Safe Switch 3G

Clean and intelligent 3Gb/s, HD and SD 2 x 2 switch

Crystal Vision

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Contents

Revision 1	Output video standard explanation amended. Pages 18, 33 & 43.	18-08-11
Revision 2	Independent fault selection on either input added. Switch on frozen or missing ATC added. Up to 25 frames of video delay added to each input. SW2.04.	19-04-13
Revision 3	Combined 3G and L-3G manuals. Added VisionWeb info and moved Statesman info to Appendix.	04-02-15
Revision 4	Added note about removal of card edge control in 2018.	11-07-19

1 Introduction

Safe Switch 3G is a video switch that is available in two versions: ***Safe Switch 3G*** and ***Safe Switch-L 3G***. Both versions provide clean and intelligent 2 x 2 switching between two 3Gb/s, HD or SD sources. The framestore synchronisers, one on each input, plus the ability to delay the earliest arriving input by up to 25 frames, means that Safe Switch 3G can correct for any timing difference (big or small) between the two inputs resulting in no disruption to the output picture when a switch takes place. Ideal for planned maintenance, switches to manually re-route a good signal around broken equipment, it can also be used as an intelligent emergency transmission switch by engineers who do not want to restrict themselves to timed inputs, with the option of selecting from 18 different fault conditions to automatically trigger the switch.

Safe Switch 3G can either be switched manually or automatically. Manual switching takes place according to the setting of the switch timing control, while automatic switching will occur at the switching point given in SMPTE RP168:2009 when the switch timing is set to 'Field' or 'Frame', or immediately if triggered by the input missing or input video standard fault conditions. Being a symmetrical switch means the user can select his preferred input by means of a 2 x 2 routing grid, rather than having pre-assigned main and secondary feeds.

The synchroniser in each input stream will ensure that both inputs to the switch are correctly timed to the external analogue reference so that there is no disruption during a switch. The synchronisers act as a self-adjusting delay, allowing a clean transition between the two channels even if their relative timing has slipped. It is easy to compensate for mistimed sources elsewhere in the system by adjusting the output timing relative to the reference through an entire frame using horizontal and vertical settings. Safe Switch 3G will lock a 3Gb/s, HD or SD input using either HD tri-level syncs or SD Black and Burst – allowing the convenient use of any existing timing signals. As well as correcting for input timing the earliest input can be delayed by up to 25 frames to allow for different processing delays in the two signal paths.

Safe Switch 3G can extract its output timing from any of the three available sources; these being the external reference which always takes precedence, input 1, and input 2. Should at any time the external reference become lost, input 1 will become the timing source – followed by input 2 should input 1 go away or become unusable. To prevent a picture disturbance on the return of a reliable reference Safe Switch 3G's output timing will drift back into lock over a period of time. This time period to lock will depend on the difference between the external timing and the output timing; if markedly different this period can be as long as several seconds to minutes. If all reference sources become unusable then the Safe Switch 3G will enter a free running mode. On regaining a reference source a lock will be reacquired but without the guarantee of timing coinciding. To force the timing between the reference and the output to coincide, the lock must be reset at the expense of a likely picture disturbance. Appendix A contains a state diagram showing the relationships of the various timing sources.

Safe Switch 3G can be set to automatically switch away from the user-selected input if it does not meet the set requirements. It extracts information about various parts of the video signal to decide which of the two inputs is better, based on the engineer's selection of which faults are significant. The 18 video and audio parameters which can be selected to perform a switch – and which are listed in order of priority – are input missing, input video standard incorrect, EDH missing, EDH full field error, EDH active picture error, line CRC error, audio group 1 missing, audio group 2 missing, audio group 3 missing, audio group 4 missing, active video black, Ancillary Timecode missing, Ancillary Timecode frozen, active video frozen (including processed frozen

picture detection) and audio silence on any channel in a selected group. Further flexibility comes from the option to set a time period of between two and 120 seconds before the video black, Ancillary Timecode frozen, video frozen and audio silence parameters trigger a switch. Safe Switch 3G will switch away from an error on the user-selected input only if the other input is free of that fault, while should both inputs have different alarms set it will work to the most significant feature to decide which feed to select.

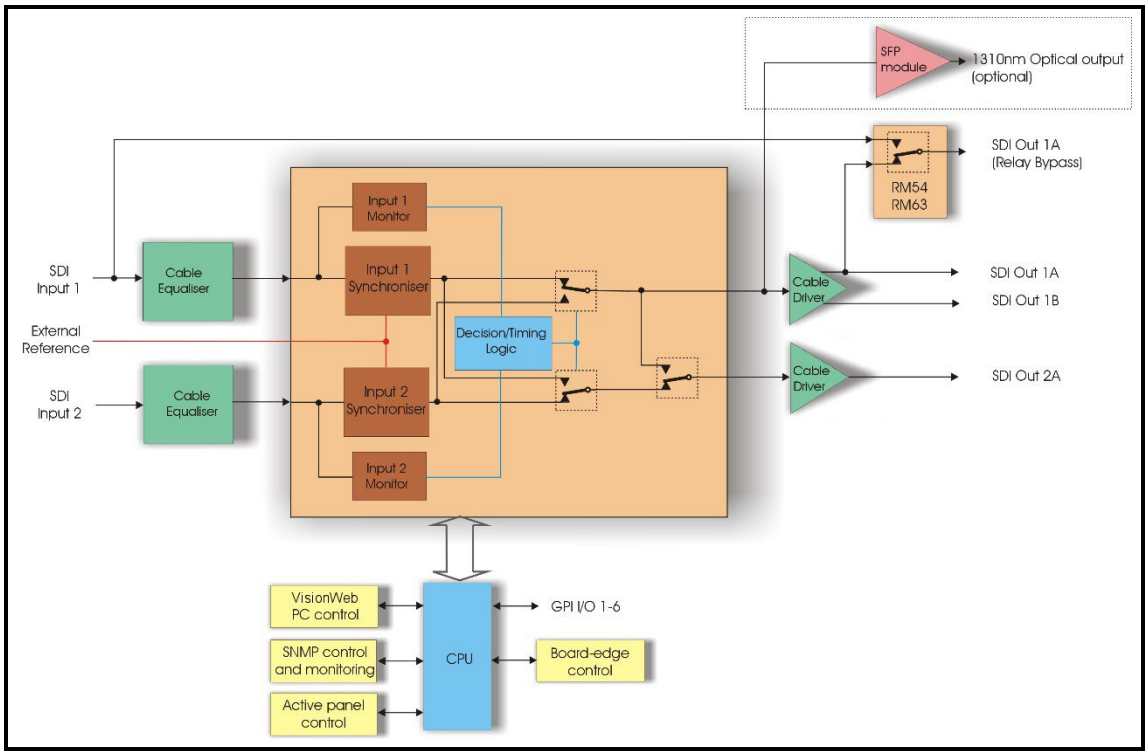
The user can decide what constitutes a fault separately for each input – specifying what he cares about on each signal with the logic then selecting the best input. This feature provides a solution in situations where the backup signal may not contain everything required in the main signal, allowing selection between signals with different characteristics – such as a live main feed and an inherently frozen apology caption on the backup.

Following a switch it can either reselect the main feed automatically (with the option to set a time period for which the signal must be good before switching back) or by user intervention.

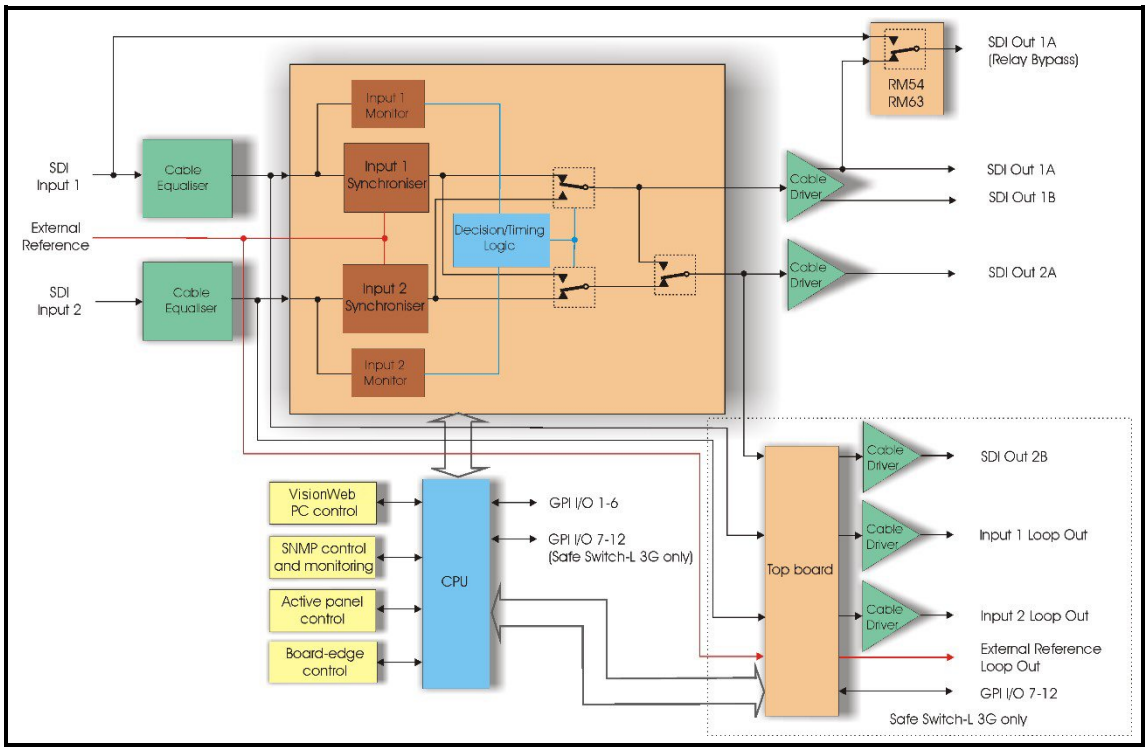
In addition to the automatic switching, two fault indications can also be set and assigned to GPIs if desired, allowing very flexible monitoring. The fault indications each have their own list of chosen parameters which can be different from the auto switch selection. Each fault indication can be assigned to a specific input, to either input, or to only become active if both inputs show a selected fault. For example, the engineer could monitor for audio silence on his main channel and get a separate indication if both channels freeze.

Safe Switch 3G is used with the RM54 and RM66 frame rear modules. The RM54 rear module includes relay bypass protection on power failure or board removal, giving the system an extra layer of security and preventing signal loss. The RM66 rear module gives an optical output when the ***Safe Switch 3G*** is fitted with a FOP fibre output option.

Safe Switch-L 3G is a ‘double-decker’ board which provides two output feeds for both output A and output B, input and reference loop-throughs, and extra GPI connections. ***Safe Switch-L 3G*** is used with the RM63. The RM63 rear module includes relay bypass protection on power failure or board removal, giving the system an extra layer of security and preventing signal loss.



Safe Switch 3G block diagram



Safe Switch-L 3G block diagram

The VisionWeb web browser control software can be used to either ignore or create an alarm on any of the features that Safe Switch 3G can measure. Additionally, Safe

Switch 3G has exceptional GPIs flexibility – ideal for GPI-focused broadcasters. The six GPIs on the ***Safe Switch 3G*** and 12 on the ***Safe Switch-L 3G*** are all bi-directional, allowing them to be configured as either GPI inputs or GPI outputs and so giving the engineer real flexibility when setting up buttons and lights for GPI control and monitoring of alarm conditions.

Safe Switch 3G is a space-saving 100mm x 266mm module, which fits in the standard Crystal Vision frames, the Safe Switch 3G card can be controlled by VisionWeb web browser control software, via SNMP or by an active control panel such as the VisionPanel. Card edge control was also available prior to 2018.

Safe Switch-L 3G is a 'double-decker' 100mm x 266mm module, which fits in the standard Crystal Vision frames, the Safe Switch-L 3G card can be controlled by VisionWeb web browser control software, via SNMP or by an active control panel such as the VisionPanel. Card edge control was also available prior to 2018.

The main features of ***Safe Switch 3G*** are:

- Clean and intelligent 2 x 2 switch which works with 3Gb/s, HD and SD
- Six configurable GPIs
- Synchronisers on both inputs ensure seamless switching
- Option to delay earliest arriving input by up to 25 frames in one frame steps
- Reference drift lock preventing picture disturbances during timing disruptions
- Relay bypass on Input 1 with the RM54 rear module
- Optional optical output with the FOP (Fibre Output) module and RM66
- Numerous switching options: input present, video black, video frozen, missing and frozen timecode, audio group present, audio silence and various EDH errors
- Board edge (prior to 2018), VisionWeb and GPI alarm indication
- Space-saving: 100mm x 266mm module allowing 12 Safe Switch 3G in 2U
- SNMP agent giving status and trap generation with suitable frame

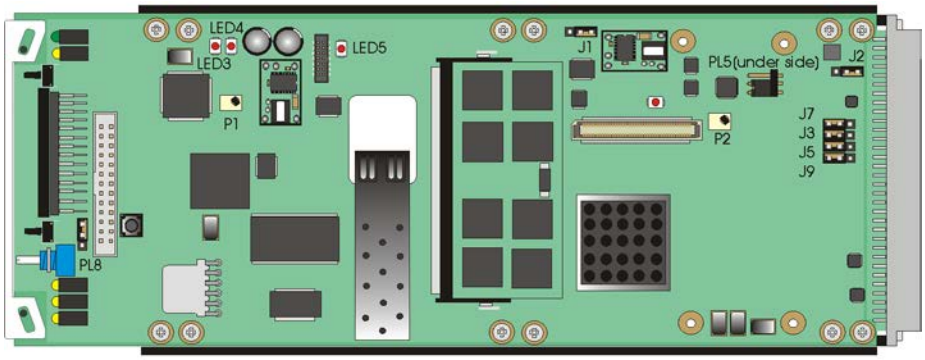
The additional features of ***Safe Switch-L 3G*** are:

- Extended outputs, input loop-throughs and 12 configurable GPIs
- Relay bypass on Input 1 with the RM63 rear module
- Space-saving: 100mm x 266mm 'double-decker' module allowing six Safe ***Switch-L 3G*** in 2U

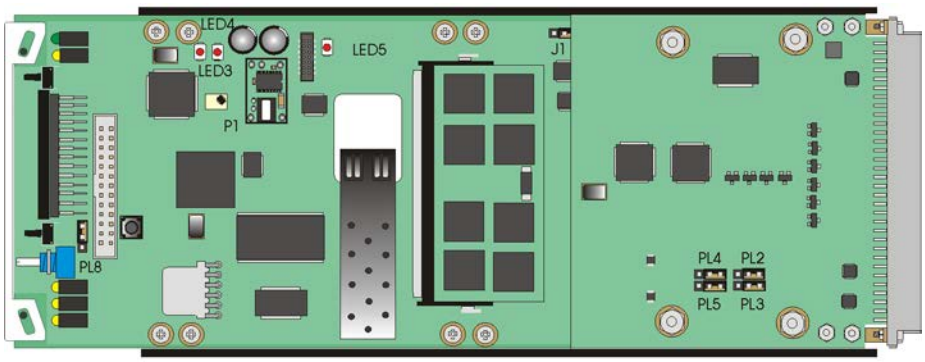
2 Hardware installation

The ***Safe Switch 3G*** single height module is used with the RM54 and RM66 rear modules which will fit into all Crystal Vision rack frames. The ***Safe Switch-L 3G*** dual height module is used with the RM63 which will fit into all Crystal Vision rack frames. All modules can be connected or removed while the frame is powered, without damaging the board.

2.1 Module configuration



Safe Switch 3G



Safe Switch-L 3G

Link configuration and LEDs

There are eight jumper links and four surface-mounted LEDs on the Safe Switch 3G range. The surface-mounted LEDs are not visible from the front of the frame and are included for diagnostic purposes only.

Link	Towards front of board or Up	Towards the rear of board or Down
J1	Not fitted	JTAG bypassed
J2	Not fitted	
J3, 5, 7 & 9	Not fitted (GPI control set by default)	
PL2-5 (***Safe Switch-L 3G*** only)	Top PCB - No user configuration	
PL5 (on underside of PCB)	External reference termination 75Ω	External reference HiZ
PL8	Default IP address 10.0.0.201	Custom set IP address
LED3	Link	
LED4	Data	
LED5	Configured	
LED12	External reference locked	

Note: P1 and P2 have been factory set and should not require any further adjustment.

3 Rear modules and signal I/O

The ***Safe Switch 3G*** is a single height module and the ***Safe Switch-L 3G*** is a dual height module. The 2U Indigo 2 frames will house up to 12 single height or six dual height modules and dual power supplies. The 1U Indigo 1 frames will house six single height or three dual height modules and a single or dual power supply. The Indigo DT desk top boxes have a built-in power supply and will house two single height modules or one dual height module. All modules can be plugged in and removed while the frame is powered without damage.

3.1 Safe Switch 3G

The default rear module for the ***Safe Switch 3G*** is the RM54 which has the added benefit of relay bypass between input 1 and output 1. If an optical output is required a FOP module can be fitted to the ***Safe Switch 3G*** and the RM66 used instead.

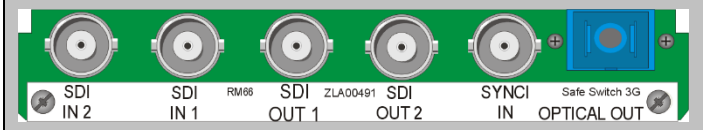
Note: For details of fitting rear connectors, please refer to the appropriate frame manual.

Rear module connections with RM54

RM54 fits in all frames	Description
	**RM54** • 12 per Indigo 2 frame • 6 per Indigo 1 frame • 2 per Indigo DT • All frame slots can be used

RM54 BNC	I/O assignment
HD/SD IN 2	Serial digital input channel 2
HD/SD IN 1	Serial digital input channel 1
HD/SD OUT 1 (switched)	Reclocked SDI output channel 1 with relay bypass protection
HD/SD OUT 1 (unswitched)	Reclocked SDI output channel 1 with no relay bypass protection
HD/SD OUT 2A	Reclocked SDI output channel 2
SYNC IN	Analogue external reference input

Rear module connections with RM66

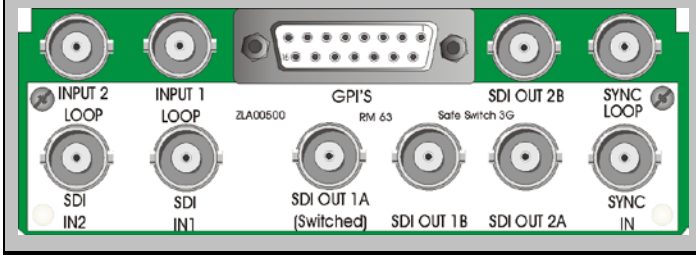
RM66 fits in all frames	Description
	**RM66** • 12 per Indigo 2 frame • 6 per Indigo 1 frame • 2 per Indigo DT • All frame slots can be used

RM66 BNC	I/O assignment
HD/SD IN 2	Serial digital input channel 2
HD/SD IN 1	Serial digital input channel 1
HD/SD OUT 1A	Reclocked SDI output channel 1
HD/SD OUT 2A	Reclocked SDI output channel 2
SYNC IN	Analogue external reference input
Optical Output	Channel 1 optical output

3.2 Safe Switch-L 3G

The only rear module for the ***Safe Switch-L 3G*** is the RM63 which has the added benefit of relay bypass between input 1 and output 1.

Rear module connections with RM63

RM63 fits in all frames	Description
	**RM63** • 6 per Indigo 2 frame • 3 per Indigo 1 frame • 1 per Indigo DT • Alternate frame slots can be used

RM63 BNC	I/O assignment
SDI IN 2	Serial digital input channel 2
SDI IN 1	Serial digital input channel 1
SD1 OUT 1A (switched)	Reclocked SDI output with relay bypass protection
SDI OUT 1B	Reclocked SDI output with no relay bypass protection
SDI OUT 2A	Reclocked SDI output channel 2
SYNC IN	Analogue external reference input
INPUT 2 LOOP	Serial digital input 2 reclocked loop output
INPUT 1 LOOP	Serial digital input 1 reclocked loop output
SDI OUT 2B	Reclocked SDI output
SYNC LOOP	Analogue external reference input loop output

GPI I/O	Pin-out
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
GND	14
No Connect	13,15

GPI D-Type connection details

4 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. The double height ***Safe Switch-L 3G*** has all 12 GPIs available at the rear module, as well as the rear of the frame.

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. A 10kΩ series resistor is connected to each GPI input along with a 10kΩ pull-up to +5V.

All GPIs (six for ***Safe Switch 3G*** and 12 for ***Safe Switch-L 3G***) can be individually enabled or disabled and configured to be either an input or output as required. When configured as an input a GPI can be selected to be either pulse triggered or level triggered. When configured as an output the GPI output can be selected to be either active high or active low.

The following tables show the various selections available:

GPI Input settings		
Disable Auto Switching	Request Input 2 to Output 2	Toggle Output 1
Enable Auto Switching	Request Input 1 to Output 1 Auto disabled	Toggle Output 2
Request Input 1 to Output 1	Request Input 1 to Output 2 Auto disabled	Clear Latch
Request Input 2 to Output 1	Request Input 2 to Output 1 Auto disabled	
Request Input 1 to Output 2	Request Input 2 to Output 2 Auto disabled	

GPI Output settings	
Input 1 Present	Asserted if Input 1 to Output 2 requested
Input 2 Present	Asserted if Input 2 to Output 2 requested
Reference Present	Fault Indication A Active
Asserted if Input 1 to Output 1	Fault Indication B Active
Asserted if Input 2 to Output 1	Auto Switch Disabled Op 1
Asserted if Input 1 to Output 2	Auto Switch Disabled Op 2
Asserted if Input 2 to Output 2	Auto Switch Enabled Op 1
Asserted if Input 1 to Output 1 requested	Auto Switch Enabled Op 2
Asserted if Input 2 to Output 1 requested	

All GPIs can also be configured to show an alarm condition for any individual or group of error conditions. Certain reportable errors such as input missing will result in an immediate indication, whereas other lesser conditions must be present continuously for a period of time set by the user before an alarm is asserted.

Reportable error conditions
Input missing
Input video standard different to expected
EDH Missing (SD formats only)
EDH Full Field Error (SD formats only)
EDH Active Picture Error (SD formats only)
Line CRC error (HD formats only)
Audio group 1 missing
Audio group 2 missing
Audio group 3 missing
Audio group 4 missing
Active Video Black for longer than set interval
ATC Missing
ATC Frozen
Active Video Frozen for longer than set interval
Silence from channel 1 of selected group for longer than set interval
Silence from channel 2 of selected group for longer than set interval
Silence from channel 3 of selected group for longer than set interval
Silence from channel 4 of selected group for longer than set interval
Reference video standard

Note: Both input 1 and input 2 share common alarm and delay controls. So for instance, if audio silence is selected for an alarm, a detected silence on either input 1 or input 2 will cause the alarm to be set after the required delayed time has expired.

4.1 2U frame GPI connections

GPI lines ‘a’ to ‘f’ of each card connect to one 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.

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1amp.

4.2 1U frame GPI connections

GPI lines 'a' to 'f' of each card connect to one of 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.

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1amp.

4.3 Indigo DT desk top box GPI connections

GPI lines 'a' to 'f' of each card connect to the rear remote connector 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.

The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-2 to approximately 1amp.

5 Control and Status monitoring

Safe Switch 3G controls and status can be accessed from card edge controls but most easily by VisionWeb web browser software, or rack front panel controls.

Board edge control was removed from Safe Switch 3G and Safe Switch-L 3G in 2018. Therefore the card edge control information detailed below is only relevant for older versions of the product.

5.1 Card edge controls

Safe Switch-L 3G card front edge view

5.2 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

5.3 Card edge rotary control

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

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

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

5.4 Reading card edge LEDs

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

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

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

Name	LED Colour	Function when ON	Function when OFF
PSU	Green	Good power supply (PSU) rails	One or more of the monitor supplies is out of specification
Ref	Yellow	Valid external reference present	Valid external reference not present
IP1HD	Yellow	Input 1 High Definition and present (Flashing, output setting incorrect)	Input 1 not present
IP1SD	Yellow	Input 1 Standard Definition and present (Flashing, output setting incorrect)	Input 1 not present
IP2HD	Yellow	Input 2 High Definition and present (Flashing, output setting incorrect)	Input 2 not present
IP2SD	Yellow	Input 2 Standard Definition and present (Flashing, output setting incorrect)	Input 2 not present
1-1	Yellow	Output 1 showing input 1	
1-2	Yellow	Output 1 showing input 2	
2-1	Yellow	Output 2 showing input 1	
2-2	Yellow	Output 2 showing input 2	

Note: Should the input video format be different to pre-selected format, the input present LEDs will flash as a warning.

5.5 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 control until the desired menu category is found
- Push ENTER to enter the sub-menus of that category
- Rotate SCROLL to select a sub-menu
- Push 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 will flash slowly to indicate that a change has been made and requires confirmation
- Push ENTER to action the change. The display will cease flashing
- Use the up-arrow [⋀] and SCROLL control to navigate to further menus

5.6 Using the front control panel

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

'Status' menu showing current software version and IP address

Selecting a Safe Switch 3G

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

'Device' menu showing Safe Switch 3G in slot 1.01

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

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

The Safe Switch 3G home menu

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

Safe Switch 3G Signal Status sub-menu

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

Control Panel keys overview

The functions assigned to the control panel keys are:

- DEVICE – enters 'device' menu to select a card or show available cards.
- ASTERISK (*) – selects 'network configuration' menu.
- F1 to F4 - soft keys not currently used by Safe Switch 3G
- HOME – returns to top of Safe Switch 3G menu structure.
- ENTER – accept current selection.
- Up arrow – used to move up through the menu structure.
- Rotary control – shaft encoder used to select sub-menus or variable data.

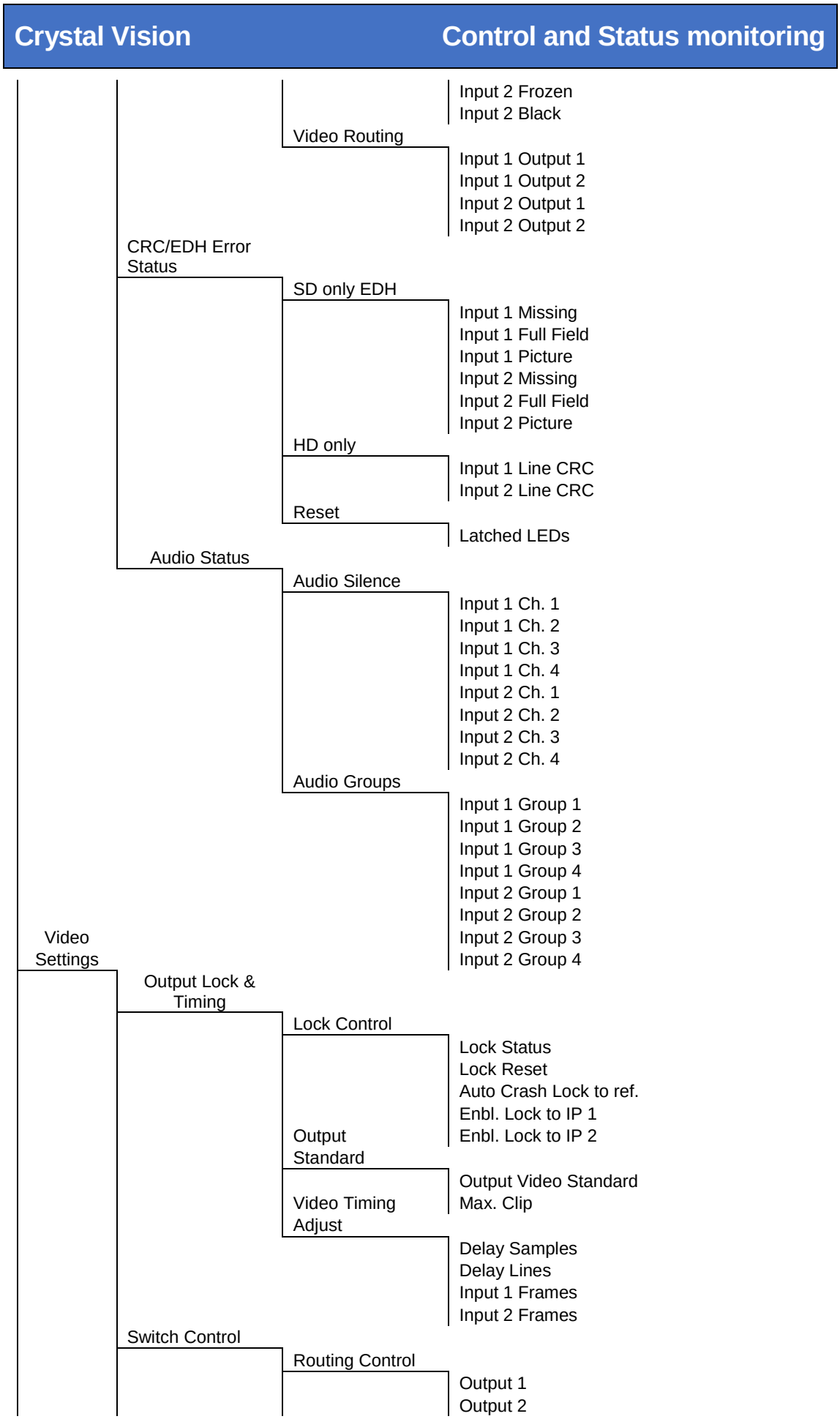
Updating the display

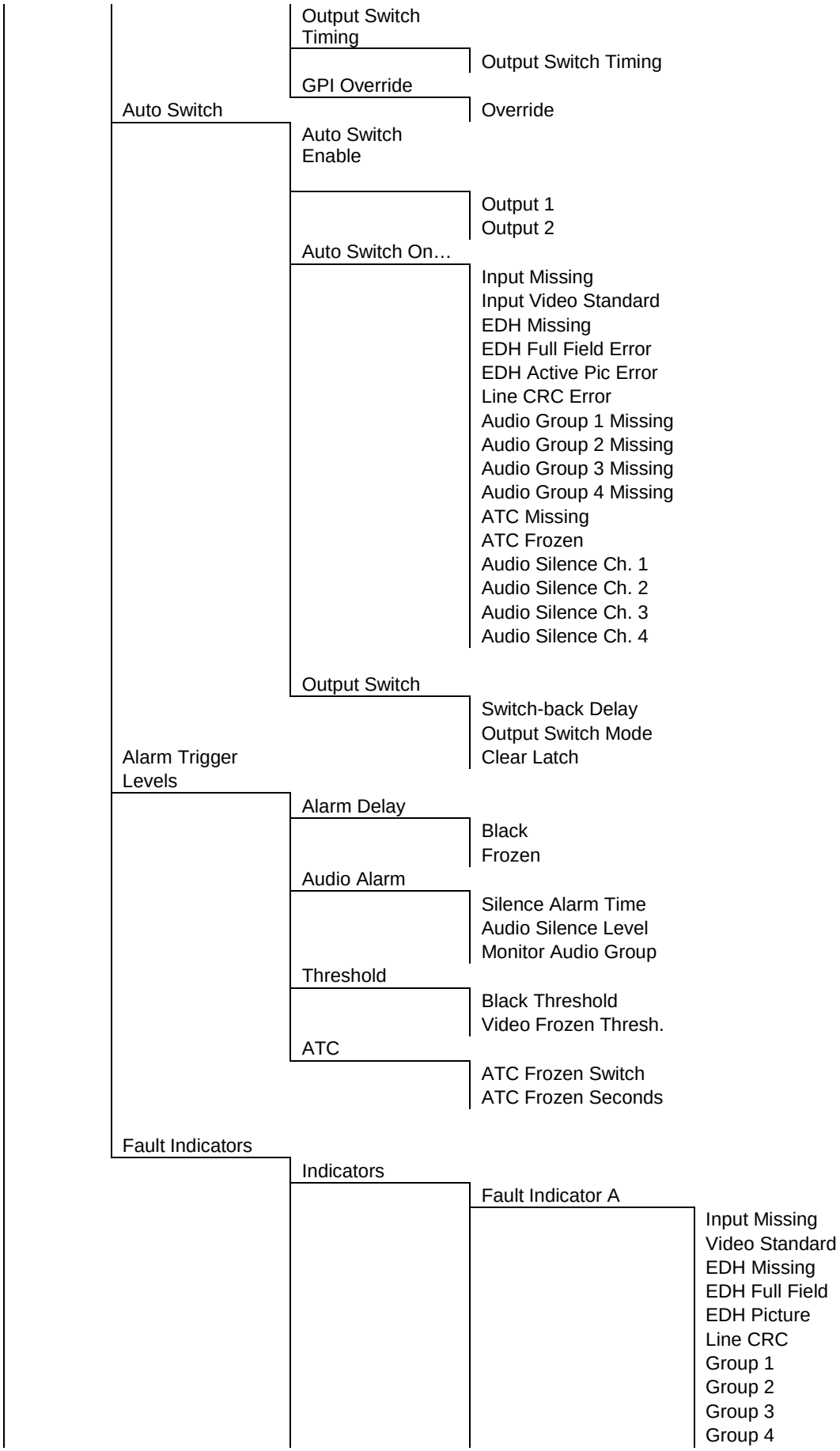
The values displayed on an active front panel are only updated when an adjustment is made and when changing menu level. If necessary, use the upward arrow to leave and then re-enter a menu to update the display.

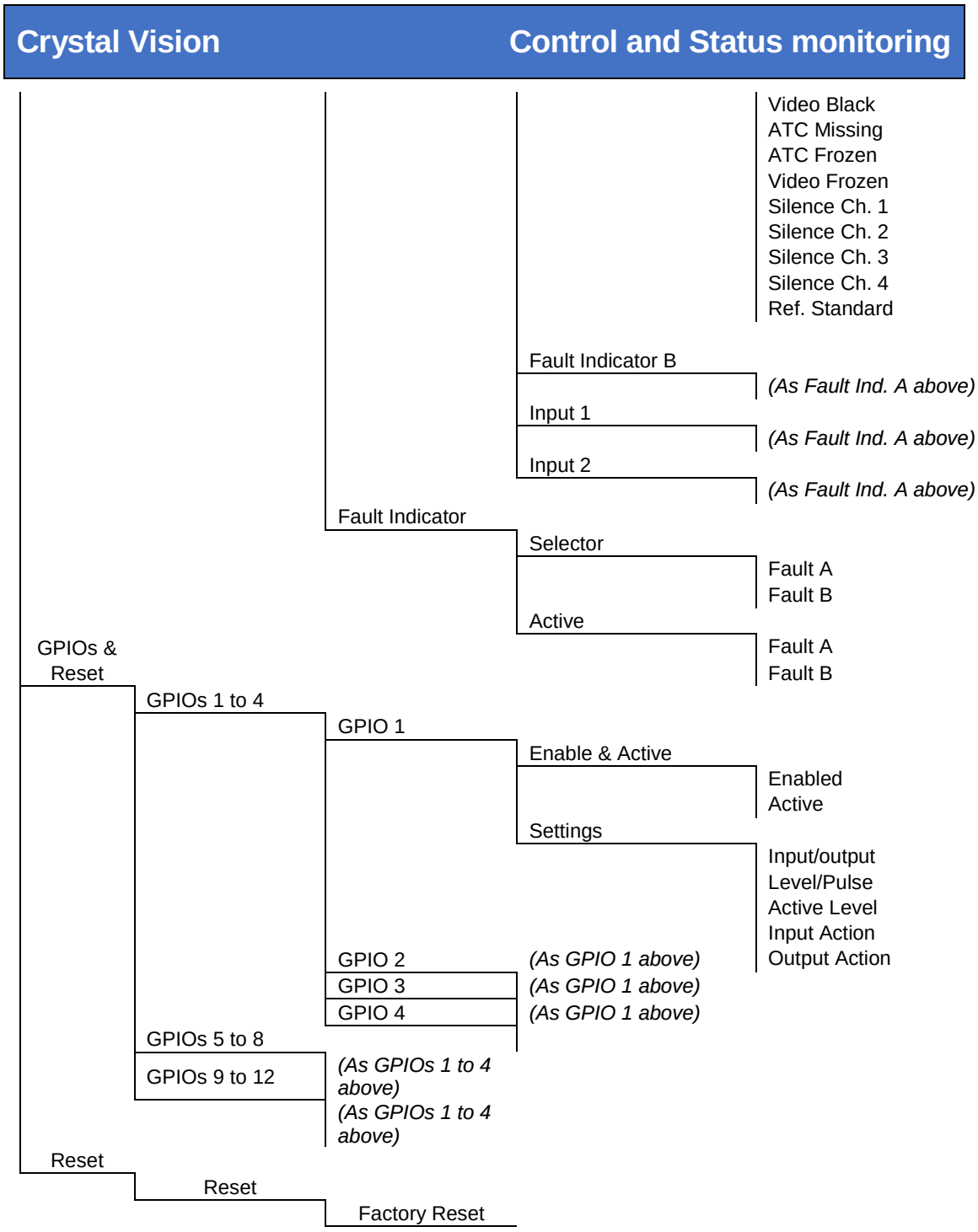
Menu Tree

The basic menu structure for card edge, front panel access and VisionWeb is identical and consists of the following menus and sub-menus.

- Status
  - Video Status
    - Input
      - Input 1 Present
      - Input 1 Format
      - Input 2 Present
      - Input 2 Format
      - Reference Present
      - Reference Format
    - Errors
      - Input 1 Standard Error
      - Input 1 Frozen
      - Input 1 Black
      - Input 2 Standard Error


Crystal Vision
Control and Status monitoring
Input 2 Frozen
Input 2 Black
Video Routing
Input 1 Output 1
Input 1 Output 2
Input 2 Output 1
Input 2 Output 2
CRC/EDH Error Status
SD only EDH
Input 1 Missing
Input 1 Full Field
Input 1 Picture
Input 2 Missing
Input 2 Full Field
Input 2 Picture
HD only
Input 1 Line CRC
Input 2 Line CRC
Reset
Latched LEDs
Audio Status
Audio Silence
Input 1 Ch. 1
Input 1 Ch. 2
Input 1 Ch. 3
Input 1 Ch. 4
Input 2 Ch. 1
Input 2 Ch. 2
Input 2 Ch. 3
Input 2 Ch. 4
Audio Groups
Input 1 Group 1
Input 1 Group 2
Input 1 Group 3
Input 1 Group 4
Input 2 Group 1
Input 2 Group 2
Input 2 Group 3
Input 2 Group 4
Video Settings
Output Lock & Timing
Lock Control
Lock Status
Lock Reset
Auto Crash Lock to ref.
Enbl. Lock to IP 1
Enbl. Lock to IP 2
Output Standard
Output Video Standard
Video Timing Adjust
Max. Clip
Delay Samples
Delay Lines
Input 1 Frames
Input 2 Frames
Switch Control
Routing Control
Output 1
Output 2


Output Switch Timing
Output Switch Timing
GPI Override
Override
Auto Switch
Auto Switch Enable
Output 1
Output 2
Auto Switch On…
Input Missing
Input Video Standard
EDH Missing
EDH Full Field Error
EDH Active Pic Error
Line CRC Error
Audio Group 1 Missing
Audio Group 2 Missing
Audio Group 3 Missing
Audio Group 4 Missing
ATC Missing
ATC Frozen
Audio Silence Ch. 1
Audio Silence Ch. 2
Audio Silence Ch. 3
Audio Silence Ch. 4
Output Switch
Switch-back Delay
Output Switch Mode
Clear Latch
Alarm Trigger Levels
Alarm Delay
Black
Frozen
Audio Alarm
Silence Alarm Time
Audio Silence Level
Monitor Audio Group
Threshold
Black Threshold
Video Frozen Thresh.
ATC
ATC Frozen Switch
ATC Frozen Seconds
Fault Indicators
Indicators
Fault Indicator A
Input Missing
Video Standard
EDH Missing
EDH Full Field
EDH Picture
Line CRC
Group 1
Group 2
Group 3
Group 4



The above menu structure is the means to access the various Safe Switch 3G controls and status. A more detailed description is in section – 'Control Descriptions'.

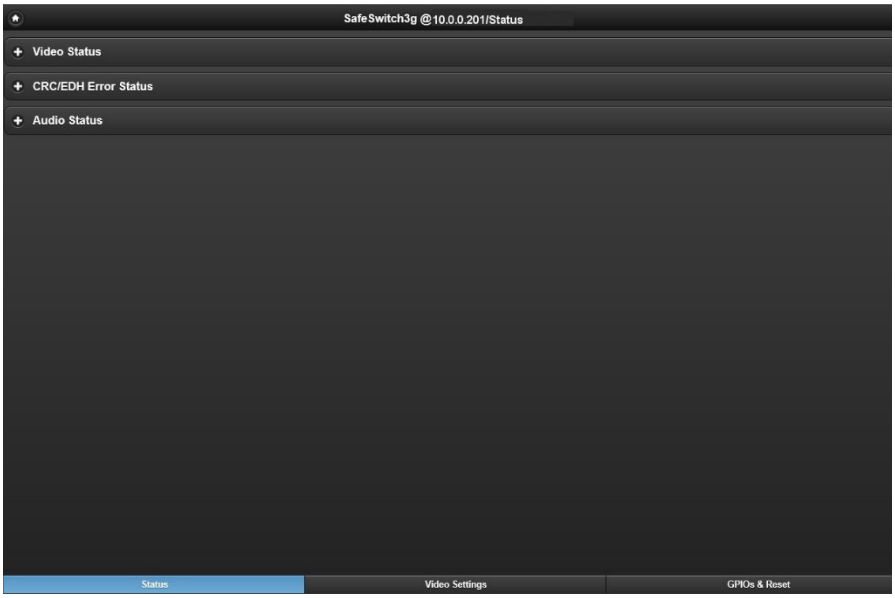
5.7 Controlling cards via VisionWeb

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

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

Indigo home page

The example above shows a Safe Switch 3G card fitted in slot one and the frame's power supply and status monitor in slots 13 and 14. Clicking on the Safe Switch 3G card will bring up the card's home page, for example:



Safe Switch 3G Status Page

6 Control Descriptions

The controls of Safe Switch 3G are accessible from Crystal Vision's VisionWeb software, the front panel or the board edge. The description of controls used in this manual is based on VisionWeb but the path to locate controls via the front panel or board edge follows the same logic. For instance, in the VisionWeb GUI, an 'Input Frozen' control is located in the '**Errors'** group of the **'Video Status'** sub-menu of the '**Status'** menu. To find the same control using the card edge or front panel follow the path **Status ->Video Status->Errors** to the **Input Frozen** control.

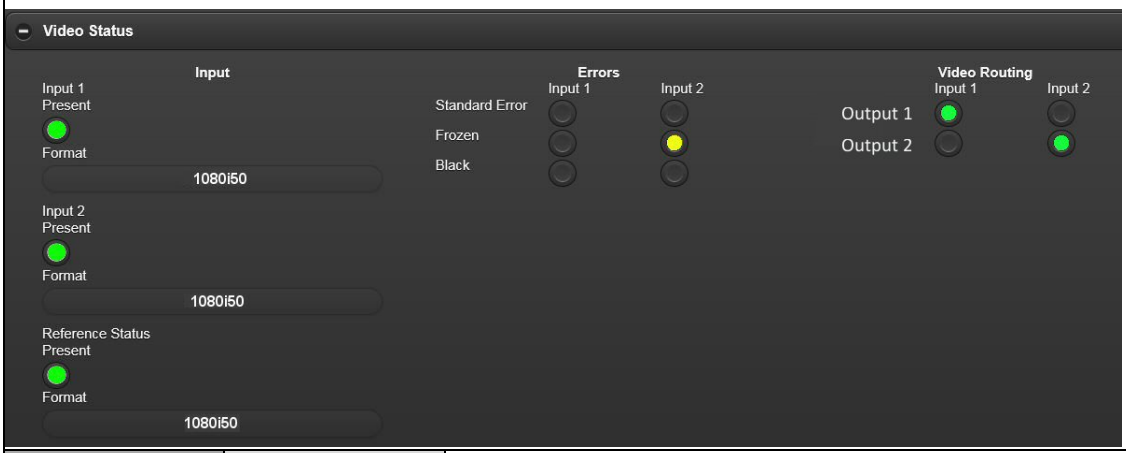
VisionWeb GUI controls are accessed by menus at the bottom of the page which, when selected, offer sub-menus containing a number of controls. Some controls are simulated LEDs that are used to show status, others are check boxes, buttons or sliders which change various Safe Switch 3G settings.

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

VIDEO STATUS, CRC/EDH ERROR STATUS, AUDIO STATUS, OUTPUT LOCK & TIMING, SWITCH CONTROL, AUTO SWITCH, ALARM TRIGGER LEVELS, FAULT INDICATORS, GPIOS 1 to 4, GPIOS 5 to 8, GPIOS 9 to 12, RESET.

Each menu is shown with a screen grab and description of each control's function. Some menus and some controls are specific to specific models only, in this case the model number(s) are indicated.

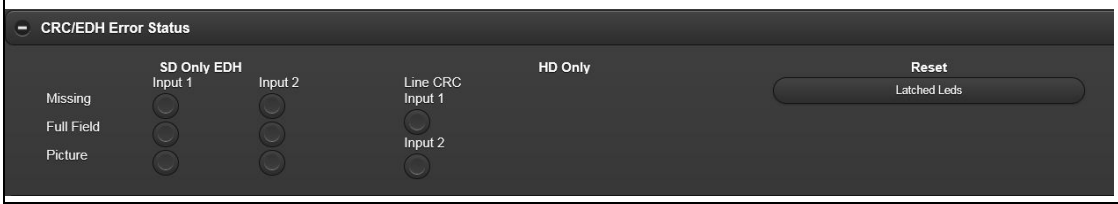
6.1 Status Menu

Video Status		
Display presence, standard and status of input and output video signals.		
		
Input 1/2	**Format**	**The Input video standard is shown. i.e. *Missing, 625/50,1920x1080i50 etc.***
	Present	**On if input video present.**
Reference Status	**Format**	**Displays reference video standard e.g. *525, 625 etc.***
	Input Present	**On when valid Black and Burst or tri-level video input present.**

Errors	Standard Error	On if the input video is of a different standard to the applied reference.
	Frozen	On if the input is still frame for more than the period set by the Frozen Alarm Delay control in the 'Alarm Trigger Levels' menu.
	Black	On if main output is below the set black threshold and for the period set by the Black Alarm Delay control in the 'Alarm Trigger Levels' menu.
Video Routing	Shows which input is currently routed to which output. The example above shows Input 1 is routed to Output 1 and Input 2 to Output 2.	

CRC/EDH Error Status

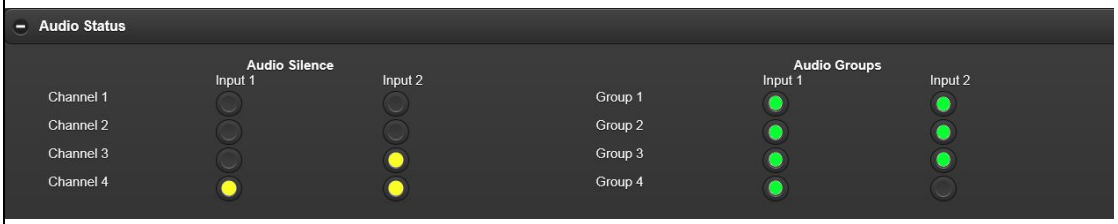
Display latched EDH errors.



SD Only EDH	Missing	On if EDH CRC codes not present in the ancillary data.
	Full Field	On if an EDH Full Field CRC error is detected.
	Picture	On if an EDH active picture area CRC error detected.
HD Only	Line CRC	On if any HD line CRC error is detected.
Reset	Latched LEDs	Clear all of the latched error LEDs above.

Audio Status

Display presence and status of embedded audio signals.

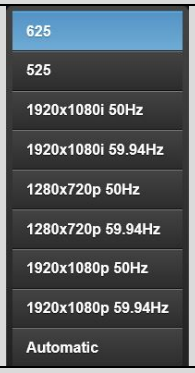


Audio Silence	On if any of the channels in the embedded audio group selected for monitoring by the 'Monitor Audio Group' control is consistently below the threshold set by the 'Audio Silence Level' control for more than the period set by the 'Silence Alarm Time' control. These additional controls are found in the Video Settings/Alarm Trigger Levels menu.
Audio Groups	On if there is embedded audio present.

6.2 Video Settings Menu

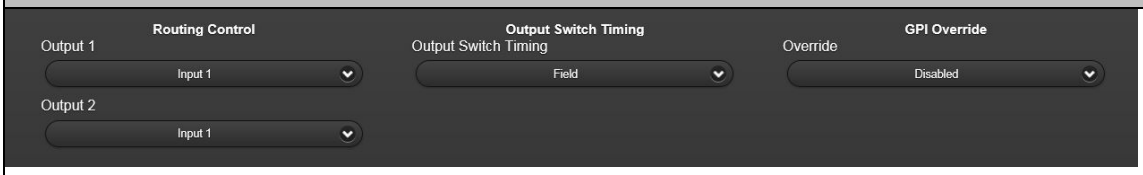
Output Lock & Timing

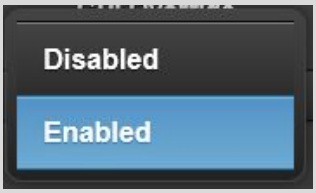
Set genlock features, output standard and video delay.

Lock Control	**Lock Status**	**Displays the current genlock status: *Clock and Timing Locked to Ref, Clock Locked to Ref, Clock Locked to Input A, Clock Locked to Input B, Locking to Ref, Free Running*. See section 'Video Timing' for more details.**
	Lock Reset	**Use the Lock Reset control to regain timing lock after recovering from free running mode.**
	Auto Crash Lock to Ref.	**Selecting Auto Crash lock to Reference Input will make the Safe Switch 3G lock to the reference immediately once an external reference is re-applied.**
	Enable Lock to ip1/2	**The 'Enable Lock' control selects which input is used to provide a locking signal if the lock to the reference is lost. If both inputs are selected, input 1 has priority. If neither input is selected the Safe Switch 3G will free run until the external reference is re-applied. To lock successfully the input must be within 2ppm of the external reference.**
Output Video Standard		**In order to maintain the desired video output standard under all conditions of input and external reference, the output video standard can be selected from the list. This will prevent the output standard being affected by any up-line changes, therefore protecting any down-stream equipment – such as an MPEG encoder – from being disturbed. Note that to initially obtain an output from the Safe Switch 3G it is necessary to set the Output Video Standard control to be the same as the input video on both input 1 and input 2. The factory default is 1080i 59.94**
Video Timing Adjust	**Delay Samples/ Lines/ Input 1,2 Frames**	**The output timing to reference can be adjusted using the lines and samples control by up to one frame. The inputs can also be adjusted with respect to each other by using the Input 1 and Input 2 frame controls so that the earliest input can be delayed by up to 25 frames in one frame steps with respect to the other input.**

Switch Control

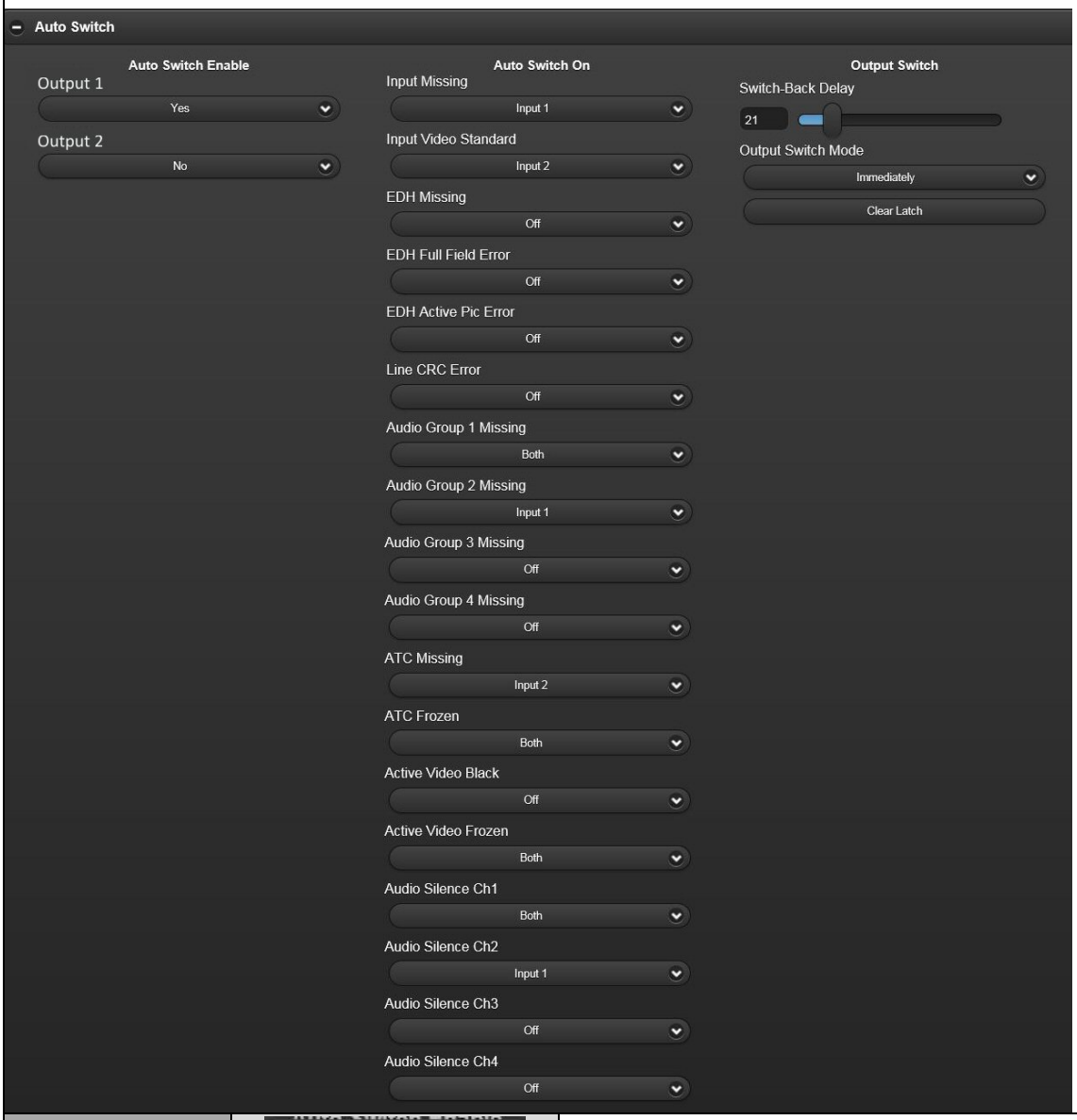
Set switch routing, switch timing and enable GPI override function.



Routing Control Output 1		**Manually select Input 1 or Input 2 as the video source for Output 1.**
Routing Control Output 2		**Manually select Input 1 or Input 2 as the video source for Output 2. Alternatively set Output 2 to either follow or be the inverse of Output 1.**
Output Switch Timing		**Select when the Safe Switch 3G will switch in the event of a fault condition occurring. 'Immediate' will make an untimed immediately; 'Field' will switch at the next 'F' bit of the SMPTE RP168 sync packet; 'Frame' will switch at the next 'V' bit of the sync packet.**
GPI Override		**Enable or disable the GPI override function. If enabled, the outputs follow GPIO 1 where high selects input 1 and low selects input 2.**

Auto Switch

Set error conditions for auto switching.

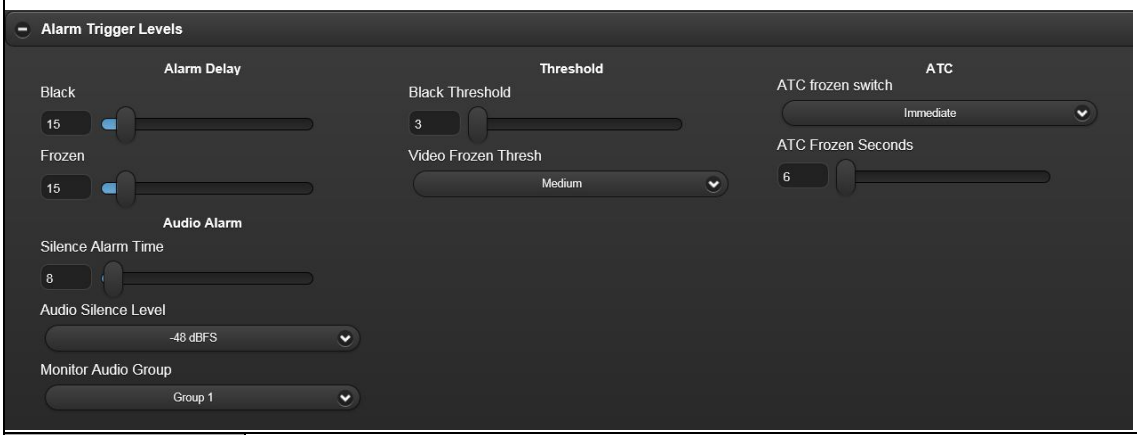


Auto Switch Enable Output 1/2		**Enable or disable the auto switching of Outputs 1 and 2 after an error condition.**

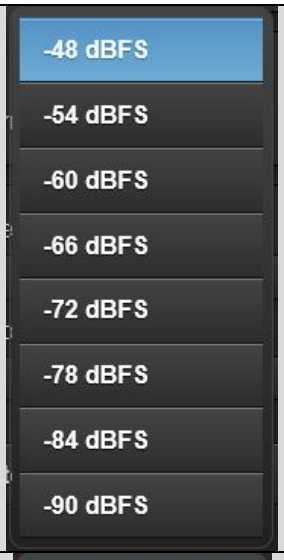
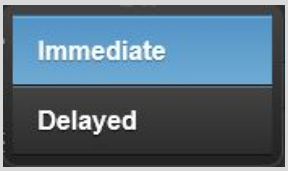
Auto Switch On		**Select the inputs that will initiate an auto switch under error conditions. (Note that these errors are of increasing seriousness from top to bottom i.e. from 'Input Missing' to 'Audio Silence Ch. 4'. This weighting is used when assessing a GPI request to switch. See GPIOs & Reset menu.)**
Switch Back Delay	**Set the time from 0 to 120 seconds that an error condition must be cleared before auto switching back to the original routing. 'Output Switch Mode' (see below) must be set to 'Delayed' mode.**	
Output Switch Mode		**Select the time that an error condition must be cleared before auto switching back to the original routing. 'Immediately' will auto switch straight away after an error has cleared; 'Latch' will not switch back until 'Clear Latch' (see below) is selected; 'Delayed' will wait for the period set by the 'Switch Back Delay' control (see above).**
Clear Latch	**Return the Safe Switch 3G auto switch to its original routing following a latched error condition (see above).**	

Alarm Trigger Levels

Set alarm thresholds and delays.

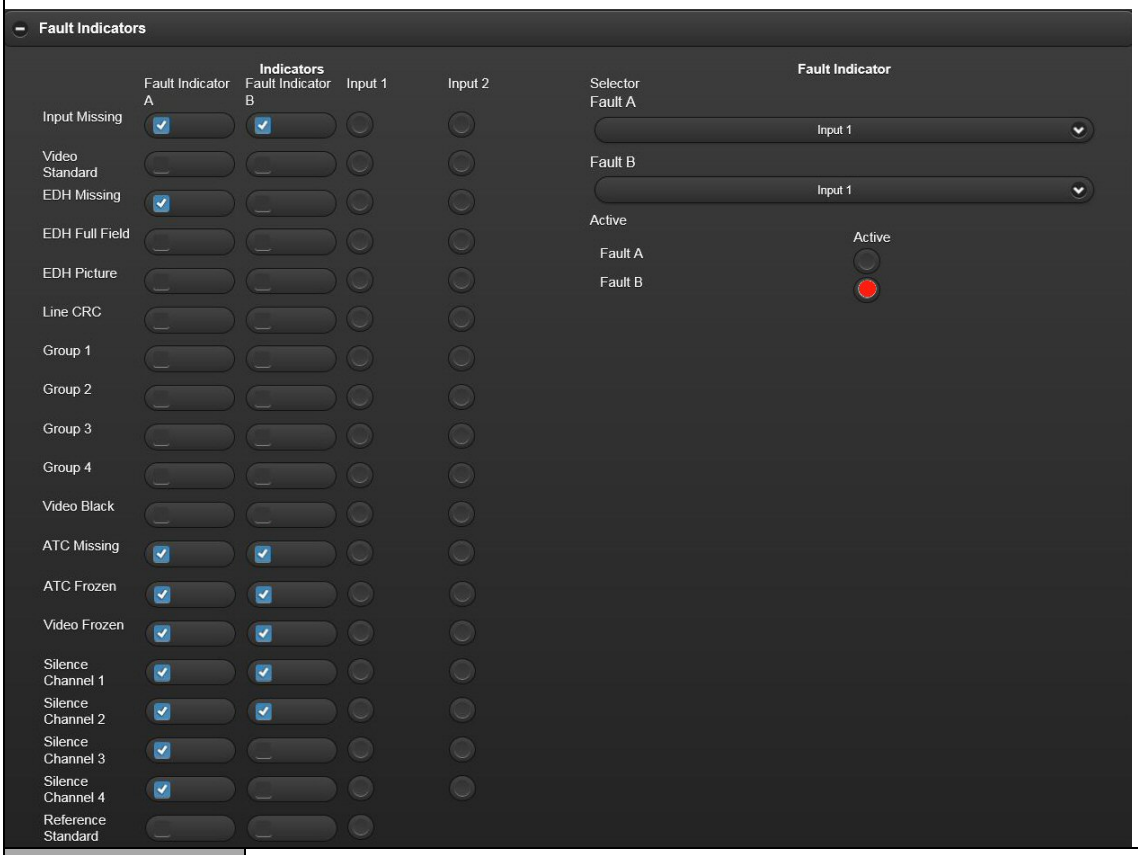


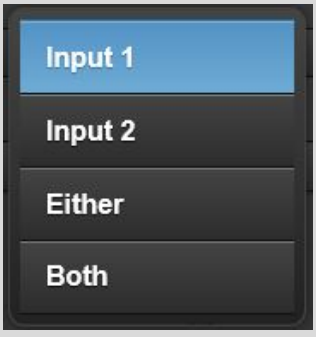
Alarm Delay Black/Frozen	**Set the time between 0 and 120 seconds that a video input must be at black level or frozen (still frame) before initiating an alarm condition.**
Silence Alarm Time	**Set the time period between 0 to 120 seconds that the level of an embedded audio channel must be below the threshold set by the 'Audio Silence Level' control' before initiating a silence alarm condition.**

Audio Silence Level		**Set the threshold that the level of an embedded audio signal must be below before being considered as 'silent'.**
Monitor Audio Group		**Select which one of the four embedded audio groups is monitored for alarm conditions.**
Black Threshold	**Set the video level that below which a video input is considered as being at 'black level'.**	
Video Frozen Threshold		**Set the amount of video activity that is necessary to consider an image changing. A 'small' selection means that only a small change to subsequent images is enough to prevent a 'Video Frozen' alarm, whereas a 'Large' selection will trigger an alarm if subsequent images are mainly identical.**
ATC Frozen Switch		**Select the period that an Ancillary Time Code signal must be frozen before an alarm condition is initiated. If 'Delayed' then the condition must prevail for the period set by the 'ATC Frozen Seconds' control (see below).**
ATC Frozen Seconds	**Set the period that an Ancillary Time Code signal must be frozen before an alarm condition is initiated. The 'ATC Frozen Switch' (above) must be in 'Delayed' mode.**	

Fault Indicators

Select which error conditions will trigger a fault condition.

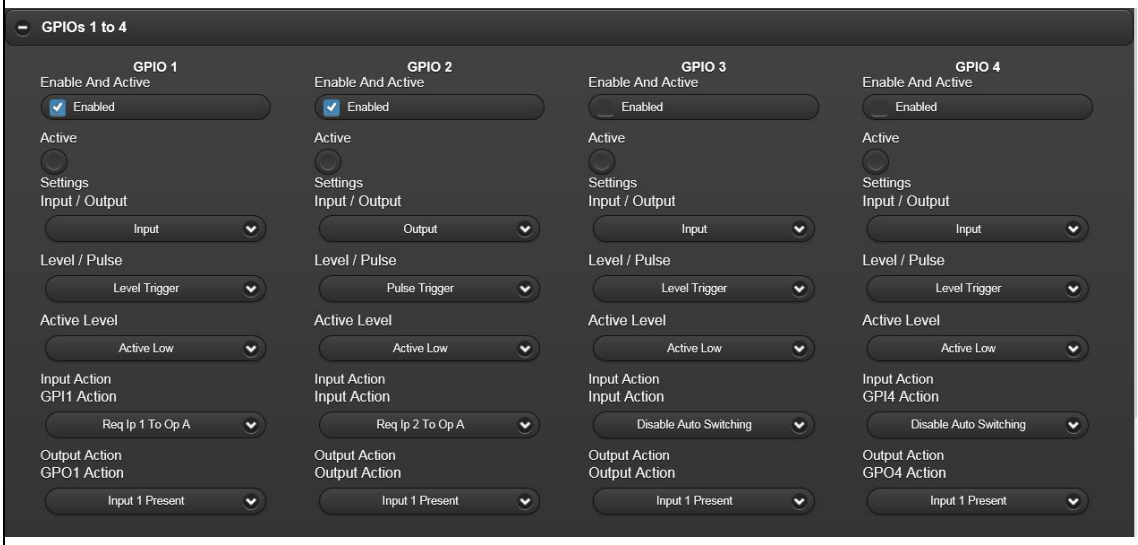


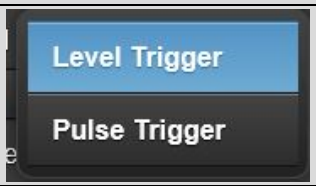
Fault Indicator A/B	**Set which of the error conditions will flag a Fault A or Fault B condition. Multiple error conditions can be selected.**
Input 1/2	**On if the error condition is present at either Input 1 or Input 2.**
Fault Indicator Selector Fault A/B	 **Select on which inputs the error conditions must be present to trigger a Fault A or Fault B condition.**
Active	**On if Fault A or Fault B conditions are active. Fault conditions can trigger a GPO if programmed to do so (see section 'General Purpose Interface').**

6.3 GPIOs & Reset Menu

GPIOs

Enable and setup GPIOs. (Only GPIOs 1 to 4 shown.)

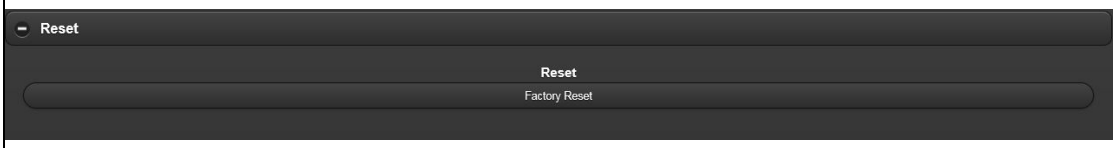


Enabled	**Set to enable the GPI.**	
Active	**On if the GPI is in an active state.**	
Input/ Output		**Set whether GPI is to be an input or output.**
Level/ Pulse		**Set GPI as an input to be activated by a change of level or as a pulse.**
Active Level		**Set GPI to be activated by either a low level or high level pulse or static level.**

Input Action		**Select what action to take for a GPI configured as an input:** ***Disable/Enable Auto Switching*** **– enable or disable the auto switching facility.** ***Req Ip to Op*** **– Manually select the input source for this output. i.e.** ***Req Ip 1 to Op 1*** **will attempt to switch Output 1 to Input 1.** ***Note that this selection will not happen if the requested input has more errors than the current input. See VisionWeb menu 'Auto Switch' for priority of errors.*** ***Req Ip to Op Dis Au.*** **– As above but also disables Auto Switching. Auto switching will need to be re-enabled after this operation.** ***Toggle Output*** **– Select the other switch input.** ***Clear Latch*** **– Clear latched alarm conditions.**
Output Action		**Select what action to take for a GPI configured as an output:** ***Input Present*** **– Assert if a video input is present.** ***Reference Present*** **– Assert if a valid reference is detected.** ***Assert if Ip = Op*** **– Assert if the switch is in the selected condition. i.e.** ***Assert if Ip 1= Op 1*** **will assert the GPO if Output 1 is switched to Input 1.** ***Assert if Ip = OpR*** **– As above but asserted if selected condition is requested (see 'Input Action' above).** ***Fault Indicate Act*** **– Assert if Fault A or B condition is active.** ***Auto Switch Dis Op*** **– Auto switching disabled for this output.** ***Auto Switch En Op*** **– Auto switching enabled for this output.**

Reset

Reset Safe Switch 3G



Factory Reset	**Select to reset Safe Switch 3G to its default settings:** *Auto Switch Enable* - No *Manual Routing* - Input 1 to Output 1, Input 2 to Output 2 *Output video standard* - 1080i 59.94 *Output switch timing* - Field *Switch mode* - Immediately *Video timing* - Lines 0, Samples 0 *Auto switch configurations* - All unticked, Fault indicator A & B set to Ip 1 *Alarm delays* - 2 seconds *Audio Silence* - -48dBFS *Audio group monitored* - Group 1 *GPI I/O 1-12* - In, Level Trigger, Active low, Disable Auto Switching

7 Video Timing

In normal operation, output timing is derived from the reference. If the reference is lost, Safe Switch 3G will switch to input 1 or (if not available or subsequently lost) input 2 as an alternative clock source, changing to the same sample/line/frame rate as the input without disrupting the output video. If the signal input is genlocked to the reference, the output will be unchanged, while if not locked to the reference the output data rate will change smoothly, slowly drifting relative to the reference and remaining in spec at all times. If the reference returns, the board will gently drift from the input source to line up with the reference over a period of time – again without disrupting the output signal.

Drift lock and Lock reset

To prevent picture disturbances when changing between reference sources such as would normally occur should the external reference go away and be replaced by say the non-coincidental timing of input 1, the output timing of the Safe Switch 3G will drift its timing from that of the removed source to that of the newly acquired reference source. The time taken for a lock to be reacquired will depend on the timing difference between the two sources; the genlock status will be displayed by way of a text message (see table below).

After recovering from the free running mode clock lock will be regained but not timing lock as the absolute timing will have been lost. It is not possible to recover timing lock without disturbing the output. Use the Lock Reset control to regain timing lock but a disturbance in the video output will result. On losing a lock to reference the Safe Switch 3G will attempt to lock to Input 1 or, failing that, Input 2. To lock successfully the input must be within 2ppm of the external reference.

Locking to either input video must be enabled by selecting ‘Enable lock to Input 1/2’ (see Video Settings - Output Lock and Timing menu). If neither input is selected, Safe Switch 3G will free run until the external reference is re-applied.

Genlock Status message	Meaning
Clock and Timing Locked to Ref	Genlocked to the external reference.
Clock Locked to Ref	External Reference reacquired. Clock locked but not timing. Reset lock to reacquire timing lock.
Clock Locked to Input 1	No or unusable external reference. Clock locked to input 1, timing not guaranteed.
Clock Locked to Input 2	No or unusable external reference and Input 1. Clock locked to input 2, timing not guaranteed.
Locking to Ref	Transitory message. External reference reacquired. Drift locking in progress.
Free Running	External reference and inputs not usable as timing reference.

Output timing relative to reference can be adjusted using the lines and samples control by up to one frame. The inputs can also be adjusted with respect to each other by using the Input 1 and Input 2 frame controls so that the earliest input can be delayed by up to 25 frames in one frame steps with respect to the other input.

8 Troubleshooting

The card edge may be used to perform simple trouble shooting. The VisionWeb web browser control system can be used for more comprehensive troubleshooting.

Board edge control was removed from Safe Switch 3G and Safe Switch-L 3G in 2018. Therefore the card edge control information is only relevant for older versions of the product.

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
Ref	Yellow	Valid external reference present	Valid external reference not present
IP1HD	Yellow	Input 1 High Definition and present (Flashing, output setting incorrect)	Input 1 not present
IP1SD	Yellow	Input 1 Standard Definition and present (Flashing, output setting incorrect)	Input 1 not present
IP2HD	Yellow	Input 2 High Definition and present (Flashing, output setting incorrect)	Input 2 not present
IP2SD	Yellow	Input 2 Standard Definition and present (Flashing, output setting incorrect)	Input 2 not present
1-1	Yellow	Output 1 showing input 1	
1-2	Yellow	Output 1 showing input 2	
2-1	Yellow	Output 2 showing input 1	
2-2	Yellow	Output 2 showing input 2	

Note: Should the input video format be different to pre-selected format the input present LEDs will flash as a warning.

Basic fault finding guide

The Power 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 is present and that any cabling is intact
	To obtain an output from the Safe Switch 3G it is necessary to set the Output Video control to be the same as the input video on both input 1 and input 2. The factory default is 1080i 59.94 Should the output be set different to the input the board edge input LEDs will flash
The video output exhibits jitter	
	Check that the input signal stability is within normal limits and that the maximum cable length has not been exceeded
The card no longer responds to card edge or remote controller	
	Check that the card is seated correctly and that the Power OK LED is 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 by simply removing it from the rack whilst powered and re-inserting it after a few seconds. It is safe to re-insert the card whilst the rack is powered Check that the remote/local lever is correctly set for the mode of operation

9 Specification

General

Dimensions	***Safe Switch-L 3G***: 100mm x 266mm dual height module with DIN 41612 connectors ***Safe Switch 3G***: 100mm x 266mm single height module with DIN 41612 connectors
Weight	***Safe Switch-L 3G***: 250g ***Safe Switch 3G***: 180g
Power consumption	***Safe Switch-L 3G***: 16.4W ***Safe Switch 3G***:11.9W

Inputs

Video	Two HD or SD SDI 270Mb/s to 2.970Gb/s serial digital compliant to EBU 3267-E, SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A Cable equalisation: 3G (2.970Gb/s) – 80 metres, Belden 1694A or equivalent HD (1.485Gb/s) – 140 metres, Belden 1694A or equivalent SD (270Mb/s) >250 metres, Belden 8281 or equivalent
Video standards supported	1080p 50/59.94, 1080i 50/59.94, 720p 50/59.94, PAL, NTSC
External reference	Tri-level syncs or analogue Black and Burst or video Amplitude of syncs 150mV to 600mV Link on PCB selects 75 ohm termination or high impedance

Outputs

Number and type:	***Safe Switch-L 3G***: RM63 Output 1x2, Output 2x2 HD or SD SDI 270Mb/s to 2.970Gb/s serial digital compliant to EBU 3267-E, SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A ***Safe Switch 3G***: RM54. Output 1x2, Output 2x1 RM66. Output 1x1, Output 2x1. Output 1 optical output HD or SD SDI 270Mb/s to 2.970Gb/s serial digital compliant to EBU 3267-E, SMPTE 259, SMPTE 292-1 and SMPTE 424/425-A
Jitter	Meets the above SMPTE specs

Processing

Video	Monitoring for black, frozen, ATC missing or frozen, EDH and CRC error on both input 1 and input 2
Audio	Four channel silence monitors assignable to any single audio group on both inputs. Silence levels and alarm delay are settable from -48dBFS to 60dBFS and 2 to 60 seconds
Timing	The timing can be fully adjusted using horizontal and vertical settings. Increasing the vertical setting will delay the output

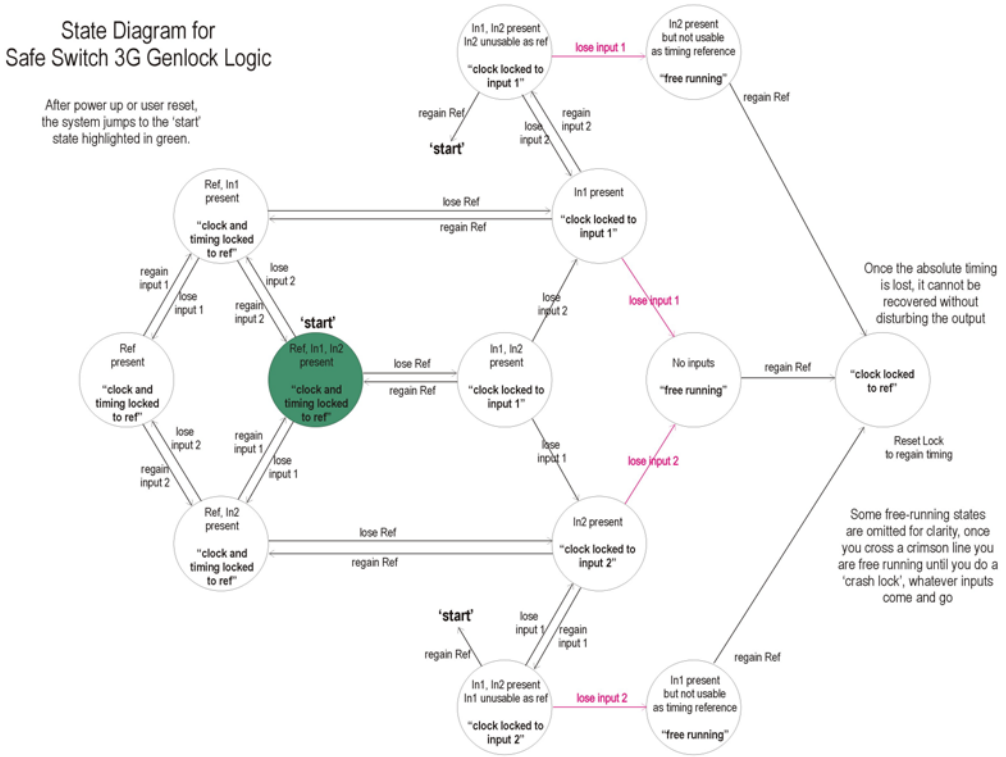
	relative to the reference in increments of one line. Increasing the horizontal setting will increase this delay in increments of approx. 74ns for SD, 13.5ns for HD and 6.7ns for 3G. The maximum setting of both controls will provide a delay of one frame plus approx. 2us Input timing differences greater than one frame can be corrected by delaying the earliest arriving input by up to 25 frames in one frame steps
Min delay through board	The minimum delay through the board is approximately 2500 samples, approximately 1 line in HD/3G and 3 lines in SD. Note. The actual delay on any signal path will depend on the respective input / output timing and the delay / timing control values
GPIs	***Safe Switch-L 3G***: 12 bi-directional GPIs (available through the frame GPI connections for the two slots and also on the top board D-Type connection) ***Safe Switch 3G***: Six bi-directional GPIs (available through the frame GPI connections) GPIs are software selectable as either inputs or outputs as required. When configured as an input a GPI can be selected to be either pulse triggered or level triggered. When configured as an output the GPI output can be selected to be either active high or active low See section 'General Purpose Interface' for the functions that can be allocated to each GPI

Status and monitoring

Local control	Card edge visual monitoring, with 10 digit dot matrix display and LED indicators to indicate: PSU rails present, inputs present, external reference and output routing
Remote control	Control from frame active front panel and remote panel VisionWeb Control is available via the web server on the frame and allows operation using a standard web browser on a PC or tablet Statesman Lite allows control from any PC on a network SNMP control and monitoring via frame CPU and Ethernet connection

10 Appendix A

State Diagram of Safe Switch 3G Logic



11 Appendix B

*In July 2014, Statesman control of Safe Switch 3G was superseded by VisionWeb control. Statesman is no longer supported after this date, but information for existing users is included in this appendix. The following is an extract from the **Safe Switch-L 3G** manual:*

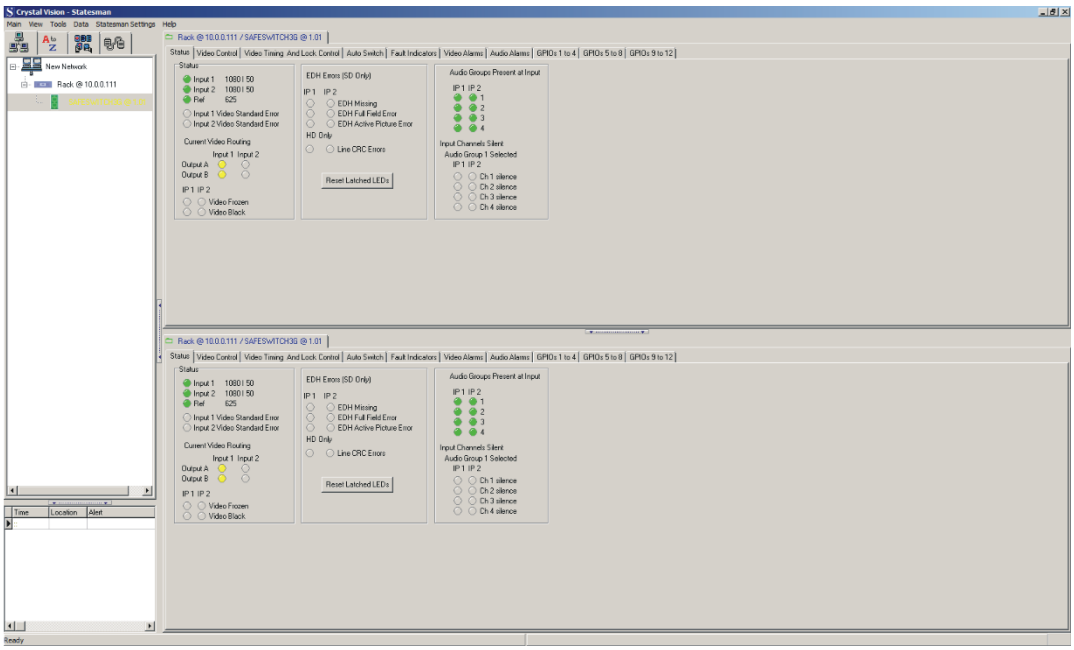
Statesman

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 an active control panel. Therefore an active panel must be fitted to allow for Statesman control.

Statesman operation

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



The Statesman main application window

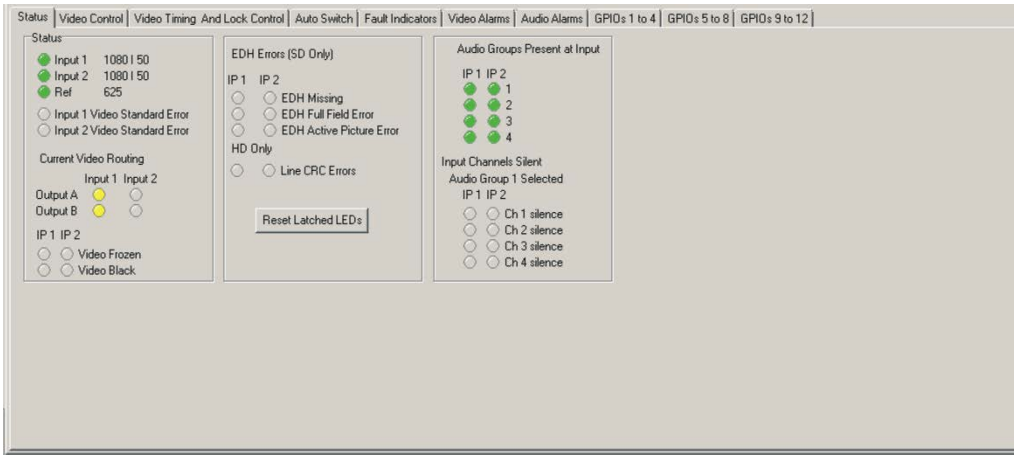
The menu display is repeated for convenience to allow dual-control display of modules with duplicate signal paths or to allow two functions to be viewed at the same time.

Safe Switch-L 3G has eight Statesman menu tabs. One provides status information. The second allows configuration of the switching characteristics. The third tab is where the video timing can be adjusted to compensate for any system delays. The fourth and fifth tabs are where the auto switch criteria and alarm monitoring are set. The final four tabs are for configuring the GPIs.

Status

The status pane is divided into three sections - Active audio groups and input status, EDH status and AV status.

Further status information is provided by the Statesman logging and alarms feature, which is described in more detail in the Statesman manual.



Safe Switch-L 3G Status menu

Input status and active audio groups

A quick view is given of the input format and routing. The Input Present indicators will illuminate green when a valid input is present or red if the input is missing. The video standard is automatically detected and is shown textually. The output routing is also given.

The four simulated LEDs show which audio groups are active within the serial digital video inputs on both input 1 and input 2.

EDH and CRC error status

For an SD input, EDH Missing, EDH Full Field Error and Active Picture Errors are monitored. Status is represented by LED indicators that change colour to show an error condition. EDH Full Field Error and Active Picture Error also have a latched indicator to show if a transitory error has occurred. If the Full Field Error rate exceeds 10 errors per second the EDH Error Rate LED will also illuminate.

For an HD input the line CRC is monitored and any error will generate an alarm condition.

For an error in both EDH and CRC the relevant LEDs will latch to show an error has occurred. Any error indication can be cleared by pressing the Reset Latched LEDs button.

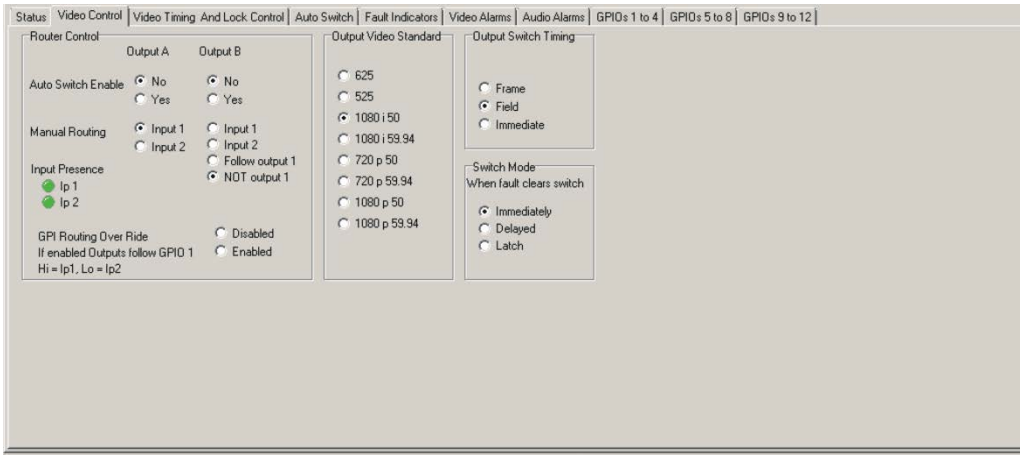
Audio/Video Signal status

If a black or frozen picture is present for longer than the set delay their respective LEDs will also be lit.

Channel silence for the selected group is also indicated by the silence LEDs illuminating yellow, again time before illumination will depend on the silence delay setting.

Video controls

The video control menu is used to set the video signal routing and switching configuration.



Safe Switch-L 3G Video control menu

Routing controls

There are two sets of routing controls for both output 1 and output 2. These give the choice to make a manual routing selection and if selected can be automatically switched away from by an error condition that has been preselected in the auto switch menu.

The conditions under which an automatic switch response occurs to an error can also be selected. Switching away from the error can be selected from Frame, Field and Immediate. Both Frame and Field selections will switch after the next switching point after the error occurs, these being the reference F flag for Frame and for Field the reference V flag. Immediate will make an untimed switch at the occurrence of the error.

Switching back after an error is also selectable from Immediately, Delayed and Latch. Selecting the 'Immediately' setting will result in the Safe Switch-L 3G returning to its previous routing selection once the error condition has been rectified. Delayed will switch back once the error has been removed after a delay set by the Switch-Back Delay control. Latch will remain in the alternate routing state until manually rerouted.

Output video standard

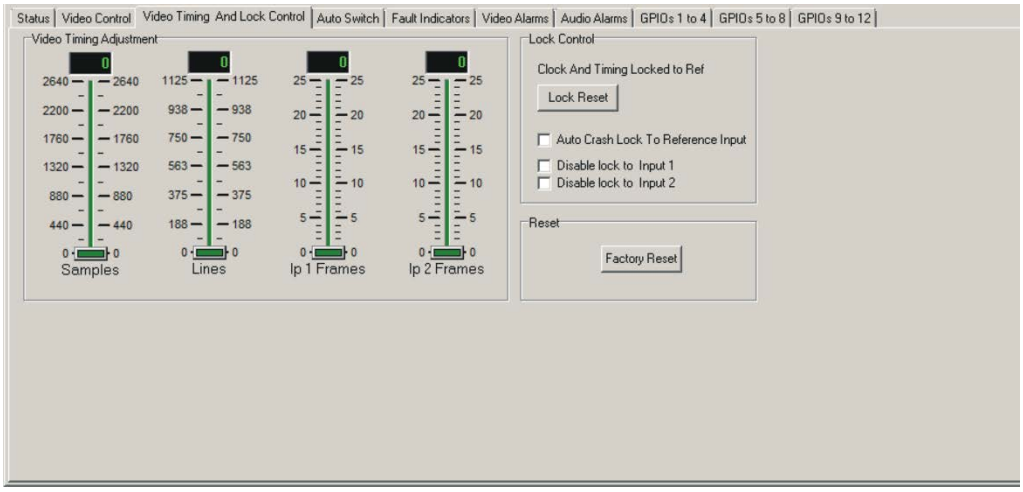
In order to maintain the desired video output standard under all conditions of input and external reference, the output video standard can be selected from the list. This will prevent the output standard being affected by any up-line changes, therefore protecting any down-stream equipment – such as an MPEG encoder – from being disturbed.

Note: To initially obtain an output from the Safe Switch-L 3G it is necessary to set the Output Video control to be the same as the input video on both input 1 and input 2. The factory default is 1080i 59.94.

Video timing

The video timing menu is used to set the delay between the video output and the external reference and to delay the inputs with respect to each other. The number of samples and lines delay will be dependent on the video format.

The factory reset control is also found in this tab.



Safe Switch-L 3G Video timing menu

Video timing

The output timing to reference can be adjusted using the lines and samples control by up to one frame. The inputs can also be adjusted with respect to each other by using the Input 1 and Input 2 frame controls so that the earliest input can be delayed by up to 25 frames in one frame steps with respect to the other input.

Drift lock and Lock reset

To prevent picture disturbances when changing between reference sources such as would normally occur should the external reference go away and be replaced by say the non-coincidental timing of input 1, the output timing of the Safe Switch-L 3G will drift its timing from that of the removed source to that of the newly acquired reference source. The time taken for a lock to be reacquired will depend on the timing difference between the two sources; the genlock status will be displayed by way of a text message.

After recovering from the free running mode clock lock will be regained but not timing lock as the absolute timing will have been lost. It is not possible to recover timing lock without disturbing the output. Use the Reset Lock control to regain timing lock.

On losing a lock to reference the Safe Switch-L 3G will attempt to lock to Input 1 or, failing that, Input 2. To lock successfully the input must be within 2ppm of the external reference.

Locking to the Input 1 video can be prevented by Selecting Disable lock to Input 1. This will cause the Safe Switch-L 3G to attempt to lock to Input 2. Selecting Disable lock to Input 2 will then make the Safe Switch-L 3G free run until the external reference is re-applied.

Selecting Auto Crash lock to Reference Input will make the Safe Switch-L 3G lock to the reference immediately once an external reference is re-applied.

Note: A disturbance in the video output will result from either operating Lock Reset or Auto Crash Lock to Reference Video.

Genlock messages	Messages
Clock and Timing Locked to Ref	Genlocked to the external reference.
Clock Locked to Ref	External Reference reacquired. Clock locked but not timing. Reset lock to reacquire timing lock.

Clock Locked to Input 1	No or unusable external reference. Clock locked to input A, timing not guaranteed.
Clock Locked to Input 2	No or unusable external reference and Input 1. Clock locked to Input 2, timing not guaranteed.
Locking to Ref	Transitory message. External reference reacquired. Drift locking in progress.
Free Running	External reference and inputs not usable as timing reference.

Factory reset

Selecting factory reset will return all configurations to their factory state.

See the following table for reset states.

Factory Reset	
Auto Switch Enable	No
Manual Routing	Input 1 to Output 1, Input 2 to Output 2
Output video standard	1080i 59.94
Output switch timing	Field
Switch mode	Immediately
Video timing	Lines 0, Samples 0
Auto switch configurations	All unticked, Fault indicator A & B set to Input 1
Alarm delays	2 seconds
Audio Silence	-48dBFS
Audio group monitored	Group 1
GPI I/O 1-12	In, Level Trigger, Active low, Disable Auto Switching

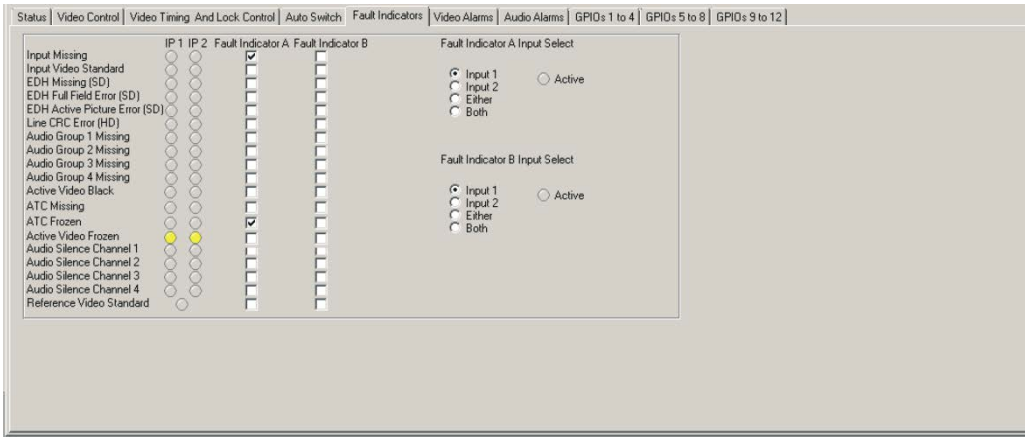
Auto switch

The auto switch menu has 18 fault conditions that can be allocated either singularly or in any multiples up to the full 18. Should any of these conditions be met the Safe Switch-L 3G will automatically switch sources.

Safe Switch-L 3G Auto switch menu

Fault indicators

The Fault Indicator menus each have 18 fault conditions that can be allocated either singularly or in any multiples up to the full 18. Both fault indicators can be assigned using the fault indicator selectors to Input 1, Input 2, Either input or Both inputs. Selecting Either will result in the indicator becoming active if either input 1 or input 2 should show a selected fault condition. Selecting Both requires both input 1 and input 2 to show the same selected fault condition.

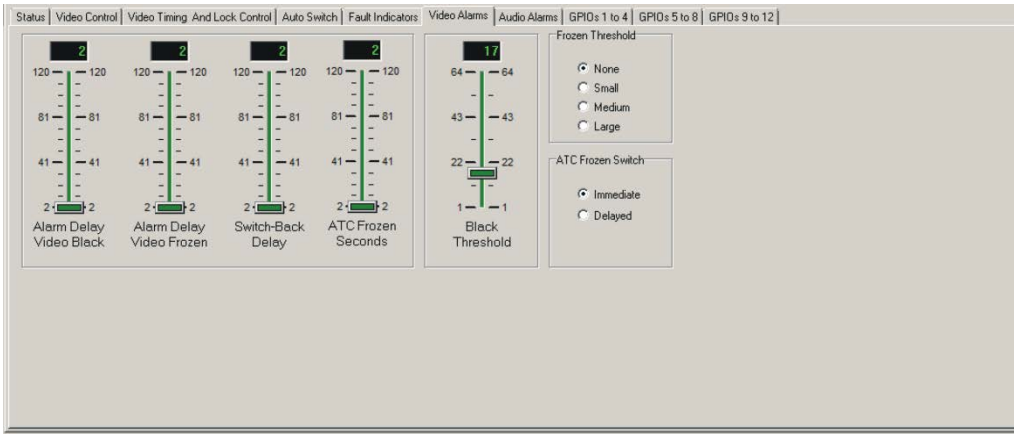


Safe Switch-L 3G fault indicator menu

Alarm delays

The Delay menus allows the setting of the video and audio switching delays, the audio silence level and monitored audio group.

Video alarm delays



Safe Switch-L 3G Video Alarm delay menu

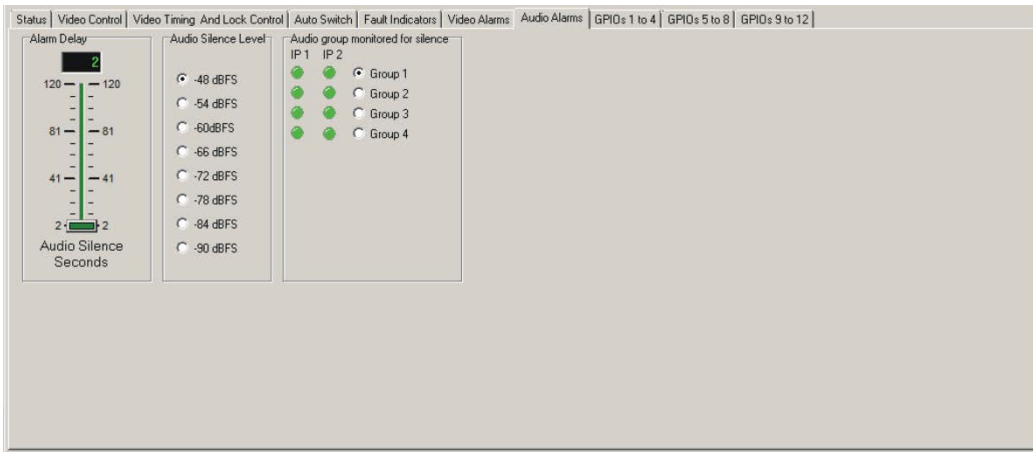
Setting delay

The four sliders labelled Alarm Delay Video Black, Alarm Delay Video Frozen, Switch-Back delay and ATC Frozen Threshold may be adjusted to obtain a delay between two and 120 seconds.

The variable assigned is always shown in the top line of the slider display. It is not possible to assign a delay beyond the range indicated by the slider. If a value less than the minimum or greater than the maximum is assigned, the slider will automatically jump to the minimum or maximum value.

The delay controls may be set in several different ways. The slider can be clicked and dragged, the numerical display may be edited, or a click on a position on the scale will cause the slider to jump to the value associated with the position that was clicked.

Audio Delays



Safe Switch-L 3G Audio Alarms menu

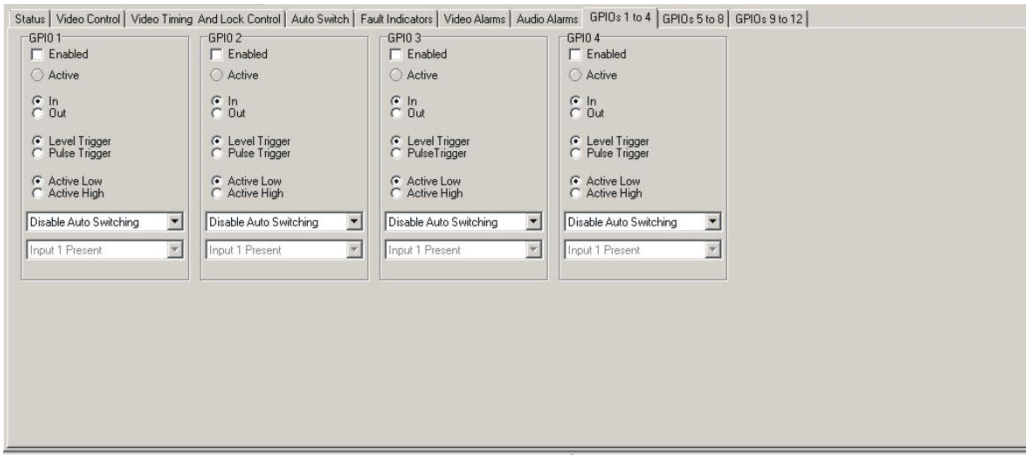
Along with the Audio Silence delay, Audio Silence Level and the audio group to be monitored for silence can be selected.

GPI I/O menu

The final four tabs deal with the GPI I/O assignments. There are in total 12 GPIs that can all be configured to be either an input or output.

Each GPI as well as being configurable as either an input or output can be set to be level triggered or pulse triggered and active low or high. When configured as an input each GPI can be assigned to change routing, and when configured as an output can indicate routing selection and fault reporting.

See chapter four for more information about GPIs and their configuration.



Safe Switch-L 3G GPI configuration menu (GPI 1-4 shown)