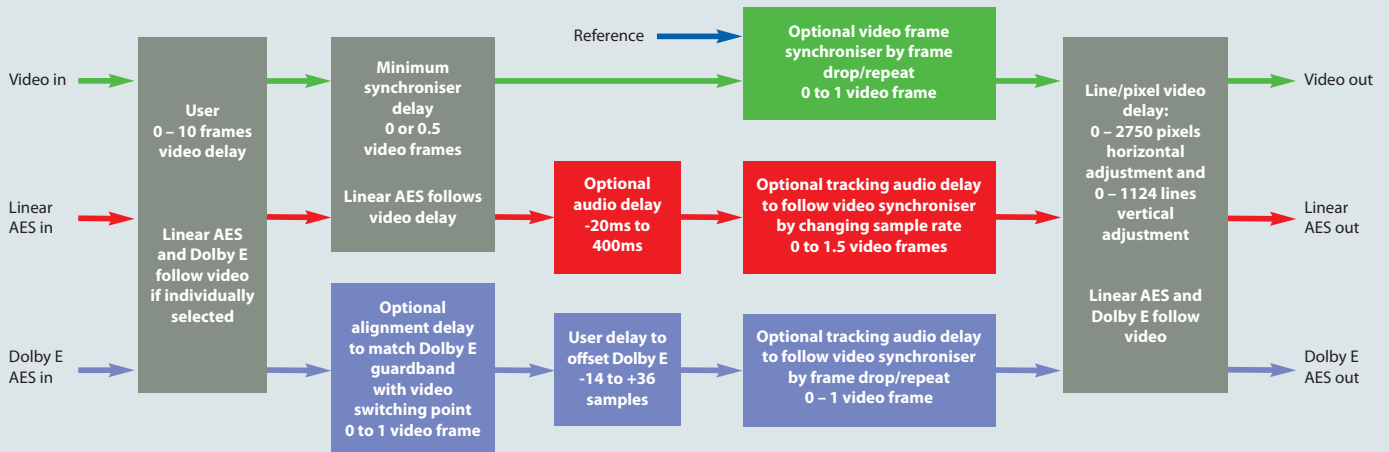
See the EASY TO MATCH ALL YOUR SIGNALS section for information on the additional delays available.

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 310 offers a flexible range of video and audio delays to help match all

Understanding the video and audio delays



your signals and ensure Dolby alignment. Some of these delays are of fixed length, while others are dynamic. (See the Understanding the video and audio delays diagram on page 2 for more information.)

For the video...

The synchroniser delay automatically adjusts over a range of 0 to 1 frames to provide the desired output timing. SYNNER 310 makes it easy to compensate for mistimed sources elsewhere in your system: the Line and pixel delay will delay the video with respect to the reference through an entire frame in Synchroniser mode – providing 0-2750 pixels horizontal timing adjustment and 0-1124 lines vertical timing adjustment. In Delay mode it will introduce a further delay to the video and audio paths.

Up to ten frames of video delay (adjustable in whole frame steps) can be used to match any big system delays, such as those created by Dolby E encoding and decoding or transcoding to AC3 and re-embedding.

The Minimum synchroniser delay allows a further 0.5 frames delay to be added to the video (and linear audio) to ensure correct Dolby E alignment.

For the audio...

An internal tracking audio delay optionally 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.

All audio will be set to the same Line and pixel delay as the video.

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.

Up to 400ms of audio delay (adjustable in 1ms steps) can be added on top of the tracking to compensate the linear AES for any audio delays introduced by other equipment.

A delay of between 0 and 1 frame can be added to a Dolby E signal so that the guardband is correctly aligned with the video timing, ready for embedding into the output video.

Up to 36 Dolby E samples of adjustable delay additionally allows you to 'nudge' the position of the Dolby E frame relative to the video, so that you can deliberately offset the Dolby from its correct position to compensate for processing further downstream.

SYNNER 310 helps you monitor exactly how much delay has been set by indicating the total audio delay in milliseconds.

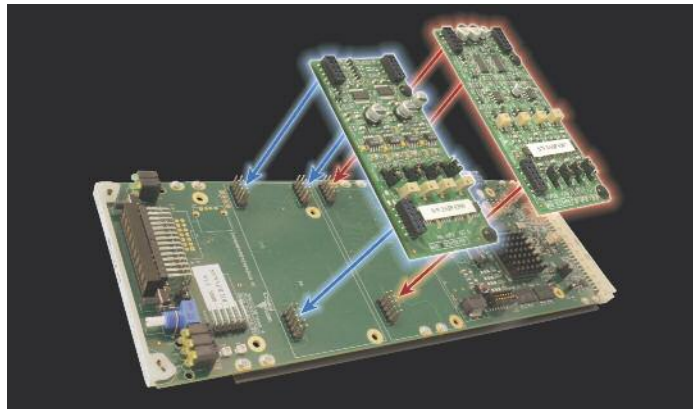
EMBED AND DE-EMBED ANALOGUE OR DIGITAL AUDIO (OR BOTH)

SYNNER 310 embeds and de-embeds external audio by fitting up to two audio piggybacks to the main board. Three different piggybacks are available.

For analogue audio the 3G-AIP2 is used for embedding two stereo pairs or four mono channels and the 3G-AOP2 for de-embedding two stereo pairs or four mono channels. For digital audio the DIOP4 piggyback is used for embedding or de-embedding four stereo pairs, with four bi-directional AES ports available on each piggyback – giving you the option of embedding or de-embedding each stereo pair independently.

By fitting two of these piggybacks SYNNER 310 can be configured as a two group analogue audio embedder/de-embedder or a four

group AES embedder/de-embedder. Alternatively 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 310 is aware of which piggyback options are fitted and adjusts the menus and audio routers to reflect the options available.



Which piggybacks can I fit?

These are the combination of piggybacks that can be fitted to SYNNER 310

Front position	Rear position
None	None
DIOP4	None
3G-AIP2	None
3G-AOP2	None
DIOP4	DIOP4
DIOP4	3G-AIP2
DIOP4	3G-AOP2
3G-AIP2	3G-AIP2
3G-AIP2	3G-AOP2
3G-AOP2	3G-AOP2

THE IDEAL SYNCHRONISER FOR DOLBY E USERS

SYNNER 310 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 310 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 310 has the ability

to auto-correct timing errors with the guardband, aligning it correctly with the output video switching point. SYNNER 310 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 310's additional video delay can be used to compensate for the one frame of delay introduced when converting to or from Dolby E.

POWERFUL AUDIO ROUTING

SYNNER 310 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 310 are two mono audio routing matrices. The first is the Embedder router which is used to select which of up to 32 audio input channels should be embedded into up to four groups on the output video. HANC cleaning removes the original version of old groups. The second router is used to select which of up to 32 audio input channels should be output as external AES or analogue audio, and is known as the Analogue output router if a 3G-AOP2 piggyback is fitted and as the AES output router if a DIOP4 (and no 3G-AOP2) piggyback is fitted.

Select your audio from up to 16 channels de-embedded from the input video, or 16 channels from two input piggybacks.

Route this audio to 16 channels for embedding into the output video, or up to 16 channels for output as external AES or analogue audio via appropriate piggybacks.

OPTIMISE THE AUDIO

SYNNER 310 includes full 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

It's not just the audio that can be improved. SYNNER 310 additionally 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 BOARD



With SYNNER 310 you can have fibre input or output straight into the board – ideal when you need to send and receive signals beyond the local equipment bay and giving you even more functionality on a single module.

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 fibre input option, FOP fibre output option or FIO fibre input and output option.

Designed for SMPTE 297-2006 short-haul applications, the FIP is used to receive an optical input and the FOP to transmit an optical output using a Class I laser. The FIO can do both – giving you simultaneous fibre input and output. With a FIP or FIO 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 310 can also support a CWDM laser if required.

SAVE RACK SPACE

SYNNER 310 is a space-saving 100mm x 266mm module which is housed in the Indigo frames – available in 2U, 1U and desk top box sizes – and with up to 12 boards fitting in 2U.

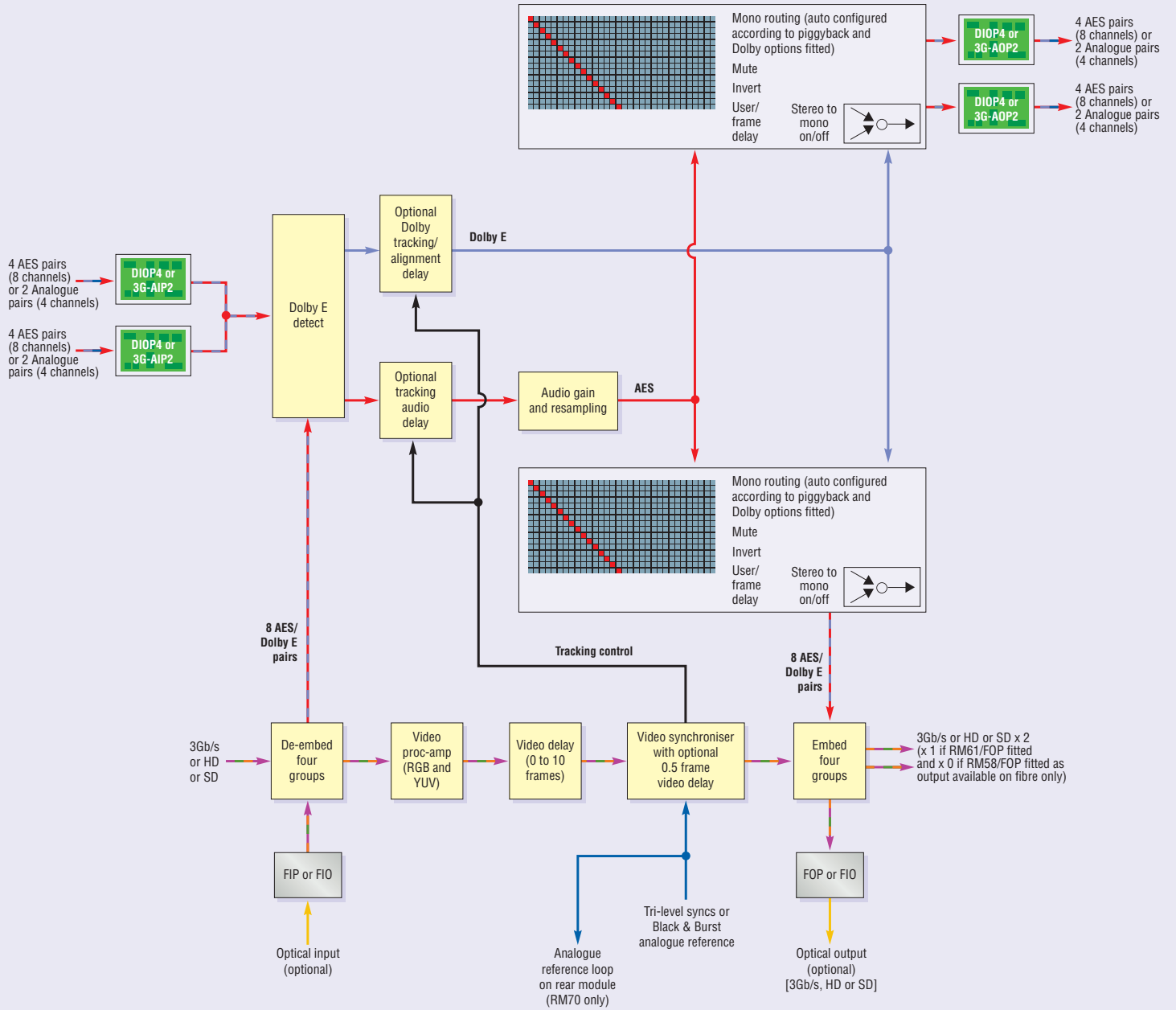
SYNNER 310 can be used with a variety of different frame rear modules to access the inputs and outputs. You select the rear module based on the type of audio you are using (75 ohm AES, 110 ohm AES or analogue audio), and whether you are using fibre input or output (or both).

See the REAR MODULE CONNECTIONS section on Page 6 for full information on the rear modules available.

EASY AND FLEXIBLE CONTROL – AND SIGNAL MONITORING

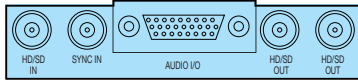
SYNNER 310 is very straightforward to operate, with control options including board edge switches, an integrated control panel on the AE frames, a remote control panel, GPIs, SNMP, the Statesman Lite PC software and the VisionWeb Control web browser software.

Up to 16 user-defined presets, containing the board setup data, may be stored and recalled. Two GPI outputs are reserved for alarm indication and may be assigned any number of video and audio alarms, allowing comprehensive signal monitoring. (See the SPECIFICATION for full list of 52 alarms, including which are available when different piggyback options are fitted.) The silence alarms can be delayed before triggering to prevent false alarming during quiet periods in the audio.

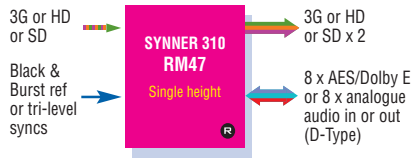


REAR MODULE CONNECTIONS

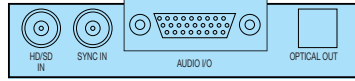
For standard applications using 110 ohm AES or analogue audio



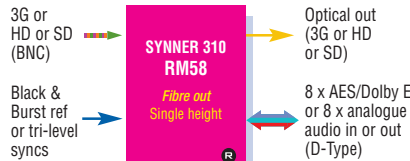
RM47



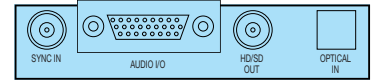
For fibre output applications using 110 ohm AES or analogue audio



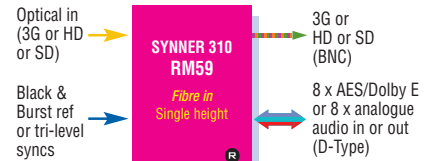
RM58



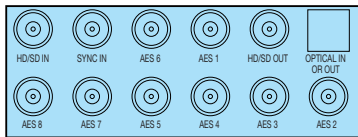
For fibre input applications using 110 ohm AES or analogue audio



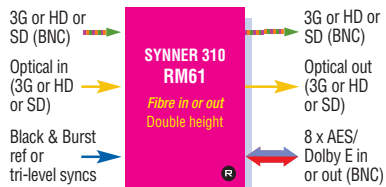
RM59



For fibre input or output applications using 75 ohm AES

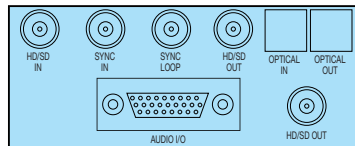


RM61

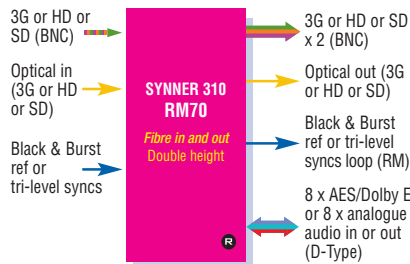


NB. Choose between fibre in or fibre out by selecting FIP or FOP option

For fibre input and output applications using 110 ohm AES or analogue audio

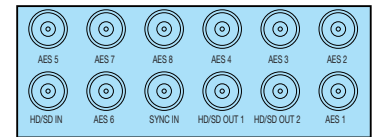


RM70

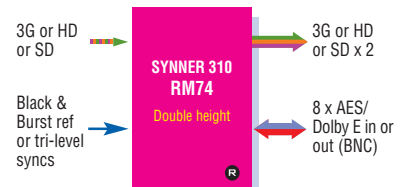


NB. Select FIP option for fibre in, FOP option for fibre out and FIO option for fibre in and out

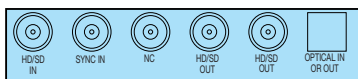
For standard applications using 75 ohm AES



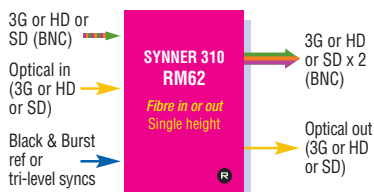
RM74



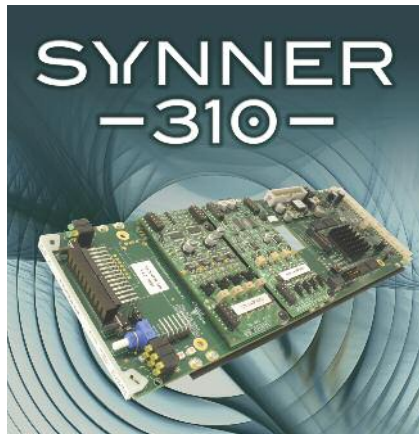
For fibre input or output video-only applications



RM62



NB. Choose between fibre in or fibre out by selecting FIP or FOP option



SPECIFICATION

SYNNER 310 MOTHERBOARD

MECHANICAL

Standard Crystal Vision module 266mm x 100mm
Weight: 200g
Power consumption: 9 Watts; 0.6 Watts (FIP and FOP); 1 Watt (FIO)

VIDEO INPUT

One 3Gb/s or HD or SD input
When using FIP or FIO fibre input options allows selection between one optical and one electrical input
270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to

SMPT 259, SMPT 292-1 and SMPT 424/425-A
The video formats supported are 625, 525, 720p50, 720p59.94, 1080p50, 1080p59.94, 1080i50, 1080i59.94, 1080p50 and 1080p59.94
3Gb/s cable equalisation up to 80m 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
Input return loss: -15dB for 50MHz to 1.5GHz
Automatic de-embedding to SMPT 272 or SMPT 299-1

The video input can contain up to four groups of embedded audio

VIDEO OUTPUTS

Using RM47 and RM74 rear modules: Two 3Gb/s, HD or SD outputs
Using RM59 and RM61 rear modules with FIP fibre input option: One 3Gb/s, HD or SD output
Using RM62 and RM70 rear modules with FIP fibre input option: Two 3Gb/s, HD or SD outputs. NB. RM62 has no audio connections
Using RM58 rear module with FOP fibre output option: One 3Gb/s, HD or SD output on fibre only

Using RM61 rear module with FOP fibre output option: Two 3Gb/s, HD or SD outputs (one on fibre and one on BNC)

Using RM62 rear module with FOP fibre output option: Three 3Gb/s, HD or SD outputs (one on fibre and two on BNC). NB. RM62 has no audio connections

Using RM70 rear module with FOP fibre input and output option: Three 3Gb/s, HD or SD outputs (one on fibre and two on BNC)

Serial output: 270Mb/s or 1.5Gb/s or 3Gb/s serial compliant to SMPT 259, SMPT 292-1 and

SPECIFICATION CONTINUED...

Statesman Lite allows control from any PC on a network
 VisionWeb Control is available via the web server on the frame and allows operation using a standard web browser on a PC or tablet
 SNMP monitoring and control available as a frame option

Control using ASCII and JSON protocols

3G-AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

MECHANICAL

Power consumption: 1.6 Watts

AUDIO INPUT

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: 0.9 Watts

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 310	3G/HD/SD video synchroniser, tracking audio delay and embedder/de-embedder for up to four groups of AES and two groups of analogue audio (allows fitting of up to two audio piggybacks)
3G-AIP2	Analogue audio input piggyback (two stereo pairs or four mono)
3G-AOP2	Analogue audio output piggyback (two stereo pairs or four mono)
DIOP4	Digital audio input or output piggyback (four stereo pairs)
FIP	Fibre input option for SYNNER 310 motherboard
FOP	Fibre output option for SYNNER 310 motherboard. For CWDM laser options, contact Crystal Vision
FIO	Fibre input and output option for SYNNER 310 motherboard
Indigo 2AE	2U frame with active front panel featuring smart CPU and integrated control panel for up to 12 Crystal Vision modules
Indigo 2SE	2U frame with active front panel featuring smart CPU for up to 12 Crystal Vision modules
Indigo 1AE	1U frame with active front panel featuring smart CPU and integrated control panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1AE-DP
Indigo 1SE	1U frame with active front panel featuring smart 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 DTSE	Desk top box with active front panel featuring smart CPU for up to two Crystal Vision modules
RM47	Single slot frame rear module. Allows maximum number of SYNNER 310 in frame (12 in 2U, six in 1U, two in desk top box). Suitable for 110 ohm AES or analogue audio. Gives access to one 3Gb/s, HD or SD input, two 3Gb/s, HD or SD outputs and all audio inputs or outputs
RM58	Single slot frame rear module. Allows maximum number of SYNNER 310 in frame (12 in 2U, six in 1U, two in desk top box). Designed for applications using fibre outputs. Suitable for 110 ohm AES or analogue audio. Gives access to one 3Gb/s, HD or SD input, one 3Gb/s, HD or SD output (on fibre only) and all audio inputs or outputs
RM59	Single slot frame rear module. Allows maximum number of SYNNER 310 in frame (12 in 2U, six in 1U, two in desk top box). Designed for applications using fibre inputs. Suitable for 110 ohm AES or analogue audio. Gives access to one 3Gb/s, HD or SD input (on fibre only) and gives out one 3Gb/s, HD or SD output and all audio inputs or outputs
RM61	Two slot frame rear module. Allows six SYNNER 310 in 2U, three in 1U and one in desk top box. Designed for applications using fibre inputs or outputs. Suitable for 75 ohm AES or analogue audio. When using fibre input , allows you to select between one fibre and one electrical 3Gb/s, HD or SD input and gives out one 3Gb/s, HD or SD output and all audio inputs or outputs. When using fibre output , gives access to one 3Gb/s, HD or SD input, two 3Gb/s, HD or SD outputs (one on fibre and one on BNC) and all audio inputs or outputs
RM62	Single slot frame rear module. Allows maximum number of SYNNER 310 in frame (12 in 2U, six in 1U, two in desk top box). Designed for applications using fibre inputs or outputs and for video-only applications (does not have any audio connections). When using 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. When using fibre output , gives access to one 3Gb/s, HD or SD input and three 3Gb/s, HD or SD outputs (one on fibre and two on BNC)
RM70	Two slot frame rear module. Allows six SYNNER 310 in 2U, three in 1U and one in desk top box. Suitable for 110 ohm AES or analogue audio. Designed for applications using both fibre inputs and outputs. When using 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, a rear module reference loop-through and all audio inputs or outputs. When using 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), a rear module reference loop-through and all audio inputs or outputs. When using both 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), a rear module reference loop-through and all audio inputs or outputs
RM74	Two slot frame rear module. Allows six SYNNER 310 in 2U, three in 1U and one in desk top box. (Note that board sits in rear module bottom slot.) Suitable for 75 ohm AES. Gives access to one 3Gb/s, HD or SD input, two 3Gb/s, HD or SD outputs and all audio inputs and outputs
VisionPanel	3U Ethernet remote control panel with touch screen
VisionWeb Control	VisionWeb web browser control included within frame software
Statesman Lite	PC Control System
SNMP	SNMP monitoring and control

Performance and features are subject to change. Figures given are typical measured values. SYNNER3100517