Crystal Vision

SYN-A 3G

3G/HD/SD video synchroniser for embedded audio sources

SYN-A 3G is a video frame synchroniser designed for use with 3Gb/s, HD or SD sources containing up to four groups of embedded audio – whether you need to synchronise sources timed to a different reference or correct any processing delays.

This feature-packed product includes audio routing and resampling, tracking audio delay, flexible delay compensation, video proc-amp and integrated fibre connectivity, while four video outputs allow you to send the synchronised signal to multiple places. You can even synchronise sources containing a mixture of linear AES and Dolby E in the same audio group – with automatic guardband alignment. SYN-A 3G can also be used as an AFD inserter, adding SMPTE 2016 AFD data to a signal to help downstream equipment automatically select the appropriate aspect ratio.

- Correct any timing problems: use it to either synchronise incoming video signals or compensate for timing delays within video system
- Use it with a variety of sources: works with 3Gb/s, HD and SD and up to four groups of embedded audio
- Excellent audio handling: with channel shuffling using the 8 x 8 stereo router and audio resampling
- 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
- Easy to time all your signals: with flexible audio and video delays, including tracking audio delay and Dolby E compensation
- Optimise the video: with adjustment of the video gain, black level and independent RGB and YUV gains
- Help downstream equipment to automatically select the correct aspect ratio: can insert SMPTE 2016 AFD data into the output video
- Give yourself peace of mind: relay bypass protection available with RM67 rear module
- Optional integrated fibre input/output connectivity means you won't be limited by cable lengths
- Send the synchronised signal to multiple places: with four video outputs
- Saves rack space: 100mm x 266mm module allows 12 SYN-A 3G in 2U (six in 1U and two in desk top box)
- Flexible control: select from front and remote panels, GPIs, SNMP, PC software and your web browser

SYNCHRONISE THE VIDEO

SYN-A 3G 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 SYN-A 3G 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. The ability to cross-lock allows it 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.

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. The delay is adjustable in samples, lines and whole frame steps.

You can easily compensate for mistimed sources elsewhere in your system by adjusting the output timing relative to the reference through an entire frame using horizontal and vertical settings. Further fixed delays can then be added for matching purposes, allowing a maximum delay of four frames, with the minimum delay dependent on the resampling and Dolby E alignment options selected. (See *EASY TO TIME ALL YOUR SIGNALS* section.) Should the reference be removed or the board powered without a connected reference, SYN-A 3G will revert to delay mode.

Both automatic and manual freeze are available. You can choose to show the last good frame or alternatively a black or blue screen or 100% colour bars, with an optional initial delay of three seconds.

The ability to force the output to a particular format – whether an input is present or not – is useful when setting up a system and checking signal paths. The output can be set to any of the formats handled by SYN-A 3G and show either a black or blue screen or 100% colour bars.

DEALING WITH EMBEDDED AUDIO

SYN-A 3G will handle, resample and route four groups of embedded audio.

Full channel shuffling is provided by the 8 x 8 stereo router which allows you to rearrange the audio tracks between the four groups. You can use the 16 audio resamplers to avoid clicks and pops in the audio should the video drop a frame. Any embedded audio channels can be selected to bypass the router and resamplers, with Dolby E automatically bypassing the resamplers. Stereo pairs can also be muted.

IDEAL FOR DOLBY E USERS

SYN-A 3G allows 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.

SYN-A 3G will synchronise video containing Dolby E, linear audio or both – allowing a mixture of Dolby E and linear AES within the same audio group. How? It separates the Dolby E and linear audio and synchronises both types in the appropriate way before re-embedding the audio. It's important to ensure that when Dolby E data is embedded, the guardband is in the correct place. SYN-A 3G has the ability to auto-correct timing errors with the guardband, aligning it correctly with the output video switching point.

Converting to or from Dolby E delays the audio by one video frame, and SYN-A 3G can therefore add a compensating delay to the video and linear audio to match all the signals, with up to three frames of delay available. (See *EASY TO TIME ALL YOUR SIGNALS* section.)

EASY TO TIME ALL YOUR SIGNALS

SYN-A 3G offers a flexible range of video and audio delays to help match all your signals and ensure Dolby E alignment.

The synchroniser delay automatically adjusts over a range of 0 to 1 frames to provide the desired output timing. A switchable one, two or three frames video delay – adjustable in whole frame steps – can match Dolby E or other big system delays and bring the video and audio timing back into alignment. The minimum video delay varies depending on the options selected, and will be 220us with resampling and Dolby alignment off, 3ms with resampling on and 0.5 frames with Dolby alignment on.

An internal tracking audio delay tracks the video delay, running the audio fast or slow to ensure the video and audio stay correctly timed and to avoid lip-sync errors. There are two tracking audio delays: one for the linear audio and the other for Dolby E. Selecting Dolby E alignment automatically introduces 0.5 frame delay in the video path. Dolby E will be delayed by the synchroniser delay plus up to one frame to align it correctly with the video. Additionally, adding a fixed audio delay of one, two or three frames to the Dolby E allows it to match the equivalent video delay. Up to 120ms of audio delay can be added on top of the tracking to compensate the linear AES for any small delay between the incoming video and audio signals caused by video processing.

INSERTING AFD

You can use SYN-A 3G as an AFD inserter, adding SMPTE 2016 AFD data to a signal which provides picture format information and allows downstream equipment to automatically select the appropriate aspect ratio. HD programmes are often made of a mixture of true High Definition sources and SD-originated sources that have been up converted and have black pillars at the sides. One of 16 AFD codes can be embedded into the signal for the down converter to read, with the code describing which areas of the screen contain a picture and which areas are black 'padding'.

See the *SPECIFICATION* for details of the 16 AFD codes.

OPTIMISE THE VIDEO

SYN-A 3G additionally includes a video proc-amp for picture optimisation and to help maintain colour fidelity, with adjustment of the video gain, black level and independent RGB and YUV gains.

FIBRE CONNECTIVITY – ON THE BOARD

SYN-A 3G allows you to have fibre input or output straight into the board – ideal when you need to send and receive signals beyond the local equipment bay. Just order either the FIP fibre input option or FOP fibre 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. With a FIP 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.

SYN-A 3G can also support a CWDM laser if required.

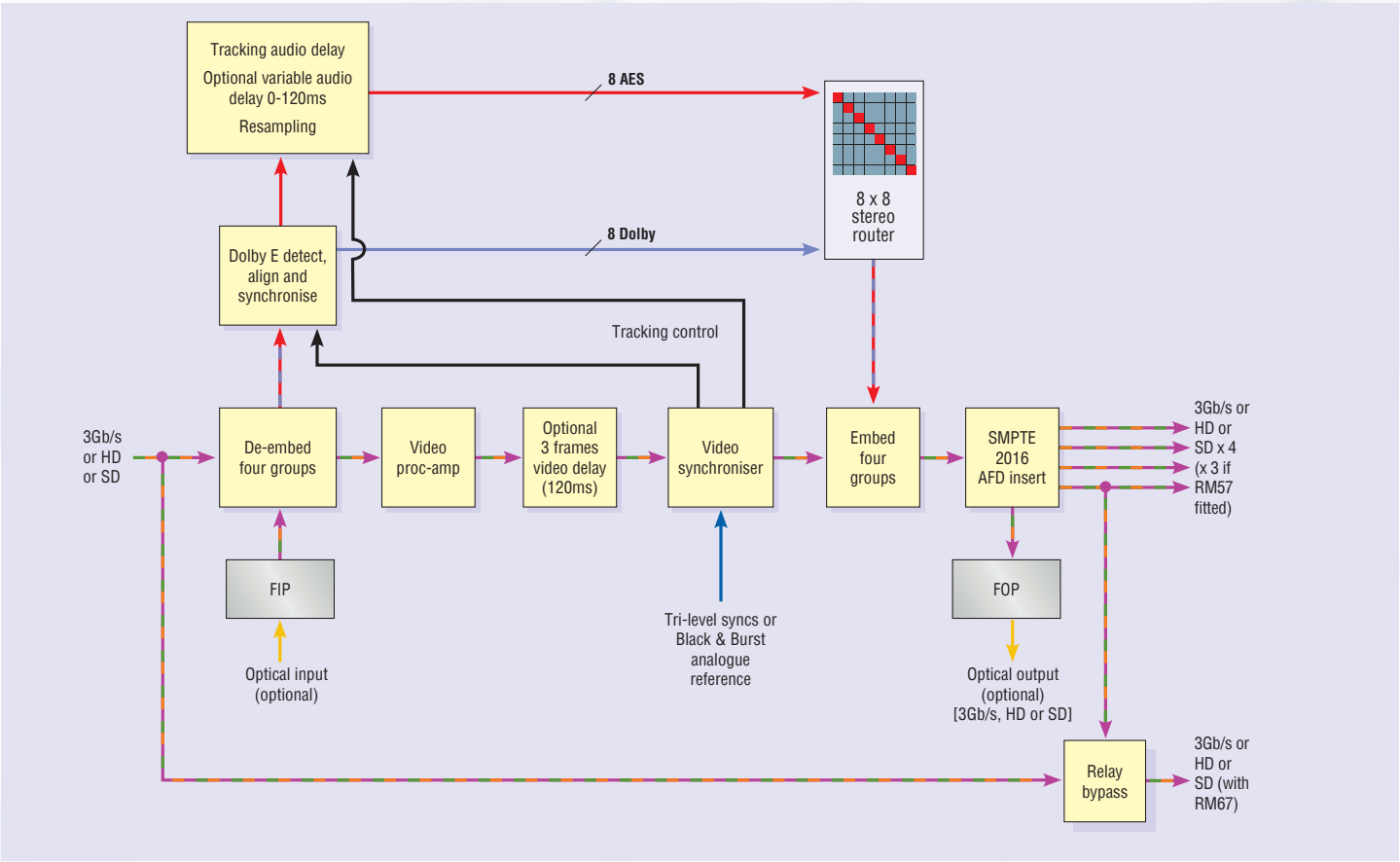
FRAMES AND CONTROL

SYN-A 3G is a space-saving 100mm x 266mm module which is housed in the Indigo frames, available in 2U, 1U and desk top sizes and with up to 12 boards fitting in 2U. It can be used with a choice of three frame rear modules – either the default RM41, the RM57 for fibre applications or the RM67 where relay bypass protection is required. The RM67 includes relay bypass protection on power failure or board removal, giving that extra layer of security and preventing signal loss. Ideal when you need to ensure that the main signal continues – whatever happens. With SYN-A 3G you'll get up to four video outputs – saving you the expense of a distribution amplifier on the output if you need to send the synchronised signal to multiple places.

Operating SYN-A 3G is very straightforward, with control options including an integrated control panel on the AE frame, the VisionPanel remote control panel, the SBB-4 smart button box, SNMP, the Statesman Lite PC software and the VisionWeb web browser control.

Up to 16 user-defined presets, containing the board setup data, may be stored and recalled. An automation system can easily control the insertion of any AFD code by recalling one of these 16 presets by GPI and so inform SYN-A 3G when to change the AFD code. Two GPI outputs are reserved for alarm indication and may be assigned any number of 16 video and audio alarms, allowing comprehensive signal monitoring. (See the *SPECIFICATION* for full list of alarms.) The video black and video frozen alarms can be delayed by up to 40 seconds before an alarm is asserted, while the silence alarms can be delayed by up to 120 seconds to prevent false alarming during quiet periods in the audio.

THE INPUTS AND OUTPUTS



SPECIFICATION

MECHANICAL

Standard Crystal Vision module 266mm x 100mm

Weight: 200g

Power consumption: 9 Watts; 0.6 Watts (FIP and FOP)

VIDEO INPUT

One 3Gb/s or HD or SD input

When using FIP fibre input option 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, 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 SMPTE 272 or SMPTE 299-1

VIDEO OUTPUTS

Using RM41 rear module: Four 3Gb/s, HD or SD outputs

Using RM57 rear module with FIP fibre input option: Three 3Gb/s, HD or SD outputs

Using RM57 rear module with FOP fibre output option: Four 3Gb/s, HD or SD outputs (one on fibre and three on BNC)

Using RM67 rear module: Four 3Gb/s, HD or SD outputs

The RM67 frame rear module provides relay bypass protection. An electromechanical relay switch needs power to hold the switch in one state and will revert to the other state (board bypass) on loss of power. It prevents signal loss by mechanically connecting the input of the SYN-A 3G to one of its outputs on complete frame power failure or board removal

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

With or without an input present, the output format can be forced to any of the formats handled by SYN-A 3G and give either a 100% colour bars, black or blue output

INTEGRATED FIBRE OPTIONS

SYN-A 3G can be given integrated fibre connectivity by fitting the FIP fibre input option or FOP fibre output option

The chosen option should be fitted at the factory

To access the optical inputs or outputs an RM57 frame rear module must be used

When fitted with a FIP or FOP, SYN-A 3G can be housed in any frame slot position but due to its extra height it is not possible to place Standard Definition or audio boards directly above it when the SYN-A 3G is in even numbered slot positions. 3Gb/s and HD boards do not share this restriction

FIP and FOP meet the SMPTE 297-2006 short-haul specification, allowing operation with single-mode and multi-mode fibre

Connector type: SC/PC

FIP:

Optical wavelength: 1260-1620nm

Input level maximum: 0dBm

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

FOP:

Optical power: Max 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

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 and specify the wavelength required

ANALOGUE REFERENCE

Tri-level syncs or analogue Black and Burst or video

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

Amplitude of syncs 150mV to 600mV

Link on PCB selects 75 ohm termination or high impedance

EMBEDDED AUDIO AND AUDIO ROUTING

Can contain up to four groups of embedded audio

Linear AES can be resampled using 16 audio resamplers

An 8 x 8 stereo router allows stereo pairs to be shuffled between all four groups

Selecting bypass will send any embedded audio directly to the output, bypassing the router and resamplers

Stereo pairs can be muted

DOLBY E HANDLING

Dolby E data will be automatically detected and processed appropriately

SYN-A 3G allows a mixture of Dolby E and linear AES within the same audio group, separating the Dolby E and linear audio and synchronising both types in the appropriate way before re-embedding the audio

SYN-A 3G 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

Dolby E can be delayed up to three frames in one frame increments

SYNCHRONISER TIMING ADJUSTMENTS

In synchroniser mode SYN-A 3G takes its timing from the external analogue reference and will automatically synchronise sources that are up to a frame apart. Further fixed delays can be added for matching purposes. Should the reference be removed, SYN-A 3G will revert to delay mode

In delay mode timing is derived from the 3Gb/s, HD or SD input, with the video delay adjusted in samples, lines and whole frame steps up to a maximum of four video frames

In both synchroniser and delay modes 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. With maximum adjustment of vertical and horizontal timing, the delay can be set between 220us (depending on options selected) and four frames

DELAY THROUGH BOARD

Minimum video and audio in to out delay: 220us (with resampling and Dolby alignment off); 3ms (with resampling on); 0.5 frames (with Dolby alignment on)

SPECIFICATION continued overleaf...

SPECIFICATION continued...

VIDEO DELAYS

0 to 1 frame video synchroniser delay

Optional one frame (33.3ms or 40ms), two frames (66.7ms or 80ms) or three frames (100ms or 120ms) video delay allows compensation for Dolby E encoding and decoding, or can match other big video delays in the system

AUDIO TIMING ADJUSTMENTS

Audio can be 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 have the same value as the video synchroniser delay. A control sets the time the TAD takes to track fast or abrupt changes in video delay

Selecting Dolby E alignment automatically introduces 0.5 frame delay in the video path. Dolby E will be delayed by the synchroniser delay plus 0 to 1 frame as required to align it correctly with the video

A fixed audio delay for Dolby E of 0, 1, 2 or 3 frames is available to match the equivalent video delay

The audio is normally delayed by the same amount as the video but an additional adjustable audio delay up to 120ms on each stereo pair of linear AES will compensate for any small delay between the incoming video and audio signals. Delay is either on or off for any given stereo pair

FREEZE FUNCTIONS

Manual freeze allows SYN-A 3G to be used as a simple still store. 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).

ACTIVE FORMAT DESCRIPTION

SYN-A 3G will insert SMPTE 2016 AFD data into the output video to allow downstream equipment to automatically select the appropriate aspect ratio

One of 16 AFD codes can be embedded, with the code describing which areas of the screen contain a picture and which areas are black 'padding'

The 16 codes are **0:** Undefined, **1:** Reserved, **2:** 16:9 top, **3:** 14:9 top, **4:** >16:9, **5:** Reserved, **6:** Reserved, **7:** Reserved, **8:** Full Frame (as coded frame), **9:** 4:3 image, **10:** 16:9 image, **11:** 14:9 image centre, **12:** Reserved for future use, **13:** 4:3 with shoot and protect 14:9 centre, **14:** 16:9 with shoot and protect 14:9 centre and **15:** 16:9 with shoot and protect 4:3 centre

The AFD code is contained in an ANC data packet, which is carried in the active portion of a specified line in the vertical blanking

When inserting SMPTE 2016 AFD data the inserter will blank any incoming SMPTE 2016 data

VIDEO PROCESSING

Video proc-amp for picture optimisation, with independent lift and gain adjustment for RGB and YUV:

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

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

Y lift: Offset the luminance component by +/- 10%

Y gain: Modify the luminance gain from +80% to +120%

U/V lift: Offset the U or V component by +/- 10%

U/V gain: Modify the U or V component gain from +80% to +120%

ANCILLARY DATA

All non-audio ancillary data passed. Audio passed subject to router settings

LED INDICATION OF:

Power supplies on board

Video input HD/SD

Input audio groups present

GPI output 5 active

GPI output 6 active

External reference connected

PRESETS

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

GPI INPUT LEVELS

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

GPI OUTPUT LEVELS

Electrically: Open collector transistors 30V, 270 ohm current limit resistors. Pulled up to +5V through 6800 ohm

GPI INPUTS

Four GPI inputs can be used to recall stored presets, either level or pulse triggered. GPIs can be used to control the insertion of any of the 16 AFD codes by recalling a preset

GPI OUTPUTS

Two GPI outputs (GPI 5 and GPI 6) are reserved for alarm indication. They may be assigned any number of 16 video and audio alarms:

Video missing

Reference missing

Input audio group 1 missing

Input audio group 2 missing

Input audio group 3 missing

Input audio group 4 missing

Silence on group 1 channels 1 and 2

Silence on group 1 channels 3 and 4

Silence on group 2 channels 1 and 2

Silence on group 2 channels 3 and 4

Silence on group 3 channels 1 and 2

Silence on group 3 channels 3 and 4

Silence on group 4 channels 1 and 2

Silence on group 4 channels 3 and 4

Video black

Video frozen

Video missing, reference missing and input groups missing will assert an alarm immediately. The video black and video frozen alarms can be delayed by up to 40 seconds before an alarm is asserted, while the silence alarms can be delayed by up to 120 seconds to prevent false alarming during quiet audio periods

REMOTE CONTROL

Control from integrated control panel on Indigo 1AE-DP frame

Control from VisionPanel 3U remote panel

VisionWeb Control is available via the web server on the frame and allows operation using a standard web browser on a PC or tablet

Statesman Lite allows control from any PC on a network

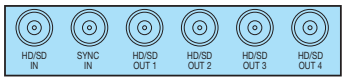
SBB-4 smart button box connects to the frame via Ethernet and provides four programmable LCD switches (which are configured for each order). The SBB-4 uses information from VisionWeb for settings. Uses Power over Ethernet so must be used with PoE enabled switch

SNMP monitoring and control available as a frame option

Control using ASCII and JSON protocols

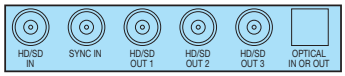
REAR MODULE CONNECTIONS

For standard applications



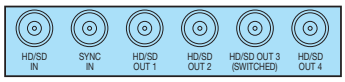
RM41

For fibre applications

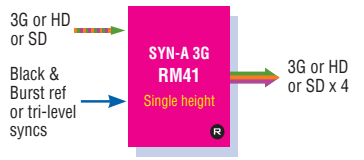


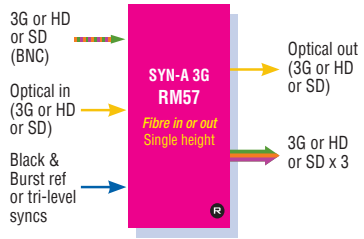
RM57

For relay bypass applications

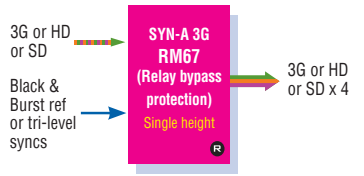


RM67





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



ORDERING INFORMATION

SYN-A 3G	3G/HD/SD video synchroniser for embedded audio sources
FIP	Fibre input option for SYN-A 3G motherboard providing integrated fibre input connectivity
FOP	Fibre output option for SYN-A 3G motherboard providing integrated fibre output connectivity. For CWDM laser options, contact Crystal Vision
Indigo 2SE	2U frame with active front panel featuring smart CPU for up to 12 Crystal Vision modules
Indigo 1AE-DP	1U frame with active front panel featuring smart CPU and integrated control panel for up to six Crystal Vision modules, with included power supply redundancy
Indigo 1SE-DP	1U frame with active front panel featuring smart CPU for up to six Crystal Vision modules, with included power supply redundancy
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

RM41	Single slot frame rear module. Allows maximum number of SYN-A 3G in frame (12 in 2U, six in 1U, two in desk top box). Gives access to one 3Gb/s, HD or SD input and four 3Gb/s, HD or SD outputs
RM57	Single slot frame rear module. Allows maximum number of SYN-A 3G in frame (12 in 2U, six in 1U, two in desk top box). Designed for applications using fibre inputs or outputs. When using fibre input, allows you to select between one fibre and one electrical 3Gb/s, HD or SD input, and gives access to three 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, along with one copy of the output on fibre
RM67	Single slot frame rear module. Allows maximum number of SYN-A 3G in frame (12 in 2U, six in 1U, two in desk top box). Provides relay bypass protection of the input. Gives access to one 3Gb/s, HD or SD input and four 3Gb/s, HD or SD outputs
VisionPanel	3U Ethernet remote control panel with touch screen
VisionWeb Control	VisionWeb web browser control included within frame software
SBB-4	Smart button box with four programmable LCD switches. It is powered by Power over Ethernet and therefore needs to be connected to a PoE enabled switch
Statesman Lite	PC Control System
SNMP	SNMP monitoring and control

Performance and features are subject to change. Figures given are typical measured values. SYN-A3G0619

Crystal Vision

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