



digital keying modular
interface audio
converters analogue video

TANDEM 3G

3Gb/s, HD and SD embedder/de-embedder
and audio processor

USER MANUAL



Contents

1	Introduction	3
2	Hardware installation	5
2.1	Module configuration	5
2.2	Rear modules and signal I/O	6
	Rear module connections with RM47	6
	Rear module connections with RM49	8
	Rear module connections with RM60	8
	Rear module connections with RM61	10
2.3	General Purpose Interface (GPI)	10
3	Card edge operation	15
3.1	Card edge controls	15
3.2	Card edge buttons	15
3.3	Card edge rotary control	15
3.4	Reading card edge LEDs	16
3.5	Navigating card edge menus	16
3.6	Card edge configuration	17
	Menu tree	17
	Status menus	19
	Video controls	20
	Audio Control menu	22
	AES setup	27
	Presets menu	27
	GPI Alarms menu	29

4	Using the front control panel	31
4.1	Module selected	31
	Updating the display	32
4.2	The TANDEM 3G active panel menu	33
	Active control panel menus	34
	The Status menu	35
	Video control menu	37
	Audio controls	38
	AES setup	43
	Preset controls	44
	GPO Alarms menu	45
5	Statesman	47
5.1	Statesman introduction	47
5.2	Statesman operation	47
	Status	48
	Control	48
	Audio input	49
	Audio delay	51
	Routing	51
	Gain controls	52
	Audio gains	53
	Presets and factory reset	54
	Alarms	55
6	Trouble shooting	57
	Card edge monitoring	57
	Basic fault finding guide	58
7	Specification	59

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Revision 4.	Embedder pattern and AV delay control added.	05-04-12

1 Introduction

TANDEM 3G is the ideal product for all High Definition embedding and de-embedding applications – whether you need a straightforward embedder/de-embedder or whether you're seeking a feature-packed product with four group handling, audio and video processing and sophisticated routing.

Flexibility is one of the main features of TANDEM 3G, with its ability to be configured in many different ways. It can be used as an embedder for one to four groups of AES audio. Alternatively it can be used as a de-embedder for one to four groups of digital audio. Should you need it, TANDEM 3G can even embed and de-embed at the same time. There are 8 AES I/O ports that can be configured as inputs or outputs.

The ability to work with SD as well as all common HD formats brings further flexibility to this versatile board.

Full channel shuffling is provided by a 32 x 16 mono router which will allow you to rearrange the audio tracks between the four groups. With audio replace you can overwrite some of the original audio channels from the HD or SD feed. An optional audio delay of up to 80ms will compensate for any video processing, with each audio channel routed either directly or via the delay.

The audio level can be increased or decreased to match the rest of your system: each mono audio channel offers individual gain control, adjustable between +18dB and -18dB in 0.1dB steps. Audio channels can be muted, while stereo to mono conversion helps those broadcasting a multi-language service. TANDEM 3G can be used for applications with a requirement simply to change the gain or shuffle the audio channels.

One of the great things about TANDEM 3G is its extensive Dolby E handling. It can embed and de-embed Dolby E, mix AES and Dolby E in a single group and overwrite the Dolby E of a single group. Forward error correction ensures audio quality is maintained.

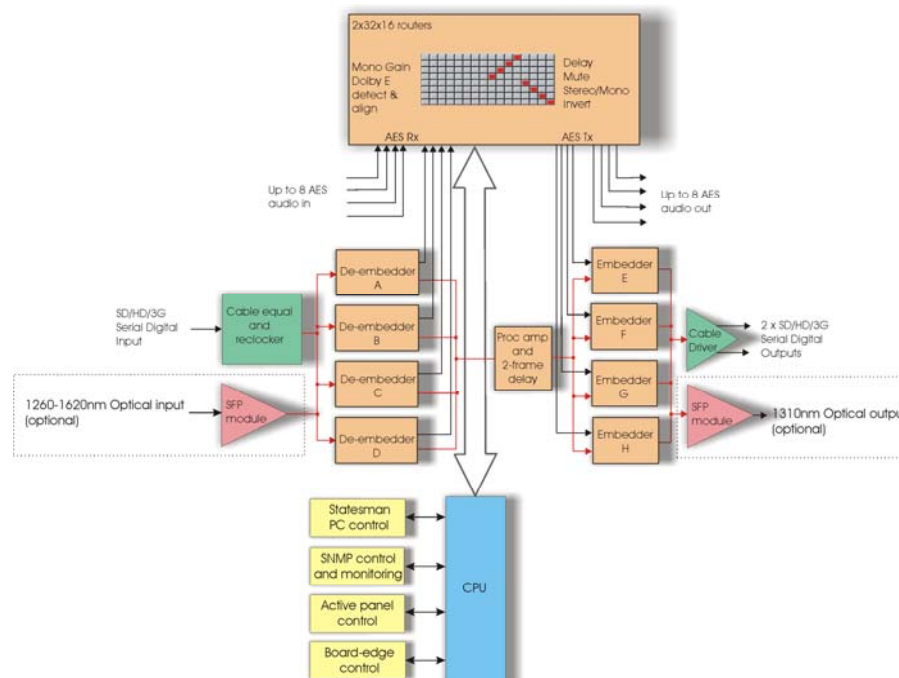
The TANDEM 3G includes the additional function of a switchable two frame video delay - useful for matching Dolby E audio delays.

Ideal for any environment that uses High Definition with embedded audio, TANDEM 3G is extremely straightforward to operate. It uses the intuitive Crystal Vision board edge interface which, using two select buttons, a shaft encoder and a display, allows you to instinctively and quickly locate any option from menus structured in the most logical way possible. Control can additionally be from an active front panel on the frame, a remote panel, the Statesman PC software or remotely via SNMP.

TANDEM 3G fits in the standard frames (available in 4U, 2U, 1U and desk top box) and can be used with two frame rear modules to access all the inputs and outputs - select the RM47 if you're using 110Ohm AES and the RM49 if you're using 75Ohm AES.

With the addition of the FIP optical input or FOP optical output, cable length will no longer be an issue when sending and receiving signals from beyond the local signal bay. The RM60 and RM61 are the rear modules for fibre connectivity.

TANDEM 3G is a space-saving 100mm x 266mm module which fits in the standard Crystal Vision frames.



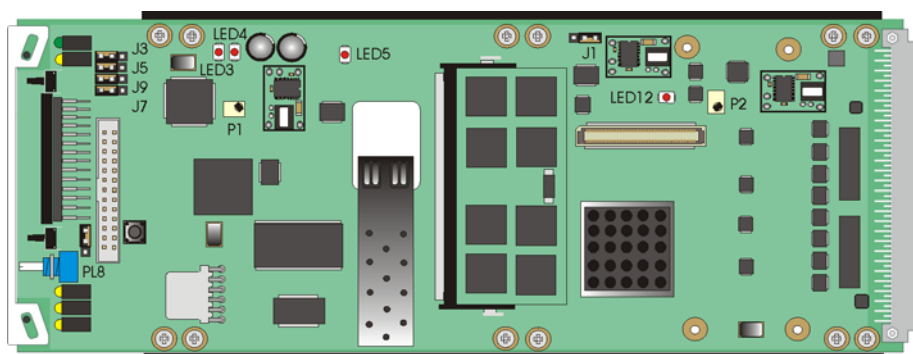
The main features are as follows:

- Use with any source - works with 3G/s, HD and SD
- Versatile audio: will de-embed and embed up to four audio groups and input or output up to 8 external AES stereo pairs which can be fully shuffled with the powerful 32 x 32 audio router
- Optimise the audio - each channel has individual gain control and stereo to mono conversion
- Ideal for Dolby E users - allows embedding and de-embedding of Dolby E
- Optimise the video - video proc-amp allows adjustment of video gain, black level and independent YUV gains
- Flexible control - select from board edge, front and remote panels, SNMP, GPIs and PC software
- Optical connectivity - send signal beyond the local equipment bay with the fibre input and output options

2 Hardware installation

2.1 Module configuration

There are six user settable links on the TANDEM 3G. These are – J1, J3, J5, J7, J9 and PL8. PL8 sets the TANDEM 3G IP address to default (10.0.0.201) or to a user-selected IP address. J1, J3, J5, J7 and J9 have no user application.



TANDEM 3G top side

The surface-mounted LEDs on the top side of the PCB are not visible from the front of the frame and are included for diagnostic purposes only.

Note: The two potentiometers have been factory set and should not require further adjustments.

Engineering link and LEDs

PL8 sets the TANDEM 3G IP address to default (10.0.0.201) or to a user-selected IP address. The LEDs LED3, LED4, LED5 and LED12 are included for diagnostic purposes and are not visible from the front of the frame.

Link	Towards front of board or Up	Towards the rear of board or Down
J1		JTAG bypassed (factory set, do not alter)
J3, 5, 7 & 9	GPI Preset control (factory set, do not alter)	
PL8	Default IP address 10.0.0.201	Custom set IP address
LED3	Link	
LED4	Data	
LED5	Configured	
LED12	Clock locked	

Potentiometers

These potentiometers have been factory set and should not require further adjustment.

Potentiometer	Function
P1	3.3V rail adjustment
P2	Clock free-running frequency


2.2 Rear modules and signal I/O

The 4U Indigo 4 frame will house up to 24 single height modules with up to four power supplies. The 2U Indigo 2 frame will house up to 12 single height modules and dual power supplies. The 1U Indigo 1 frame 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.

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 channels of audio AES stereo pairs are presented as balance 110 ohm on the 26-way high density D-Type connector.

RM47 rear module connector	Description
	RM47 <ul style="list-style-type: none"> • 24 TANDEM 3G modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • 2 per Indigo DT • All frame slots can be used

BNC connections


BNC	I/O assignment
SDI OUT(B)	3G/High Definition/Standard Definition serial digital output
SDI OUT(A)	3G/High Definition/Standard Definition serial digital output
SYNC/NC	No user connection
SDI IN	3G/High Definition/Standard Definition serial digital input

110 ohm 26-way D-Type Audio connections

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

Rear module connections with RM49


The RM49 is a dual height module presenting the eight channels of un-balanced audio AES stereo pairs on 75 ohm BNC connectors.

RM49 rear module connector	Description
	RM49 <ul style="list-style-type: none"> 12 TANDEM 3G modules per Indigo 4 frame Six per Indigo 2 frame Three per Indigo 1 frame One per Indigo DT Alternate frame slots can be used

BNC	I/O assignment
AES1 I/O	AES1 stereo pair 75 ohm input/output
SDI OUT(B)	3G/High Definition/Standard Definition serial digital output
SDI OUT(A)	3G/High Definition/Standard Definition serial digital output
AES5 I/O	AES5 stereo pair 75 ohm input/output
SYNC IN/NC	No user connection
SDI IN	3G/High Definition/Standard Definition serial digital input
AES2 I/O	AES2 stereo pair 75 ohm input/output
AES3 I/O	AES3 stereo pair 75 ohm input/output
AES6 I/O	AES6 stereo pair 75 ohm input/output
AES7 I/O	AES7 stereo pair 75 ohm input/output
AES8 I/O	AES8 stereo pair 75 ohm input/output

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 channels of audio AES stereo pairs are presented as balance 110 ohm on the 26-way high density D-Type connector.

RM60 rear module connector	Description
	RM60 <ul style="list-style-type: none"> 24 TANDEM 3G modules per Indigo 4 frame 12 per Indigo 2 frame Six per Indigo 1 frame 2 per Indigo DT All frame slots can be used

BNC connections


BNC	I/O assignment
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted.
SDI OUT	3G/High Definition/Standard Definition serial digital output
SDI IN	3G/High Definition/Standard Definition serial digital input

110 ohm 26-way D-Type Audio connections

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

Rear module connections with RM61

The RM61 is a dual height module presenting the eight channels of un-balanced audio AES stereo pairs on 75 ohm BNC connectors.

RM61 rear module connector	Description
	RM61 <ul style="list-style-type: none"> 12 TANDEM 3G modules per Indigo 4 frame Six per Indigo 2 frame Three per Indigo 1 frame One per Indigo DT Alternate frame slots can be used

BNC	I/O assignment
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted.
SDI OUT	3G/High Definition/Standard Definition serial digital output
AES1 I/O	AES1 stereo pair 75 ohm input/output
AES5 I/O	AES5 stereo pair 75 ohm input/output
SYNC IN/NC	No user connection
SDI IN	3G/High Definition/Standard Definition serial digital input
AES2 I/O	AES2 stereo pair 75 ohm input/output
AES3 I/O	AES3 stereo pair 75 ohm input/output
AES6 I/O	AES6 stereo pair 75 ohm input/output
AES7 I/O	AES7 stereo pair 75 ohm input/output
AES8 I/O	AES8 stereo pair 75 ohm input/output

2.3 General Purpose Interface (GPI)

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.

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'			
6	'f'	Alarms (See alarm table)	Alarm condition	No alarm

As supplied, each 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.

Each General Purpose Input (GPI) is fitted with a 6800Ω resistor connected to the internal +5V.

The 16 user preset configurations can be recalled using binary notation.

GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1	GPI Preset	Bit 8	Bit 4	Bit 2	Bit 1
1	0	0	0	0	9	1	0	0	0
2	0	0	0	1	10	1	0	0	1
3	0	0	1	0	11	1	0	1	0
4	0	0	1	1	12	1	0	1	1
5	0	1	0	0	13	1	1	0	0
6	0	1	0	1	14	1	1	0	1
7	0	1	1	0	15	1	1	1	0
8	0	1	1	1	16	1	1	1	1

GPI out 6 (f) can be configured to be asserted for a selection of error conditions. The following table lists the conditions to be selected from.

Reportable error conditions	
Video Missing	Silence AES 7
Input group 1 Missing	Silence AES 8
Input group 2 Missing	Dolby E on Input Group 1 Channel 1&2
Input group 3 Missing	Dolby E on Input Group 1 Channel 3&4
Input group 4 Missing	Dolby E on Input Group 2 Channel 1&2
Silence on Group 1 Channel 1&2	Dolby E on Input Group 2 Channel 3&4
Silence on Group 1 Channel 3&4	Dolby E on Input Group 3 Channel 1&2
Silence on Group 2 Channel 1&2	Dolby E on Input Group 3 Channel 3&4
Silence on Group 2 Channel 3&4	Dolby E on Input Group 4 Channel 1&2
Silence on Group 3 Channel 1&2	Dolby E on Input Group 4 Channel 3&4
Silence on Group 3 Channel 3&4	Dolby E on AES 1
Silence on Group 4 Channel 1&2	Dolby E on AES 2
Silence on Group 4 Channel 3&4	Dolby E on AES 3
Silence AES 1	Dolby E on AES 4
Silence AES 2	Dolby E on AES 5
Silence AES 3	Dolby E on AES 6
Silence AES 4	Dolby E on AES 7
Silence AES 5	Dolby E on AES 8
Silence AES 6	

4U frame GPI connections

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

Table shows pin number (remote number)

Note: Remote 1, Remote 3, Remote 5 and Remote 7 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, Remote 4, Remote 6 and Remote 8 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 and Remote 6.

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. Remotes 5-8 are similarly protected.

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.

3 Card edge operation

3.1 Card edge controls



TANDEM 3G board edge

3.2 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

3.3 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 /ADJUST	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.

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

3.4 Reading card edge LEDs

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

Refer also to the trouble-shooting 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	Yellow		
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
nCal	Yellow	Video Gain controls not at cal points	Video Gain control at cal points
GPO6	Yellow	GPO6 active / low	GPO6 inactive / high

3.5 Navigating card edge menus

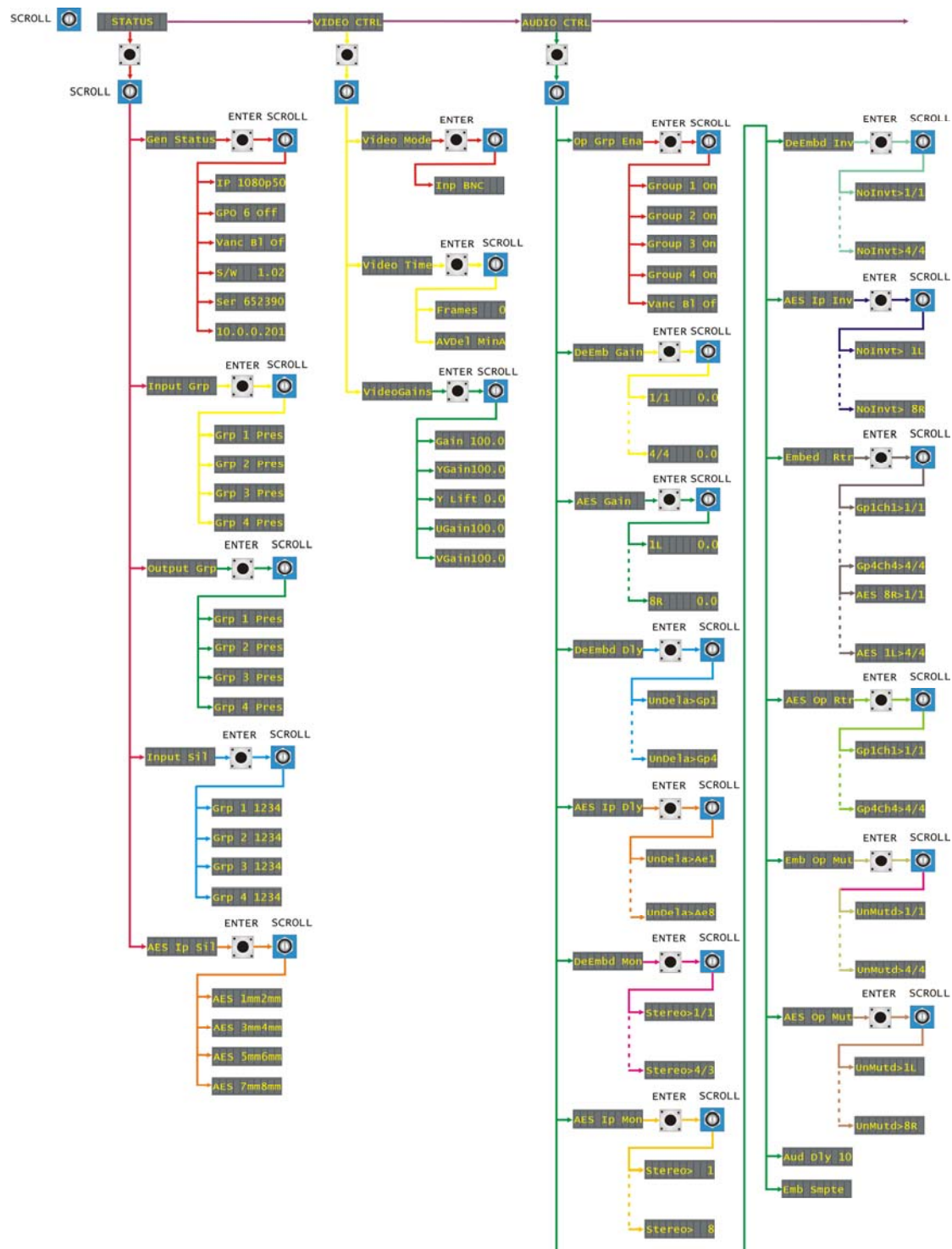
To access the card edge menu system proceed as follows:

- 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 brightness flashes slowly to indicate that a change has been made and requires confirmation
- When required push ENTER to action the change. The display will cease flashing
- Use the up-arrow [^] and SCROLL/ADJ control to navigate to further menus

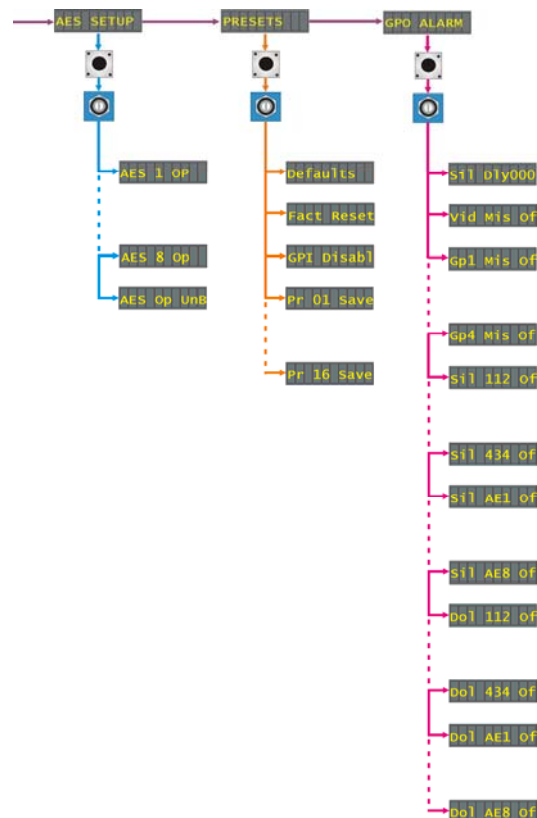
Note: The displayed menu brightness will flash slowly if confirmation of a change is required.

3.6 Card edge configuration

Menu tree



TANDEM 3G Board edge menu structure



TANDEM 3G Board edge menu structure

Tip: To reach the top menu push the [^] button repeatedly until a top menu is reached. Rotate the SCROLL/ADJ control anti-clockwise until the STATUS menu appears.

Status menus

From the STATUS top menu press ENTER then SCROLL/ADJ to access the five status sub menu options. These options are; General Status, Input Groups present, Output Groups present, Embedded Input channel silence and AES input silence. To enter a sub menu once selected press ENTER and use the SCROLL/ADJ/ADJ control to traverse the sub menu.







	Menu	Comment
STATUS		
Gen Status	General Status	Press ENTER and rotate SCROLL/ADJ.
IP 1080p50	Input present	The Input video standard is shown. <i>Ip 1080p50/59/60, Ip 1080p50/59/60, Ip720p50/59/60, Ip 525, Ip 625, IP Missing, IP Not Sup.</i>
GPO 6 off	GPO 6 status	GPO 6 Status. <i>On, Off.</i>
Vanc Bl of	VANC blanking	Vertical ancillary data blanking. <i>On, Off.</i>
S/w 1.02	Board software	The version number of the currently installed software.
Ser 652390	Serial number	The electronically stored PCB serial number.
10.0.0.201	IP address	Tandem 3G IP address. Note, the Ethernet connection is available on-board and is only used when updating the board software
Input Grp	Input Groups	Press ENTER and rotate SCROLL/ADJ.
Grp 1 Pres	Audio Group 1	Input Video Embedded Audio Group 1 status <i>Group 1 Present, Group 1 Missing.</i>
Grp 2 Pres	Audio Group 2	Input Video Embedded Audio Group 2 status <i>Group 2 Present, Group 2 Missing.</i>
Grp 3 Pres	Audio Group 3	Input Video Embedded Audio Group 3 status <i>Group 3 Present, Group 3 Missing.</i>
Grp 4 Pres	Audio Group 4	Input Video Embedded Audio Group 4 status <i>Group 4 Present, Group 4 Missing.</i>
Output Grp	Output Groups	Press ENTER and rotate SCROLL/ADJ.
Grp 1 Pres	Audio Group 1	Output Video Embedded Audio Group 1 status <i>Group 1 Present, Group 1 Missing.</i>
Grp 2 Pres	Audio Group 2	Output Video Embedded Audio Group 2 status <i>Group 1 Present, Group 2 Missing.</i>
Grp 3 Pres	Audio Group 3	Output Video Embedded Audio Group 3 status <i>Group 1 Present, Group 3 Missing.</i>
Grp 4 Pres	Audio Group 4	Output Video Embedded Audio Group 4 status <i>Group 1 Present, Group 4 Missing.</i>

Input Sil	Input Silence	Press ENTER and rotate SCROLL/ADJ.
Grp 1 1234	Audio Group 1	Input Video Embedded Audio Group 1 channel status <i>1234, s=silent, m=missing, dd=dolby E.</i>
Grp 2 1234	Audio Group 2	Input Video Embedded Audio Group 2 channel status <i>1234, s=silent, m=missing, dd=dolby E.</i>
Grp 3 1234	Audio Group 3	Input Video Embedded Audio Group 3 channel status <i>1234, s=silent, m=missing, dd=dolby E.</i>
Grp 4 1234	Audio Group 4	Input Video Embedded Audio Group 4 channel status <i>1234, s=silent, m=missing, dd=dolby E.</i>
AES Ip Sil	AES Input Silence	Press ENTER and rotate SCROLL/ADJ/Adj
AES 1LR2LR	AES input Ch12	AES input status channels 1 & 2 <i>L=left, R=right, dd=dolby E, s=silent, mm=missing.</i>
AES 3LR4LR	AES input Ch34	AES input status channels 3 & 4 <i>L=left, R=right, dd=dolby E, s=silent, mm=missing.</i>
AES 5dd6ss	AES input Ch56	AES input status channels 5 & 6 <i>L=left, R=right, dd=dolby E, s=silent, mm=missing.</i>
AES 7mm8mm	AES input Ch78	AES input status channels 7 & 8 <i>L=left, R=right, dd=dolby E, s=silent, mm=missing.</i>

Video controls

From the STATUS top menu rotate SCROLL/ADJ to select the Video control menu. Press ENTER and then rotate SCROLL/ADJ to access the two video control menu options. These options are; video timing, video gain and optical input selection. To enter a sub menu once selected press ENTER and use the SCROLL/ADJ control to traverse the sub menu.

VIDEO CTRL	Menu	Comment
Video Mode	Video mode	Press ENTER and rotate SCROLL/ADJ.
Inp BNC	Input select	Rotate the SCROLL/ADJ. control to show the frame delay control. Press ENTER and rotate SCROLL/ADJ. to select. <i>BNC, Optical.</i>
Video Time	Video timing	Press ENTER and rotate SCROLL/ADJ.
Frames 0	Video delay	Rotate the SCROLL/ADJ. control to show the frame delay control. Press ENTER and rotate SCROLL/ADJ. to vary. <i>0,1,2.</i>
AVDel MinA	Audio & Video delay	Rotate the SCROLL/ADJ. control to show the AV delay control. Press ENTER and rotate SCROLL/ADJ. to vary. <i>Both Minimum, Both minimum Audio Delay, Both 1 frame delay.</i>

	VideoGains	Video Gains	Press ENTER and rotate SCROLL/ADJ
	Gain 100.0	Overall Gain	Rotate the SCROLL/ADJ. control to show the overall gain control. Press ENTER and rotate SCROLL/ADJ. to vary. 0.0% – +200.0% .
	YGain100.0	Y Gain	Rotate the SCROLL/ADJ. control to show the Y component gain control. Press ENTER and rotate SCROLL/ADJ. to vary. 0.0% – +200.0% .
	Y Lift 0.0	Y Lift	Rotate the SCROLL/ADJ. control to show the L component lift control. Press ENTER and rotate SCROLL/ADJ. to vary. -10.0% – 10.0% .
	UGain100.0	U Gain	Rotate the SCROLL/ADJ. control to show the U component gain control. Press ENTER and rotate SCROLL/ADJ. to vary. 0.0% – +200.0% .
	VGain100.0	V Gain	Rotate the SCROLL/ADJ. control to show the V component gain control. Press ENTER and rotate SCROLL/ADJ. to vary. 0.0% – +200.0% .

Input mode

The TANDEM 3G has the option of either receiving an optical input or transmitting an optical output once the necessary SPF optical module has been fitted. If the optical receiver module is fitted the fibre optic I/O input select will allow the video input to be selected between the input BNC and the optical input.

With the optical output fitted the number of outputs will be reduced from two to one.

Video timing controls

The video delay is a straight forward fixed video delay that can be adjusted in whole-frame steps. Additionally the minimum delay through the board can be set.

The selections are;

Audio to be 3 milliseconds and Video 4 lines.
Both to be equivalent to the minimum audio delay of 3 milliseconds.
Both audio delay and video delay exactly 1 frame.

Any user selected delays will be in addition to these settings.

Video gains

The 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%

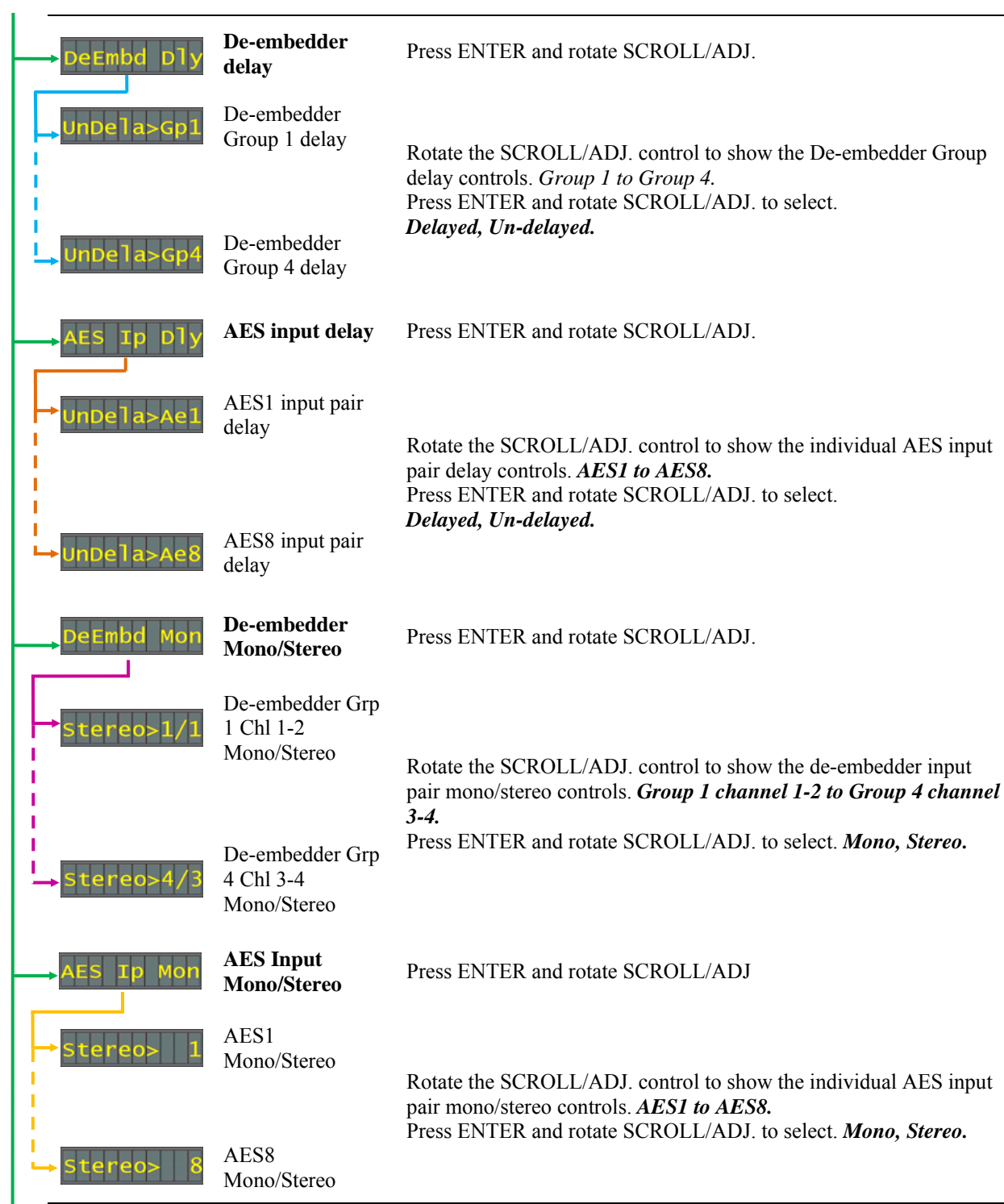
Note: It is possible to set the gain control so that their combined indicated gain will exceed 200%. In these circumstances the indicated values will not be valid.

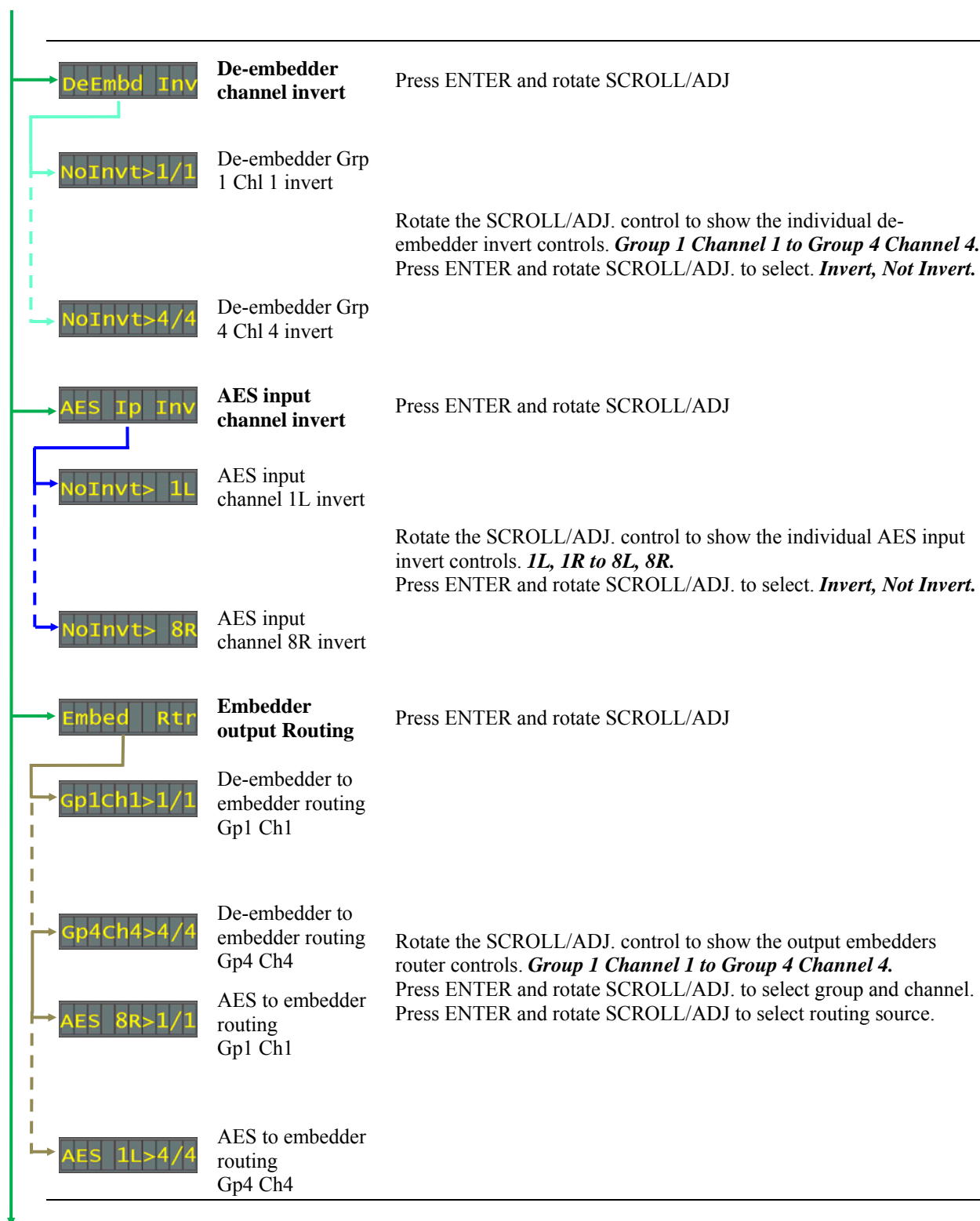
Audio Control menu

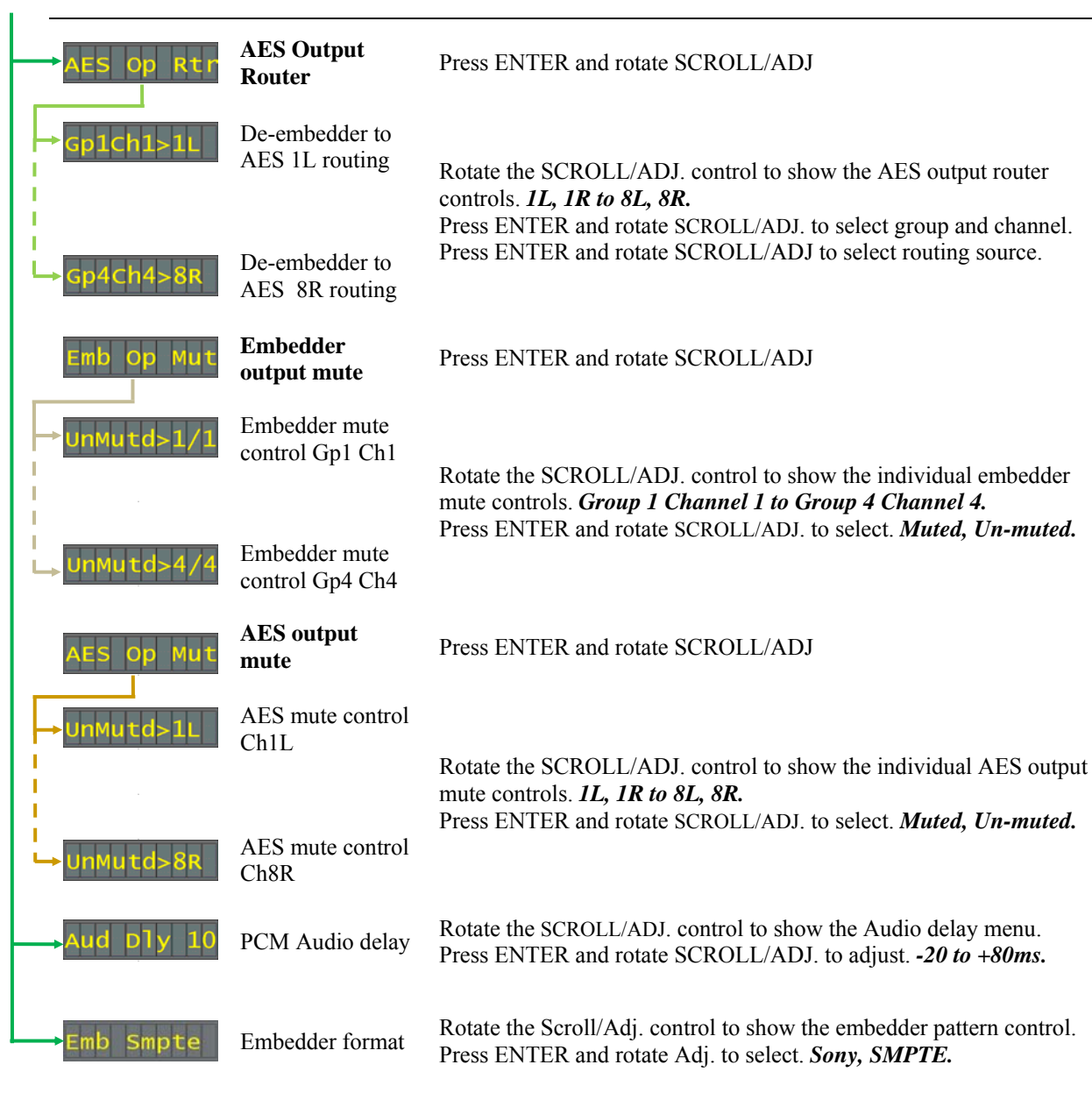
From the STATUS top menu rotate SCROLL/ADJ to select the Audio control menu. Press ENTER and then rotate SCROLL/ADJ to access the audio control menu options. To enter a sub menu once selected press ENTER and use the SCROLL/ADJ control to traverse the sub menu.

The audio control menu contains all of the De-embedder, Embedder and routing controls.

AUDIO CTRL	Menu	Comment
Op Grp Ena	Output Group Enable	Press ENTER and rotate SCROLL/ADJ
Group 1 On	Output Group 1 enable	Rotate the SCROLL/ADJ. control to show the Group 1 control. Press ENTER and rotate SCROLL/ADJ. to select. <i>On, Off.</i>
Group 2 On	Output Group 2 enable	Rotate the SCROLL/ADJ. control to show the Group 2 control. Press ENTER and rotate SCROLL/ADJ. to select. <i>On, Off.</i>
Group 3 On	Output Group 3 enable	Rotate the SCROLL/ADJ. control to show the Group 3 control. Press ENTER and rotate SCROLL/ADJ. to select. <i>On, Off.</i>
Group 4 On	Output Group 4 enable	Rotate the SCROLL/ADJ. control to show the Group 4 control. Press ENTER and rotate SCROLL/ADJ. to select. <i>On, Off.</i>
vanc Bl of	Vertical Blanking on output enable	Rotate the SCROLL/ADJ. control to show the Vertical Blanking control. Press ENTER and rotate SCROLL/ADJ. to select. <i>On, Off.</i>
DeEmb Gain	De-embedder gains	Press ENTER and rotate SCROLL/ADJ.
1/1 0.0	De-embedder group 1 channel 1 gain	Rotate the SCROLL/ADJ. control to show the individual De-embedder channel gain controls. Group 1 channel 1 to Group 4 channel 4. Press ENTER and rotate SCROLL/ADJ. to vary. <i>-18.0 – +18.0dB.</i>
4/4 0.0	De-embedder group 4 channel 4 gain	
AES Gain	AES Input gains	Press ENTER and rotate SCROLL/ADJ.
1L 0.0	AES input channel 1L gain	Rotate the SCROLL/ADJ. control to show the individual AES input channel gain controls. 1L, 1R to 8L, 8R. Press ENTER and rotate SCROLL/ADJ. to vary. <i>-18.0 – +18.0dB.</i>
8R 0.0	AES input channel 8R gain	







Audio controls

Output Group Enable

The four output embedders can be individually enabled or disabled, this allows for any other data already present on the input video to be retained for down-stream use. If required the ancillary data can also be removed by enabling the VANC blanking.

Audio Gains

In total there are 32 audio gain controls, one for each of the 16 channels of de-embedded audio and 16 channels of AES 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.

Audio delay

These controls can be used to delay the audio with respect to the video by up to 80ms and compensate for any small delay between the incoming video and audio signals. This audio delay can be applied individually to each of the de-embedded groups and individual AES stereo pairs by selecting them to be delayed or not delayed. The delay is applied at the output of the router and is a single global control set in the audio delay menu.

Stereo to Mono conversion

For the purposes of this discussion it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair, etc.

The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed, a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of selection will cause that channel to output the mono sum of itself and its associated channel. The associated channel output will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

Example: Selecting channel 1 for mono conversion will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly deselecting channel 1 and selecting channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Note: When transporting Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Invert and mute

Each of the 32 audio input channels can be individually inverted or muted by selecting mute and invert in the de-embedder invert, AES invert, de-embedder mute and AES mute menus.

Note: When routing Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Routing matrix

At the heart of TANDEM 3G is the twin 32 input/16 output routing matrix. This will allow any of the up to 32 possible inputs, 16 embedded channels and up to eight stereo AES audio inputs to be routed to any of the 16 outputs for embedding or up to eight stereo AES outputs. The AES channels can be configured as either inputs or outputs from the AES SETUP menu giving a total of eight stereo channels of mixed I/O.

Note: All routing matrix changes are live so care should be taken when re-routing as all changes in routing will appear on the output of the routing matrix instantaneously.

Embedder pattern

The embedders can be set to give either the Sony pattern or the SMPTE pattern.

AES setup

From the STATUS top menu rotate SCROLL/ADJ to select the AES Setup menu. Press ENTER and then rotate SCROLL/ADJ to access the AES Setup menu options. This menu is where the AES I/O is individually configured to be either inputs or outputs.

AES SETUP	Menu	Comment
AES 1 OP	AES1 Configuration	Rotate the SCROLL/ADJ. control to show the individual AES I/O controls. AES1 to AES8. Press ENTER and rotate SCROLL/ADJ. to select. Terminated, Hi Z, Output.
AES 8 Op	AES8 Configuration	
AES Op UnB	AES format	Rotate the SCROLL/ADJ. control to show the AES I/O format control. Press ENTER and rotate SCROLL/ADJ. to select. Balanced, Unbalanced.

Note: The AES format control acts globally on all AES inputs and outputs.

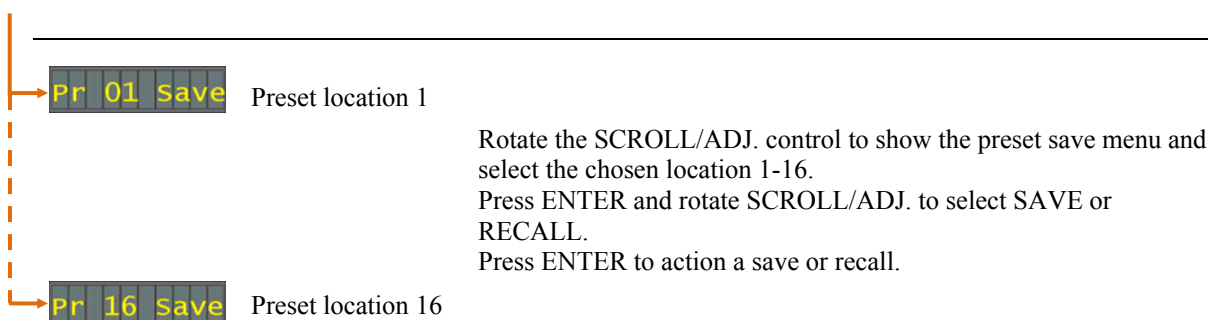
AES format

TANDEM 3G has eight AES I/Os all of which can be configured independently to be either an input or an output. It is also possible to select globally the format to be either balanced or unbalanced giving 110R differential and 75R single sided when termination is applied. Hi Z will have an impedance of approximately 1k.

Presets menu

From the STATUS top menu rotate SCROLL/ADJ to select the Presets menu. Press ENTER and then rotate SCROLL/ADJ to access the presets menu options. To enter a sub menu once selected press ENTER and use the SCROLL/ADJ control to traverse the sub menu.

PRESETS	Menu	Comment
Defaults	Factory defaults	Rotate the SCROLL/ADJ. control to show the defaults menu. Press ENTER to action.
Fact Reset	Factory reset	Rotate the SCROLL/ADJ. control to show the factory reset menu. Press ENTER to action.
GPI Disabl	Enable GPI control of presets	Selecting ENABLE allows the recall of previously saved user configurations via GPI inputs 1-4. Enable, Disable



Preset menu and factory reset

Up to 16 user-defined configurations may be stored and recalled either from the board control, active front panel, 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.

Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use.

To save the current settings, select the preset location and press ENTER. Select the save option and press ENTER to write the current settings into this location.

Note: If the selected location contains previously saved setting information it will be overwritten by the new setting data.

To recall previously stored setting information, again choose the selected location and select recall, pressing ENTER will recall the stored configuration.

The recalling of previously stored presets can also be implemented externally via the GPI port. To use this facility, enable GPI control of presets.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user-stored configuration presets. Selecting the Defaults option will perform the same reset to factory defaults values but will leave any user-stored configurations unaffected.

Note: Factory reset will erase all user-stored presets

Parameter	Default value
De-embedded Input Audio	Delay, Mono, Invert all un-ticked
AES Input Audio	Delay, Mono, Invert all un-ticked
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Video delay	0
Audio and Video delay	Both have minimum video delay
AES Setup	Balanced inputs
Audio delay	3ms
Video input select	BNC
Embedder output routing	Group 1 to group 1.....Group 4 to group 4
AES output routing	None (AES set to inputs)
Video gains	100%
Video lift	0%
De-embedder gains	0dB
AES input gains	0dB
Embedder pattern	SMTPE
Preset selection	Preset 1
GPI control of Presets	Disabled
GPO6 Alarms	Un-selected
Silence delay	0 seconds

GPI Alarms menu

The GPO6 output is reserved for alarm indication and may have assigned any of the 37 video and audio alarms.

Any number of alarms may be assigned to the GPI output; video missing and input groups 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. This ability is especially useful to prevent false alarming during quiet periods in the audio.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause.

Visual indication of GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.

GPO ALARM	Menu	Comment
Sil Dly000	Silence delay	Rotate the SCROLL/ADJ. control to show the silence delay control. Press ENTER and rotate SCROLL/ADJ. to vary. 0-128 seconds.
Vid Mis Of	Input video present	Rotate the SCROLL/ADJ. control to show the video missing alarm. Press ENTER and rotate SCROLL/ADJ. to select. On, Off.
Gp1 Mis Of	Input audio group 1 missing	Rotate the SCROLL/ADJ. control to show the input audio groups missing alarms. Group 1, Group 2, Group 3, Group 4. Press ENTER and rotate SCROLL/ADJ. to select. On, Off.
Gp4 Mis Of	Input audio group 4 missing	
Sil 112 Of	De-embedder Grp1 Ch1-2 silent	
Sil 434 Of	De-embedder Grp4 Ch3-4 silent	
Sil AE1 Of	AES1 input silent	Rotate the SCROLL/ADJ. control to show the de-embedder channel silent alarms. Group 1 channel 1-2 to Group 4 channel 3-4. Press ENTER and rotate SCROLL/ADJ. to select. On, Off.
Sil AE8 Of	AES8 input silent	Rotate the SCROLL/ADJ. control to show the AES channel silent alarms. AES1 to AES8. Press ENTER and rotate SCROLL/ADJ. to select. On, Off.
Do1 112 Of	Dolby E on de-embedder Gp1 Ch1-2 silent	
Do1 434 Of	Dolby E on de-embedder Gp4 Ch3-4 silent	
Do1 AE1 Of	Dolby E on AES1 input silent	
Do1 AE8 Of	Dolby E on AES8 input silent	Rotate the SCROLL/ADJ. control to show the Dolby E on the input group silent alarms. Group 1 channel 1-2 to Group 4 channel 3-4. Press ENTER and rotate SCROLL/ADJ. to select. On, Off.
Do1 AE1 Of	Dolby E on AES1 input silent	
Do1 AE8 Of	Dolby E on AES8 input silent	
Do1 AE8 Of	Dolby E on AES8 input silent	

Note: With the silence delay control set to its minimum there will remain a small delay to prevent false triggering.

4 Using the front control panel

4.1 Module selected

This operational guide assumes that the panel has been set up according to the panel setup procedure described in the Crystal Vision Control Panel manual.

Note: It is **ESSENTIAL** that the panel set up procedure is followed and any old or unknown passwords cleared prior to using the panel for the first time.

At power up all eight control panel keys LEDs will illuminate briefly. Once the panel has completed its power up and configuration sequence the panel will enter Statesman mode and the message 'Press Cal to Exit' will be displayed.



Statesman mode is entered by default

To continue with control panel operation or configuration, press the CAL key once. A second press of the CAL key will return to Statesman control.

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.

Navigating the display

The functions assigned to control panel keys are:

- **DEVICE** – enters Device menu to select a card or show cards available/enters panel set up when held down during power up/shows frame status when pressed from Statesman mode
- **CAL** – enters or leaves Statesman mode/enters Panel Diagnostics mode when held down during power up/updates the display
- **Asterisk** – enters board rename menu from the Device menu (early RS422 panels only)
- **F1 to F4** – soft keys, function assigned within each menu
- **HOME** – moves the display to the Home menu
- **ENTER** – accept current selection

- Upward arrow – used to move up the menu structure/enter lock panel menu from the Device menu
- Rotary control – shaft encoder used to select options or variable data

Note: Please refer to the Crystal Vision Control Panel manual for details of the Panel Setup, Lock Panel and Diagnostic menus.

Selecting a TANDEM 3G

To select a particular card in a frame, press the DEVICE key to go to the Device menu.

Note: There may be a delay whilst the frame is interrogated during which time the 'No cards Found' could be displayed.

The top line of the display will show 'Available Cards X', where X is the number of cards that have responded so far to the polling request.

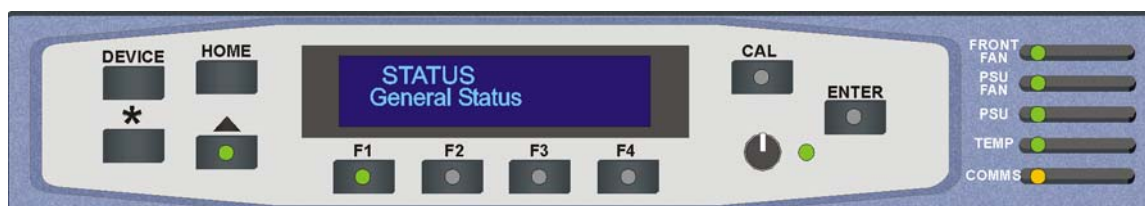


The available cards menu

Rotate the shaft encoder and the bottom row will display the successfully polled cards by name and location or slot number.

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 message shows that a TANDEM 3G has been selected.



The TANDEM 3G home menu

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.

4.2 The TANDEM 3G active panel menu

At any time the main top-level menu (Home) is obtained by pressing the HOME key. From the Home menu further selections can be made. Active function keys are indicated by illuminated, integrated LEDs.

Rotating the SCROLL control will traverse the horizontal menus which can then be entered by pressing a function key. Once within a menu or sub menu the SCROLL control will take the user back down the menu.

Menu keys are illuminated when active and when further menus are available.

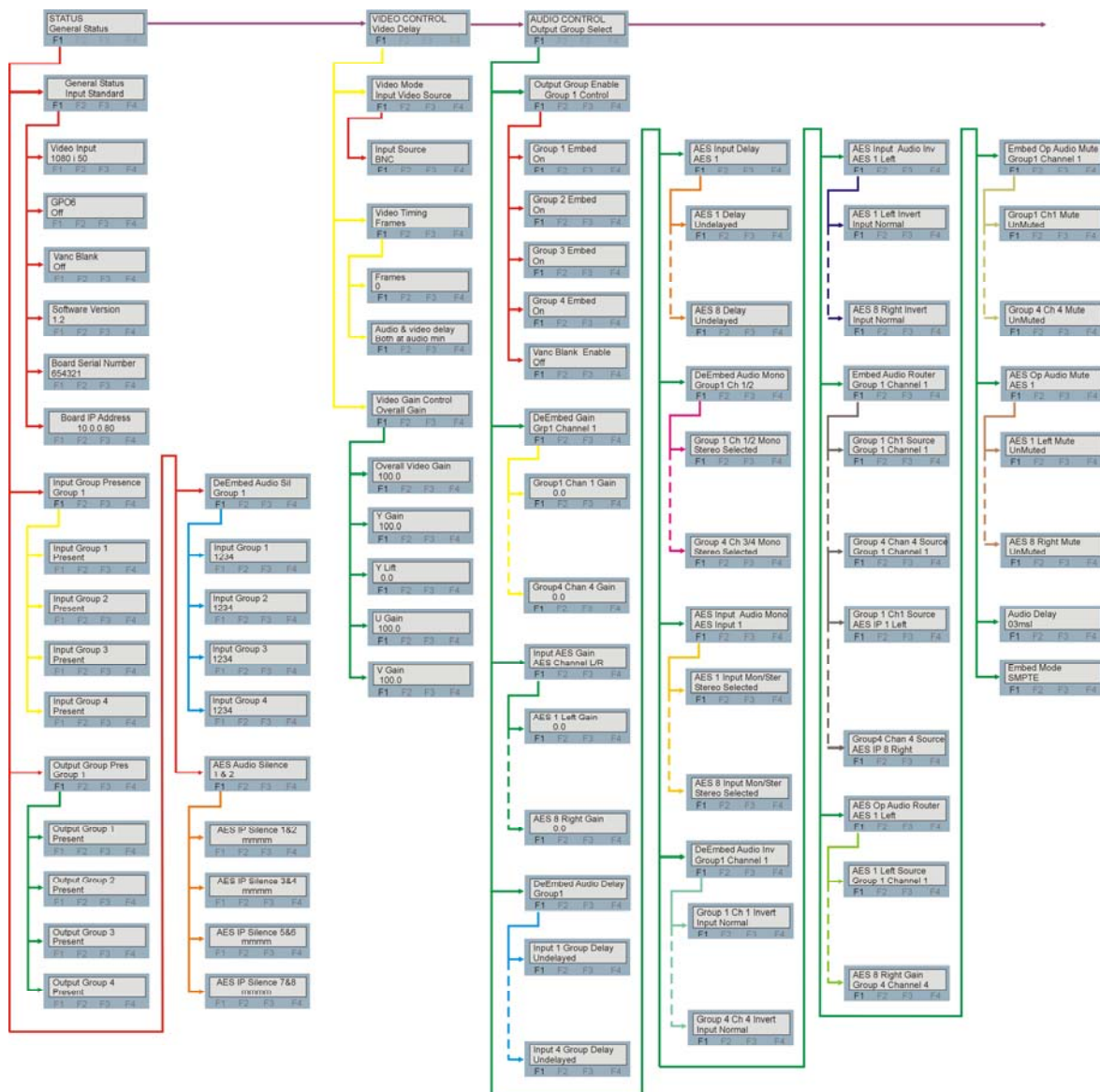
The top-level menus are:

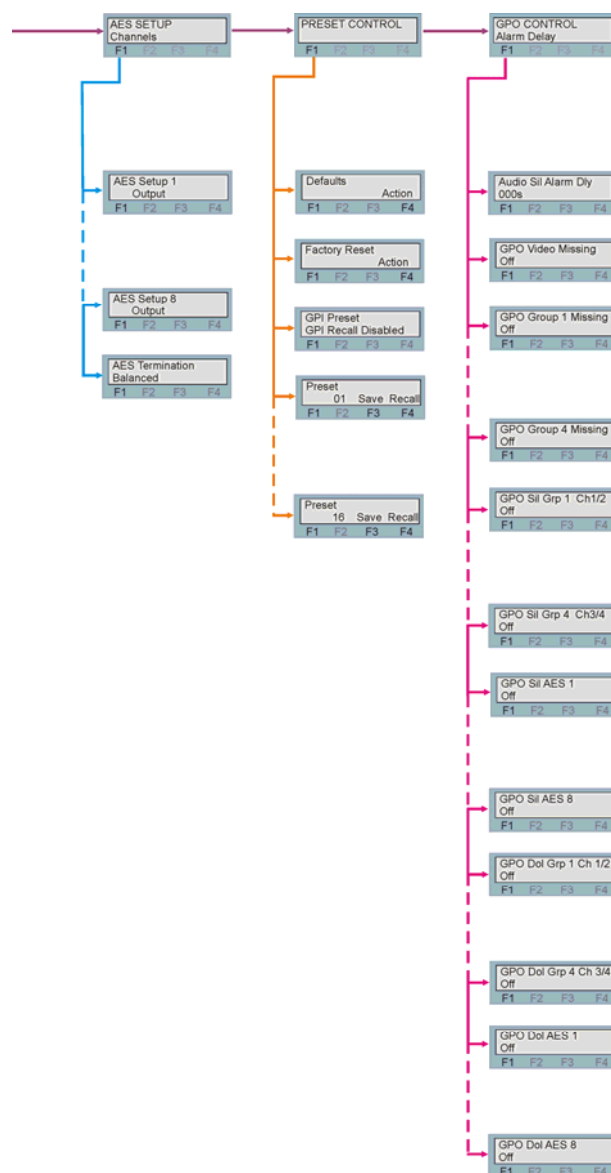
- Status
 - General Status
 - Input Group Presence
 - Output Group Presence
 - De Embedder Audio Silence
 - AES Audio Silence
- Video Control
 - Video Timing
 - Video Gain Controls
- Audio Control
 - Output Group enable
 - De-embedder Gain
 - Input AES Gain
 - De-embedder Audio delay
 - AES input delay
 - De-embedder audio Mono/Stereo
 - AES input audio Mono/Stereo
 - De-embedder audio invert
 - AES input audio invert
 - Embedder audio router
 - AES output audio router
 - Embedded audio output mute
 - AES output audio mute
 - Audio delay

- AES Setup
- Preset Control
- GPO Control

When a sub menu has been selected, further options may be obtained by using the Shaft control to SCROLL/ADJ through them. Once the desired option has been located a selection or value change can be made by either toggling the appropriate function key or by selecting and using the shaft control to alter a numerical value. A configuration change or value will be activated as the shaft control is rotated or function button is toggled. The following chart shows the available TANDEM 3G menus. The actual menus available may vary slightly as software is updated.

Active control panel menus





Note: Function key LEDs are illuminated when active.

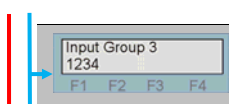
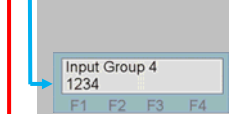
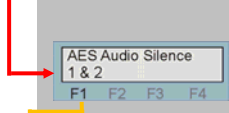
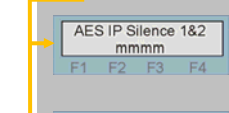
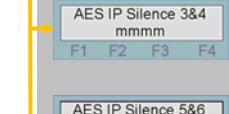
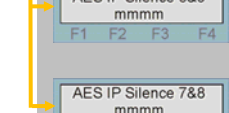
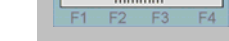
The Status menu

From the STATUS top menu press F1 then SCROLL/ADJ to access the five status sub menu options. These options are; General Status, Input Groups present, Output Groups present, Embedded Input channel silence and AES input silence. To enter a sub menu once selected press F1, then use the SCROLL/ADJ/ADJ control to traverse the sub menu.

No changes can be made from this read only menu.


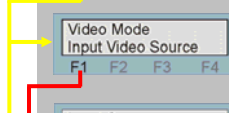
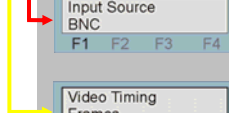


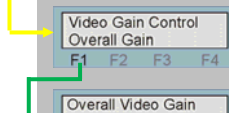

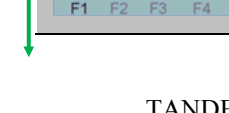
Note: Not all status information will be updated in real time. If necessary press the * button to cause the display to update.

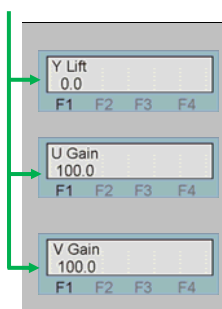
	Menu	Description
	STATUS General Status F1 F2 F3 F4	
General Status Input Standard F1 F2 F3 F4	General Status	Rotate the shaft control and press F1.
Video Input 1080 i 50 F1 F2 F3 F4	Input present	Rotate the shaft control to view the Input video standard is shown. Ip 1080p50/59/60, Ip 1080p50/59/60, Ip720p50/59/60, Ip 525, Ip 625, IP Missing, IP Not Supported.
GPO6 Off F1 F2 F3 F4	GPO 6 status	Rotate the shaft control to view the GPO 6 status. On, Off.
Vanc Blank Off F1 F2 F3 F4	VANC blanking	Rotate the shaft control to view the vertical ancillary data blanking status. On, Off.
Software Version 1.2 F1 F2 F3 F4	Board software	Rotate the shaft control to view currently installed software version
Board Serial Number 654321 F1 F2 F3 F4	Serial number	Rotate the shaft control to view the electronically stored PCB serial number
Board IP Address 10.0.0.80 F1 F2 F3 F4	IP address	Rotate the shaft control to view the TANDEM 3G IP address. Note, the Ethernet connection is available on-board and is only used when updating the board software.
Input Group Presence Group 1 F1 F2 F3 F4	Input Groups	Rotate the shaft control and press F1.
Input Group 1 Present F1 F2 F3 F4	Input Group 1 audio	Rotate the shaft control to view the input audio group 1 status Present, Missing.
Input Group 2 Present F1 F2 F3 F4	Input Group 2 audio	Rotate the shaft control to view the input audio group 2 status Present, Missing.
Input Group 3 Present F1 F2 F3 F4	Input Group 3 audio	Rotate the shaft control to view the input audio group 3 status Present, Missing.
Input Group 4 Present F1 F2 F3 F4	Input Group 4 audio	Rotate the shaft control to view the input audio group 4 status Present, Missing.
Output Group Pres Group 1 F1 F2 F3 F4	Output Groups	Rotate the shaft control and press F1.
Output Group 1 Present F1 F2 F3 F4	Output Group 1 audio	Rotate the shaft control to view the output audio group 1 status Present, Missing.
Output Group 2 Present F1 F2 F3 F4	Output Group 2 audio	Rotate the shaft control to view the output audio group 2 status Present, Missing
Output Group 3 Present F1 F2 F3 F4	Output Group 3 audio	Rotate the shaft control to view the output audio group 3 status Present, Missing
Output Group 4 Present F1 F2 F3 F4	Output Group 4 audio	Rotate the shaft control to view the output audio group 4 status Present, Missing
DeEmbed Audio Sil Group 1 F1 F2 F3 F4	De-embedder audio silence	Rotate the shaft control and press F1.
Input Group 1 1234 F1 F2 F3 F4	De-embedder Group 1 audio channel silence	Rotate the shaft control to view de-embedder group 1 channel status. 1234 =channel not silent, s=silent , m=missing , dd = Dolby E present.
Input Group 2 1234 F1 F2 F3 F4	De-embedder Group 2 audio channel silence	Rotate the shaft control to view de-embedder group 2 channel status. 1234 =channel not silent, s=silent , m=missing , dd = Dolby E present.

	De-embedder Group 3 audio channel silence	Rotate the shaft control to view de-embedder group 3 channel status. 1234 =channel not silent, s=silent , m=missing , dd= Dolby E present.
	De-embedder Group 4 audio channel silence	Rotate the shaft control to view de-embedder group 4 channel status. 1234 =channel not silent, s=silent , m=missing , dd= Dolby E present.
	AES input channel silence	Rotate the shaft control and press F1.
	AES input 1&2 silence	Rotate the shaft control to view the AES input 1&2 status. LRLR =channel not silent, mm=missing , ss=silent , dd= Dolby E present.
	AES input 3&4 silence	Rotate the shaft control to view the AES input 3&4 status. LRLR =channel not silent, mm=missing , ss=silent , dd= Dolby E present.
	AES input 5&6 silence	Rotate the shaft control to view the AES input 5&6 status. LRLR =channel not silent, mm=missing , ss=silent , dd= Dolby E present.
	AES input 7&8 silence	Rotate the shaft control to view the AES input 7&8 status. LRLR =channel not silent, mm=missing , ss=silent , dd= Dolby E present.

Video control menu

From the STATUS top menu, rotate shaft control to select the Video control menu. Press F1 and then rotate the shaft control to access the two video control menu options. These options are: - video time, video gain and optical input selection. To enter a sub menu once selected, press F1 and use the shaft control to traverse the sub menu.

Menu	Description
	
	Video source Rotate the shaft control and press F1.
	Video input source Rotate the shaft control to view the video input source. Press F1 and rotate the shaft control to select. BNC, Optical.
	Video Timing Rotate the shaft control and press F1.
	Video delay Rotate the shaft control to view the video timing in frames. Press F1 and rotate the shaft control to adjust. 0, 1, 2.
	Audio & Video delay Rotate the shaft control to view the Audio & Video delay. Press F1 and rotate the shaft control to adjust. Both at own min, Both at audio min, Both at 1 video frame.
	Video Gain Rotate the shaft control and press F1.
	Overall video gain Rotate the shaft control to view the overall video gain. Press F1 and rotate the shaft control to adjust. 0-200%.
	Y component gain Rotate the shaft control to view the Y component gain. Press F1 and rotate the shaft control to adjust. 0-200%.

	Y component lift	<p>Rotate the shaft control to view the Y component lift. Press F1 and rotate the shaft control to adjust.</p> <p>$\pm 10\%$.</p>
	U component gain	<p>Rotate the shaft control to view the U component gain. Press F1 and rotate the shaft control to adjust.</p> <p>0-200%.</p>
	V component gain	<p>Rotate the shaft control to view the V component gain. Press F1 and rotate the shaft control to adjust.</p> <p>0-200%.</p>

Input mode

The TANDEM 3G has the option of either receiving an optical input or transmitting an optical output once the necessary SPF optical module has been fitted. If the optical receiver module is fitted the fibre optic I/O input select will allow the video input to be selected between the input BNC and the optical input.

With the optical output fitted the number of outputs will be reduced from two to one.

Video timing controls

The video delay is a straight forward fixed video delay that can be adjusted in whole-frame steps. Additionally the minimum delay through the board can be set.

The selections are;

Audio to be 3 milliseconds and Video 4 lines.
Both to be equivalent to the minimum audio delay of 3 milliseconds.
Both audio delay and video delay exactly 1 frame.

Any user selected delays will be in addition to these settings.

Video gains

The 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 is set where this maximum would be exceeded, the gain will be limited to 200%

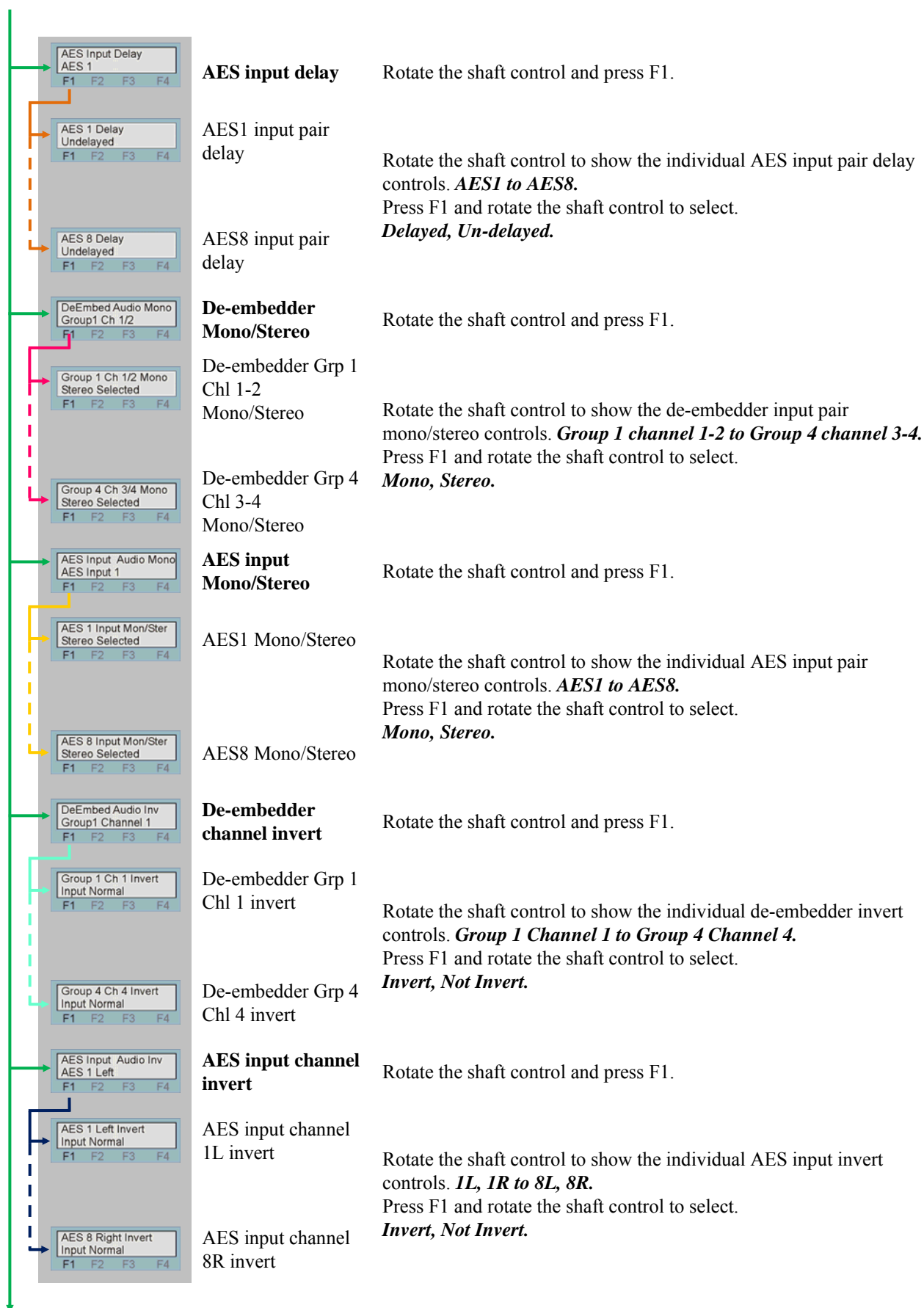
Note: It is possible to set the gain control so that their combined indicated gain will exceed 200%. In these circumstances the indicated values will not be valid.

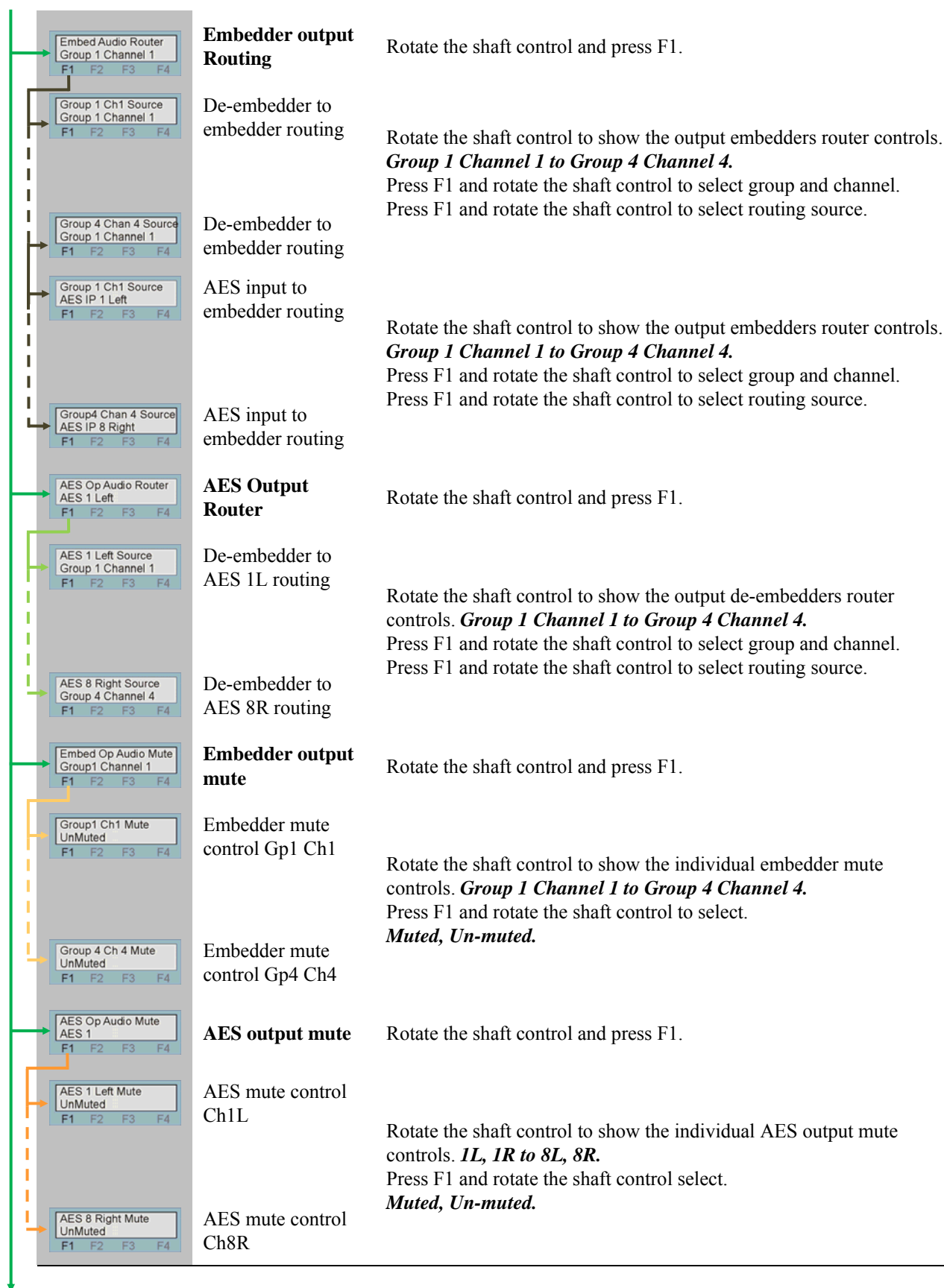
Audio controls

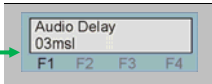
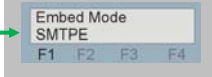
From the STATUS top menu, rotate shaft control to select the Audio control menu. Press F1 and then rotate shaft control access the audio control sub menu options. To enter a sub menu once selected press F1, use the shaft control to traverse that sub menu.

The audio control menu contains all of the De-embedder, Embedder gain and routing controls.

AUDIO CONTROL Output Group Select F1 F2 F3 F4	Menu	Description
Output Group Enable Group 1 Control F1 F2 F3 F4	Output Audio Group Enable	Rotate the shaft control and press F1.
Group 1 Embed On F1 F2 F3 F4	Embedder Group 1 enable	Rotate the shaft control to view audio group 1 status. Press F1 and rotate the shaft control to select. On, Off.
Group 2 Embed On F1 F2 F3 F4	Embedder Group 2 enable	Rotate the shaft control to view audio group 2 status. Press F1 and rotate the shaft control to select. On, Off.
Group 3 Embed On F1 F2 F3 F4	Embedder Group 3 enable	Rotate the shaft control to view audio group 3 status. Press F1 and rotate the shaft control to select. On, Off.
Group 4 Embed On F1 F2 F3 F4	Embedder Group 4 enable	Rotate the shaft control to view audio group 4 status. Press F1 and rotate the shaft control to select. On, Off.
Vanc Blank Enable Off F1 F2 F3 F4	Vertical Blanking on output enable	Rotate the shaft control to view the Vertical blanking status. Press F1 and rotate the shaft control to select. On, Off.
DeEmbed Gain Grp1 Channel 1 F1 F2 F3 F4	De-embedder gain controls	Rotate the shaft control and press F1.
Group1 Chan 1 Gain 0.0 F1 F2 F3 F4	De-embedder gain Group 1 channel 1	Rotate the shaft control to show the individual De-embedder channel gain controls. Group 1 channel 1 to Group 4 channel 4. Press F1 and rotate the shaft control to vary. -18.0 – +18.0dB.
Group4 Chan 4 Gain 0.0 F1 F2 F3 F4	De-embedder gain Group 4 channel 4	
Input AES Gain AES Channel L/R F1 F2 F3 F4	Input AES gain controls	Rotate the shaft control and press F1.
AES 1 Left Gain 0.0 F1 F2 F3 F4	AES input channel 1L gain	Rotate the shaft control to show the individual AES input channel gain controls. 1L, 1R to 8L, 8R. Press F1 and rotate the shaft control to vary. -18.0 – +18.0dB
AES 8 Right Gain 0.0 F1 F2 F3 F4	AES input channel 8R gain	
DeEmbed Audio Delay Group1 F1 F2 F3 F4	De-embedder delay	Rotate the shaft control and press F1.
Input 1 Group Delay Undelayed F1 F2 F3 F4	De-embedder Group 1 delay	Rotate the shaft control to show the De-embedder Group delay controls. Group 1 to Group 4. Press F1 and rotate the shaft control to select. Delayed, Un-delayed.
Input 4 Group Delay Undelayed F1 F2 F3 F4	De-embedder Group 4 delay	





	PCM Audio delay	Rotate the shaft control to show the Audio delay menu. Press F1 and rotate the shaft control to adjust. -20 to +80ms.
	Output embedder pattern	Rotate the shaft control to show the output embedder pattern menu. Press ENTER and rotate SCROLL/ADJ. to select. Sony, SMPTE.

Audio controls

Output Group Enable

The four output embedders can be individually enabled or disabled, this allows for any other data already present on the input video to be retained for down-stream use. If required the ancillary data can also be removed by enabling the VANC blanking.

Audio Gains

In total there are 32 audio gain controls, one for each of the 16 channels of de-embedded audio and 16 channels of AES 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.

Audio delay

These controls can be used to delay the audio with respect to the video by up to 80ms and compensate for any small delay between the incoming video and audio signals. This audio delay can be applied individually to each of the de-embedded groups and individual AES stereo pairs by selecting them to be delayed or not delayed. The delay is applied at the output of the router and is a single global control set in the audio delay menu.

Stereo to Mono conversion

For the purposes of this discussion it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair, etc.

The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed, a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of selection will cause that channel to output the mono sum of itself and its associated channel. The associated channel output will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

Example: Selecting channel 1 for mono conversion will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly deselecting channel 1 and selecting channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Note: When transporting Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Invert and mute

Each of the 32 audio input channels can be individually inverted or muted by selecting mute and invert in the de-embedder invert, AES invert, de-embedder mute and AES mute menus.

Note: When routing Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Routing matrix

At the heart of TANDEM 3G is the twin 32 input/16 output routing matrix. This will allow any of the up to 32 possible inputs, 16 embedded channels and up to eight stereo AES audio inputs to be routed to any of the 16 outputs for embedding or up to eight stereo AES outputs. The AES channels can be configured as either inputs or outputs from the AES SETUP menu giving a total of eight stereo channels of mixed I/O.




Note: All routing matrix changes are live so care should be taken when re-routing as all changes in routing will appear on the output of the routing matrix instantaneously.

Embedder pattern

The embedders can be set to give either the Sony pattern or the SMPTE pattern.

AES setup

From the STATUS top menu rotate shaft control to select the AES Setup menu. Press F1 and then rotate the shaft control to access the AES Setup menu options. This menu is where the AES I/O is individually configured to be either inputs or outputs.

AES SETUP Channels F1 F2 F3 F4	Menu	Comment
	AES1 Configuration	Rotate the shaft control to show the individual AES I/O controls. <i>AES1 to AES8.</i> Press F1 and rotate the shaft control to select.
	AES8 Configuration	<i>Terminated, Hi Z, Output.</i>
	AES termination	Rotate the shaft control to show the AES I/O termination control. Press F1 and rotate the shaft control to select. <i>Balanced, Unbalanced.</i>

Note: The AES format control acts globally on all AES inputs and outputs.

AES format

TANDEM 3G has eight AES I/O, all of which can be configured independently to be either an input or an output. It is also possible to select globally the format to be either balanced or Unbalanced giving 110R differential and 75R single sided when termination is applied. Hi Z will have an impedance of approximately 1k.

Preset controls

From the STATUS top menu rotate the shaft control to select the Presets menu. Press F1 and then rotate the shaft control to access the presets menu options. To enter a sub menu once selected press ENTER and use the shaft control to traverse the sub menu.

PRESET CONTROL F1 F2 F3 F4	Menu	Comment
Defaults F1 F2 F3 F4 Action	Factory defaults	Rotate the shaft control to show the defaults menu. Press F1 to select and press F4 to action.
Factory Reset F1 F2 F3 F4 Action	Factory reset	Rotate the shaft control to show the factory reset menu. Press F1 to select and press F4 to action.
GPI Preset GPI Recall Disabled F1 F2 F3 F4	Enable GPI control of presets	Rotate the shaft control to show the GPI preset control. Press F1 and rotate the shaft control to select. Enable, Disable Selecting enable allows the recall of previously saved user configurations via GPI inputs 1-4.
Preset 01 Save Recall F1 F2 F3 F4	Preset location 1	Rotate the shaft control to show the preset save/recall menu. Press F1 and rotate the shaft control to select the chosen location 1-16. Press F1 to enter menu and press F3 to save the current configuration. Press F4 to recall a previously saved board configuration.
Preset 16 Save Recall F1 F2 F3 F4	Preset location 16	

Preset menu and factory reset

Up to 16-user defined configurations may be stored and recalled either from the board control, active front panel, 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.

Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use.

To save the current settings, select the preset location and press ENTER. Select the save option and press ENTER to write the current settings into this location.

Note: If the selected location contains previously saved setting information it will be overwritten by the new setting data.

To recall previously stored setting information, again choose the selected location and select recall, pressing ENTER will recall the stored configuration.

The recalling of previously stored presets can also be implemented externally via the GPI port. To use this facility, enable GPI control of presets.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user stored configuration presets. Selecting the Defaults option will perform the same reset to factory defaults values but will leave any user stored configurations unaffected.

Note: Factory reset will erase all user stored presets

Parameter	Default value
De-embedded Input Audio	Delay, Mono, Invert all un-ticked
AES Input Audio	Delay, Mono, Invert all un-ticked
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Video delay	0
Audio and Video delay	Both have minimum video delay
AES Setup	Balanced inputs
Audio delay	3ms
Video input select	BNC
Embedder output routing	Group 1 to group 1.....Group 4 to group 4
AES output routing	None (AES set to inputs)
Video gains	100%
Video lift	0%
De-embedder gains	0dB
AES input gains	0dB
Embedder pattern	SMPTE
Preset selection	Preset 1
GPI control of Presets	Disabled
GPO6 Alarms	Un-selected
Silence delay	0 seconds

GPO Alarms menu

The GPO6 output is reserved for alarm indication and may have assigned any of the 37 video and audio alarms.

Any number of alarms may be assigned to the GPI output; video missing and input groups 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. This ability is especially useful to prevent false alarming during quiet periods in the audio.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause. Visual indication of GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.

GPO CONTROL Alarm Delay F1 F2 F3 F4	Menu	Description
Audio Sil Alarm Dly 000s F1 F2 F3 F4	Silence delay	Rotate the shaft control to show the silence delay control. Press F1 and rotate the shaft control to vary. 0-128 seconds .
GPO Video Missing Off F1 F2 F3 F4	Input video present	Rotate the shaft control to show the video missing menu. Press F1 and rotate the shaft control to select. On, Off .
GPO Group 1 Missing Off F1 F2 F3 F4	Input audio group 1 missing	Rotate the shaft control to show the input audio groups missing alarms. Group 1, Group 2, Group 3, Group 4 . Press F1 and rotate shaft control to select. On, Off .
GPO Group 4 Missing Off F1 F2 F3 F4	Input audio group 4 missing	
GPO Sil Grp 1 Ch1/2 Off F1 F2 F3 F4	De-embedder Grp1 Ch1-2 silent	Rotate the shaft control to show the de-embedder channel silent alarms. Group 1 channel 1-2 to Group 4 channel 3-4 . Press F1 and rotate shaft control to select. On, Off .
GPO Sil Grp 4 Ch3/4 Off F1 F2 F3 F4	De-embedder Grp4 Ch3-4 silent	
GPO Sil AES 1 Off F1 F2 F3 F4	AES1 input silent	Rotate the shaft control to show the AES input channel silent alarms. AES1 to AES8 . Press F1 and rotate shaft control to select. On, Off .
GPO Sil AES 8 Off F1 F2 F3 F4	AES8 input silent	
GPO Dol Grp 1 Ch 1/2 Off F1 F2 F3 F4	Dolby E on de-embedder Gp1 Ch1-2 silent	Rotate the shaft control to show the Dolby E on the input group silent alarms. Group 1 channel 1-2 to Group 4 channel 3-4 . Press F1 and rotate shaft control to select. On, Off
GPO Dol Grp 4 Ch 3/4 Off F1 F2 F3 F4	Dolby E on de-embedder Gp4 Ch3-4 silent	
GPO Dol AES 1 Off F1 F2 F3 F4	Dolby E on AES1 input silent	Rotate the shaft control to show the Dolby E on AES channel silent alarms. AES1 to AES8 . Press F1 and rotate the shaft control to select. On, Off .
GPO Dol AES 8 Off F1 F2 F3 F4	Dolby E on AES8 input silent	

Note: With the silence delay control set to its minimum there will remain a small delay to prevent false triggering.

5 Statesman

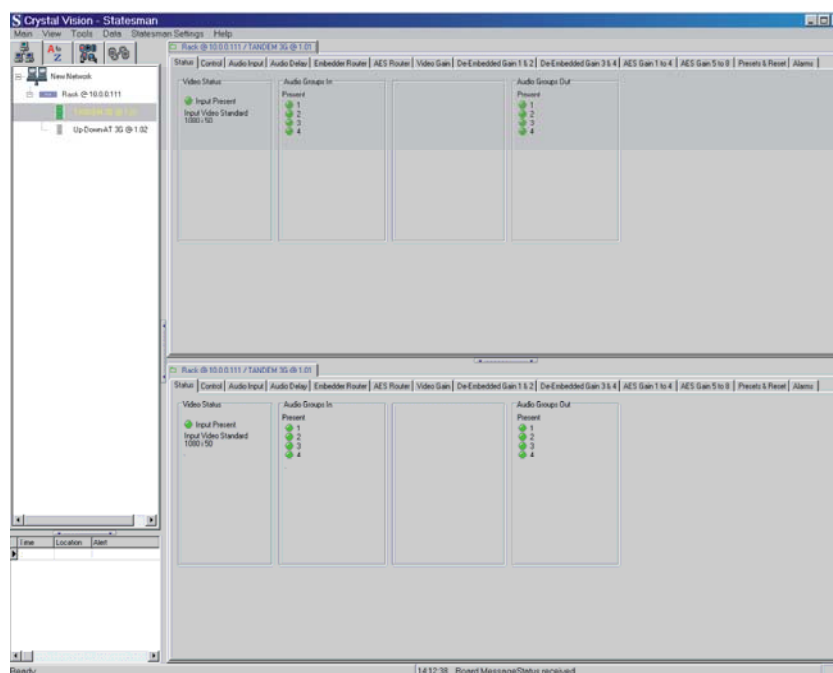
5.1 Statesman introduction

The Crystal Vision Statesman PC control software is designed to control a range of Crystal Vision modules via serial 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 or active control panel. An active panel or REMIND remote control panel must be fitted to allow Statesman control.

5.2 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.



Statesman main application window

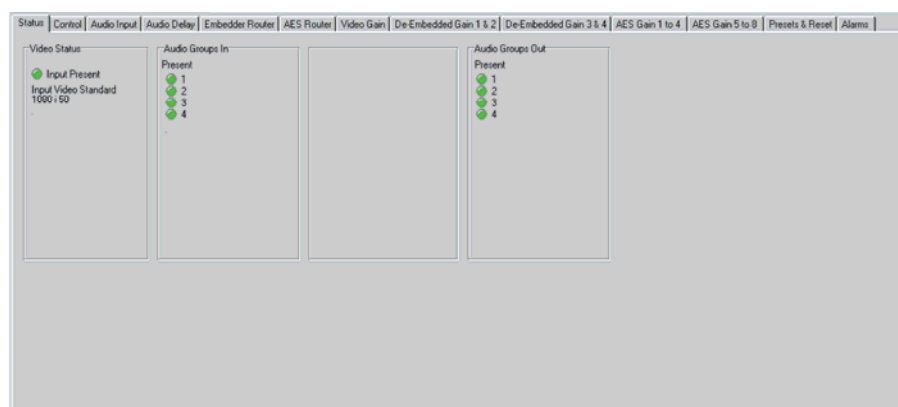
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower pane or drag the button to vary the size of the panes.

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

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 so input present will turn red if the input should go away. A greyed LED will indicate an absence such as non-alarm or non-warning status.

Text is used where more information is required than can be inferred by a simple LED such as video standards.



Status monitoring

Input Video and audio status

Input present is indicated by a simulated LED, green will indicate that the input is present, red for no input. The video standard of the incoming video is also given in text.

Audio present on the input video and output video is indicated by green LEDs, one for each of the four available audio groups. Should an audio group be missing the corresponding will be greyed out.

Control

The control tab contains the TANDEM 3G configuration controls.



Control menu

Output Group Enable

The four output embedders can be individually enabled or disabled, this allows for any other data already present on the input video to be retained for down-stream use. If required the ancillary data can also be removed by enabling the VANC blanking.

Video timing controls

The video delay is a straight forward fixed video delay that can be adjusted in whole-frame steps. Additionally the minimum delay through the board can be set.

The selections are;

Audio to be 3 milliseconds and Video 4 lines.
Both to be equivalent to the minimum audio delay of 3 milliseconds.
Both audio delay and video delay exactly 1 frame.

Any user selected delays will be in addition to these settings.

AES setup

TANDEM 3G has eight AES I/Os all of which can be configured independently to be either an input or an output. It is also possible to select globally the format to be either balanced or unbalanced giving 110R differential and 75R single sided when termination is applied. Hi Z will have an impedance of approximately 1k.

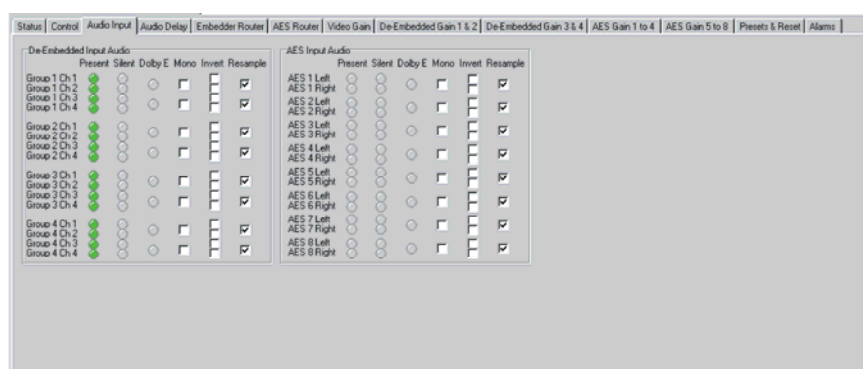
Note: The AES format control acts globally on all AES inputs and outputs.

Optical I/O

The TANDEM 3G has the option of either receiving an optical input or transmitting an optical output once the necessary SPF optical module has been fitted. If the optical receiver module is fitted the fibre optic I/O input select will allow the video input to be selected between the input BNC and the optical input. With the optical output fitted the number of outputs will be reduced from two to one.

Audio input

The audio status and control tab is where the non-routing audio controls are located. In this menu simulated LEDs are used to indicate audio present on the sixteen audio channels embedded in the incoming video stream and the up to sixteen (eight stereo) channels available on the external AES I/O. Further LEDs are used to indicate whether any of the 32 channels are silent or contain Dolby E. The mono-stereo, invert and resample controls are also found here.



Audio Status and Control

Stereo to Mono conversion

For the purposes of this discussion it is assumed that all inputs are stereo pairs and that each half of the stereo pair is on a consecutive input i.e. input 1 and input 2 are a stereo pair, input 3 and input 4 are a stereo pair, etc.

The action of converting a stereo pair to a mono output is simply a summing process followed by a gain correction. The gain correction is necessary because when the two components of a stereo signal are summed, a 6dB increase in output level will result; this will then need to be corrected to maintain unity gain.

The action of selection will cause that channel to output the mono sum of it and its associated channel. The associated channel output will still output its unaltered programme. Either channel of a pair can be selected for stereo to mono conversion.

Example: Selecting channel 1 for mono conversion will result in channel 1 outputting the converted mono sum of channels 1 and 2. Channel 2 will remain outputting the original channel 2 programme. Similarly deselecting channel 1 and selecting channel 2 will cause channel 2 to output the converted mono programme and channel 1 the original channel 1 programme.

Invert

Each of the 32 audio input channels can be individually inverted by selecting invert in the de-embedder input audio control area and AES input audio control area.

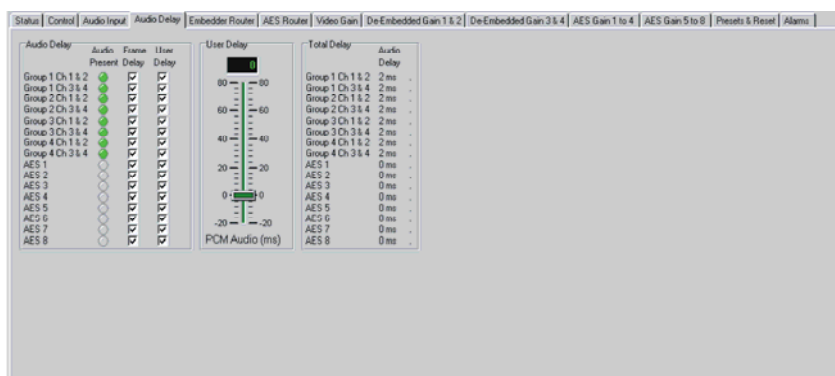
Note: When routing Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Audio Resampling

The Resample Enable control affects how the audio data is manipulated to change the PCM delays. On resampled channels (resample enabled) the audio will be continuously resampled allowing seamless changes in audio delay. On non-resampled channels (resample not enabled) samples will be passed unchanged through the signal path: if the delay has to change, single audio samples will be dropped or repeated as required. This control has no effect on channels containing Dolby E.

Audio delay

Audio delay can be assigned, or not, to each individual stereo pair by checking the tick-boxes adjacent to each pair. Audio present for each audio pair is given by a simulated LED. A useful feature is the total delay which is given in milliseconds, the total delay being the sum of the fixed frame delay plus the variable PCM audio delay.



Audio delay

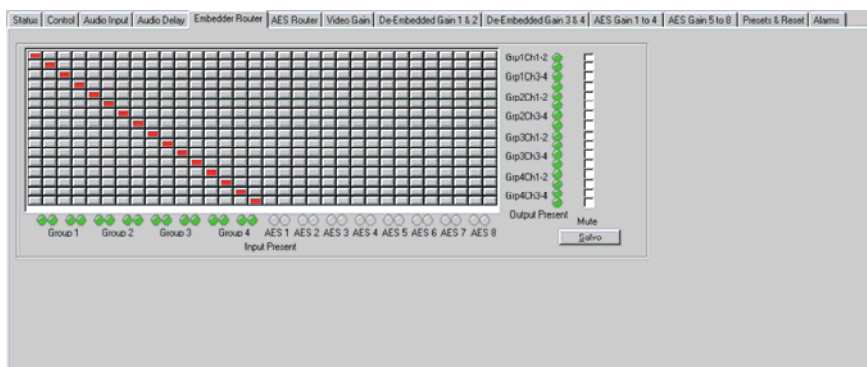
Audio delay

Each de-embedder and AES input stereo pair has a set of controls to enable the various delays. These controls in combination with the video delay controls (0, 1, 2 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 several video lines. The selectable delays are; Frame delay giving a fixed 1 or 2 lines of delay, User delay which selects the global -20 to 80ms delay. Note, a negative delay is only possible when a frame delay has been selected i.e. 1 or 2 frames -20ms to +80ms.

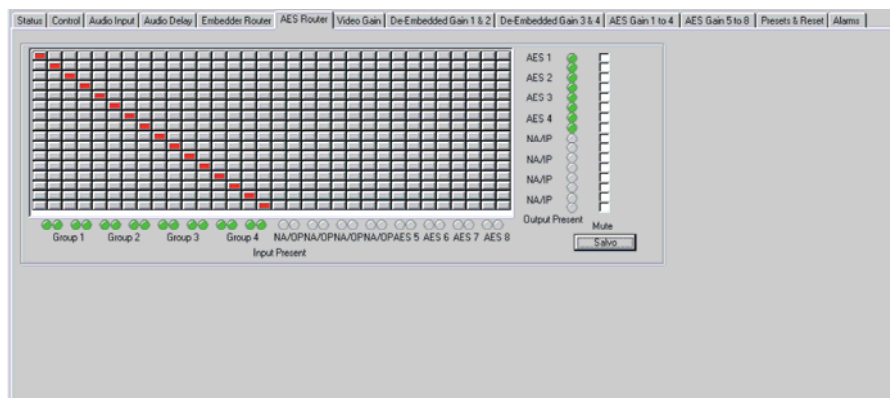
Routing

At the heart of TANDEM 3G is the twin 32 input/16 output routing matrix. This will allow any of the up to 32 possible inputs, 16 embedded channels and up to eight stereo AES audio inputs to be routed to any of the 16 outputs for embedding or up to eight stereo AES outputs. The AES channels can be configured as either inputs or outputs from the AES SETUP menu giving a total of eight stereo channels in total of mixed I/O.

Embedder output router



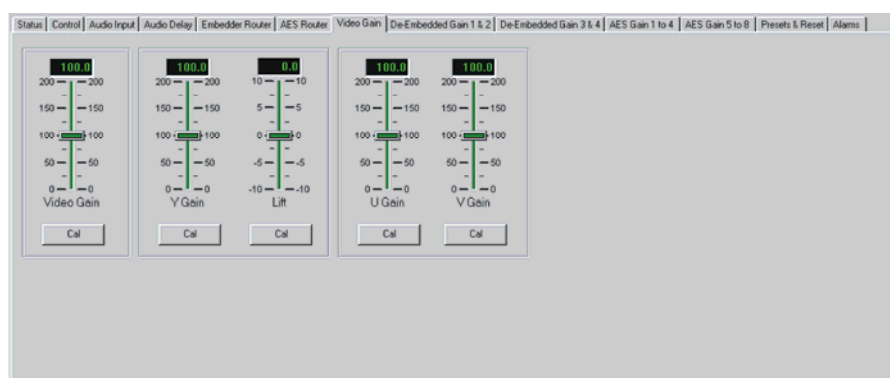
Embedder output router

AES output router*AES output router***Routing Selection**

An input to output routing selection is applied by clicking on the crosspoint squares in the matrix. Any selections made will turn dark red. Invalid selections will be rejected and returned to the last valid selection. Once a routing selection is finished it will require the Salvo button to be pressed, until this point no changes to the original routing will have been made. Valid selections will turn bright red and new source-destination assignments will be loaded into the routing table. Any output channel can be muted by ticking its adjacent box.

Gain controls**Video gains**

TANDEM 3G's YUV lift and gain controls allow independent digital image adjustments, essential for maintaining colour fidelity.

*YUV lift and gain controls*

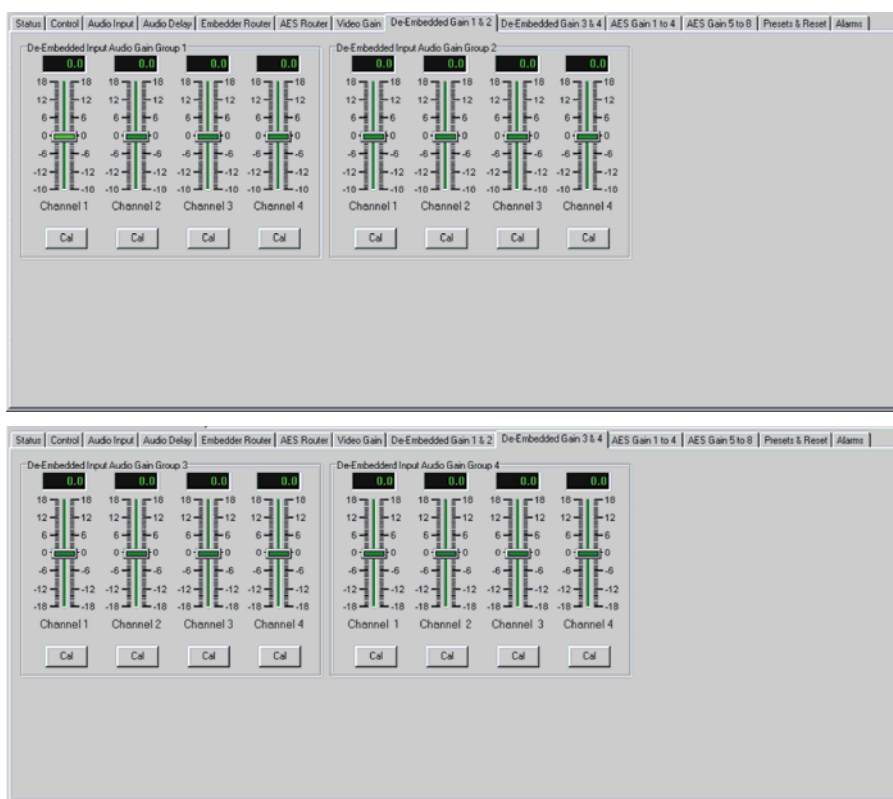
The video proc-amp allows adjustment of video gain, black level and independent YUV gains. The maximum increase in overall gain allowed is 200%, should any combination of controls be set where this maximum would be exceeded the gain will be limited to 200%

Note: It is possible to set the gain control so that their combined indicated gain will exceed 200%. In these circumstances the indicated values will not be valid.

Audio gains

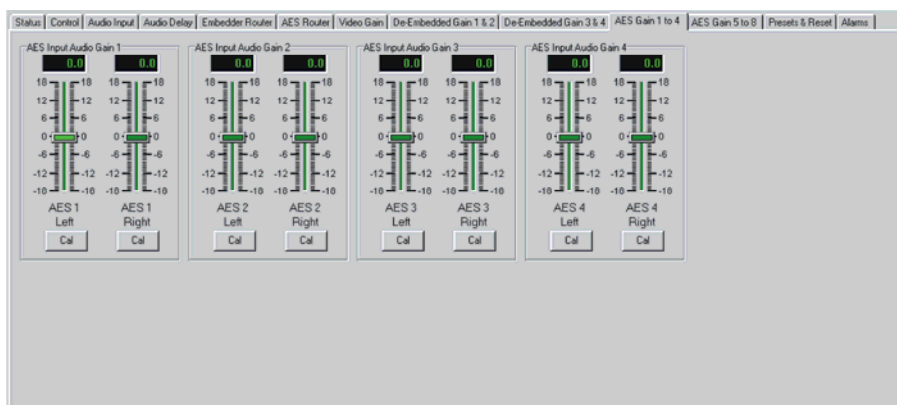
In total there are 32 audio gain controls, one for each of the 16 channels of de-embedded audio and 16 channels of AES audio. The gain controls will give $\pm 18\text{dB}$ of gain relative to the input level up to the point where digital clipping will occur.

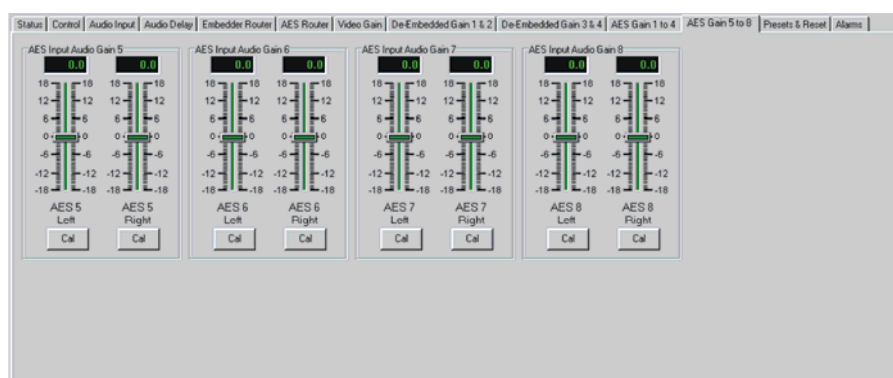
De-embedder gain controls



De-embedder gain controls

AES input gain controls

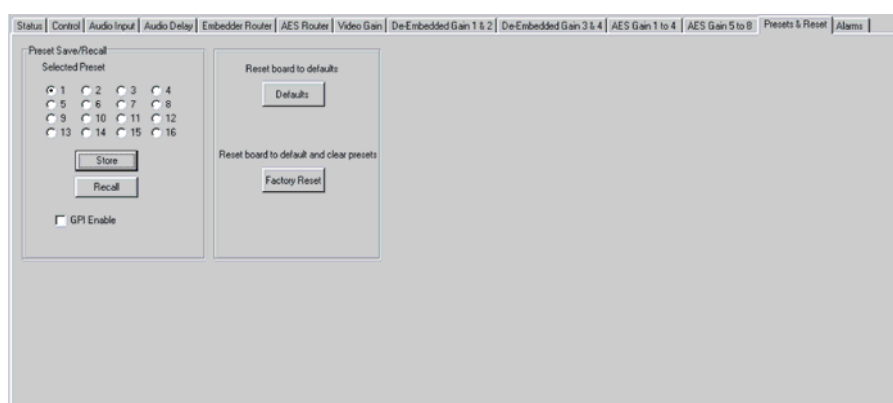




AES input gain controls

Presets and factory reset

Up to 16 user-defined configurations may be stored and recalled either from the board control, active front panel, 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.



Preset and factory reset

Note: Care should be taken when storing presets that the desired configuration is not changed by any external input prior to saving.

Saving and recalling presets

The current board settings can be saved in one of 16 locations to be recalled as desired. This allows the user to store and recall up to 16 different configurations for later use.

To save the current settings, select the preset location and press enter. This will write the current settings into this location.

Note: If the selected location contains previously saved setting information it will be overwritten by the new setting data.

To recall previously stored setting information, again choose the selected location and press enter to recall the stored configuration.

The recalling of previously stored presets can also be implemented externally via the GPI port. To sanction this facility, enable the GPI controls preset recall box.

Factory reset

The user has the choice of performing a total factory reset or a partial reset. Factory Reset will return all parameters to their factory default values and erase all user-stored configuration presets. Selecting the Defaults option will perform the same reset to factory defaults values but will leave any user-stored configurations unaffected.

Note: Factory reset will erase all user-stored presets

Parameter	Default value
De-embedded Input Audio	Delay, Mono, Invert all un-ticked
AES Input Audio	Delay, Mono, Invert all un-ticked
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Video delay	0
Audio and Video delay	Both have minimum video delay
AES Setup	Balanced inputs
Audio delay	3ms
Video input select	BNC
Embedder output routing	Group 1 to group 1.....Group 4 to group 4
AES output routing	None (AES set to inputs)
Video gains	100%
Video lift	0%
De-embedder gains	0dB
AES input gains	0dB
Embedder pattern	SMPTE
Preset selection	Preset 1
GPI control of Presets	Disabled
GPO6 Alarms	Un-selected
Silence delay	0 seconds

Alarms

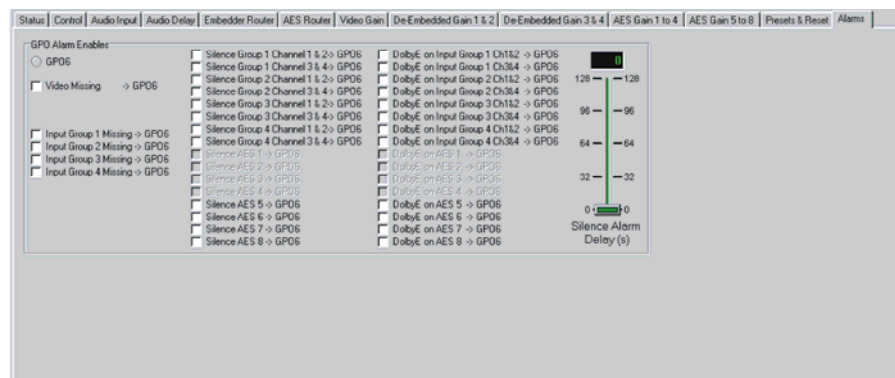
The GPO6 output is reserved for alarm indication and may have assigned any of the 37 video and audio alarms.

Any number of alarms may be assigned to the GPI output, video missing and input groups 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. This ability is especially useful to prevent false alarming during quiet periods in the audio.

Where more than one alarm is flagged and an alarm condition is asserted, use the various status indicators to determine the exact cause.

Visual indication of GPO6 status is provided on the board edge.

See Section 2.3 for further discussion of GPIs and pinout details.



Alarms

6 Trouble shooting

Card edge monitoring

The front edge of the card provides useful power rail monitoring, input status, vertical filter and analogue output format.



TANDEM 3G front edge view

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	Yellow		
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
nCal	Yellow	Video Gain controls not at cal points	Video Gain control at cal points
GPO6	Yellow	GPO6 active / low	GPO6 inactive / high

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 Statesman if available.

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.

7 Specification

General

Dimensions	100mm x 266mm module with DIN 41612 connector.
Weight	200g.
Power consumption	TANDEM 3G- 11.9 Watts. FIP - 0.6 Watts. FOP - 0.6 Watts.

Inputs

Video	HD or SD SDI 270Mb/s to 2.970Gb/s serial digital compliant to EBU 3267-E, SMPTE-259M, SMPTE-292M and SMPTE-424M. 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
Video standards supported	1080p 50/59.94, 1080i 50/59.94, 720p 50/59.94, PAL, NTSC. Input format auto selected.
Return loss	50Mhz to 1.5GHz -15dB, 1.5GHz to 2.97GHz -10dB.
Audio	Up to eight 24 bit stereo pairs (total of eight inputs and outputs). AES3 110Ohm or HiZ (balanced) D-Type, or AES3-id (unbalanced) 75Ohm BNC. Synchronous 48kHz audio to video

Outputs

Video	Serial output: 270Mbit to 2.970Gbit serial compliant to EBU 3267-E, SMPTE 259M, SMPTE 292M and SMPTE 424M Output follows the input format Audio is embedded to SMPTE 272M or SMPTE 299M
Audio	Up to eight 24 bit stereo pairs (total of eight inputs and outputs). AES: 110Ohm balanced D-Type or 75Ohm unbalanced BNC
RM47	Two video outputs with 110 ohm balanced audio on a high density D-Type.
RM49	Two video outputs with 75 ohm unbalanced audio on BNCs
RM60	One video outputs with 110 ohm balanced audio on a high density D-Type and an optical I/O.
RM61	Two video outputs with 75 ohm unbalanced audio on BNCs and an optical I/O

Audio Delay	Adjustable audio delay of up to 80ms 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 Statesman
Delay through board	Selectable two frame video delay can be used to compensate for audio delays from Dolby E encoding or 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
Audio protection	Full support for data recovery using SMPTE 299M error correction codes A variety of sophisticated techniques are employed to protect and minimise the effects of cuts to untimed and asynchronous SDI
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 6 active
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GPI inputs

Number and type:	4 x GPI inputs. Recall of presets Active pull to ground, pulled up to +5V through 7kOhm
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GPI outputs

Number and type:	1 x GPI output, selectable from loss of input, audio missing, audio channel silence. Electrically: Open collector transistors 30V, 270Ohm current limit resistors. Pulled up to +5V through 7kOhm
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Input fail output

Type:	Dark Blue
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Control

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

Remote RS422/485

19200 baud, 8 bits, 1 stop no parity

Control from frame active front panel and remote panel

Statesman allows control from any PC on a network

All functions available from Statesman. All main functions available from frame active front panel and remote panel

SNMP control and monitoring via frame CPU and Ethernet connection