SYNNER 310

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

Crystal Vision

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Contents

Revision 1	NCal card edge LED replaced with GPO5. VisionWeb info added. Statesman info moved to Appendix 1. Dolby encoder option details added.	02/12/14
Revision 2	Removed all references to DBE-E encoder.	01/10/15
Revision 3	Added revised RM46 diagram to page 18. Changed edge to pulse on page 59, changed LoRoSurround description on page 71 and other minor changes.	14/04/16
Revision 4	Clarified GPI section.	24/06/16
Revision 5	Added note about removal of card edge control in 2018. Removed all references to DBE-D decoder.	27/06/19

1 Introduction

SYNNER 310 simplifies system design by providing a versatile solution for audio embedding and de-embedding with built-in video delay and synchronising.The SDI video signal passes through a de-embedder and an embedder which allows the extraction and insertion of up to 16 channels (four groups) of audio. The video path can be delayed by up to ten frames and synchronised to an analogue Black and Burst or tri-level reference.

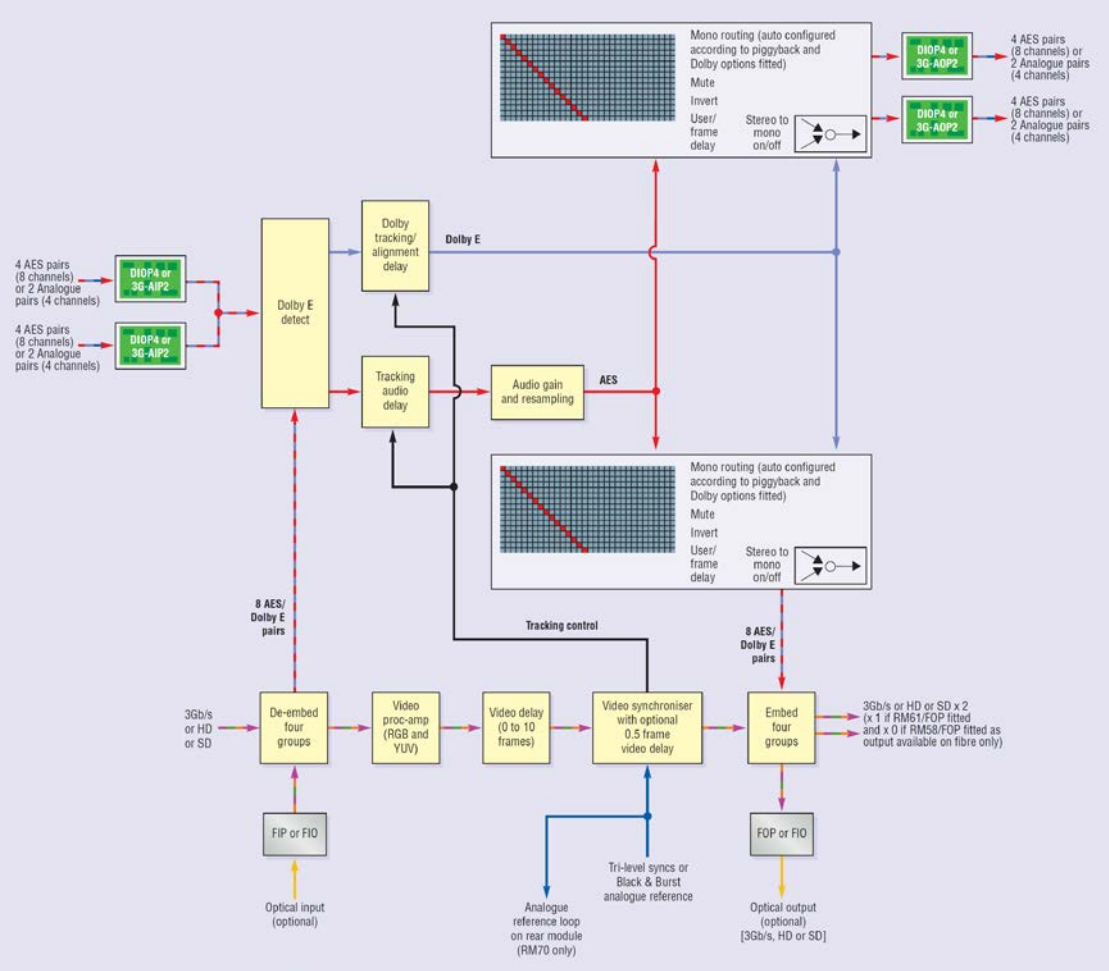
Embedded audio signals can be extracted and output as analogue or AES, then re-sampled and re-embedded into the video signal in the same or different channel positions with user-controlled gain, fixed delays and tracking delays to match the video synchroniser. Additionally, external analogue and AES audio inputs can be embedded into the video signal in any channel position.

There are two slots for optional analogue and digital I/O piggybacks of which there are three types: 3G-AIP2, 3G-AOP2 and DIOP4. The 3G-AIP2 piggyback has four analogue inputs; 3G-AOP2 has four analogue outputs; DIOP4 has four stereo AES pairs – each pair can be individually configured as an input or output.

The main features are as follows:

- **Use with any source -** works with 3Gb/s, HD and SD
- **Supports the following video standards:** 625, 525, 720p50, 720p59.94, 1080i 50, 1080i 59.94, 1080p 50, 1080p 59.94, 1080psf 23.98, 1080psf 24.
- **Versatile audio:** will de-embed and embed up to four audio groups and input or output up to eight external AES stereo pairs or four analogue stereo pairs which can be fully shuffled with the powerful 32 x 16 audio routers.
- **Optimise the video:** video proc-amp allows adjustment of video gain, black level and independent RGB and YUV gains. SYNNER 310 features a full-frame synchroniser that re-times the video output and embedded signals to match an external reference. Additionally there is a switchable 0-10 frame video delay - useful for matching Dolby E or other audio processing delays.
- **Tracking Audio Delay:** TAD allows audio signals to automatically track the dynamic delays of the video frame synchroniser by resampling or sample drop/repeat.
- **Align Dolby E:** Dolby E guardband can be automatically aligned to the video switching point prior to synchronisation and embedding.
- **Optimise the audio:** each channel has individual gain control and stereo to mono conversion. The audio level can be increased or decreased to match the rest of the system: each mono audio channel offers individual gain control, adjustable between +18dB and -18dB in 0.1dB steps. Audio channels can be muted and stereo pairs converted to mono. PCM Audio channels can be delayed with respect to the video by a fixed amount of up to 400mS and Dolby E channels by up to 40 samples.
- **Control** of SYNNER 310 is most easily achieved by Crystal Vision's VisionWeb web browser software. Control can additionally be from an active front panel on the frame, remote panel or SNMP. Card edge control was also available prior to 2018.

- **Optical connectivity:** send signals beyond the local equipment bay with the fibre input and output options
- **GPI control** of configuration set-ups and status alarms.
- **VANC** blanking option.
- **EDH** insertion.
- **Supports the following rear module connectors:** RM47, RM58, RM59, RM61, RM62, RM70 and RM74.
- **Compatible** with Crystal Vision standard frames available in 2U, 1U and desk top box.
- Passes all timecode, AFD and subtitling information.



SYNNER 310 functional block diagram

Block Diagram Description

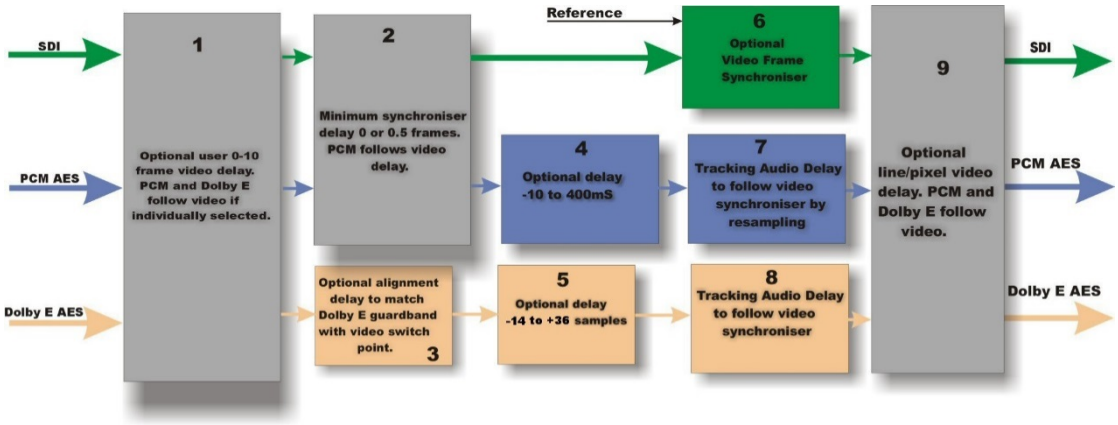
SDI video is cable-equalised, re-clocked and passed through a de-embedder block where up to 16 channels of audio are extracted. The video signal is then processed allowing for adjustment of video gain, black level and independent RGB and YUV gains. This is followed by up to ten video frames of delay and optional synchronisation to an external video reference. The video is then passed to the embedder block where up to 16 audio channels are inserted.

All input audio from both external (up to 16 channels via the optional plug-in input piggyback) and de-embedded sources (16 channels) are passed to audio processing blocks where gain and fixed delay and/or automatic tracking delay for non Dolby-encoded signals, or alignment delay for Dolby E signals are made after resampling.

The outputs of the audio processing block are input to two independent 32 x 16 routers which feed the optional plug-in output piggybacks and the embedding block. In this way any of the 32 sources can be output or embedded.

Video and audio delays in SYNNER 310

SYNNER 310 has a variety of video and audio delays some of which are of fixed length and others are dynamic.



SYNNER 310 Delay Paths

When reference video is selected as the genlock source the video path is synchronised to an external Black and Burst or tri-level reference and audio signals can optionally be made to track this dynamic delay to maintain lip-sync. When the video input is the genlock source (i.e. itself) the synchroniser is effectively bypassed and just the bulk delays active. In the following description of delay blocks, the paragraph number refers to the delay block number in the 'SYNNER 310 Delay Paths' drawing above. The input signals in the Delay Paths block diagram are from the de-embedder and external AES inputs. AES signals with Dolby E encoding are treated differently to PCM signals. The output of the delay block goes to the embedder and external output piggybacks.

1. This delay block will delay the video path by the value selected by the '*Frame Delay*' control in the '*Sync & Output Settings*' menu and can be from 0 to 10 frames. The PCM and Dolby E audio signals will also be delayed by this amount if the appropriate '*Frame Delay*' control is selected in the '*Discrete Delay*' menu. This fixed delay is

useful for delaying the video with respect to the audio or to compensate for timing errors elsewhere.

2. This block introduces a fixed delay to both video and PCM signals of either 0 or 0.5 frame depending on the value of '*Min Sync Delay'* in the *'Sync & Output Settings'* menu. This delay can be useful to help overcome synchroniser disturbances and to minimise Dolby E alignment delays.

   If 'Reference' is selected as the genlock source in the '*Sync & Output Settings* menu, the amount of delay through the following video frame synchroniser (see 6) will vary according to the difference in timing between the video and reference signals and can be anywhere from 0 to 1 frame. If the reference signal is not locked to the input video, the synchroniser delay will increase or reduce to follow the reference. When the delay goes beyond its minimum or maximum range it will jump instantaneously to the opposite end of its range, either skipping or repeating a frame, possibly causing a motion disturbance for non-static pictures. If the input video is nominally locked to the reference but drifting slowly backwards and forwards or jittering, then it is sometimes better to introduce an additional delay to the video path to centre the synchroniser delay half-way through its range. Although the synchroniser control logic has hysteresis to minimise this problem, in extreme cases of jitter the '*Min Sync Delay'* delay can help give the synchroniser +/- 0.5 frame of dynamic delay adjustment before hitting the end stops.

   As Dolby E signals are not routed through this delay they will be advanced by up to 0.5 frames with respect to the video path. This can help minimise delays caused by the alignment process (see 3).

3. Dolby E is sensitive to any disturbances to the data stream such as those introduced during editing or routing. To overcome this, Dolby E includes a part of the signal called the 'guardband' that is insensitive to disturbance and should be aligned with the video switching point prior to editing, routing or synchronising. If '*Dolby E Align'* is selected in the '*Discrete Delay'* menu, the alignment delay block will automatically delay the Dolby signal by up to one frame to match the guardband and video switch point. If the Dolby E channel is put through a series of embedding/de-embedding sequences the alignment delay can be magnified to several frames but if the '*Min Sync Delay'* control is set to 0.5 frames the overall Dolby E delay with respect to the video will be minimised.

4. If the '*User Delay'* control in the '*Discrete Delay'* menu is selected, this delay block introduces a delay to PCM signals by the amount set by the '*PCM Audio'* control from -20 to +400mS. Note that for negative delay values at least one frame of video delay and '*Frame Delay'* must be selected as well.

5. If the '*User Delay'* control in the '*Discrete Delay'* menu is selected, this delay block introduces a delay to Dolby E signals by the amount set by the '*Dolby E'* control from -14 to +36 samples. This range is chosen so the user cannot move the Dolby E guardband away from the video switch point after alignment. Note that for negative delay values at least one frame of video delay and '*Frame Delay'* must be selected as well.

6. If the genlock mode is set to 'Reference', this block synchronises the incoming video signal to the external reference by setting a dynamic delay of up to one frame. If Tracking Alignment Delay is selected by the '*TAD Delay'* control in the '*Discrete Delay'* menu then the audio signals will be delayed by the same amount to maintain lip-sync and Dolby E alignment.

7. If '*TAD Delay'* is selected in the '*Discrete Delay'* menu, this delay is slaved to the video frame synchroniser to provide the same delay for PCM signals as the video

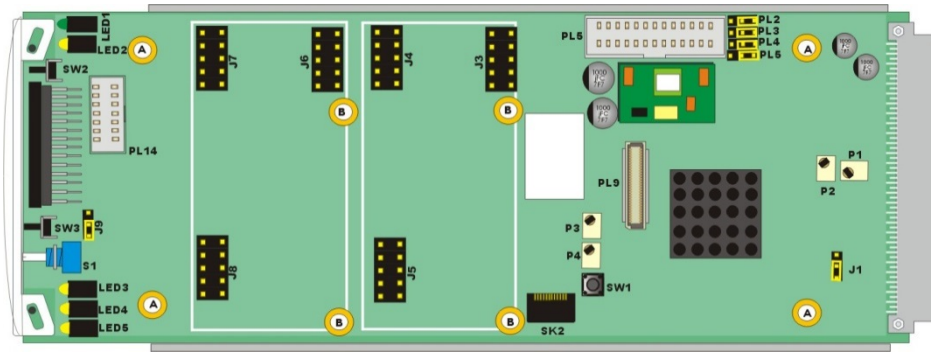
path. Variable delay is achieved by either resampling if '*Resample'* is selected in the '*Discrete Settings'* menu or audio sample drop/repeat if not.

8. If '*TAD Delay'* is selected in the '*Discrete Delay'* menu for Dolby E signals, this delay will produce the same delay as the video frame synchroniser. Frames will be dropped or repeated at the same time as the video. Dolby E encoded signals cannot be resampled or samples dropped/repeated.

9. This delay is after the frame synchroniser and TAD delays. If 'Reference' is selected as the genlock source, the values set by the '*Line and Pixel Delay'* controls in the '*Sync & Output Settings'* menu will delay the video and audio signals with respect to the refererence. Otherwise this block will introduce a further delay to the video and audio paths.

2 Hardware installation

Board configuration



SYNNER 310 main board top-side

Note: *The potentiometers P1, P2, P3 and P4 have been factory set and should NOT be adjusted. Holes marked 'B' are for the fitting of the I/O piggybacks*.

Link Configuration

There are four user-settable links on the SYNNER 310. These are PL2-5, all other links should be left in the position shown in the above picture. PL2-5 set whether the board's GPI inputs are used as GPIs or as an extra serial I/O port.

Link	Towards front of board or Up	Towards the rear of board or Down
J1	Sync input unterminated	Sync input terminated by 75 ohm
J9	Debug mode – forces board's IP address to be 10.0.0.201	Normal mode (factory set, do not alter)
PL2	GPI 1 Input = RS422 Rx+	GPI 1 Input = GPI 1
PL3	GPI 2 Input = RS422 Rx-	GPI 2 Input = GPI 2
PL4	GPI 3 Input = RS422 Tx+	GPI 3 Input = GPI 3
PL5	GPI 4 Input = RS422 Tx-	GPI 4 Input = GPI 4

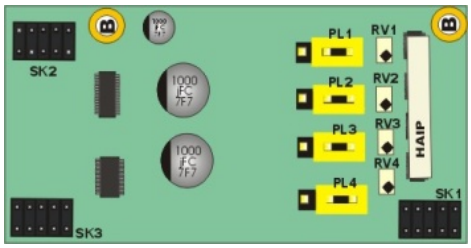
Input and output piggyback boards

The main SYNNER 310 board has two positions where one of three types of I/O module can be plugged to enable analogue or digital input and output.

The three types of piggybacks are 3G-AIP2, 3G-AOP2 and DIOP4. The following table shows the legal combinations of piggybacks that can be fitted into front and rear positions:

FRONT	none	DIOP4	3G-AIP2	3G-AOP2	DIOP4	DIOP4	DIOP4	3G-AIP2	3G-AIP2	3G-AOP2
REAR	none	none	none	none	DIOP4	3G-AIP2	3G-AOP2	3G-AIP2	3G-AOP2	3G-AOP2

3G-AIP2 Analogue Input

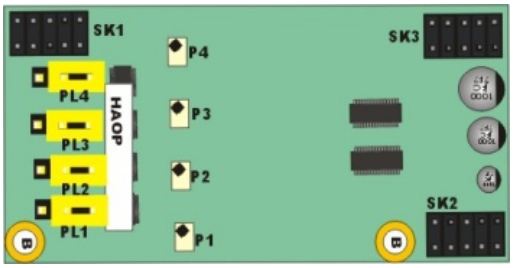


This analogue module has four balanced audio inputs. The links PL1-4 allow 0dBFS to be set to +18dBu (to the right, towards SK1) or +24dBu (to the left, towards SK2/3). The adjacent potentiometers RV1-4 are factory set and should **NOT** be adjusted.

3G-AIP2 Channel number	Link number
CH1	PL1
CH2	PL2
CH3	PL3
CH4	PL4

Table showing links controlling the input gain of the 3G-AIP2 channels

3G-AOP2 Analogue Output

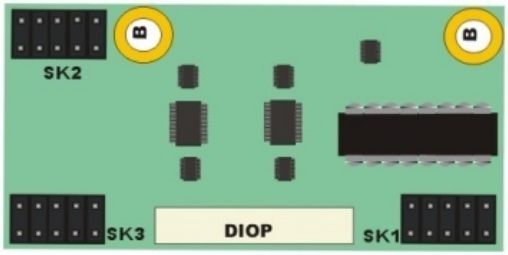


This analogue piggyback has four balanced audio outputs. The links PL1-4 set 0dBFS to +18dBu (to the right, towards SK2/3) or +24dBu (to the left, towards SK1). The four potentiometers P1-P4 are factory set and should **NOT** be adjusted.

3G-AOP2 Channel number	Link number
CH1	PL1
CH2	PL2
CH3	PL3
CH4	PL4

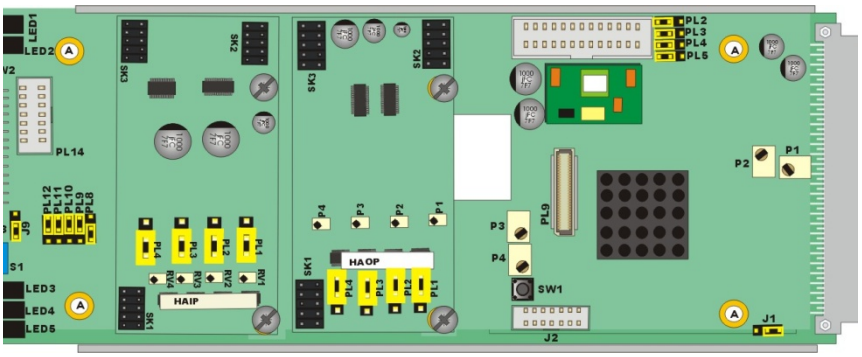
Table showing links controlling the output gain of the 3G-AOP2 channels

DIOP4 AES I/O



This digital audio piggyback has four AES stereo pairs that are individually configured as inputs or outputs by software. There are no links or user-adjustments on this card.

Fitting the I/O piggybacks onto the main board



Example showing 3G-AIP2 and 3G-AOP2 piggybacks fitted

The I/O piggybacks plug onto the main board such that main board plugs J3, J4, J5 and J6, J7, J8 align with piggyback sockets SK2, SK3, SK1. With the component side of the module top-most, align the piggyback sockets carefully with the plugs and push firmly. Insert the plastic rivets supplied with the fitting kit through the main board from the underside so they protrude through the piggyback board, then push the rivet peg firmly to splay the end to lock the piggyback board in position.

Note: *The position that the piggyback is fitted determines the function of the rear module connectors*.

Front edge LEDs				
LED1	LED2	LED3	LED4	LED5
On if power supply OK	On if Dolby not 5.1	On if error occurs in audio content	On if Vertical frame sync error	Bitstream Format OFF= Dolby E, ON = other

There are 13 links that are factory set and should **NOT** be moved.There is one potentiometer P2 that is factory set and should **NOT** be adjusted.

3 Rear modules and signal I/O

The 2U Indigo 2 frames will house up to 12 single height modules and dual power supplies. The 1U Indigo 1 frames will house six single height modules and a single or dual power supply. The Indigo DT desk top boxes have a built-in power supply and will house up to two single height modules. All modules can be plugged in and removed while the frame is powered without damage.

Note: *For details of fitting rear connectors please refer to the appropriate frame manual.*

The SYNNER 310 can support the following rear modules: RM47, RM58, RM59, RM61, RM62, RM70 and RM74. The RM47, RM58 and RM59 are designed for 110 ohm operation and the RM74 for 75 ohm operation.

Rear module connections with RM47

The RM47 being a single height module will allow maximum packing density with the maximum number of outputs available. Eight AES stereo pairs or eight mono analogue channels are presented as balanced I/O on the 26-way high density D-Type connector.

RM47 rear module connector	Description
	**RM47** • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
SYNC IN	Analogue BlackBurst or tri-level sync reference for video synchroniser
SDI OUT(A)	3G/High Definition/Standard Definition serial digital output
SDI OUT(B)	3G/High Definition/Standard Definition serial digital output

26-way D-Type Audio Connections

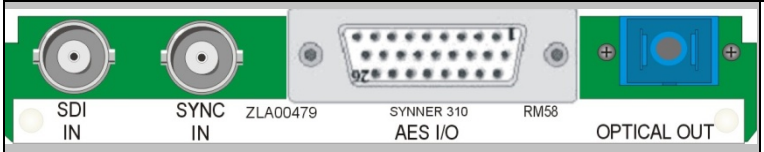
The 26-way audio ‘D’ connector RM47 module can be used for analogue or digital, inputs or outputs - or a mixture of both depending on the I/O piggybacks fitted. Half of the I/O channels on the rear module are connected to the front I/O (nearest handle) piggyback position and the remainder to the rear. The DIOP4 will normally be configured as 110 ohm balanced operation when using this rear module.

Module position	I/O		Pin-out
	GND		1
Front	Analogue audio 1/ AES1	+	2
		-	3
	Analogue audio 2/ AES2	+	4
		-	5
	Analogue audio 3/ AES3	+	6
		-	7
	Analogue audio 4/ AES4	+	8
		-	18
	GND		9
Rear	Analogue audio 5/ AES5	+	14
		-	15
	Analogue audio 6/ AES6	+	10
		-	11
	Analogue audio 7/ AES7	+	16
		-	17
	Analogue audio 8/ AES8	+	12
		-	13
	GND		19, 20, 23, 24
	NC		21, 22, 25, 26

RM47 audio I/O connector wiring - *All audio balanced signals can be either input or output depending on I/O module fitted.*

Rear module connections with RM58

The RM58 being a single height module will allow maximum packing density with the option of an optical connection. Eight AES stereo pairs or eight mono analogue channels are presented as balanced I/O on the 26-way high density D-Type connector. Video output is optical only.

RM58 rear module connector	Description
	**RM58** • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC Connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
SYNC IN	Analogue Black and Burst or tri-level sync reference for video synchroniser
OPTICAL I/O	SC optical output connector

26-way D-Type Audio connections

The 26-way audio ‘D’ connector RM58 module can be used for analogue or digital, inputs or outputs - or a mixture of both depending on the I/O piggybacks fitted. Half of the I/O channels on the rear module are connected to the front I/O (nearest handle) piggyback and the remainder to the rear. The DIOP4 will normally be configured as 110 ohm balanced operation when using this rear module.

Module position	I/O			Pin-out
	GND			1
Front	Analogue audio 1/ AES1	+		2
		-		3
	Analogue audio 2/ AES2	+		4
		-		5
	Analogue audio 3/ AES3	+		6
		-		7
	Analogue audio 4/ AES4	+		8
		-		18
	GND			9
Rear	Analogue audio 5/ AES5	+		14
		-		15
	Analogue audio 6/ AES6	+		10
		-		11
	Analogue audio 7/ AES7	+		16
		-		17
	Analogue audio 8/ AES8	+		12
		-		13
	GND			19, 20, 23, 24
	NC			21, 22, 25, 26

RM58 audio I/O connector wiring - *All audio balanced signals can be either input or output depending on I/O module fitted.*

Rear module connections with RM59

The RM59 being a single height module will allow maximum packing density with the option of an optical connection. Eight AES stereo pairs or eight mono analogue channels are presented as balanced I/O on the 26-way high density D-Type connector. Video input is optical only.

RM59 rear module connector	Description
	**RM59** • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC connections

BNC	I/O assignment
SYNC IN	Analogue Black and Burst or tri-level sync for video path synchroniser
SDI OUT	3G/High Definition/Standard Definition serial digital output
OPTICAL IN	SC optical input connector

26-way D-Type audio connections

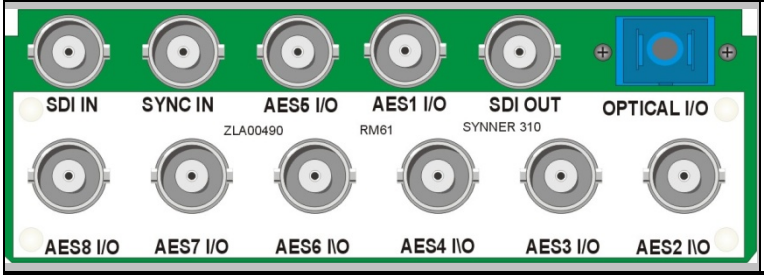
The 26-way audio ‘D’ connector RM59 module can be used for analogue or digital, inputs or outputs - or a mixture of both depending on the I/O piggybacks fitted. Half of the I/O channels on the rear module are connected to the front I/O (nearest handle) piggyback and the remainder to the rear. The DIOP4 will normally be configured as 110 ohm balanced operation when using this rear module.

Module position	I/O		Pin-out
	GND		1
Front	Analogue audio 1/ AES1	+	2
		-	3
	Analogue audio 2/ AES2	+	4
		-	5
	Analogue audio 3/ AES3	+	6
		-	7
	Analogue audio 4/ AES4	+	8
		-	18
	GND		9
Rear	Analogue audio 5/ AES5	+	14
		-	15
	Analogue audio 6/ AES6	+	10
		-	11
	Analogue audio 7/ AES7	+	16
		-	17
	Analogue audio 8/ AES8	+	12
		-	13
	GND		19, 20, 23, 24
	NC		21, 22, 25, 26

RM59 audio I/O connector wiring - *All audio balanced signals can be either input or output depending on I/O module fitted.*

Rear module connections with RM61

The RM61 is a dual height module presenting the eight AES stereo pairs on 75 ohm BNC connectors. The DIOP4 I/O module(s) must be used with this rear module as there is no provision for analogue audio I/O. Video I/O can be BNC or optical.

RM61 rear module connector	Description
	**RM61** • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Alternate frame slots can be used

BNC Connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
SYNC IN	Analogue Black and Burst or tri-level sync reference for video synchroniser
AES5 I/O	AES5 stereo pair 75 ohm input/output
AES1 I/O	AES1 stereo pair 75 ohm input/output
SDI OUT	3G/High Definition/Standard Definition serial digital output
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted
AES8 I/O	AES8 stereo pair 75 ohm input/output
AES7 I/O	AES7 stereo pair 75 ohm input/output
AES6 I/O	AES6 stereo pair 75 ohm input/output
AES4 I/O	AES4 stereo pair 75 ohm input/output
AES3 I/O	AES3 stereo pair 75 ohm input/output
AES2 I/O	AES2 stereo pair 75 ohm input/output

Rear module connections with RM62

The RM62 being a single height module will allow maximum packing density with the option of an optical connection. Video I/O can be BNC or optical.

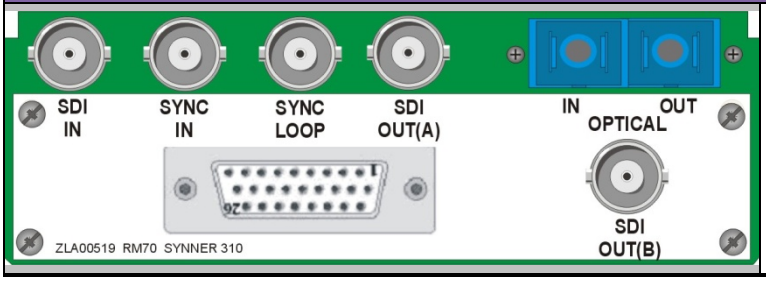
RM62 rear module connector	Description
	**RM62** • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
SYNC IN	Analogue Black and Burst or tri-level sync reference for video synchroniser
NC	No connection
SDI OUT(1A)	3G/High Definition/Standard Definition serial digital output
SDI OUT(1B)	3G/High Definition/Standard Definition serial digital output
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted

Rear module connections with RM70

The RM70 being a dual height module will allow maximum packing density with the option of a dual optical connection. Eight AES stereo pairs or eight mono analogue channels are presented as balanced I/O on the 26-way high density D-Type connector.Video I/O can be BNC or optical.

RM70 rear module connector	Description
	**RM70** • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Alternate frame slots can be used

BNC Connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
SYNC IN	Analogue Black and Burst or tri-level sync input for video path synchroniser
SYNC LOOP	Loop-through of sync input
SDI OUT (A)	3G/High Definition/Standard Definition serial digital output
OPTICAL IN	SC optical input connector
OPTICAL OUT	SC optical output connector
SDI OUT (B)	3G/High Definition/Standard Definition serial digital output

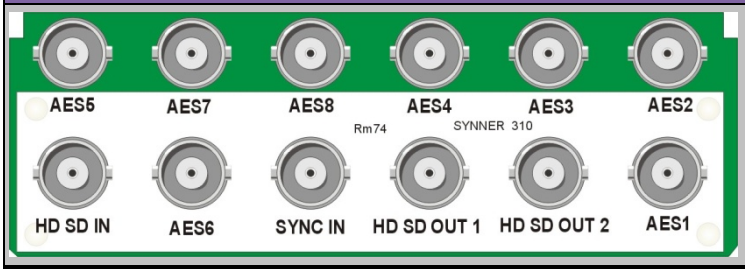
26-way D-Type Audio connections

Module position	I/O		Pin-out
	GND		1
Front	Analogue audio 1/ AES1	+	2
		-	3
	Analogue audio 2/ AES2	+	4
		-	5
	Analogue audio 3/ AES3	+	6
		-	7
	Analogue audio 4/ AES4	+	8
		-	18
	GND		9
Rear	Analogue audio 5/ AES5	+	14
		-	15
	Analogue audio 6/ AES6	+	10
		-	11
	Analogue audio 7/ AES7	+	16
		-	17
	Analogue audio 8/ AES8	+	12
		-	13
	GND		19, 20, 23, 24
	NC		21, 22, 25, 26

RM70 audio I/O connector wiring - *All audio balanced signals can be either input or output depending on I/O module fitted.*

Rear module connections with RM74

The RM74 is a dual height module presenting the eight unbalanced AES stereo pairs on 75 ohm BNC connectors. The DIOP4 I/O piggyback(s) must be used with this rear module as there is no provision for analogue audio I/O.

RM74 rear module connector	Description
	**RM74** • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Alternate frame slots can be used

BNC Connections

BNC	I/O assignment
AES5	AES5 stereo pair 75 ohm input/output
AES7	AES7 stereo pair 75 ohm input/output
AES8	AES8 stereo pair 75 ohm input/output
AES4	AES4 stereo pair 75 ohm input/output
AES3	AES3 stereo pair 75 ohm input/output
AES2	AES2 stereo pair 75 ohm input/output
SDI IN	3G/High Definition/Standard Definition serial digital input
AES6	AES6 stereo pair 75 ohm input/output
SYNC IN	Analogue black burst or tri-level sync reference for video synchroniser
HD SD OUT 1	3G/High Definition/Standard Definition serial digital output
HD SD OUT 2	3G/High Definition/Standard Definition serial digital output
AES1	AES1 stereo pair 75 ohm input/output

4 General Purpose Interface

Introduction

Each frame slot has up to six connections ‘a-f’ for GPI control and monitoring. These connections are available at the rear of the frame on the 26-way D-Type remote connectors.

SYNNER 310 has four GPI inputs and two GPI outputs.

Each General Purpose Interface (GPI) input is fitted with a 6800Ω resistor connected to the internal +5V and in the following table, this equates to logic ‘H’. With the GPI preset recall lines set to ‘level’ mode and no connections (logic ‘HHHH’), preset 1 will be selected. With the GPI preset recall lines set to ‘pulse’ mode, the GPI will be activated whenever a bit is pulled low but no change to the preset selection will occur when all bits return to logic ‘HHHH’. Note that preset 16 is not accessible in pulse mode.

***Note**: Because the GPI inputs are sampled in the vertical interval it is recommended that in ‘pulse’ mode, the GPI should be asserted at least 2mS before the start of vertical sync to ensure stability and held active for at least 40mS.*

See *Presets, Resets & GPI/Os Menu* in this manual for details of inverting the GPI preset logic.

Each General Purpose Interface (GPI) output has a 270Ω resistor in series with its output. This allows for an external LED to be driven, connected to a DC voltage of +5V.

The GPI inputs can be programmed to automatically recall a previously saved preset configuration. The 16 user preset configurations are selected using binary notation. The two outputs can be programmed to assert themselves for a number of different alarm conditions.

GPI			Low (<1V)	High (+5V)
1	**‘a’**	**Recall preset bit 1**	See following table for user preset control	
2	**‘b’**	**Recall preset bit 2**		
3	**‘c’**	**Recall preset bit 4**		
4	**‘d’**	**Recall preset bit 8**		
5	**‘e’**	**Alarms** (See alarm table)	Alarm condition	No alarm
6	**‘f’**	**Alarms** (See alarm table)	Alarm condition	No alarm

Table showing the six GPI functions

GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1
1	H	H	H	H
2	H	H	H	L
3	H	H	L	H
4	H	H	L	L
5	H	L	H	H
6	H	L	H	L
7	H	L	L	H
8	H	L	L	L
9	L	H	H	H
10	L	H	H	L
11	L	H	L	H
12	L	H	L	L
13	L	L	H	H
14	L	L	H	L
15	L	L	L	H
16	L	L	L	L

Binary coding of GPI inputs to recall preset configurations in level mode.

GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1
No change				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16	Not accessible in pulse mode.			

Binary coding of GPI inputs to recall preset configurations in pulse mode.

Alarms

GPI outputs 5 and 6 (e, f) can be configured to be asserted (logic 'L') for a selection of error conditions.

There are a number of alarm conditions which can be assigned to either or both of the GPI outputs. The number of alarm conditions available at any time depends on the number and type of piggybacks fitted.

Reportable error conditions
Video Missing
Reference Missing
Video Black
Video Frozen
Input groups 1-4 Missing
Channel pair silent for all groups
Channel pair has Dolby E encoding present for all groups
AES channel pair input missing (for all fitted DIOP4 piggybacks)
AES channel pair input silent (for all fitted DIOP4 piggybacks)
AES channel pair is Dolby E encoded (for all fitted DIOP4 piggybacks)
Analogue channel pair silent (for all fitted 3G-AIP2 piggybacks)

See *Control Descriptions* for more details of alarms.

2U frame GPI connections

GPI lines 'a' to 'f' of each card connect to two of four rear remote connectors as follows:

Slot no.	'a' pin	'b' pin	'c' pin	'd' pin	'e' pin	'f' pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	8 (3)	9 (3)	18 (3)	26 (3)	19 (4)	20 (4)
4	7 (3)	16 (3)	17 (3)	25 (3)	10 (4)	11 (4)
5	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
6	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
7	5 (3)	6 (3)	15 (3)	24 (3)	1 (4)	2 (4)
8	4 (3)	14 (3)	13 (3)	23 (3)	3 (4)	4 (4)
9	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
10	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)
11	3 (3)	12 (3)	22 (3)	21 (3)	12 (4)	13 (4)
12	10 (3)	11 (3)	19 (3)	20 (3)	21 (4)	22 (4)

Table shows pin number (remote number)

Note: *Remote 1 and Remote 3 are 26-way high-density D-Type female sockets. Frame ground is pin 2 and +5V @500mA is pin 1 in each case.*
Remote 2 and Remote 4 are 26-way high-density D-Type male plugs and frame ground is pin 6 in each case and +5V @500mA is pin 15 on Remote 2.
Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1A.

1U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)
3	5 (1)	6 (1)	15 (1)	24 (1)	1 (2)	2 (2)
4	4 (1)	14 (1)	13 (1)	23 (1)	3 (2)	4 (2)
5	3 (1)	12 (1)	22 (1)	21 (1)	12 (2)	13 (2)
6	10 (1)	11 (1)	19 (1)	20 (1)	21 (2)	22 (2)

Table shows pin number (remote number)

Note: *Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.*
Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15.
Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

Indigo DT desk top box GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to two rear remote connectors as follows:

Slot no.	‘a’ pin	‘b’ pin	‘c’ pin	‘d’ pin	‘e’ pin	‘f’ pin
1	8 (1)	9 (1)	18 (1)	26 (1)	19 (2)	20 (2)
2	7 (1)	16 (1)	17 (1)	25 (1)	10 (2)	11 (2)

Table shows pin number (remote number)

Note: *Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.*
Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15.
Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1A.

5 Control and Status monitoring

SYNNER 310 controls and status can be accessed most easily by 'VisionWeb' remote control web browser software but also by card edge control and the rack front panel. SYNNER 310 is aware of what optional boards are fitted and adjusts the card edge/front panel menu tree accordingly to reflect the options available. For instance, if no audio I/O piggybacks are fitted, then no provision is shown for selecting those audio sources or outputs. Similarly, the VisionWeb GUI also only shows the functionality of the fitted options.

Board edge control was removed from SYNNER 310 in 2018. Therefore the card edge control information detailed below is only relevant for older versions of the product.

Card edge controls

SYNNER 310 board edge

Card edge buttons

The two tactile push button switches allow the operator to navigate within the menu structure.

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Button	Function	Normal state Up, Action Down
^	Up Menu	Push to jump up a menu level or cancel a selection
ENTER	Select/Action	Push to select a menu and to action and confirm a change

Card edge rotary control

The board edge rotary encoder is used to navigate through the menu categories and adjust parameter values.

Control	Function
SCROLL/ ADJ	Rotate SCROLL/ADJ to identify a menu category. In combination with the ENTER button select and ADJUST to change the current level or select a further option.

Note: *The rotary control can access menus and parameter values by clockwise or anti-clockwise rotation.*

Reading card edge LEDs

Card edge LEDs may be used in conjunction with status information from any connected remote status panel display or from VisionWeb if available.

Refer also to the troubleshooting chapter for more help with solving problems and monitoring status information.

The following table summarises the card edge LED functions and colours:

Name	LED Colour	Function when ON	Function when Off
PSU	Green	Good power supply (PSU) rails	One or more of the monitor supplies is out of specification
Lock	Green		
HD	Yellow	Video input standard is HD (High Definition)	} Input not present
SD	Yellow	Video input standard is SD (Standard Definition)	
G1	Yellow	Audio Group 1 present	Audio Group 1 not present
G2	Yellow	Audio Group 2 present	Audio Group 2 not present
G3	Yellow	Audio Group 3 present	Audio Group 3 not present
G4	Yellow	Audio Group 4 present	Audio Group 4 not present
GPO5	Yellow	GPO5 active / low	GPO5 inactive / high
GPO6	Yellow	GPO6 active / low	GPO6 inactive / high

Navigating card edge menus

To access the card edge menu system proceed as follows:

- Press the up-arrow [⋀] until a top menu category is reached
- Rotate the SCROLL/ADJ control until the desired menu category is found
- Press ENTER to enter the sub-menus of that category
- Rotate SCROLL/ADJ to select a sub-menu
- Press ENTER to select the desired function. Selection will be indicated by the text being displayed in ***italic*** text
- Rotate ADJUST to make the desired change to the selected parameter. The display changes to ***italics*** to indicate that a change has been made and requires confirmation
- When required push ENTER to action the change. The display will return to normal non-italic text
- Use the up-arrow [⋀] and SCROLL/ADJ control to navigate to further menus

Using the front control panel

At power up, the LEDs of all eight control panel keys will illuminate briefly. Once the panel has completed its power up and configuration sequence the panel will enter its status mode and display the current software version and frame IP address.

'Status' menu showing current software version and IP address

Selecting a SYNNER 310

To continue with control panel operation or configuration, press the 'Device' key once. The control panel will display the name of the card that first responds to the polling request together with its location number. The location number consists of the frame number plus the card position in the frame. Rotate the Shaft control to poll through the available cards.Use the F2 soft key to toggle between the card's serial number and issue number with modification level.

'Device' menu showing SYNNER 310 in slot 1.01

In the example above, the card displayed is located in the first frame in slot number 1.

When the desired card is selected press the ENTER key to access that card's HOME menu.

The SYNNER 310 home menu

Rotate the shaft control to scroll through the menu structure and press ENTER to select the sub-menus. Press HOME at any time to return to the home menu.

SYNNER 310 Video Status sub-menu

Press ENTER to select the Video Status menu or SCROLL to display other sub-menus. See description of menu structure below for list of sub-menus.

***Note**: The audio routing cannot be set from the front panel when running SYNNER 310 software V1.2 and Indigo frame software V4.4.*

Control Panel keys overview

The functions assigned to the control panel keys are:

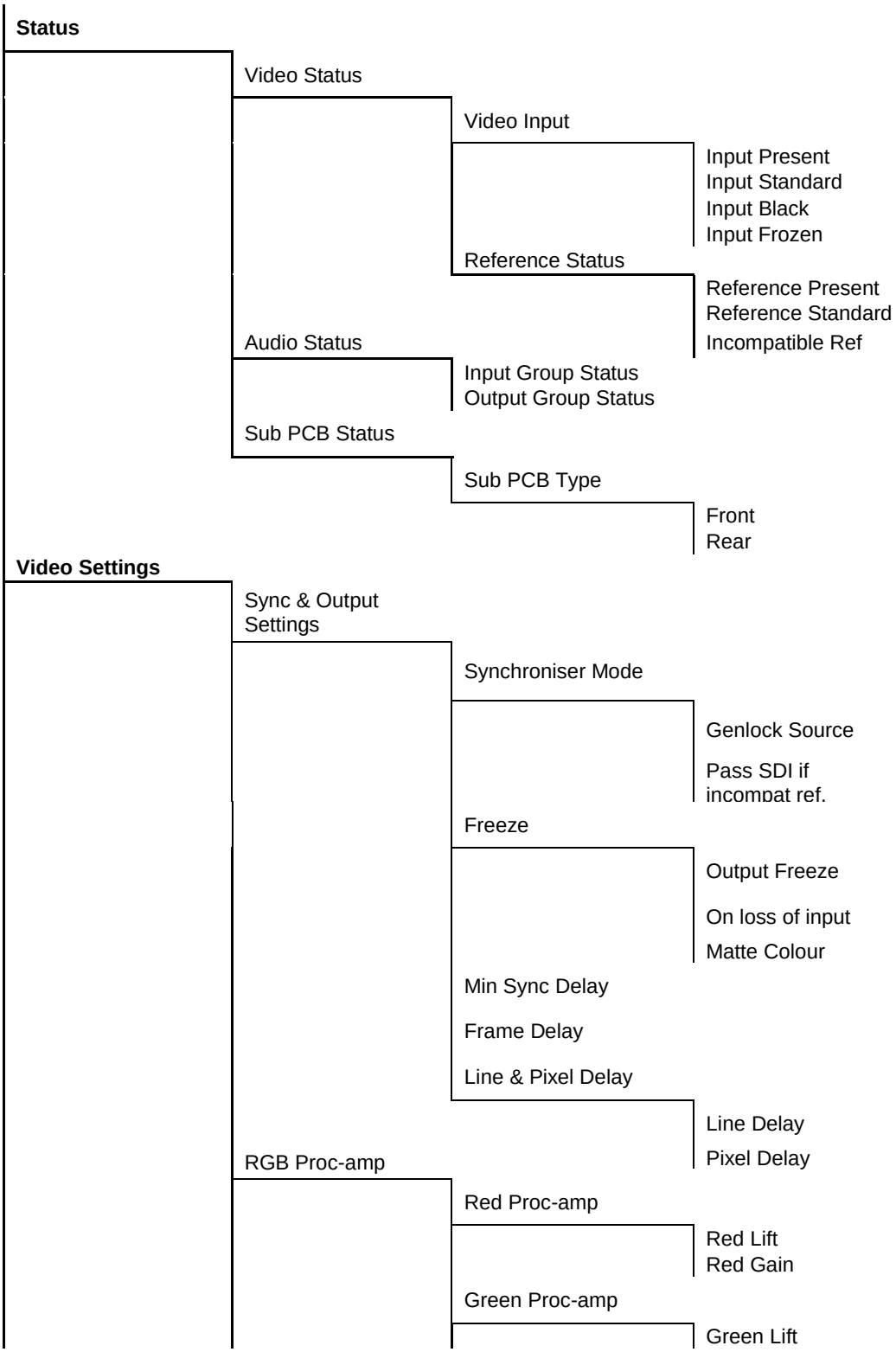
- DEVICE – enters 'device' menu to select a card or show available cards.
- ASTERISK (*) – selects 'network configuration' menu.
- F1 to F4 – soft keys not currently used by SYNNER 310
- HOME – returns to top of SYNNER 310's menu structure.
- ENTER – accept current selection.
- Up arrow – used to move up through the menu structure.
- Rotary control – shaft encoder used to select sub-menus or variable data.

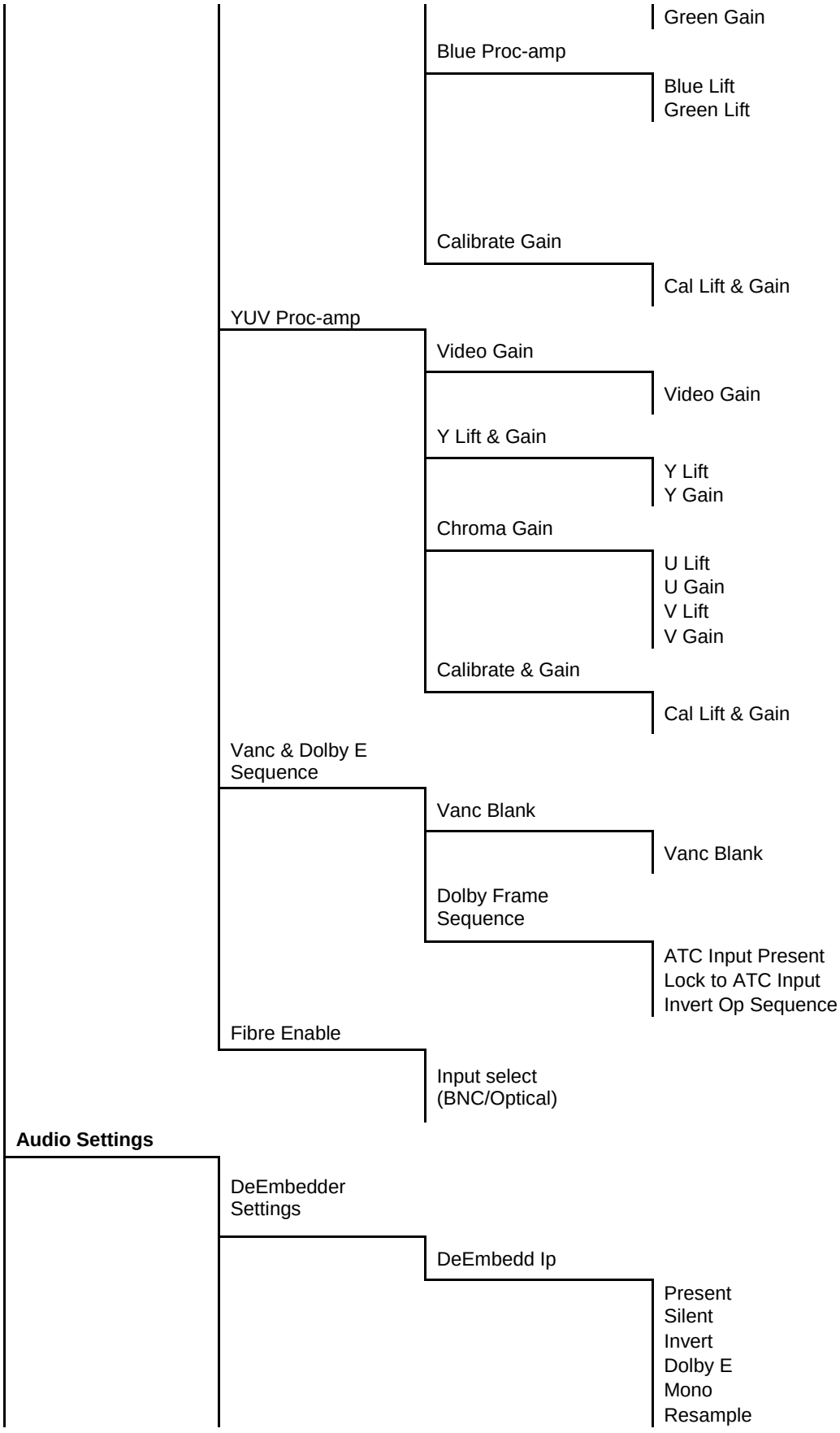
Updating the display

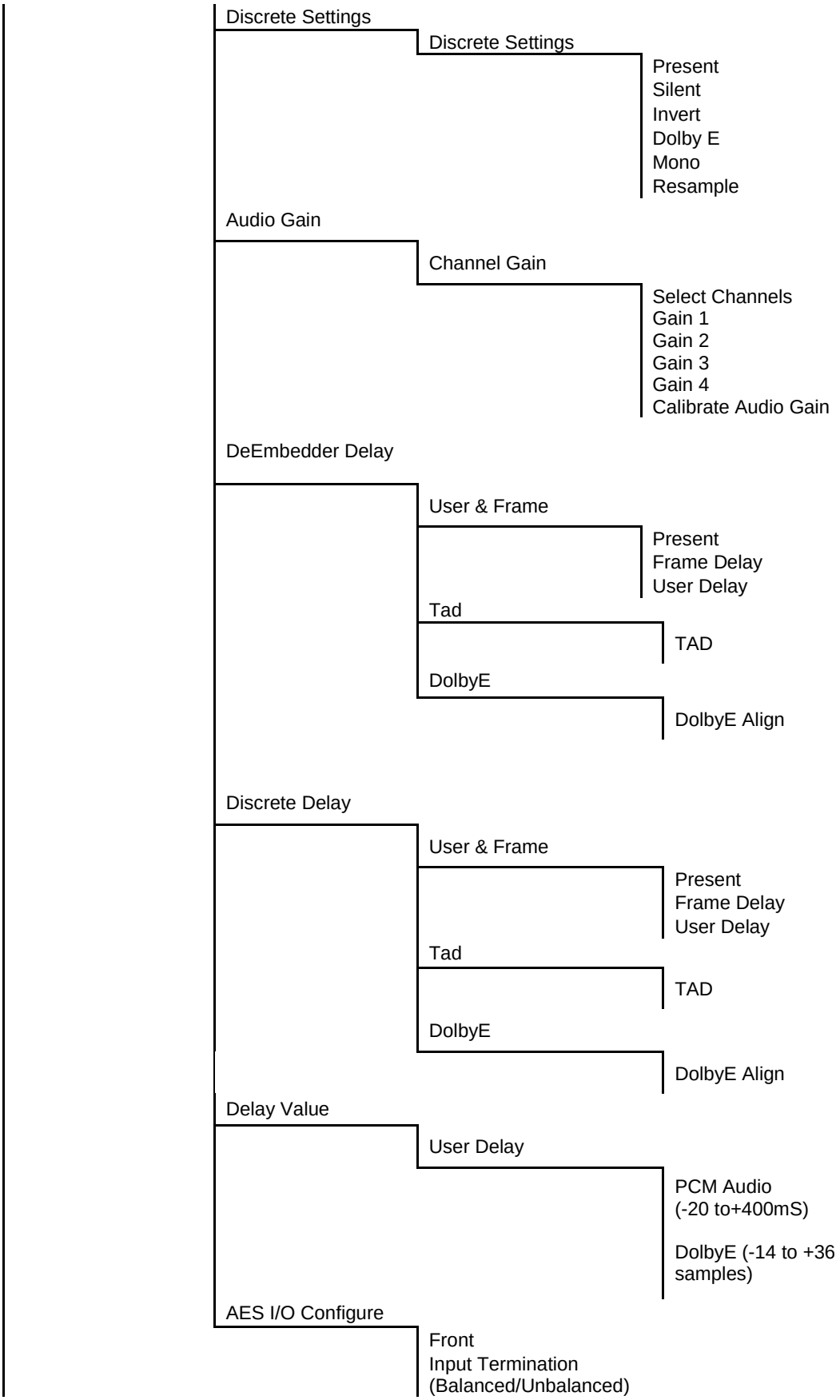
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If changes occur through the use of card edge controls or other remote control, the text displayed on the active front panel will not be updated immediately. If necessary, use the upward arrow to leave and then re-enter a menu to update the display.

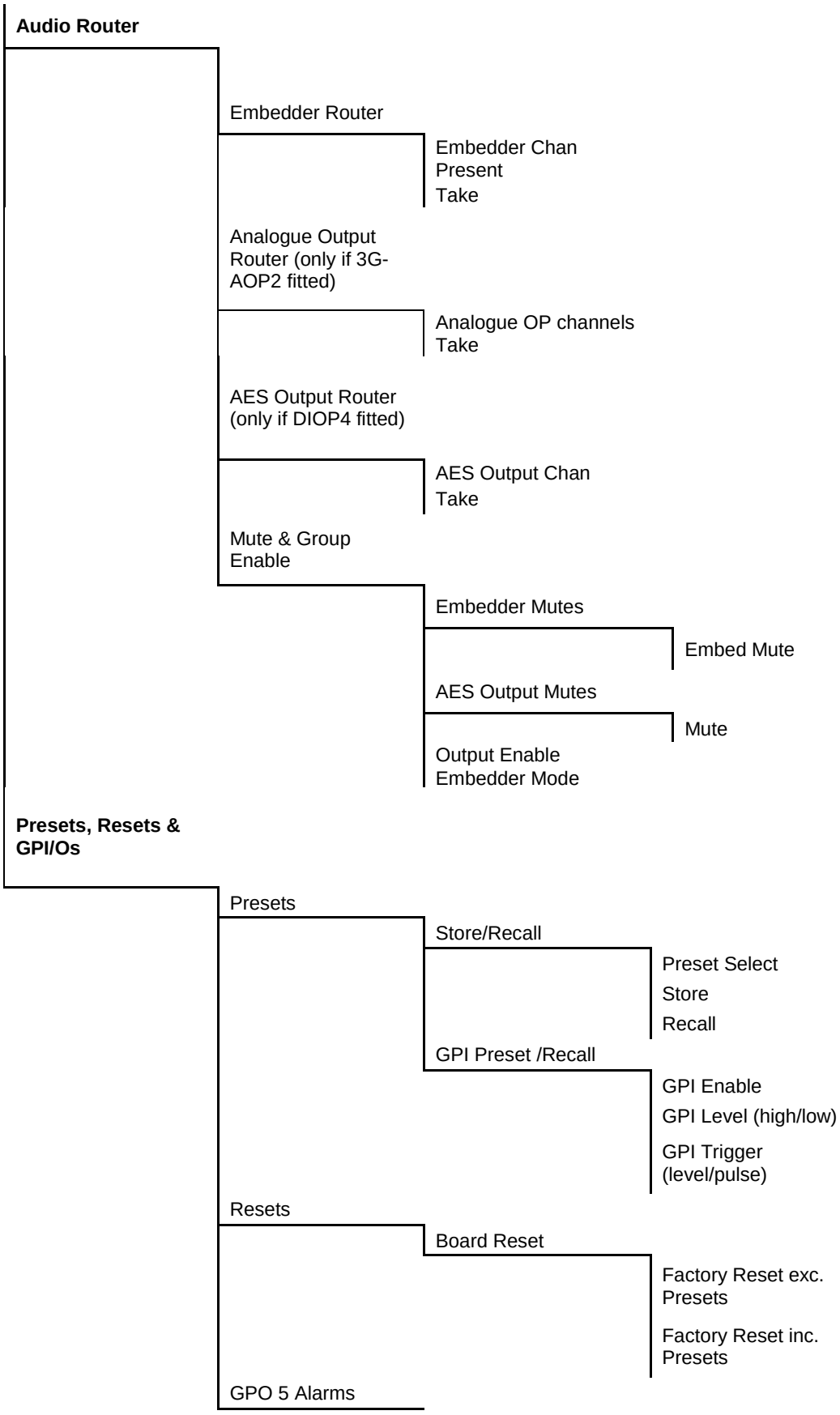
Menu Structure

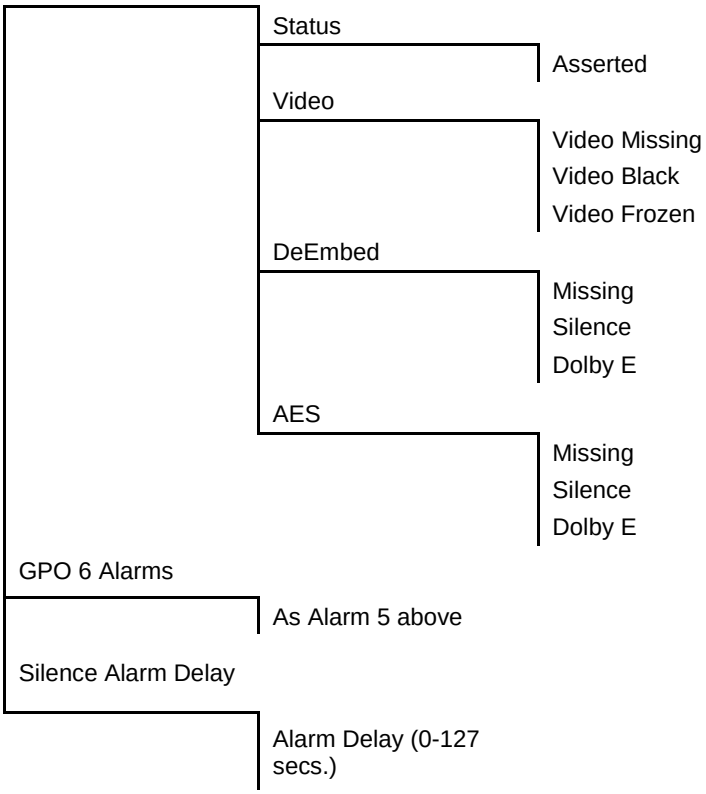
The basic menu tree for both card-edge, front panel access and VisionWeb is identical and consists of the following groups and sub-groups (tabs and panels in Statesman). *Note that some of these groups and sub-groups will change according to the optional boards fitted – for example, references to AES will only appear if a DIOP4 piggyback is fitted.*




Green Gain
Blue Proc-amp
Blue Lift
Green Lift
Calibrate Gain
Cal Lift & Gain
YUV Proc-amp
Video Gain
Video Gain
Y Lift & Gain
Y Lift
Y Gain
Chroma Gain
U Lift
U Gain
V Lift
V Gain
Calibrate & Gain
Cal Lift & Gain
Vanc & Dolby E Sequence
Vanc Blank
Vanc Blank
Dolby Frame Sequence
ATC Input Present
Lock to ATC Input
Invert Op Sequence
Fibre Enable
Input select (BNC/Optical)
Audio Settings
DeEmbedder Settings
DeEmbedd Ip
Present
Silent
Invert
Dolby E
Mono
Resample


Discrete Settings
Discrete Settings
Present
Silent
Invert
Dolby E
Mono
Resample
Audio Gain
Channel Gain
Select Channels
Gain 1
Gain 2
Gain 3
Gain 4
Calibrate Audio Gain
DeEmbedder Delay
User & Frame
Present
Frame Delay
User Delay
Tad
TAD
DolbyE
DolbyE Align
Discrete Delay
User & Frame
Present
Frame Delay
User Delay
Tad
TAD
DolbyE
DolbyE Align
Delay Value
User Delay
PCM Audio
(-20 to+400mS)
DolbyE (-14 to +36
samples)
AES I/O Configure
Front
Input Termination
(Balanced/Unbalanced)


Audio Router
Embedder Router
Embedder Chan
Present
Take
Analogue Output Router (only if 3G-AOP2 fitted)
Analogue OP channels
Take
AES Output Router (only if DIOP4 fitted)
AES Output Chan
Take
Mute & Group Enable
Embedder Mutes
Embed Mute
AES Output Mutes
Mute
Output Enable
Embedder Mode
Presets, Resets & GPI/Os
Presets
Store/Recall
Preset Select
Store
Recall
GPI Preset /Recall
GPI Enable
GPI Level (high/low)
GPI Trigger (level/pulse)
Resets
Board Reset
Factory Reset exc. Presets
Factory Reset inc. Presets
GPO 5 Alarms



Controlling cards via VisionWeb

Crystal Vision cards use an XML file to create a control database that is used by SYNNER 310's front-edge controller, the Indigo frame front panel controller, the VisionPanel control panel and the VisionWeb software. VisionWeb software offers a full range of controls with slider controls etc. similar to that available with the older Statesman PC software.

Accessing the Indigo home page with a PC browser via the Ethernet connector of an Ethernet-enabled frame will display a list of the cards fitted (see Frame Manual for more details).

Indigo home page

The example above shows a SYNNER 310 card fitted in slot one and the frame's power supply and status monitor in slots 13 and 14. Clicking on the SYNNER 310 card will bring up the card's home page:

SYNNER 310 Status Page

6 Control Descriptions

The controls of SYNNER 310 are accessible from the front panel, the board edge or from Crystal Vision's VisionWeb software. The description of controls used in this manual is based on VisionWeb GUI screengrabs but the path to locate controls via the front panel or board edge follows the same logic. For instance, in the VisionWeb GUI the 'Input Frozen' control is located in the '**Video Status'** group of the '**Status'** menu. To find the same control using the card edge or front panel follow the path **Status->Vid Status** to the **Ip Frozen** control.

VisionWeb GUI controls are accessed by menus at the bottom of the page which, when selected, offer sub-menus containing a number of controls. Some controls are simulated LEDs that are used to show status, others are check boxes, buttons or sliders which change various SYNNER 310 settings.

The description of the menus are in the order shown in the GUI i.e.

VIDEO STATUS, AUDIO STATUS, SUB PCB STATUS, SYNC & OUTPUT SETTINGS, RGB PROC-AMP, YUV PROC-AMP, VANC & DOLBY E SEQUENCE, FIBRE ENABLE, DE-EMBEDDER SETTINGS, DISCRETE SETTINGS, AUDIO GAIN, DE-EMBEDDER DELAY, DISCRETE DELAY, DELAY VALUE, AES I/O CONFIGURE, EMBEDDER ROUTER, AES OUTPUT ROUTER, ANALOG OUTPUT ROUTER, MUTE & GROUP ENABLE, PRESETS, RESETS, SILENCE ALARM DELAY, GPO5/GPO6 ALARMS.

*(Note: the **ANALOG OUTPUT ROUTER** menu is only available whenever a 3G-AOP2 piggyback is fitted. If a DIOP4 piggyback is fitted, the menu displayed becomes **AES OUTPUT ROUTER.** Neither menu is shown if neither 3G-AOP2 nor DIOP4 piggybacks are fitted.*

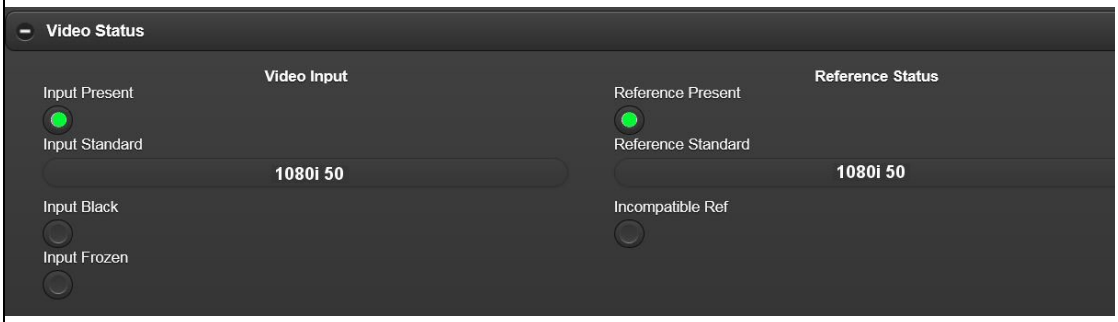
Each menu is shown with a screengrab and description of each control's function. The controls that are available vary with the option boards fitted and this is most noticeable with the routers as the number and types of audio inputs and outputs will vary according to the optional audio I/O piggybacks that are fitted.

The following screengrabs are mainly based upon either a DIOP4 AES I/O piggyback in the front and rear position (16 digital inputs or outputs) or a 3G-AIP2 in the front position (four analogue inputs) and a 3G-AOP2 piggyback (four analogue outputs) in the rear position. Screengrabs from both configurations will be used to show controls specific to each.

Status Menu

Video Status

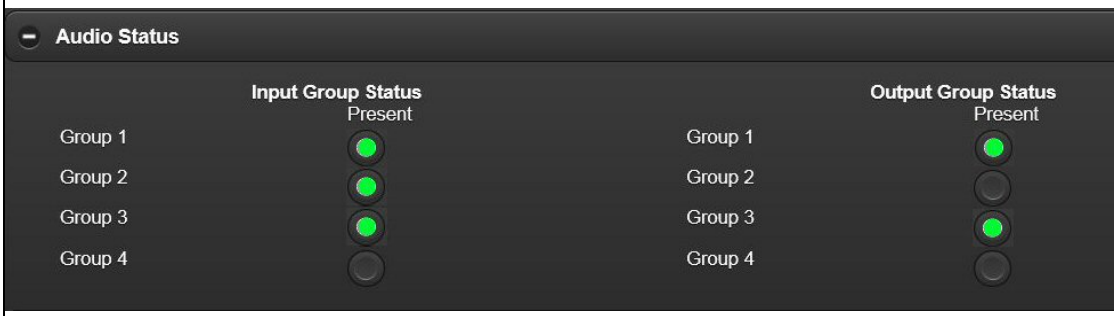
Display presence, standard and status of incoming video signal.



Input Present	**On when input video is present.**
Input Standard	**Displays video standard of incoming video i.e. 1080i 50, 1080p 50, 720p 50, 625, 525 etc.**
Input Black	**On if video input is permanently at black level**
Input Frozen	**On if video input is a permanent still frame.**
Reference Present	**On if a valid video reference signal is connected.**
Reference Standard	**Displays video standard of incoming reference i.e. 1080i 50, 1080p 50, 720p 50, 625, 525 etc.**
Incompatible Ref	**On if applied reference is incompatible to the input standard.**

Audio Status

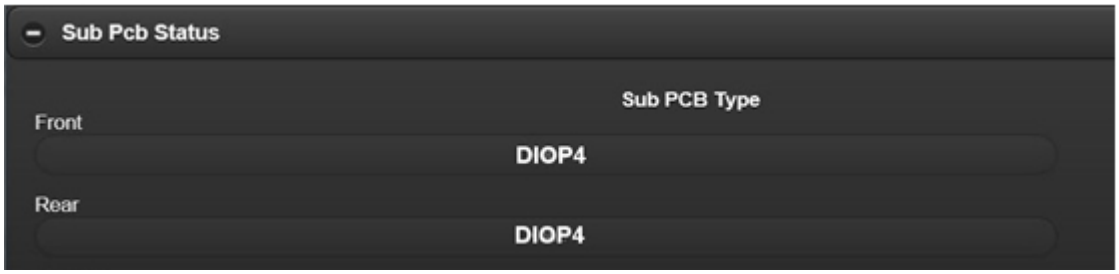
Displays presence of audio embedded in incoming and outgoing video signal.



Input Group Status - Present	**On when audio group detected in incoming video.**
Output Group Status - Present	**On when audio group detected in outgoing video.**

Sub Pcb Status

Displays type of piggyback fitted.

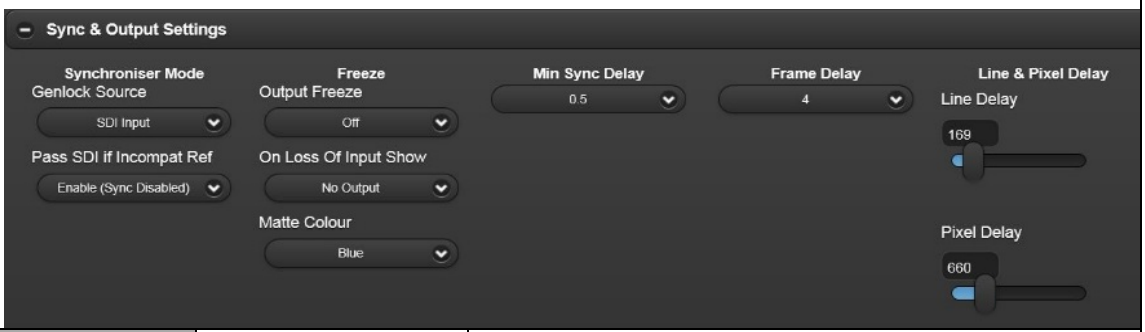


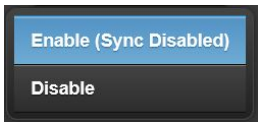
Front	**Displays type of piggyback in front position (nearest handle) i.e. DIOP4, 3G-AIP2, 3G-AOP2 or none.**
Rear	**Displays type of piggyback in rear position (nearest edge connector) i.e. DIOP4, 3G-AIP2, 3G-AOP2 or none.**

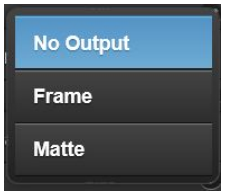
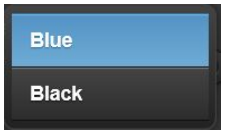
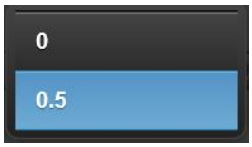
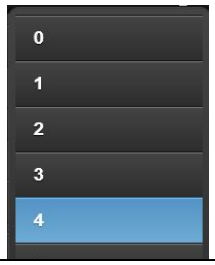
Video Settings Menu

Sync & Output Settings

Set up the synchroniser and frame, line and pixel delays.

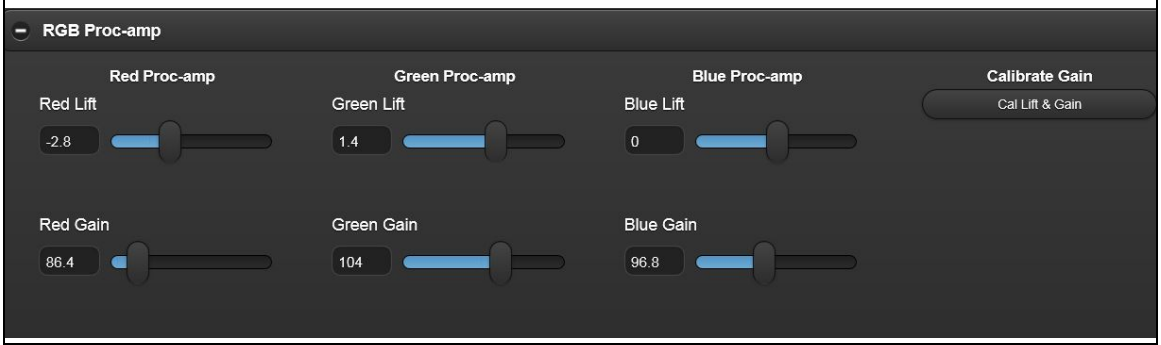


Genlock Source		**Select the SDI input or the reference video as the timing reference for the synchroniser. With the SDI input selected as reference, the synchroniser is effectively disabled.**
Pass SDI If Incompat Ref		**When enabled, the output video will follow the input standard regardless of the reference video standard. i.e. the synchroniser is disabled regardless of the setting of the genlock source.**

Output Freeze		**Select to freeze the video output with the last video frame or output a colour matte. The matte colour can be Black or Blue.**
On Loss of Input Show		**In the event of the input missing, choose between no output, an output of the last good frame or the colour matte.**
Matte Colour		**Select either black or blue as the matte colour to be output if selected or in the event of the input missing.**
Min Sync Delay		**Select an additional 0.5 frame delay for the video path and PCM (non-Dolby E) audio channels. Used in synchroniser mode to advance reference signal +0.5 frame with respect to video path to help centre synchroniser delay and/or for Dolby E channels to advance them +0.5 frame with respect to video thereby reducing alignment delays.**
Frame Delay		**Select a delay of between 0-10 video frames in the video path. As the audio path is not affected by this delay, this control will delay the video with respect to the audio. Audio channels will be delayed by the same amount if 'Frame Delay' is selected in the Audio Delay tab.**
Line Delay	**Provides additional vertical timing adjustment (delay) of 0-1124 lines with respect to the reference signal when synchroniser is active, or with respect to the input video in delay mode. Audio channels are delayed by the same amount.**	
Pixel Delay	**Provides additional horizontal timing adjustment (delay) of 0-2750 pixels with respect to the reference video when synchroniser is active, or with respect to the input video in delay mode. Audio signals are delayed by the same amount.**	

RGB Proc-amp

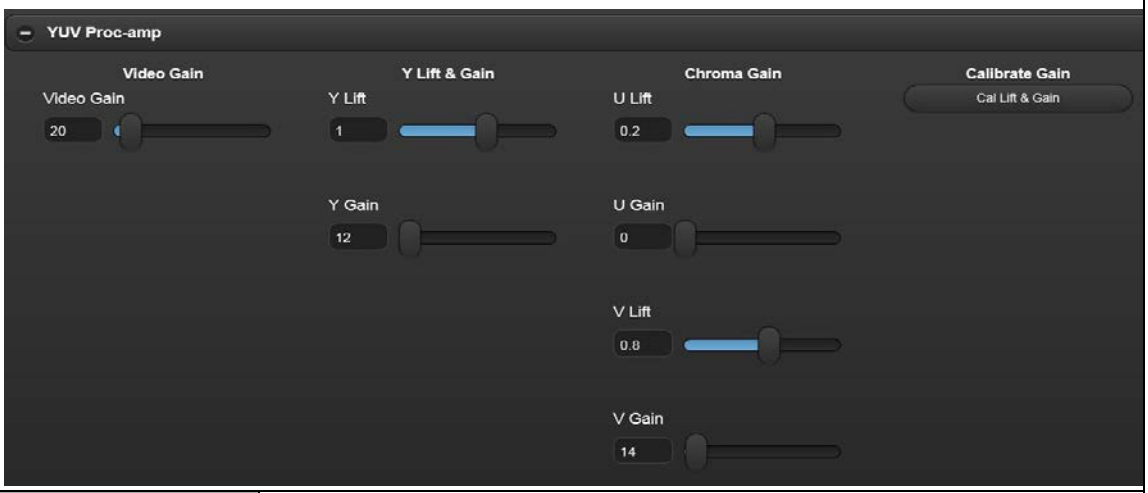
Apply varying amounts of lift and gain to the Red, Green and Blue channels of the video path.



Red/Green/Blue Lift	**Apply a positive or negative DC offset to the black level of the Red, Green and Blue components of the video path.**
Red/Green/Blue Gain	**Apply 80% to 120% gain to the Red, Green and Blue components of the video path.**
Cal Lift & Gain	**Return Lift and Gain for all components to their calibrated values of 0 lift and 100% gain.**

YUV Proc-amp

Apply varying amounts of lift and gain to the YUV channels of the video path.

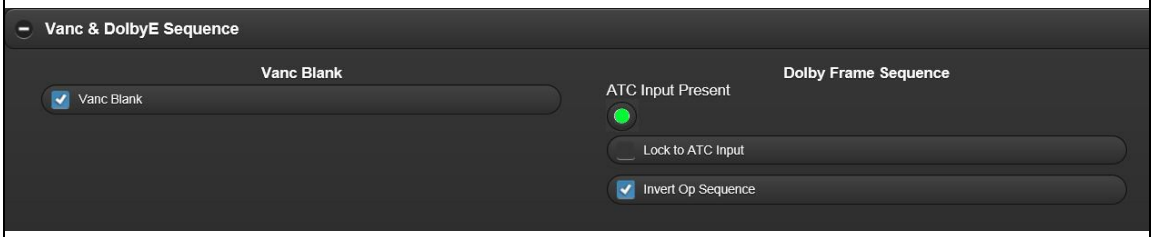


Video Gain	**Apply 0 to 200% overall gain to the video path.**
Y/U/V Lift	**Apply a positive or negative DC offset to the black level of the Y, U and V components of the video path.**

Y/U/V Gain	**Apply 0 to 200% gain to the Y, U and V components of the video path.**
Cal Lift & Gain	**Return Lift and Gain for all components to their calibrated values of 0 lift and 100% gain.**

Vanc & Dolby E Sequence

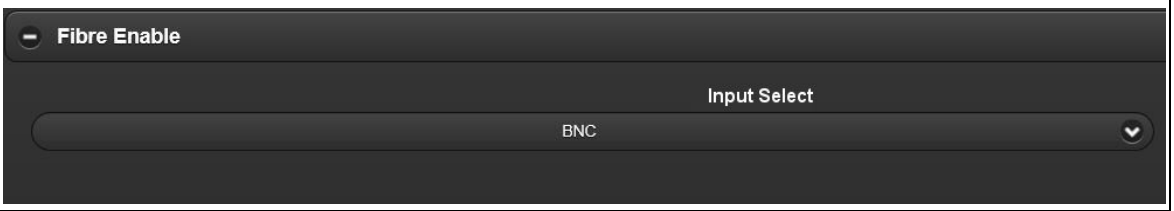
Blank ancillary data and lock progressive HD video output to ATC, or invert sequence to help ensure that Dolby E has its guardband correctly positioned.



Vanc Blank	**Select to blank the vertical ancillary data in the video signal vertical interval.**
ATC Input Present	**On when Ancillary Timecode is present.**
Lock to ATC Input	**Set to lock the HD progressive video output field sequence to Ancillary Timecode**
Invert Op Sequence	**Invert HD progressive video output field sequence.**

Fibre Enable

Select optical or BNC as the video source.

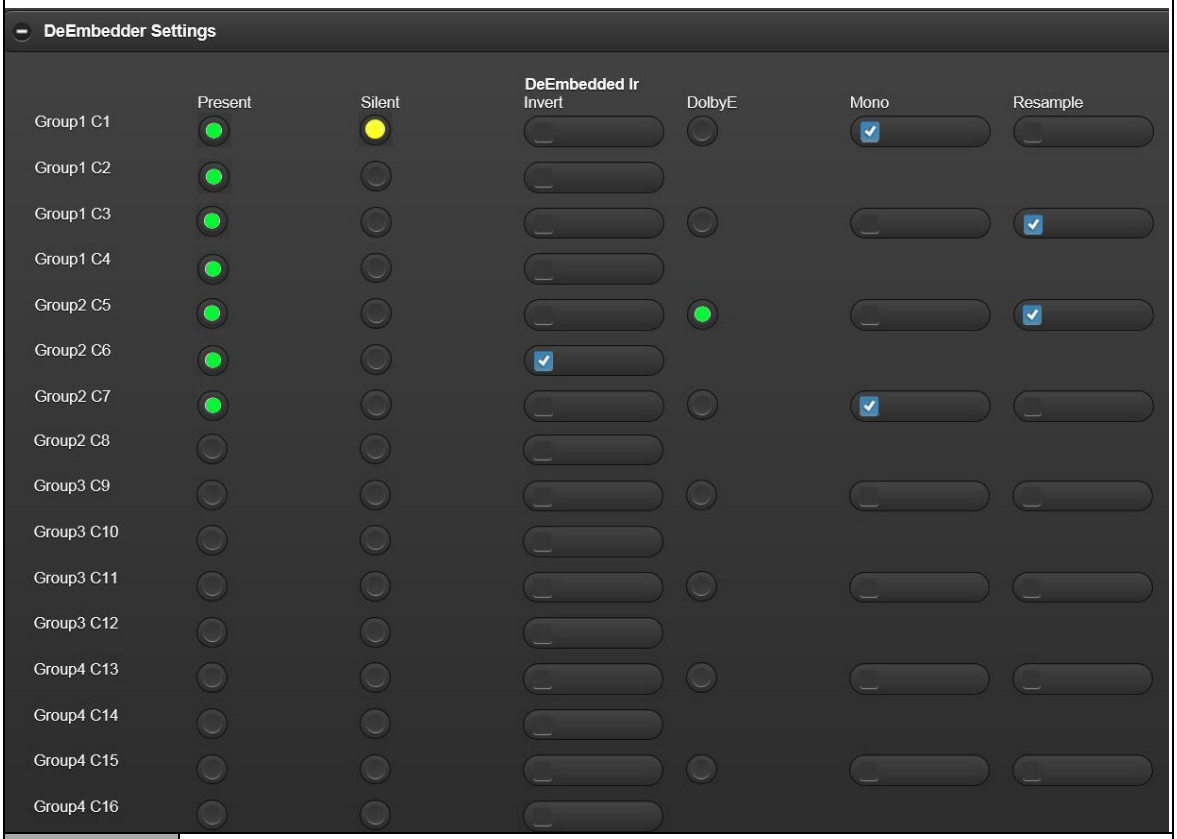


Input Select		**Select BNC or optical as the video input. The optional SPF module and correct rear module must be fitted for optical input.**

Audio Settings Menu

DeEmbedder Settings

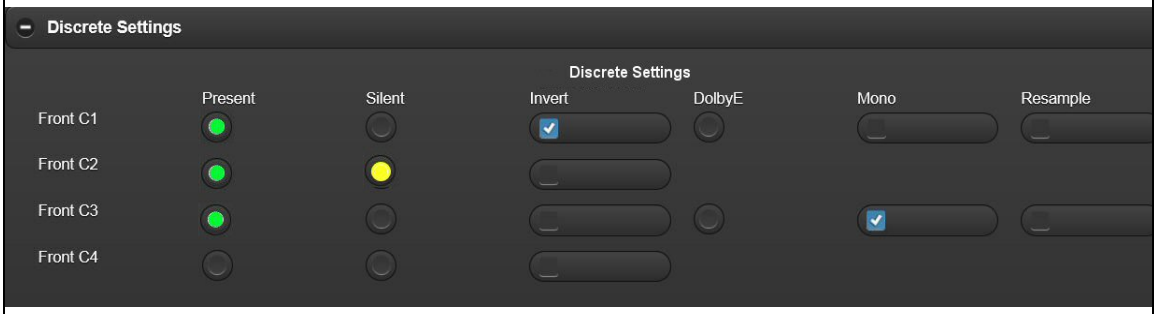
Monitor de-embedder channel status, invert channels, detect Dolby E encoded channel pairs, mono and resample stereo pairs.



Present	**On when embedded channel detected.**
Silent	**On if the audio channel is silent i.e. consistently below the set threshold.**
Invert	**Select to enable inversion of the de-embedder output for the selected channel.**
Dolby E	**On if the channel pair has Dolby E encoding.**
Mono	**Select to mono the channel pair. *N.B. Only the first channel of the stereo pair is converted to mono, the second channel is unchanged. The mono output is gain corrected to maintain unity gain.***
Resample	**Select to enable resampling of the selected stereo pair output from the de-embedder. Resampling is used to seamlessly match the timing of audio signals when the user-controlled delay is altered and is the default condition. If resampling is deselected it is essential that the input and output source is derived from the same source and the timing should not be adjusted while on air. Without resampling, an adjustment in timing will cause a number of audio samples to be dropped or repeated.**

Discrete Settings

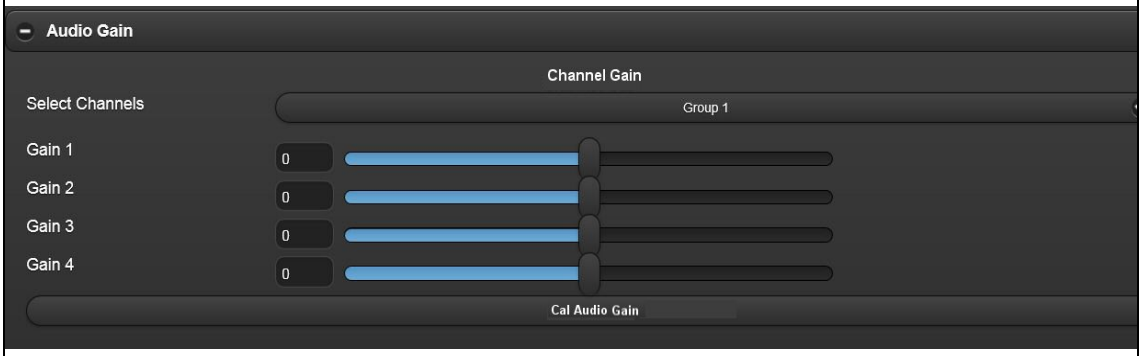
Monitor external analogue or AES input channel status, invert channels, detect Dolby E encoded channel pairs, mono and re-sample stereo pairs. Screengrab below shows a 3G-AIP2 in the front piggyback position with four analogue inputs.

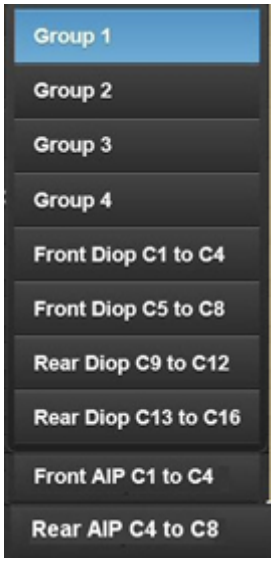


Present	**On when embedded channel detected.**
Silent	**On if the audio channel is silent i.e. consistently below the set threshold.**
Invert	**Select to enable inversion of the de-embedder output for the selected channel.**
Dolby E	**On if the channel pair has Dolby E encoding (AES inputs only).**
Mono	**Select to mono the channel pair. *N.B. Only the first channel of the stereo pair is converted to mono, the second channel is unchanged. The mono output is gain corrected to maintain unity gain.***
Resample	**Select to enable resampling of the selected stereo pair output from the de-embedder. Resampling is used to seamlessly match the timing of audio signals when the user-controlled delay is altered and is the default condition. If resampling is deselected it is essential that the input and output source is derived from the same source and the timing should not be adjusted while on air. Without resampling, an adjustment in timing will cause a number of audio samples to be dropped or repeated.**

Audio Gain

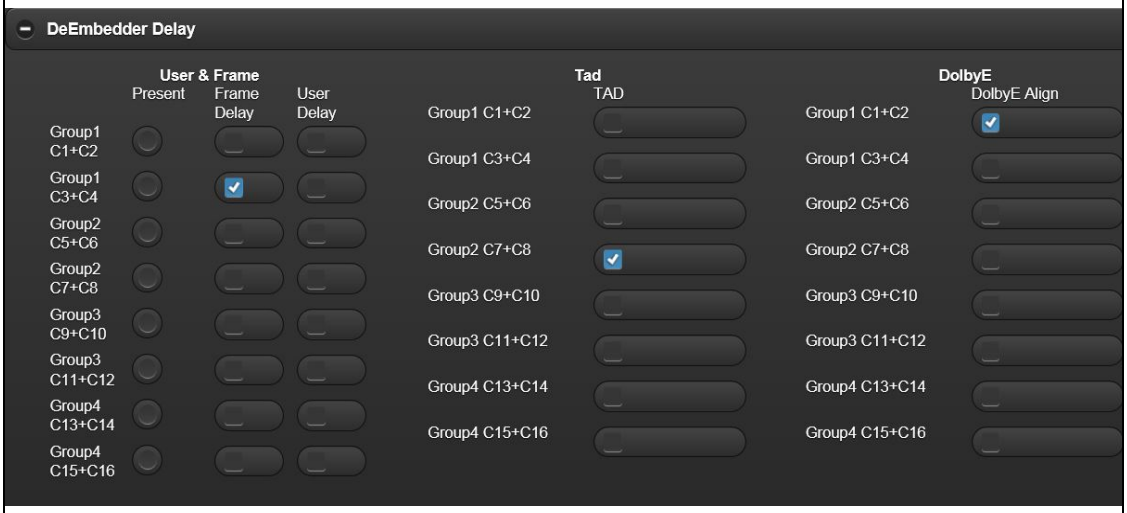
Change the gain of the audio inputs by +/- 18dB.



Gain 1-4	**In total there are 32 audio gain controls, one for each of the 16 channels of de-embedded audio and 16 channels of external audio. The gain controls will give ± 18dB of gain relative to the input level up to the point where digital clipping will occur.**	
Channel Gain		**Select the group of channels to control. The options available will depend on the option sub-boards fitted. The screengrab shown here is for all possible options including DIOP4 piggybacks with AES inputs fitted front and rear, and 3G-AIP2 piggybacks with analogue inputs fitted front and rear. In practice not all these options will be available at the same time.**
Cal Audio Gain	**Select to return all channels to the calibrated gain level.**	

DeEmbedder Delay

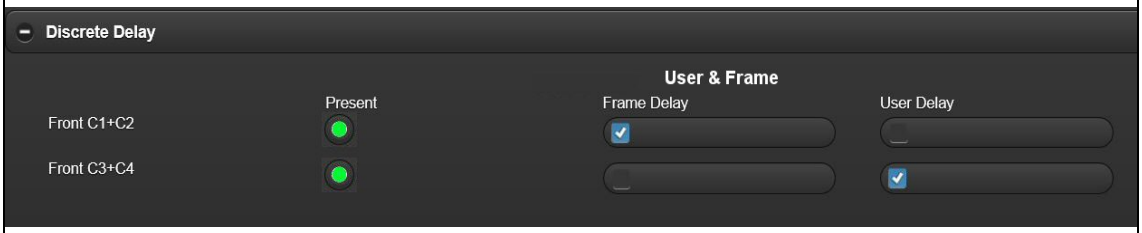
These controls in combination with the video delay controls (0-10 frames) can be used to delay the de-embedded audio with respect to the video and compensate for any small delay between the incoming video and audio signals, or when bypassed, delay the video with respect to the audio by up to ten frames.



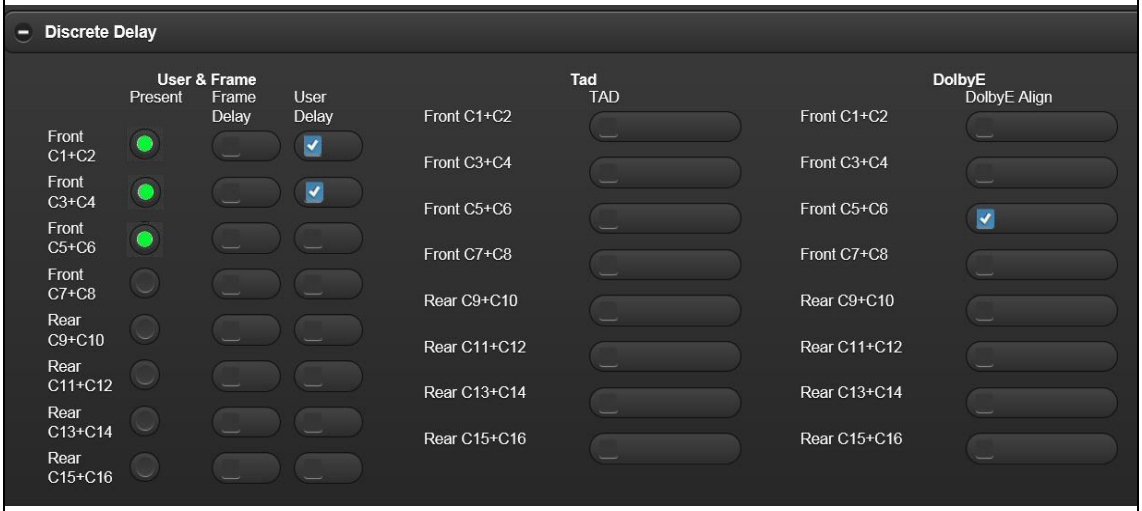
Present	**On if the audio channel pair is present.**
Frame Delay	**For each channel pair, select to enable delay to match the total video delays set in 'Video Settings/Frame Delay Settings' control.**
User Delay	**For each channel pair, select to enable the variable delay set by the 'Audio Settings/Delay Value' control. For PCM signals this is -20 to +400mS and for Dolby E signals -14 to +36 samples. *N.B. Negative values of delay can only be set if 'Frame Delay' is also enabled for that channel and at least one frame of video delay***
TAD delay	**Select to enable automatic tracking of video delay. The audio delays will follow the video path delays through the synchroniser.**
Dolby	**On if Dolby E encoding is present in the channel pair.**
DolbyE Align	**Delay Dolby E channel pair by up to one frame so that the Dolby guardband is automatically aligned with the video switch point.**

Discrete Delay

These controls in combination with the video delay controls (0-10 frames) can be used to delay the external audio with respect to the video and compensate for any small delay between the incoming video and audio signals, or when bypassed, delay the video with respect to the audio by up to ten frames. The number of inputs will depend on the type of piggyback(s) and sub-board fitted. Screengrabs below show two different configurations.



3G-AIP2 piggyback fitted in front position



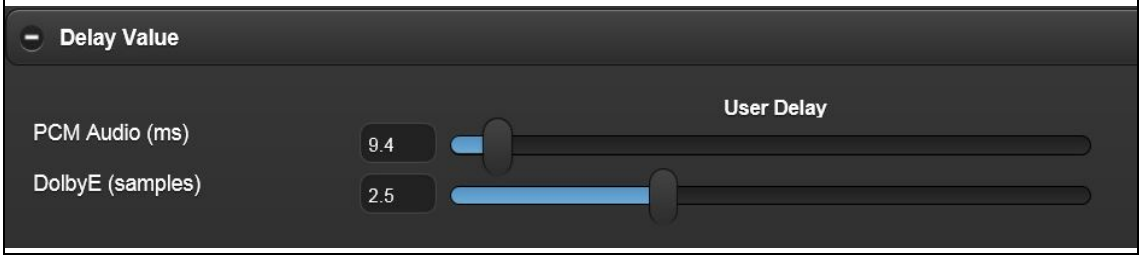
DIOP4 piggyback fitted in front and rear positions

Present	**On if the audio channel pair is present.**
Frame Delay	**For each channel pair, select to enable delay to match the total video delays set in 'Video Settings/Frame Delay Settings' control.**
User Delay	**For each channel pair, select to enable the variable delay set by the 'Audio Settings/Delay Value' control. For PCM signals this is -20 to +400mS and for Dolby E signals -14 to +36 samples. *N.B. Negative values of delay can only be set if 'Frame Delay' is also enabled for that channel and at least one frame of video delay selected.***
TAD delay	**Select to enable automatic tracking of video delay. The audio delays will follow the video path delays through the synchroniser (AES sources only).**
Dolby	**ON if Dolby E encoding is present in the channel pair (AES sources only).**

Dolby E Align	**Delay Dolby E channel pair by up to one frame so that the Dolby guardband is automatically aligned with the video switch point (AES sources only).**

Delay Value

Set the 'User Delay' value for de-embedded and external audio signals.



PCM Audio (mS)	**Set the delay value between -20 to +400mS for all channel pairs (de-embedded or discrete) with the 'User Delay' control selected.**
Dolby E (samples)	**Set the delay value between -14 to +36 samples for all Dolby E encoded channel pairs with the 'User Delay' control selected.**

AES I/O Configure

Configure the optional DIOP4 piggyback AES I/O channels as input or output.

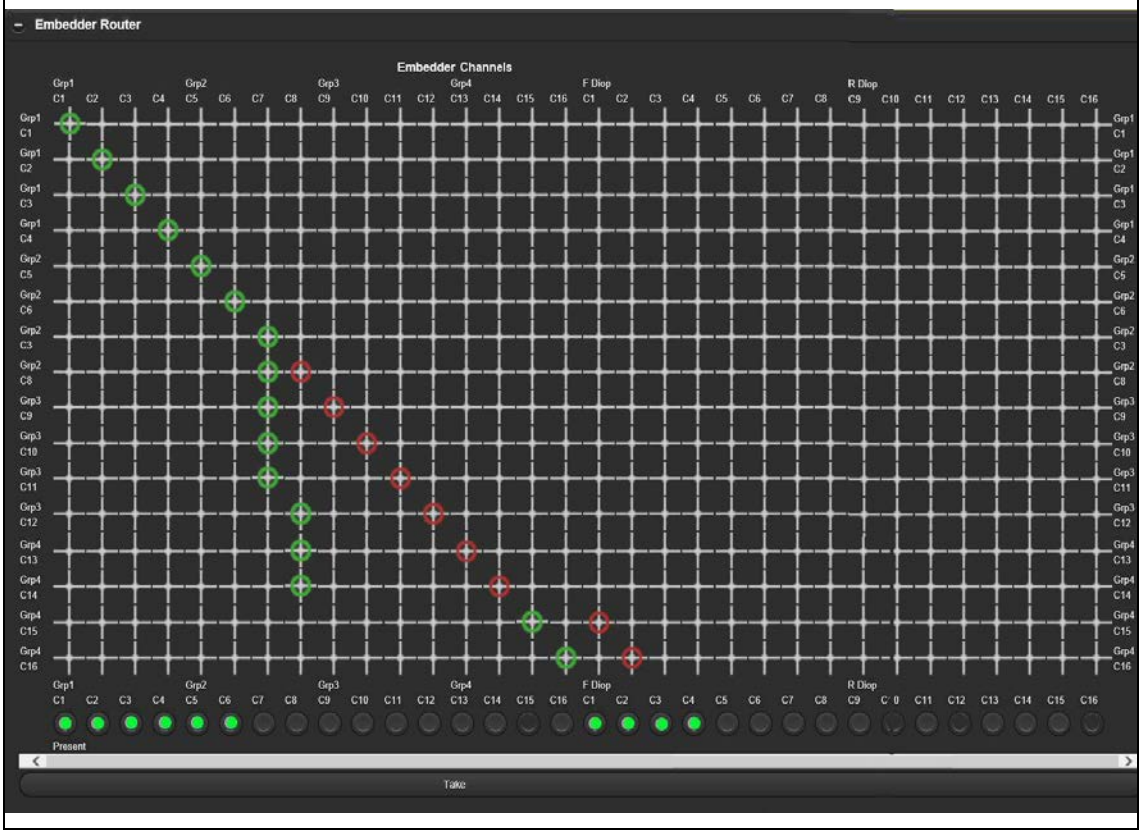
Front/Rear Channel Pair		**Set the selected AES channel pair to be input or output.**

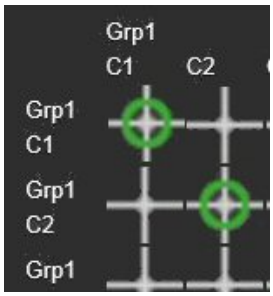
Input Termination		**Set those AES channel pairs selected as inputs to be balanced or unbalanced. The correct rear module must be used for either option.**

Audio Router Menu

Embedder Router

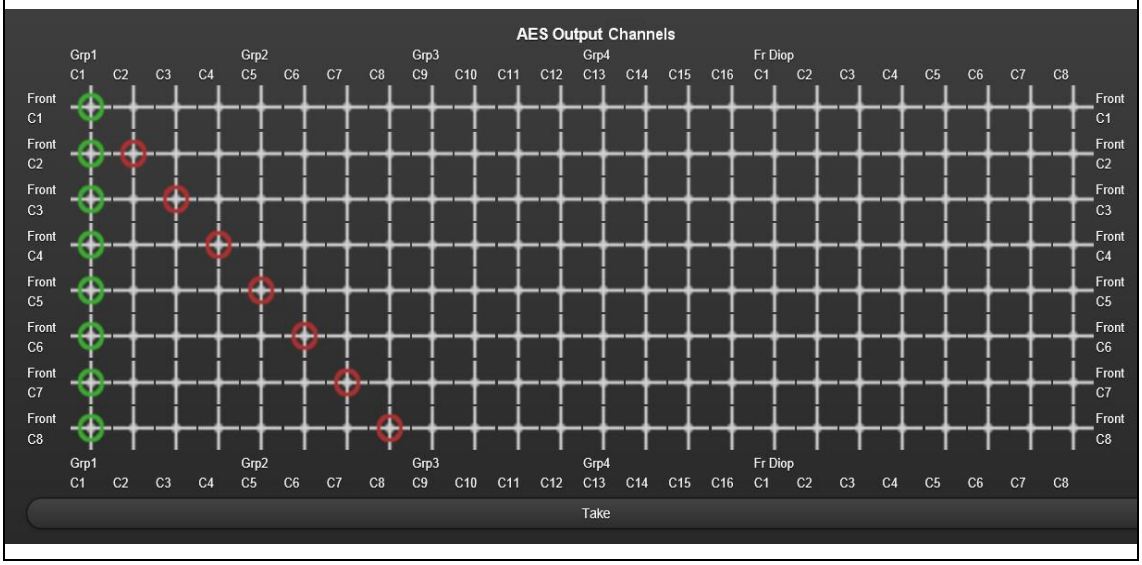
Select the channels that will be embedded into the output video. The available channels for selection will depend on the optional piggyback and sub-boards fitted. The screengrab below shows a DIOP4 piggyback in the front and rear positions giving a potential of 16 external AES inputs.

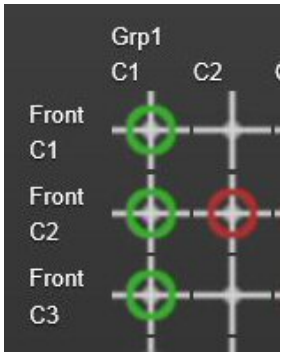


Embedder Channel		**Display current selections (green circles) and pre-select the crosspoints to be routed when the 'Take' button is pressed (red circles). The inputs shown along the top of the matrix are, or will be, routed to the embedded channels shown on the left hand side. The example above has 16 de-embedded inputs Grp1-Grp4, C1-C16 and 16 external AES inputs FDiop and RDiop C1-C16. Different piggybacks will show alternative router inputs. Clicking on the intersection of the input and output will show a red circle which will change to green when the 'Take' control is selected. All crosspoints can be pre-selected. The screengrab above shows de-embedded inputs C8-C14 pre-selected to embedded channels C8-14 and front DIOP4 channels C1 and C2 pre-selected to embedded channels C15 and C16.**
Take	**Switch all pre-selected crosspoints in one go.**	
Present	**On if audio channel is present.**	

AES Output Router

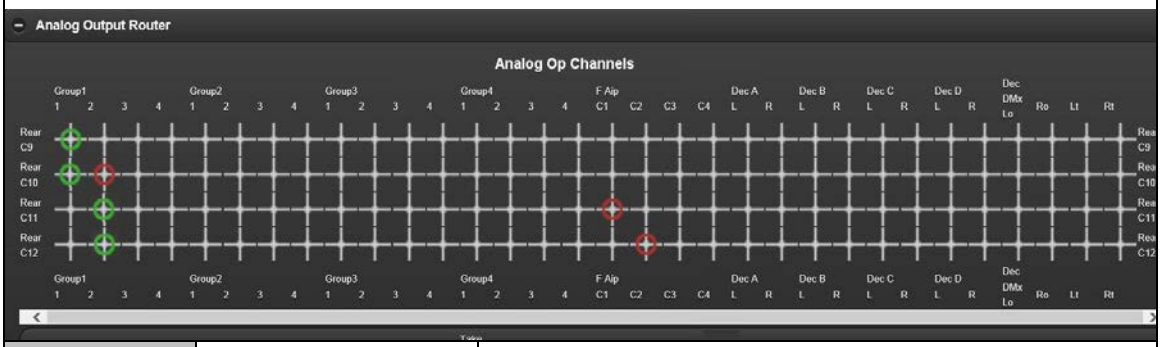
Select the channels that will be output as AES signals. This menu is only available if a DIOP4 piggyback is fitted. The number of AES output channels available for routing will depend on the number of DIOP4 piggybacks fitted. The screengrab below shows a single DIOP4 piggyback in the front position configured as all outputs.

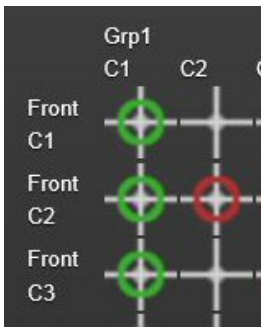


AES Op Channels		**Display current selections (green circles) and pre-select the crosspoint to be routed when the 'Take' button is pressed (red circles). The inputs shown along the top of the matrix will be routed to the AES output channels shown on the left hand side. The screengrab above has a DIOP4 piggyback fitted in the front position configured as all outputs (C1-8). Clicking on the intersection of the input and output will show a red circle which will change to green when the 'Take' control is selected. All crosspoints can be pre-selected. The screengrab above shows de-embedded inputs 2-8 pre-selected to front DIOP4 channels C2-C8.**
Take	**Switch all pre-selected crosspoints in one go.**	

Analog Output Router

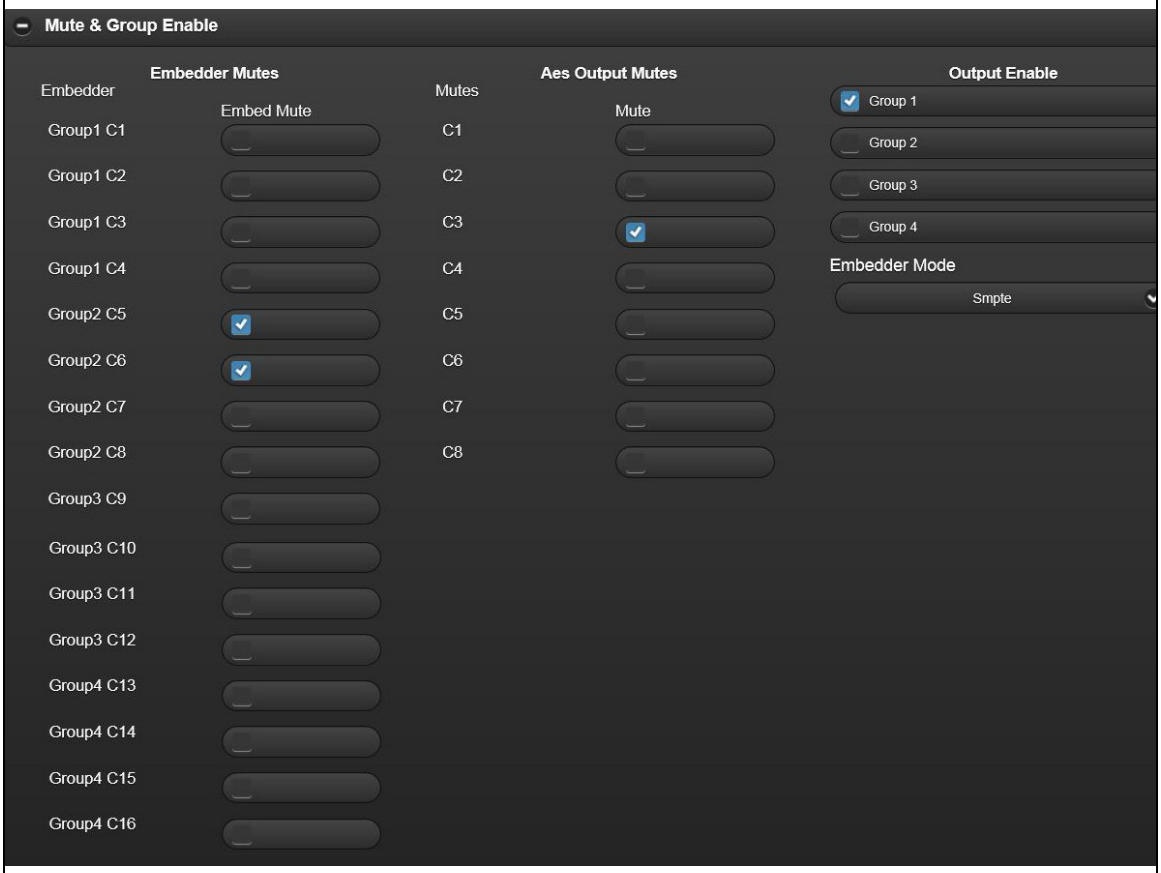
Select the channels that will be output as analogue audio. This menu is only available if a 3G-AOP2 piggyback is fitted. The screengrab below shows a 3G-AIP2 piggyback in the front position and a 3G-AOP2 in the rear.



Analog Op Channels		**Display current selections (green circles) and pre-select the crosspoints to be routed when the 'Take' button is pressed (red circles). The inputs shown along the top of the matrix will be routed to the analogue output channels shown on the left hand side. The screengrab above has a 3G-AIP2 piggyback fitted in the front position and a 3G-AOP2 in the rear providing four analogue output channels. Clicking on the intersection of the input and output will show a red circle which will change to green when the 'Take' control is selected. All crosspoints can be pre-selected. The screengrab above shows de-embedded input 2 pre-selected to rear 3G-AOP2 channel C10 and front 3G-AIP2 channels C1-C2 pre-selected to rear DIOP4 channels C11-C12.**
Take	**Switch all pre-selected crosspoints in one go.**	

Mute & Group Enable

Mute embedder output and external AES and analogue outputs, enable embedder groups and select embedder encoding mode. The screengrab below shows a single DIOP4 piggyback fitted.

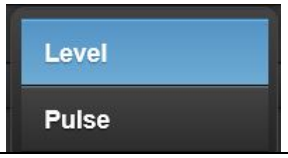


Embed Mutes	**Select to mute embedder output channels.**
Aes Output Mutes ***(only if DIOP4 piggyback fitted)***	**Mute AES output audio.**
Aop Output Mutes ***(only if 3G-AOP2 piggyback fitted)***	**Mute analogue audio outputs.**
Output Enable	**Select to enable embedder output for that group.**
Embedder Mode	 **Select either SMPTE or Sony embedder format (for SD video only).**

Presets, Resets & GPI/Os Menu

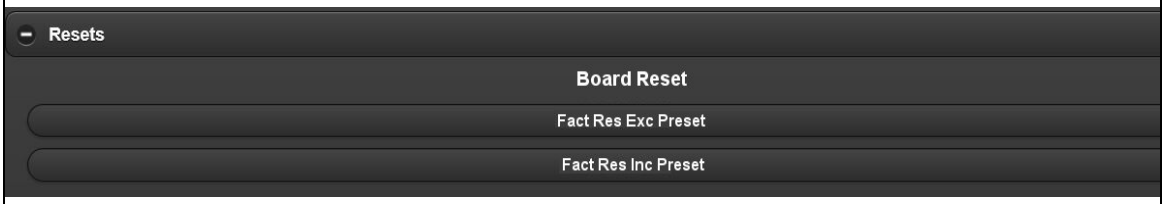
Presets

Up to 16 user-defined configurations may be stored and recalled either from VisionWeb or through the use of external GPIs. Presets store the board setup data including operating mode card status. The presets are numbered 1-16.

Preset select		**Store or recall SYNNER 310's configuration to one of 16 memory locations.**
GPI Enable	**Select to recall previously saved presets via the external GPI port. See Chapter "General Purpose Interface" for more information on GPIs.**	
GPI Level		**Select either low or high level to trigger the GPI recall.**
GPI Trigger		**Select either level or pulse to trigger GPI recall.**

Resets

Reset the board to its default settings.



Fact Res Exc Preset	**Reset the board to default settings but leave preset memories unaffected.**
Fact Res Inc Preset	**Reset the board to default settings and erase preset memories.**

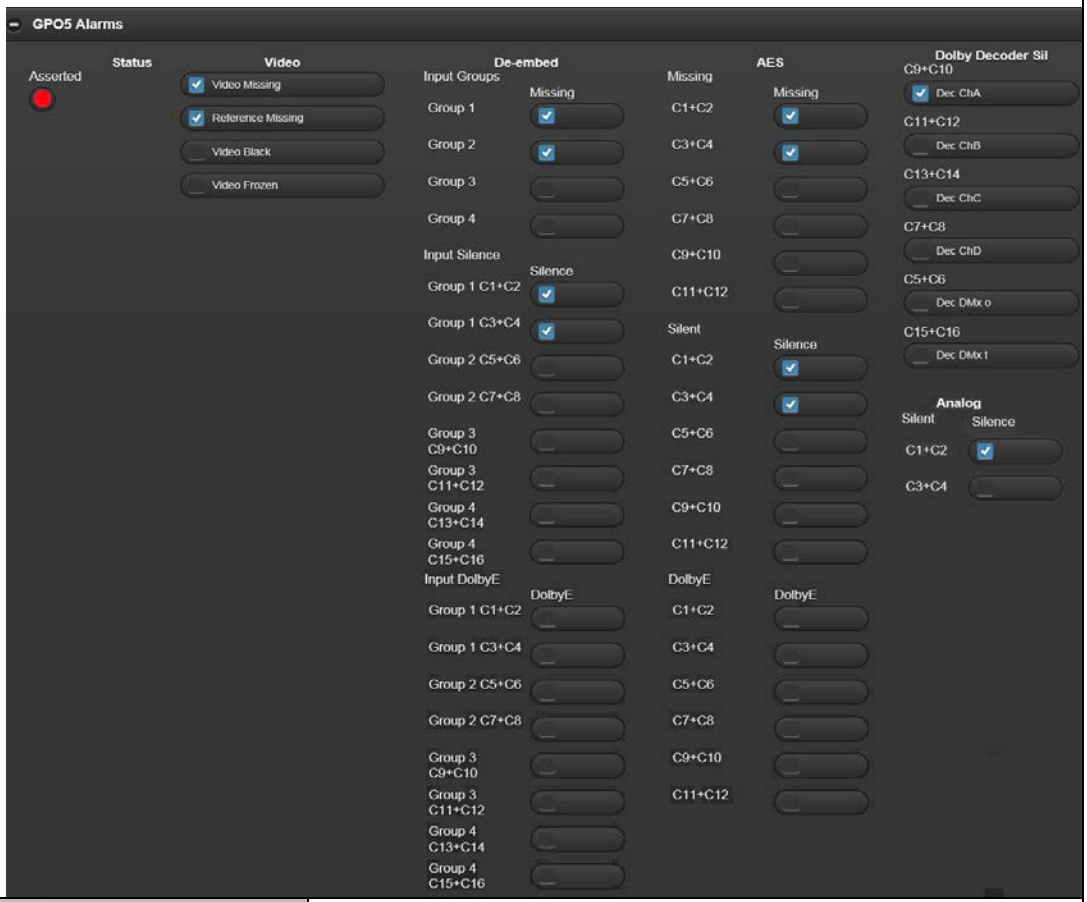
Silence Alarm Delay

Set the period that a signal must be silent before asserting an alarm.

Alarm Delay	**Set the period (0 to 127 seconds) that a signal must be silent (<-63dBFS) before asserting GPO5 or GPO6 alarms, set to trigger on audio silence.**

GPO5/GPO6 Alarms

Set conditions to trigger GPO5/GPO6 alarms. *(Screengrab below is for GPO5 but GPO6 has identical options).* Available alarms vary according to piggyback and sub-boards fitted.



Asserted	**On when alarm is asserted (active).**
Video missing/black/frozen	**Select to assert alarm whenever the input video is missing, black or frozen.**
Reference missing	**Select to assert alarm whenever the video reference signal is missing.**
De-embed group missing	**Set to assert alarm whenever a de-embedded group is missing.**
De-embed channel pair silent/Dolby E	**Set to assert whenever a de-embedded channel pair is silent (<-63dBFS) for the period set by the 'Silence Delay' control or is Dolby E encoded.**

AES input missing/silent/Dolby E	**Set to assert whenever an AES channel pair is missing, silent for the period set by the 'Silence Delay' control, or is Dolby E encoded. A DIOP4 piggyback must be fitted.**
Analog Audio Silent ***(only available when a 3G-AIP2 piggback fitted)***	**Set to assert alarm whenever an analogue audio channel pair is silent for the period set by the 'Silence Delay' control.**

7 Troubleshooting

Card edge monitoring

The front edge of the card provides useful power rail monitoring and input status.

SYNNER 310 front edge view

See **Card Edge Controls** for explanation of card edge LEDs.

The card edge LEDs and ten-digit display may be used in conjunction with status information from any connected remote status panel display or from VisionWeb if available.

Board edge control was removed from SYNNER 310 in 2018. Therefore the card edge control information is only relevant for older versions of the product.

Basic fault finding guide

The Power OK LEDs are not illuminated

Check that the frame PSU is functioning – refer to the appropriate frame manual for detailed information

There is no video output

Check that a valid SDI input is present and that any cabling is intact

The video output exhibits jitter

Check that the input SDI stability is within normal limits

The card no longer responds to card edge or front panel control

Check that the card is seated correctly and that the Power OK LEDs are lit

Check any active control panel cabling

Check if the control panel can control another card in the same rack

If necessary reset the card

Resetting the card

If required, the card may be reset by removing the card from the rack and then re-inserting it

It is safe to re-insert the card whilst the rack is powered. Any previous configuration will be retained, use a factory reset to erase any configurations stored in the card.

8 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector.
Weight	200g.
Power consumption	SYNNER 310 - 11.9 Watts. FIP - 0.6 Watts. FOP - 0.6 Watts. FIO - 1 Watt.

Inputs

Video	HD or SD SDI 270 Mb/s to 2.970 Gb/s serial digital compliant to EBU 3267-E, SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A. Cable Equalisation: 3G (2.970Gb/s) – 80 metres, Belden 1694A or equivalent. HD (1.485Gb/s) – 140 metres, Belden 1694A or equivalent. SD (270Mb/s) >250 metres, Belden 8281A or equivalent. Automatic de-embedding to SMPTE 272M or SMPTE 299M. SC optical input.
Video standards supported	1080p 50/59.94, 1080i 50/59.94, 720p 50/59.94, 1080psf 23.98/24, PAL, NTSC. Input format auto selected.
Return loss	50Mhz to 1.5GHz -15dB.
Audio	Up to eight 24 bit stereo pairs (total of eight inputs and outputs). AES3 110 ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 75 ohm BNC. Synchronous 48kHz audio to video.

Outputs

Video	Serial output: 270Mb/s to 2.970Gb/s serial compliant to EBU 3267-E, SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A. Output follows the input format. Audio is embedded to SMPTE 272M or SMPTE 299M. SC optical outputs.
Audio	Up to eight 24 bit stereo pairs (total of eight inputs and outputs). AES: 110 ohm balanced D-Type or 75 ohm unbalanced BNC.

Rear Module I/O

RM47	Two video outputs with 110 ohm balanced audio on a high density D-Type.

RM61	Two video outputs with eight x 75 ohm unbalanced audio on BNCs and SC optical I/O.
RM62	One video output with 110 ohm balanced audio on a high density D-Type and SC optical I/O.
RM70	One video output with 110 ohm balanced audio on a high-density D-Type and SC optical I/O.
RM74	Two video outputs with eight x 75 ohm unbalanced audio on BNCs. Metadata I/O via frame's GPIs.
Audio Delay	Adjustable audio delay of up to 400ms on each channel. Delay is either on or off for any given channel. Store presets and control via the card, frame active front panel, remote panel and VisionWeb.
Delay through board	Selectable ten frame video delay can be used to compensate for audio delays from Dolby E decoding.
Audio Replace	Routing of input audio together with audio or Dolby E from up to four de-embedded groups present on video input to any channel of up to four output embedder groups. HANC cleaning means that there is no remnant of the original version of old groups. If group 1 is replaced there is not an old group 1 with the "mark for deletion" flag set. Instead there is just the new modified group 1.
Audio Processing	Gain level adjustment on each channel between +18dB and -18dB in 0.1dB steps with 0dB calibration. Mute. Stereo to mono conversion.
Auxiliary data	Auxiliary data passed unless set to blank.

Status monitoring

LEDs	Front of card edge LED indicators to indicate: PSU rails present, SDI input HD/SD, Input audio groups present, Gains not calibrated, GPI Out 5 active, GPI Out 6 active.

GPI inputs

Number and type:	4 x GPI inputs. Recall of presets. Active pull to ground, pulled up to +5V through 7 kohm. Pulse mode GPI to be asserted for min. of 40mS and at least 2mS before vertical interval.

GPI outputs

Number and type:	2 x GPI outputs, assignable to alarm conditions such as loss of input, audio missing and audio channel silence (<-63dBFS). Electrically: Open collector transistors 30V, 270 ohm current limit resistors. Pulled up to +5V through 7 kohm.

Input fail output

Type: Dark Blue.

Control

Local: Intuitive board edge interface with two select buttons, shaft encoder and ten character alphanumeric display.

Remote: Control from frame active front panel and 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.
SNMP control and monitoring via frame CPU and Ethernet connection.

9 Appendix 1

Statesman

In July 2014, Statesman control of SYNNER 310 was superceded by VisionWeb control. Statesman is no longer supported after this date, but the original information for existing Statesman users is included in this appendix. Please note this section includes removed features such as Dolby E decoding.

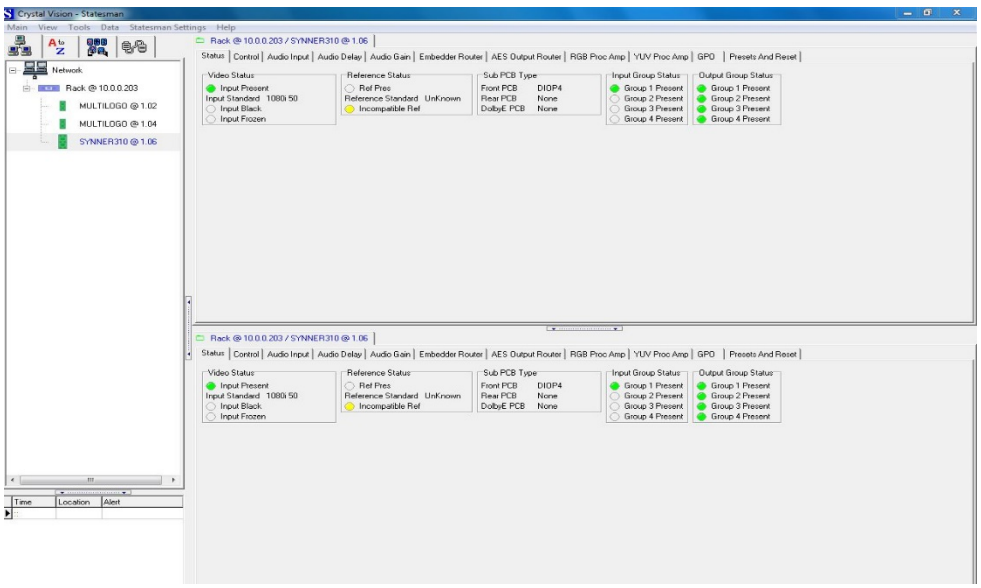
Introduction

The Crystal Vision Statesman PC control software is designed to control a range of Crystal Vision modules via ethernet control from a PC. Statesman provides a user friendly means of configuring and operating Crystal Vision modules with the benefit of "see-at-a-glance" status monitoring.

The main Statesman application communicates with each module in a frame through a Statesman-capable front panel CPU or full active control panel. Either of these must be fitted to the frame to allow Statesman control.

Statesman operation

The initial view will show an Explorer style view of the connected frames and modules. Double clicking on a module will enable the display of the main application menus.



The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower pane or drag the button to vary the size of the panes.

Note: *The above and following screengrabs contain some status information that will not be shown if the optional modules are not fitted.*

Note Also: *For further details of Statesman configuration and operation please refer to the Statesman manual.*

Control Descriptions

The controls of SYNNER 310 are accessible from the front panel, the board edge or from Crystal Vision's Statesman software. The description of controls used in this manual is based on Statesman but the path to locate controls via the front panel or board edge follows the same logic. For instance, in the Statesman GUI the 'Input Frozen' control is located in the '**Video Status'** group of the '**Status'** tab. To find the same control using the card edge or front panel follow the path **Status->Vid Status** to the **Ip Frozen** control.

Statesman GUI controls are located in a number of tabs each containing panels which mostly contain the controls. Some controls are LEDs that are used to show status, others are check boxes, buttons or sliders which change various SYNNER 310 settings.

The description of the tabs are in the order shown in the GUI i.e.

STATUS, CONTROL, AUDIO INPUT, AUDIO DELAY, AUDIO GAIN, EMBEDDER ROUTER, DE-EMBEDDED OUTPUT ROUTER / AES OUTPUT ROUTER, RGB PROC-AMP, YUV PROC-AMP, GPO, PRESETS AND RESET.

*(Note that the **DE-EMBEDDED OUTPUT ROUTER** tab is only available whenever an 3G-AOP2 piggyback is fitted. If a DIOP4 piggyback is fitted instead, the tab displayed becomes **AES OUTPUT ROUTER.** Neither tab is shown if neither 3G-AOP2 nor DIOP4 piggybacks are fitted.)*

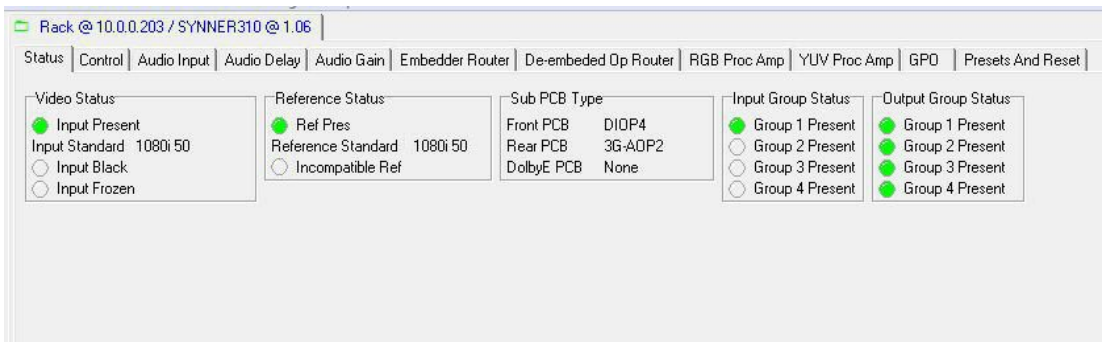
Each tab is shown with a screengrab and description of each control's function. The controls that are available vary with the option boards fitted and this is most noticeable with the routing matrices as the number of audio inputs and outputs will vary according to the optional audio I/O piggybacks that are fitted.

The following screengrabs are based upon a DIOP4 AES I/O piggyback in the front position (eight digital inputs or outputs) and a 3G-AOP2 piggyback (four analogue outputs) in the rear position.

Following the main controls description, an additional section describes the extra controls that are available when a Dolby E Decoder board (DBE-D) is fitted. *Note that for the Dolby E controls section the SYNNER 310 is fitted with a single DIOP4 AES piggyback in the front position (see table on page 14 for all valid piggyback combinations when using the Dolby E decoder sub-board).*

Status

The board status is shown using a mixture of simulated LEDs and text information. As a general rule a green LED shows a good condition such as input present. An amber LED will give a warning as with video black or video frozen. If a LED turns red this is a fault condition. A greyed LED will indicate an absence such as non-alarm or non-warning status.



Video Status	
Input Present	On when video input present.
Input Standard	Shows input video standard e.g. 1080p 50.
Input Black	On when input video is black level.
Input Frozen	On when input video is frozen.

Reference Status	
Ref Pres	On when compatible video reference present.
Reference Standard	Shows reference video standard e.g. 625 or 525 for analogue Black and Burst, or 1080i 50, 1080i 59.94, 720p 60 or 720p 59.94 for tri-level syncs.
Incompatible Ref	On when reference video frame rate is incompatible with the input video frame rate i.e a 55.94Hz reference with 50Hz video input.

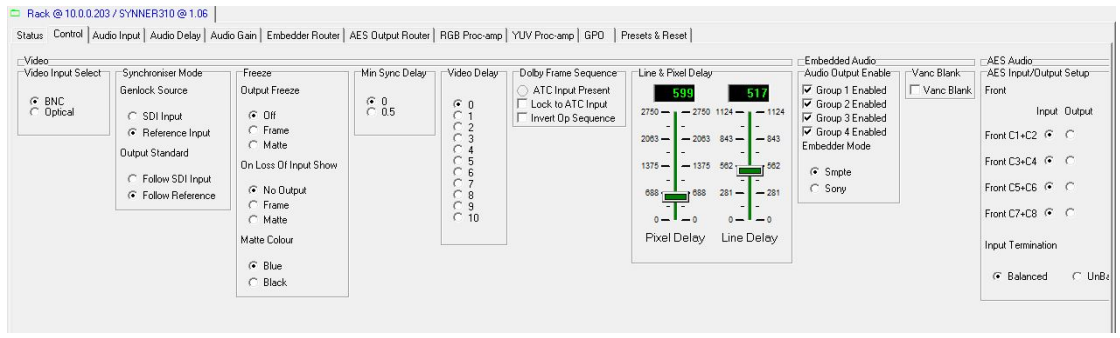
Sub-PCB Type	
Front PCB	Type of option PCB fitted in front position i.e DIOP4.
Rear PCB	Type of option PCB fitted in rear position i.e. 3G-AOP2.
Dolby E PCB	Indicates if optional Dolby E decoder is fitted.

Input Group Status	
Group 1-4 Present	On when audio groups 1-4 are embedded in the video input.

Output Group Status	
Group 1-4 Present	**On when audio groups 1-4 are embedded into the video output.**

Control

The control tab contains the SYNNER 310 configuration controls.



Video Input Select		
Video Input Select	**BNC**	**Select to enable BNC as the input video source.**
	Optical	**Select to enable optical as the input video source. *N.B. The optional SPF module and correct rear module must be fitted.***

Synchroniser Mode		
Genlock Source	**SDI Input/ Reference Input**	**Select the SDI input or the reference video as the timing reference for the synchroniser.**
Output Standard	**Follow Reference**	**When selected, the output video standard will attempt to match the reference standard (regardless of the input standard).**
	Follow SDI Input	**When selected, the output video standard will follow the input standard. This should be selected if the input standard is likely to be different to the reference.**

Freeze		
Output Freeze	**Off**	**Select to unfreeze the video output.**
	Frame	**Select to freeze the video output with the last video frame.**
	Matte	**Select to enable a black or blue colour matte output.**

On Loss of Input Show	No Output	Select to display no video output if the input video is missing.
	Frame	Select to freeze the video output with the last good frame if the video input is missing.
	Matte	Select to display a colour matte output if the video input is missing.
Matte Colour	Blue	Select to enable colour blue video output if the input video is missing and Matte mode enabled.
	Black	Select to enable black video output if the input video is missing and Matte mode enabled.

Min Sync Delay	
0, 0.5	Select an additional 0.5 frame delay for the video path and PCM (non-Dolby E) audio channels. Used in synchroniser mode to advance reference signal +0.5 frame with respect to video path to help centre synchroniser delay and/or for Dolby E channels to advance them +0.5 frame with respect to video thereby reducing alignment delays.

Video Delay	
0-10	Select video path delay in frames. Audio channels will be delayed by the same amount if 'Frame Delay' is selected in the Audio Delay tab.

Dolby Frame Sequence	
ATC Input Presence	On when Ancillary Timecode is present.
Lock to ATC Input	Lock the HD progressive video output field sequence to Ancillary Timecode.
Invert OP Sequence	Invert HD progressive video output field sequence.

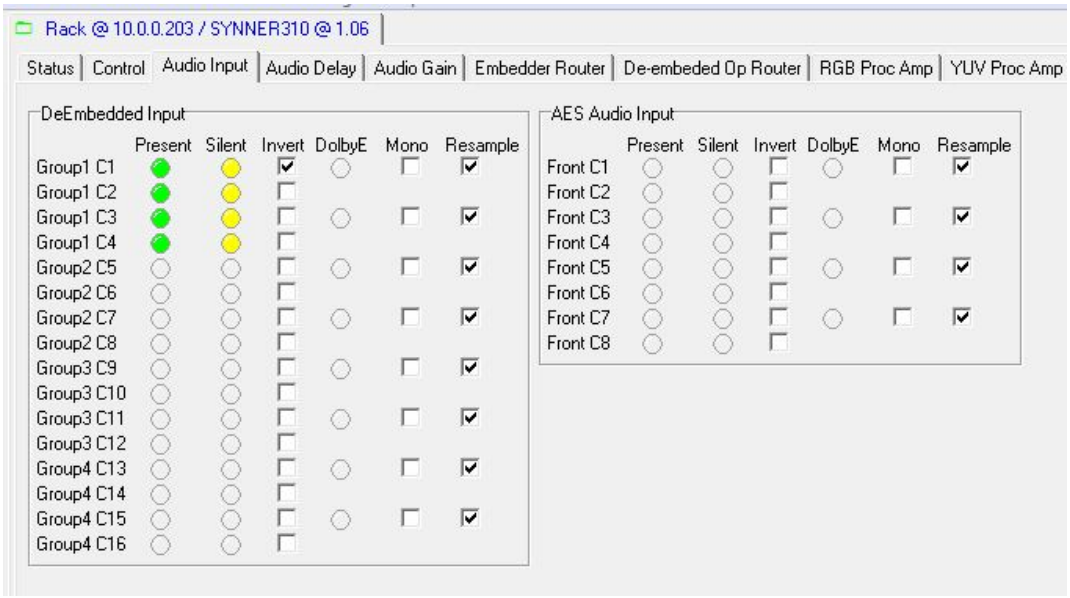
Line and Pixel Delay	
Pixel Delay	Provides additional horizontal timing adjustment (delay) of 0-2750 pixels with respect to the reference video in synchroniser mode, or with respect to the input video in delay mode. Audio signals are delayed by the same amount.
Line Delay	Provides additional vertical timing adjustment (delay) of 0-1124 lines with respect to the reference signal in synchroniser mode, or with respect to the input video in delay mode. Audio channels are delayed by the same amount.

Embedded Audio	
Audio Output Enable	**Select which of four embedded audio groups to enable in the video output.**
Embedder Mode	**Select either SMPTE or Sony embedder format (for SD video only).**
Vanc Blank	**Select to blank the vertical ancillary data in the video signal vertical interval.**

AES Audio		
AES Input/Output Setup	**Front C1+C2 To Front C7+C8**	**Select each of the DIOP4 board AES channel pairs to be individually configured as input or output. *N.B. The router configurations do NOT reflect the I/O state of the DIOP4 piggybacks. Note also that if a rear DIOP4 piggyback was fitted then the Control would refer to Rear C1+C2 etc.***
Input Termination	**Balanced**	**Select to configure the DIOP4 piggyback AES audio inputs to be 110 ohm.**
	Unbalanced	**Select to configure the DIOP4 piggyback AES audio inputs to be 75 ohm unbalanced.**

Audio Input

The audio status and control tab is where the non-routing audio controls are located. In this menu, green LEDs are used to indicate audio present on the 16 audio channels embedded in the incoming video. Further LEDs are used to indicate whether any of the 16 channels are silent or contain Dolby E. The mono-stereo, invert and resample controls are also found here.

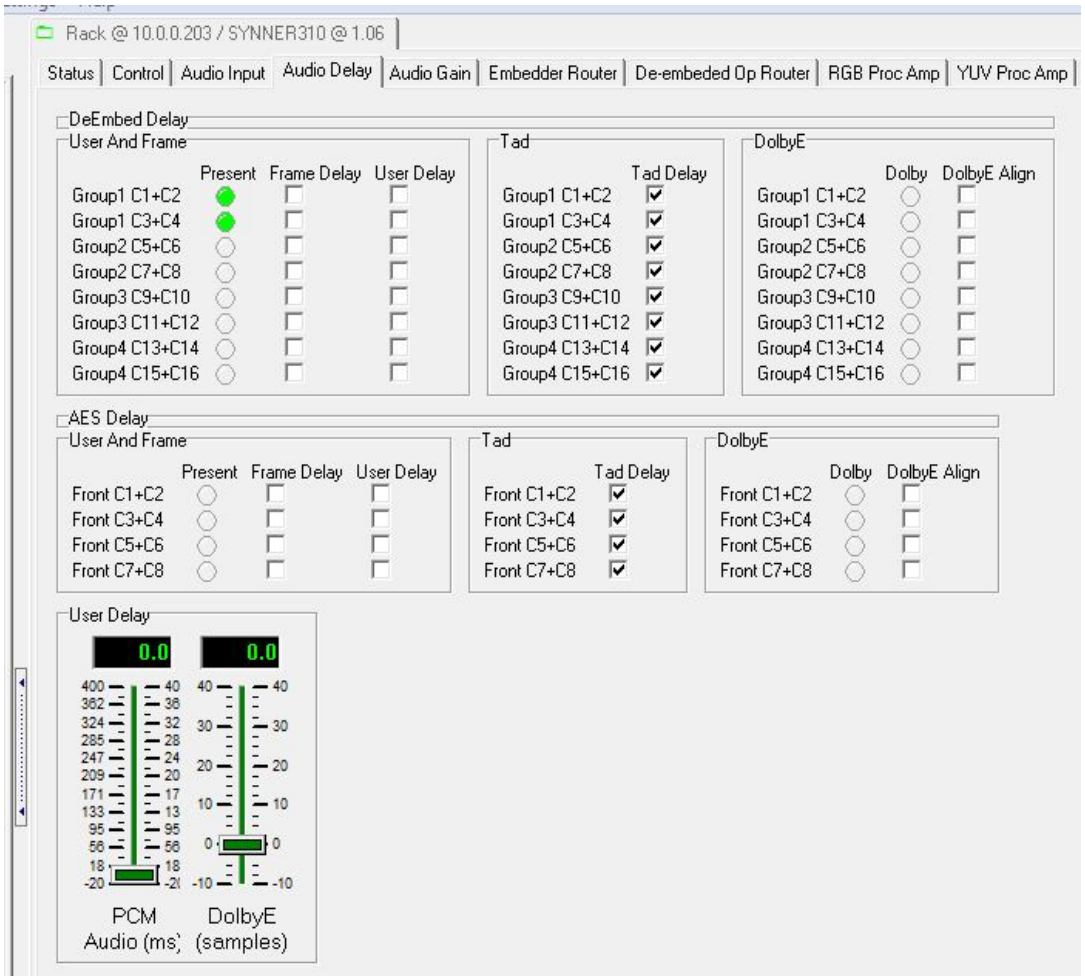


De-embedded Input	AES Audio Input
For each of the 16 channels de-embedded from the input video signal.	For all AES channels from optional DIOP4 piggybacks configured as inputs.

Present	On if the audio channel is present.
Silent	On if the audio channel is silent i.e. consistently below -63dBFS.
Invert	Select to enable inversion of the de-embedder output for the selected channel.
Dolby E	On if the channel pair has Dolby E encoding.
Mono	Select to mono the channel pair. ***N.B. Only the first channel of the stereo pair is converted to mono, the second channel is unchanged. The mono output is gain corrected to maintain unity gain.***
Resample	Select to enable resampling of the selected stereo pair output from the de-embedder. Resampling is used to seamlessly match the timing of audio signals when the user-controlled delay is altered or during TAD, and is the default condition. If resampling is deselected it is essential that the input and output source is derived from the same source and the timing should not be adjusted while on air. Without resampling, an adjustment in timing will cause a number of audio samples to be dropped or repeated.

Audio Delay

Each de-embedder, audio input and decoded Dolby E stereo pair has a set of controls to enable the various delays. These controls in combination with the video delay controls (0-10 frames) can be used to delay the audio with respect to the video and compensate for any small delay between the incoming video and audio signals, or when bypassed, delay the video with respect to the audio by up to ten frames. The selectable delays are: Frame Delay to match the video delays, User Delay which selects an additional global -20 to 400ms delay for PCM channels or -14 to + 36 samples for Dolby E channels. Note, a negative delay is only possible when at least one frame of video delay has been selected.



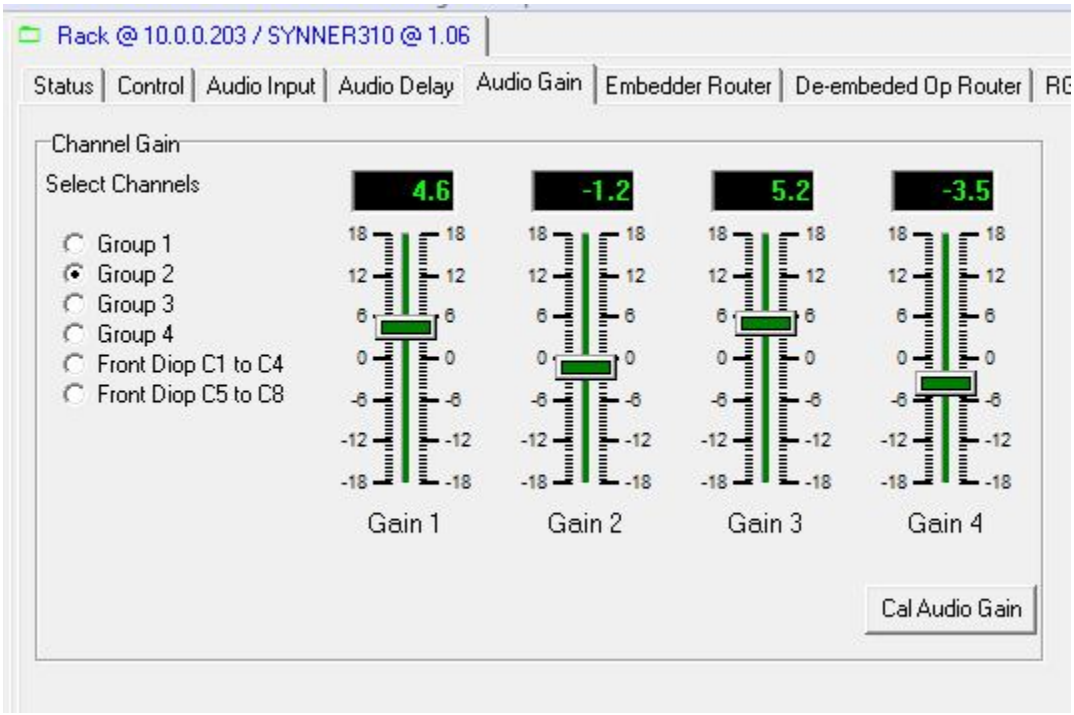
De-embed Delay	AES Delay
For each of the eight channel pairs de-embedded from the input video signal.	For all AES channel pairs from optional DIOP4 piggybacks configured as inputs.

Present	On if the audio channel pair is present.
Frame Delay	For each channel pair, select to enable delay to match the total video delays set in 'Control' tab 'Video Delay' control.
User Delay	For each channel pair, select to enable the variable delay set by the 'User Delay' controls. For PCM signals this is -20 to +400mS and for Dolby E signals -14 to +36 samples. *N.B. Negative values of delay can only be set if 'Frame Delay' is also enabled for that channel and at least one frame of video delay selected.*
TAD delay	Select to enable automatic tracking of video delay in synchroniser mode. The audio delays will follow the video path delays through the synchroniser.
Dolby	ON if Dolby E encoding is present in the channel pair.
Dolby E Align	Delay Dolby E channel pair by up to one frame so that the Dolby guardband is automatically aligned with the video switch point.

User Delay	
PCM Audio (mS)	Use this control to set the variable delay value -20 to +400mS for all audio PCM channel pairs selected to use 'User Delay'.
Dolby E (samples)	Use this control to set a delay value of between -14 to +36 samples for all Dolby E channels selected to use 'User Delay'.

Audio Gain

In total there are 32 audio gain controls, one for each of the 16 channels of de-embedded audio and 16 channels of external audio (or six channels of external audio and ten channels of decoded Dolby E if decoder fitted). The gain controls will give ± 18dB of gain relative to the input level up to the point where digital clipping will occur.



Channel Gain

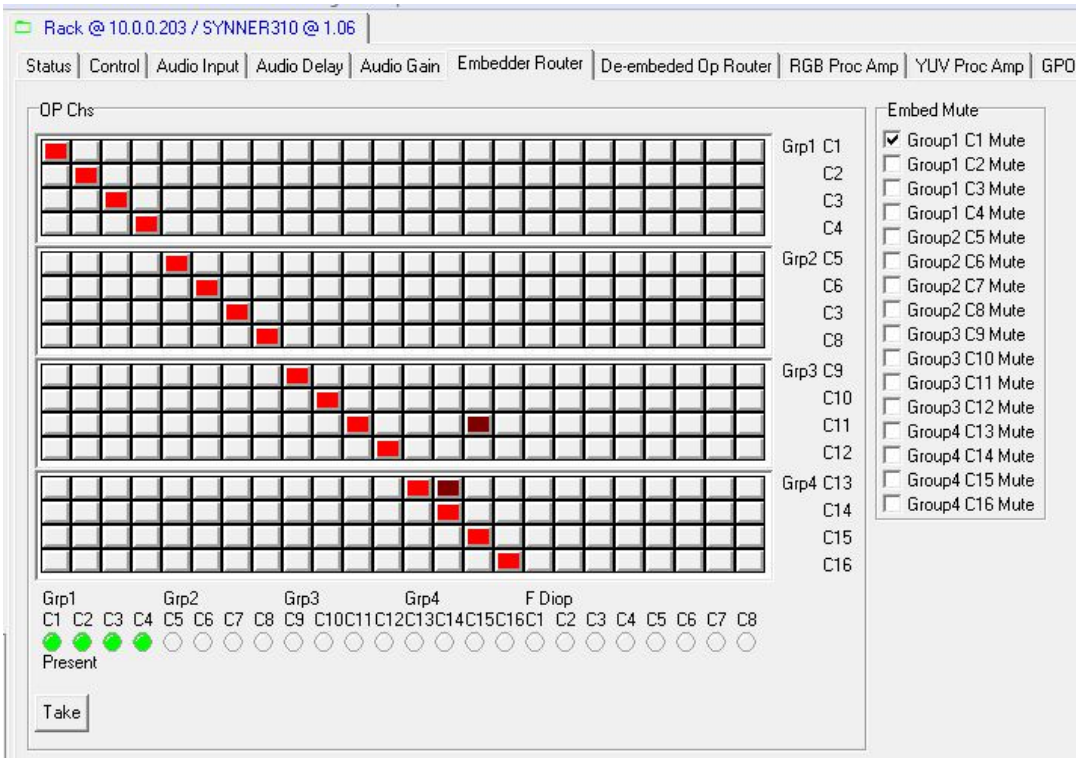
For each of the channels of the four audio groups de-embedded from the input video and all channels of the four audio groups from the optional input piggybacks.

Select Channels	**Select the audio group of four to apply the gain controls to.**
Gain 1-4	**Use these controls to set the audio gain by +/- 18dB individually for each of the four channels of the group. Select the group first and then adjust the gain. Gain control is prior to the embedder and audio output option routers and can be applied to all available sources.**
Cal Audio Gain	**Select to return all channels to the calibrated gain level.**

N.B. To set the gain for all of the possible 32 channels in Statesman, first select the audio group, adjust the gain for the individual channels within the group and press 'ENTER' on the keyboard to store.

Embedder Router

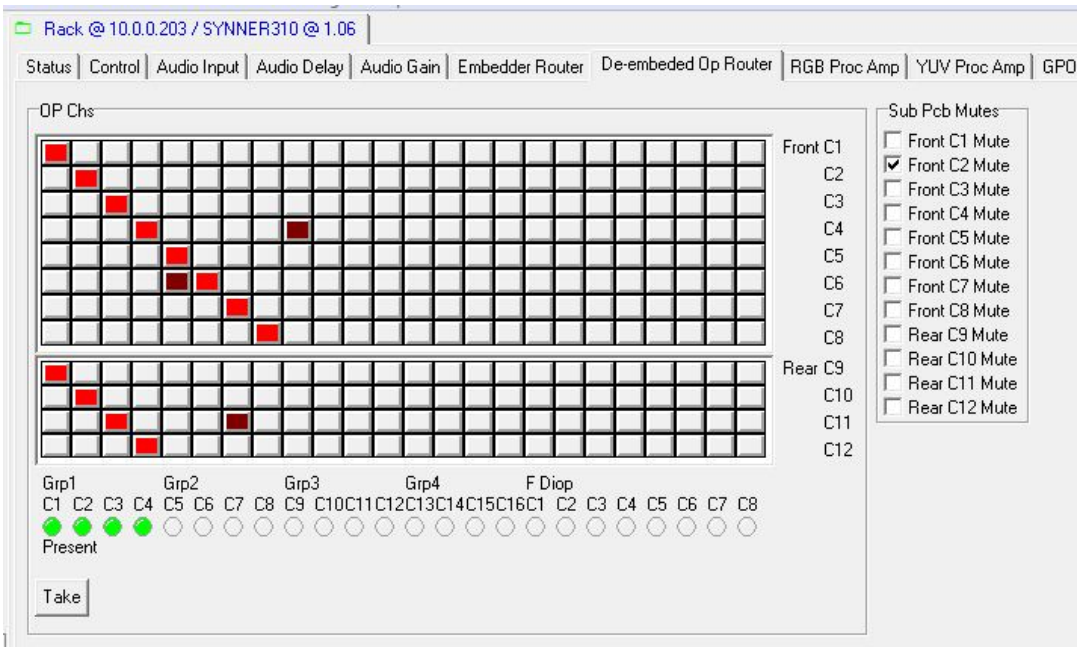
At the heart of SYNNER 310 is this 32 input/16 output routing router. The embedder router will allow any of the up to 32 possible inputs, 16 embedded channels and up to eight stereo external audio inputs or decoded Dolby E stereo pairs to be routed to any of the 16 embedded outputs.



OP Chs	
Route the 16 channels de-embedded from the input video and up to 16 other optional audio channels to the output embedder.	
Router selection buttons	**Preset the router condition by selecting the button at the intersection of the input and output channel. Input selections are labelled at the bottom and output selections on the right. The button will light dark red once selected and red once taken. *N.B. GUI example shows the first 16 input channels routed to the 16 output channels one-to-one. Input front DIOP4 C1 is preset to be routed to output Grp1 Ch1.***
Take	**Select this to action all presets. *N.B. Dark red preset selections will light red once taken.***
Present	**On if audio signal is present. Shows all input audio signals, embedded and external.**
Embed Mute	
For all 16 channels embedded into the output video signal.	
Group 1 C1 to Group 4 C4	**Select to mute embedded channel.**

De-embedded Op Router

This 32 x 16 router is for routing signals to the optional audio output modules. Any of the 16 de-embedded channels or 16 external audio inputs can be routed to 16 external audio outputs. This tab appears whenever an 3G-AOP2 piggyback is fitted.



Audio Op Channels

Route the 16 channels de-embedded from the input video and up to 16 other optional audio channels to the optional audio output piggybacks.

Router selection buttons	**Preset the router condition by selecting the button at the intersection of the input and output channel. Input selections are labelled at the bottom and output selections on the right. The button will light dark red once selected and red once 'taken'. *N.B. GUI example with a front DIOP4 and rear 3G-AOP2 shows the first 12 input channels routed to the 12 output channels one-to-one. Input front DIOP4 C1 is preset to be routed to output rear 3G-AOP2 C9.***
Take	**Select this to action all presets. *N.B. Dark red preset selections will light red once taken.***
Present	**On if audio signal is present. Shows all input audio signals, embedded and external.**

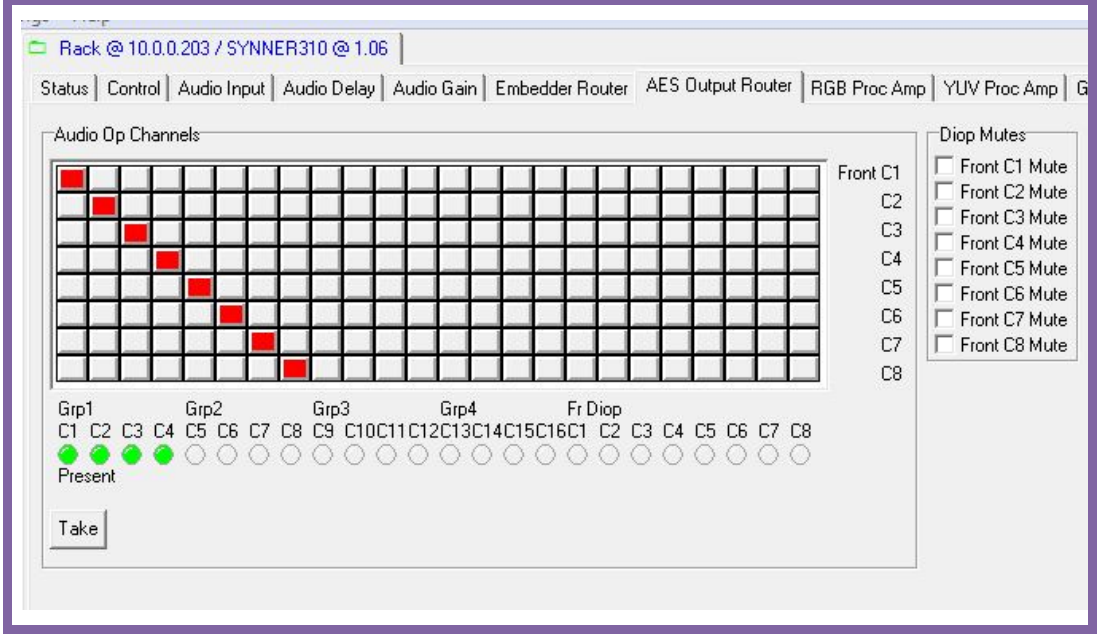
Sub-PCB Mutes

For all fitted optional output boards...

Front C1-8, Rear C1-8	**Select to Mute output channel.**

AES Output Router

This 32 x 16 router is for routing signals to the optional audio output modules. Any of the 16 de-embedded channels or 16 external audio inputs can be routed to 16 external audio outputs. This tab appears whenever a DIOP4 but no 3G-AOP2 piggyback is fitted.



Audio Op Channels

Route the 16 channels de-embedded from the input video and up to 16 other optional audio channels to the 16 optional audio outputs.

Router selection buttons	**Preset the router condition by selecting the button at the intersection of the input and output channel. Input selections are labelled at the bottom and output selections on the right. The button will light dark red once selected and red once 'taken'. *N.B. GUI example with a single DIOP4 board fitted shows the first eight input channels routed to the eight output channels one-to-one. Input C9 is preset to be routed to output front DIOP4 C4.***
Take	**Select this to action all presets. *N.B. dark red preset selections will light red once taken.***
Present	**On if audio signal is present. Shows all input audio signals, embedded and external.**

N.B. If the optional Dolby E decoder is fitted then only six channels for external audio signals are available. The other router inputs are replaced by the ten output channels from the decoder board – DECA,B,C,D,DM.

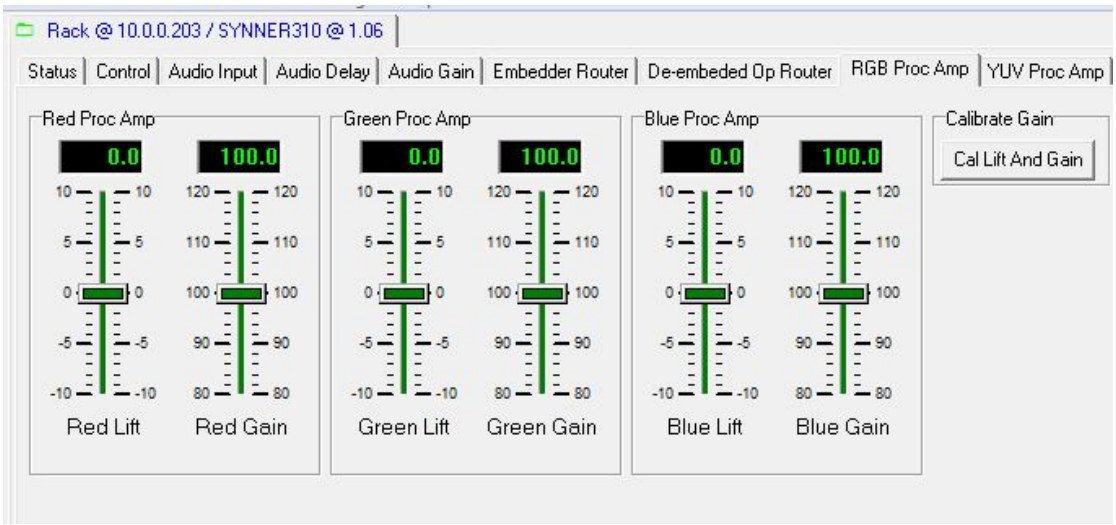
DIOP Mutes

For all fitted optional DIOP4 output piggybacks.

Front C1-8, Rear C1-8	**Select to Mute output channel.**

RGB Proc-Amp

The video proc-amp allows adjustment of the individual RGB lift and gain of the signal path.

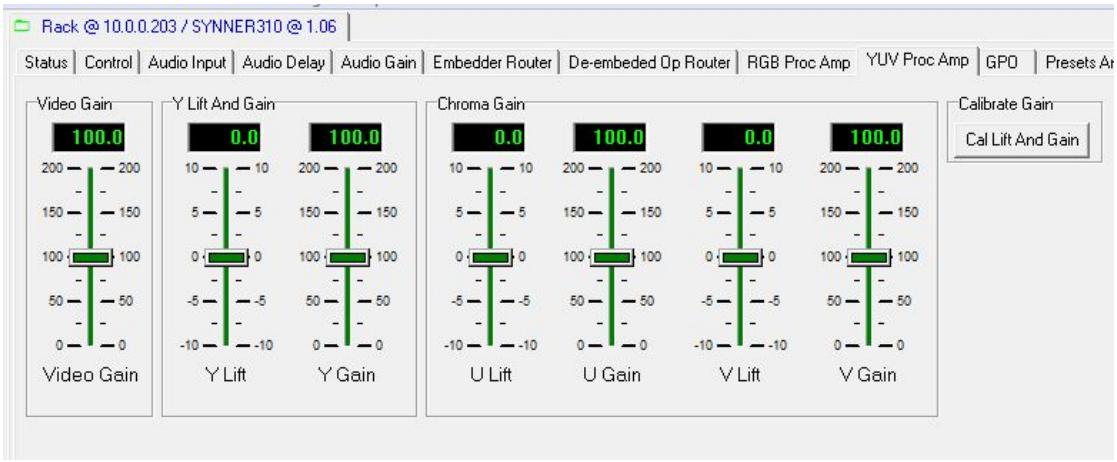


Red/Green/Blue Proc-Amps

Modify the output video signal by altering the levels of the individual colour components in the RGB domain.	
Red/Green/Blue Lift	**Offset the colour component by +/- 10%.**
Red/Green/Blue Gain	**Modify the gain of the colour component from +80% to +120%.**
Cal Lift and Gain	**Set lift and gain to calibrated values.**
N.B. The values set by these controls are not reflected by the YUV Proc-Amp tab.	

YUV Proc-Amp

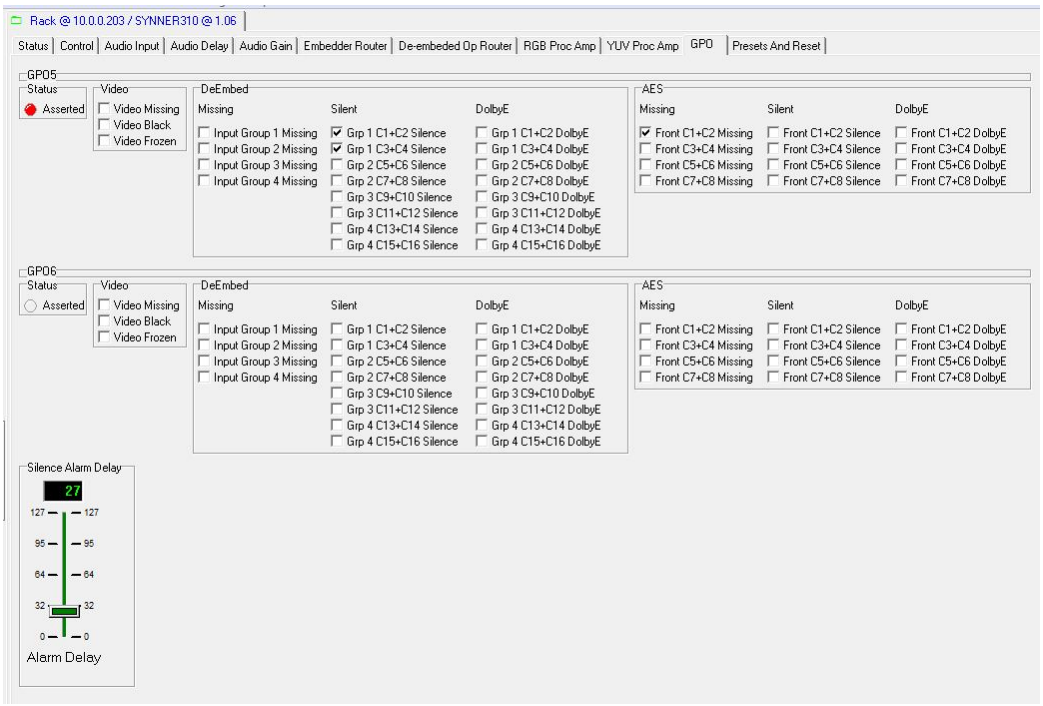
This video proc-amp allows adjustment of video gain, black level and independent YUV gains. The maximum increase in overall gain allowed is 200%, should any combination of controls be set where this maximum would be exceeded the gain will be limited to 200%.



YUV Proc-Amp	
Modify the output video signal by altering the levels of the individual colour components in the YUV domain.	
Video Gain	**Modify the gain of the whole video signal from 0 to +200%.**
Y Lift	**Offset the luminance component by +/- 10%.**
Y Gain	**Modify the luminance gain from 0 to +200%.**
U/V Lift	**Offset the U or V component by +/- 10%.**
U/V Gain	**Modify the U or V component gain from 0 to +200%.**
Cal Lift and Gain	**Set lift and gain to calibrated values.**
N.B. The values set by these controls are not reflected by the RGB Proc-Amp tab.	

GPI outputs

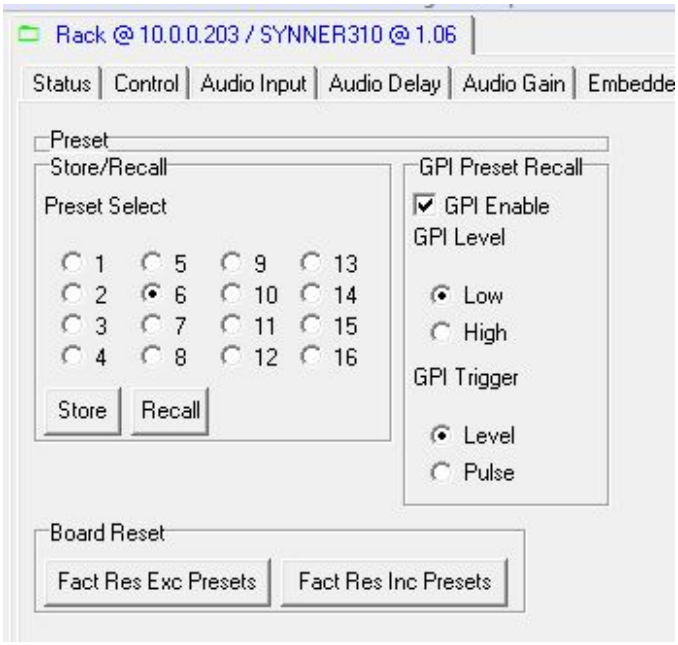
The GPO5 and GPO6 outputs are reserved for alarm indication and may each be assigned to any of the many video and audio alarm conditions. Video, input groups or Dolby encoding missing will assert an alarm immediately whereas the silence alarms can be assigned a delay timer to delay the time after which an alarm is asserted.



GPO5/GPO6		
Set the various conditions that assert GPO5 & GPO6.		
Status	**On if GPO is asserted. *N.B. Visual indication of GPO5 & GPO6 status is provided on the board edge.***	
Video	**Select the input video conditions that assert the GPO. Video Missing, Video Black, Video Frozen.**	
De-Embed /AES	**Set the conditions for the incoming de-embedded audio signals or external AES input signals that assert the GPO.**	
	Missing	**Set to assert GPO if a group not embedded or missing.**
	Silence	**Set to assert GPO if a channel pair is silent for the period set by the Alarm Delay.**
	Dolby E	**Set to assert GPO if a channel pair has Dolby E encoding.**
Silence Alarm Delay	**Set the time period that a silence condition must be true before asserting the GPO from 0 to 127 secs. This feature is especially useful to prevent false alarming during quiet periods in the audio.**	

Presets and Reset

Up to 16 user-defined configurations may be stored and recalled either from Statesman or through the use of external GPIs. Presets store the board setup data including operating mode card status. The presets are numbered 1-16. Reset the board to factory (default) settings.



Preset		
Save or recall SYNNER 310 settings.		
Preset Select	**Select which preset to store or recall.**	
Store/Recall	**Store**	**Save the setup in preset memory 1-16.**
	Recall	**Recall the setup from preset memory 1-16.**
GPI Preset Recall	**GPI Enable**	**Select to recall previously saved presets via the external GPI port. See Chapter 4 for more information on GPIs.**
	GPI Level	**Select either low or high level to trigger the GPI recall.**
	GPI Trigger	**Select either level or pulse to trigger GPI recall.**

Board Reset	
Reset SYNNER 310 settings to default values.	
Fact Res Exc Presets	**Reset the board to default settings but leave preset memories unaffected.**
Fact Res Inc Presets	**Reset the board to default settings and erase preset memories.**

Dolby E decoder controls

The optional Dolby E decoder board (DBE-D) decodes Dolby E signals embedded into the de-embedded input video signal or external AES inputs, and outputs five stereo pairs: A, B, C, D and DM (downmix). These outputs appear as inputs to the embedder and output routers.The following changes to controls become active if the DBE-D board is fitted. *Note that unchanged controls are blurred for clarity*. *Note also that these GUI snap-shots show a single DIOP4 in the front position.*

Audio Input

Extend Audio Input tab features to Dolby E decoder outputs.

Dolby Decoder Output	
For all ten output channels of the optional Dolby E decoder (DBE-D) board.	
Present	**On if the audio channel is present.**
Silent	**On if the audio channel is silent i.e consistently below the set threshold.**
Invert	**Select to enable inversion of the de-embedder output for the selected channel.**
Dolby E	**Not used.**
Mono	**Select to mono the channel pair. *N.B. Only the first channel of the stereo pair is converted to mono, the second channel is unchanged. The mono output is gain corrected to maintain unity gain.***
Resample	**Select to enable resampling of the selected stereo pair output from the de-embedder. Resampling is used to seamlessly match the timing of audio signals when the user-controlled delay is altered and is the default condition. If resampling is deselected it is essential that the input and output source is derived from the same source and the timing should not be adjusted while on air. Without resampling, an adjustment in timing will cause a number of audio samples to be dropped or repeated. *N.B. Resampling cannot be done prior to Dolby E decoding, only afterwards.***

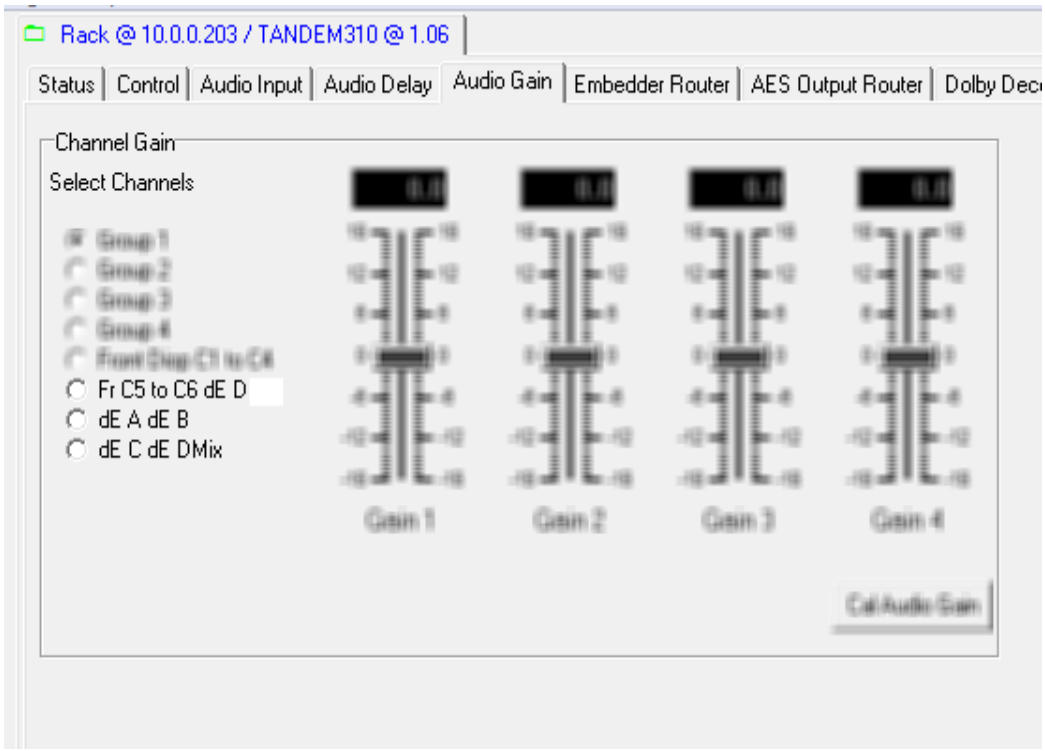
Audio Delay

Extend Audio Delay tab features to Dolby E decoder outputs.

Dolby Decoder Delay	
For the five channel pairs output from the Dolby E decoder board.	
Present	**On if the Dolby E decoded channel pair is present.**
Frame Delay	**Select to enable a video frame delay for the channel pair at the output of the decoder.**
User Delay	**Select to enable the variable delay (-20 to +400mS from 'User Delay' control) for the selected channel pair at the output of the decoder. *N.B. Negative values of delay can only be set if 'Frame Delay' is also enabled for that channel pair.***

Audio Gain

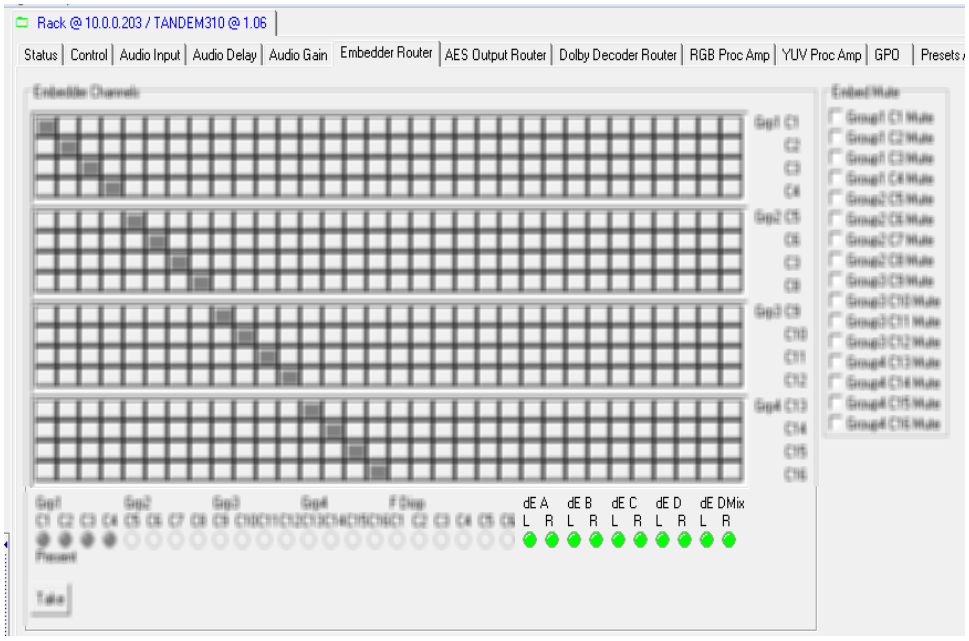
Extend Audio Gain tab features to Dolby E decoder outputs.



Channel Gain	
Select Channels	**Select the group of four channels to apply the gain to.** ***Note that the gain of dE D left channel will be set by fader Gain 3 and dE D right channel by Gain 4. The gains of dE A left, dE A right, dE B left and dE B right are set by Gain 1, 2, 3, 4 respectively. Similarly for dE C and dE DMix.***

Embedder Router

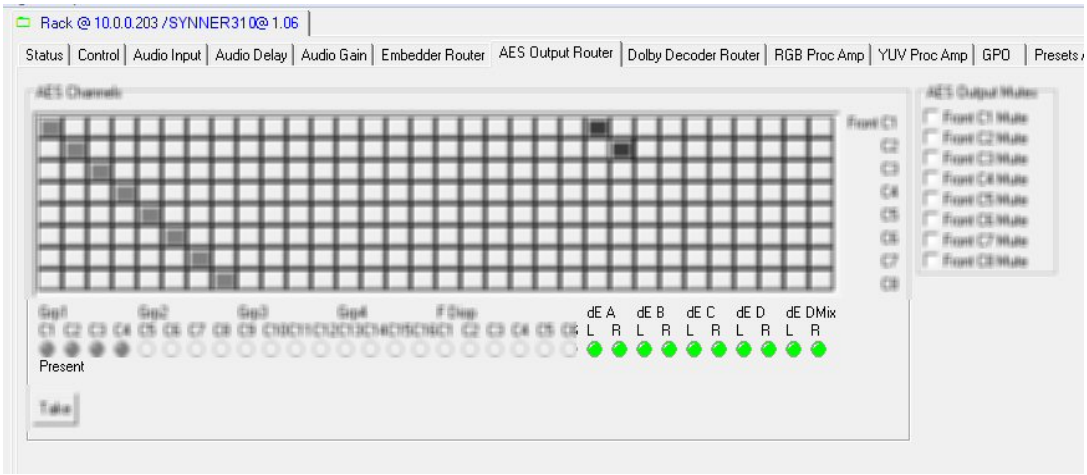
Extend inputs to embedder router to include Dolby E decoder output channels.



OP Chs	
Additionally select outputs from the Dolby E decoder to be embedded.	
Router selection buttons	**Select ten Dolby E decoder output channel(s) as sources to the embedder router. *N.B. As the maximum number of sources to this router is 16, this limits the number of external inputs from the option boards that can be selected to a maximum of six.***

AES Output Router

Extend the routable to include ten decoded Dolby E channels which can be routed to up to eight external digital audio outputs.

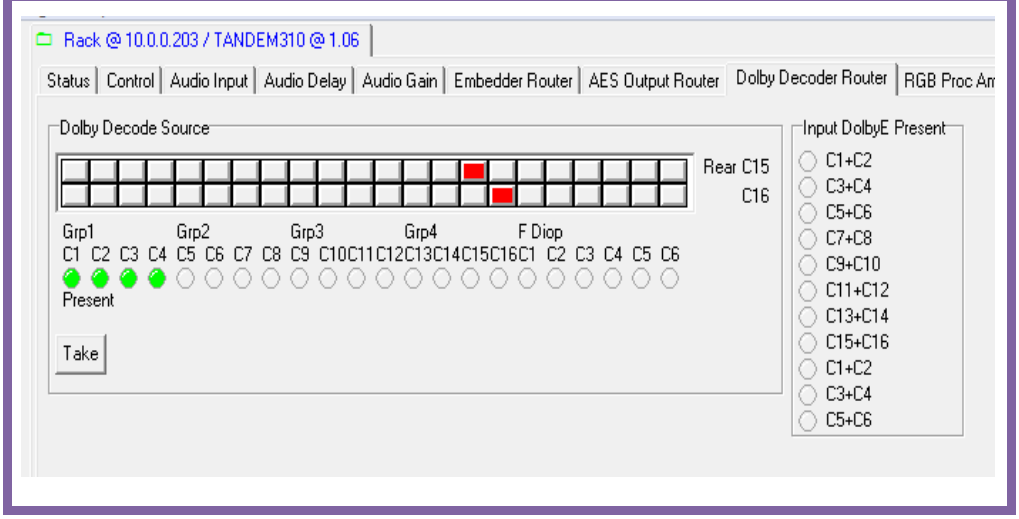


AES Channels

Route the 16 channels embedded in the input video, six optional input AES channels and ten Dolby E decoder channels to the eight optional AES outputs.	
Present	**On if audio signal present. Shows ten additional outputs from Dolby E decoder board available as routable sources for the output.**

Dolby Decoder Router

Select any de-embedded signal or AES input as a source for the Dolby E decoder.

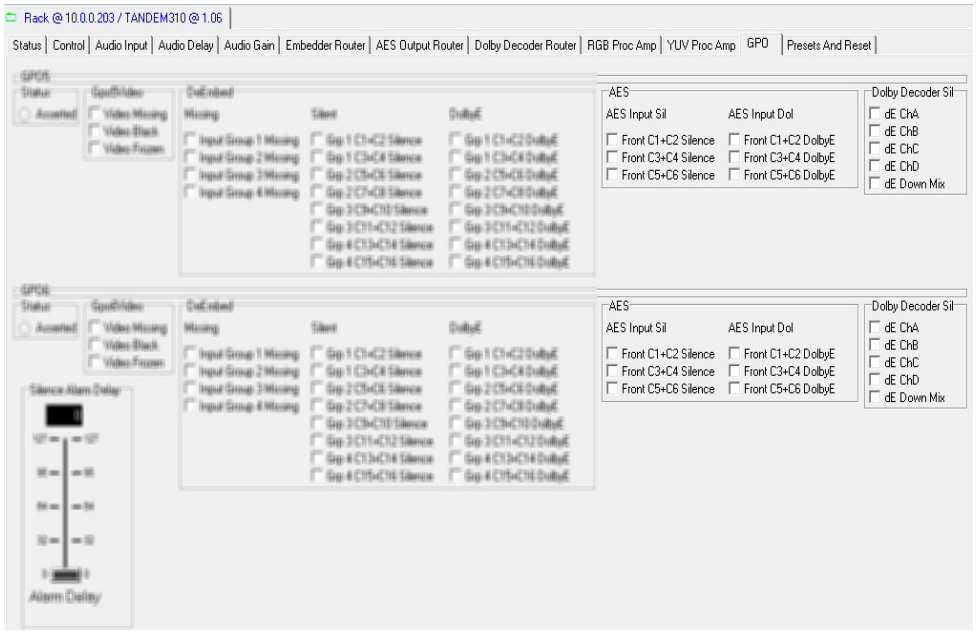


Dolby Decode Source	
Route the 16 channels de-embedded from the input video or six optional input AES channels as sources for the Dolby E decoder board.	
Router selection buttons	**Preset the router condition by selecting the button at the intersection of the input and output channel. Input selections are labelled at the bottom and output selections on the right. The button will light dark red once selected and red once 'taken'. *N.B. GUI example with a single DIOP4 board fitted shows de-embedded Grp 4 C15 and 16 routed to the decoder's inputs.***
Present	**On if audio signal present. Shows all available routable sources.**
Take	**Activate the pre-selection.**

Input Dolby E Present	
For all available sources.	
De-embedded channels C1-C16 **Digital inputs C1-C6**	**On if stereo pair has Dolby E encoding.**

GPI outputs

For all possible AES inputs, select silence and Dolby E presence alarm conditions. Also select Dolby decoder output silence alarm conditions.



GPO5/GPO6		
Set the various conditions that assert GPO5 & GPO6.		
AES	**Set the conditions for the external AES input signals that assert the GPO.**	
	AES Input Sil	**Set to assert GPO if a channel pair is silent for the period set by the Alarm Delay.**
	AES Input Dol	**Set to assert GPO if a channel pair has Dolby E encoding.**
Dolby Decoder Sil	**dE ChA - dE Down Mix**	**Select the Dolby decoder output pair(s) that assert the GPO if silent for the period set by the Alarm Delay.**