

USER MANUAL

 **Indigo**
SYSTEM



TANDEM 310

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

Crystal  **Vision**

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Revision 1		30/09/13
Revision 2	VisionWeb info added, Statesman info moved to Appendix 1. Dolby sub-board, RM46 and RM74 details added. Removed references to DBE-E Dolby encoder.	19/01/16
Revision 3	Updated GPI section.	31/07/16
Revision 4	Added note about removal of card edge control in 2018. Removed all references to DBE-D decoder.	03/07/19

1 Introduction

TANDEM 310 provides a versatile solution for audio embedding and de-embedding. It has a single SDI video path with a de-embedder and an embedder which allow the extraction and insertion of up to 16 channels (four groups) of audio.

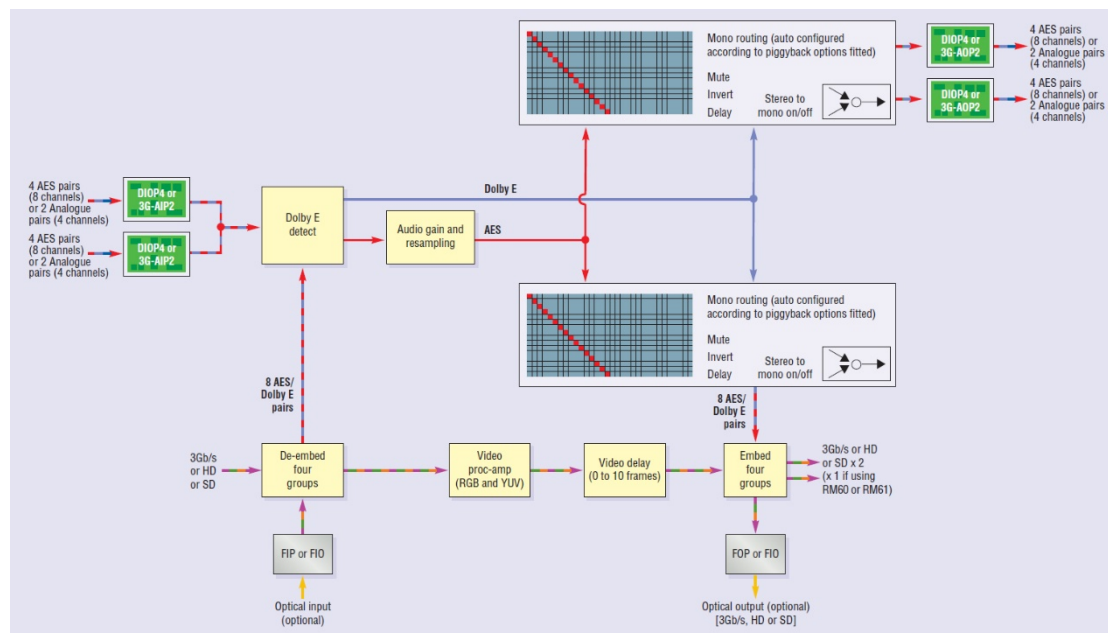
Embedded audio signals can be extracted and output as analogue or AES, then re-sampled and re-embedded into the video signal in the same or different channel position with user-controlled gain and delay. Additionally, external analogue and AES audio inputs can be embedded into the video signal in any 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 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. Audio channels can be delayed by up to 400mS.
- **Optimise the video:** video proc-amp allows adjustment of video gain, black level and independent RGB and YUV gains. TANDEM 310 includes the additional function of a switchable 0-10 frame video delay - useful for matching Dolby E or other audio processing delays
- **Control** of TANDEM 310 is 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, RM49, RM60, RM61, RM70 and RM74.
- **Compatible** with Crystal Vision standard frames available in 2U, 1U and desk top box.
- Passes all timecode, AFD and subtitling information.



TANDEM 310 functional block diagram

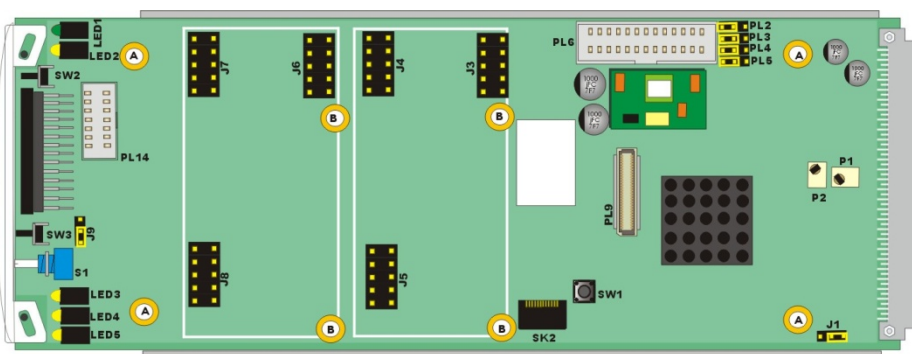
SDI video is cable-equalised, re-clocked and passed through a de-embedder block where up to 16 channels of audio are extracted. The video signal is then processed allowing for adjustment of video gain, black level and independent RGB and YUV gains. This is followed by up to ten frames of delay. The video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

The outputs of the audio processing block are inputs to two independent 32x16 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.

2 Hardware installation

2.1 Board configuration



TANDEM 310 main board top-side

Note: The potentiometers P1, P2, P3 and P4 have been factory set and should NOT be adjusted.

Holes marked 'A' are for the fitting of the Dolby E decoder sub-board.

Holes marked 'B' are for the fitting of the I/O piggybacks.

Link Configuration

There are four user-settable links on the TANDEM 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	Unused	Unused
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

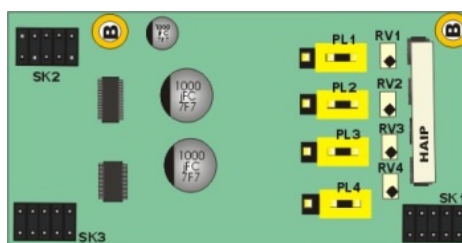
2.2 Input and output piggyback boards

The main TANDEM 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

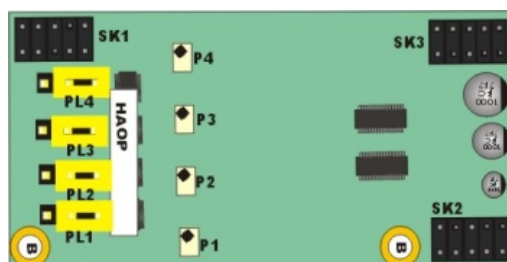


This analogue module has four balanced audio inputs. The links PL1-4 allow 0dBFS to be set to +18dBu (to the right, towards SK1) or +24dBu (to the left, towards SK2/3). The adjacent potentiometers RV1-4 are factory set and should **NOT** be adjusted.

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

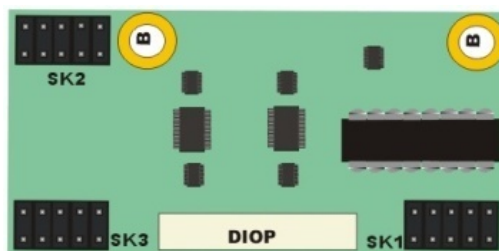


This analogue piggyback has four balanced audio outputs. The links PL1-4 set 0dBFS to +18dBu (to the right, towards SK2/3) or +24dBu (to the left, towards SK1). The four potentiometers P1-P4 are factory set and should **NOT** be adjusted.

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

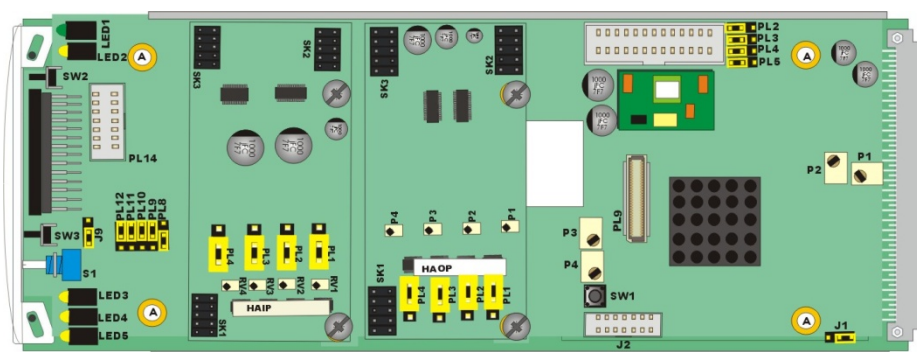
Table showing links controlling the output gain of the 3G-AOP2 channels

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.

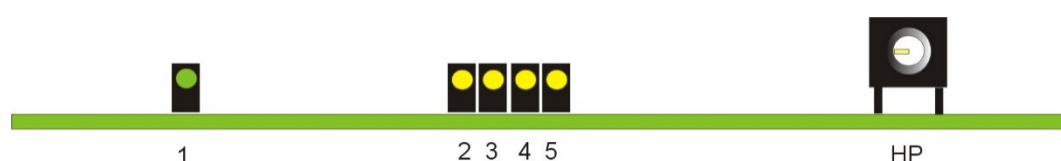
Fitting the I/O piggybacks onto the main board



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.

TANDEM 310 can support the following rear modules: RM47, RM60, RM61, RM70 and RM74.

3.1 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
 <p>SDI IN NC TANDEM 310 AUDIO I/O Rm47 SDI OUT (A) SDI OUT (B)</p>	RM47 <ul style="list-style-type: none"> • 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
NC	No user connection
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 audio piggybacks fitted. Half of the I/O channels on the rear module are connected to the front I/O (nearest handle) module position and the remainder to the rear module position. 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.

3.2 Rear module connections with RM60

The RM60 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.

RM60 rear module connector	Description
 <p>SDI IN TANDEM 310 Audio I/O ZLA00478 SDI OUT OPTICAL I/O</p>	RM60 <ul style="list-style-type: none"> • 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
SDI OUT	3G/High Definition/Standard Definition serial digital output
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted.

26-way D-Type Audio connections

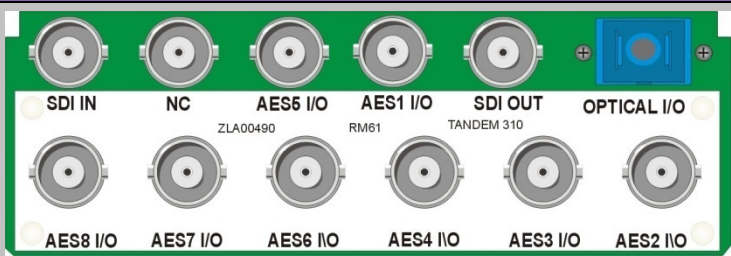
The 26-way audio 'D' connector RM60 module can be used for analogue or digital, inputs or outputs – or a mixture of both depending on the I/O modules fitted. Half of the I/O channels on the rear module are connected to the front I/O (nearest handle) module position and the remainder to the rear module position. 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

RM60 audio I/O connector wiring - All audio balanced signals can be either input or output depending on I/O module fitted.

3.3 Rear module connections with RM61

The RM61 is a dual height module presenting the eight channels of unbalanced audio 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.

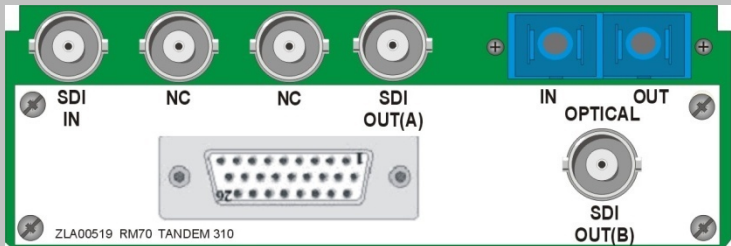
RM61 rear module connector	Description
	RM61 <ul style="list-style-type: none"> • Six per Indigo 2 frame • Three per Indigo 1 frame • One per Indigo DT • Alternate frame slots can be used

BNC Connections

BNC	I/O assignment
SDI IN	3G/High Definition/Standard Definition serial digital input
NC	No user connection
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

3.4 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.

RM70 rear module connector	Description
	RM70 <ul style="list-style-type: none"> • 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
NC	No user connection
NC	No user connection
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.

3.5 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 <ul style="list-style-type: none"> • 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
HD SDI IN	3G/High Definition/Standard Definition serial digital input
AES6	AES6 stereo pair 75 ohm input/output
NC	No Connection
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

4.1 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.

TANDEM 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](#) for details of inverting the GPI preset logic.

Each General Purpose Interface output (GPO) 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	Bit 8	Bit 4	Bit 2	Bit 1
Preset				
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	Bit 8	Bit 4	Bit 2	Bit 1
Preset				
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
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)

Alarm Table

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)

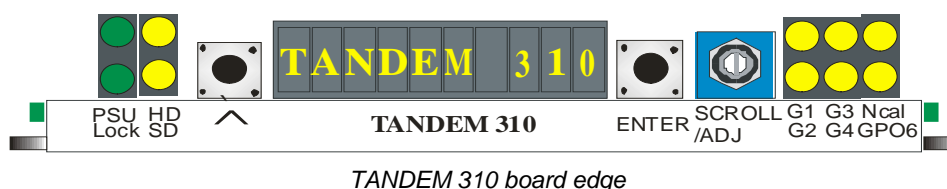
Note: Remote 1: 26-way high-density D-Type female socket. Frame ground is pin 2 and +5V @500mA is pin 1.
 Remote 2: 26-way high-density D-Type male plugs and frame ground is pin 6 and +5V @500mA is pin 15.
 Note: The +5V output is protected by self-resetting thermal fuses, which limit the total output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

5 Control and Status monitoring

TANDEM 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. TANDEM 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 TANDEM 310 in 2018. Therefore the card edge control information detailed below is only relevant for older versions of the product.

5.1 Card edge controls



Card edge buttons

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

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

5.2 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 TANDEM 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 TANDEM 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 TANDEM 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.



TANDEM 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 TANDEM 310 software V1.2 and Indigo frame software V4.4.

Control Panel keys overview

The functions assigned to the control panel keys are:

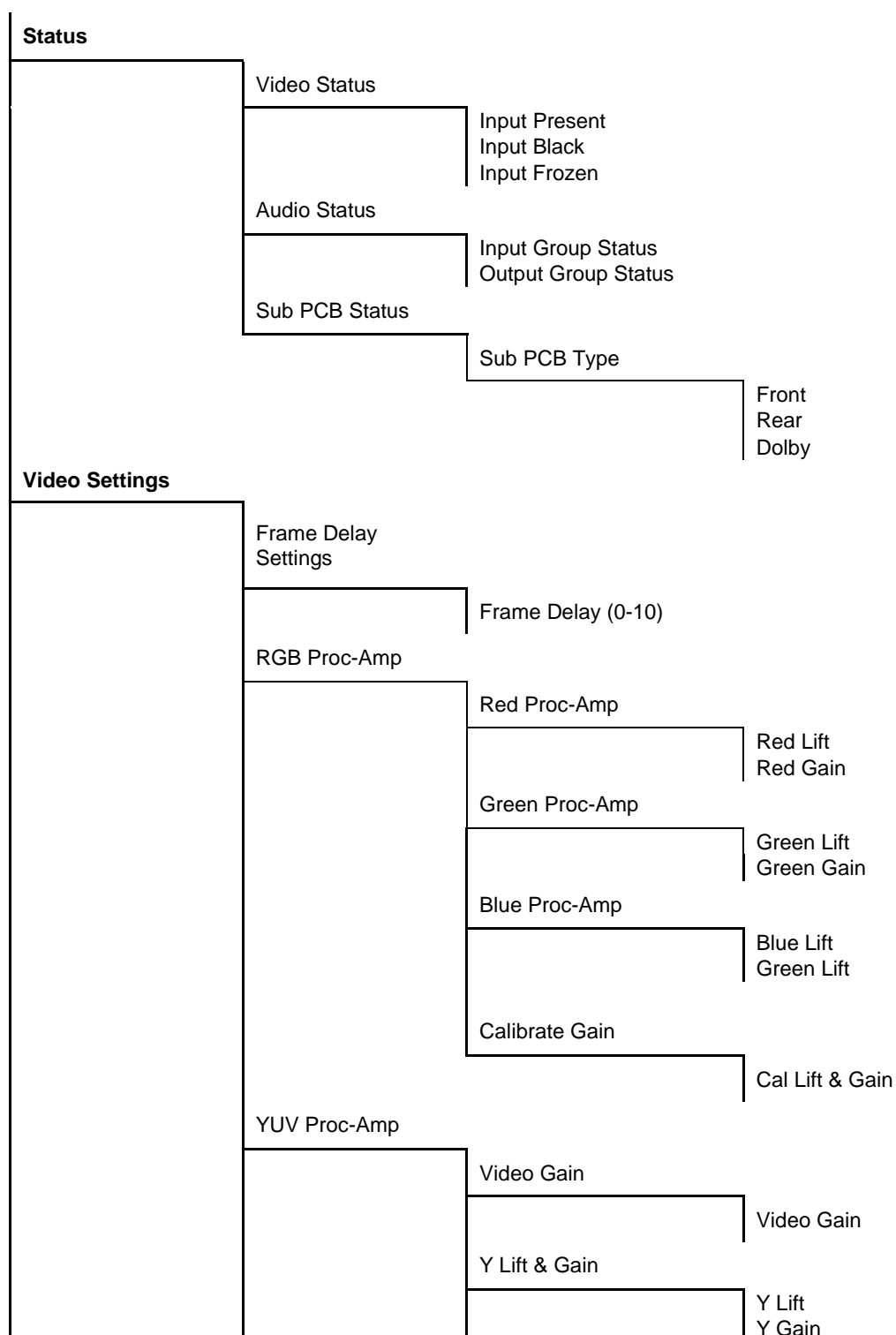
- DEVICE – enters 'device' menu to select a card or show available cards.
- ASTERISK (*) – selects 'network configuration' menu.
- F1 to F4 – soft keys not currently used by TANDEM 310.
- HOME – returns to top of TANDEM's menu structure.
- ENTER – accept current selection.
- Up arrow – used to move up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

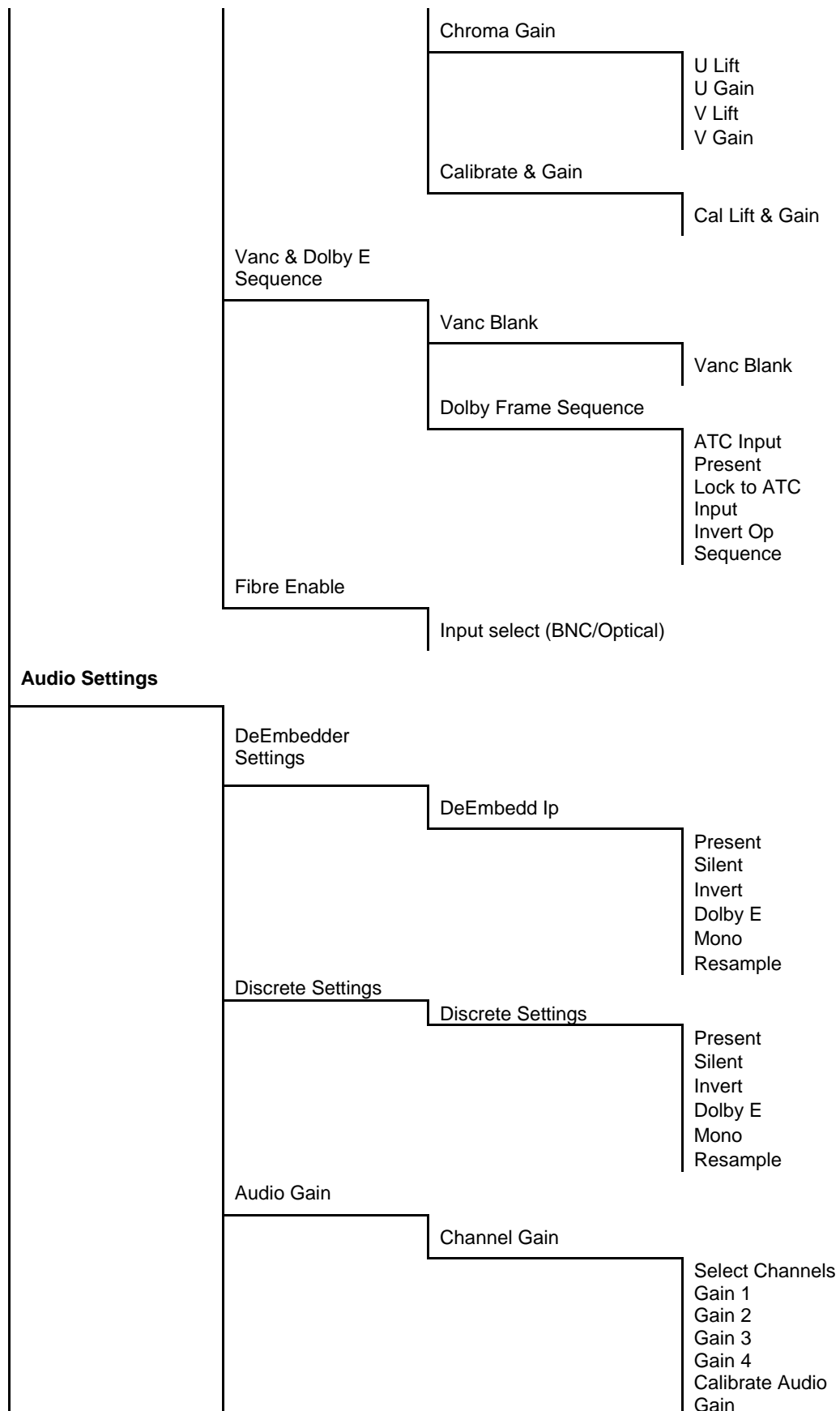
Updating the display

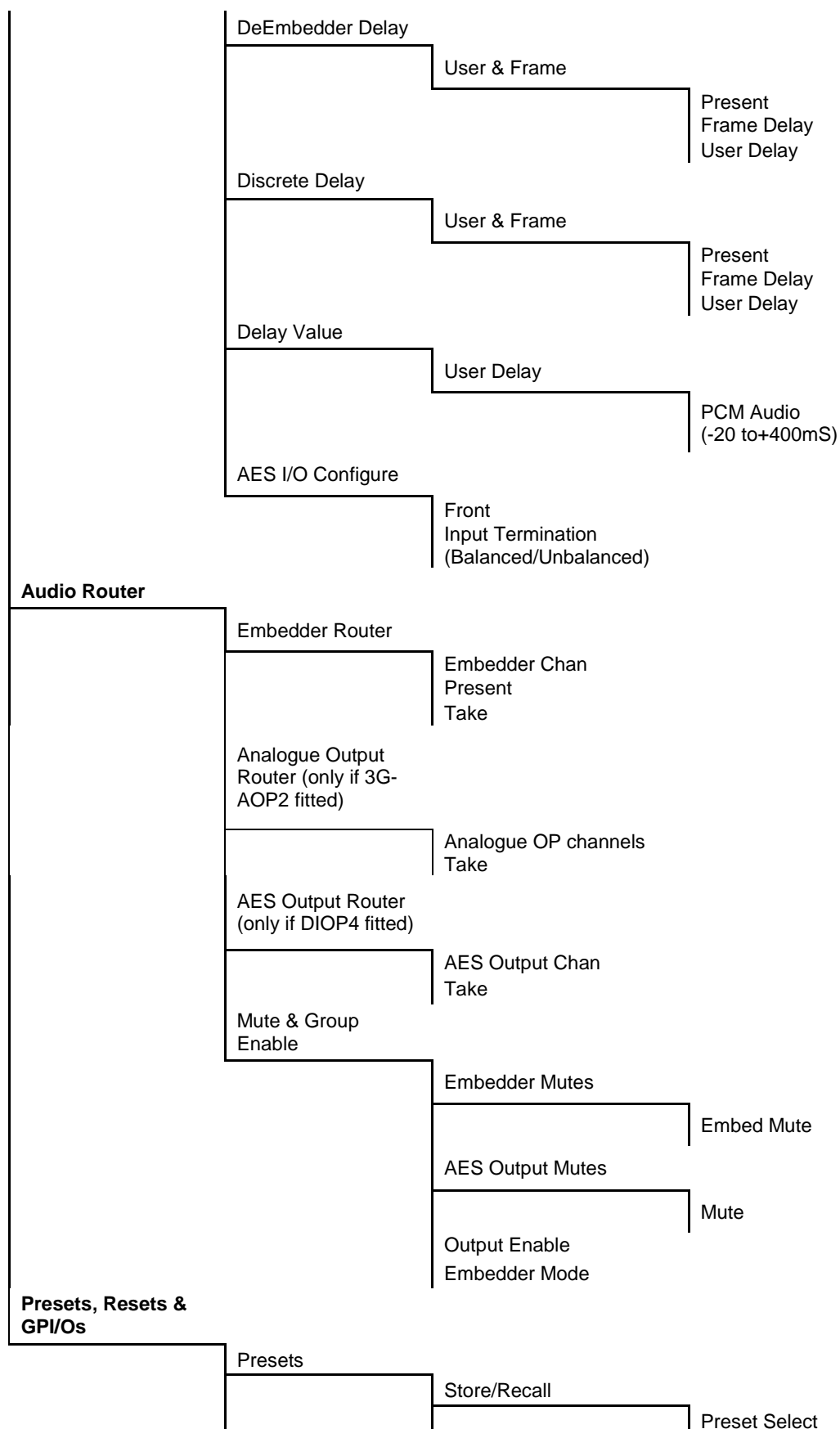
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If changes occur through the use of card edge controls or other remote control, the text displayed on the active front panel will not be updated immediately. If necessary, use the upward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

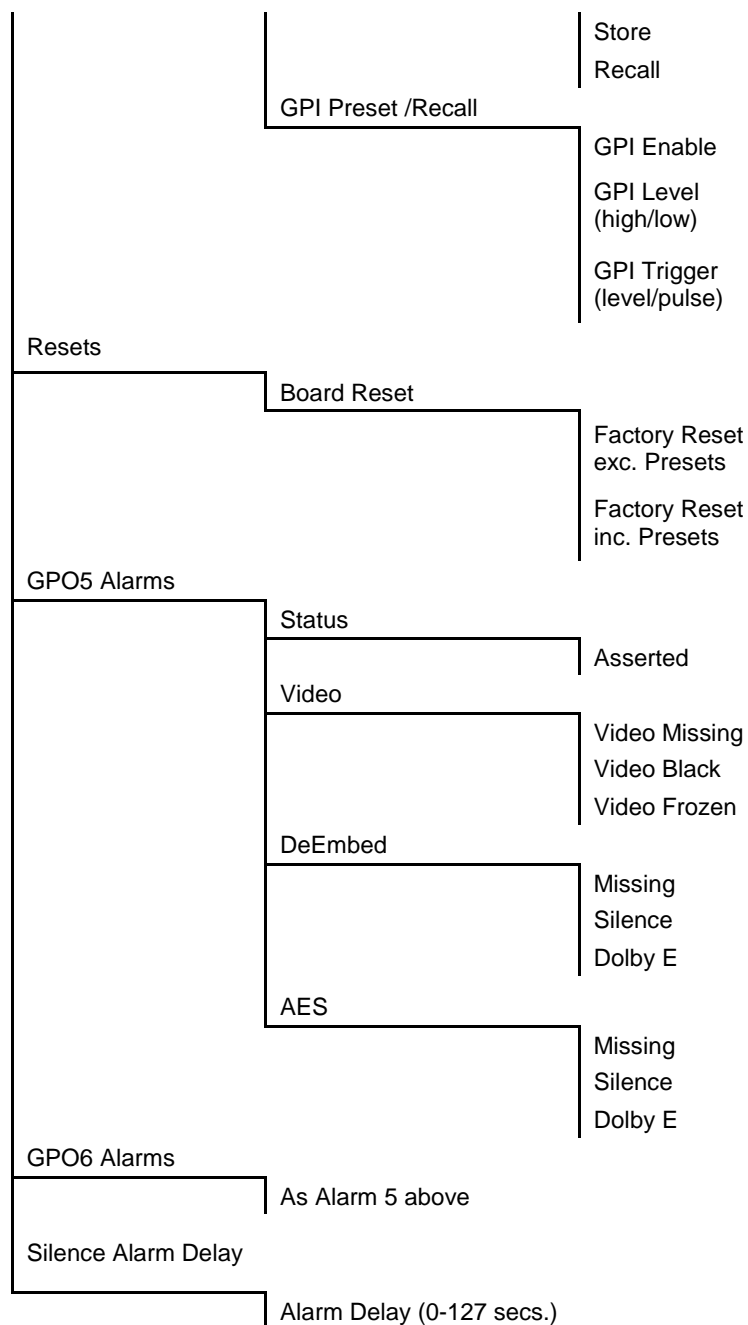
Menu Structure

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









The above menu structure is the means to access the various TANDEM 310 controls and status. A more detailed description is in the section 'Control Descriptions'.

5.3 Controlling cards via VisionWeb

Crystal Vision cards use an XML file to create a control database that is used by the card's front-edge controller, the Indigo frame front panel controller 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 TANDEM 310 card fitted in slot one and the frame's power supply and status monitor in slots 13 and 14. Clicking on the TANDEM 310 card will bring up the card's home page:



TANDEM 310 Status Page

6 Control Descriptions

The controls of TANDEM 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 screen grabs 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 TANDEM 310 settings.

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

VIDEO STATUS, AUDIO STATUS, SUB PCB STATUS, FRAME DELAY 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 screen grab 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 screen grabs 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. Screen grabs from both configurations will be used to show controls specific to each.

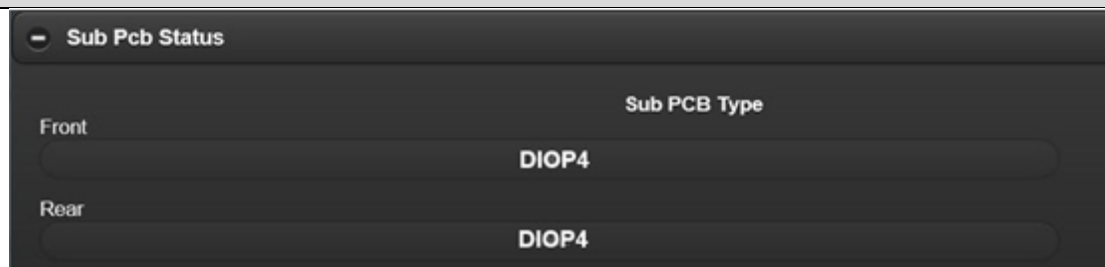
6.1 Status Menu

Video Status	
Display presence, standard and status of incoming video signal.	
<div> <div> <div>Video Status</div> <div> <div>Input Present</div> <div> <input checked="" type="radio"/> </div> </div> <div>Input Standard</div> <div> <div>1080i 50</div> </div> <div>Input Black</div> <div> <input type="radio"/> </div> <div>Input Frozen</div> <div> <input type="radio"/> </div> </div> </div>	
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.

Audio Status	
Displays presence of audio embedded in incoming and outgoing video signal.	
<div> <div> <div>Audio Status</div> <div> <div> <div>Input Group Status</div> <div>Present</div> <div> <div>Group 1</div> <div> <input checked="" type="radio"/> </div> </div> <div>Group 2</div> <div> <input checked="" type="radio"/> </div> </div> <div>Group 3</div> <div> <input checked="" type="radio"/> </div> <div>Group 4</div> <div> <input type="radio"/> </div> </div> <div> <div>Output Group Status</div> <div>Present</div> <div> <div>Group 1</div> <div> <input checked="" type="radio"/> </div> </div> <div>Group 2</div> <div> <input type="radio"/> </div> </div> <div>Group 3</div> <div> <input checked="" type="radio"/> </div> <div>Group 4</div> <div> <input type="radio"/> </div> </div> </div>	
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.



Sub Pcb Status

Sub PCB Type

Front

DIOP4

Rear

DIOP4

Front

Displays type of piggyback in front position (nearest handle) i.e. DIOP4, 3G-AIP2, 3G-AOP2 or none.

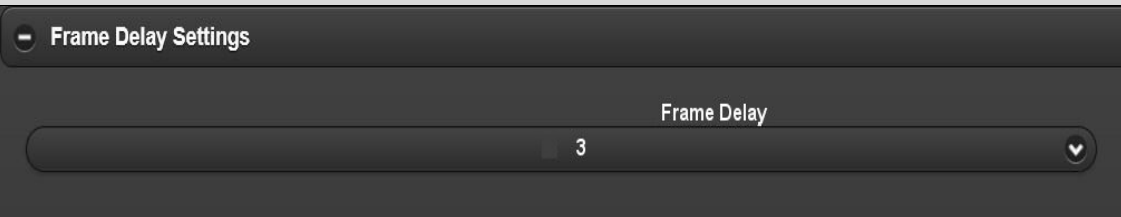
Rear

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

6.2 Video Settings Menu

Frame Delay Settings

Set the delay in the video path.



Frame Delay Settings

Frame Delay

3

Frame Delay

0

1

2

3

4

5

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.

RGB Proc-amp

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

RGB Proc-amp

Red Proc-amp	Green Proc-amp	Blue Proc-amp	Calibrate Gain
Red Lift -2.8	Green Lift 1.4	Blue Lift 0	Cal Lift & Gain
Red Gain 86.4	Green Gain 104	Blue Gain 96.8	

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.

YUV Proc-amp

Video Gain	Y Lift & Gain	Chroma Gain	Calibrate Gain
Video Gain 20	Y Lift 1	U Lift 0.2	Cal Lift & Gain
	Y Gain 12	U Gain 0	
		V Lift 0.8	
		V Gain 14	

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.

6.3 Audio Settings Menu

DeEmbedder Settings						
Monitor de-embedder channel status, invert channels, detect Dolby E encoded channel pairs, mono and resample stereo pairs.						
- DeEmbedder Settings						
	Present	Silent	DeEmbedded Ir Invert	DolbyE	Mono	Resample
Group1 C1	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Group1 C2	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group1 C3	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Group1 C4	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group2 C5	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Group2 C6	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group2 C7	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Group2 C8	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group3 C9	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group3 C10	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group3 C11	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group3 C12	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group4 C13	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group4 C14	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group4 C15	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group4 C16	<input type="radio"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
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. <i>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.</i>					

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 resample stereo pairs. Screen grab below shows a 3G-AIP2 in the front piggyback position with four analogue inputs.

The screenshot shows the 'Discrete Settings' menu. It lists four channels: Front C1, Front C2, Front C3, and Front C4. For each channel, there are six controls: Present (green dot), Silent (yellow dot), Invert (checkbox), DolbyE (radio button), Mono (checkbox), and Resample (checkbox). Front C1 has Present, Invert checked, and Mono checked. Front C2 has Present and Silent. Front C3 has Mono checked. Front C4 has Present, Silent, and Invert.

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. <i>N.B. only the 1st channel of the stereo pair is converted to mono, the 2nd channel is unchanged. The mono output is gain corrected to maintain unity gain.</i>
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

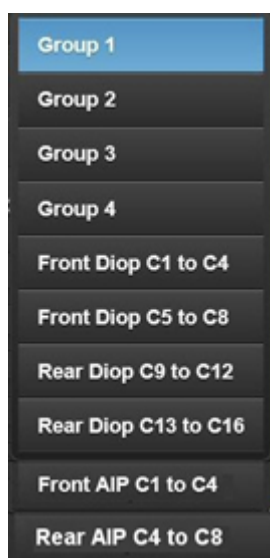
Change the gain of the audio inputs by +/- 18dB.



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 $\pm 18\text{dB}$ 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 screen grab 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.

DeEmbedder Delay

	Present	User & Frame Frame Delay	User Delay
Group1 C1+C2	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input type="text"/>
Group1 C3+C4	<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Group2 C5+C6	<input checked="" type="radio"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Group2 C7+C8	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group3 C9+C10	<input checked="" type="radio"/>	<input checked="" type="checkbox"/>	<input type="text"/>
Group3 C11+C12	<input type="radio"/>	<input type="checkbox"/>	<input type="text"/>
Group4 C13+C14	<input type="radio"/>	<input type="checkbox"/>	<input type="text"/>
Group4 C15+C16	<input type="radio"/>	<input type="checkbox"/>	<input type="text"/>

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, this is -20 to +400mS. <i>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.</i>
Dolby	ON if Dolby E encoding is present in the channel pair.

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. Screen grabs below show two different configurations.

Discrete Delay

	Present	User & Frame	
		Frame Delay	User Delay
Front C1+C2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Front C3+C4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

3G-AIP2 piggyback fitted in front position

Discrete Delay

	Present	User & Frame	
		Frame Delay	User Delay
Front C1+C2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Front C3+C4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Front C5+C6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Front C7+C8	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Rear C9+C10	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Rear C11+C12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rear C13+C14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rear C15+C16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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, this is -20 to +400mS. <i>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.</i>
Dolby	ON if Dolby E encoding is present in the channel pair (AES sources only)

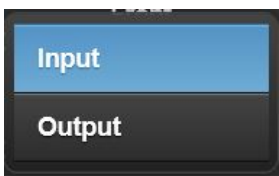
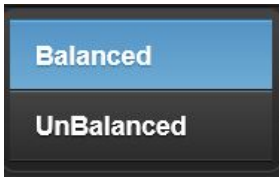
Delay Value

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

Delay Value	
PCM Audio (ms)	<div> <div>60</div> <div> <div></div> <div></div> </div> <div>User Delay</div> </div>
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.

AES I/O Configure

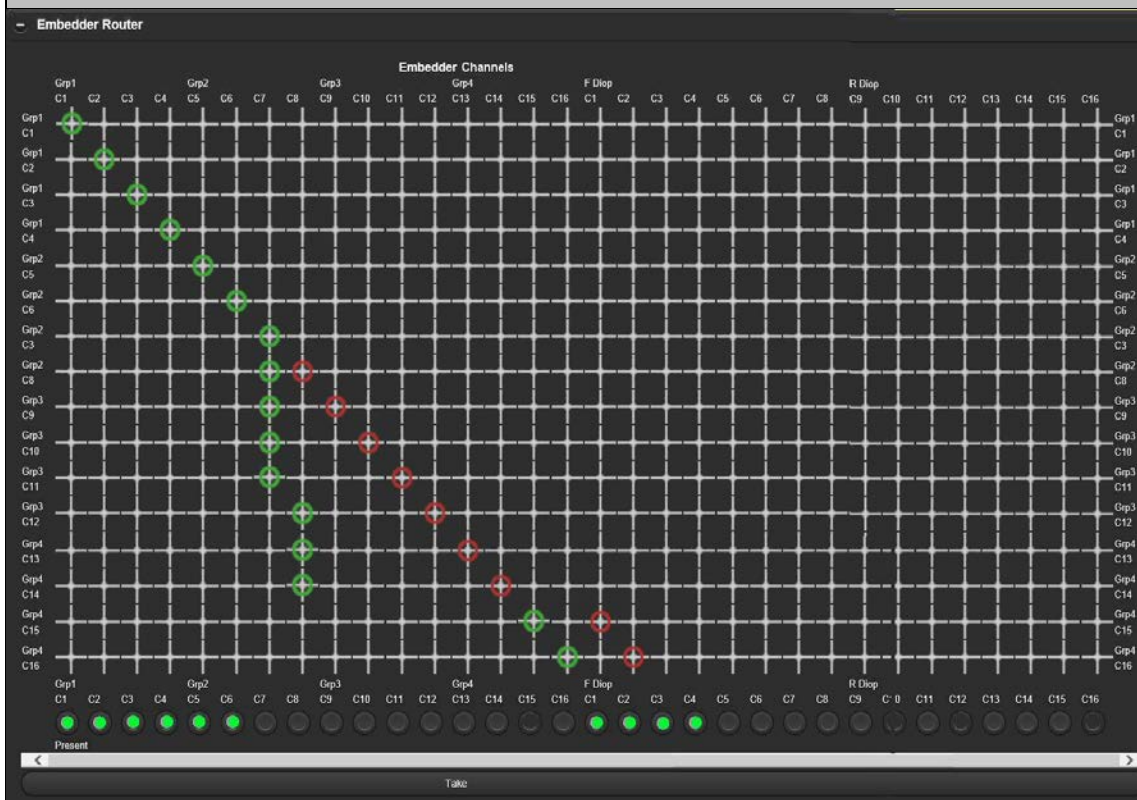
Configure the optional DIOP4 piggyback AES I/O channels as input or output.

AES I/O Configure			
	<div> <div>Front</div> <div>Front C1+C2</div> <div>Input</div> </div> <div> <div>Front C3+C4</div> <div>Input</div> </div> <div> <div>Front C5+C6</div> <div>Input</div> </div> <div> <div>Front C7+C8</div> <div>Input</div> </div>	<div> <div>Rear</div> <div>C9+C10</div> <div>Input</div> </div> <div> <div>C11+C12</div> <div>Input</div> </div> <div> <div>C13+C14</div> <div>Input</div> </div> <div> <div>C15+C16</div> <div>Input</div> </div>	<div> <div>Input Termination</div> <div>Balanced</div> </div>
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.	

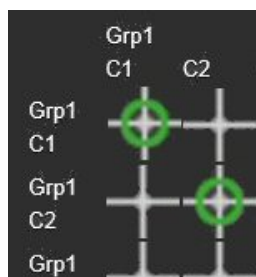
6.4 Audio Router Menu

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 screen grab 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 screen grab 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

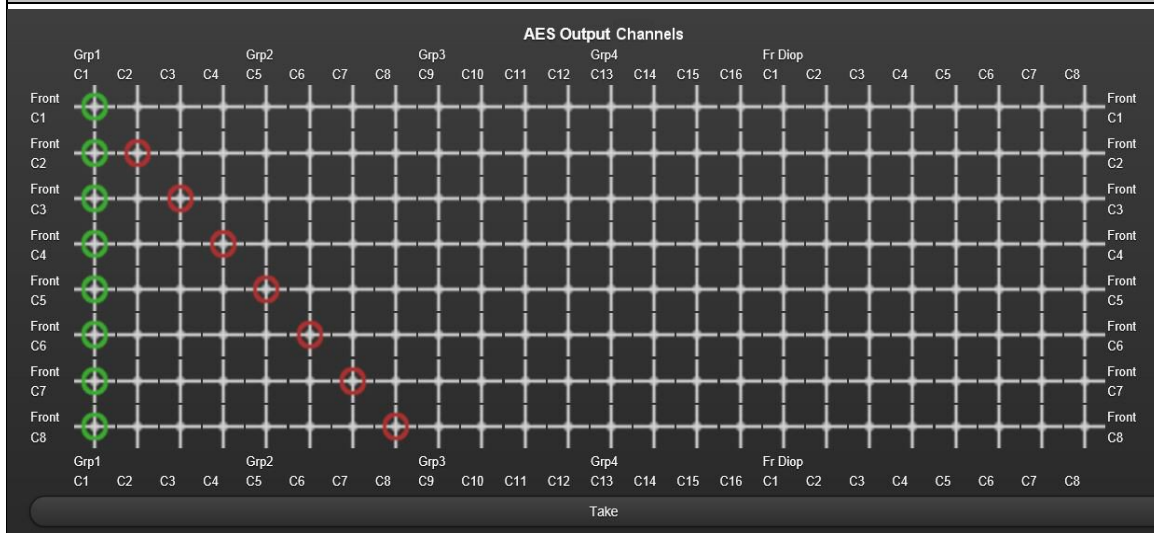
Switch all pre-selected crosspoints in one go.

Present

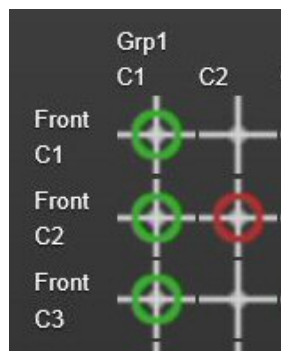
On if audio channel is present.

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 screen grab below shows a single DIOP4 piggyback in the front position configured as all outputs.



AES Op Channels



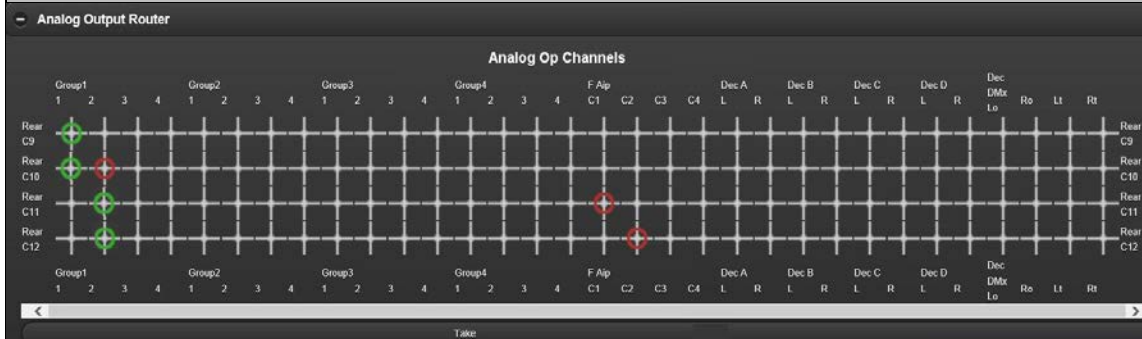
Display current selections (green circles) and pre-select the crosspoint to be routed when the 'Take' button is pressed (red circles). The inputs shown along the top of the matrix will be routed to the AES output channels shown on the left hand side. The screen grab above has a DIOP4 piggyback fitted 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 screen grab above shows de-embedded inputs 2-8 pre-selected to front DIOP4 channels C2-C8.

Take

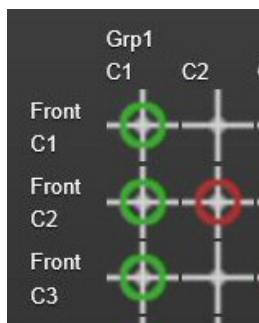
Switch all pre-selected crosspoints in one go.

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 screen grab 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 screen grab 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 screen grab 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


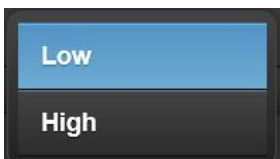
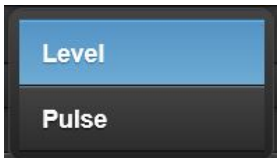
Mute embedder output and external AES and analogue outputs, enable embedder groups and select embedder encoding mode. The screen grab below shows a single DIOP4 piggyback fitted.

Mute & Group Enable

Embedder	Embedder Mutes	Mutes	Aes Output Mutes	Output Enable
	Embed Mute		Mute	<input checked="" type="checkbox"/> Group 1
Group1 C1	<input type="checkbox"/>	C1	<input type="checkbox"/>	<input type="checkbox"/> Group 2
Group1 C2	<input type="checkbox"/>	C2	<input type="checkbox"/>	<input type="checkbox"/> Group 3
Group1 C3	<input type="checkbox"/>	C3	<input checked="" type="checkbox"/>	<input type="checkbox"/> Group 4
Group1 C4	<input type="checkbox"/>	C4	<input type="checkbox"/>	Embedder Mode
Group2 C5	<input checked="" type="checkbox"/>	C5	<input type="checkbox"/>	Smpte
Group2 C6	<input checked="" type="checkbox"/>	C6	<input type="checkbox"/>	
Group2 C7	<input type="checkbox"/>	C7	<input type="checkbox"/>	
Group2 C8	<input type="checkbox"/>	C8	<input type="checkbox"/>	
Group3 C9	<input type="checkbox"/>			
Group3 C10	<input type="checkbox"/>			
Group3 C11	<input type="checkbox"/>			
Group3 C12	<input type="checkbox"/>			
Group4 C13	<input type="checkbox"/>			
Group4 C14	<input type="checkbox"/>			
Group4 C15	<input type="checkbox"/>			
Group4 C16	<input type="checkbox"/>			

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).

6.5 Presets, Resets & GPI/Os Menu

Presets		
<p>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.</p>		
<div> <div>Presets</div> <div> <div> <div>Presets</div> <div> <div>Store/Recall</div> <div> <div>Preset Select</div> <div>1</div> <div>Store</div> <div>Recall</div> </div> </div> <div> <div>GPI Preset Recall</div> <div> <div>GPI Enable</div> <div>GPI Level</div> <div>GPI Trigger</div> </div> <div> <div>Low</div> <div>Level</div> </div> </div> </div> </div> </div>		
Preset select		Store or recall TANDEM 310's configuration to one of 16 memory locations.
GPI Enable	Select to recall previously saved presets via the external GPI port. See 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.

– Resets

Board Reset

Fact Res Exc Preset

Fact Res Inc Preset

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.

– Silence Alarm Delay

Alarm Delay

10

Silence Alarm Delay

Silence 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. Screen grab 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.
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 (<i>only available when a 3G-AIP2 piggyback fitted</i>)	Set to assert alarm whenever an analogue audio channel pair is silent for the period set by the 'Silence Delay' control.

7 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector.
Weight	200g.
Power consumption	TANDEM 310 - 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.
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RM60	One video output with 110 ohm balanced audio on a high density D-Type and SC optical I/O.
RM61	Two video outputs with eight x 75 ohm unbalanced audio on BNCs 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.
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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.

8 Troubleshooting

Card edge monitoring

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



TANDEM 310 front edge view

See [Card edge controls](#) for explanation of card edge LEDs.

The card edge LEDs and 10-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 TANDEM 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 re-set the card

Re-setting 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.

9 Appendix 1

9.1 Statesman

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

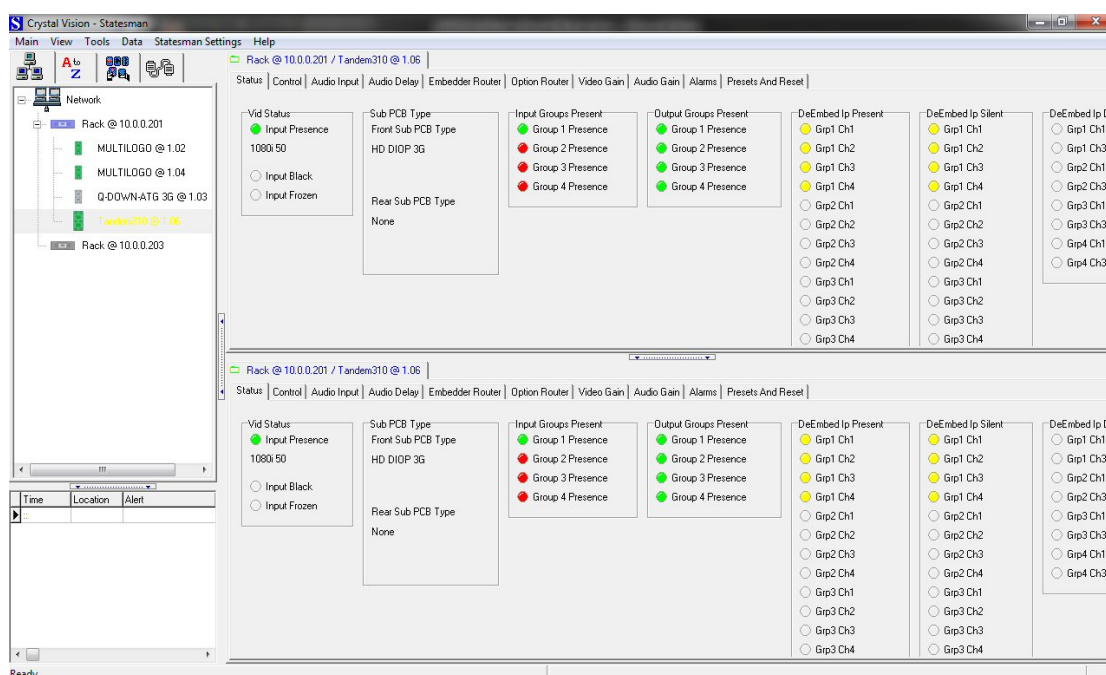
Introduction

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 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 screen grabs 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.*

9.2 Control Descriptions

The controls of TANDEM 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 TANDEM 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.)*

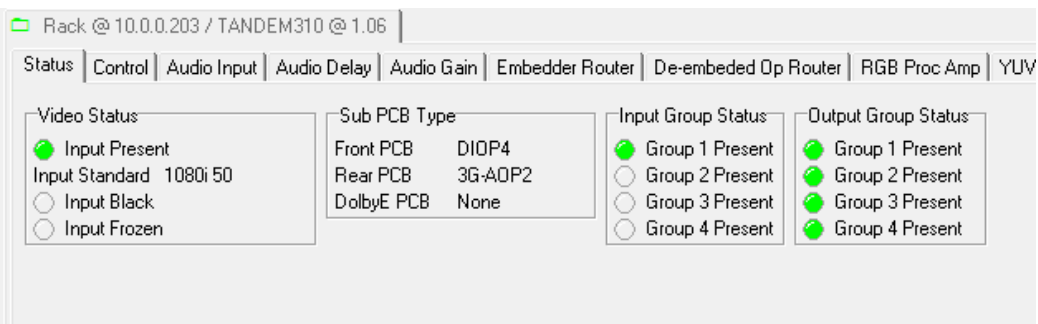
Each tab is shown with a screen grab and description of each control's function. The controls that are available vary with the option boards fitted and this is most noticeable with the routing routers as the number of audio inputs and outputs will vary according to the optional audio I/O piggybacks that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

The following screen grabs 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 TANDEM 310 is fitted with a single DIOP4 AES piggyback in the front position (see table on page ten for all valid piggyback combinations when using the DBE-D 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.

Sub PCB Type

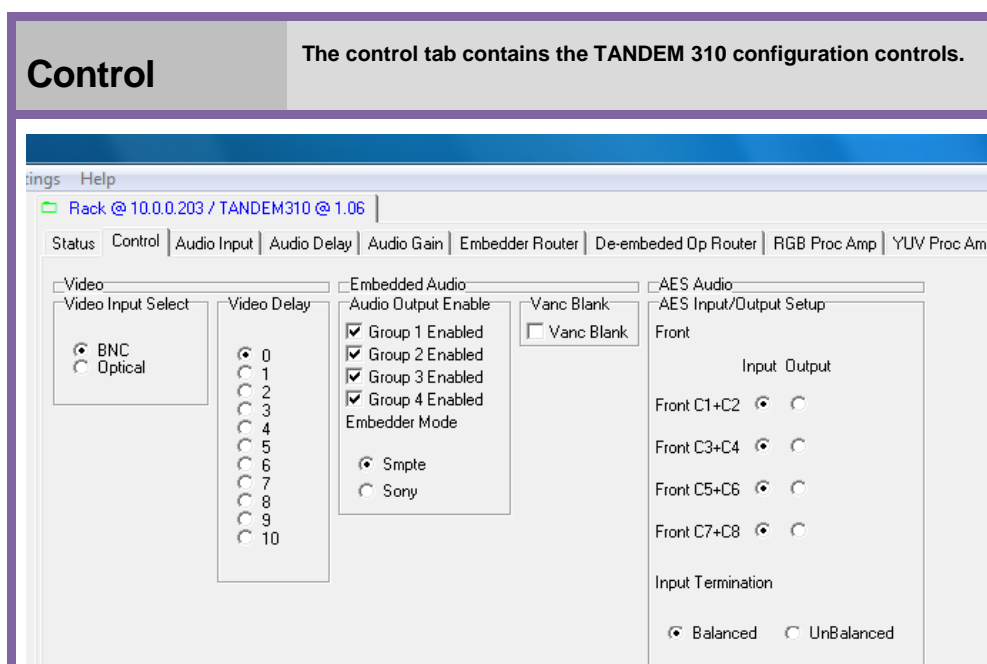
Front PCB	Type of option PCB fitted in front position.
Rear PCB	Type of option PCB fitted in rear position.
Dolby E PCB	Indicates if optional Dolby E decoder is fitted.

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.
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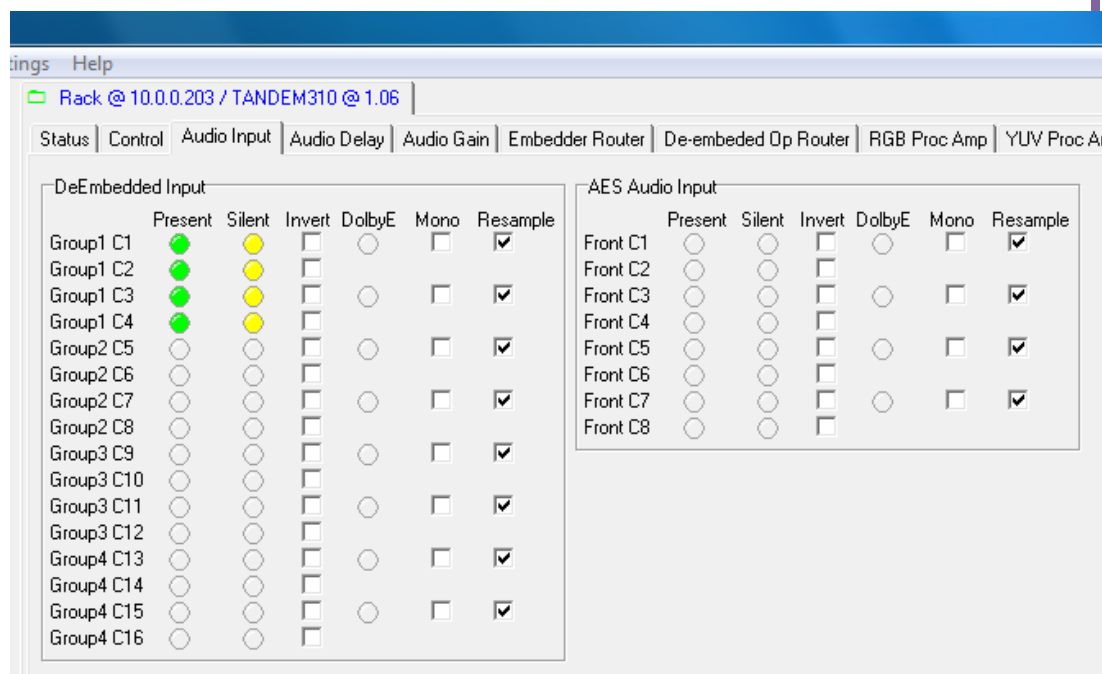
Video		
Video Input Select	BNC	Select to enable BNC as the input video source.
	Optical	Select to enable optical as the input video source. <i>N.B. the optional SPF module and correct rear module must be fitted.</i>
Video Delay	Select input video delay from 0 to 10 frames.	

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. <i>N.B. The router configuration does NOT reflect the I/O state of the DIOP4 piggyback. Note also that if a rear DIOP4 piggyback was fitted then the Control would refer to Rear C1+C2 etc.</i>
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

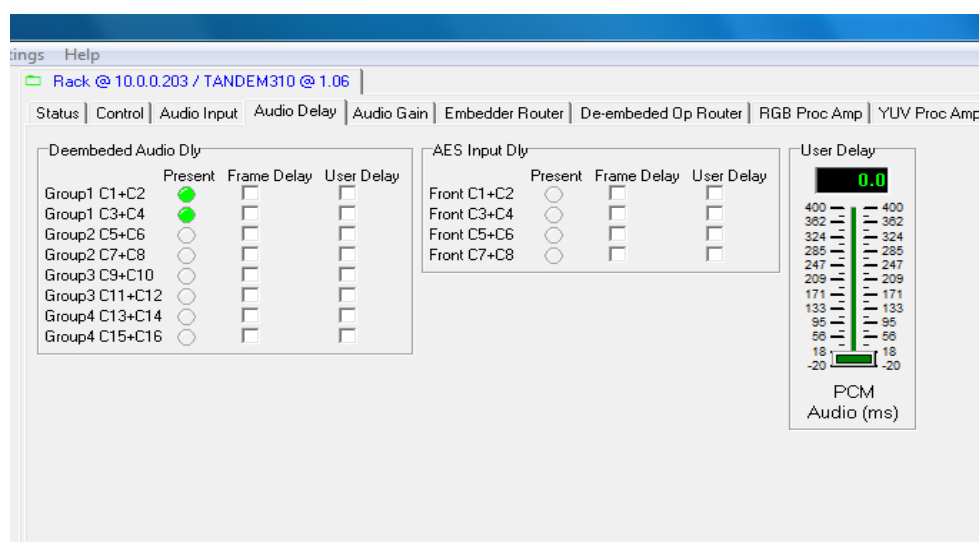
The audio status and control tab is where the non-routing audio controls are located. In this menu, green LEDs are used to indicate audio present on the 16 audio channels embedded in the incoming video. Further LEDs are used to indicate whether any of the 16 channels are silent or contain Dolby E. The 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 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. <i>N.B. only the 1st channel of the stereo pair is converted to mono, the 2nd channel is unchanged. The mono output is gain corrected to maintain unity gain.</i>		
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 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 10 frames. The selectable delays are: Frame delay giving a fixed 1-10 frame delay, User delay which selects the global -20 to 400ms delay. Note, a negative user delay is only possible when frame delay has been selected i.e. at least one frame -20/+400ms.

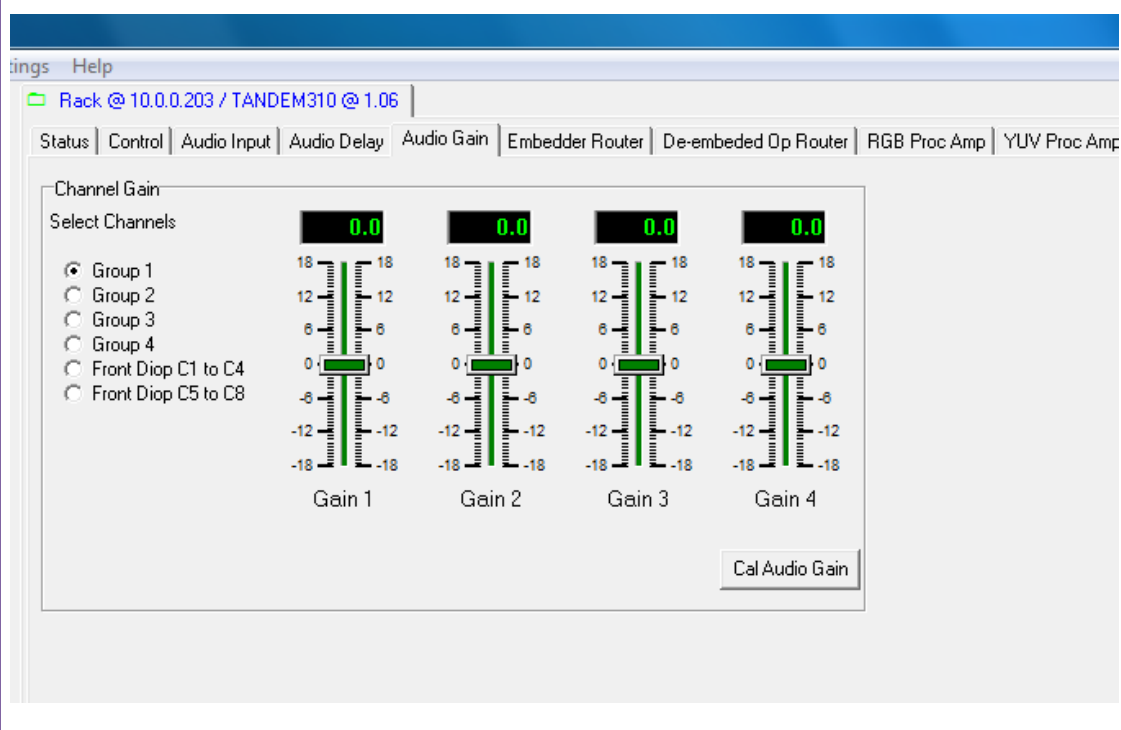


De-embedded Audio Delay		AES Input Dly
For each of the eight channel pairs de-embedded from the input video signal.		For all AES channel pairs from optional DIOP4 piggybacks configured as inputs.
Present	On if the audio channel pair is present.	
Frame Delay	Select to enable video frame delay for the channel pair at the output of the de-embedder. Delay is equal to video delay set in 'Control' tab Video Delay control.	
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 de-embedder. <i>N.B. Negative values of delay can only be set if 'Frame Delay' is also enabled for that channel.</i>	

Audio Delay	
PCM Audio (mS)	Use this control to set the variable delay value (-20 to +400mS) for all audio channel pairs programmed to use the 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 $\pm 18\text{dB}$ of gain relative to the input level up to the point where digital clipping will occur.



Channel Gain

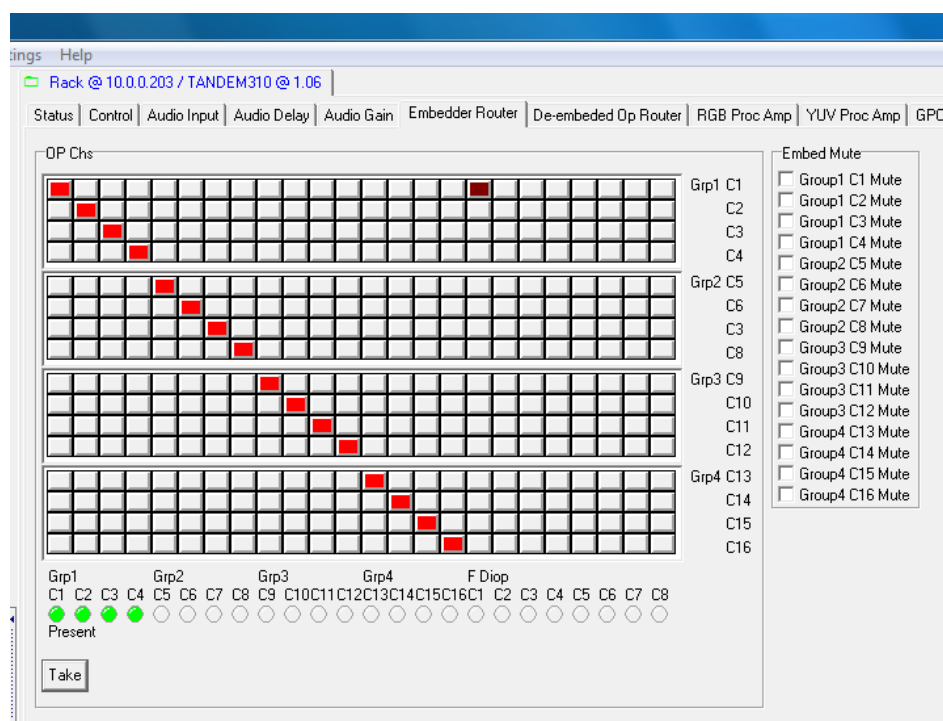
For each of the channels of the four audio groups de-embedded from the input video and all channels of the four audio groups from the optional input piggybacks.

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 $\pm 18\text{dB}$ 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 TANDEM 310 is this 32 input/16 output routing matrix. 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. <i>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.</i>
Take	Select this to action all presets. <i>N.B. Dark red preset selections will light red once taken.</i>
Present	On if audio signal is present. Shows all input audio signals, embedded and external.

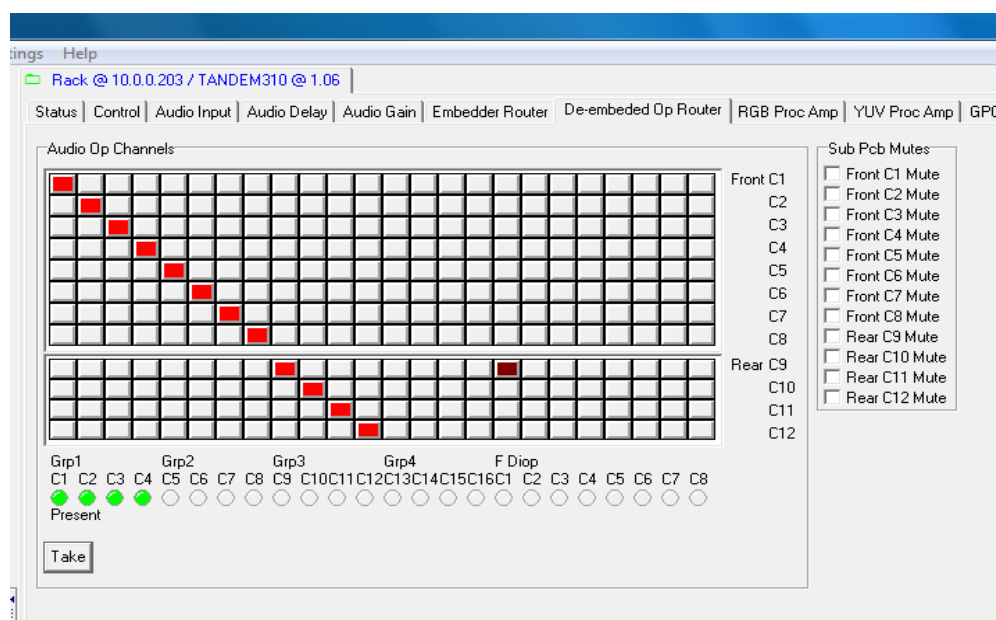
Embed Mute

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'. <i>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.</i>
Take	Select this to action all presets. <i>N.B. Dark red preset selections will light red once taken.</i>
Present	On if audio signal is present. Shows all input audio signals, embedded and external.

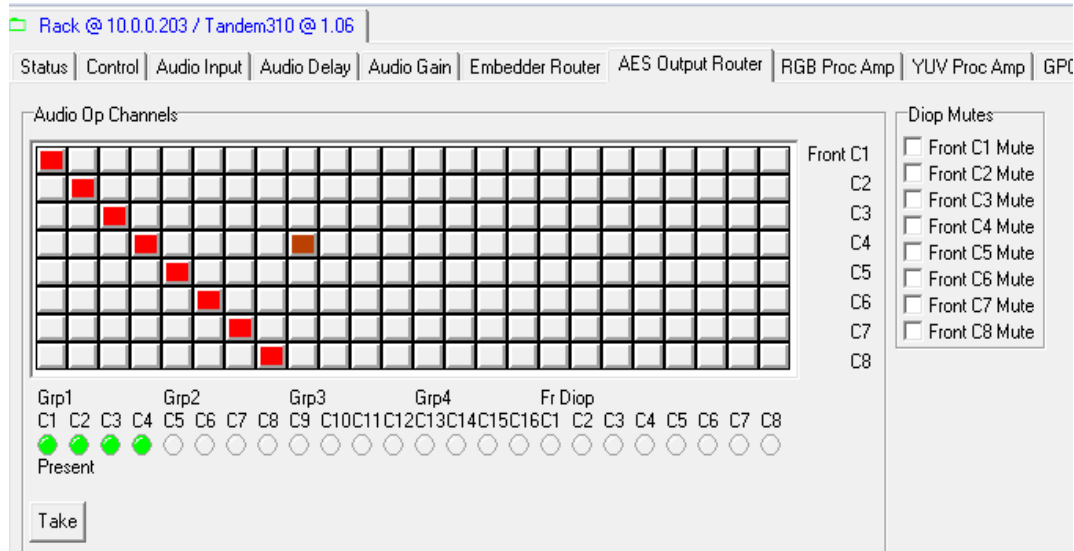
Sub PCB Mutes

For all fitted optional output boards...

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

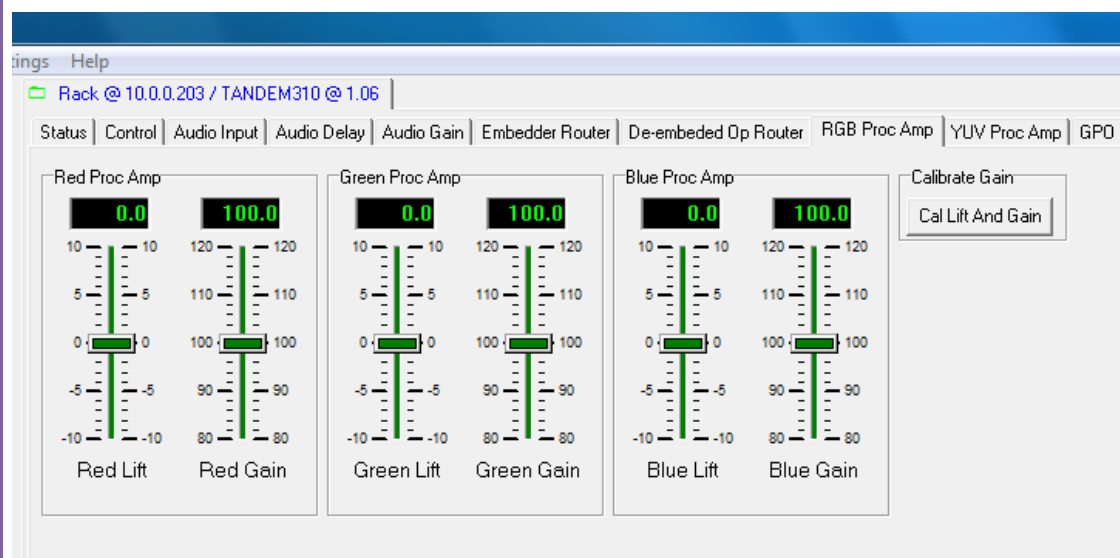
For all fitted optional DIOP4 output piggybacks.

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.



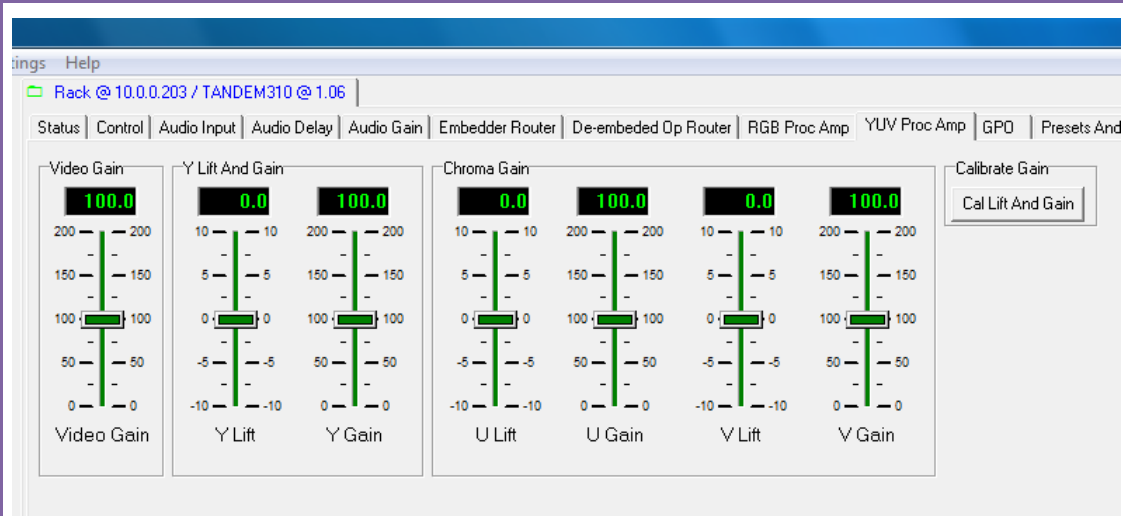
Red/Green/Blue Proc-Amps

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.
<i>N.B. The values set by these controls are not reflected by the YUV Proc-Amp tab.</i>	

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%.



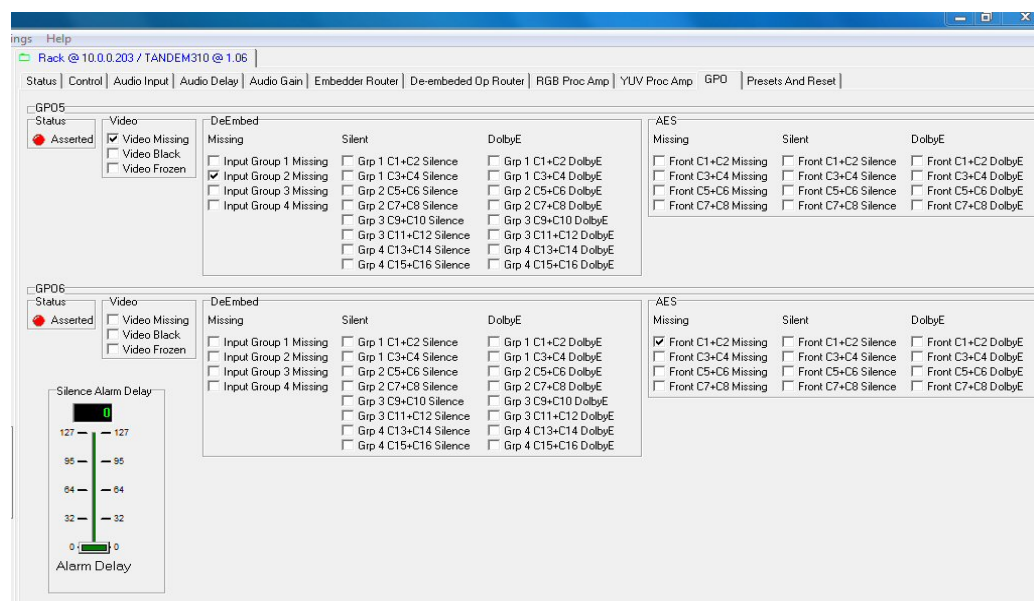
YUV Proc-Amp

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.
<i>N.B. The values set by these controls are not reflected by the RGB Proc-Amp tab.</i>	

GPO

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.



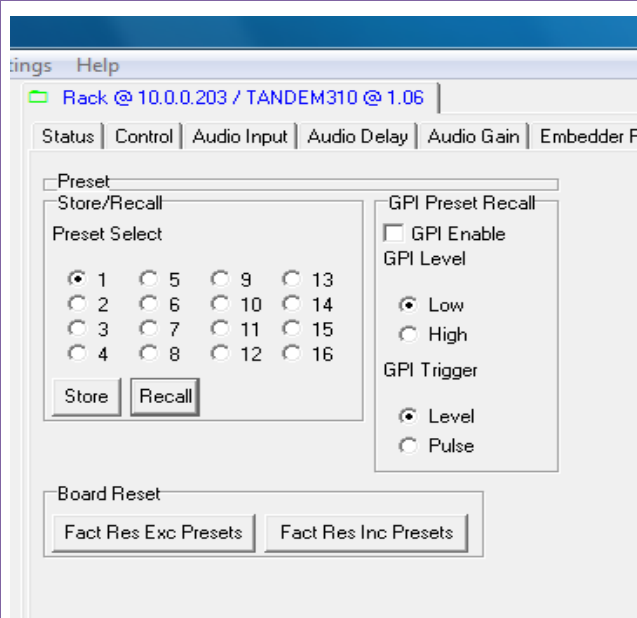
GPO5/GPO6

Set the various conditions that assert GPO5 and GPO6.

Status	On if GPO is asserted. <i>N.B. Visual indication of GPO5 and GPO6 status is provided on the board edge.</i>	
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 TANDEM 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.

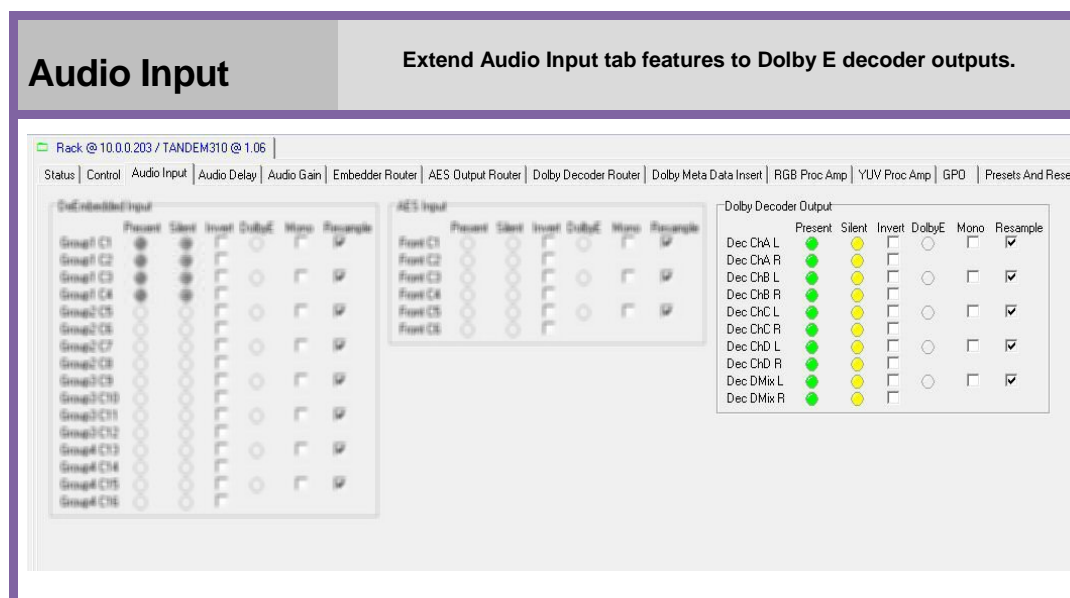
Board Reset

Reset TANDEM 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.

9.3 Dolby E decoder controls

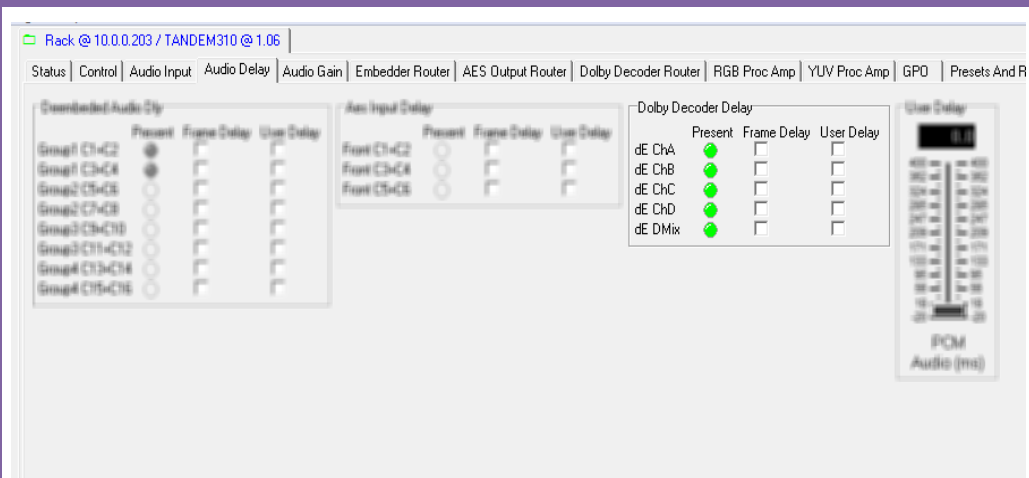
The optional Dolby E decoder board (DBE-D) decodes Dolby E signals embedded into the de-embedded input video signal or external AES inputs, and outputs five stereo pairs: A, B, C, D and DM (downmix). These outputs appear as inputs to the embedder and output routers. The following changes to controls 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.*



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. <i>N.B. only the 1st channel of the stereo pair is converted to mono, the 2nd channel is unchanged. The mono output is gain corrected to maintain unity gain.</i>
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. <i>N.B. Resampling cannot be done prior to Dolby E decoding, only afterwards.</i>

Audio Delay

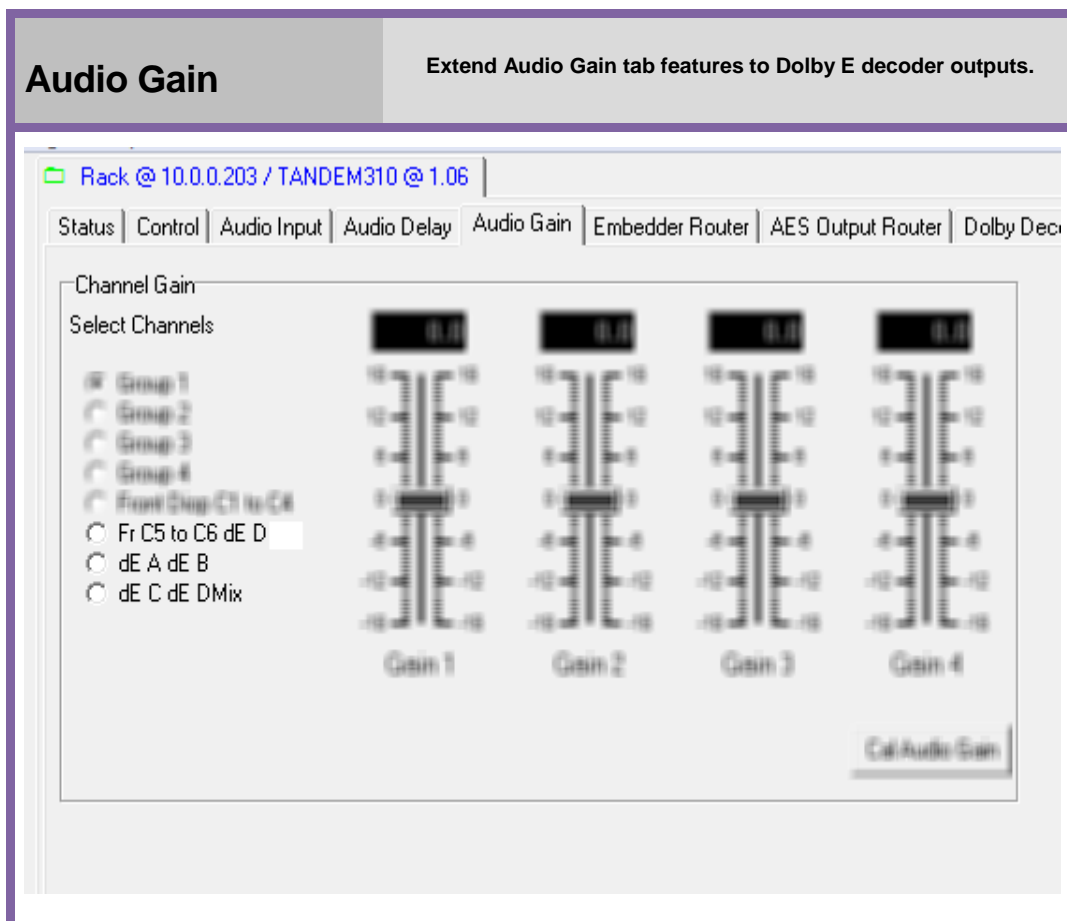
Extend Audio Delay tab features to Dolby E decoder outputs.



Dolby Decoder Delay

For the five channel pairs output from the Dolby E decoder board.

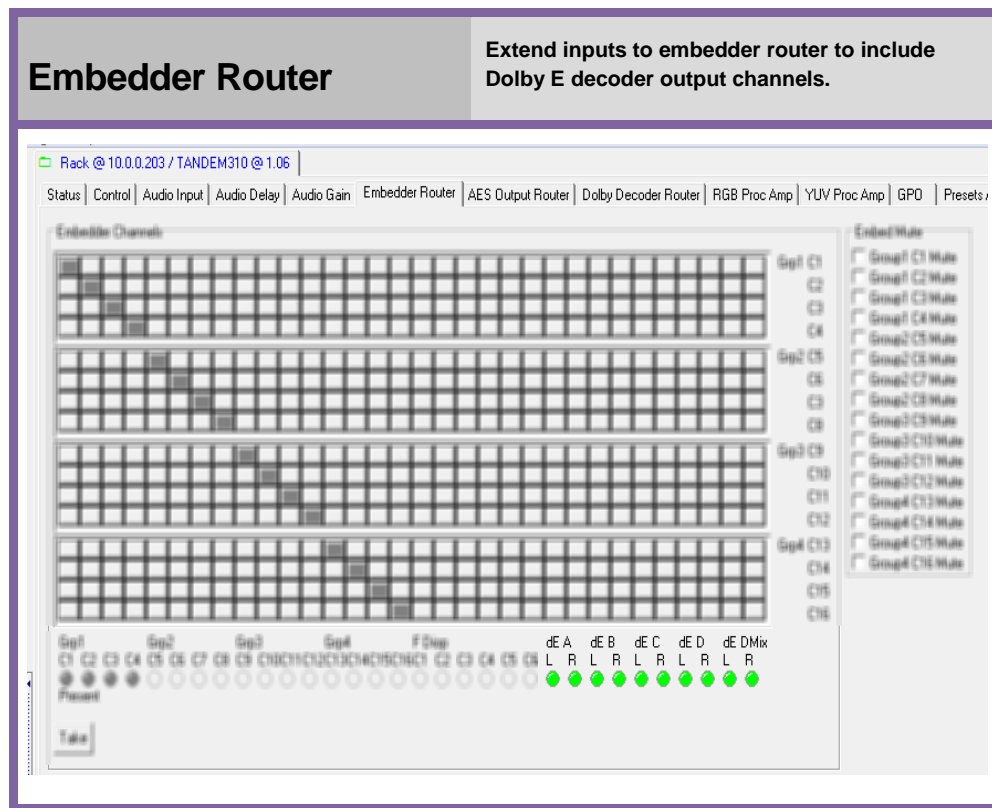
Present	On if the Dolby E decoded channel pair is present.
Frame Delay	Select to enable a video frame delay for the channel pair at the output of the decoder.
User Delay	Select to enable the variable delay (-20 to +400mS from 'User Delay' control) for the selected channel pair at the output of the decoder.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



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.*



OP Chs

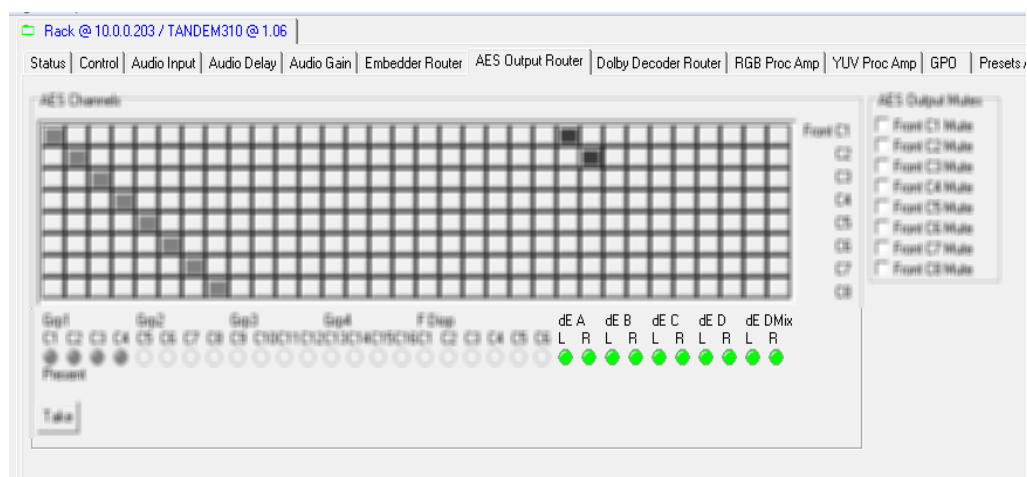
Additionally select outputs from the Dolby E decoder to be embedded.

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

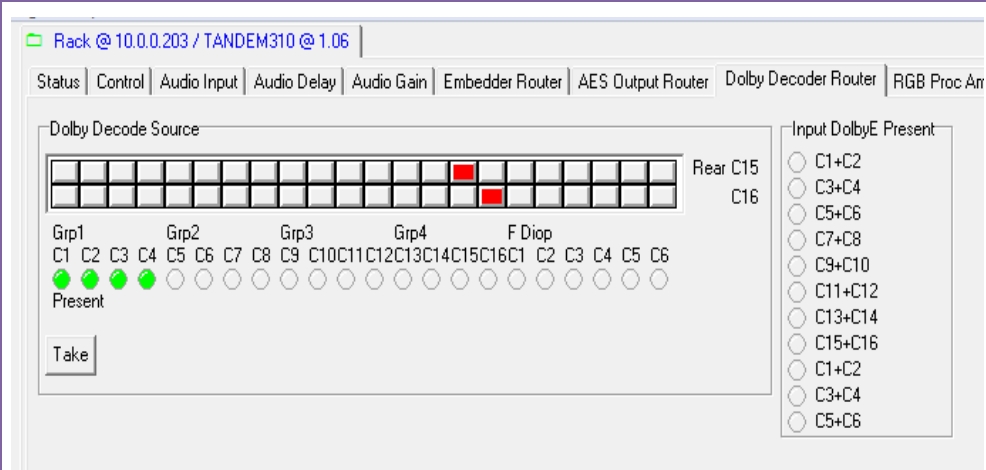
Route the 16 channels embedded in the input video, six optional input AES channels and ten Dolby E decoder channels to the eight optional AES outputs.

Present

On if audio signal present. Shows ten additional outputs from Dolby E decoder board (DBE-D) 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 (DBE-D).



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 (DBE-D).

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'. <i>N.B. GUI example with a single DIOP4 board fitted shows de-embedded Grp 4 C15 and 16 routed to the decoder's inputs.</i>
Present	On if audio signal present. Shows all available routable sources.
Take	Activate the pre-selection.

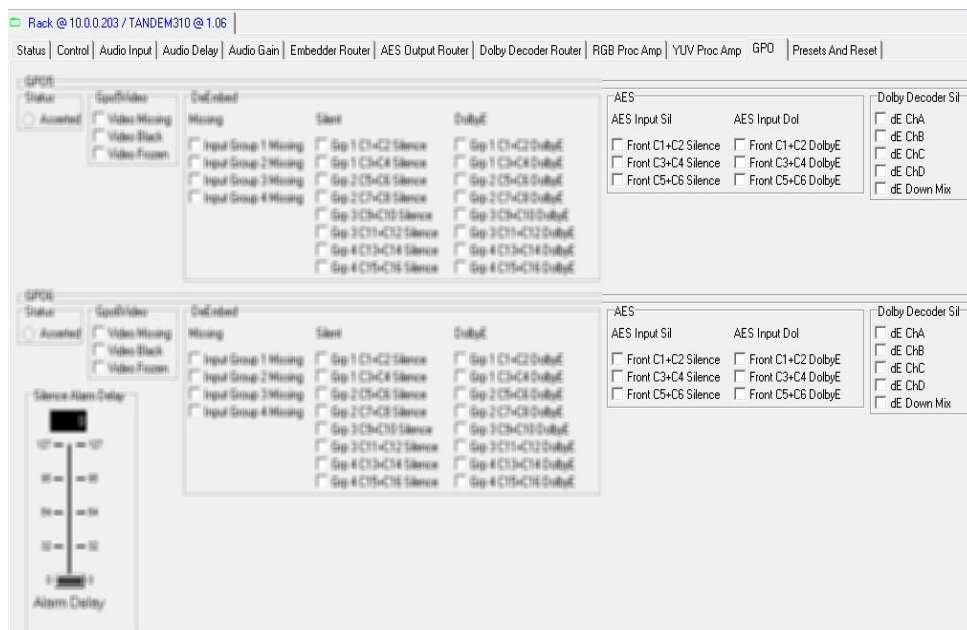
Input Dolby E Present

For all available sources.

De-embedded channels C1-C16	
Digital inputs C1-C6	On if stereo pair has Dolby E encoding.

GPO

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 and GPO6.

Set the various conditions that assert GPO5 and 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.