

# Reference Manual

**P VD 5810 D**

**P VD 5810 U**

**SD/HD/3G Multi-format Frame Synchronizer with Full Embedded  
and External AES Audio Support**

**Revision 1.1 – August 2013**

<b>This Manual Supports Device Revisions:</b>	
P VD 5810 Firmware Revision	558
Control System GUI Release	6.3.0

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**LYNX Technik AG**  
**Brunnenweg 3**  
**D 64331 Weiterstadt**  
**Germany**  
[www.lynx-technik.com](http://www.lynx-technik.com)

# Contents

<b>Contents .....</b>	<b>2</b>
<b>Warranty .....</b>	<b>5</b>
<b>Regulatory information .....</b>	<b>6</b>
<i>Europe.....</i>	<i>6</i>
Declaration of Conformity.....	6
<i>USA.....</i>	<i>6</i>
FCC 47 Part 15 .....	6
<b>Getting Started .....</b>	<b>7</b>
<i>Packaging.....</i>	<i>7</i>
<i>ESD Warning.....</i>	<i>7</i>
Preventing ESD Damage.....	7
<b>Product Description .....</b>	<b>8</b>
<i>Input Video Formats .....</i>	<i>9</i>
<i>Output Video Formats.....</i>	<i>10</i>
<i>Input Reference Signal.....</i>	<i>11</i>
<i>Reference Lock.....</i>	<i>12</i>
<i>Frame Synchronization.....</i>	<i>12</i>
<i>Video Processing .....</i>	<i>13</i>
Proc Amp Functions .....	13
Aperture Correction .....	13
Test Patterns .....	13
Programmable Output Delay.....	13
<i>Audio Processing .....</i>	<i>14</i>
DolbyE Audio Signals.....	14
Automatic Audio Synchronization & Channel Assignment (ASCA) .....	15
Introduction.....	15
Working Principle.....	15
Limited Sync Resources.....	16
Limitations: .....	16
<i>GPI Function.....</i>	<i>18</i>
Freeze input with GPI .....	18
User Presets – GPI Switch.....	18
GPI Connections .....	18
<i>Functional Diagrams.....</i>	<i>19</i>
<i>Module Layout.....</i>	<i>21</i>
<b>Connections.....</b>	<b>22</b>
<i>Video .....</i>	<i>22</i>
<i>External Audio (AES) .....</i>	<i>22</i>
<i>GPI Connections.....</i>	<i>22</i>
<b>Installation .....</b>	<b>23</b>

<b>Settings and Control</b>	<b>24</b>
<i>Switch Settings</i>	25
<b>Switch Function Detail</b>	25
<b>Factory Preset Condition</b>	26
<b>Auto Store</b>	26
<b>Reset Button</b>	26
<b>Alarm/LED Status Indicators</b>	<b>27</b>
<b>REF Status (LED1)</b>	27
<b>SDI Status (LED2)</b>	27
<b>Power Indication</b>	28
<b>Local/remote LED</b>	28
<b>Control System GUI</b>	<b>29</b>
<b>Main Tab</b>	30
<b>REF in Select</b>	30
<b>AES Inputs</b>	31
<b>Automatic Audio Detection and Sample Rate Converters</b>	31
<b>Configuring Audio Inputs</b>	31
<b>Maintaining DolbyE Transparency</b>	32
<b>AES Outputs</b>	32
Setting Mono Cross Points	33
<b>Output Mux</b>	34
<b>Selecting Functions</b>	35
<b>Sync Tab</b>	36
General Video Settings	36
External Reference Source	36
Frequency Pre-select	36
Freeze Mode	37
Synchronization Mode	37
Synchronous SDI Input (minimum audio delay)	38
General Audio (ASCA)	38
<b>Video Proc Tab</b>	39
<b>Aperture Correction</b>	39
<b>Clip Cr/Cb Headroom</b>	39
<b>H and V Blanking</b>	39
<b>H Flip</b>	39
<b>Settings</b>	40
Output if no input	40
Freeze Mode	40
Test Pattern Pre-select	40
Test Pattern Standard	40
Test Pattern Enable	40
<b>Video Adjustments</b>	41
<b>Timing Tab</b>	42
<b>AES Port Setup</b>	43
<b>AES Proc Tab</b>	44
<b>User Presets Tab</b>	45
To save a preset	45
To load a saved preset	46
Setting GPI control of Preset selections	46
GPI Influence	46
<b>Events Tab</b>	47

<b>Log in GUI Function</b> .....	47
<b>Alarm Activation</b> .....	47
<b>SNMP Support</b> .....	47
<b>Specifications</b> .....	48
<b>Service</b> .....	50
<i><b>Parts List</b></i> .....	50
<i><b>Technical Support</b></i> .....	50
<b>Contact Information</b> .....	50

# Warranty

LYNX Technik AG warrants that the product will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment. If this product proves defective during the warranty period, LYNX Technik AG at its option will either repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, customer must notify LYNX Technik of the defect before expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by LYNX Technik, with shipping charges prepaid. LYNX Technik shall pay for the return of the product to the customer if the shipment is within the country which the LYNX Technik service center is located. Customer shall be responsible for payment of all shipping charges, duties, taxes and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure, or damage caused by improper use or improper or inadequate maintenance and care. LYNX Technik shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than LYNX Technik representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non LYNX Technik supplies; or d) to service a product which has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty servicing the product.

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# Regulatory information

## Europe

### Declaration of Conformity

We LYNX Technik AG  
Brunnenweg 3  
D-64331 Weiterstadt  
Germany  
*Declare under our sole responsibility that the product*

TYPE: **P VD 5810 D; P VD 5810 U**

*To which this declaration relates is in conformity with the following standards (environments E1-E3):*

EN 55103-1 /1996

EN 55103-2 /1996

EN 60950-1 /2006

*Following the provisions of 89/336/EEC and 73/23/EEC directives.*

Winfried Deckelmann

Weierstadt, May 2013



*Place and date of issue*

*Legal Signature*

## USA

### FCC 47 Part 15

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Getting Started

Most CardModules are installed into the rack frames and system tested in the factory. If this is an upgrade part or service exchange item then the module is supplied in a padded cardboard carton which includes the CardModule, rear connection plate and mounting screws.

## Packaging

The shipping carton and packaging materials provide protection for the module during transit. Please retain the shipping cartons in case subsequent shipping of the product becomes necessary. Do not remove the module from its protective static bag unless observing adequate ESD precautions. Please see below.

## ESD Warning



This product is static sensitive. Please use caution and use preventative measures to prevent static discharge or damage could result to module.

## Preventing ESD Damage

Electrostatic discharge (ESD) damage occurs when electronic assemblies or the components are improperly handled and can result in complete or intermittent failure.

Do not handle the module unless using an ESD-preventative wrist strap and ensure that it makes good skin contact. Connect the strap to any solid grounding source such as any exposed metal on the rack chassis or any other unpainted metal surface.

### Caution

Periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 Megohms.

# Product Description

The P VD 5810 Module is a high performance SD/HD/3GBit/s frame synchronizer / line synchronizer with full embedded and external AES audio support. Basic functionality is a single channel multi format frame synchronizer

Eight AES ports are provided which can be switched by the user individually as AES inputs or outputs.

All deembedded and external AES signals can be processed in an audio processing stage incl. mono gain, stereo downmix, mute, overload and silence detection as well as a 1kHz test tone generator.

Dolby E processing is included in the audio processing stage, i.e. one encoded Dolby E stream can be synchronized to the Reference Signal and the Guard Band is automatically aligned.



## Input Video Formats

The module has one multi-format serial digital input with automatic input detection. The module will detect the following input standards and configure the input stage automatically for operation in the connected format.

<b>SDTV Formats</b>	<b>HDTV Formats</b>
525 / 59.94Hz	1080i / 50Hz
625 / 50Hz	1080i / 59.94Hz
	1080i / 60Hz
	1080p / 23.98Hz
	1080p / 24Hz
	1080p / 25Hz
	1080p / 29.97Hz
	1080p / 30Hz
	1080psf / 23.98Hz
	1080psf / 24Hz
	1080psf / 25Hz
	720p / 23.98Hz
<b>3GBit/s Formats (Level A)</b>	720p / 24Hz
1080p / 50Hz	720p / 25Hz
1080p / 59.94Hz	720p / 29.97Hz
1080p / 60Hz	720p / 30Hz
	720p / 50Hz
	720p / 59.94Hz
	720p / 60Hz

## Output Video Formats

The module provides one SDI output on two BNC connectors. Supported output video formats are:

<b>SDTV Formats</b>	<b>HDTV Formats</b>
525 / 59.94Hz	1080i / 50Hz
625 / 50Hz	1080i / 59.94Hz
	1080i / 60Hz
	1080p / 23.98Hz
	1080p / 24Hz
	1080p / 25Hz
	1080p / 29.97Hz
	1080p / 30Hz
	1080psf / 23.98Hz
	1080psf / 24Hz
	1080psf / 25Hz
	720p / 23.98Hz
<b>3GBit/s Formats (Level A)</b>	720p / 24Hz
1080p / 50Hz	720p / 25Hz
1080p / 59.94Hz	720p / 29.97Hz
1080p / 60Hz	720p / 30Hz
	720p / 50Hz
	720p / 59.94Hz
	720p / 60Hz

The output format frequency (or frame rate) is determined by the connected reference signal and the output will remain fixed to this reference regardless of the connected input signal.

For input signals mismatched the connected reference frame rate, the synchronizer will show this as an asynchronous source (indicated by a yellow status indication in the GUI) and any output signal derived from this “async” source can show video disturbances (see below “Reference Lock”)

## Input Reference Signal

The module has a very flexible input reference stage which facilitates the use of either SDTV analog bi-phase sync (i.e. black burst) or HDTV analog tri-level sync. The reference input is “cross lock” compatible so an SDTV reference can be used to frequency lock HDTV signals (and vice versa). The connected reference is auto detected and the synchronizer automatically configures the outputs to the frame rate of the connected reference signal.

Supported reference signals are shown below.

SDTV Analog Bi-Level Sync	HDTV Analog Tri-Level Sync
525 / 59.94Hz	1080i / 50Hz
625 / 50Hz	1080i / 59.94Hz
	1080i / 60Hz
	1080p / 23.98Hz
	1080p / 24Hz
	1080p / 25Hz
	1080p / 29.97Hz
	1080p / 30Hz
	1080psf / 23.98Hz
	1080psf / 24Hz
	1080psf / 25Hz
	720p / 23.98Hz
	720p / 24Hz
	720p / 25Hz
	720p / 29.97Hz
	720p / 30Hz
	720p / 50Hz
	720p / 59.94Hz
	720p / 60Hz

## Reference Lock

If the input frame rate, the output frame rate and the frame rate of the reference signal are equal, exactly half of each other or double of each other then all modes of the P VD 5810 operates with no limitations:

- All 25 Hz and 50 Hz input formats will be synchronized to any 25 Hz or 50 Hz reference signal (from the tables above). The output frame rate can be any format with a frame rate of 25 Hz or 50 Hz.
- All 30 Hz and 60 Hz input formats will be synchronized to any 30 Hz or 60 Hz reference signal (from the tables above). The output frame rate can be any format with a frame rate of 30 Hz or 60 Hz.
- All 29.97 Hz and 59.94 Hz input format will be synchronized to any 29.97 Hz or 59.94 Hz reference signal (from the tables above). The output frame rate can be any format with a frame rate of 29.97 Hz or 59.94 Hz.
- All 23.98 Hz input formats will be synchronized to any 23.98 Hz reference signal (from the tables above). The output frame rate can be any format with a frame rate of 23.98 Hz.
- All 24 Hz input formats will be synchronized to any 24 Hz reference signal (from the tables above). The output frame rate can be any format with a frame rate of 24 Hz.

**NOTE:** If the frame rate of the reference signal is not equal, double or half of the input/output frame rate, then all functions still are available except the video delay as the frame rate of the output video does not match the frame rate of the reference signal. The video output remains frequency locked to the Reference signal. In this case a synchronized Dolby E signal **will not match** the required guard band of the video output signal.

## Frame Synchronization

The algorithms used for frame synchronization are extremely robust and very tolerant of poor input signals. The synchronizer uses “Flywheel” functionality. This allows the module to recover from any missing sync pulses on the input signal(s) by predicting where they should be and then re-inserting them.

The synchronizer can also be switched into a Line Synchronizer Mode (see page 37)

## Video Processing

### Proc Amp Functions

The output channel has an associated video processing amp which provides user adjustable ***Gain*** / ***Saturation*** / ***Black Level*** and ***Hue*** using on screen sliders.

### Aperture Correction

An adjustable horizontal aperture corrector is provided. This can be used to add (or remove) image sharpness as required.

### Test Patterns

The output processor provides a test pattern generator with a wide range of test pattern to choose from.

The selected test pattern is also available as one of the modes the synchronizer will switch to when excessive video TRS errors are encountered. Possible synchronizer actions when the input video errors become excessive are:

- Freeze Field 1
- Freeze Field 2
- Freeze Frame
- Selected Test Pattern
- Black

### Programmable Output Delay

The SDI output has a separate programmable video output delay which can be set (independently) between 0 and 62 frames (max). The adjustment is available in pixel, line and full frame increments or can be switched to a ms increment entry.

This adjustment will delay the SDI video output, including the embedded audio, relative to the connected reference by the delay setting specified. (+ fixed delay)

## Audio Processing

The module will de-embed the complete audio payload from the incoming SDI stream signal, i.e. 4 AES groups = 8 AES = 16 audio channels per channel, and passed to an AES audio processing stage along with up to 8 external AES inputs.

The type of audio (PCM, Dolby E or Audio Data) is detected by the module automatically.

The audio is fed through sample rate converters (SRC's) where the audio is re-sampled and synchronized.

PCM Audio using the sample rate converters will be free from any audio interference ("pops and clicks") when frames are dropped or repeated by the frame synchronizer.

**Note.** *If an encoded Dolby E audio signal is detected by the module the associated SRC and the following audio processing will be switched off automatically. For asynchronous Dolby E streams you should use the Dolby E synchronizer.*

The audio streams can be individually delayed in various zones (see GUI section).

All AES signals are fed into a full audio processing stage, which includes mono gain adjustment, mute, phase inversion, silence and overload detection and stereo down mix as well as a 1kHz test tone generator.

## DolbyE Audio Signals

The PVD 5810 is transparent to any embedded or external DolbyE bit streams:

- a) If the input is synchronous,
- b) If the input is asynchronous – one selectable Dolby E synchronizer is provided, which synchronizes the Dolby E signal to the reference signal and automatically aligns the guard-band.

**Note:** *Synchronization and auto guard band alignment only works correctly if the frame rates of the video input/output matches the reference signal (see above "Reference lock").*

**Note.** *All external AES connections are isolated through transformer coupling.*

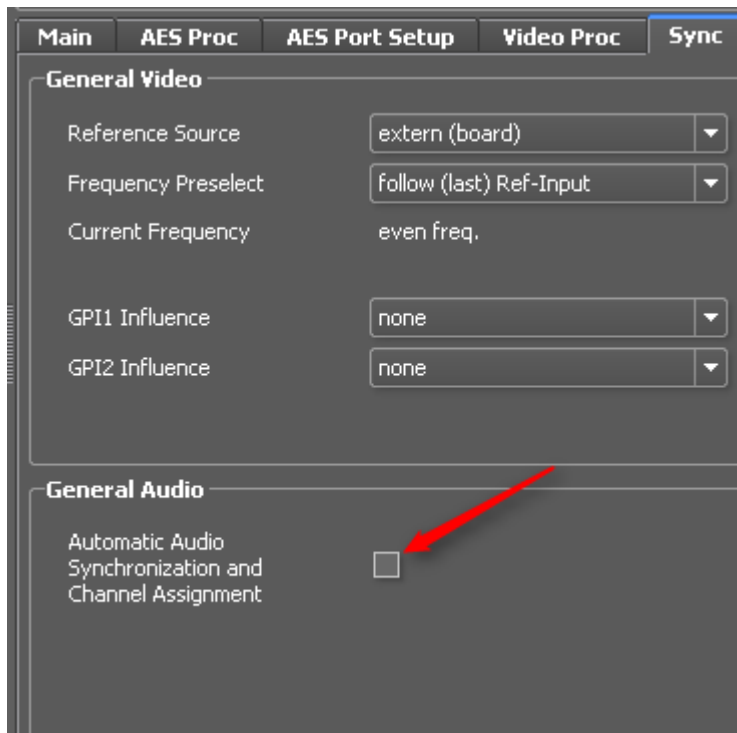
**Note.** *For more details on the audio routing part, please see the GUI section of this manual*

## Automatic Audio Synchronization & Channel Assignment (ASCA)

### Introduction

The P VD 5810 Frame Synchronizer provides comprehensive audio routing capabilities; providing individual mono crossbars for each output channel. While this provides the greatest level of flexibility it can also be cumbersome for basic applications which just need the audio passed through the system transparently (The same embedded audio configuration on the input is required on the synchronized output).

The Automatic Audio Synchronization and Channel Assignment (ASCA) function has been introduced to address this, and once enabled will ensure the incoming embedded audio streams are correctly synchronized and re-embedded into the video output.



**Note.** External AES inputs are not supported while the ASCA function is enabled. The ASCA function is by default OFF which requires manual configuration of the audio crossbars.

The ASCA function is enabled and configured on the video Sync tab using the LYNX Desktop Controller (control system)

### Working Principle

Depending on the type of audio content (PCM, DolbyE, other data ...), different synchronization methods, and therefore different internal audio pathways have to be used for each audio input stream. The ASCA function will automatically select the appropriate audio pathway through the module by automatically configuring the internal audio crossbars based on the type of audio signal.

## Limited Sync Resources

The synchronization resources are limited on each module. All Audio signals have sample rate converters (SRC), but there is only one DolbyE frame-synchronizers (DE-FS) available.

In the event that the available synchronization resources for Dolby E Streams are exceeded, the remaining audio content will be passed through **un-synchronized** and a warning will be visible in the control system GUI.

For example, this situation can occur if there is more than one DolbyE stream embedded in the incoming SDI signal,

The available resources (per SDI channel) are applied to the embedded audio streams in the following order of priority (if one of the audio-streams is not present, it will not be assigned any resources):

1. Audio streams de-embedded from group 1
2. Audio streams de-embedded from group 2
3. Audio streams de-embedded from group 3
4. Audio streams de-embedded from group 4
5. In the event of unavailable synchronization resources, a warning will be issued and the remaining audio-channels will be process un-synchronized. All audio signals will be delivered on the output in any case. So the limitation applies only in an asynchronous environment.

## Limitations:

### 1. Audio Disturbances

Whenever the ASCA function is re-configuring the audio-channels, the configuration process will possibly generate audible disturbances in some of the audio output channels (embedded or AES) of the same video program. Such re-configuration will be triggered by any change of the appropriate input configuration (video, embedded audio). Therefore this function is recommended to be used in environments, in which the incoming signal configuration does not change while a programming stream is being processed. I.e. it can be used for automatic pre-setup only.

### 2. Flexibility: Crossbars and processing

Using the ASCA function imposes the following limitations to the audio infrastructure:

- Internal audio processing (mute, gain, invert, ...) is disabled and set to neutral
- Takes full control over all internal audio-crossbars, except the crossbar configuring the external AES output channel assignment.

Accordingly, the effected audio-crossbar and audio processing parameters will be grayed out and set to read-only in the control system.

### 3. Persistence of user settings

After turning the ASCA function ON, audio-infrastructure settings (crossbar, SRCs, Embedders) are modified by an automatic process. When the ASCA function is then turned OFF again, previous settings are \*not\* automatically restored. As a consequence, turning the ASCA ON and OFF can result in a modified audio-infrastructure (crossbars, processing).



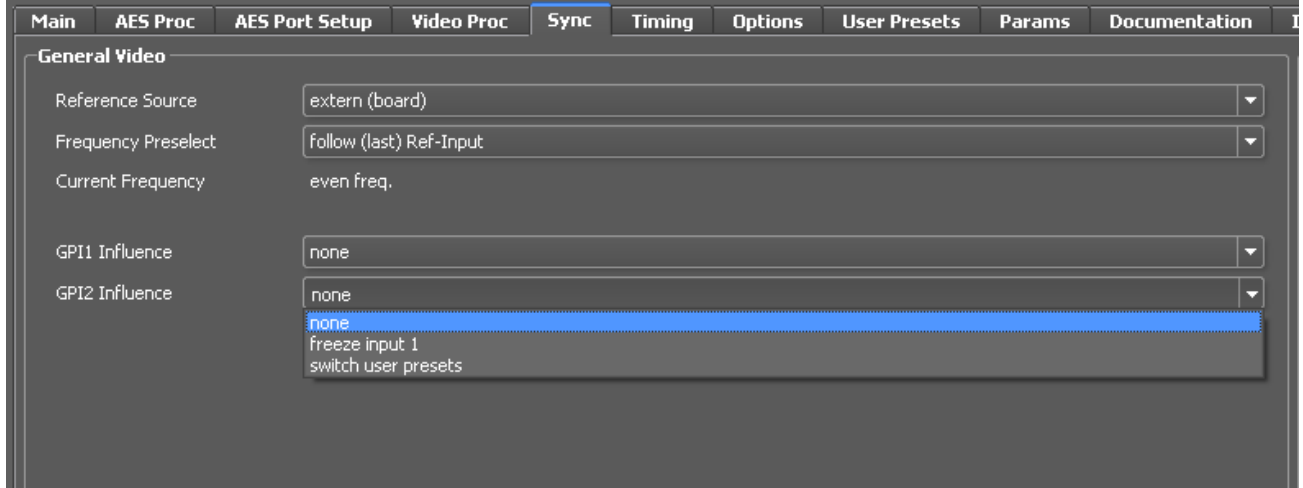
#### **4. External AES input not usable**

Turning the ASCA function ON will allocate the Dolby E synchronizer to one of the signals de-embedded from the video input. The external AES inputs cannot be used at all.

On the other hand, the external AES outputs are not controlled by ASCA, i.e. the "AES output" crossbar is still active (not grayed out). However, the automatic ASCA process can re-assign individual audio streams to different internal audio channels. So, if an external AES output is connected to a particular internal audio stream, the content of that stream can change spontaneously, because ASCA has modified the AES crossbar, following a change of the audio in the input signal.

## GPI Function

The two GPI inputs (**G**eneral **P**urpose **I**nterface) which are switch input functions (contact closure) can be used to perform a number of functions. The influence of these inputs can be set by the user using the control system on the Sync Tab.



### Freeze input with GPI

If this mode of the GPI influence is selected then the following functions will be performed:

- With GPI open the module processes all input signals as usual
- With GPI closed the input will be frozen (volatile freeze, i.e. frozen frame is not retained through power cycle)

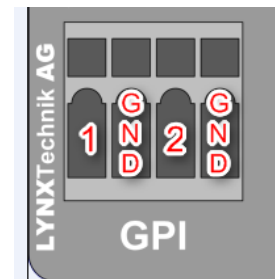
In the case of an activated freeze the module processing performs all functions on the frozen frame.

### User Presets – GPI Switch

User Presets allow the user to store 7 additional sets of module settings (snapshots) in addition to the current settings in module flash RAM. The GPI can then be configured to toggle between any 2 or 4 of the 8 stored presets by selecting “*switch user presets*” as the GPI influence setting. (Refer to the *User Settings* section in the GUI part of this manual for more details, page 46)

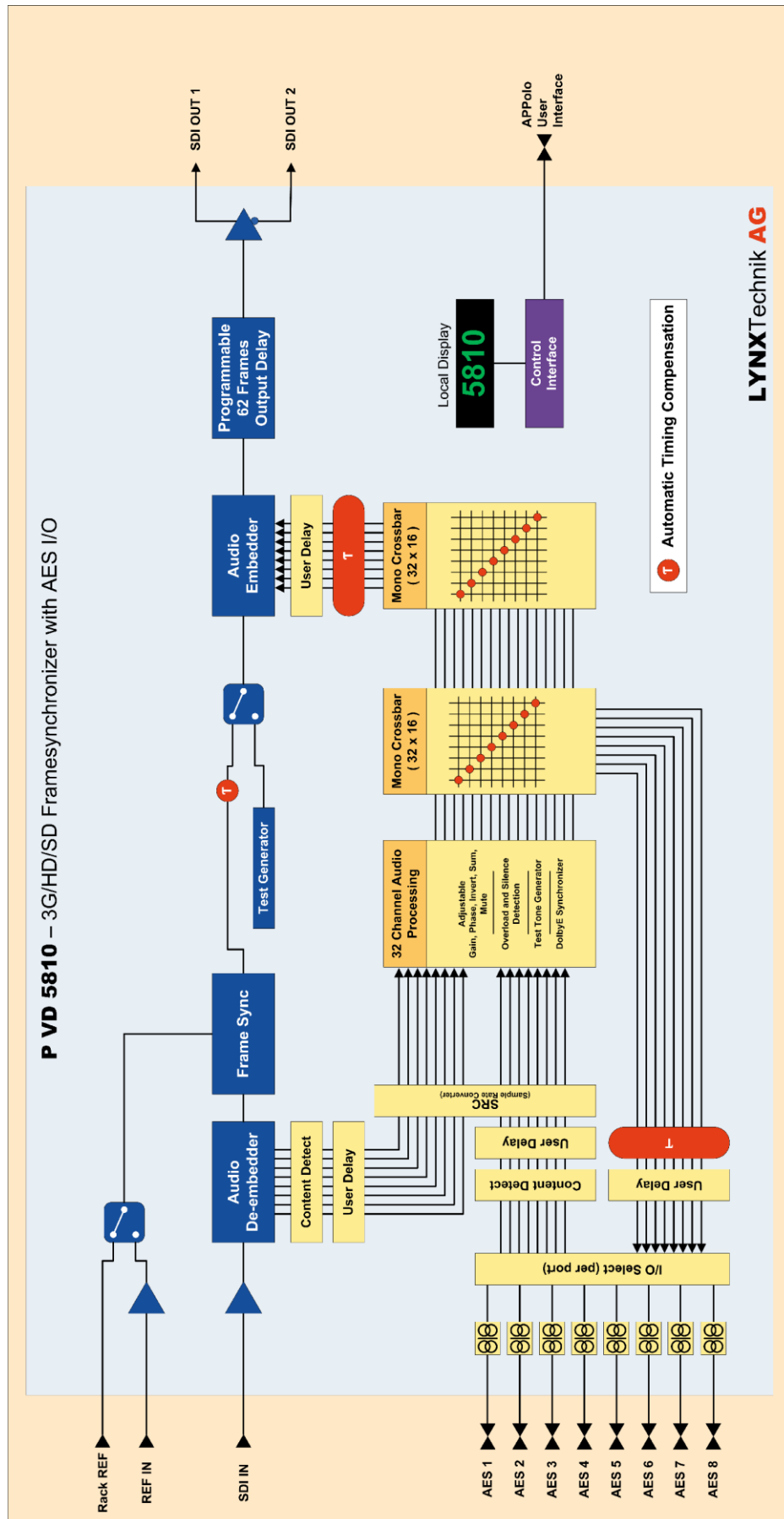
### GPI Connections

The pinning of GPI contacts are shown in the picture on the right:

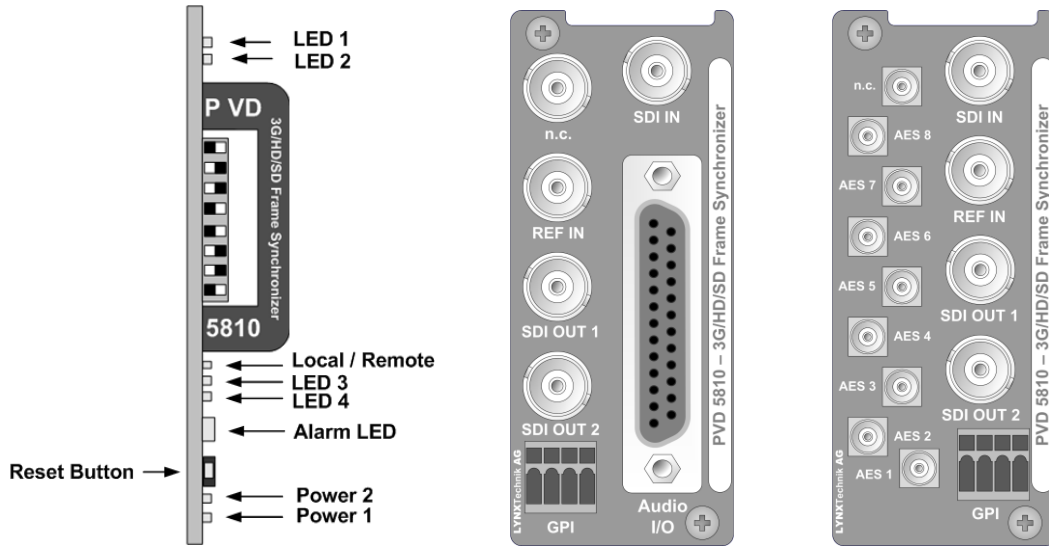


## **Functional Diagrams**

The functional diagram of the PVD 5810 is shown on the next page.



## Module Layout

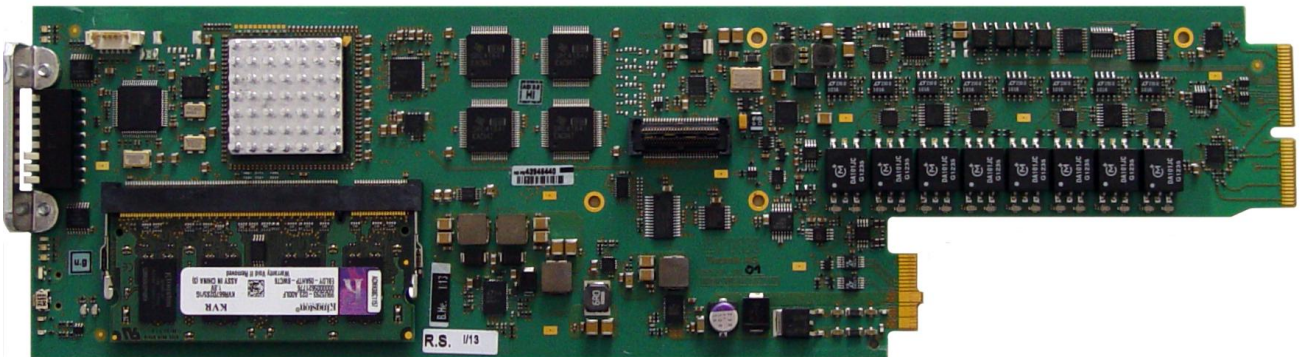


### Module Front

### Module Rear Termination Panels

**P VD 5810 U** = Mini-DIN connectors for unbalanced AES3id

**P VD 5810 D** = SubD 25 connector for balanced AES3



# Connections

## Video

The P VD 5810 uses standard 75 Ohm BNC connectors. We recommend the use of high quality video cable for digital video connections to reduce the risk of errors due to excessive cable attenuation. Max cable lengths the module will support are shown below.

SDTV = 250m Belden 8281 (270Mbits/s)

HDTV = 140m Belden 1694A (1.4Gbits/s)

3Gbit/s = 80m Belden 1694A (2.97Gbits/s)

**Note.** Due to the compact design of the connection plate it will be necessary to use a connection tool to secure the BNC video connectors.

## External Audio (AES)

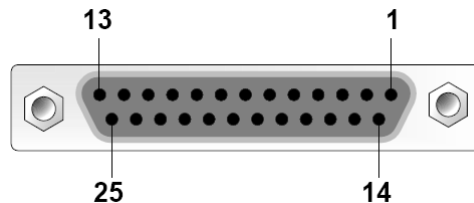
The module provides for both Unbalanced (AES3id on MINI DIN connectors) and Balanced (AES3) external audio connections.

The **PVD 5810 U** version provides MiniDIN (DIN1.0/2.3) connections for unbalanced AES3id

The **PVD 5810 D** version provides a SubD connector for balanced AES3

Connections for the SubD connector are provided below :

Pin Number	Connection	Pin Number	Connection
1	AES 8 +	14	AES 8 -
2	AES 8 GND	15	AES 7 +
3	AES 7 -	16	AES 7 GND
4	AES 6 +	17	AES 6 -
5	AES 6 GND	18	AES 5 +
6	AES 5 -	19	AES 5 GND
7	AES 4 +	20	AES 4 -
8	AES 4 GND	21	AES 3 +
9	AES 3 -	22	AES 3 GND
10	AES 2 +	23	AES 2 -
11	AES 2 GND	24	AES 1 +
12	AES 1 -	25	AES 1 GND
13	n.c.		

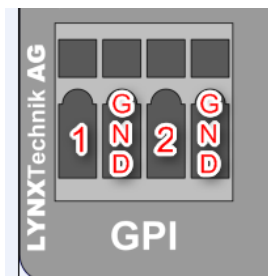


View looking INTO connector as seen on module

We recommend you use high quality screened (twisted pair) cable for the balanced audio connections.

## GPI Connections

The pinning of GPI contacts are shown in the picture on the right:



# Installation

If this module was supplied as part of a system it is already installed in the rack enclosure. If the module was supplied as a field upgrade please follow the installation procedure below.



**NOTE** Observe static precautions when handling card. Please see ESD warnings on Page 7.

This module has a single width rear connection panel, meaning it will occupy one slot of a standard Series 5000 Card Rack. This is to accommodate the additional connections needed for this module and to also provide adequate space for cooling in the rack. Up to ten P VD 5810 modules can be accommodated in a single Series 5000 rack frame.

**NOTE.** When using this module the **R FR 5012 Fan Front Rack Frame** should be used, which provides additional airflow into the rack.

Each Card Module is supplied with a rear connection panel and mounting screws. Please follow the procedure below for the installation of the card module into the Series 5000 Card Frame.

We recommend you power the rack down before installing any additional modules into an existing card frame.

1. Select a free slot space in the card frame where the CardModule will be located.
2. Remove the blank connection panels from the rear of the rack (if fitted)
3. Install the rear connection panel using the screws supplied. Do not tighten the screws fully
4. Slide the card module into the card frame and carefully check the CardModule connects to the rear connection plate. The card should fit easily and should not require excessive force to insert - if you feel any resistance, there could be something wrong with the rear connection panel location. **Do not** try and force the connection this may damage the connectors. Remove the rear connection panel and check alignment with the CardModule.
5. Insert and remove the CardModule a few times to ensure correct alignment and then tighten the two screws to secure the rear connection plate.
6. Power up the rack and check the module LED's illuminate. Check the module is automatically logged into the control system device tree.  
(It may take a few seconds for the control system to "discover" the new module)

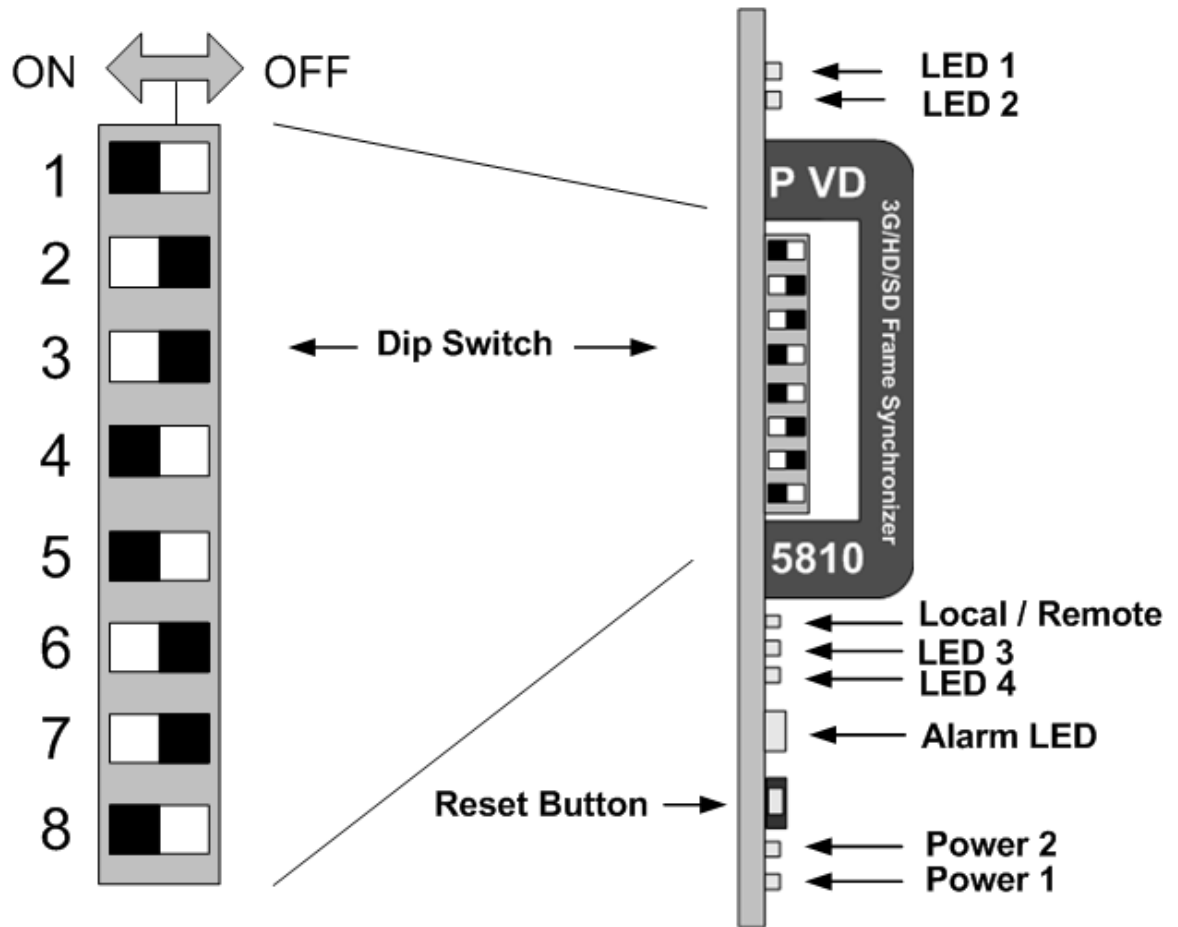
**NOTE.** The use of the optional control system is **mandatory** for the control and setup of this module. If you do not have the control system, then please contact your LYNX representative for details on how to upgrade your installation with the LYNX control system.

## Settings and Control

The P VD 5810 has an integrated micro-controller, which enables the module to be configured and controlled locally via the dip-switch or from remote when using one of the optional controllers and control software.

Once set, all settings are automatically saved in non-volatile internal memory. (Flash RAM) The module will always recall the settings used prior to power down.

### PCB Front View



Switch and LED locations



## Switch Settings

Below the switch settings for the 8-position dip-switch are defined.

Switch	Setting	Function
1	ON	Enable Local Adjustment
	OFF	Disable Local Adjustment
2	ON	Audio Embedder for Group 1 active
	OFF	No Embedding for Audio Embedder Group 1
3	ON	Audio Embedder for Group 2 active
	OFF	No Embedding for Audio Embedder Group 2
4	ON	Audio Embedder for Group 3 active
	OFF	No Embedding for Audio Embedder Group 3
5	ON	Audio Embedder for Group 4 active
	OFF	No Embedding for Audio Embedder Group 4
6	ON	Erase content in H-Blanking interval
	OFF	Content in H-Blanking interval preserved
7	ON	Erase content in V-Blanking interval
	OFF	Content in V-Blanking interval preserved
8		Not used

## Switch Function Detail

### Dip Switch 1

This switch is used to enable or disable local adjustments. Set to **ON** enables the setting of the other dip switches to configure the module. Set to **OFF** will prevent any switch settings taking effect.

### Dip Switch 2

This switch configures audio embedder for group 1. **ON** enables the embedder, new audio is then embedded into the SDI signal. Already embedded audio of group 1 will be overwritten, **OFF** disables the embedder, already embedded audio in the SDI signal will be preserved

### Dip Switch 3

This switch configures audio embedder for group 2. **ON** enables the embedder, new audio is then embedded into the SDI signal. Already embedded audio of group 2 will be overwritten, **OFF** disables the embedder, already embedded audio in the SDI signal will be preserved

### Dip Switch 4

This switch configures audio embedder for group 3. **ON** enables the embedder, new audio is then embedded into the SDI signal. Already embedded audio of group 3 will be overwritten, **OFF** disables the embedder, already embedded audio in the SDI signal will be preserved

### Dip Switch 5

This switch configures audio embedder for group 4. **ON** enables the embedder, new audio is then embedded into the SDI signal. Already embedded audio of group 4 will be overwritten, **OFF** disables the embedder, already embedded audio in the SDI signal will be preserved

### Dip Switch 6

If this Dip Switch is set to ON all content in the horizontal blanking intervals will be erased  
If set to OFF the content in the horizontal blanking intervals will be preserved

### Dip Switch 7

If this Dip Switch is set to ON all content in the vertical blanking intervals will be erased  
If set to OFF the content in the vertical blanking intervals will be preserved

## Factory Preset Condition

The P VD 5810 is delivered programmed and preset for the following mode of operation:

Switch 1   **ON** Local Adjustment Enabled

Switch 2 -5 **ON** Embedders for Group 1..4 enabled

Switch 6   **OFF** Content in H-Blanking interval preserved

Switch 7   **OFF** Content in V-Blanking interval preserved

If this is the required mode of operation, then no adjustments are necessary.

## Auto Store

If no parameters are changed for 10 seconds then the current settings will be written into the flash memory automatically. This can be seen by the channel status LEDs flashing yellow three times.

## Reset Button

If this button is pressed for 5 seconds all parameters will be reset to their factory default settings. To confirm this reset, the device will blink all LEDs once (OFF – ON – OFF) and then return to their normal state.

# Alarm/LED Status Indicators

The P VD 5810 module has integral LED indicators, which serve as alarm and status indication for the module. Function is described below.

## REF Status (LED1)

This LED indicates the status of the Reference signal

LED Color	Indication
Green	REF present and ok
Yellow	REF missing, but not required (self-lock on SDI input) REF ok, but not matching a fixed frequency setting (odd/even)
Red	REF missing

## SDI Status (LED2)

This LED indicates the status of the audio input signals

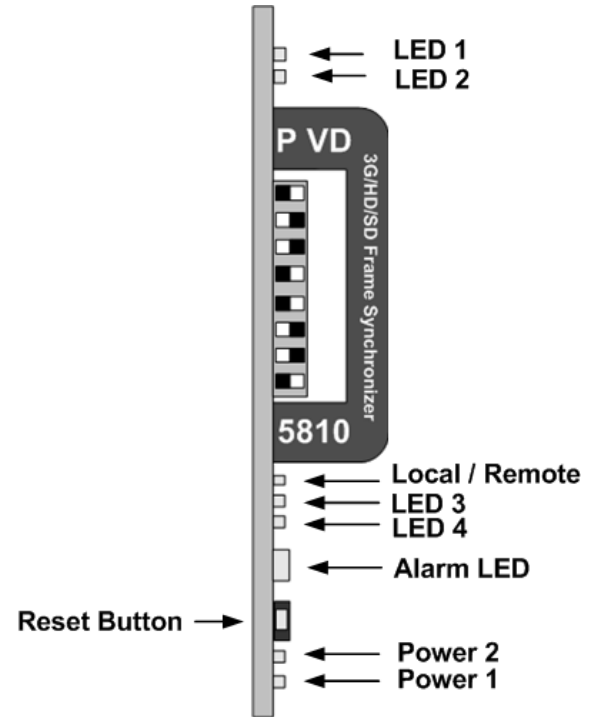
LED Color	Indication
Green	SDI input ok
Yellow	SDI input not matching a fixed frequency setting (odd/even)
Red	SDI input missing

**LED3 and LED 4 are not used for this module**

## Alarm Indicator


There is also a single alarm LED on the lower edge of the module. This is visible through the card frame front cover and provides a general indication of the module status.


LED Color	Indication
Green	External Audio Output: - All audio output pairs have two audio channels Embedder: - Each selected embedded group has all four possible audio channels.
Yellow	frequency mismatch (see LEDs 1 and 2 above) -OR- Some audio input (ext. or embedded) is missing one or more channels
Yellow flashing	Locate device activated from GUI
Black, triple yellow flash	Save settings to flash of on-board microcontroller
Red	SDI or REF missing -OR- Some audio input (ext. or embedded) is missing all channels




## Power Indication

There are two LEDs on the lower edge of the module indicating the presence of the two power supply voltages (main power supply and redundant power supply).

LED 1	Indication
Green 	Power from Main PSU ok
off	No power from Main Power Supply

LED 2	Indication
Green 	Power from Redundant PSU ok
off	No power from Redundant PSU

## Local/remote LED

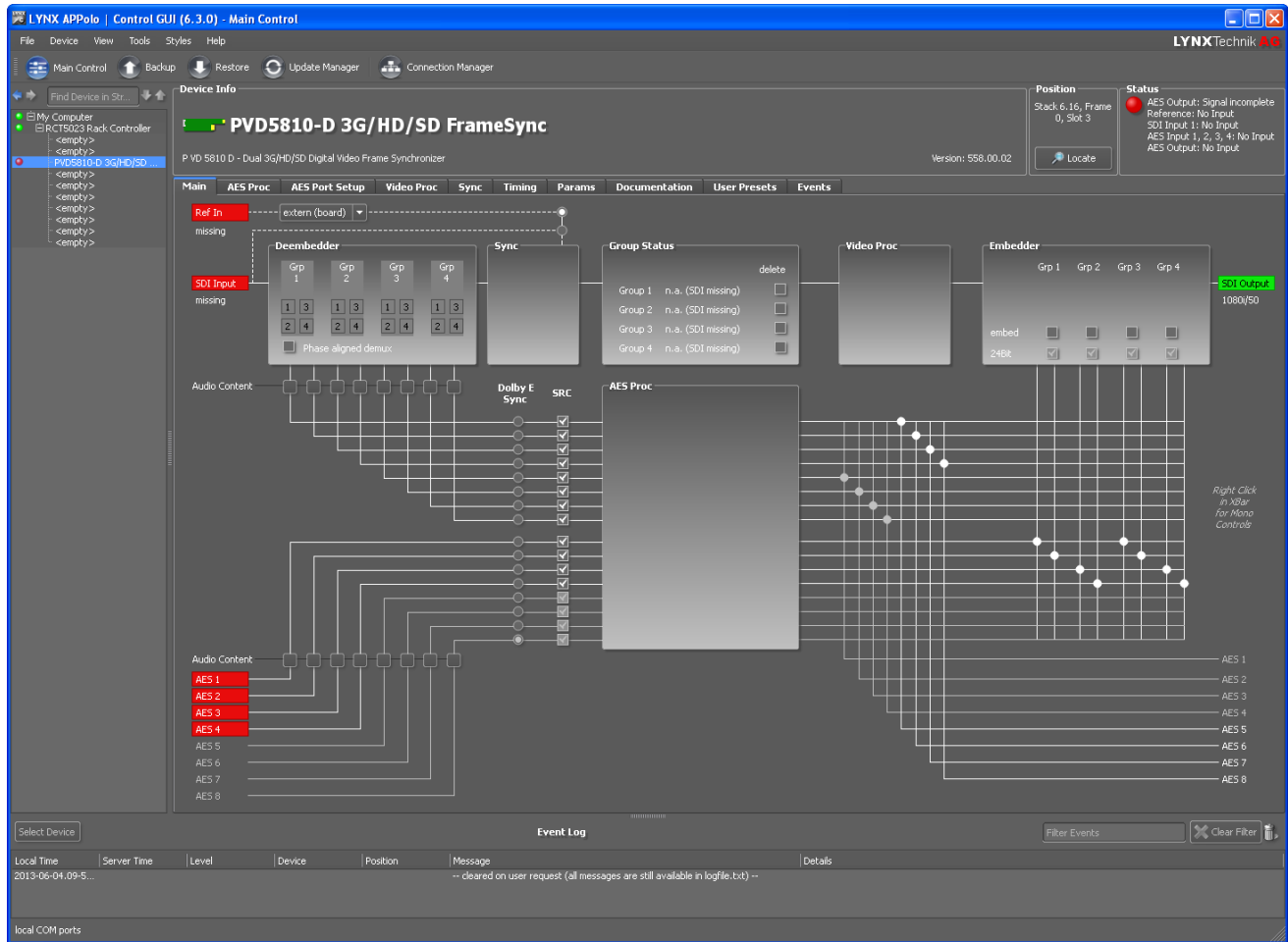
LED Color	Indication
Green 	Local control via DIP switches active, all settings according to local DIP switches
off	Current settings may be overwritten through remote control

## Control System GUI

All LYNX CardModules support a computer interface which allows setting the modules parameters using a simple GUI interface. Access to all standard features *and in some cases* extended features is possible using this interface. Due to the complex nature and extensive user settings provided on the P VD 5810 **we recommend** the use of the control system.

**Note.** Any settings made using the control system overrides any local settings made on the module. All settings are stored in internal flash ram and will survive power cycles and long term storage.

The following GUI screenshots and descriptions shown below describe the settings and adjustments possible for the P VD 5810 CardModule.



The above screenshot shows the complete module GUI. The Device info area contains information about the module including name and firmware revision. If used as part of a larger system (using the LYNX central control system) the modules position and physical location is displayed above the “locate” button.

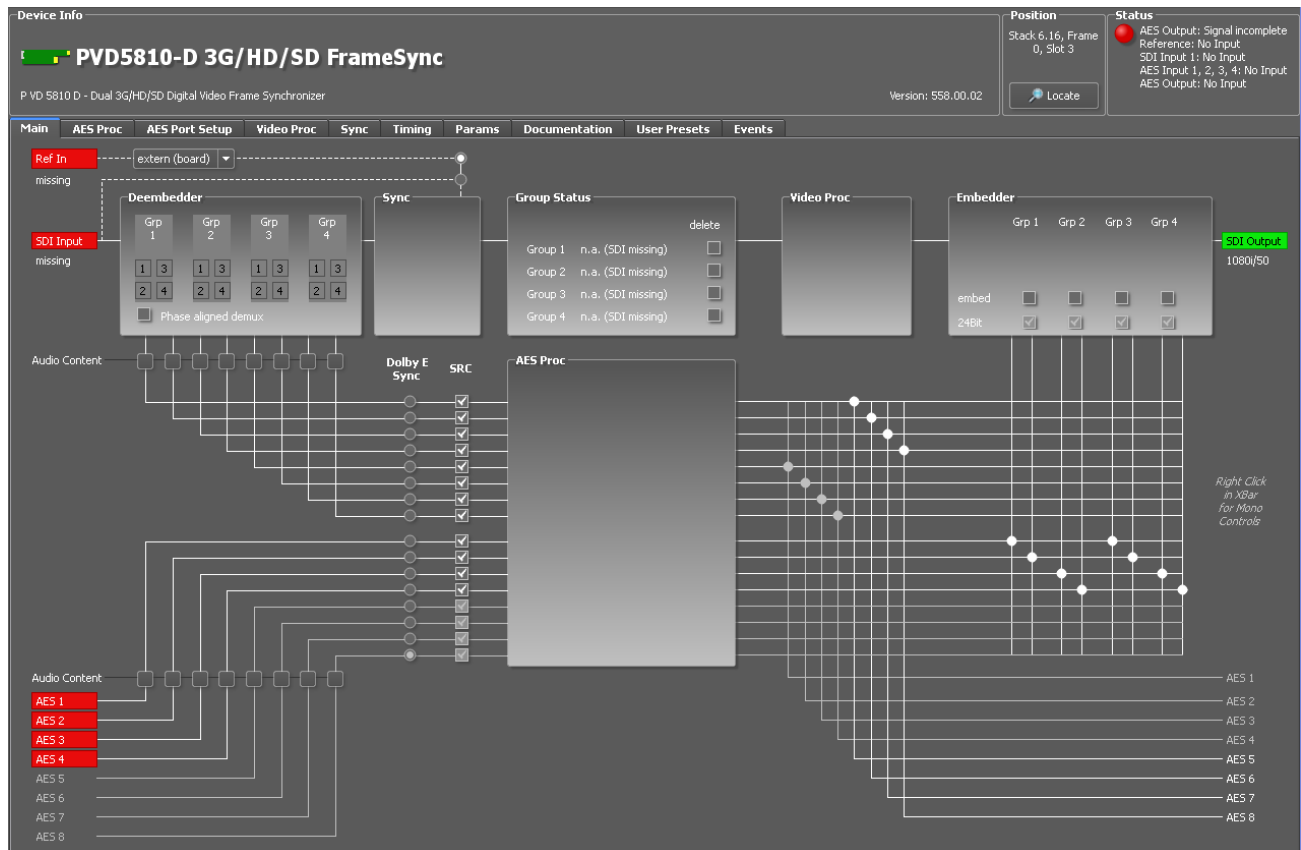
**Note.** The Locate function is a tool used to quickly identify a module in larger systems. Selecting “locate” will flash the module alarm LED yellow. (This does not affect module operation)

The first screen displayed when the module is selected is the **Main Tab** this is a graphical representation of the modules overall function and signal flow (left to right). Clicking on the processing boxes will link to other GUI screens with more controls for these specific functions.

The area at the bottom of the screen is the error log. Any fault condition (or event) will be time stamped and entered into the log.

There are a number of “Tabs” along the top of the screen which splits up the module settings into a number of logical displays. The various GUI screens and primary functions are described below.

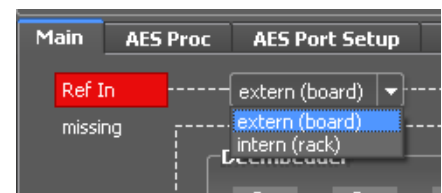
## Main Tab



This screen is the main interface and is presented first when the module is displayed in the GUI. The layout replicates module “block” functions and signal flow from left to right. The primary purpose of this screen is to show the overall signal flow through the module and allow easy navigation to other areas. Input standards and formats are auto detected and displayed in the GUI. Parameters will be annunciated in different colors to show status (green = good, red = problem, yellow = caution etc).

### REF in Select

There is a select list next to the **REF in** connection. This selects if the reference signal is to be used from the common rack reference input (intern(rack)) or the board connection plate reference input (extern(board)).



The reference for the frame synchronizer can also be derived from the digital inputs. This is useful for applications where the P VD 5810 is used as a video delay line.

## AES Inputs

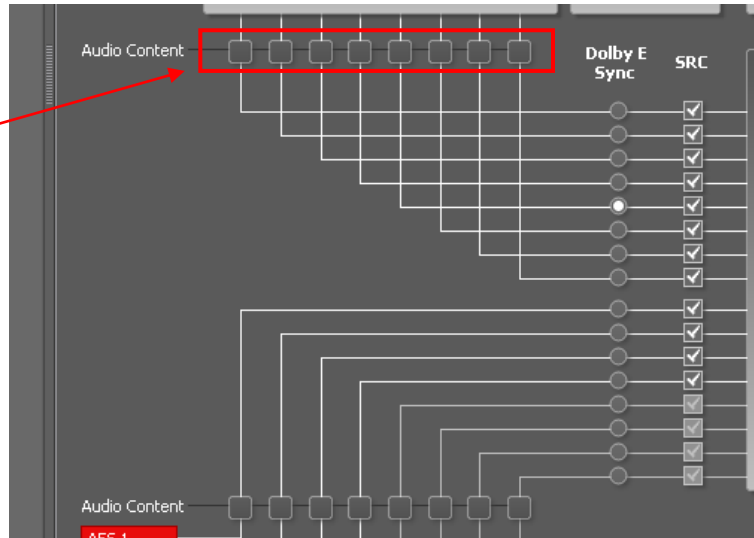
The complete audio payload (8 x AES) is de-embedded from the input channel and up to 8 external AES inputs can be applied to the module.

## Automatic Audio Detection and Sample Rate Converters

Audio presence and audio format for the embedded audio on the SDI input and the external AES inputs is automatically detected and displayed on the module GUI in the LYNX control system.

This can be seen below; the small blocks under the de-embedder indicate the audio status for each AES stream:

**P** = PCM Audio Detected  
**E** = Dolby E Audio Detected  
**D** = Compressed Audio Stream Detected (other than Dolby E)  
**Blank** = No Audio Signal Present



**Sample Rate Converters** for all AES inputs (de-embedded and external) can be switched on and off at the input lines of the audio processor

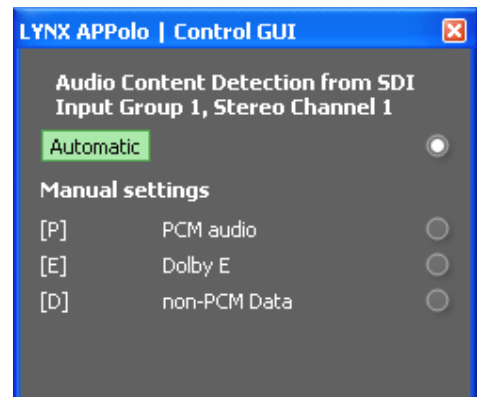
## Configuring Audio Inputs

Audio inputs can be configured automatically based on the audio detected, or manually configured to be only a particular type. When an input is manually configured the system will indicate when a conflict exists between the configured setting and the detected audio on that channel by highlighting the box in yellow.

Clicking on one of the audio boxes with the mouse will bring up the audio configuration dialog for that channel:

The default setting is always automatic. To manually set this input simply click on the respective selection with the mouse

Any conflict is flagged by turning the box yellow. This is indicating the channel is manually preset for an audio format, but the audio format is in conflict with this setting, **Note**. *Even though there is a conflict the actual audio content is passed through the system – i.e. it is not blocked.*



## Maintaining DolbyE Transparency

The PVD 5810 can process and synchronize one DolbyE signal transparently, the available DolbyE synchronizer can be dedicated with the radio buttons to one of the internal audio signals going into the audio processing stage.

The module will automatically disable the input audio delay, the sample rate converter and bypass the audio processing for this channel in the Audio Processing amp (controls will be greyed out) – so in this case the DolbyE signal will be passed transparently and is ready for re-embedding into the outputs (or passing to an external output)

Another area of concern for DolbyE or compressed audio streams is the mono audio output crossbars. These should not be changed from the default setting for these types of signals. The Module will also provide a visual warning if any of the mono cross points are in conflict.

**Note.** *For information on how to configure and switch mono cross-points, please refer to the respective GUI section of the manual*

## AES Outputs

This section is used to configure the external AES outputs. Up to 8 outputs are provided and any of the internal audio signals can be routed to the external outputs if required.

All inputs to the crossbar are shown horizontally and the 8 x External AES outputs are shown at the bottom of the screen. Selecting a cross point will route the required signal to the selected AES output.

When a cross point is selected it will select the AES pair (left and right channel). However, these cross points are Mono in nature. Please refer to the section “Setting Mono Cross Points” below for details on how to use the mono cross point functionality.

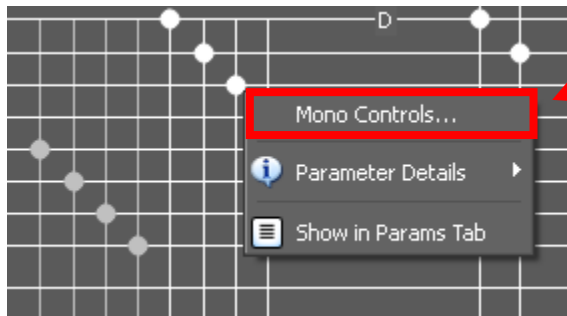
**\*\*Note.** *All selections made for the AES outputs on the crossbar MUST be made from the same timing zone or audio disturbances may occur.*



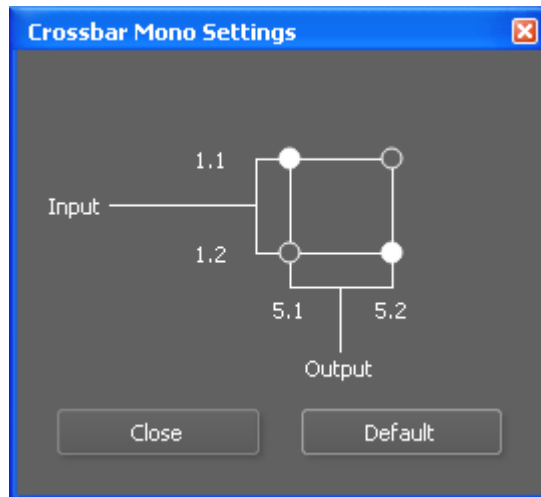
## Setting Mono Cross Points

To keep the GUI simplified the default operation of the External AES output crossbar and the four individual output embedder cross bars are AES in nature, meaning selecting a cross point with the mouse will switch both channels (left and right) in the AES pair. Mono selections are possible, instructions below.

With the cursor positioned over the required cross point, click the right button on the mouse to display a submenu:



Select "Mono Controls" from this small submenu and a new mini cross point control box is displayed

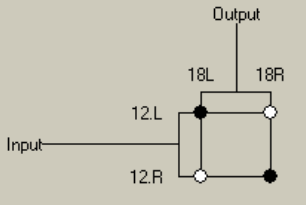
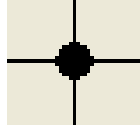
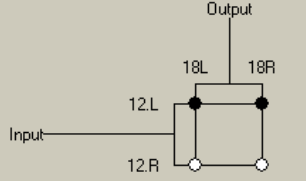
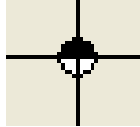
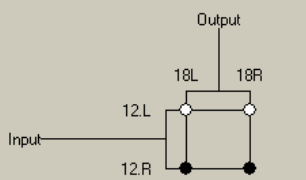
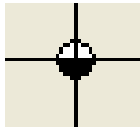
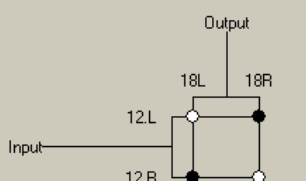
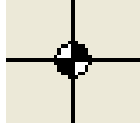


The Mini cross bar looks like shown, and permits full control over the routing of the left and right audio channels within the AES cross point selected.

Simply select the desired routing by clicking the mouse on a cross point and then click "close" to apply the selection and close the dialog.

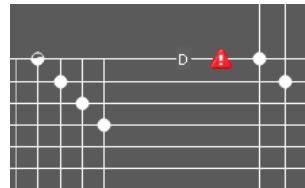
The default button will return the selection to the standard "default" settings

When a cross point has been changed, the graphical cross point selection changes to indicate the underlying configuration. This is shown below:

Status	Cross Point Selection	GUI Indication
Default		
Left input channel into both output channels		
Right input channel into both output channels		
Left and right channel swapped		

If the mouse pointer is positioned on the cross point using the “ctrl” key and left mouse button click will toggle the settings. Use of this function takes a little practice - as the position of the pointer on the correct cross point quadrant is critical. We recommend you select the mini crossbar as specified above, as this provides the most precise control. Pressing CTRL+ALT and clicking the left mouse button will result in a channel swap.

**Note:** If a Dolby E signal (or any other compressed Audio Data) is connected to the cross point, and if a mono control is performed then a warning will be indicated.



## Output Mux

The embedder can embed the full AES payload (8xAES) back into the output SDI signals.

All of the internal audio are made available as inputs to the embedder. The embedder can be seen at the top of the GUI and it's possible to quickly disable or enable an individual AES “Group” using the checkbox provided.

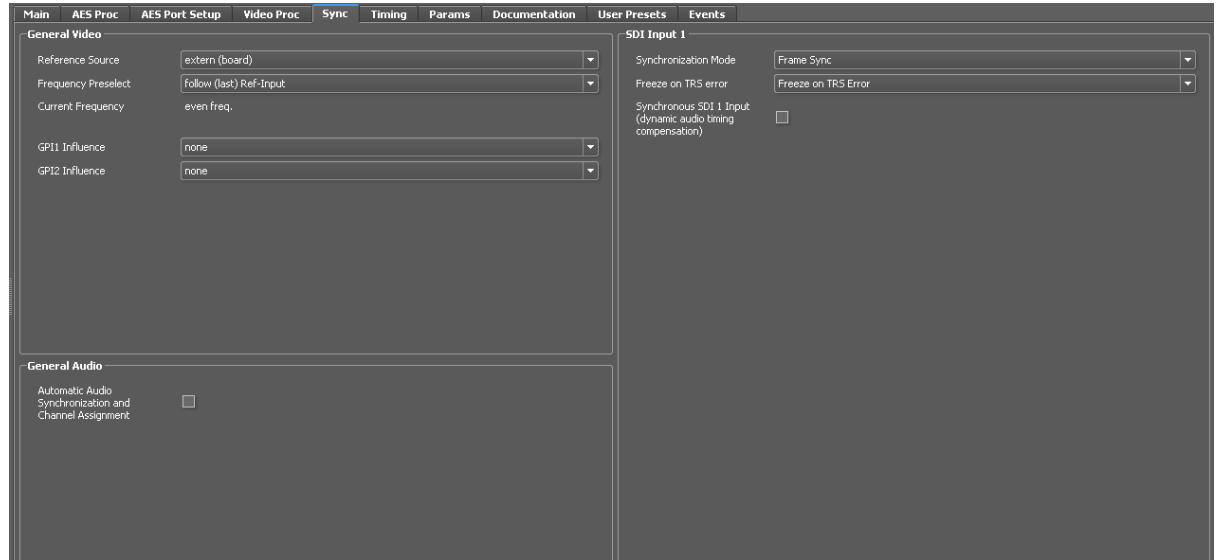
## **Selecting Functions**

Functions of the module can be selected by clicking on the tabs on top of the screen or by clicking directly into the respective box

## Sync Tab

### General Video Settings

The first area covers some General setup parameters for the frame sync operation.



### External Reference Source

It is possible to take the external reference signal from two sources. Either from the common rack reference (*an external reference connection to the rack frame which is fed to all cards installed in the rack*) or via the BNC connection provided on the module rear connection panel. Selections provided are:

- External (board) = Via module rear connection panel
- Internal (rack) = Common rack reference

### Frequency Pre-select

This is where the frame synchronizer output frequency (or frame rate) is selected. This can be jammed into a frame rate which will never change to maintain this constant output frame rate at all times regardless of the connected reference signal, or any disturbance to the connected reference signal. This will prevent the output frame rate and format automatically “tracking” the connected reference standard should this change. The output video signal will maintain the “jammed” to the video frame rate but the video will be disturbed if the input reference signal changes.

It is also possible for the synchronizer to configure the output frame rate based upon the connected reference. This is the default setting for the module. Possible settings are:

- Even (24, 25, 30 or 50 Hz)
- Odd (23,98, 29,97 or 59,94 Hz)
- Follow (last) reference (default)

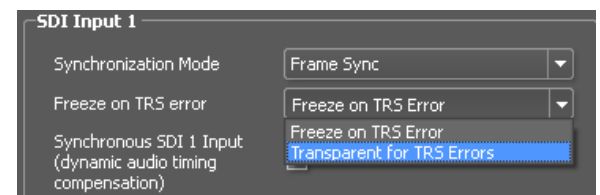
**Note.** The synchronizer is supplied from the factory with the last stored reference as 50Hz. With no reference connected its possible to change the last stored reference to something else. Simply select the desired fixed frequency and then re-select “follow last reference”. Now the module will use this new setting through a power cycle

Also, this value will not be restored to 50Hz following a “Restore Factory Defaults” operation, the stored setting is preserved.

The “Current Frequency” area in the GUI is showing the frequency the frame synchronizer is running in currently (useful if the *follow last reference* selection is made)

## Freeze Mode

This is where the reaction of the synchronizer is defined in the case of excessive video errors (TRS Errors). The output can be configured to freeze (“Freeze on TRS Error”) or pass the input signal transparently when excessive errors are encountered. If configured to pass video transparently (“Transparent”) then all video errors and disturbances are passed from the input to the output.



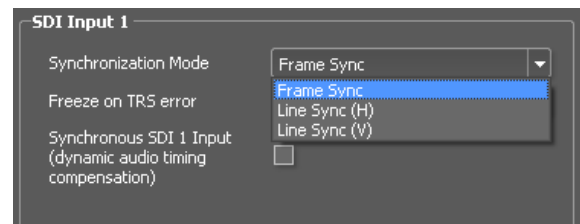
The synchronizer is very robust in its ability to handle poor quality input signals but there may be occasions where excessive errors cannot be recovered by the synchronizer. This is generally qualified by TRS errors. TRS means “Timing Reference Signals” and is a sequence of digital values embedded in the SDI data streams. If the frame synchronizer cannot recover these errors, then the channel will freeze the video until the errors can be recovered. One function of the synchronizer is to repair any bad TRS values ensuring a stable and technically correct video stream is delivered on the outputs. Selections for each channel are as follows:

- Freeze on TRS errors
- Transparent

## Synchronization Mode

Three different modes of synchronization can be selected:

**Frame Synchronization:** The input signal is always buffered for 1 frame. TRS errors can be hidden with a freeze frame of the last valid frame. Also repeat frames in case the input clock is lower than the reference clock will be generated from the last buffered frame. Delay input to output is always minimum 1 frame plus the timing difference of input signal to Reference.

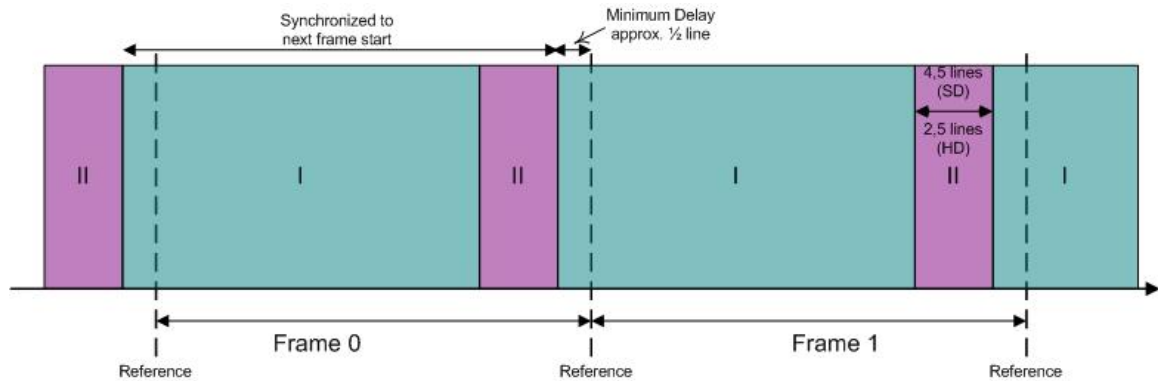


**Line Sync (H):** In case of clock synchronized signals the Line synchronizer H mode can be activated to achieve minimum delay. The input signal is buffered for 1 line to correct timing differences within 1 line

A minimum delay of approx. ½ line before the start of the next line has to be maintained to compensate for the processing delay of the P VD 5810.

**Line Sync (V):** In this mode the synchronizer delays the input signal towards the next frame start to achieve horizontally and vertically aligned pictures. The delay is then the timing difference of the input signal to the Frame Pulse of the Reference. This results in frame aligned signals without the additional 1 frame delay of the frame synchronizer mode.

A minimum delay of approx.  $\frac{1}{2}$  line before the start of the next frame has to be maintained to compensate for the processing delay of the P VD 5810.



For distortion free switching in front of the P VD 5810, e.g. in a router, all signals have to be in area "I" or all signals in area "II".

Area "II" is a window for line synchronization of 2.5 lines (HD) and 4.5 lines (SD).

Area "I" is an extension of the standard line synchronization to allow for "infinite" line synchronization. As this extended functionality is buffered differently, distortion free switching is only possible within these two areas.

To adjust the timing of video signals relative to the reference to avoid larger delays the video output delay function can be used (see page 63). This shifts the video signal into the required area. This adds the manually adjusted delay, but avoids the additional frame delay, e.g. if a signal is in the area of the minimum delay.

### **Synchronous SDI Input (minimum audio delay)**

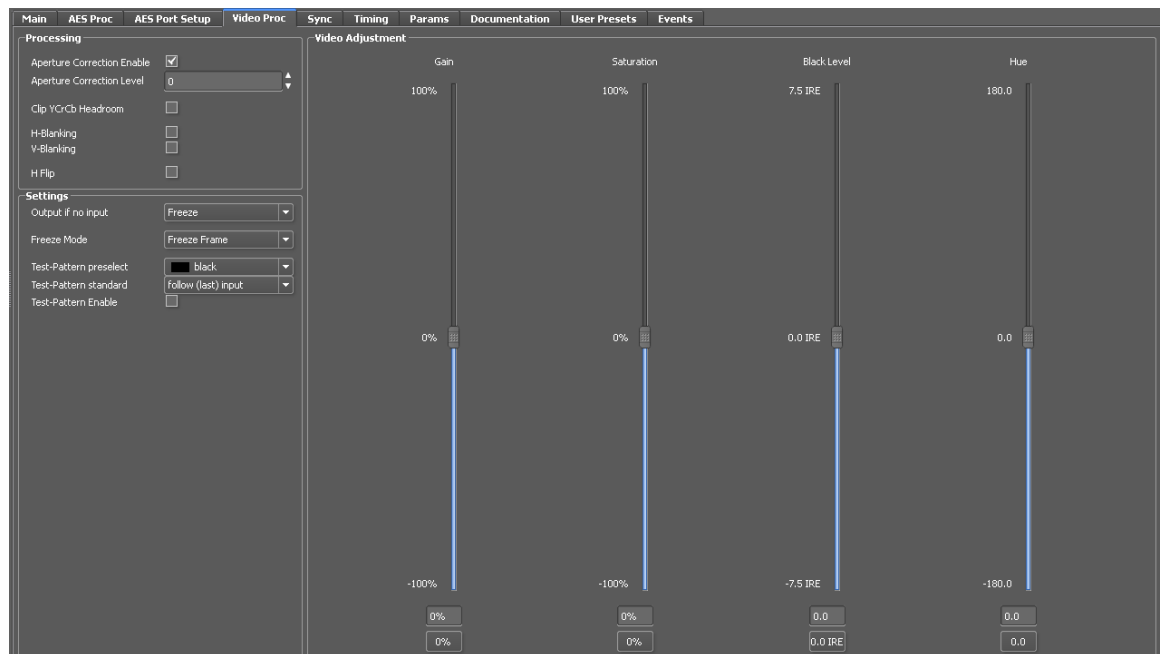
If activated the embedded audio to video delay at the output is always minimal. This should be used for clock synchronized signals only, because the audio is automatically delayed to compensate for the AV delay, which can cause audio disturbances with asynchronous sources.

### **General Audio (ASCA)**

If the checkbox is enabled the Automatic Audio Synchronization and Channel Assignment Function (ASCA; as described above, see page 15) is active

## Video Proc Tab

This is where the individual video processing functions are set for the video signal.



### Aperture Correction

Horizontal aperture correction is provided, which can be used to sharpen or soften the video signal. (This is sometimes required for down converted video signals as the filtering process rolls off the high frequency very slightly). If adjusted in the positive direction this will increase sharpness, if adjusted in the negative direction this will soften the image.

There is a check box to switch aperture correction ON and OFF and an adjustment range. The numerical adjustment range provided is + 80 to -30, and is changed by clicking on the “+” or “-” Buttons.

**Note.** Aperture correction OFF is the same as a Zero setting in the adjustment range

### Clip Cr/Cb Headroom

If activated all Luminance (Y) values below 64 and above 940, and all Chrominance (Cr,CB) values below 64 and above 864 will be clipped.

### H and V Blanking

A checkbox selection is provided for H (Horizontal) and V (Vertical) blanking. When selected the video output will have new blanking applied in both of these areas (which will overwrite any information in the vertical and horizontal blanking intervals).

### H Flip

A checkbox selection is provided for H (Horizontal) flip. When selected the video will be flipped horizontally. This is useful e.g. for virtual studio applications to have a mirrored picture for the speaker.

## Settings

This area is where the freeze function is defined and also the action (and settings) of the integrated test pattern generator.

### Output if no input

Here the behavior of the P VD 5810 can be selected if no input is present

- Off
- Freeze
- Black
- Test Pattern

### Freeze Mode

When the synchronizer encounters excessive TRS errors it can be set to freeze or pass the video transparently (selected on the Video Proc tab). If Freeze is selected then the behavior of the freeze function is selected using the drop down selections. These are:

- Freeze Field 1
- Freeze Field 2
- Freeze Frame
- Test Pattern

### Test Pattern Pre-select

A wide range of patterns is provided which can be selected using the drop down selection provided. The pre-selected pattern will be used if the freeze mode is set to “test pattern” and will also the pattern used if “test pattern on” is selected. Patterns provided are:

- Full field Black
- Full field White
- Full field Yellow
- Full field Cyan
- Full field Green
- Full field Magenta
- Full field Red
- Full field Blue
- 15% Grey (full field)
- 75% Color bars
- 75% Color bars over Red
- Pathological PLL/EQ

### Test Pattern Standard

With no input signal connected the module can be used a stand alone test generator using this selection is possible to configure the test pattern into any of the supported standards, or it can be set to follow the last input standard. Settings provided are:

- Follow last input (default)
- Fixed standards (half, same or double or current reference frame rate)

### Test Pattern Enable

This checkbox simply switches on the pre-selected test Pattern. Activated test pattern will be indicated on the **Main** Tab.



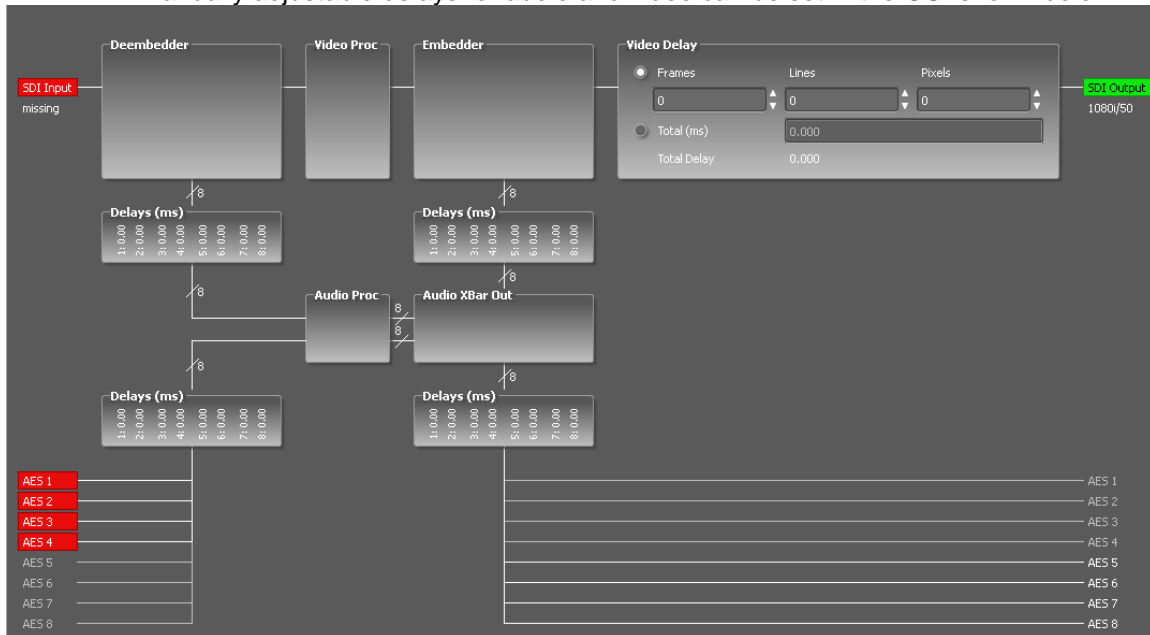
## **Video Adjustments**

Four on screen sliders are provided to allow for the adjustment of individual video parameters. Separate sliders are provided for video Brightness (gain), Saturation, Pedestal (Black level) and Hue.

Default (null) settings are 0% (this is the default). Sliders can be quickly returned to the factory null (or transparent) settings using the buttons provided at the bottom of each slider.

## Timing Tab

All manually adjustable delays for audio and video can be set in the GUI shown below.



The output delay can be adjusted for the SDI output either in frames, lines, pixels or in ms. The total delay can be up to 62 frames. Adjusting the output delay will also delay the audio being embedded into the SDI output. This additional audio delay can be reduced again by entering a negative audio delay.

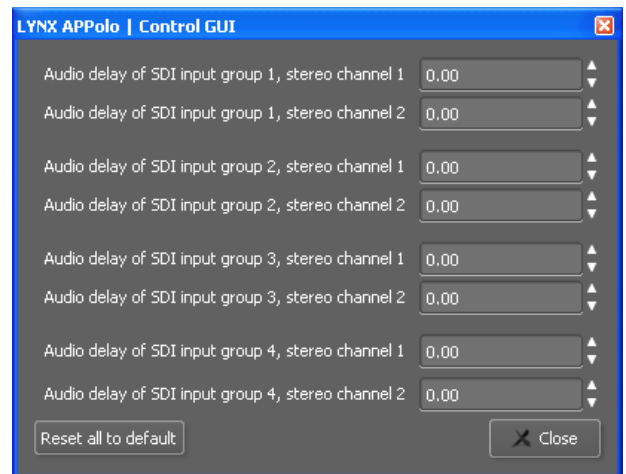
The audio delay can be set at various positions:

- SDI in:** Delay of the embedded audio after de-embedding
- SDI out:** Delay of audio for re-embedding
- AES in:** Individual delays for the AES inputs
- AES out:** Delay at AES outputs

Setting of the audio delay can be performed in a pop-up window, when clicking on the deembedder/embedder blocks

**Note:** The Synchronizer will auto track the audio delay to the video processing delay. The adjustments provided here are offsets relative to the internal tracking delay.

The audio delay offset can be set at various positions as graphically shown in the audio processing chain. Clicking the + and – buttons adjusts the setting. The possible Audio Delay Range is 10 seconds total (input to output, set in ms)



**Note:** In case of detected Dolby E signals the input audio delay (AES in or De-embedders) will be deactivated (control is greyed out) as this delay would be “re-aligned” by the Dolby E Synchronizer again.

## AES Port Setup

In this tab the AES ports can be configured. The configuration is locked automatically when the tab is closed and the selections to configure the individual ports are greyed out. To change a configuration the check box “Unlock AES-Port Settings” has to be activated.

Input		Output
AES Port 1	Input	-----
AES Port 2	Input	-----
AES Port 3	Input	-----
AES Port 4	Input	-----
-----	Output	AES Port 5
-----	Output	AES Port 6
-----	Output	AES Port 7
-----	Output	AES Port 8

**Note.** The P VD 5810 is shipped with AES1..4 as inputs and AES 5..8 as outputs

**Note.** Please check connected peripheral equipment before using the P VD 5810 to make sure the audio ports of the P VD 5810 are configured correctly, e.g. an output is not connected to an output of another device, this might damage the equipment.

## AES Proc Tab

This tab provides access to the internal audio processing functions such as audio gain / mute / phase invert / overload and silence detection and down mix per audio mono channel and a 1kHz test tone generator.

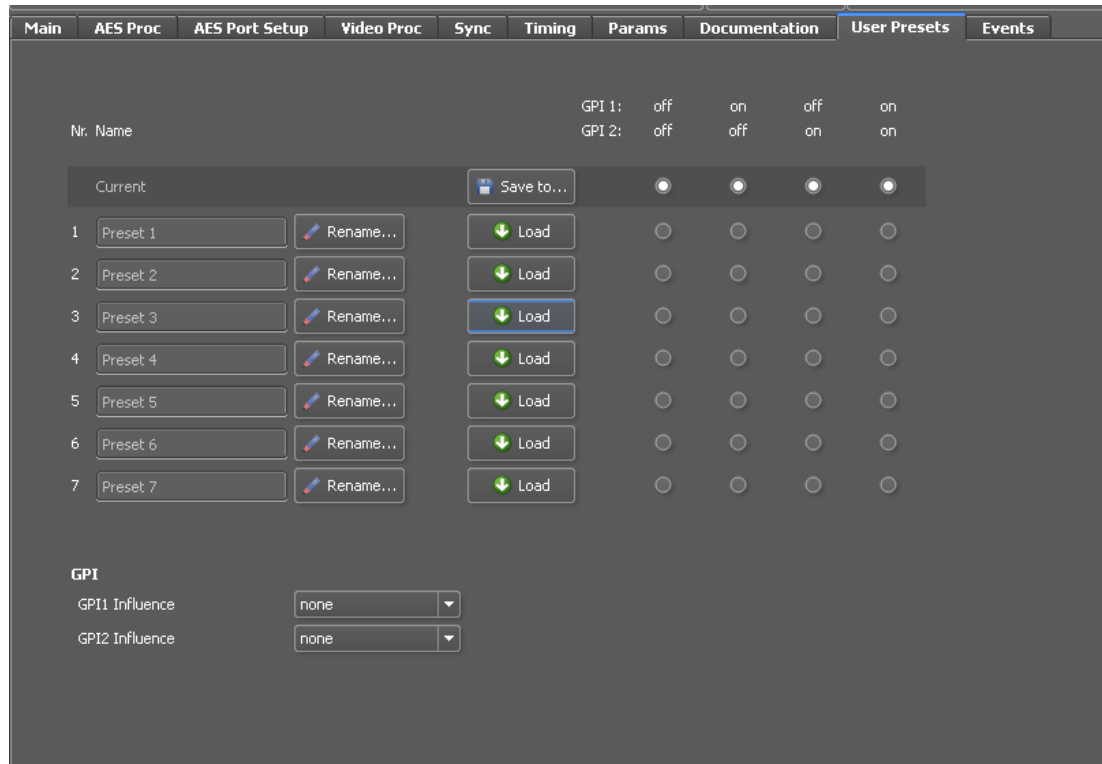
(overload and silence are indicated by color of the respective symbol: Green = OK Red = overload or silence.



**Note:** If any Dolby E signal or other Audio data is passed through the processing stage, the processing will be deactivated, so the audio data will not be modified (controls will be greyed out). Settings will be set back to the original value if PCM audio will be switched to the same path.

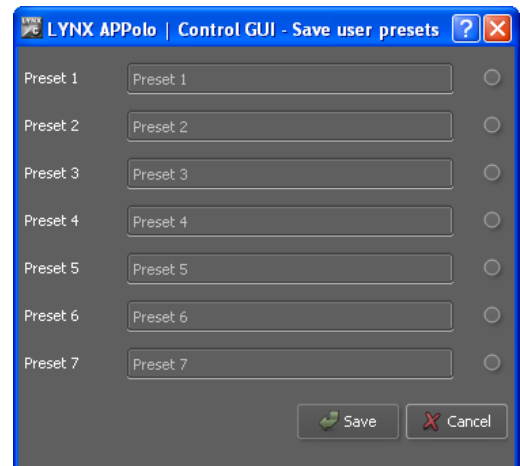
## User Presets Tab

This Tab allows the user to store and recall 7 sets of additional module presets (settings), and also configure GPI switching between any two or four of the 7 stored presets and / or the current module settings (8 total). The presets are stored in module flash ram and will survive power cycles.



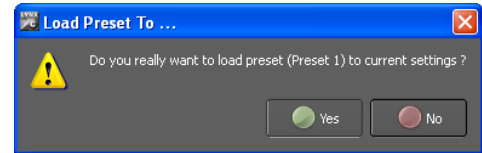
### To save a preset

1. First make all the module settings required using the various settings provided for the module.
2. Click the button "Save To" to switch up the dialog box:
3. Using the radio button to select the preset location you wish to save the settings to and type in a name.
4. Click "Save" and the all the current module settings are stored in the named preset.
5. Use the "rename" button to rename any stored preset



## To load a saved preset

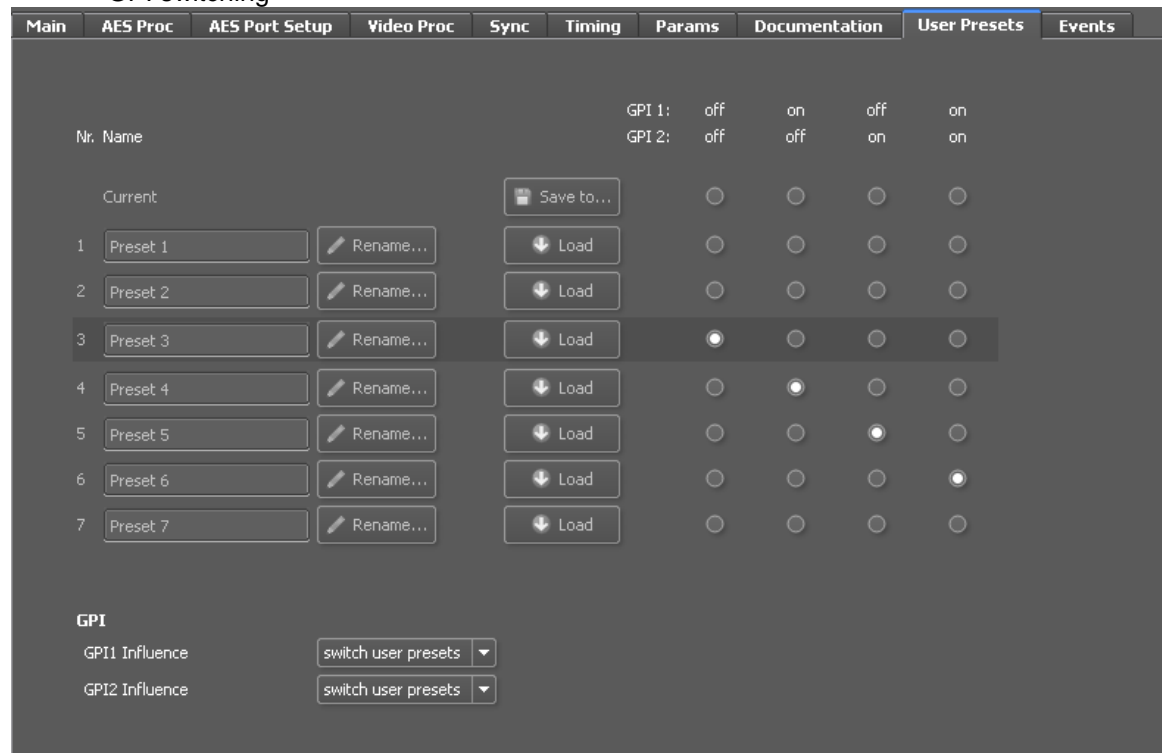
To load a saved preset into the module simply click on the “load” button adjacent to the preset, this will show the dialog shown below asking you to confirm your selection (as this will overwrite any current stored module settings)



## Setting GPI control of Preset selections

In some cases its desirable to switch quickly between two sets of stored presets, this can be achieved using the external GPI trigger

1. Next to each preset there are four radio buttons which allow for the selection of GPI switching



2. Simply select any of the stored presets and the required GPI polarities.
3. Set the GPI influence to “switch user presets” the presets are now toggled based upon the polarity external GPI input signal.
4. The active Preset is indicated by the grey bar around the Preset (in the picture above around “Preset 3”)

**Note:** If a Preset (except “Current”) is active, all control parameters for the P VD 5810 are greyed out.

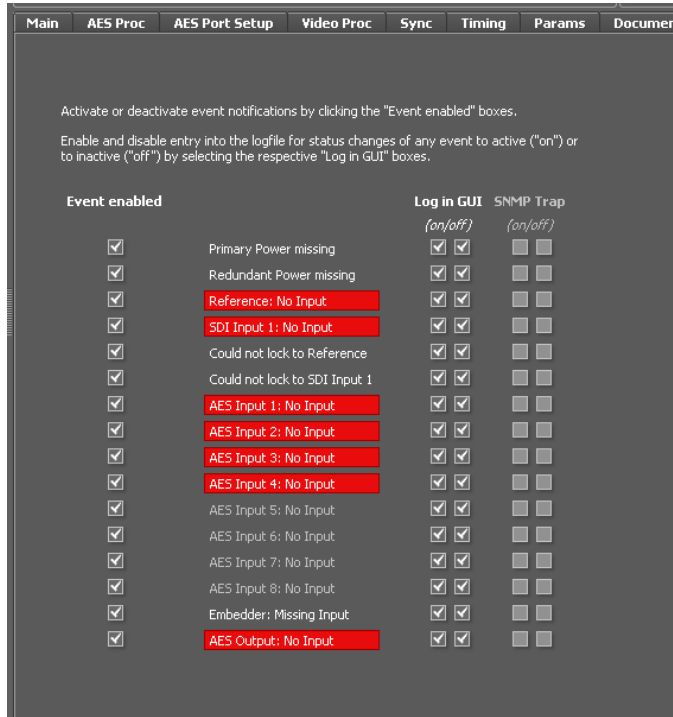
## GPI Influence

The drop down box for GPI influence is used to set the function of the GPI input. Settings include:

- None
- Freeze input 1
- Switch user presets

## Events Tab

The Events Tab is where the module alarming and error notifications are configured for the module.



The GUI has an integrated error log, which is a simple text log file stored in the controller PC. This will record an event and timestamp it. The log can be seen at the bottom of the GUI screen and can be scrolled through using the scrolling bar.

### Log in GUI Function

Events are selectable, you can chose if you want to record a particular event in the log (or not) or configure it to only record one side of the event. (*For example you might want to log when a SDI input was removed but do not want to log when it came back*). The ON/OFF trigger can be configured for each of the available events shown in the list and is setup using the checkboxes provided.

### Alarm Activation

By default all alarm conditions are activated (checked), by de-selecting a specific alarm condition I this column you are telling the module to ignore this condition completely. It will not color the alarm LED, log and event in the GUI or send a SNMP trap. This is useful if for example you never have anything connected to AES input 1 and want the card to ignore this input condition completely you would simply de-select "AES Input 1 No Input" and it will be ignored.

### SNMP Support

If the system is using a LYNX Server and the SNMP option is installed then the "SNMP Trap" columns become available.

Here you can configure what events you would like to transmit a "SNMP trap" for over the network. (This has no impact or influence over the internally error log maintained by the LYNX control system)

(Internal LYNX error logging and external SNMP traps can be configured independently).

**Note.** *The simulated event is part of the GUI simulator and allows us to force a particular error condition for testing and demonstration purposes.*

# Specifications

Video Inputs (BNC)	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C, 424 M
Input standards	See table on page 9
No. of inputs	1
Connector	BNC
Impedance	75 Ohm
Cable Equalization	Up to 250m Belden 8281 (270MHz) Up to 140m Belden 1694A (1.485GHz) Up to 80m Belden 1694A (2.97GHz)
Return Loss	> 15 dB (270MHz) > 10dB (1.485GHz)
Reference Input	
Signal Type	Analog Bi-level / Tri-level (auto detect) cross lock compatible. Standards see table on page 11
No of inputs	1 x External or internal rack reference (selectable)
Connection	BNC
Impedance	75 Ohm
Video Outputs (BNC)	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C, 424 M
Output standards	See table on page 10
No. of outputs	2
Connector	BNC
Impedance	75 Ohms
Jitter	< 0.2 UI (Timing Jitter); (270MHz) < 0.2 UI (Alignment Jitter); < 1.0 UI (Timing Jitter); (1.485GHz) < 0.3 UI (Alignment Jitter); < 2.0 UI (Timing Jitter); (2.97GHz)
Return Loss	> 15 dB (1.485GHz); 10dB (2.97GHz)
Video Processing	
Delay adjustment range	Up to 62 frames of programmable delay in pixel / line / frame increments or in ms
Video adjustments	Gain / Saturation / Hue / Black Level
Aperture correction	Horizontal only, adjustable
AES Audio Inputs / outputs	
Signal	PVD 5810 U = AES3 id un-balanced on Mini DIN connectors P VD 5810 D = AES3 balanced on SubD 25 connector
No. of inputs / outputs	8 x AES ports
Coupling	Transformer
Audio Processing	
De-embedder	De-embed all audio (4 audio groups = 8 AES)
Audio delay	Audio is delayed to match the video delay and will automatically track the frame synchronizer. User adjustment of up to 10 seconds (in ms) is provided
Audio Embedder	Independent embedder applies 4 audio groups (8 AES) into output channel. User selectable.
Operating Modes	
Frame Sync	SD / HD / 3GBit/s Multi-rate Frame/Line Synchronizer
Control	
Local Controls	Local DIP switches for setting "basic" module parameters.
Remote Control	Comprehensive remote control and status monitoring supported when used with a LYNX Controller option. <b>The use of the control system is recommended for this module</b>
External GPI	Two GPI inputs. GPI influence configured in control system.
Electrical Specifications	
Operating Voltage	12 VDC
Power Consumption	10 W max.



Safety	IEC 60950/ EN 60950/ VDE 0805
<b>Mechanical</b>	
Size	283mm x 78mm
Weight	CardModule 200g, connector plate 150g
Rack space	Requires 1 slot in rack frame (max 10 modules per frame)
<b>Ambient</b>	
Temperature	5°C to 40°C Maintaining specifications
Humidity	90% Max non condensing

# Service

## Parts List

Due to the very dense design and high level of integration there the module is not user serviceable. Please contact LYNX for repairs or to request an exchange unit.

There is one consumable part used on this module which is the cooling fan. A service kit is available to exchange the fan. Ordering information below.

Part type: **Cooling Fan Service Kit Series 5000 CardModules**

## Technical Support

If you are experiencing problems, or have questions please contact your local distributor for further assistance.

Technical support is also available from our website.

Please do not return products to LYNX without an RMA. Please contact your authorized dealer or reseller for more details.

More detailed product information and product updates may be available on our web site:

[www.lynx-technik.com](http://www.lynx-technik.com)

## Contact Information

Please contact your local distributor; this is your local and fastest method for obtaining support and sales information.

LYNX Technik can be contacted directly using the information below.

**Address** LYNX Technik AG  
Brunnenweg 3  
D-64331 Weiterstadt  
Germany

**Website** [www.lynx-technik.com](http://www.lynx-technik.com)

**E-Mail** [info@lynx-technik.com](mailto:info@lynx-technik.com)

LYNX Technik manufactures a complete range of high quality modular products for broadcast and Professional markets, please contact your local representative or visit our web site for more product information.

**LYNX**Technik **AG**<sup>®</sup>  
Broadcast Television Equipment