Crystal Vision

SYNNER-E HD

HD/SD Video Synchroniser, Tracking Audio Delay and Embedder/De-embedder with Dolby E processing

SYNNER-E HD will simplify the system designs for anybody working in a Dolby E environment. Put simply, any synchronising, embedding, de-embedding or delay compensation that you're ever likely to want to do with Dolby E, can be done with this product.

SYNNER-E HD will save you money and rack space by combining a video synchroniser, tracking audio delay, embedder, de-embedder and audio processor (along with advanced handling of Dolby E) on one board.

SYNNER-E HD can both synchronise incoming video signals which are not locked to the local reference and compensate for timing delays within the video system. With timing coming from either SD or HD analogue syncs, it will synchronise the video, de-embed up to two audio groups, mono route the audio channels, pass the standard audio through a tracking audio delay to resample it before any audio processing while detecting, synchronising and aligning any Dolby E, and finally re-embed the two groups – outputting video and embedded audio timed to your system.

You can synchronise video containing Dolby E, standard audio or a mixture of the two, with SYNNER-E HD allowing a mixture of Dolby E and standard AES within a single audio group. SYNNER-E HD will separate the Dolby E and standard audio and synchronise both types in the appropriate way before re-embedding the audio.

You can embed or de-embed analogue audio, digital audio or Dolby E. Add input piggybacks and SYNNER-E HD will accept an untimed feed of video and embed up to two groups of external analogue, digital or Dolby E audio, producing timed video and embedded audio with optional overwriting of audio channels. With output piggybacks fitted SYNNER-E HD can take an untimed feed of video and embedded audio and produce video and separate analogue, digital or Dolby E audio, timed to station syncs. By fitting one input piggyback and one output piggyback, SYNNER-E HD can be used as a combined video synchroniser and tracking audio delay for independent video and audio.

You can delay the video and standard audio to compensate for Dolby E delays and make the Dolby E position within the video frame earlier if required – it's one of the few products that allow you to realign the guardband. Or why not use SYNNER-E HD to process your standard audio, with gain adjustment and stereo to mono conversion.

It might be packed with features, but SYNNER-E HD is very easy to operate. Choose your favourite control method – from board edge, an active front panel on the frame, a remote panel or the Statesman PC software. SYNNER-E HD fits in the standard frames (available in 4U, 2U, 1U and desk top box) and can be used with two frame rear modules to access all the inputs and outputs, with the RM33 designed for analogue audio or 110 ohm AES and the RM39 for 75 ohm AES.

SYNNER-E HD: one very powerful product for Dolby E users.

- HD/SD synchroniser, tracking audio delay, embedder/de-embedder and audio processor with Dolby E processing
- Synchronise video which contains a mixture of Dolby E and standard AES within a single audio group
- Use as synchroniser or fixed delay line
- Full vertical and horizontal timing adjustment (0-1 frame)
- Cross-locking: HD or SD source can be referenced to either HD tri-level syncs or SD Black and Burst
- Fast locking after an upstream switch
- Selectable black, blue or freeze on input failure
- Tracking audio delay will automatically synchronise video and audio
- Correctly aligns Dolby E data with the video frame to ensure guardband in exactly the right place – selectable one field video delay allows 'advance' of Dolby E
- Delay video and standard audio to compensate for Dolby E delays, with one frame video delay and up to 80ms variable audio delay
- Configure audio inputs and outputs using piggybacks: embed or de-embed one or two groups of Dolby E, AES or analogue audio
- Shuffle or overwrite existing embedded audio
- Process your standard audio, with gain adjustment and stereo to mono conversion
- Audio follow output control
- Space-saving: 100mm x 266mm module allows 12 SYNNER-E HD in 2U (24 in 4U, six in 1U and two in desk top box)
- Flexible control, including PC software

VIDEO SYNCHRONISER

Essentially a frame synchroniser allowing any timing difference, SYNNER-E HD additionally offers the advantages of a line synchroniser, with quick recovery of input timing. SYNNER-E HD has two operational modes: synchroniser and delay line. Ideal for external sources that are not timed to station references, in synchroniser mode SYNNER-E HD takes its timing from the external analogue reference and will automatically synchronise sources between 0 and 1 frame, fixing any incorrect frame rates plus any delays. SYNNER-E HD's ability to cross-lock allows it to use any existing timing signals, with an HD or SD input referenced to either HD tri-level syncs or SD Black and Burst. The output timing relative to the reference can be adjusted through an entire frame using horizontal and vertical settings. Should the reference be removed or the board powered without a connected reference SYNNER-E HD will revert to delay mode.

Delay mode is ideal for when the frame rate is correct but the source has been passed through other equipment and therefore been delayed for a few lines. With full adjustment of vertical and horizontal timing available, the fixed delay can be set between 16us and one frame plus approximately 16us.

SYNNER-E HD offers a powerful synchronising system, synchronising at three separate points: at the start of the field or frame, just after the switching point, and at the start of the active field or frame. This allows it to avoid picture disturbances for switches on the input that are between mistimed sources and that occur in the vertical blanking.

Manual freeze allows SYNNER-E HD to be used as a simple still store, with the type of freeze selected from frame, field 1 or field 2. Automatic freeze is available when input fails through loss of signal, with alternative responses selectable as blue screen, black screen, delay then blue or delay then black. A TTL level pulse allows an audio delay to track the video delay through SYNNER-E HD, while up to 16 presets may be stored for later recall.

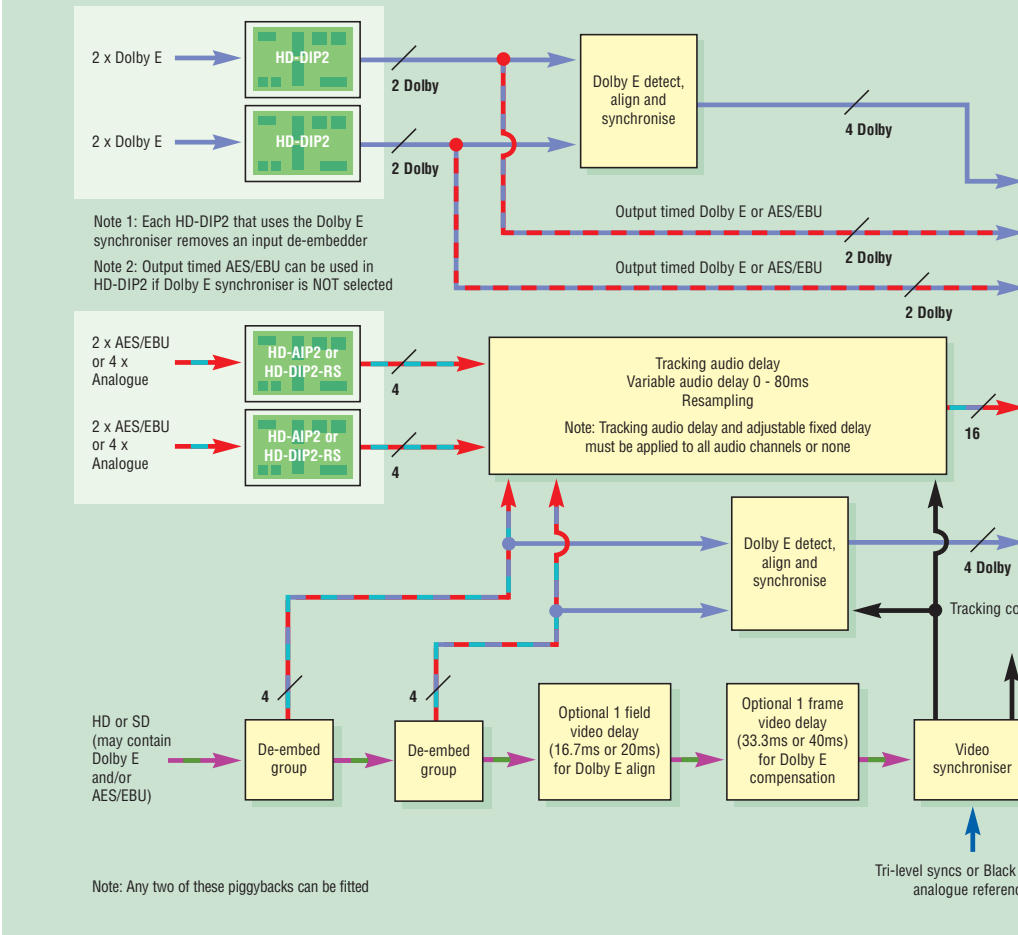
DOLBY E HANDLING

SYNNER-E HD allows very flexible handling of Dolby E, with Dolby E data automatically detected and processed appropriately. Up to four sources of Dolby E are possible and can come from a variety of sources: four channels from two audio groups embedded in the video, four channels from two input piggybacks or a mixture of the two. SYNNER-E HD even allows a mixture of Dolby E and standard AES within a single audio group. De-embedded Dolby E or input-timed Dolby E from a piggyback 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 – meeting the strict requirements recommended by Dolby to allow many more stages of processing. In either case the video can be optionally delayed by one field. Two Dolby E streams with different timings can be realigned with each other as well as with the video. Output-timed Dolby E from a piggyback will be treated as correctly timed and embedded with minimum processing delay. Standard audio de-embedded from the same group as Dolby E will be resampled and delayed in the usual way, while output-timed standard audio from the same piggyback as output-timed Dolby E will be routed and embedded with minimum delay.

AUDIO AND VIDEO DELAYS

The internal audio delay tracks the video delay, running the audio fast or slow to ensure the video and standard audio stay correctly timed and to avoid lip sync errors. SYNNER-E HD also allows you to delay the video and standard audio to compensate for

INPUTS AN



Dolby E delays, with the option to add one frame of video delay and up to 80ms of fixed audio delay on top of the tracking. You can also advance the position of the Dolby E within the video frame by using the optional one field video delay, and therefore fix any Dolby E that's not correctly aligned. An audio follow output pulse allows SYNNER-E HD to be used with an external tracking audio delay.

AUDIO EMBEDDING AND DE-EMBEDDING

By fitting piggybacks to the motherboard SYNNER-E HD can include an audio embedder, de-embedder or mixed embedder/de-embedder for analogue, digital or Dolby E audio. This allows you to embed one or two groups of audio (with optional overwriting or shuffling of existing audio), or de-embed one or two groups of audio timed to your system. So which piggybacks do you need?

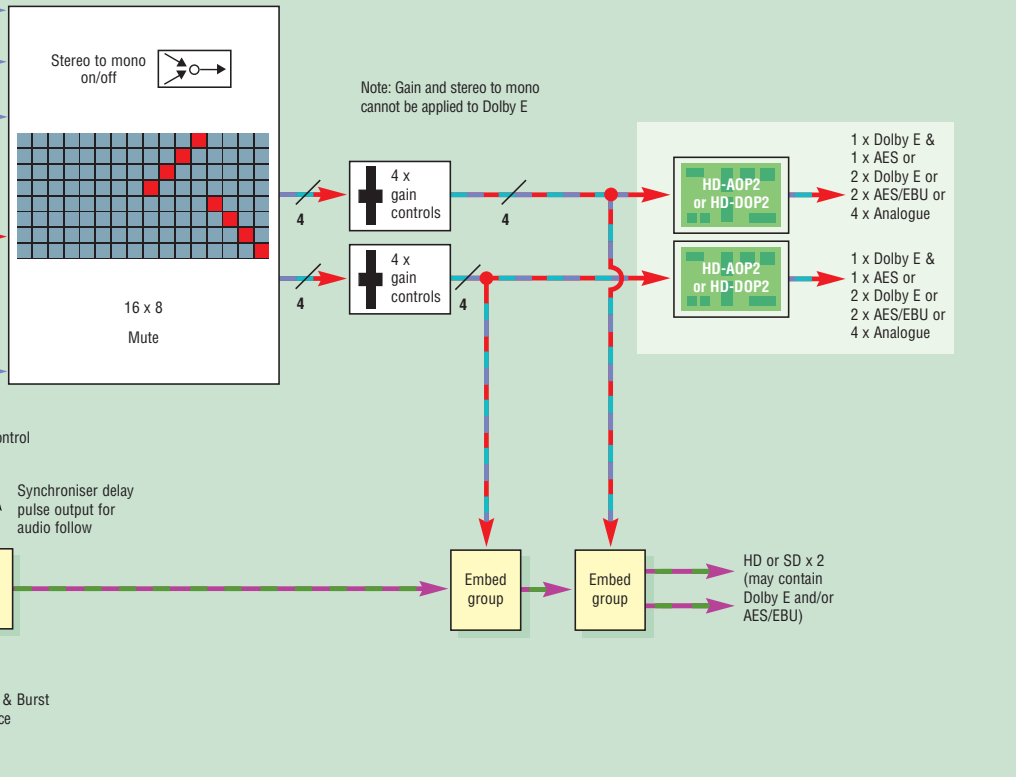
To embed external audio, use the HD-DIP2-RS piggyback for AES, the HD-DIP2 for Dolby E and the HD-AIP2 for analogue audio. The HD-DIP2 can be used to embed AES when you want to synchronise the video but embed external audio without delaying it. Each HD-DIP2 that uses the Dolby E synchroniser removes an input de-embedder. To de-embed audio, use the HD-DOP2-75 for 75 ohm AES, the HD-DOP2-110 for 110 ohm AES and the HD-AOP2 for analogue audio. One piggyback is required for one audio group and two piggybacks for two audio groups. It's even possible to embed one group and de-embed another – just by fitting the appropriate piggybacks.

The powerful audio routing includes full channel shuffling which allows you to rearrange the audio tracks between the two groups, and audio replace where an input piggyback can overwrite some of the original audio channels from the HD or SD feed.

AUDIO PROCESSING

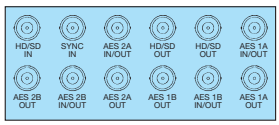
SYNNER-E HD offers powerful audio processing capabilities for the standard audio. The audio level can be increased or decreased to match the rest of your system, with each mono audio channel offering individual gain control, adjustable between +3dB and -3dB in 0.1dB steps. Audio channels can be muted, while stereo to mono conversion helps those broadcasting a multi-language service. Forward error correction ensures audio quality is maintained on HD sources, while a headphone socket on the front of the board can be used to preview the audio sources.

D OUTPUTS

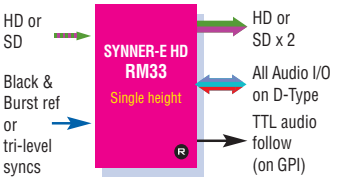


REAR MODULES

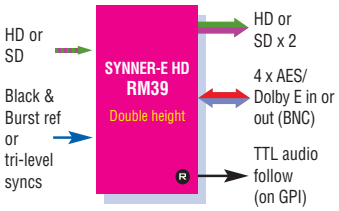
RM33



RM39



NB. All Audio I/O = 8 x analogue audio in or out, or 4 x AES/Dolby E in or out, or 4 x analogue audio & 2 x AES/Dolby E in or out



SPECIFICATION

SYNNER-E HD MOTHERBOARD

MECHANICAL
Standard Crystal Vision module 266mm x 100mm
Weight (with two piggyback modules fitted): 260g
Power consumption (without piggybacks): 11.5 Watts

VIDEO INPUT
One HD or SD input with reclocking
270Mbit or 1.485Gbit serial compliant to EBU 3267-E, SMPTE 259M and SMPTE 292M
HD cable equalisation up to 140m with Belden 1694 or equivalent (approx. 100m with Belden 8281). SD cable equalisation >250m Belden 8281 or equivalent
Input return loss: -15dB for 50MHz to 1.5GHz
Auto 50/59.94Hz selection
Automatic de-embedding to SMPTE 272M (SD) or SMPTE 299M (HD)
The video input can contain up to two groups of embedded audio. Either or both groups can contain one or two channels of Dolby E

VIDEO OUTPUTS
Two HD or SD outputs using RM33 or RM39 frame rear modules
Serial output: 270Mbit or 1.485Gbit serial compliant to EBU 3267-E, SMPTE 259M and SMPTE 292M
Output follows the input format
Audio is embedded to SMPTE 272M or SMPTE 299M

ANALOGUE REFERENCE
Tri-level syncs or analogue Black and Burst or video
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
Amplitude of syncs 150mV to 600mV
Link on PCB selects 75 ohm termination or high impedance

TIMING ADJUSTMENTS
SYNNER-E HD synchronises at three separate points within each field or frame: at the start of the field/frame, just after the switching point and at the start of the active field/frame
In synchroniser mode SYNNER-E HD takes its timing from the analogue external reference and will automatically synchronise sources between 0 and 1 frame. Should the reference be removed SYNNER-E HD will revert to delay mode
In delay mode timing is derived from the HD or SD input
The timing can be fully adjusted using horizontal and vertical settings. Increasing the vertical setting will delay the output relative to the reference in increments of one line. Increasing the horizontal setting will increase this delay in increments of approx. 74ns for SD and 13.5ns for HD. The maximum setting of both controls will provide a delay of one frame plus approx. 16us

FREEZE FUNCTIONS
Manual freeze allows the SYNNER-E HD to be used as a simple still store. Selecting single field output can counteract any flicker caused by the interlacing of the two fields on a picture with significant movement. Either field can be selected. The single field is output only when the picture is frozen. Automatic freeze is available when input fails through loss of signal. The user can specify to show the whole frame in which failure happened, field 1 or 2 of the last frame or alternatively a black or blue screen (with or without an initial delay)

VIDEO DELAYS
Optional one field video delay (16.7ms or 20ms) for Dolby E align
Optional one frame video delay (33.3ms or 40ms) for Dolby E compensation
Minimum delay through board: 16us

AUDIO INPUTS AND OUTPUTS (OPTIONAL)
Piggybacks can be added to the main board to enable either input or output of 2 x Dolby E or 2 x AES or 2 x analogue stereo pairs. Fit one piggyback for one audio group or two piggybacks for two audio groups
Use HD-AIP2 to input analogue audio
Use HD-DIP2-RS to input AES audio
Use HD-DIP2 to input Dolby E. Can also be used for output timed AES. Each HD-DIP2 that uses the Dolby E synchroniser removes an input de-embedder
Use HD-AOP2 to output analogue audio
Use HD-DOP2-75 to output 75 ohm AES
Use HD-DOP2-110 to output 110 ohm AES

DOLBY E HANDLING
Dolby E data will be automatically detected and processed appropriately
De-embedded 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. Input-timed Dolby E from a piggyback will be handled in the same way. In either case the video can be optionally delayed by one field (16.7 or 20ms) so that the timing change relative to the video will be +/- 1 field rather than 0 to 1 frame.
Output-timed Dolby E from a piggyback will be treated as correctly timed and embedded with minimum processing delay
Standard audio de-embedded from the same group as Dolby E will be resampled and delayed in the usual way. Output-timed standard audio from the same piggyback as output-timed Dolby E will be routed and embedded with minimum delay

AUDIO TIMING ADJUSTMENTS
Tracking delay auto or off
The audio is normally delayed by the same amount as the video but an additional fixed delay can be added to the audio of up to 80ms, allowing the standard AES to match any Dolby E delays

AUDIO REPLACE
Routing of input piggyback audio together with audio de-embedded from up to two groups present on video input, to any channel in up to two groups embedded on video output. Audio includes Dolby E, routed as a stereo pair

AUDIO PROTECTION IN DE-EMBEDDERS
Full support for data recovery using SMPTE 299M error correction codes

EMBEDDER TIMING PERFORMANCE
Interchannel: <1 clock cycle
Audio to video: embed and de-embed delays approximately 800us in SD and 90us in HD
De-embedder automatically handles asynchronous and synchronous audio

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

EDH
EDH insertion on HD and SD output

AUDIO FOLLOW OUTPUT
TTL output on GPI
Pulse length shows delay through store
Can provide control signal for audio delay systems

AUDIO PROCESSING
Gain level adjustment on each channel between +3dB and -3dB in 0.1dB steps with 0dB calibration
Mute
Stereo to mono conversion
Audio processing cannot be applied to Dolby E

PRESETS
Sixteen presets are available to store board configurations – recalled from the board edge, GPIs, active front panel or Statesman

GPI INPUT LEVELS
Active: pull to ground, pulled up to +5V through 10 kohm

GPI OUTPUT LEVELS
Electrically: Open drain transistors 48V, 270 ohm current limit resistors. Pulled up to +5V through 6800 ohm

GPI INPUTS
Four GPI inputs can be used to recall stored presets

GPI OUTPUTS
One GPI output has programmable alarm output. Eight output silence alarms and three video alarms: video missing, reference missing and video frozen. Can set the silence detect delay from 0 to 128 seconds for the amount of time a signal is allowed to remain below -50dB with respect to Full Scale before a silence error is flagged
One GPI output provides tracking delay pulse

LED INDICATION OF:
Power supplies on board
Video input absent
HD input present
SD input present
Flagged audio channel contains silence
Audio levels calibrated

LOCAL CONTROL
Intuitive board edge interface with two select buttons, shaft encoder and 10 character alphanumeric display
All functions available from board edge

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

HD-AIP2 DUAL ANALOGUE AUDIO INPUT PIGGYBACK

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.

HD-DIP2 DUAL DIGITAL AUDIO INPUT PIGGYBACK

AUDIO INPUTS
Two Dolby E or PCM audio as AES3 110 ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 75 ohm BNC. Set by on board jumper links
Synchronous audio to video 48kHz. Dolby E can be synchronous to either input or output video, linear audio should be synchronous to output video. Both stereo pairs should be synchronous to the same video timing

TOTAL HARMONIC DISTORTION
0.0002%

HD-DIP2-RS DUAL DIGITAL AUDIO INPUT PIGGYBACK

AUDIO INPUTS
Two 24 bit stereo pairs. AES3 110 ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced)
75 ohm BNC. Set by on board jumper links
Synchronous audio to video 48kHz
Asynchronous audio to video 48kHz + or - 50ppm

TOTAL HARMONIC DISTORTION
0.0002%

HD-AOP2 DUAL ANALOGUE AUDIO OUTPUT PIGGYBACK

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.

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

AUDIO OUTPUT
Two 24 bit AES/EBU or Dolby E stereo pairs
AES: HD-DOP2-110 110 ohm balanced D-Type or HD-DOP2-75 75 ohm unbalanced BNC

ORDERING INFORMATION

SYNNER-E HD	HD/SD video synchroniser, tracking audio delay and embedder/de-embedder for one or two groups of analogue or digital audio (allows fitting of one or two audio piggybacks). Includes special Dolby E processing
HD-AIP2	Analogue audio (two stereo pairs) input piggyback
HD-DIP2-RS	75 ohm, 110 ohm, HiZ AES/EBU (two stereo pairs) resampling input piggyback. 30-108kHz AES/EBU. Used to embed input timed AES
HD-DIP2	75 ohm, 110 ohm, HiZ AES/EBU (two stereo pairs) input piggyback. 48kHz only, synchronous to video input. Used to embed Dolby E or output timed AES
HD-AOP2	Analogue audio (two stereo pairs) output piggyback
HD-DOP2-110	110 ohm AES/EBU balanced (two stereo pairs) output piggyback
HD-DOP2-75	75 ohm AES/EBU unbalanced (two stereo pairs) output piggyback
HD-DCDCV18	18 Volt regulator for analogue audio configurations (one required if analogue audio piggyback fitted)
Indigo 4	4U frame with passive front panel for up to 24 Crystal Vision modules
Indigo 4SE	4U frame with passive front panel fitted with Statesman CPU for up to 24 Crystal Vision modules
Indigo 2	2U frame with passive front panel for up to 12 Crystal Vision modules
Indigo 2AE	2U frame with active front panel for up to 12 Crystal Vision modules
Indigo 2SE	2U frame with passive front panel fitted with Statesman CPU for up to 12 Crystal Vision modules
Indigo 1	1U frame with passive front panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1-DP
Indigo 1AE	1U frame with active front panel for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1AE-DP
Indigo 1SE	1U frame with passive front panel fitted with Statesman CPU for up to six Crystal Vision modules. Power supply redundancy available with Indigo 1SE-DP
Indigo DT	Desk top box with passive front panel for up to two Crystal Vision modules
Indigo DTAE	Desk top box with active front panel for up to two Crystal Vision modules
Indigo DTSE	Desk top box with passive front panel fitted with Statesman CPU for up to two Crystal Vision modules
RM33	Single slot frame rear module. Allows maximum number of SYNNER-E HD in frame (24 in 4U, 12 in 2U, six in 1U, two in desk top box). Suitable for analogue or 110 ohm digital audio. Allows all audio connections and two HD or SD outputs
RM39	Two slot frame rear module. Allows 12 SYNNER-E HD in 4U, six in 2U, three in 1U and one in desk top box. Suitable for 75 ohm digital audio. Allows all audio connections and two HD or SD outputs
REMIND	19" remote control panel
REMIND-E	19" Ethernet remote control panel
Statesman	PC Control System

Crystal Vision

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