Smart Switch

Intelligent SDI 2 x 1 switch

USER MANUAL

Crystal Vision

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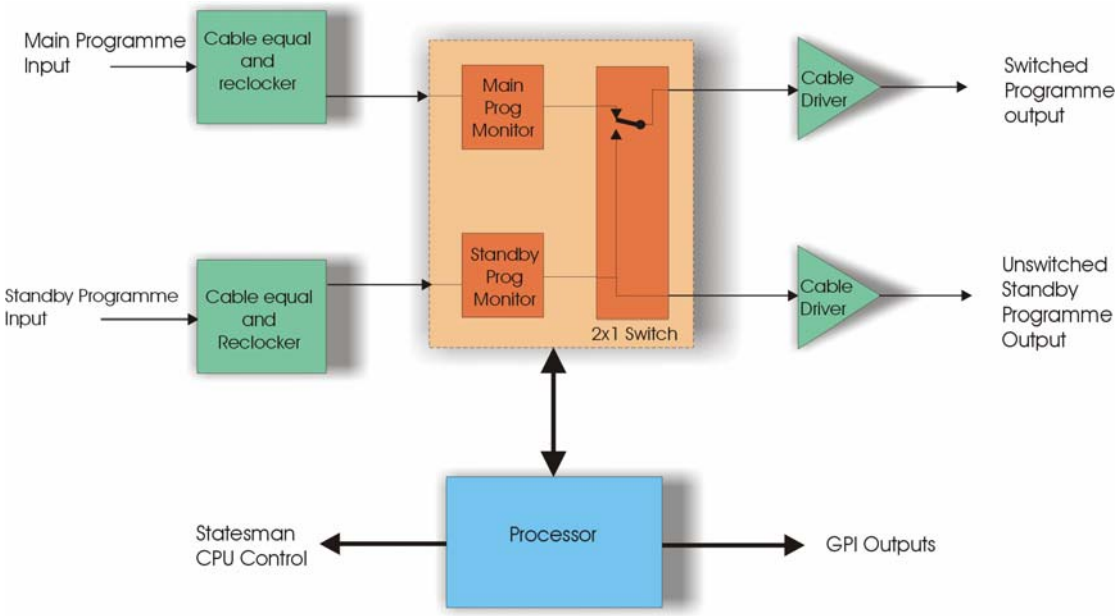
1 Introduction

The Smart Switch is a SDI 2x1 intelligent switch that incorporates sophisticated monitoring for the two video inputs which can include embedded audio. Smart Switch as well as automatically switching between two sources can also be controlled manually.

The auto switch function relies on an error priority rating to control the switch function. This gives the Smart Switch the ability to appraise both sources and make its switching decision on the error rating attributed to both sources. This means that the Smart Switch will not switch away from the primary source if it detects that the standby source contains an error with a higher priority rating than the error detected on the primary source.

Once a switch has occurred the option is then available to either reselect the primary source on removal of the error, delay before reselecting the primary source or latch in the switched state until reset manually.

Smart Switch monitors twelve criteria on both the primary and standby inputs. These twelve criteria are listed in order of priority from input missing to channel 4 audio silent. Any of these twelve criteria can be selected to create and alarm as well as perform a switch although a switch can only occur away from the highest priority error.



Smart Switch - intelligent 2x1 switch

The Smart Switch card is designed to be controlled primarily by Statesman PC control software, therefore it has been given only limited card edge control.

The main features of Smart Switch are:

- Smart SDI 2 x 1 Switch
- Two re-clocked outputs
- Numerous switching options: input present, video black, video frozen, audio group present, audio silence and various EDH errors

- Statesman and GPI alarm indication
- Space-saving: 100mm x 266mm module allowing 24 Smart Switches in 4U

The Smart Switch fits in Crystal Vision's four standard frames and can be integrated with any boards from the company's full product range. The RM04 is the frame rear module giving in addition to the two SDI inputs main and standby, a switched output and a fixed output showing the standby input.

Applications include immediate reaction to and indication of signal or transmission problems in large systems especially in unmanned automatic playout facilities or as a simple signal probe.

2 Hardware installation

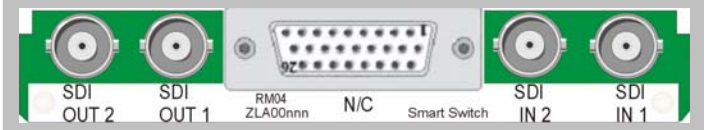
The Smart Switch single height module is used with the RM04 rear connector, which will fit into all Crystal Vision rack frames. All modules can be connected or removed while the frame is powered, without damaging the board.

2.1 Rear modules and signal I/O

The 4U Indigo 4 frame will house up to 24 single height modules with up to three power supplies. The 2U Indigo 2 frames will house up to 12 single height modules and dual power supplies. The 1U Indigo 1 frames will house six single height modules and a single power supply. The Indigo DT desktop box has a built-in power supply and will house up to two single height modules.

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

Rear module connections with RM04

RM04 fits in all frames	Description
	**RM04** • 24 Smart Switch modules per Indigo 4 frame • 12 per Indigo 2 frame • Six per Indigo 1 frame • Two per Indigo DT • All frame slots can be used

BNC	I/O assignment
SDI IN 1	Serial Digital Input 1 (Main Programme Input)
SDI IN 2	Serial Digital Input 2 (Aux or Standby Input)
SDI OUT 1	Reclocked SDI output (Programme Out)
SDI OUT 2	Reclocked SDI output (SDI IN 2 Loop-through)

2.2 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		Manual	Statesman configured	Low (<1V)	High (+5V)
1	‘a’	No function			
2	‘b’	No function			
3	‘c’	No function			
4	‘d’	No function			
5	‘e’	Input missing (either)	See table below	Alarm condition	Non-alarm
6	‘f’	Input Frozen or Black (either)			

As supplied, each GPI output has a 220Ω resistor in series with its output. This allows for an external LED to be driven, connected to a DC voltage of +5V.

GPI 5 and GPI 6 can be configured to show an alarm condition for any individual or group of error conditions. Configuration of the GPI reporting can only be carried out using the Statesman PC control system.

Reportable error conditions
Selected Audio group missing
Silence from any channel 1-4 of selected group for longer than set interval
EDH Missing
EDH Error Rate
EDH Full Field Error
EDH Active Picture Error
Active Video Black for longer than set interval
Active Video Frozen for longer than set interval

Note. When set to local control, GPI 5 input present/missing will react immediately to a loss of input signal. GPI 6 will report an error only if any of the monitored parameters are incorrect for approximately 30 seconds. Error delay is not variable in local mode.

4U frame GPI connections

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

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

Table shows pin number (Remote number)

Note: Remote 1, Remote 3, Remote 5 and Remote 7 are 26-way high-density D-Type female sockets. Frame ground is pin 2 and +5V @500mA is pin 1 in each case.

Remote 2, Remote 4, Remote 6 and Remote 8 are 26-way high-density D-Type male plugs and frame ground is pin 6 in each case and +5V @500mA is pin 15 on Remote 2 and Remote 6.

Note. The +5V output is protected by self-resetting thermal fuses, which limit the total output current available from Remotes 1-4 to approximately 1amp. Remotes 5-8 are similarly protected.

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.

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

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

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

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

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

3 Card edge operation

The Smart Switch card is designed to be controlled primarily by a remote panel, therefore it has been given only limited card edge control. This chapter will concentrate on these card edge controls.

The front card provides power rail monitoring and monitor configuration.

Smart Switch card front edge view

Card edge LED

The card edge LEDs when illuminated indicate that all power rails are within tolerance.

Card edge switch settings

The 8-way piano switch allows control options to be selected.

Lever	Function	Action	
1	Remote/Local	Set lever 1 DOWN for board edge control.	
2	Auto/Manual	Sets the board to auto switch or force with Switch 3	
3	Manual Select	Force the main output to show Input 1 or Input 2.	
4	Audio Monitoring	Set lever DOWN to disable audio monitoring.	
5	Select audio group	UP, UP Group 1	UP, DOWN Group 3
6		DOWN, UP Group 2	DOWN, DOWN Group 4

8-way piano switch menu functions

Remote local

Lever 1 selects between card edge control or remote mode. A more comprehensive control of the Smart Switch's monitoring functions is available when controlled remotely via a Statesman PC control system. UP = Remote control, DOWN = Local control (card edge)

In local mode Statesman will still monitor all video parameters but will have no control of audio group, channel or GPI selection.

Auto / Manual control

This lever (lever 2) allows the main programme output to switch automatically on detecting an error or be forced to show the output selected by lever 3. UP = Auto control, DOWN = Manual control

Manual Select

Lever 3 in the UP position will force the main output to show the main input (SDI 1), assuming Lever 2 is set to manual (DOWN).

Lever 3 in the DOWN position will force the main output to show the aux/standby input (SDI 2) again assuming lever 2 is set to manual.

Audio Monitoring

In the absence of embedded audio in the video signal it is necessary to disable audio monitoring to prevent a continuous error condition. Setting lever 4 to DOWN disables audio monitoring.

Audio group selection

Embedded audio within the video signal is contained within four groups. The positions of levers 5 and 6 select which of the four groups within the video signal, Smart Switch's de-embedders will monitor.

Audio Group	Lever 5	Lever 6
1	UP	UP
2	DOWN	UP
3	UP	DOWN
4	DOWN	DOWN

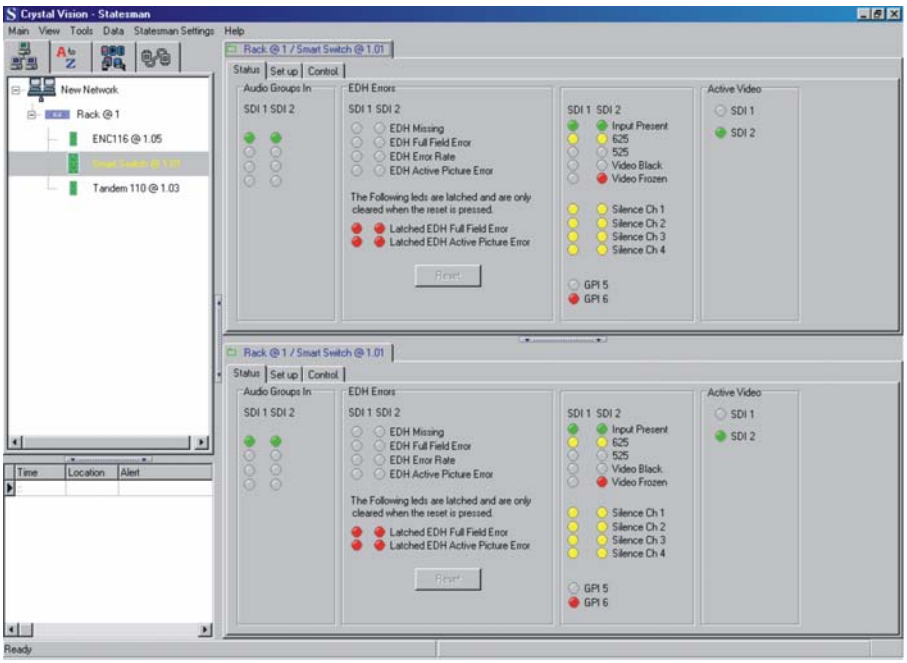
4 Statesman

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.

4.1 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.

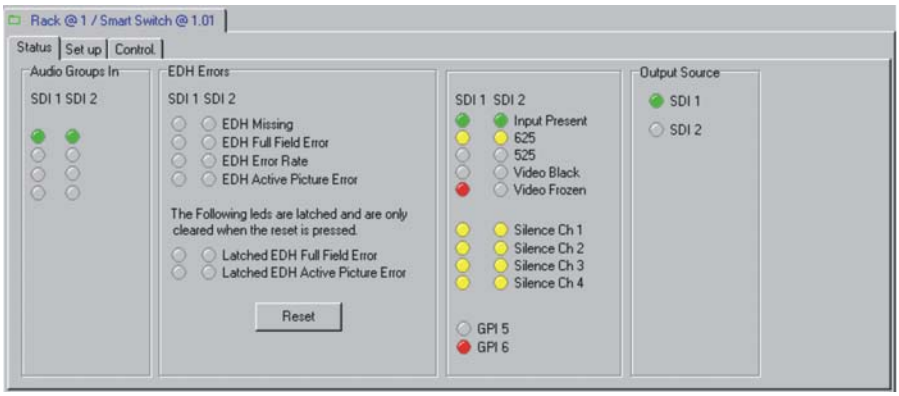


The Statesman main application window

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.

Smart Switch has three Statesman menu tabs, one that provides status information, the second that allows configuration of delay and assigning the GPI outputs. The third tab is where the response to errors and monitoring functions are configured.

Status



Smart Switch Status menu

The status pane is divided into four sections - Active audio groups, EDH status, AV status and Output source.

Active Audio Groups

The four simulated LEDs show which audio groups are active within the serial digital video inputs.

EDH status

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.

Audio/Video Signal status

The Input Present indicator 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 by a yellow indicator. 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.

Any asserted GPIs are also indicated here.

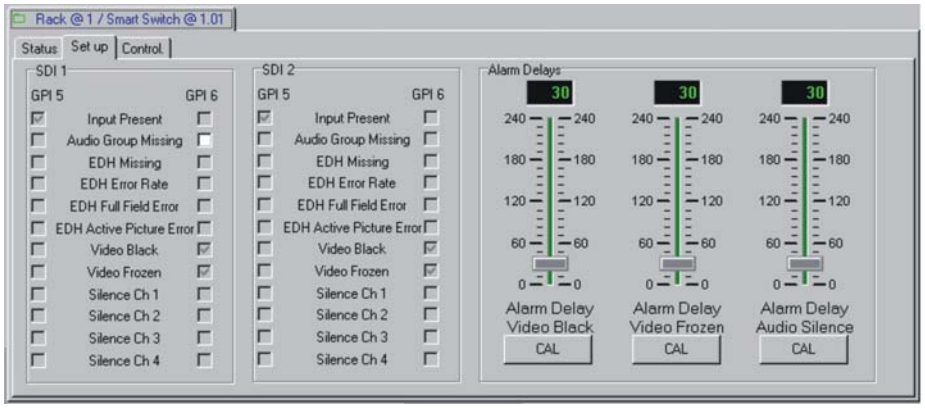
Output source

This is a simple indication of which input source is present on the main programme output.

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

Set up

The Set up menu allows the configuring of the GPIs and delay times for Video Black, Video Frozen and Audio Silence.



Smart Switch Set up menu

GPI Assignment

Smart Switch has two assignable GPI outputs, GPI 5 and GPI 6.

GPI 5 and GPI 6 are assigned by ticking the check box associated with each parameter. Any number of available parameters can be assigned to a single GPI by ticking multiple check boxes.

Configuring delay

The three sliders labelled Alarm Delay Video Black, Alarm Delay Video Frozen and Alarm Delay Audio Silence may be adjusted to obtain a delay between 0 and 240 seconds.

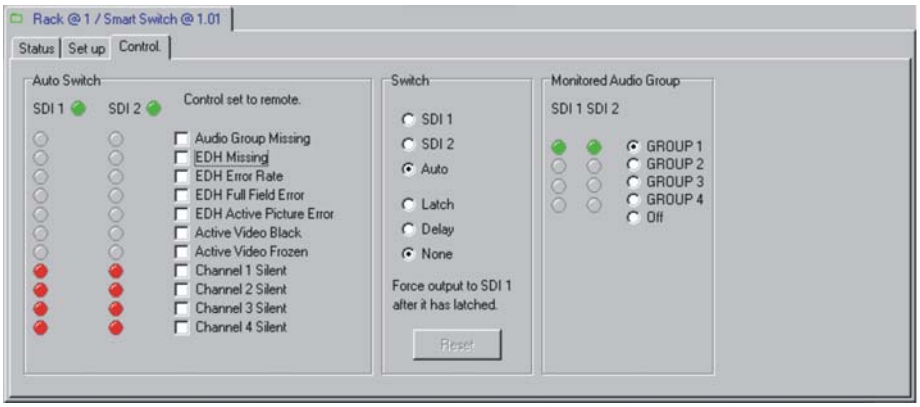
The variable assigned is always shown in the top line of the slider display. It is not possible to assign a delay beyond the range indicated by the slider. If a value less than the minimum or greater than the maximum is assigned, the slider will automatically jump to the minimum or maximum value. Set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

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

The sliders may be reset to their default values of 30 seconds at any time by clicking on the Cal button below each slider.

Control

The Control menu allows the setting of the switching criteria and audio monitor.



Smart Switch Control menu

Auto Switch

The switching criteria are listed in order of priority; the highest priority being loss of input, which is non-maskable, so is omitted from the list. Should an error occur in the main programme switching, the main programme output to the aux/standby input can only occur if any errors in the aux/standby input are of a lesser priority or a criteria of higher priority has been masked by leaving its check box unticked.

Ticking the appropriate check boxes configures the switching criteria. Any number of criteria may be selected by ticking multiple boxes.

Switch control

The switching mode is configured by adding a check mark to the appropriate switch panel radio button.

In Auto mode Smart Switch will act on any error conditions that meet the switching criteria set-up in the Auto Switch pane and preset delays pane. Either input can also be forced to the output by selecting its respective radio button.

When set to Auto three more modes are selectable, none will allow the Smart Switch to react to any qualifying error by switching away from the faulty input but will return once the error has disappeared for a minimum of one frame. In certain circumstances this could result in the output flip-flopping between the main program input and aux/standby input erratically. To avoid this, the switching action can either be delayed which imposes a 20 second delay from the last recorded error or latched so that once switched, the output will remain in the switched state until reset.

Finally, the audio group to be monitored can be selected. Selecting none will remove unwanted silence alarms.

5 Trouble shooting

The card edge may be used to perform simple trouble shooting. The Statesman PC control system can be used for more comprehensive trouble shooting.

The card edge LEDs will indicate a fault in the on-board power supplies or a misplaced switch.

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

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.

6 Specification

General

Dimensions	100mm x 266 mm module with DIN 41612 connector
Weight	155g
Power consumption	6 W

Inputs

Video	270Mb/s serial digital to EBU Tech 3267-E and SMPTE 259M
	Cable equalisation >250m Belden 8281 or equivalent

Outputs

Number and type:	Two (main program and aux/standby program) SDI re-clocked
	Each will drive >250m Belden 8281 or equivalent
Jitter	Typically 0.2UI, 10Hz

Processing

Video	Picture and EDH status
Audio	Two four channel de-embedders assignable to any single audio group
GPIs	Two output alarms are available:
	In local mode they default to SDI input present and the other as picture frozen or black.
	In remote mode both GPI alarms are user configurable

Status and monitoring

Card edge visual monitoring, with LED indicators to indicate:

PSU rails present.

Statesman control.