SYNNER-E 3G

3Gb/s HD and SD synchroniser, embedder/de-embedder and tracking audio delay for Dolby E

USER MANUAL

Crystal Vision

Crystal Vision Ltd., Lion Technology Park, Station Road East, Whittlesford, Cambridge, CB22 4WL, England.
E-mail: sales@crystalvision.tv Website: www.crystalvision.tv Tel: +44(0) 1223 497049 Fax: +44(0) 1223 497059

Contents

7 Specification 73

Revision 1.	SMPTE, Sony embedder patterns control added to Audio controls and RM70 rear module added.	04-04-12
Revision 2.	Synchroniser override control added to video controls, pages 30, 50 & 62. Software version 2.50.	15-08-12

1 Introduction

SYNNER-E 3G is the ideal product for all High Definition synchronising 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 SYNNER-E 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, SYNNER-E 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. SYNNER-E 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 SYNNER-E 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.

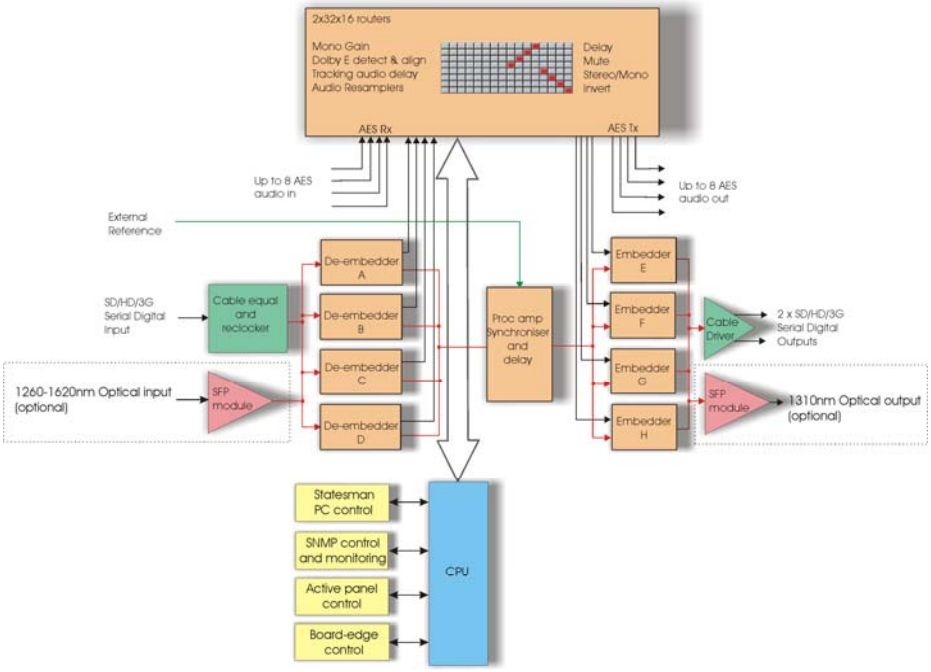
The SYNNER-E 3G includes the additional function of a switchable two frame video delay - useful for matching Dolby E audio delays.

Ideal for any environment that uses High Definition with embedded audio, SYNNER-E 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.

SYNNER-E 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.

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



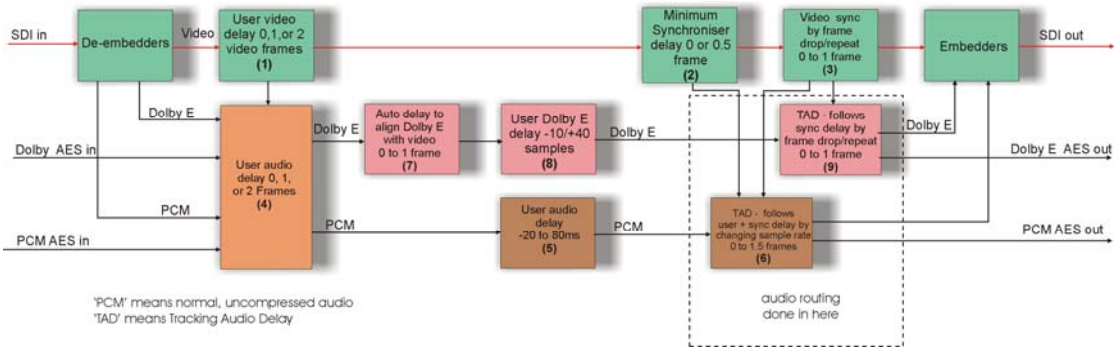
The main features are as follows:

- Use with any source - works with 3G/s, HD and SD
- Full vertical and horizontal timing adjustment, cross-locking (allowing use of either tri-level syncs or Black & Burst as the analogue reference), and fast locking after an upstream switch to avoid picture disturbance.
- 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 audio routers
- Optimise the audio - each channel has individual gain control and stereo to mono conversion
- Synchronise video which contains a mixture of Dolby E and standard AES within a single audio group, embed and de-embed Dolby E and correctly align Dolby E data with the video frame to ensure guardband in exactly the right position.
- 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 signals beyond the local equipment bay with the fibre input and output options

Delays

SYNNER-E 3G's design approach has been to provide the user with a full set of controls to set and/or bypass the delays – especially the various audio delays - as required. This has benefits in at least two areas:

- Maximum flexibility
- It simplifies the interaction between the different delays



SYNNER-E 3G delays

Video Delays

The video delay can be considered as being in three parts although the action of these delays will depend on if the SYNNER-E 3G is set to synchronise or delay mode.

(1) Fixed video delays of several frame lengths, 0, 1, or 2. This is 'bulk' video delay for (i) matching other big video delays in the system (ii) allowing the audio to be advanced relative to the video, to compensate for slippage elsewhere.

(2) A fixed video delay of 0 or 0.5 frames. This interacts differently with delays on different types of audio. PCM audio is delayed by the same amount as the video, maintaining lipsync. Dolby E is not directly affected by this delay, so the Dolby E can be made earlier, relative to the video, prior to the alignment process. Without this delay, the alignment process will always delay the Dolby E relative to the video, by between 0 and 1 frame. With the 0.5 frame delay in the video path, the alignment process can change the Dolby E timing by +/- 0.5 frames relative to the video. This allows repeated embed/de-embed cycles with less risk of the Dolby E getting progressively later relative to the video.

(3) A synchroniser delay, this automatically adjusts over a range 0 to 1 frame to provide the desired output timing.

Note: The 'frames' used for describing delays are Dolby E frames. For interlaced video, a Dolby E frame is the same length as a video frame. For the relevant progressive video standards, a Dolby E frame is the same length as two video frames.

The fundamental difference in "delay" mode is that the "video synchroniser" delay is set directly by user controls rather than automatically, by the relative timing of the input and the reference.

The change also affects the values available on one other video delay. In "synchroniser" mode delay (2) can have the values 0 or 0.5 frames. In "delay" mode, it can have the values 0, "matched", and 1 frame where "matched" means that the video will be delayed by the minimum needed for the lipsync to remain absolutely unchanged through the de-embed/embed process. This is roughly 3ms.

The audio controls have the same effect in delay mode as in synchroniser mode.

Audio Delays

Two types of audio are considered – PCM and 'Dolby E'. The SYNNER-E 3G will automatically detect Dolby E. There is a control to disable resampling of non-Dolby E data on per-stereo basis.

The audio delay can be considered in six parts, although not all delays are available for all types of audio.

(4) A fixed audio delay of 0, 1, or 2 frames that matches the equivalent video delay. All types of audio can go through this, selected on a per-stereo basis.

(5) A continuously adjustable -20 to 80 ms delay. This delay can also change either by resampling or by audio sample drop/repeat on a per-channel basis. The user control for this can also select negative values; these will be provided by reducing delays elsewhere in the signal path where possible.

(6) A **T**racking **A**udio **D**elay (TAD) of between 0 and 1.5 frames that have the same value as the video synchroniser delay plus the 0.5 frame video delay (i.e. this delay tracks the total delay through (2)+(3). This delay can change either by resampling or by audio sample drop/repeat, selected on a per-channel basis (using the same control as delay (5)).

(7) A delay of 0 to 1 video frame that delays a Dolby E signal as required for the guardband to be correctly aligned with the video timing. If the Dolby E channel is going through the TAD then this block will align the Dolby E with the input video timing, if not it will be aligned with the output video timing. Only Dolby E can go through this delay.

(8) A -10 to +40 Dolby E samples adjustable delay in the Dolby E path. As the user control for this can also select negative values; these will be provided by reducing delays elsewhere in the signal path where possible.

(9) A TAD of between 0 and 1 frame that has the same value as the video synchroniser delay. This is for Dolby E only and drops/repeats frames at the same time as the video synchroniser.

Tracking audio delay

When enabled, the built-in video tracking (strictly speaking Audio Follow Video tracking) helps to ensure that the audio delay matches the video delay to maintain lipsync; by operating dynamically in Synchronisation mode as input/output timing changes.

When video tracking is on in Synchronisation mode, the rate at which the audio delay tracks fast or abrupt changes in video delay is controlled by the tracking audio delay (TAD) rate.

The faster the TAD speed, the faster the audio delay will match the video delay, but at the expense of musical pitch.

Since the TAD speed can be audible as a pitch change the response time needs to be chosen with care. A sports event may well benefit from a fast TAD speed but classical music with piano and violins would require the slowest speed.

For example a TAD speed of 0.1% can cause a pitch change of the same value to be heard as the audio delay catches up with the video.

To put this in perspective, imagine a piano recital is in progress and a concert pitch A above middle C is heard. This has a fundamental frequency of 440Hz. A 0.1% change would produce 440.44Hz. A sharp or B flat is 466.16Hz so in this case the audio delay slew rate only causes a pitch change of the order of one sixtieth of a semitone.

The TAD speeds are 0.8%, 0.4%, 0.2%, 0.1% and 0.05%.

TAD versus slew rate

A 40ms change in video timing only takes five seconds at the 0.8% TAD speed. Each decreasing response step takes double the time to catch up, so a 0.05% rate means that the audio would take 80 seconds to catch up with the video.

The following table relates audio tracking response time to video changes for a range of TAD values:

Video timing change	T.A.D. 0.05%	T.A.D. 0.1%	T.A.D. 0.2%	T.A.D. 0.4%	T.A.D. 0.8%
40ms	80 seconds	40 seconds	20 seconds	10 seconds	5 seconds
20ms	40 seconds	20 seconds	10 seconds	5 seconds	2.5 seconds
10ms	20 seconds	10 seconds	5 seconds	2.5 seconds	1.25 seconds
5ms	10 seconds	5 seconds	2.5 seconds	1.25 seconds	0.6 seconds
1ms	5 seconds	2.5 seconds	1.25 seconds	0.6 seconds	0.3 seconds

User Controls

Each stereo audio channel has the same set of controls, which determine whether it bypasses various delays or processes.

The TAD selection determines whether a stereo channel passes through the appropriate TAD (6) or (9), or bypasses it with minimum delay. This also affects the operation of the Dolby E alignment delay (7). If Dolby E goes through the TAD, then the output of (7) is aligned with the input video, ready to be synchronised. If Dolby E bypasses the TAD, the output of (7) is aligned with the output video, ready to be embedded.

The Frame delays selection determines whether a stereo channel passes through the 0, 1, or 2 frame audio delay (4), or bypasses it with minimum delay.

The user delay determines the whether a stereo channel passes through the "user" audio delay, or bypasses it with minimum delay. The "user" delay for Dolby E is (8), for other audio it is (5).

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.

The Dolby-E align control allows the user to send Dolby E through delay (7) to produce the correct relationship with the video timing, or to bypass delay (7), passing the Dolby E to the next stage with minimum delay.

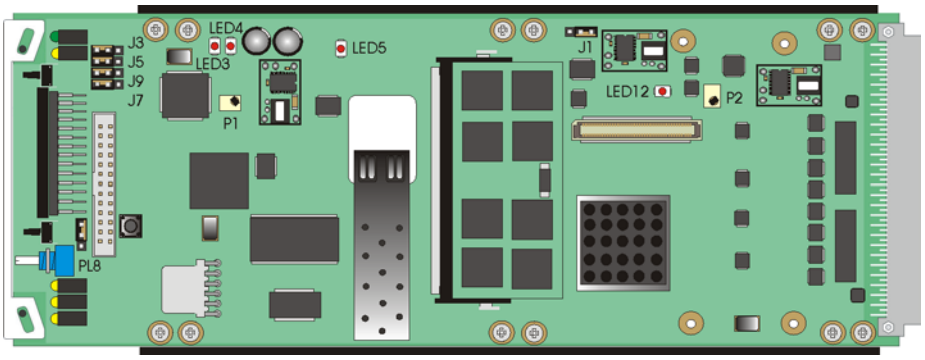
There are two global controls PCM Audio Delay and Dolby E Delay. The PCM Audio Delay control has a range of -20 to 80ms and will increase the tracking delay by the required amount. If a delay elsewhere in the signal path is non-zero the overall audio delay can be shortened by up to 20ms by setting the PCM Audio Delay in its negative range.

The Dolby E delay has a range of -10 to +40 Dolby E samples. The 0 to 40 sample section is straightforward; the audio is delayed by the required amount. If a delay elsewhere in the signal path is non-zero the overall Dolby delay can be shortened by up to 10 samples by setting the Dolby E delay in its negative range. This delay affects timing after the alignment process and allows for Dolby E to be embedded at a fixed offset from the default guardband position. Because this delay sits between the alignment block and the synchroniser the delay range was chosen so that the user cannot move the Dolby E so far that it gets corrupted if the synchroniser drops or repeats a frame.

2 Hardware installation

2.1 Module configuration

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



SYNNER-E 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 SYNNER-E 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
J3, 5, 7 & 9	GPI Preset control	422 controller on GPI 1-4
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** • 24 SYNNER-E 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

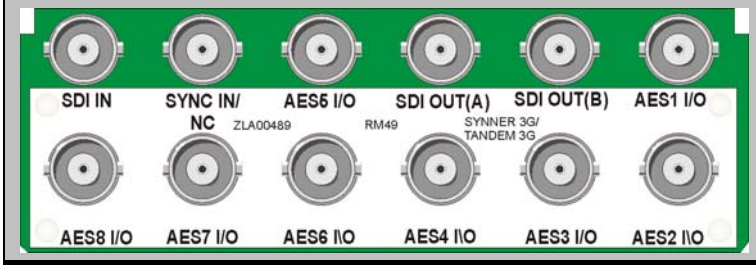
BNC	I/O assignment
SDI OUT(B)	3G/High Definition/Standard Definition serial digital output
SDI OUT(A)	3G/High Definition/Standard Definition serial digital output
SYNC/NC	Tri-level and Black & Burst analogue reference input
SDI IN	3G/High Definition/Standard Definition serial digital input

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** • 12 SYNNER-E 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	Tri-level and Black & Burst analogue reference input
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 RM58

The RM58 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.

RM58 rear module connector	Description
	**RM58** • 24 SYNNER-E 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.
SYNC IN	Tri-level and Black & Burst analogue reference input
SDI OUT	3G/High Definition/Standard Definition serial digital output

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 RM59

The RM59 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.

RM59 rear module connector	Description
	**RM59** • 24 SYNNER-E 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.
SYNC IN	Tri-level and Black & Burst analogue reference input
SDI IN	3G/High Definition/Standard Definition serial digital Input

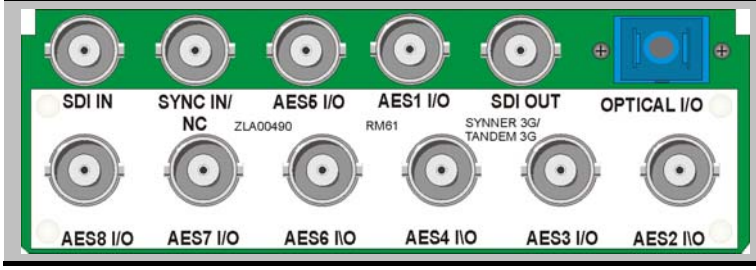
110 ohm 26-way D-Type Audio connections

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** • 12 SYNNER-E 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	Tri-level and Black & Burst analogue reference input
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 RM62

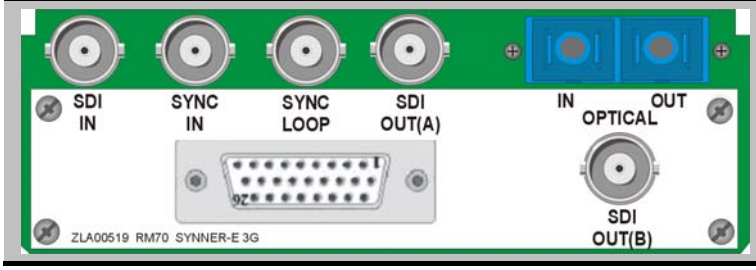
The RM62 is a single height module used for video only applications.

RM62 rear module connector	Description
	**RM62** • 24 SYNNER-E 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	I/O assignment
OPTICAL I/O	SC optical connector. Input or output depending on optical module fitted.
SDI OUT(B)	3G/High Definition/Standard Definition serial digital output
SDI OUT(A)	3G/High Definition/Standard Definition serial digital output
NC	No user connection
SYNC IN	Tri-level and Black & Burst analogue reference input
SDI IN	3G/High Definition/Standard Definition serial digital input

Rear module connections with RM70

The RM70 is a dual height module giving the benefit of a sync loop-though and simultaneous optical in and out.

RM70 rear module connector	Description
	**RM70** • 12 SYNNER-E 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(A)	3G/High Definition/Standard Definition serial digital output
SYNC LOOP	External reference input loop-though
SYNC IN	Tri-level and Black & Burst analogue reference input
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

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 6
Reference 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

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)

Upper

Lower

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

SYNNER-E 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	Valid reference input present	
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

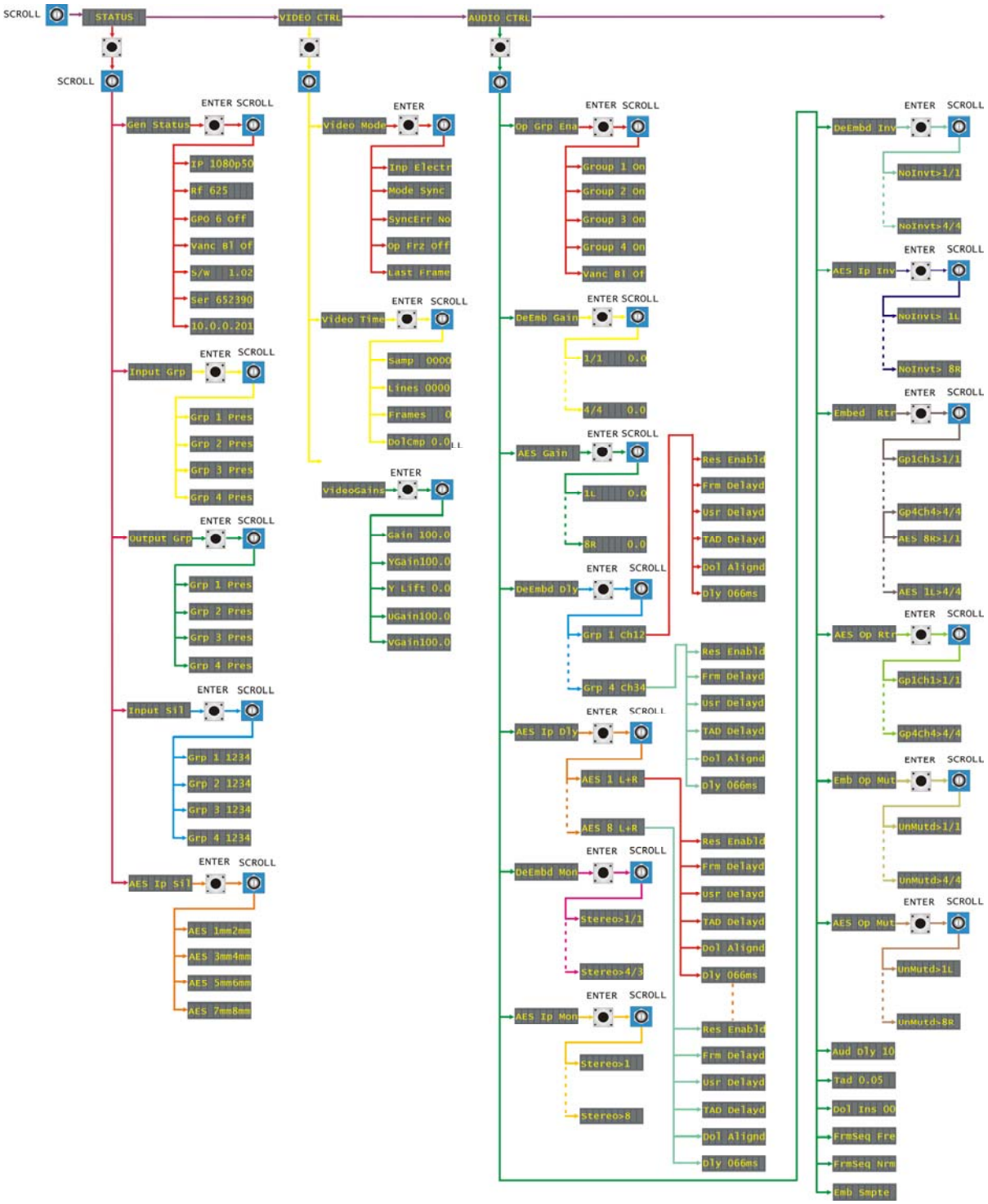
To access the card edge menu system proceed as follows:

- 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

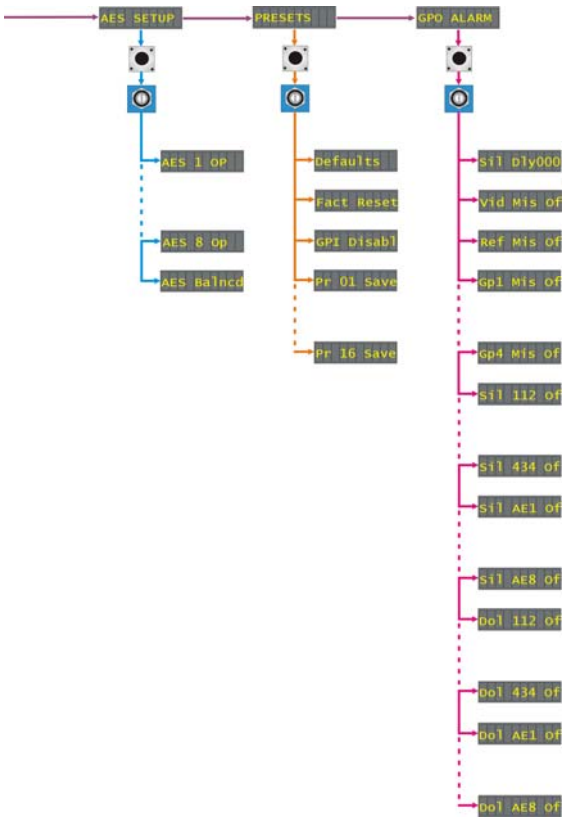
Note: The displayed menu brightness will flash slowly if confirmation of a change is required.

3.6 Card edge configuration

Menu tree



SYNNER-E 3G Board edge menu structure

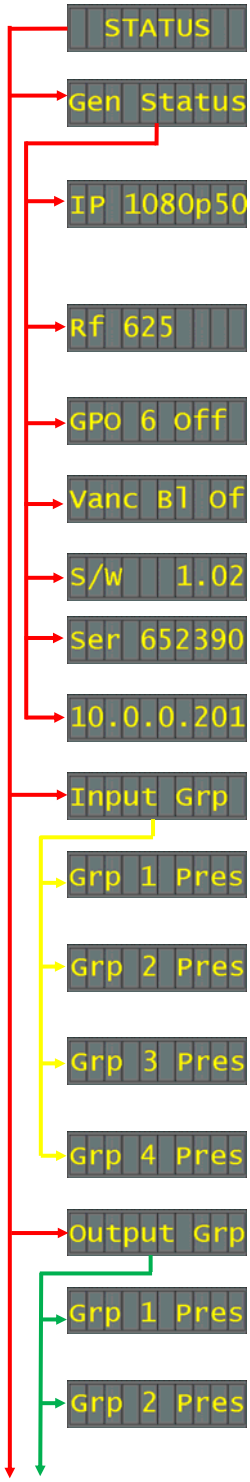


SYNNER-E 3G Board edge menu structure

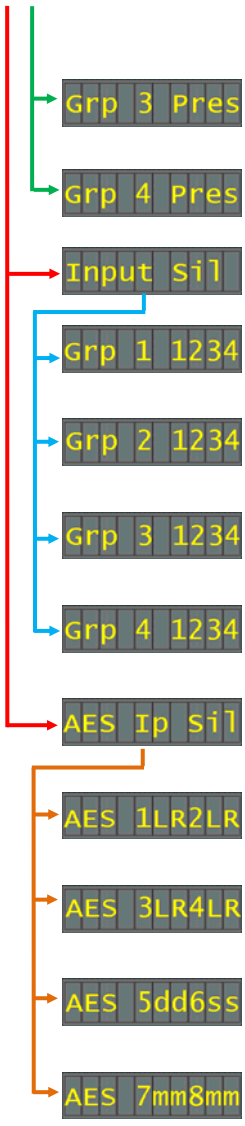
Tip: To reach the top menu push the ^ button repeatedly until a top menu is reached. Rotate the SCROLL/ADJ control anti-clockwise until the STATUS menu appears.

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.



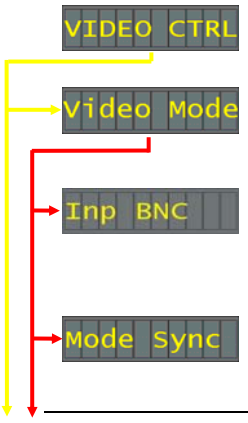
Menu		Comment
General Status		Press ENTER and rotate SCROLL/ADJ.
	Input present	The Input video standard is shown. ***Ip 1080p50/59/60, Ip 1080p50/59/60, Ip720p50/59/60, Ip 525, Ip 625, IP Missing, IP Not Sup.***
	External reference	The external reference video standard is shown. ***Rf 1080p50/59/60, Rf 1080p50/59/60, Rf720p50/59/60, Rf 525, Rf 625, Rf Missing, Rf Not Sup.***
	GPO 6 status	GPO 6 Status. ***On, Off.***
	VANC blanking	Vertical ancillary data blanking. ***On, Off.***
	Board software	The version number of the currently installed software.
	Serial number	The electronically stored PCB serial number.
	IP address	SYNNER-E 3G IP address. Note, the Ethernet connection is available on-board and is only used when updating the board software
Input Groups		Press ENTER and rotate SCROLL/ADJ.
	Audio Group 1	Input Video Embedded Audio Group 1 status ***Group 1 Present, Group 1 Missing.***
	Audio Group 2	Input Video Embedded Audio Group 2 status ***Group 2 Present, Group 2 Missing.***
	Audio Group 3	Input Video Embedded Audio Group 3 status ***Group 3 Present, Group 3 Missing.***
	Audio Group 4	Input Video Embedded Audio Group 4 status ***Group 4 Present, Group 4 Missing.***
Output Groups		Press ENTER and rotate SCROLL/ADJ.
	Audio Group 1	Output Video Embedded Audio Group 1 status ***Group 1 Present, Group 1 Missing.***
	Audio Group 2	Output Video Embedded Audio Group 2 status ***Group 2 Present, Group 2 Missing.***



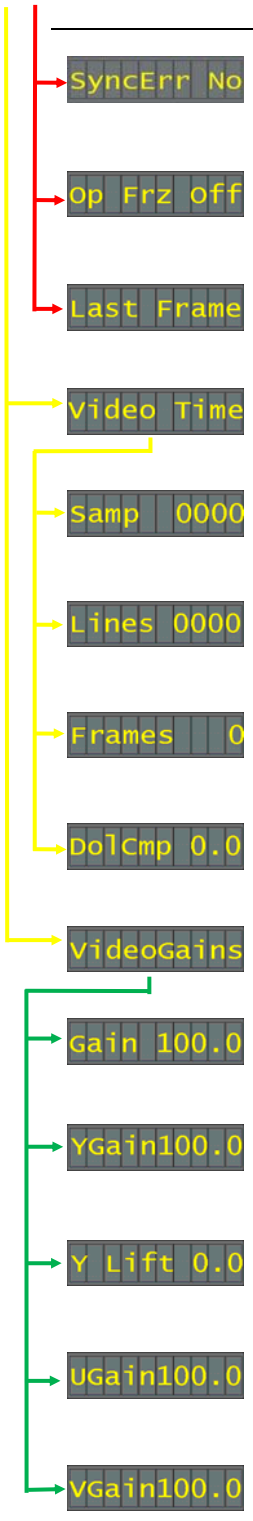
Audio Group 3	Output Video Embedded Audio Group 3 status ***Group 3 Present, Group 3 Missing.***
Audio Group 4	Output Video Embedded Audio Group 4 status ***Group 4 Present, Group 4 Missing.***
Input Silence	Press ENTER and rotate SCROLL/ADJ.
Audio Group 1	Input Video Embedded Audio Group 1 channel status ***1234, s=silent, m=missing, dd=dolby E***.
Audio Group 2	Input Video Embedded Audio Group 2 channel status ***1234, s=silent, m=missing, dd=dolby E***.
Audio Group 3	Input Video Embedded Audio Group 3 channel status ***1234, s=silent, m=missing, dd=dolby E***.
Audio Group 4	Input Video Embedded Audio Group 4 channel status ***1234, s=silent, m=missing, dd=dolby E***.
AES Input Silence	Press ENTER and rotate SCROLL/ADJ/Adj
AES input Ch12	AES input status channels 1 & 2 ***L=left, R=right, dd=dolby E, s=silent, mm=missing***.
AES input Ch34	AES input status channels 3 & 4 ***L=left, R=right, dd=dolby E, s=silent, mm=missing***.
AES input Ch56	AES input status channels 5 & 6 ***L=left, R=right, dd=dolby E, s=silent, mm=missing***.
AES input Ch78	AES input status channels 7 & 8 ***L=left, R=right, dd=dolby E, s=silent, mm=missing***.

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 mode, video timing and video gain. To enter a sub menu once selected press ENTER and use the SCROLL/ADJ control to traverse the sub menu.



Menu	Comment
Video mode	Press ENTER and rotate SCROLL/ADJ.
Input select	Rotate the SCROLL/ADJ. control to show the frame delay control. Press ENTER and rotate SCROLL/ADJ. to select. ***BNC, Optical.***
Mode selection	Rotate the SCROLL/ADJ. control to show the synchroniser mode control. Press ENTER and rotate SCROLL/ADJ. to select. ***Delay, Synchroniser.***



Synchroniser override	Rotate the SCROLL/ADJ. control to show the Sync override control. Press ENTER and rotate SCROLL/ADJ. to select. ***Normal Operation, Override Sync.***
Output freeze	Rotate the SCROLL/ADJ. control to show the output freeze control. Press ENTER and rotate SCROLL/ADJ. to select. ***Off, Frame, Black Matte, Blue Matte.***
On loss of input show	Rotate the SCROLL/ADJ. control to show the loss of input control. Press ENTER and rotate SCROLL/ADJ. to select. ***Last Frame, Black, Blue, Delay Then Black, Delay Then Blue.***
Video timing	Press ENTER and rotate SCROLL/ADJ.
Video delay in samples	Rotate the SCROLL/ADJ. control to show the sample delay control. Press ENTER and rotate SCROLL/ADJ. to vary. ***0-2640.***
Video delay in lines	Rotate the SCROLL/ADJ. control to show the frame delay control. Press ENTER and rotate SCROLL/ADJ. to vary. ***0-1125.***
Video delay in frames	Rotate the SCROLL/ADJ. control to show the frame delay control. Press ENTER and rotate SCROLL/ADJ. to vary. ***0,1,2.***
Dolby E compensation delay	Rotate the SCROLL/ADJ. control to show the Dolby E compensation control. Press ENTER and rotate SCROLL/ADJ. to vary. ***0.0 – 0.5.***
Video Gains	Press ENTER and rotate SCROLL/ADJ
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%.***
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	Rotate the SCROLL/ADJ. control to show the Y component lift control. Press ENTER and rotate SCROLL/ADJ. to vary. ***-10.0% – 10.0%.***
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%.***
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 SYNNER-E 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.

Mode selection

Setting the mode to synchroniser will lock the output to the incoming external reference to compensate for timing delays within the video system. Selected Delay mode make the SYNNER-E 3G become a fixed delay line.

Should the input signal go away the output will freeze. The 'On loss of input' control allows the user to select the frozen output. The selection is; Last Frame, Black, Blue, or after a delay of 2 seconds Delay Then Black, Delay Then Blue.

Output freeze when selected will cause the output to freeze and show the selected pattern. These are selectable from the following list; the last frame shown, Black Matte or Blue Matte.

Sync override will force the SYNNER-E 3G into delay mode when the external sync is incorrect.

Video timing controls

In delay mode the video delay is a straight forward fixed bulk video delay that can be adjusted in samples, lines and whole-frame steps up to a maximum of 3.5 video frames.

When switched to synchroniser mode the initial delay will vary between 0-1 frame depending on the timing between the input video and external reference. Further fixed delays can then be added for matching purposes.

The Dolby E compensation delay allows a further 0.5 frame delay to be added to the video delay to ensure correct Dolby E alignment. Along with an increase in the video delay the PCM audio delay will also be further delayed by a similar amount allowing the user to avoid a potential problem with aligning Dolby E.

Note: For the relevant progressive video standards two video frames are the length of one interlaced frame. The sample and line control will only make adjustments of one frame of either progressive or interlaced video.

Video gains

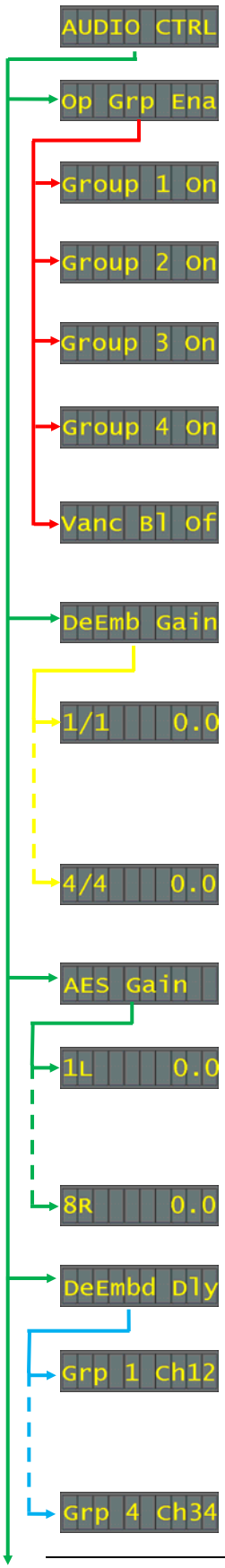
The video proc-amp allows adjustment of video gain, black level and independent YUV gains. The maximum increase in overall gain allowed is 200%, should any combination of controls be set where this maximum would be exceeded the gain will be limited to 200%

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.

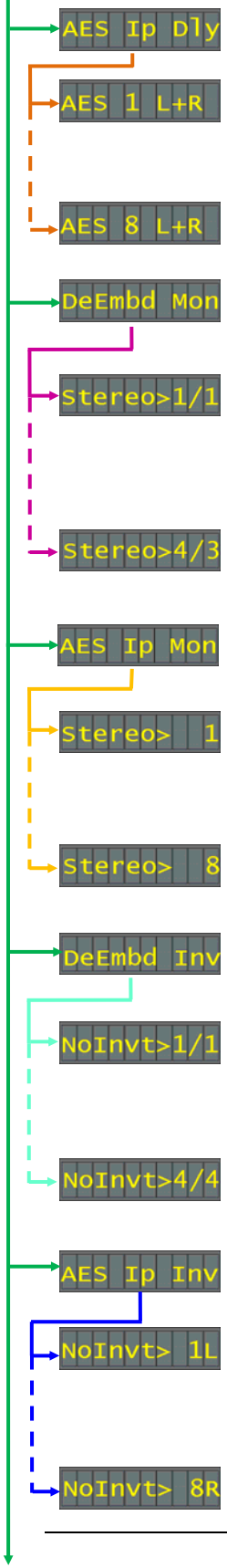
Audio Control menu

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.



Menu	Comment
Output Group Enable	Press ENTER and rotate SCROLL/ADJ
Output Group 1 enable	Rotate the SCROLL/ADJ. control to show the Group 1 control. Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***
Output Group 2 enable	Rotate the SCROLL/ADJ. control to show the Group 2 control. Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***
Output Group 3 enable	Rotate the SCROLL/ADJ. control to show the Group 3 control. Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***
Output Group 4 enable	Rotate the SCROLL/ADJ. control to show the Group 4 control. Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***
Vertical Blanking on output enable	Rotate the SCROLL/ADJ. control to show the Vertical Blanking control. Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***
De-embedder gains	Press ENTER and rotate SCROLL/ADJ.
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. ***-18.0 – +18.0dB.***
De-embedder group 4 channel 4 gain	
AES Input gains	Press ENTER and rotate SCROLL/ADJ.
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. ***-18.0 – +18.0dB.***
AES input channel 8R gain	
De-embedder delay	Press ENTER and rotate SCROLL/ADJ.
De-embedder Group 1 delay	Rotate the SCROLL/ADJ. control to show the De-embedder Group delay controls. *Group 1channel 12 to Group 4 channel 34.* Press ENTER and rotate SCROLL/ADJ. to select. ***Resampler, Frame, User, TAD, Dolby E alignment, Total Delay.*** Press ENTER and adjust as necessary.
De-embedder Group 4 delay	



AES input delay

Press ENTER and rotate SCROLL/ADJ.

AES1 input delay

AES8 input delay

Rotate the SCROLL/ADJ. control to show the individual AES input pair delay controls. ***AES1 to AES8.***
Press ENTER and rotate SCROLL/ADJ. to select.
Resampler, Frame, User, TAD, Dolby E alignment, Total Delay.
Press ENTER and adjust as necessary.

De-embedder Mono/Stereo

Press ENTER and rotate SCROLL/ADJ.

De-embedder Grp 1 Chl 1-2 Mono/Stereo

De-embedder Grp 4 Chl 3-4 Mono/Stereo

Rotate the SCROLL/ADJ. control to show the de-embedder input pair mono/stereo controls. ***Group 1 channel 1-2 to Group 4 channel 3-4.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Mono, Stereo.***

AES Input Mono/Stereo

Press ENTER and rotate SCROLL/ADJ

AES1 Mono/Stereo

AES8 Mono/Stereo

Rotate the SCROLL/ADJ. control to show the individual AES input pair mono/stereo controls. ***AES1 to AES8.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Mono, Stereo.***

De-embedder channel invert

Press ENTER and rotate SCROLL/ADJ

De-embedder Grp 1 Chl 1 invert

De-embedder Grp 4 Chl 4 invert

Rotate the SCROLL/ADJ. control to show the individual de-embedder invert controls. ***Group 1 Channel 1 to Group 4 Channel 4.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Invert, Not Invert.***

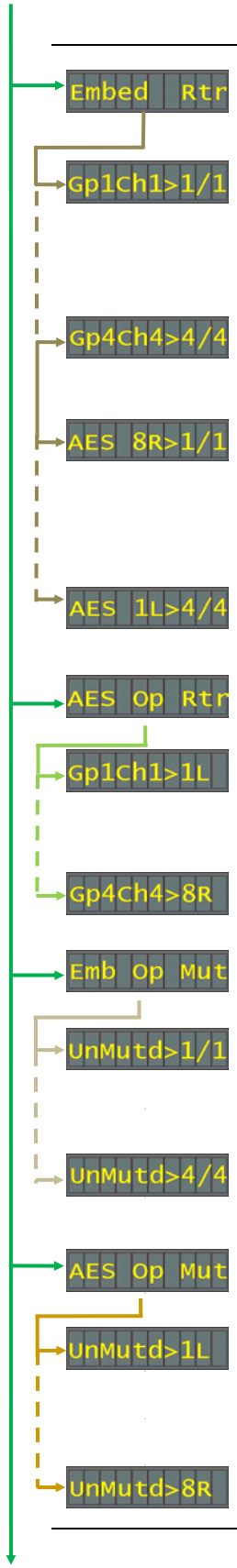
AES input channel invert

Press ENTER and rotate SCROLL/ADJ

AES input channel 1L invert

AES input channel 8R invert

Rotate the SCROLL/ADJ. control to show the individual AES input invert controls. ***1L, 1R to 8L, 8R.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Invert, Not Invert.***



Embedder output Routing

Press ENTER and rotate SCROLL/ADJ

De-embedder to embedder routing Gp1 Ch1

De-embedder to embedder routing Gp4 Ch4

AES to embedder routing Gp1 Ch1

Rotate the SCROLL/ADJ. control to show the output embedders router controls. ***Group 1 Channel 1 to Group 4 Channel 4.***
Press ENTER and rotate SCROLL/ADJ. to select group and channel.
Press ENTER and rotate SCROLL/ADJ to select routing source.

AES to embedder routing Gp4 Ch4

AES Output Router

Press ENTER and rotate SCROLL/ADJ

De-embedder to AES 1L routing

De-embedder to AES 8R routing

Rotate the SCROLL/ADJ. control to show the AES output router controls. ***1L, 1R to 8L, 8R.***
Press ENTER and rotate SCROLL/ADJ. to select group and channel.
Press ENTER and rotate SCROLL/ADJ to select routing source.

Embedder output mute

Press ENTER and rotate SCROLL/ADJ

Embedder mute control Gp1 Ch1

Embedder mute control Gp4 Ch4

Rotate the SCROLL/ADJ. control to show the individual embedder mute controls. ***Group 1 Channel 1 to Group 4 Channel 4.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Muted, Un-muted.***

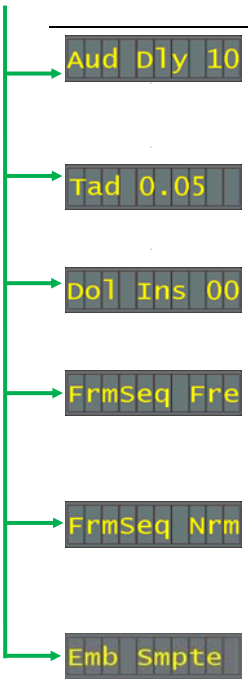
AES output mute

Press ENTER and rotate SCROLL/ADJ

AES mute control Ch1L

AES mute control Ch8R

Rotate the SCROLL/ADJ. control to show the individual AES output mute controls. ***1L, 1R to 8L, 8R.***
Press ENTER and rotate SCROLL/ADJ. to select. ***Muted, Un-muted.***



PCM Audio delay	Rotate the SCROLL/ADJ. control to show the Audio delay menu. Press ENTER and rotate SCROLL/ADJ. to adjust. ***-20 to +80ms.***
Tracking audio delay speed	Rotate the SCROLL/ADJ. control to show the TAD speed menu. Press ENTER and rotate SCROLL/ADJ. to select. ***0.05%, 0.1%, 0.2%, 0.4%, 0,8%.***
Dolby E insertion sample	Rotate the SCROLL/ADJ. control to show the Dolby insertion menu. Press ENTER and rotate SCROLL/ADJ. to select. ***-10 to 40 Samples.***
Output frame sequence	Rotate the Scroll/Adj. control to show the output frame sequence. Press ENTER and rotate Adj. to select. ***Free-running, Locked to ATC.***
Invert output frame sequence	Rotate the Scroll/Adj. control to show the invert output sequence control. Press ENTER and rotate Adj. to select. ***Normal, Inverted.***
Embedder format	Rotate the Scroll/Adj. control to show the embedder pattern control. Press ENTER and rotate 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 ± 18dB of gain relative to the input level up to the point where digital clipping will occur.

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, 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. See the delays discussion in the introduction for details of how these various delays interact with each other. 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, TAD (tracking audio delay) to ensure the audio follows the output video timing, and Dolby E alignment to ensure the correct positioning of the guardband.

Finally, an indication of the total delay is given. The inclusion of tracking audio delay will make the indicated total delay vary as the input video timing and external reference change with respect to each other, as the board edge does not continuously update it will be necessary to refresh display by pressing the ENTER button to give a correct length of delay.

Resamplers

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.

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 SYNNER-E 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.

Tracking audio delay speed

This sets the time the audio delay takes to track fast or abrupt changes in video delay, when video tracking is on. The faster the rate of change, the quicker the audio delay will match

changes in video delay so minimising lip sync errors, but at the expense of a matching change of musical pitch.

Refer to the Introduction chapter for more help with TAD speed settings for different applications.

Frame sequence

A useful feature of the SYNNER-E 3G is its ability to take incoming ancillary data time code and use it to determine the field sequence of a High Definition progressive video input. This is very useful to ensure that Dolby E has its guardband correctly positioned.

Another useful feature is the Invert output sequence; this allows the output sequence to be swapped when using black and burst as an external reference for a progressive video input.

Note: The ATC lock control is only active when a progressive video input is present. When disabled the field sequence of the interlaced output will free-wheel.

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.***

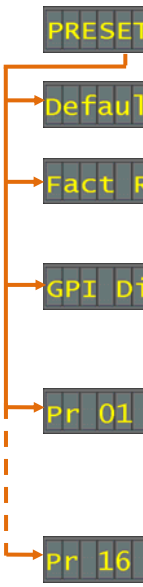
Note: The AES format control acts globally on all AES inputs and outputs.

AES format

SYNNER-E 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.



Menu	Comment
Factory defaults	Rotate the SCROLL/ADJ. control to show the defaults menu. Press ENTER to action.
Factory reset	Rotate the SCROLL/ADJ. control to show the factory reset menu. Press ENTER to action.
Enable GPI control of presets	Selecting ENABLE allows the recall of previously saved user configurations via GPI inputs 1-4. ***Enable, Disable***
Preset location 1	Rotate the SCROLL/ADJ. control to show the preset save menu and select the chosen location 1-16. Press ENTER and rotate SCROLL/ADJ. to select SAVE or RECALL. Press ENTER to action a save or recall.
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. When pasting a board setup from Statesman, GPI enable will be set to disabled.

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 over-written 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
Mode	Synchroniser
Output Freeze	Off
Video input select	BNC
On loss of input show	Last Frame
Video delay controls	0
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Tracking speed	0.05%
AES Setup	Terminated and Balanced inputs
Lock to ATC input	Free running
Invert output sequence	Normal
De-embedded Input Audio	Mono, Invert un-selected, Resample selected
AES Input Audio	Mono, Invert un-selected, Resample selected
Audio delay	Frame, User and TAD delays selected
Dolby E delay	Alignment selected
User delay	0
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

GPI Alarms menu

The GPO6 output is reserved for alarm indication and may have assigned any of the 38 video and audio alarms.

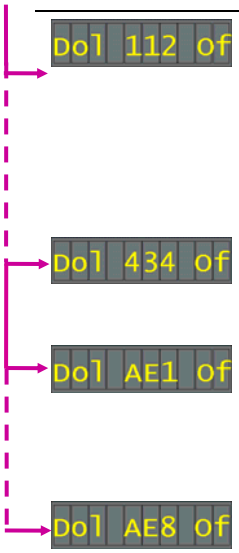
Any number of alarms may be assigned to the GPI output; video missing and input groups missing will assert an alarm immediately whereas the silence alarms can be assigned a delay timer to delay the time after which an alarm is asserted. This ability is especially useful to prevent false alarming during 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.***
Ref Mis Of	External reference missing	Rotate the SCROLL/ADJ. control to show the reference missing alarms. 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	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 434 Of	De-embedder Grp4 Ch3-4 silent	
Sil AE1 Of	AES1 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.***
Sil AE8 Of	AES8 input silent	



Dolby E on de-embedder Gp1 Ch1-2 silent

Dolby E on de-embedder Gp4 Ch3-4 silent

Dolby E on AES1 input silent

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.***

Rotate the SCROLL/ADJ. control to show the Dolby E on AES channel silent alarms. ***AES1 to AES8.***
Press ENTER and rotate SCROLL/ADJ. to select. ***On, Off.***

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
- 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 SYNNER-E 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 SYNNER-E 3G has been selected.

The SYNNER-E 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 SYNNER-E 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:

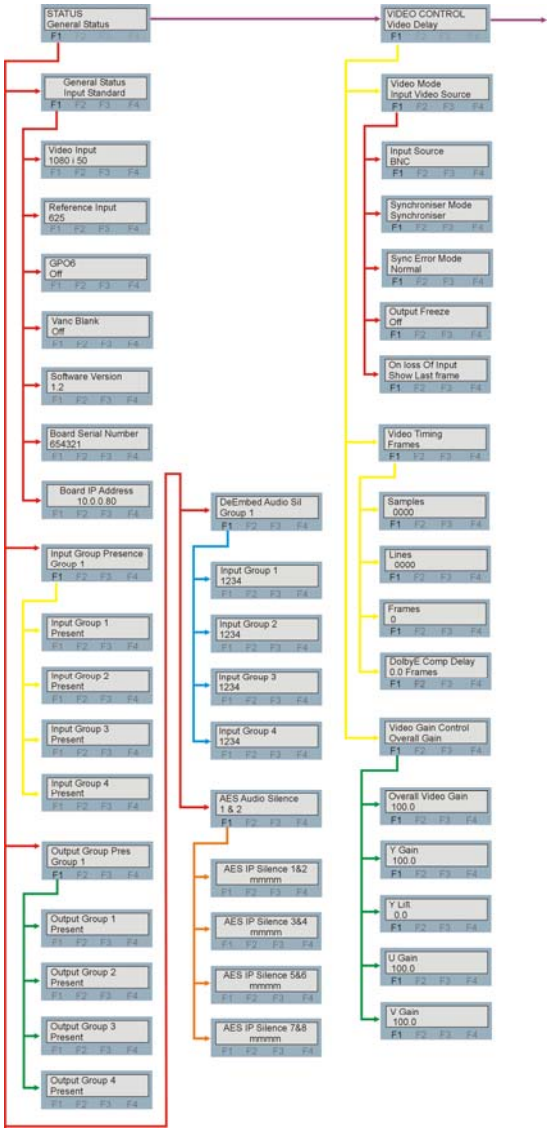
- Status
  - General Status
  - Input Group Presence
  - Output Group Presence
  - De Embedder Audio Silence
  - AES Audio Silence
- Video Control
  - Video Timing
  - Video Gain Controls
- Audio Control
  - Output Group enable
  - De-embedder Gain
  - Input AES Gain
  - De-embedder Audio delay
  - AES 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

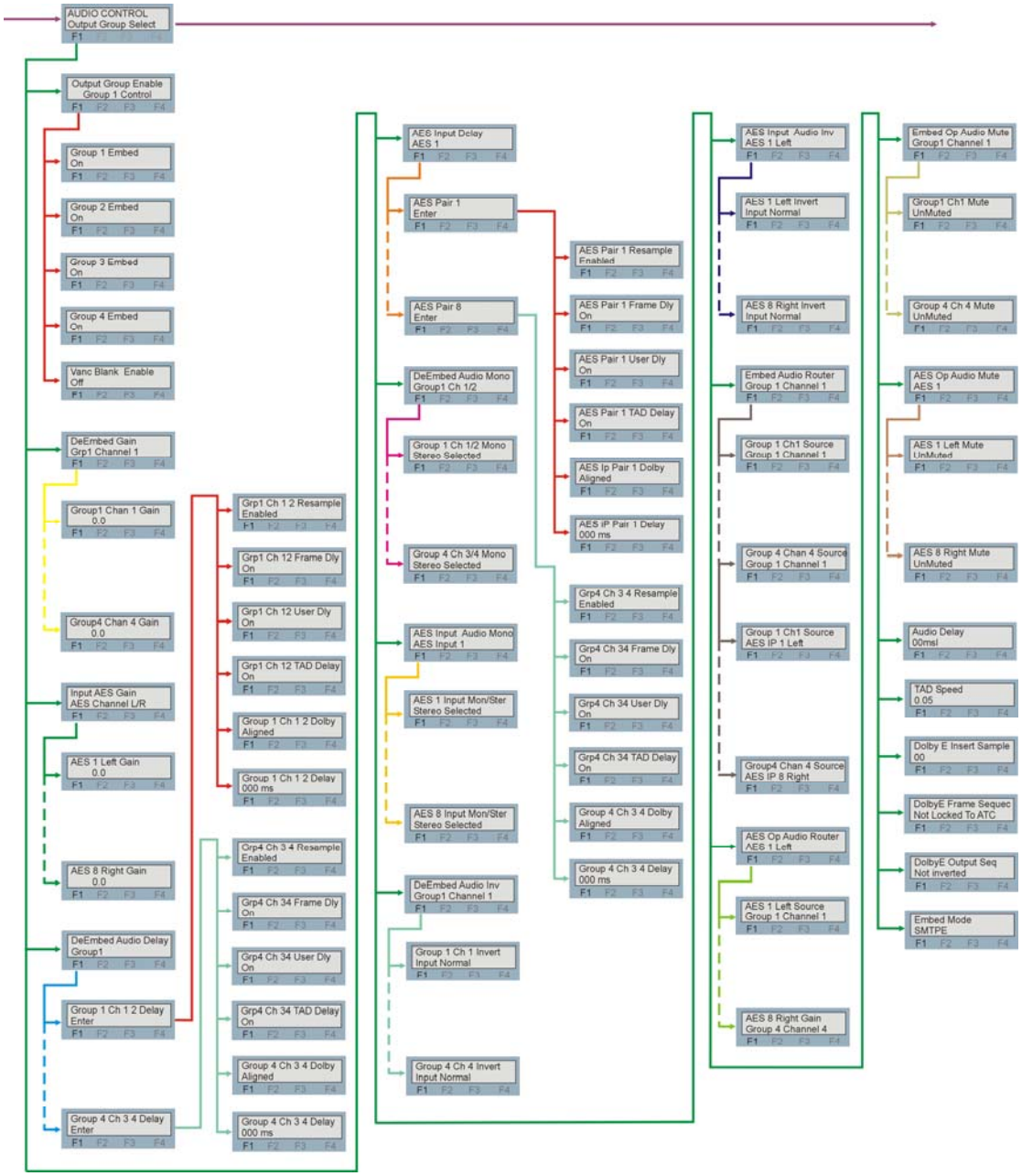
- Dolby E insertion line
- Dolby E alignment

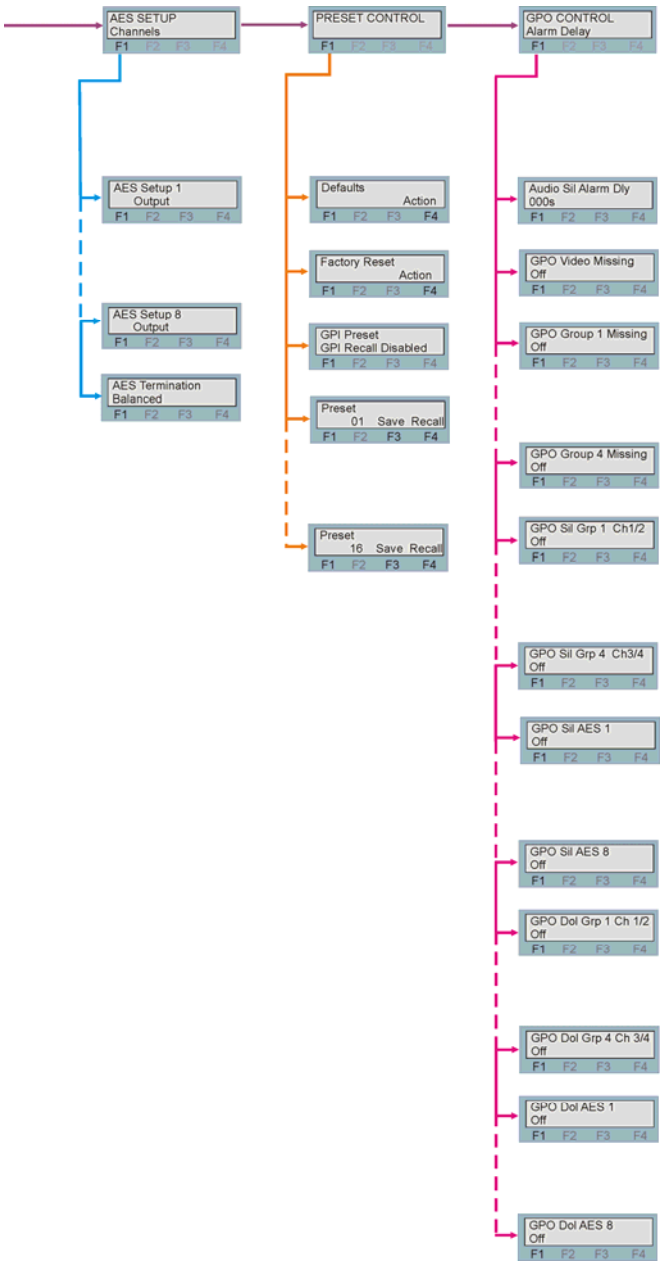
- AES Setup
- Preset Control
- GPO Control

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 SYNNER-E 3G menus. The actual menus available may vary slightly as software is updated.

Active control panel menus




AUDIO CONTROL
Output Group Select
Output Group Enable
Group 1 Control
Group 1 Embed
On
Group 2 Embed
On
Group 3 Embed
On
Group 4 Embed
On
Vanc Blank Enable
Off
DeEmbed Gain
Grp1 Channel 1
Group1 Chan 1 Gain
0.0
Group4 Chan 4 Gain
0.0
Input AES Gain
AES Channel L/R
AES 1 Left Gain
0.0
AES 8 Right Gain
0.0
DeEmbed Audio Delay
Group1
Group 1 Ch 1 2 Delay
Enter
Group 4 Ch 3 4 Delay
Enter
Grp1 Ch 1 2 Resample
Enabled
Grp1 Ch 12 Frame Dly
On
Grp1 Ch 12 User Dly
On
Grp1 Ch 12 TAD Delay
On
Group 1 Ch 1 2 Dolby
Aligned
Group 1 Ch 1 2 Delay
000 ms
Grp4 Ch 3 4 Resample
Enabled
Grp4 Ch 34 Frame Dly
On
Grp4 Ch 34 User Dly
On
Grp4 Ch 34 TAD Delay
On
Group 4 Ch 3 4 Dolby
Aligned
Group 4 Ch 3 4 Delay
000 ms
AES Input Delay
AES 1
AES Pair 1
Enter
AES Pair 8
Enter
DeEmbed Audio Mono
Group1 Ch 1/2
Group 1 Ch 1/2 Mono
Stereo Selected
Group 4 Ch 3/4 Mono
Stereo Selected
AES Input Audio Mono
AES Input 1
AES 1 Input Mon/Ster
Stereo Selected
AES 8 Input Mon/Ster
Stereo Selected
DeEmbed Audio Inv
Group1 Channel 1
Group 1 Ch 1 Invert
Input Normal
Group 4 Ch 4 Invert
Input Normal
AES Pair 1 Resample
Enabled
AES Pair 1 Frame Dly
On
AES Pair 1 User Dly
On
AES Pair 1 TAD Delay
On
AES Ip Pair 1 Dolby
Aligned
AES iP Pair 1 Delay
000 ms
Grp4 Ch 3 4 Resample
Enabled
Grp4 Ch 34 Frame Dly
On
Grp4 Ch 34 User Dly
On
Grp4 Ch 34 TAD Delay
On
Group 4 Ch 3 4 Dolby
Aligned
Group 4 Ch 3 4 Delay
000 ms
AES Input Audio Inv
AES 1 Left
AES 1 Left Invert
Input Normal
AES 8 Right Invert
Input Normal
Embed Audio Router
Group 1 Channel 1
Group 1 Ch1 Source
Group 1 Channel 1
Group 4 Chan 4 Source
Group 1 Channel 1
Group 1 Ch1 Source
AES IP 1 Left
Group4 Chan 4 Source
AES IP 8 Right
AES Op Audio Router
AES 1 Left
AES 1 Left Source
Group 1 Channel 1
AES 8 Right Gain
Group 4 Channel 4
Embed Op Audio Mute
Group1 Channel 1
Group1 Ch1 Mute
UnMuted
Group 4 Ch 4 Mute
UnMuted
AES Op Audio Mute
AES 1
AES 1 Left Mute
UnMuted
AES 8 Right Mute
UnMuted
Audio Delay
00msl
TAD Speed
0 05
Dolby E Insert Sample
00
DolbyE Frame Sequec
Not Locked To ATC
DolbyE Output Seq
Not inverted
Embed Mode
SMTPE



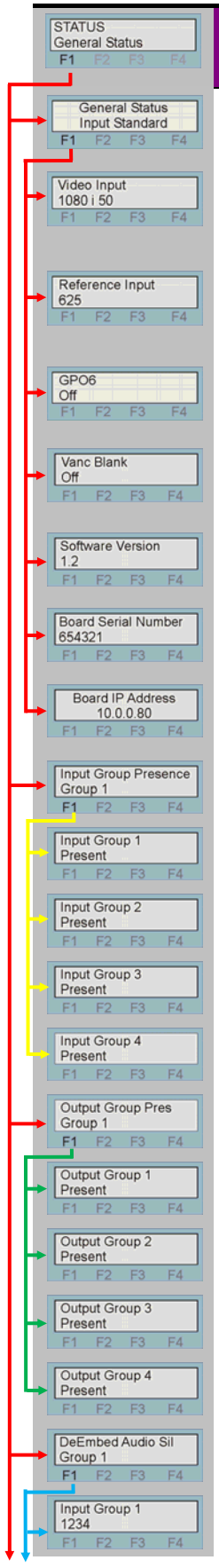
Note: Function key LEDs are illuminated when active.

The Status menu

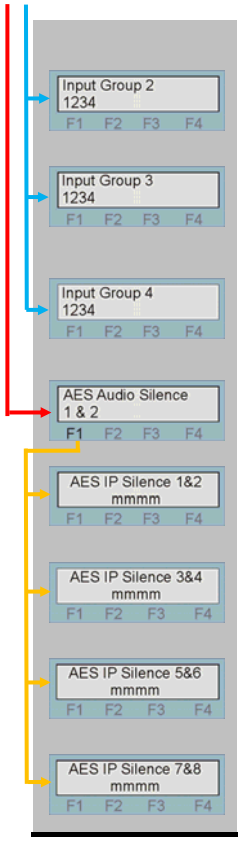
From the STATUS top menu press F1 then SCROLL/ADJ to access the five status sub menu options. These options are; General Status, Input Groups present, Output Groups present, DeEmbedded Audio silence and AES Audio silence. To enter a sub menu once selected press F1, then use the SCROLL/ADJ/ADJ control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



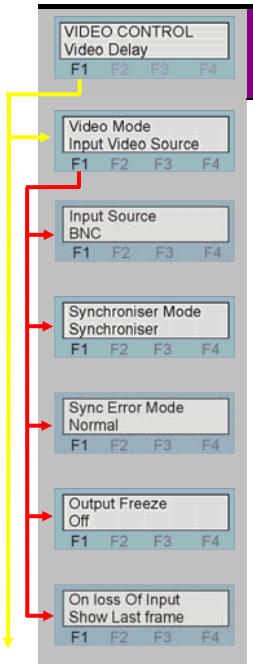
Menu	Description
General Status	Rotate the shaft control and press F1.
Input present	Rotate the shaft control to view the Input video standard is shown. ***Ip 1080p50/59/60, Ip 1080p50/59/60, Ip720p50/59/60, Ip 525, Ip 625, IP Missing, IP Not Supported.***
External reference input	Rotate the shaft control to view the external reference video standard present. ***1080p50/59/60, 1080p50/59/60,720p50/59/60, 525, 625, Missing, Not Supported.***
GPO 6 status	Rotate the shaft control to view the GPO 6 status. ***On, Off.***
VANC blanking	Rotate the shaft control to view the vertical ancillary data blanking status. ***On, Off.***
Board software	Rotate the shaft control to view currently installed software version
Serial number	Rotate the shaft control to view the electronically stored PCB serial number
IP address	Rotate the shaft control to view the SYNNER-E 3G IP address. Note, the Ethernet connection is available on-board and is only used when updating the board software.
Input Groups	Rotate the shaft control and press F1.
Input Group 1 audio	Rotate the shaft control to view the input audio group 1 status ***Present, Missing.***
Input Group 2 audio	Rotate the shaft control to view the input audio group 2 status ***Present, Missing.***
Input Group 3 audio	Rotate the shaft control to view the input audio group 3 status ***Present, Missing.***
Input Group 4 audio	Rotate the shaft control to view the input audio group 4 status ***Present, Missing.***
Output Groups	Rotate the shaft control and press F1.
Output Group 1 audio	Rotate the shaft control to view the output audio group 1 status ***Present, Missing.***
Output Group 2 audio	Rotate the shaft control to view the output audio group 2 status ***Present, Missing***
Output Group 3 audio	Rotate the shaft control to view the output audio group 3 status ***Present, Missing***
Output Group 4 audio	Rotate the shaft control to view the output audio group 4 status ***Present, Missing***
De-embedder audio silence	Rotate the shaft control and press F1.
De-embedder Group 1 audio	Rotate the shaft control to view de-embedder group 1 channel status. ***1234***=channel not silent, ***s=silent***, ***m***=missing, ***dd***= Dolby E



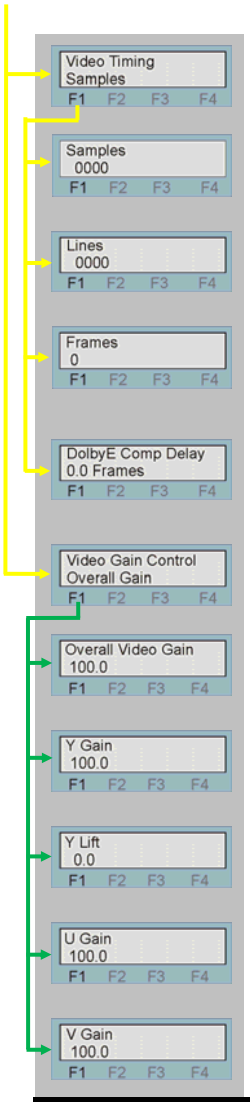
channel silence	present.
De-embedder Group 2 audio channel silence	Rotate the shaft control to view de-embedder group 2 channel status. ***1234***=channel not silent, ***s=silent***, ***m***=missing, ***dd***= Dolby E present.
De-embedder Group 3 audio channel silence	Rotate the shaft control to view 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.***
Mode selection	Rotate the shaft control to view the mode selection. Press F1 and rotate the shaft control to select. ***Synchroniser, Delay.***
Synchroniser override	Rotate the shaft control to view the synchroniser override. Press F1 and rotate the shaft control to select. ***Normal, Over Ride.***
Output freeze	Rotate the shaft control to view the output freeze selection. Press F1 and rotate the shaft control to select. ***Off, Frame, Black Matte, Blue Matte.***
On loss of input	Rotate the shaft control to view the On loss of input selection. Press F1 and rotate the shaft control to select. ***Last Frame, Show Black, Show Blue, Delay Then Black, Delay Then Blue.***



Video Timing	Rotate the shaft control and press F1.
Video delay	Rotate the shaft control to view the video timing in samples. Press F1 and rotate the shaft control to adjust. ***0, 2640.***
Video delay	Rotate the shaft control to view the video timing in lines. Press F1 and rotate the shaft control to adjust. ***0, 1125.***
Video delay	Rotate the shaft control to view the video timing in frames. Press F1 and rotate the shaft control to adjust. ***0, 1.0, 2.0.***
Dolby E compensation delay	Rotate the shaft control to view the Dolby E compensation delay in frames. Press F1 and rotate the shaft control to adjust. ***0, 0.5.***
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	Rotate the shaft control to view the Y component lift. Press F1 and rotate the shaft control to adjust. ***±10%.***
U component gain	Rotate the shaft control to view the U component gain. Press F1 and rotate the shaft control to adjust. ***0-200%.***
V component gain	Rotate the shaft control to view the V component gain. Press F1 and rotate the shaft control to adjust. ***0-200%.***

Input mode

The SYNNER-E 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.

Mode selection

Setting the mode to synchroniser will lock the output to the incoming external reference to compensate for timing delays within the video system. Selected Delay mode make the SYNNER-E 3G become a fixed delay line.

Should the input signal go away the output will freeze. The ‘On loss of input’ control allows the user to select the frozen output. The selection is; Last Frame, Black, Blue, or after a delay of 2 seconds Delay Then Black, Delay Then Blue.

Sync override will force the SYNNER-E 3G into delay mode when the external sync is incorrect.

Output freeze when selected will cause the output to freeze and show the selected pattern. These are selectable from the following list; the last frame shown, Black Matte or Blue Matte.

Video timing controls

In delay mode the video delay is a straight forward fixed bulk video delay that can be adjusted in samples, lines and whole-frame steps up to a maximum of 3.5 video frames.

When switched to synchroniser mode the initial delay will vary between 0-1 frame depending on the timing between the input video and external reference. Further fixed delays can then be added for matching purposes.

The Dolby E compensation delay allows a further 0.5 frame delay to be added to the video delay to ensure correct Dolby E alignment. Along with an increase in the video delay the PCM audio delay will also be further delayed by a similar amount allowing the user to avoid a potential problem with aligning Dolby E.

Note: For the relevant progressive video standards two video frames are the length of one interlaced frame. The sample and line control will only make adjustments of one frame of either progressive or interlaced video.

Video gains

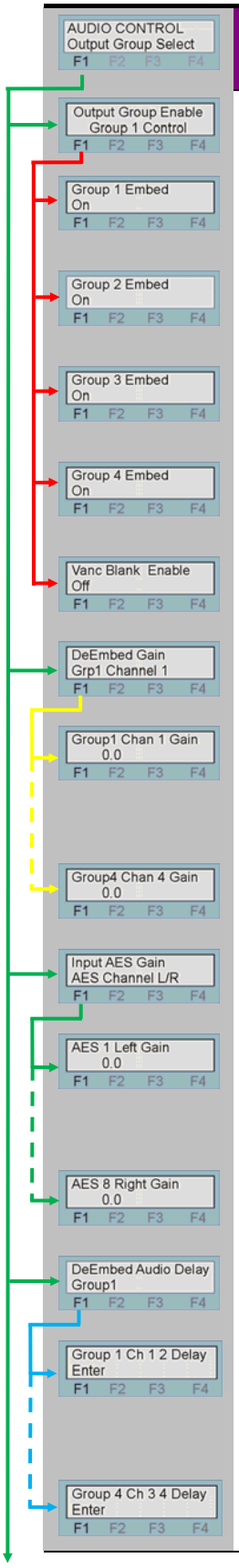
The video proc-amp allows adjustment of video gain, black level and independent YUV gains. The maximum increase in overall gain allowed is 200%, should any combination of controls be set where this maximum would be exceeded the gain will be limited to 200%

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.

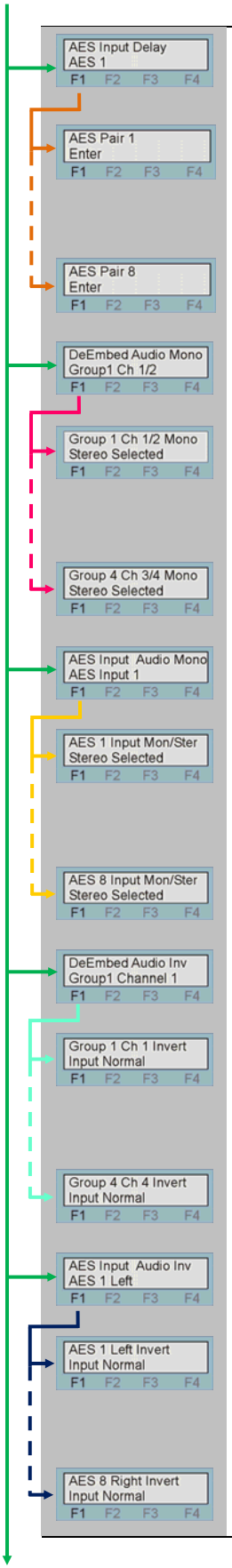
Audio controls

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.

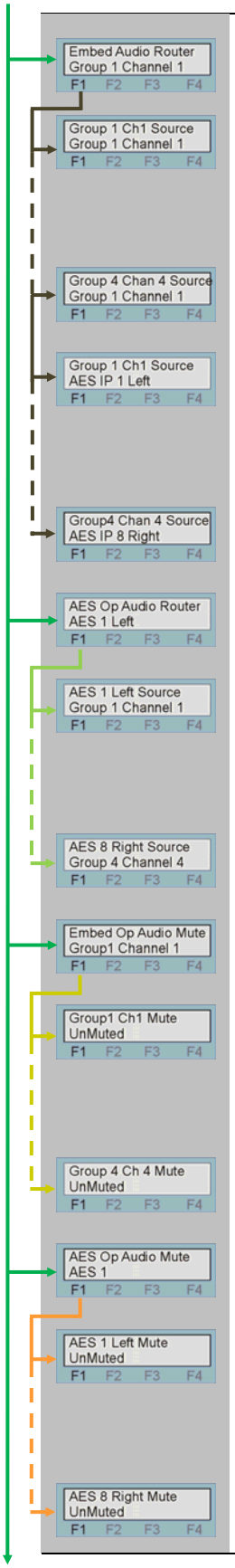
The audio control menu contains all of the De-embedder, Embedder gain and routing controls.



Menu	Description
Output Audio Group Enable	Rotate the shaft control and press F1.
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.***
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.***
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.***
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.***
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.***
De-embedder gain controls	Rotate the shaft control and press F1.
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.***
De-embedder gain Group 4 channel 4	
Input AES gain controls	Rotate the shaft control and press F1.
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 input channel 8R gain	
De-embedder delay	Rotate the shaft control and press F1.
De-embedder Group 1 delay	Rotate the shaft control to show the De-embedder Group delay controls. *Group 1channel 12 to Group 4 channel 34.* Press ENTER and rotate SCROLL/ADJ. to select. ***Resampler, Frame, User, TAD, Dolby E alignment, Total Delay.*** Press ENTER and adjust as necessary.
De-embedder Group 4 delay	



AES input delay	Rotate the shaft control and press F1.
AES1 input pair delay AES8 input pair delay	Rotate the shaft control to show the AES input delay controls. AES pair 1 to AES pair 8. Press ENTER and rotate SCROLL/ADJ. to select. ***Resampler, Frame, User, TAD, Dolby E alignment, Total Delay.*** Press ENTER and adjust as necessary.
De-embedder Mono/Stereo	Rotate the shaft control and press F1.
De-embedder Grp 1 Chl 1-2 Mono/Stereo De-embedder Grp 4 Chl 3-4 Mono/Stereo	Rotate the shaft control to show the de-embedder input pair mono/stereo controls. ***Group 1 channel 1-2 to Group 4 channel 3-4.*** Press F1 and rotate the shaft control to select. ***Mono, Stereo.***
AES input Mono/Stereo	Rotate the shaft control and press F1.
AES1 Mono/Stereo AES8 Mono/Stereo	Rotate the shaft control to show the individual AES input pair mono/stereo controls. ***AES1 to AES8.*** Press F1 and rotate the shaft control to select. ***Mono, Stereo.***
De-embedder channel invert	Rotate the shaft control and press F1.
De-embedder Grp 1 Chl 1 invert De-embedder Grp 4 Chl 4 invert	Rotate the shaft control to show the individual de-embedder invert controls. ***Group 1 Channel 1 to Group 4 Channel 4.*** Press F1 and rotate the shaft control to select. ***Invert, Not Invert.***
AES input channel invert	Rotate the shaft control and press F1.
AES input channel 1L invert AES input channel 8R invert	Rotate the shaft control to show the individual AES input invert controls. ***1L, 1R to 8L, 8R.*** Press F1 and rotate the shaft control to select. ***Invert, Not Invert.***



Embedder output Routing

Rotate the shaft control and press F1.

De-embedder to embedder routing

De-embedder to embedder routing

Rotate the shaft control to show the output embedders router controls. ***Group 1 Channel 1 to Group 4 Channel 4.***
Press F1 and rotate the shaft control to select group and channel.
Press F1 and rotate the shaft control to select routing source.

AES input to embedder routing

AES input to embedder routing

AES Output Router

Rotate the shaft control and press F1.

De-embedder to AES 1L routing

De-embedder to AES 8R routing

Rotate the shaft control to show the AES output router controls. ***1L, 1R to 8L, 8R.***
Press F1 and rotate the shaft control to select group and channel.
Press F1 and rotate the shaft control to select routing source

Embedder output mute

Rotate the shaft control and press F1.

Embedder mute control Gp1 Ch1

Embedder mute control Gp4 Ch4

Rotate the shaft control to show the individual embedder mute controls. ***Group 1 Channel 1 to Group 4 Channel 4.***
Press F1 and rotate the shaft control to select.
Muted, Un-muted.

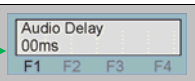
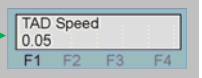
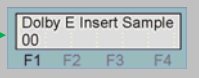
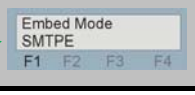
AES output mute

Rotate the shaft control and press F1.

AES mute control Ch1L

AES mute control Ch8R

Rotate the shaft control to show the individual AES output mute controls. ***1L, 1R to 8L, 8R.***
Press F1 and rotate the shaft control select.
Muted, Un-muted.

	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.***
	Tracking audio speed	Rotate the shaft control to show the tracking audio delay speed. Press F1 and rotate the shaft control to select. ***0.05%, 0.1%, 0.2%, 0.4%, 0,8%.***
	Dolby E insertion sample	Rotate the shaft control to show the Dolby insertion menu. Press F1 and rotate the shaft control to select. ***-10 to 40 Samples.***
	Output frame sequence	Rotate the shaft control to show the . Press F1 and rotate the shaft control to select. ***Not Locked To ATC. Locked To ATC***
	Invert output frame sequence	Rotate the shaft control to show the Dolby alignment menu. Press ENTER and rotate SCROLL/ADJ. to select. ***Not inverted, Inverted.***
	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 ± 18dB of gain relative to the input level up to the point where digital clipping will occur.

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 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. See the delays discussion in the introduction for details of how these various delays interact with each other. 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, TAD (tracking audio delay) to ensure the audio follows the output video timing, and Dolby E alignment to ensure the correct positioning of the guardband.

Finally, an indication of the total delay is given. The inclusion of tracking audio delay will make the indicated total delay vary as the input video timing and external reference change with respect to each other, as the board edge does not continuously update it will be necessary to refresh the display by pressing the ENTER button to give a correct length of delay.

Resamplers

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.

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 SYNNER-E 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.

Tracking audio delay speed

This sets the time the audio delay takes to track fast or abrupt changes in video delay, when video tracking is on. The faster the rate of change, the quicker the audio delay will match changes in video delay so minimising lip sync errors, but at the expense of a matching change of musical pitch.

Refer to the Introduction chapter for more help with TAD speed settings for different applications.

Frame sequence

A useful feature of the SYNNER-E 3G is its ability to take incoming ancillary data time code and use it to determine the field sequence of a High Definition progressive video input. This is very useful to ensure that Dolby E has its guardband correctly positioned.

Another useful feature is the Invert output sequence; this allows the output sequence to be swapped when using black and burst as an external reference for a progressive video input.

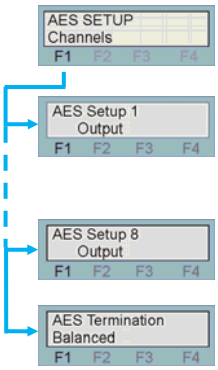
Note: The ATC lock control is only active when a progressive video input is present. When disabled the field sequence of the interlaced output will free-wheel.

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.



Menu	Comment
AES1 Configuration	Rotate the shaft control to show the individual AES I/O controls. ***AES1 to AES8.*** Press F1 and rotate the shaft control to select. ***Terminated, Hi Z, Output.***
AES8 Configuration	
AES termination	Rotate the shaft control to show the AES I/O termination control. Press F1 and rotate the shaft control to select. ***Balanced, Unbalanced.***

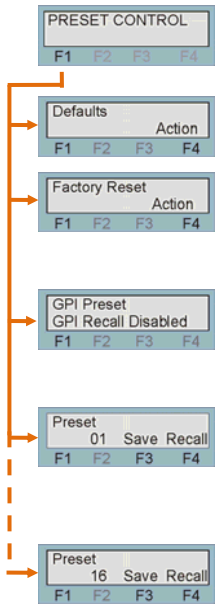
Note: The AES format control acts globally on all AES inputs and outputs.

AES format

SYNNER-E 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.



Menu	Comment
Factory defaults	Rotate the shaft control to show the defaults menu. Press F1 to select and press F4 to action.
Factory reset	Rotate the shaft control to show the factory reset menu. Press F1 to select and press F4 to action.
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 location 1 Preset location 16	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 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.
When pasting a board setup from Statesman, GPI enable will be set to disabled.

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 over-written 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
Mode	Synchroniser
Output Freeze	Off
Video input select	BNC
On loss of input show	Last Frame
Video delay controls	0
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Tracking speed	0.05%
AES Setup	Terminated and Balanced inputs
Lock to ATC input	Free running
Invert output sequence	Normal
De-embedded Input Audio	Mono, Invert un-selected, Resample selected
AES Input Audio	Mono, Invert un-selected, Resample selected
Audio delay	Frame, User and TAD delays selected
Dolby E delay	Alignment selected
User delay	0
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

GPO Alarms menu

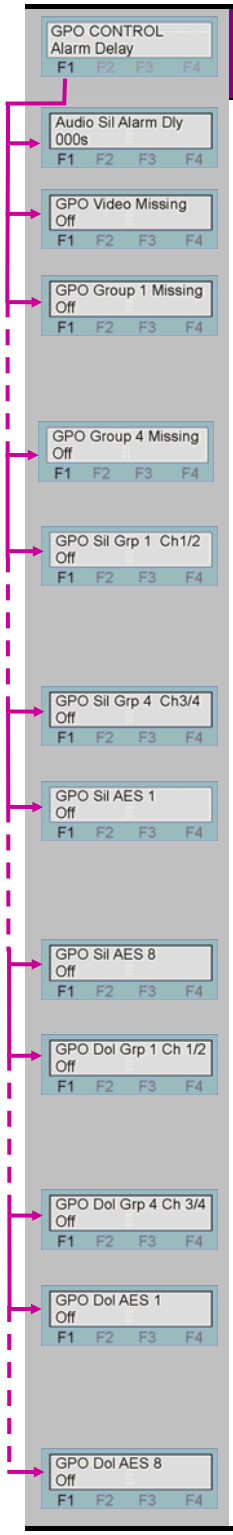
The GPO6 output is reserved for alarm indication and may have assigned any of the 38 video and audio alarms.

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.



Menu	Description
Silence delay	Rotate the shaft control to show the silence delay control. Press F1 and rotate the shaft control to vary. ***0-128 seconds.***
Input video present	Rotate the shaft control to show the video missing menu. Press F1 and rotate the shaft control to select. ***On, Off.***
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.***
Input audio group 4 missing	
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.***
De-embedder Grp4 Ch3-4 silent	
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.***
AES8 input silent	
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***
Dolby E on de-embedder Gp4 Ch3-4 silent	
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.***
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

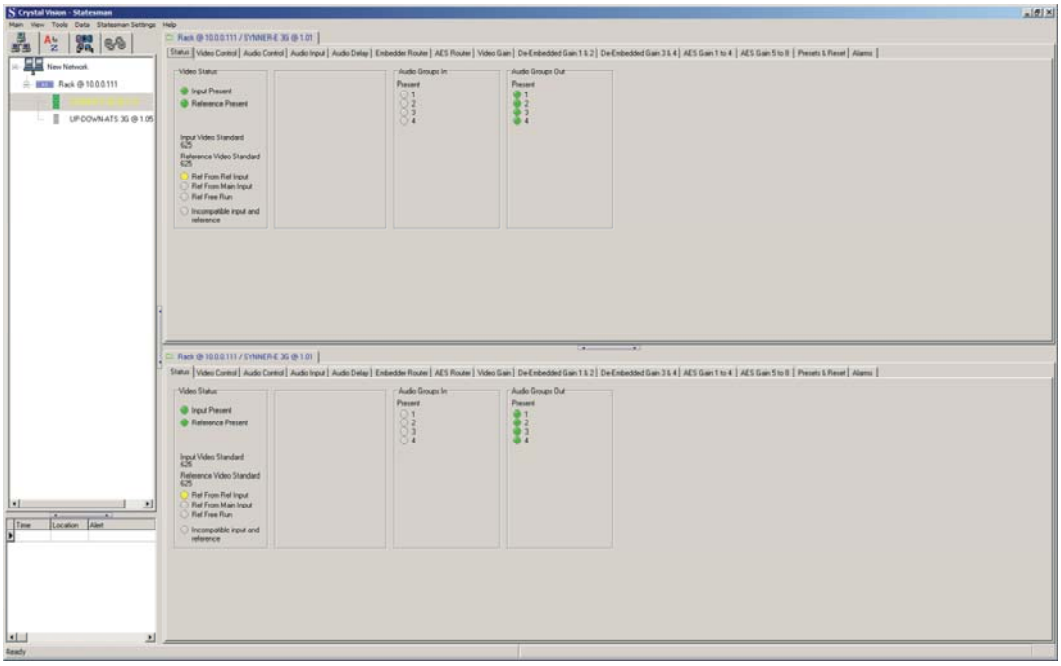
5.1 Statesman introduction

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

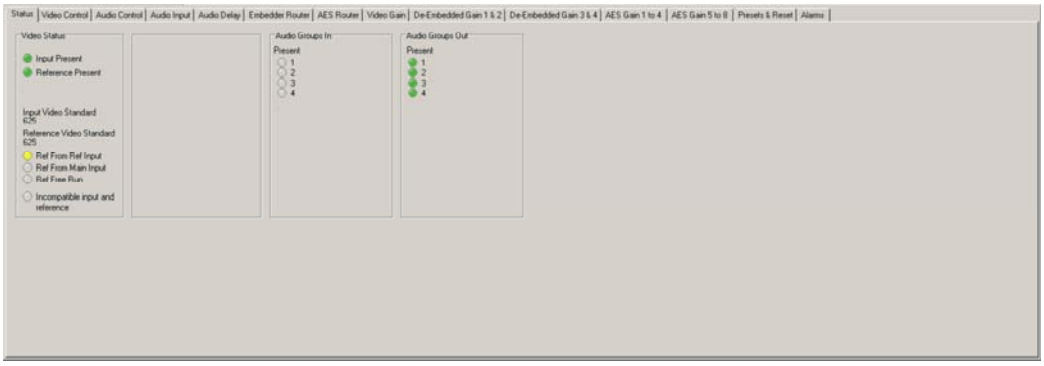
The two large control panes shown in the upper and lower halves of the window may display different menus for the same card, or controls for different cards. Click on the horizontal button-bar between the two panes to close the lower pane or drag the button to vary the size of the panes.

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

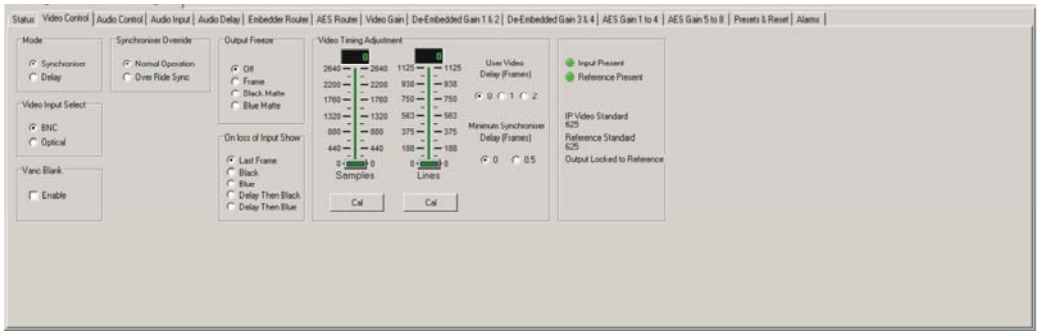
Input Video and audio status

Input present and external reference 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 and external reference 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.

Video Control

The video control tab contains the various controls associated with the board mode and video timing. Basic status information is also repeated here.



Video controls

Video Input select

The SYNNER-E 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.

Mode selection

Setting the mode to synchroniser will lock the output to the incoming external reference to compensate for timing delays within the video system. Selecting Delay mode makes the SYNNER-E 3G become a fixed delay line.

Should the input signal go away the output will be frozen. The 'On loss of input' control allows the user to select the frozen output. The selection is; Last Frame, Black, Blue, or after a delay of 2 seconds - Delay Then Black, Delay Then Blue.

Output freeze when selected will cause the output to freeze and show the selected pattern. These are selectable from the following list; the last frame shown, Black Matte or Blue Matte.

Sync override will force the SYNNER-E 3G into delay mode when the external sync is incorrect.

Video timing controls

In delay mode the video delay is a straight forward fixed bulk video delay that can be adjusted in samples, lines and whole-frame steps up to a maximum of 3.5 video frames.

When switched to synchroniser mode the initial delay will vary between 0-1 frame depending on the timing between the input video and external reference. Further fixed delays can then be added for matching purposes.

The Minimum synchronisation or Dolby E compensation delay allows a further 0.5 frame delay to be added to the video delay to ensure correct Dolby E alignment. Along with an increase in the video delay the PCM audio delay will also be further delayed by a similar amount allowing the user to avoid a potential problem with aligning Dolby E.

Note: For the relevant progressive video standards two video frames are the length of one interlaced frame. The sample and line control will only make adjustments of one frame of either progressive or interlaced video.

Audio controls

The audio controls tab contains the audio configuration controls. The eight external audio I/O can be selected individually to be either an input or output and have their termination type and impedance assigned. Tracking audio delay speed is also assigned in this tab.

Audio controls 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.

AES setup

SYNNER-E 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.

Tracking audio delay speed

This sets the time the audio delay takes to track fast or abrupt changes in video delay, when video tracking is on. The faster the rate of change, the quicker the audio delay will match changes in video delay so minimising lip sync errors, but at the expense of a matching change of musical pitch.

Refer to the Introduction chapter for more help with TAD speed settings for different applications.

Frame sequence

A useful feature of the SYNNER-E 3G is its ability to take incoming ancillary data time code and use it to determine the field sequence of a High Definition progressive video input. This is very useful to ensure that Dolby E has its guardband correctly positioned.

Another useful feature is the Invert output sequence; this allows the output sequence to be swapped when using black and burst as an external reference for a progressive video input.

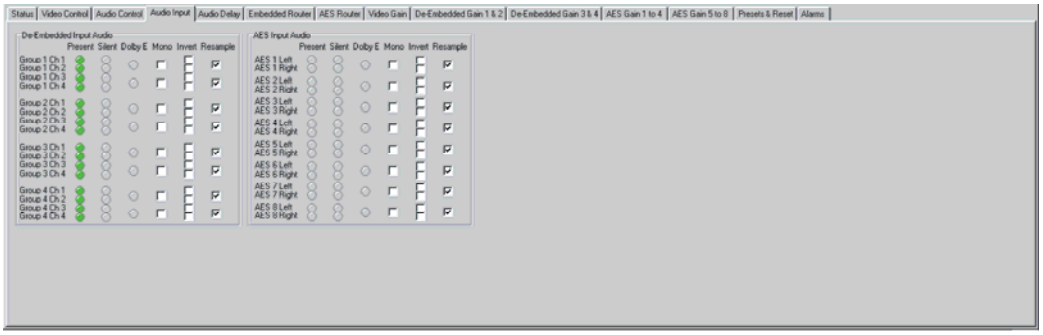
Note: The ATC lock control is only active when a progressive video input is present. When disabled the field sequence of the interlaced output will free-wheel.

Embedder pattern

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

Audio input control

The audio input 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 input

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.

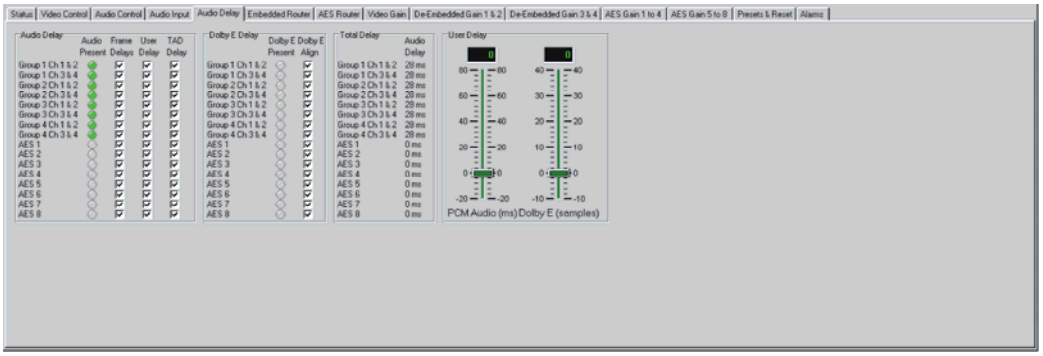
Note: When routing Dolby E, to ensure integrity of the audio any Dolby E stream must be treated as a stereo pair and no audio processing such as mute, mono and gain is applied.

Resamplers

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. Please note that the total delay is the sum of the fixed delays plus the variable tracking delay which will make this combined value change as the video input timing varies against the external reference.



Audio input

Audio delay

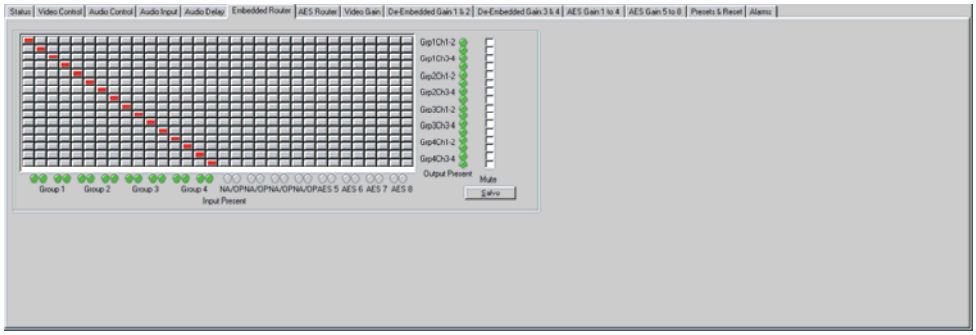
Each de-embedder and AES input stereo pair has a set of controls to enable the various delays. These controls in combination with the video delay controls can be used to delay the audio with respect to the video and compensate for any small delay between the incoming video and audio signals, or when bypassed delay the video with respect to the audio by up to several video lines. See the delays discussion in the introduction for details of how these various delays interact with each other. 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, TAD (tracking audio delay) to ensure the audio follows the output video timing, and Dolby E alignment to ensure the correct positioning of the guardband.

Finally, an indication of the total delay is given. The inclusion of tracking audio delay will make the indicated total delay vary as the input video timing and external reference change with respect to each other.

Routing

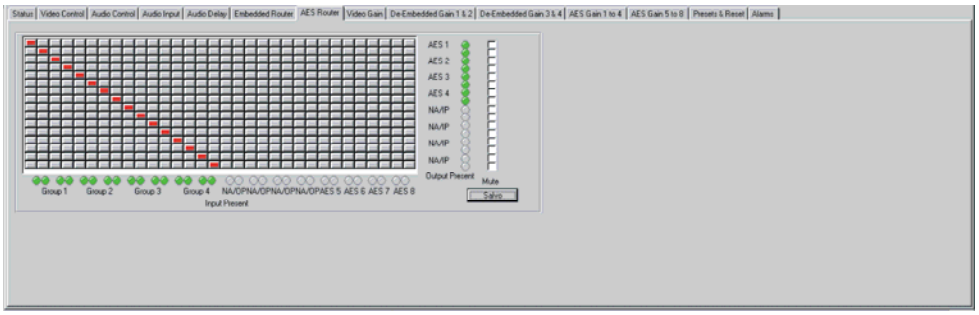
At the heart of SYNNER-E 3G is the twin 32 input/16 output routing matrix. This will allow any of the up to 32 possible inputs, 16 embedded channels and up to eight stereo AES audio inputs to be routed to any of the 16 outputs for embedding or up to eight stereo AES outputs. The AES channels can be configured 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



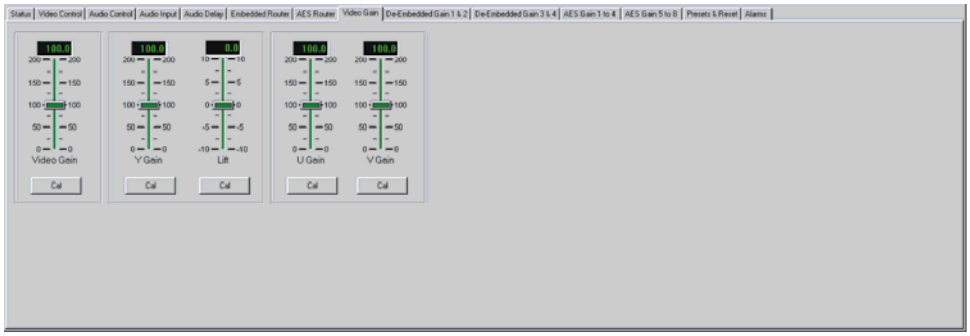
AES output router

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 tick-box.

Video gain controls

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



YUV lift and gain controls

Video gains

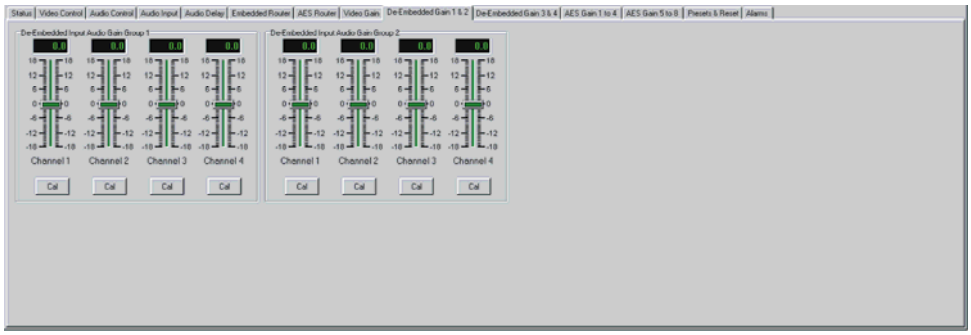
The video proc-amp allows adjustment of video gain, black level and independent YUV gains. The maximum increase in overall gain allowed is 200%, should any combination of controls be set where this maximum would be exceeded the gain will be limited to 200%

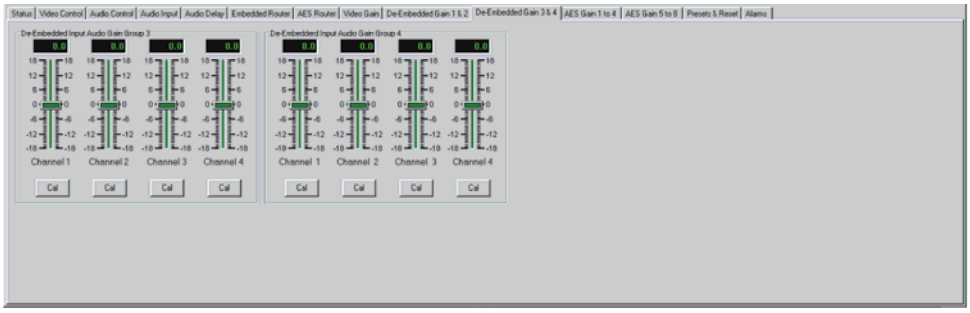
Note: It is possible to set the gain control so that their combined indicated gain will exceed 200%. In these circumstances the indicated values will not be valid.

Audio gain controls

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 ± 18dB of gain relative to the input level up to the point where digital clipping will occur.

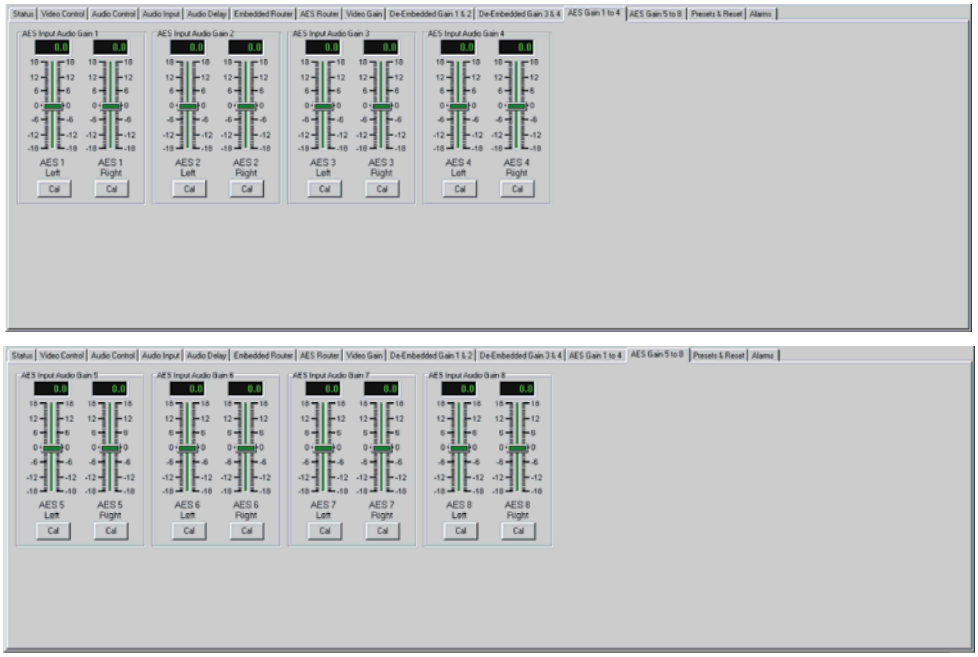
De-embedder gain controls





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 over-written by the new setting data.
When pasting a board setup from Statesman, GPI enable will be set to disabled.

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
Mode	Synchroniser
Output Freeze	Off
Video input select	BNC
On loss of input show	Last Frame
Video delay controls	0
Output Audio Groups	Enabled
VANC Blank	Un-blanked
Tracking speed	0.05%
AES Setup	Terminated and Balanced inputs
Lock to ATC input	Free running
Invert output sequence	Normal
De-embedded Input Audio	Mono, Invert un-selected, Resample selected
AES Input Audio	Mono, Invert un-selected, Resample selected
Audio delay	Frame, User and TAD delays selected
Dolby E delay	Alignment selected
User delay	0
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

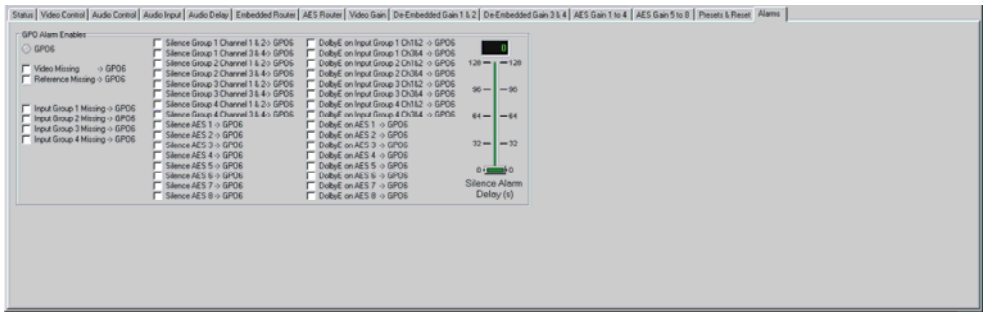
The GPO6 output is reserved for alarm indication and may have assigned any of the 38 video and audio alarms.

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 time 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.

SYNNER-E 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	Valid reference input present	
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	SYNNER-E 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 8281 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, SMPTE 299M, or 'Sony'
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
RM58	Optical output with 110 ohm balanced audio on a high density D-Type
RM59	Optical input with one video output and 110 ohm balanced audio on a high density D-Type

RM61	Two video outputs with 75 ohm unbalanced audio on BNCs and an optical I/O
RM62	Two video outputs and an optical I/O (no external audio connection)
RM70	Optical input and output, sync loop-though with two video output and 110 ohm balanced audio on a high density D-Type
Audio Delay	Tracking audio delay following the synchroniser video delay. Adjustable audio delay of up to 80ms on each channel. Delay is either on or off for any given channel
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

GPI inputs

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

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

Input fail output

Type:	Last Frame, Show Black, Show Blue, Delay Then Black, Delay Then Blue.

Control

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