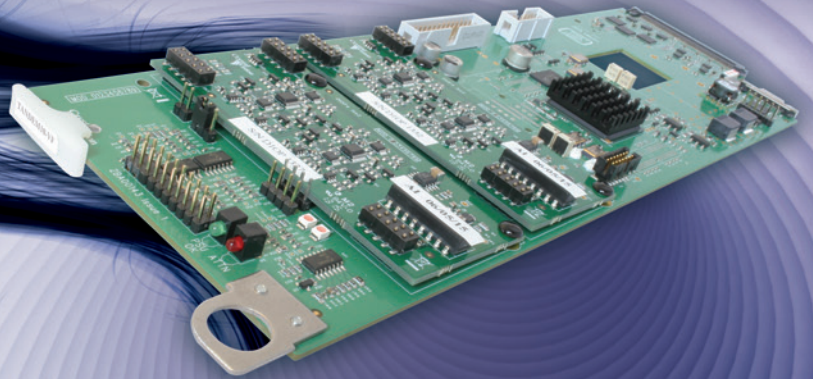# Crystal Vision

Vision SYSTEM

TANDEM10-VF

3G/HD/SD audio embedder/de-embedder

TANDEM10-VF is a very powerful and flexible four group audio embedder/de-embedder system. You can use it when you need to embed and de-embed at the same time or if you want a single product for use as an embedder or de-embedder as required.

TANDEM10-VF can be used with a variety of signals. It works with 3Gb/s, HD and SD video and with synchronous 48kHz AES, asynchronous 48kHz AES, synchronous Dolby E and analogue audio.

TANDEM10-VF provides flexible embedding and de-embedding of external audio. Using piggybacks TANDEM10-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.

TANDEM10-VF offers the most video outputs yet on a Crystal Vision embedder/de-embedder, while other useful features include audio and video processing, flexible delay compensation, fibre input/output connectivity and comprehensive signal monitoring.

With up to 20 cards fitting in the Vision 3 frame, TANDEM10-VF saves you rack space and can be housed alongside any other interface or IP cards from the Vision range.

◎ **Four group audio embedder/de-embedder**

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

◎ **Saves money: ideal for applications requiring both embedding and de-embedding at the same time, or for those who want to buy just one device to embed or de-embed as required**

◎ **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: additional audio delay of up to 400ms and additional ten frames of video delay**

◎ **Ideal for synchronous Dolby E users: allows embedding and de-embedding of synchronous Dolby E, while the ten frames of video delay can be used to match Dolby E delays**

◎ **Optimise the audio: with full audio processing including individual gain adjustments, stereo to mono conversion and channel muting and inversion**

◎ **Optimise the video: 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 TANDEM10-VF in 3U**

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

Crystal Vision has always been known for creating the industry's most flexible embedded audio products. Not only can TANDEM10-VF be used as either an embedder, a de-embedder or a mixed embedder/de-embedder, it can be used with AES, analogue audio or a mixture of both.

TANDEM10-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 TANDEM10-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. TANDEM10-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 combination 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

TANDEM10-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 TANDEM10-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 externally as AES or analogue audio via the DIOP4 or 3G-AOP2 piggybacks.

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, TANDEM10-VF makes it easy to compensate for any delay between the incoming video and audio and match all the signals.

An adjustable audio delay of up to 400ms (adjustable in 1ms steps) provides flexibility in compensating for any audio delays introduced by other equipment.

Up to ten frames of video delay (adjustable in one 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. This allows the video and audio timing to be brought back into alignment at points where it matters (such as when switching signals or approaching a mixer) and therefore avoid lip-sync errors.
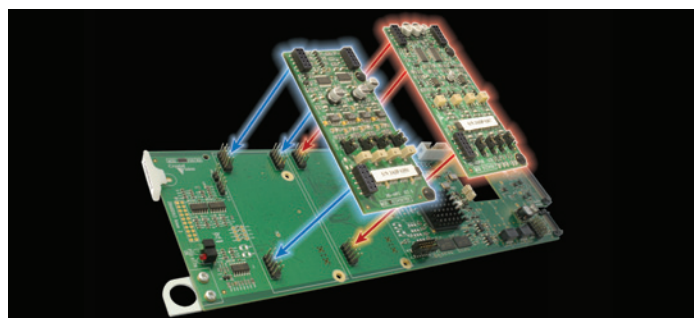
OPTIMISE THE AUDIO

TANDEM10-VF 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

TANDEM10-VF includes a video proc-amp for picture optimisation, with adjustment of the video gain, black level and independent RGB and YUV gains.

VisionWeb

REMOTE CONTROL

All control is done remotely. The control and monitoring options for TANDEM10-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.

TANDEM10-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 TANDEM10-VF are available at www.crystalvision.tv and allow you to explore the full functionality of the product.

FIBRE CONNECTIVITY – ON THE CARD

If you need to embed and de-embed signals from beyond your local equipment bay, it's easy to give TANDEM10-VF integrated fibre connectivity. Just order either the FIP-VF fibre input option, FOP-VF fibre output option or FIO-VF fibre input and output option.

With a fibre option fitted you could easily, for example, take signals from another part of the building and de-embed audio into the audio mixer, or embed audio from the audio mixer and then send the signals to another area.

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

TANDEM10-VF can also support a CWDM laser if required.

SAVE RACK SPACE

Housed in the Vision frames, TANDEM10-VF is a space-saving 96mm x 325mm card that sits in one frame slot – allowing up to 20 embedders/ de-embedders in 3U, depending on the rear module fitted.

TANDEM10-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.
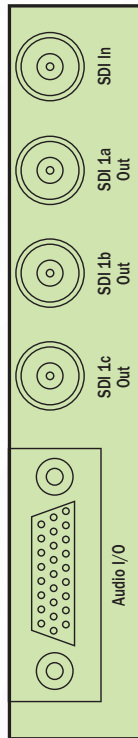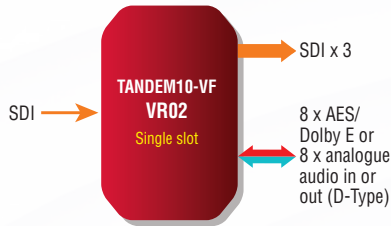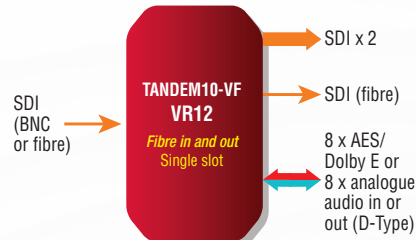

THE INPUTS AND OUTPUTS
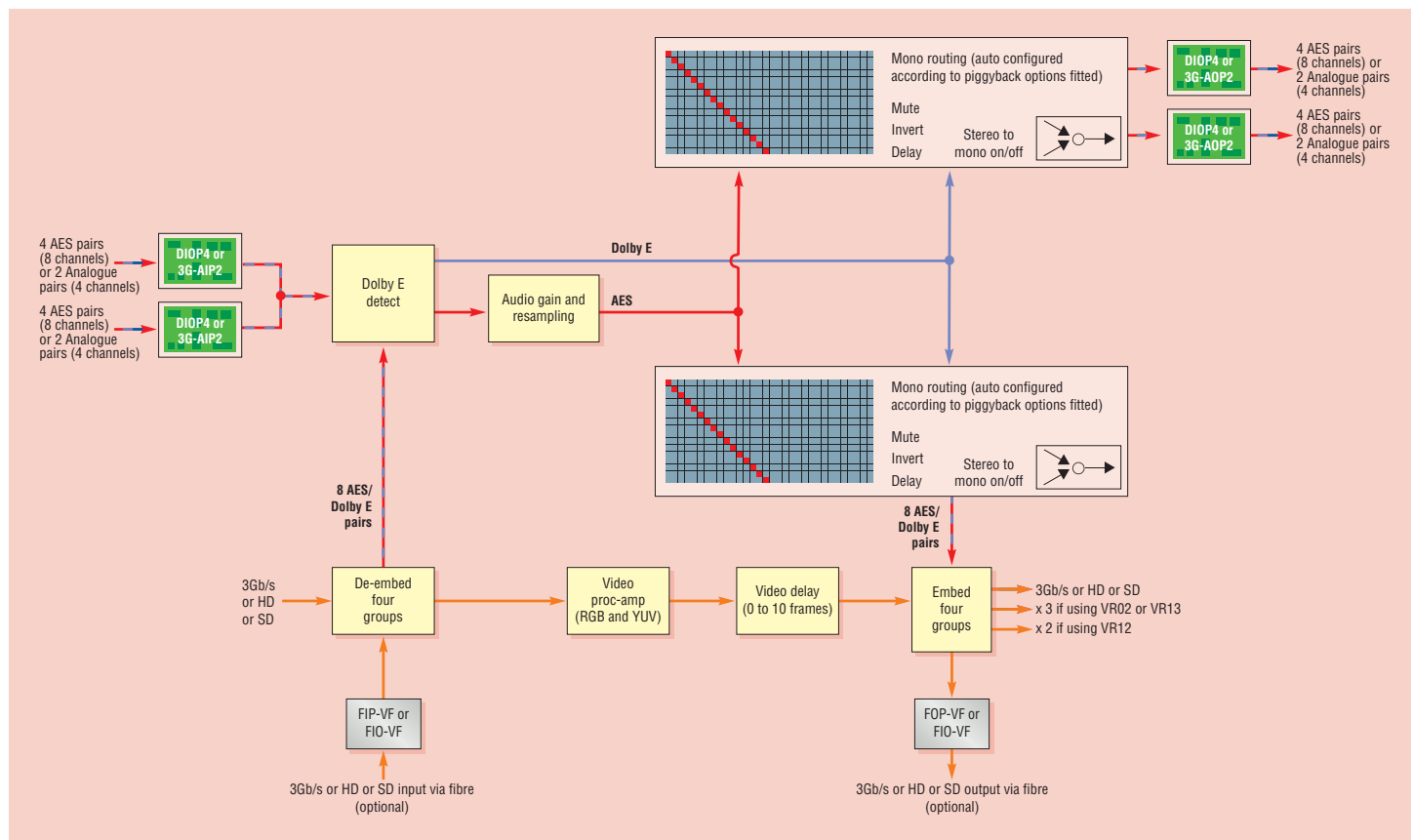
REAR MODULE CONNECTIONS

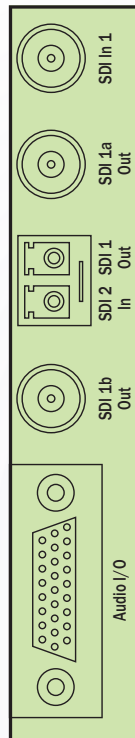## For 110 ohm AES or analogue audio applications (BNC SDI)

TANDEM10-VF VR02
Single slot

SDI →
→ SDI x 3
→ 8 x AES/Dolby E or 8 x analogue audio in or out (D-Type)

VR02

Connectors (top to bottom): SDI In, SDI 1a Out, SDI 1b Out, SDI 1c Out, Audio I/O

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

TANDEM10-VF VR12
Fibre in and out
Single slot

SDI (BNC or fibre) →
→ SDI x 2
→ SDI (fibre)
→ 8 x AES/Dolby E or 8 x analogue audio in or out (D-Type)

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

VR12

Connectors (top to bottom): SDI In 1, SDI 1a Out, SDI 2 In / SDI 1 Out, SDI 1b Out, Audio I/O

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

TANDEM10-VF VR13
Fibre in and out
Double slot

SDI (BNC or fibre) →
→ SDI x 3
→ SDI (fibre)
→ 8 x AES/Dolby E in or out (BNC)
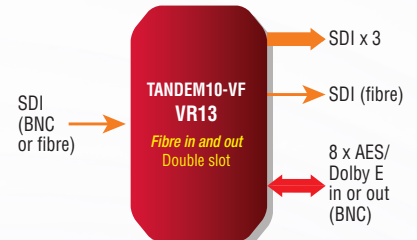
NB. Select no fibre option for BNC SDI 75 ohm AES applications, FIP-VF option for fibre in, FOP-VF option for fibre out and FIO-VF option for fibre in and out

VR13

Connectors left column (top to bottom): SDI In, SDI 1a Out, SDI In / SDI Out, SDI 1b Out, SDI 1c Out, AES 1 I/O
Connectors right column (top to bottom): AES 2 I/O, AES 3 I/O, AES 4 I/O, AES 5 I/O, AES 6 I/O, AES 7 I/O, AES 8 I/O
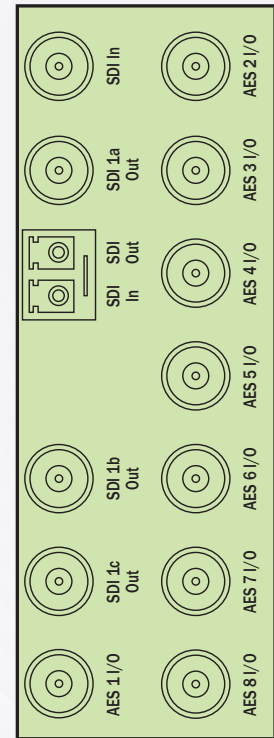
SPECIFICATION

TANDEM10-VF

MECHANICAL

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

Power consumption: 10 Watts (TANDEM10-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

TANDEM 10-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 four 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

On loss of input the output can be user selected as black, blue or no output

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 TANDEM10-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

TANDEM 10-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 TANDEM10-VF to embed synchronous compressed audio such as AC3

DELAY THROUGH BOARD

Minimum video in to out delay: <1 line

Minimum embedding audio delay: <200us

VIDEO DELAY

Up to ten frames of video delay adjustable in one frame steps allows compensation for any big system delays such as Dolby E encoding and decoding and transcoding to AC3 and re-embedding

AUDIO DELAY

Adjustable audio delay of up to 400ms on each stereo pair will compensate for any delay between the incoming video and audio signals. Delay is either on or off for any given stereo pair or can be set to follow the video frame delay

AUDIO REPLACE

TANDEM10-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 video delay (0 to 10 frames) and format to delay, what to show on video input loss, RGB proc-amp, YUV proc-amp, VANC blank enable, 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, embedded output router, discrete output router, audio groups to output, SMPTE or Sony embedder mode (SD only), card defaults and presets save and recall

Remote monitoring of the following:

As standard:

Video present

Video black

Video frozen

Video format

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

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

TANDEM10-VF	3G/HD/SD four group audio 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 TANDEM10-VF card
FOP-VF	Fibre output option for TANDEM10-VF card. For CWDM laser options, contact Crystal Vision
FIO-VF	Fibre input and output option for TANDEM10-VF card
Vision 3	3U frame with active front panel featuring smart CPU and integrated control panel for up to 20 Crystal Vision cards from the Vision range
VR02	Single slot frame rear module. Allows 20 TANDEM10-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 (on BNC) and all audio inputs or outputs
VR12	Single slot frame rear module. Allows 20 TANDEM10-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 TANDEM10-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