LYNXTechnik AG®

Broadcast Television Equipment

Reference Manual

P DM 5280 D

P DM 5280 U

P DM 5280 DO

P DM 5280 UO

SD/HD/3G Multi-format digital Audio Embedder / Deembedder with optional Optical SDI connections

Revision 2.1 – December 2014

This Manual Supports Device Revisions:	
P DM 5280 Firmware Revision	626
Control System GUI Release	8.2.0

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Warranty

LYNX Technik AG warrants that the product will be free from defects in materials and workmanship for a period of two (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 DM 5280 D; P DM 5280 U; P DM 5280 DO; P DM 5280 UO**

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

Weiterstadt, October 2011

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 their 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 MOhms.

Product Description

The P DM 5280 Module is a high performance SD/HD/3GBit/s audio embedder and deembedder for AES digital audio streams.

Eight external AES ports are provided which can be switched by the user individually as AES inputs or outputs. These AES ports are provided as balanced AES3 audio inputs or outputs on a 25 pin SubD connector (P DM 5240 D) and as unbalanced AES3id audio inputs or outputs on 75Ohm MiniDIN connectors (P DM 5280 U).

All deembedded and external AES input streams 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.

DolbyE processing is included in the audio processing stage, i.e. one encoded DolbyE stream can be synchronized to the SDI clock domain and the Guard Band is automatically aligned.

The P DM 5280 DO / UO variants provide an optional optical SDI interface (RX/TX).

NOTE: The P DM 5280 is delivered from the factory preconfigured with 4 external AES Inputs and 4 external AES outputs. See page 27 for information on re-configuration of the signal direction of each AES port.

***Note.** Please check connected peripheral equipment before using the P DM 5280 to make sure the audio ports of the P DM 5280 are configured correctly, e.g. an output is not connected to an output of another device, this might damage the equipment.*

Key Features

- Support for SDTV, HDTV and 3GBit/s standards
- Automatic video standard and format detection
- Audio ports can be individually configured as inputs or outputs
- Existing embedded audio can be deembedded
- Delete, replace or shuffle existing embedded audio
- Mono audio crossbar
- Audio processing (mono gain, test tone, mute, phase invert, mix, overload and silence detection)
- Video delay up to 62 frames in steps of frames, lines and pixels
- Audio delay up to 10s in steps of audio samples
- Embedded audio group selection
- Embedding into test pattern output video frame with no SDI input signal
- Selectable Horizontal and Vertical Video Blanking

- Optional optical SDI interface (RX and/or TX)
  (P DM 5280 DO and P DM 5280 UO only)

Video Input Formats

The module has a 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.

SDTV Formats	HDTV Formats
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
3GBit/s Formats	720p / 24Hz
1080p / 50Hz	720p / 25Hz
1080p / 59.94Hz	720p / 29.97Hz
1080p / 60Hz	720p / 30Hz
	720p / 50Hz
	720p / 59.94Hz
	720p / 60Hz

Video Output Formats

Same as the input format, or the pre-selected format if no input is connected (see above).

Video and Audio Delay

The SDI output signal can be delayed up to 62 frames in steps of frames, lines and pixels. This user delay effectively modifies the total processing time of the device (input to output).

Audio content can also be adjusted independently from the video content. The audio delay is always in reference to the video delay and can be negative to video, depending on the video delay. Max. audio delay is 10 sec. in steps of single audio samples.

Audio Processing

The module will de-embed the complete audio payload from the incoming SDI stream (4 AES groups = 8 AES streams = 16 mono channels), and passed to the AES audio processing infrastructure, along with up to 8 external AES inputs.

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

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 DolbyE audio signal is detected by the module the associated SRC and the following audio processing will be switched off automatically. For asynchronous DolbyE streams, the DolbyE functionality should be enabled on the respective path. See page 24 for details.

Audio Embedding with No Video Input

With no SDI signal connected the module will switch to the last connected video standard (default) and will produce a test pattern video output with the audio embedded.

The test pattern can be selected using the APPolo Controlsystem.

NOTE: It is possible to disable this automatic generation of an output SDI signal. When this function is disabled, and no SDI input is connected, the SDI output will not generate any signal at all.

If used in standalone mode with no SDI input connected, the output standard can be changed from the default, so that it generates a free-running SDI stream in any standard. See page 19for details. If the SDI video input is removed during operation, then the embedder will continue to embed audio into a test pattern video frame in the selected format until the video input is restored.

NOTE: The factory default setting is "default to the last connected video standard". This will be 1080i/50 for new modules when delivered from the factory. This can be cleared by connecting a different video input, or by selecting the required video format (using the selections provided). See page 32 for details on making permanent changes to the device.

Functional Diagrams

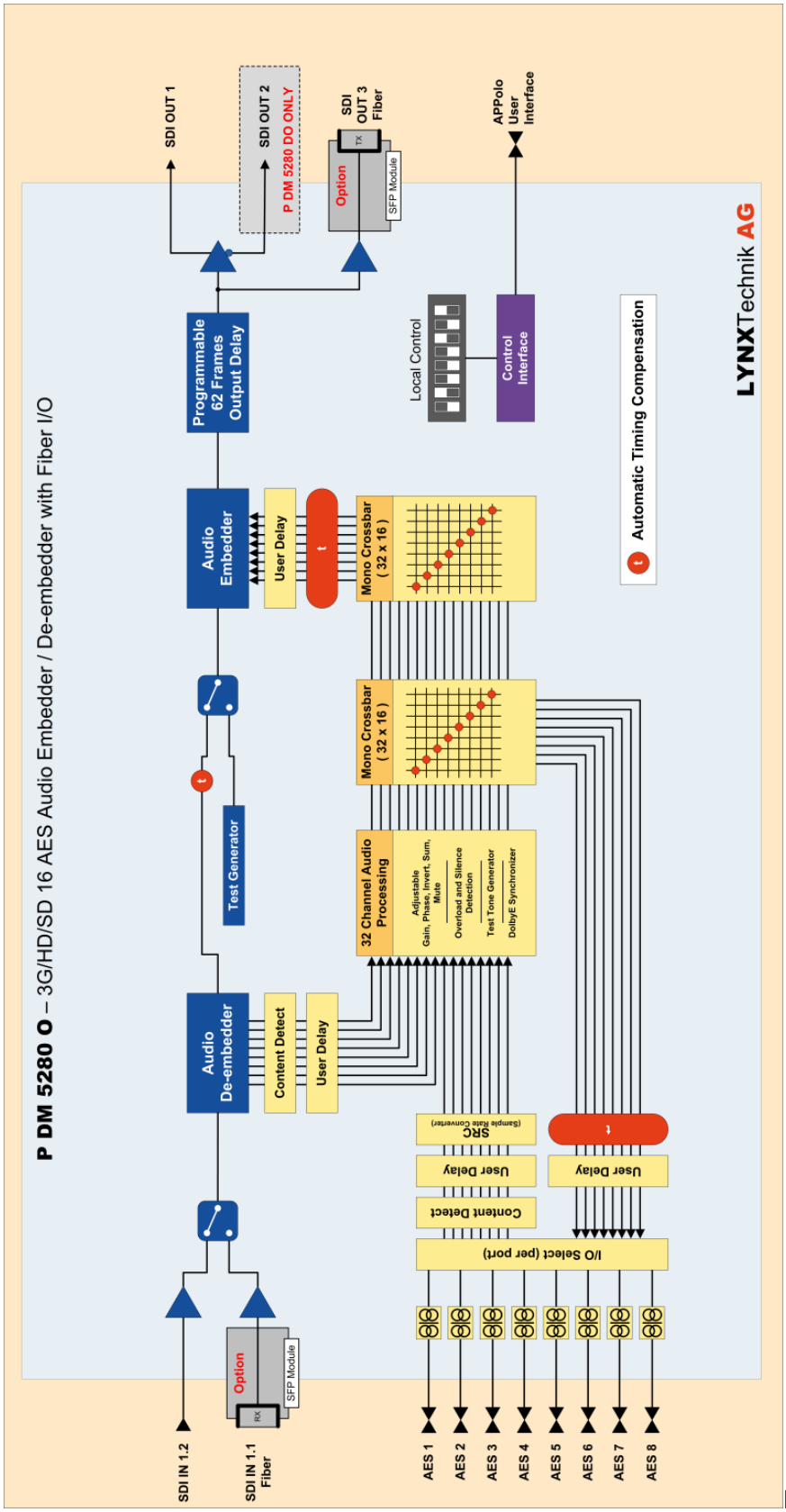

Figure 1: Functional Diagram

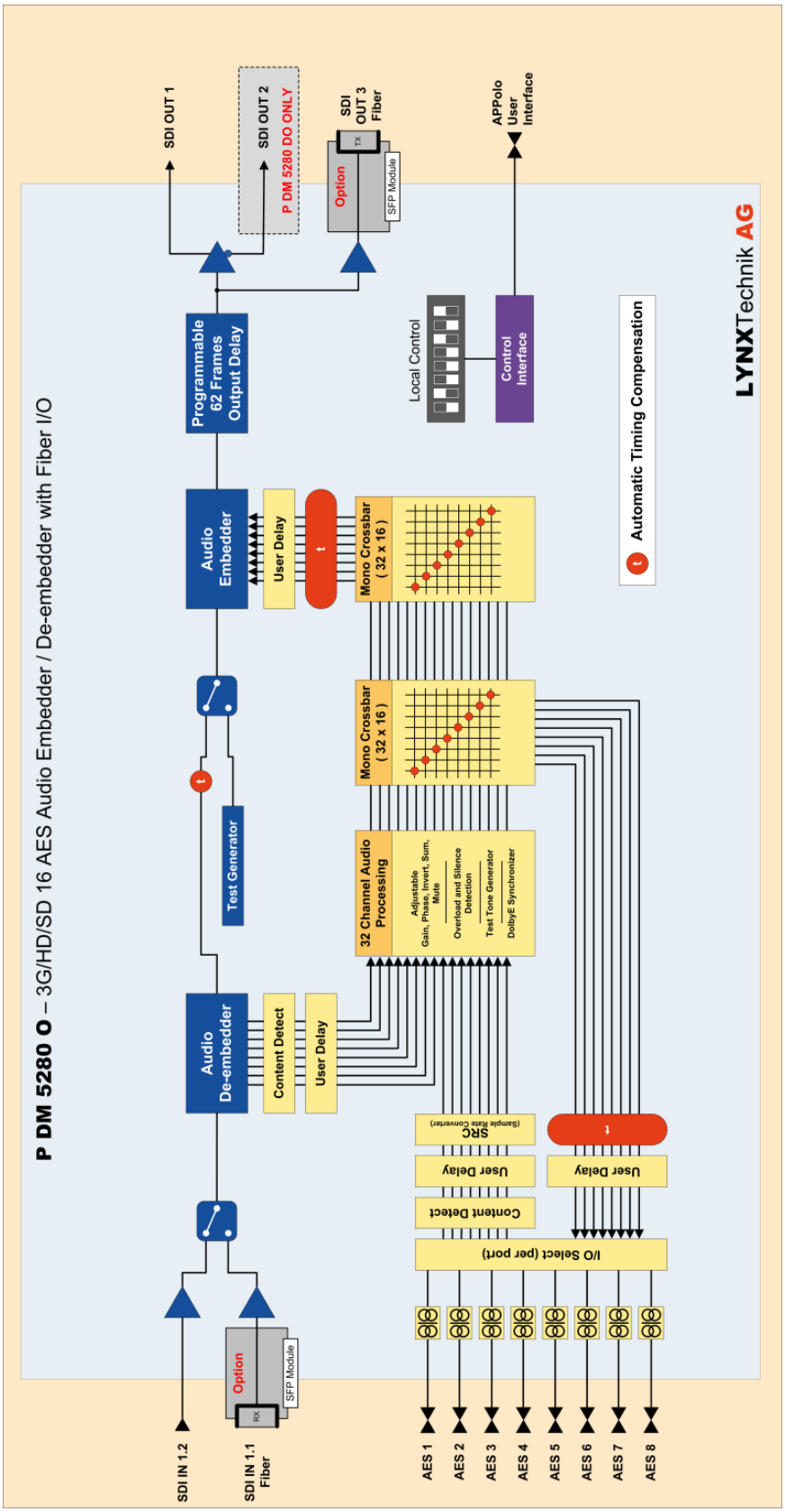

Figure 2: Functional Diagram(Optical Variants)

Module Layout

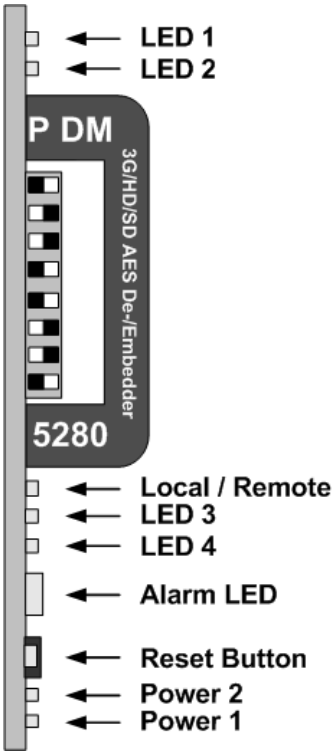

Figure 3: Card Edge

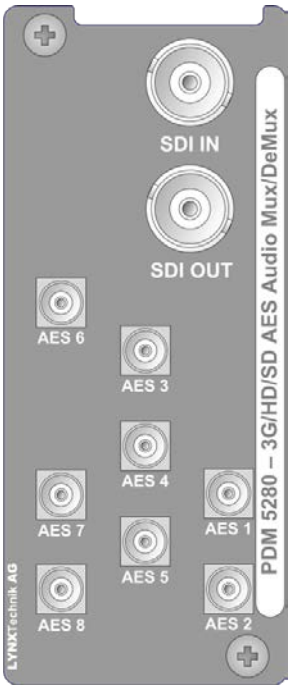

Figure 5:
Rear Termination Panel
P DM 5280-U

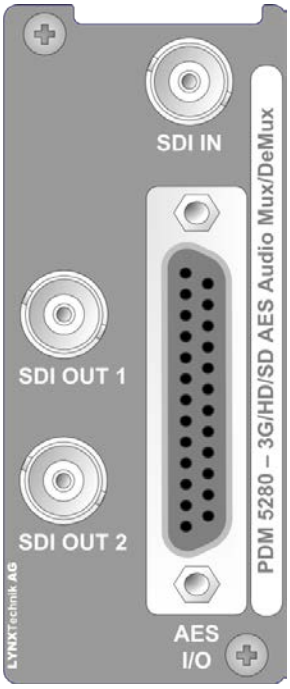

Figure 4:
Rear Termination Panel
P DM 5280-D

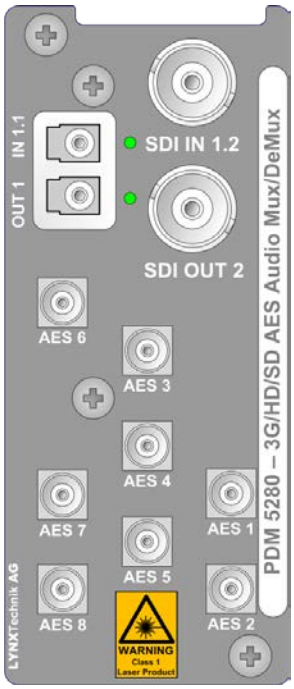

Figure 7:
Rear Termination Panel
P DM 5280-UO

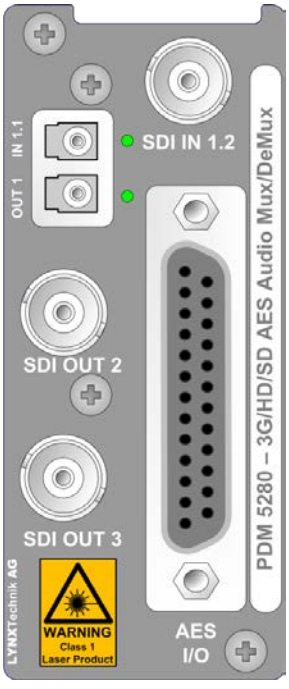

Figure 6:
Rear Termination Panel
P DM 5280-DO

Connections

Video

The P DM 5280 uses standard 75 Ohm BNC connectors for SDI connectivity. 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.

Audio

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

The **P DM 5280 U/UO** versions provide MiniDIN (DIN1.0/2.3) connections for unbalanced AES3id

The **P DM 5280 D/DO** versions provide a SubD25 connector for balanced AES3 (pin layout see table below and Figure 8)

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.		

It is recommended to use high quality screened (twisted pair) cable for the balanced audio connections. LYNX Technik provides optional audio breakout cables which will bring out all audio connections to in line XLR connectors. Model number R AC M 25-8 or R AC F 25-8

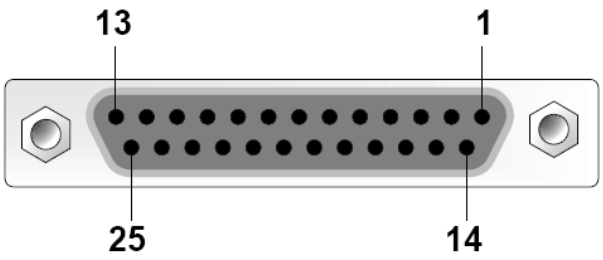

Figure 8: SubD25 Audio connector
(looking into connector from back of module)

Optical Fiber

The P DM 5280 UO and DO versions provide LC/PC connectors for single mode fiber cables (option). The fiber interfaces can be selected from a variety of different SFP style modules. Also from all of the 18 CWDM wavelengths a SFP module can be selected.

Multimode fiber cables can be used also, but this will limit the max. fiber length to approx. 1km.

! NOTE: Please take care that surfaces of fiber cables and LC connectors are always protected against scratching and dust if not fiber cables are connected. Dust and/or scratches will lead to high attenuation of the optical power transmitted.

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.

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.

NOTE. This module should be installed in the R FR 5012 RackFrame with a Fan Front Cover, to ensure sufficient airflow into the RackFrame.

We recommend you power the RackFrame down before installing any additional modules into an existing RackFrame.

1. Select a free two 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 and matrix display 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)*

Settings and Control

The P DM 5280 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. See section “Save Settings Now” on page 32 for more details.

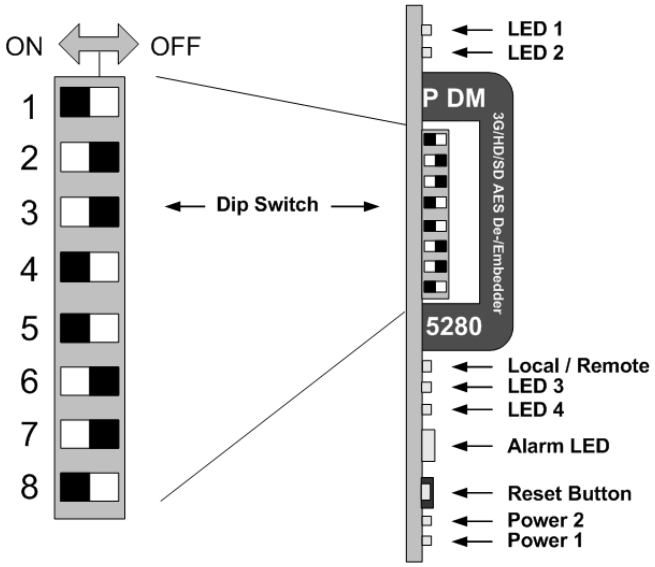

Figure 9: Card Edge switches and LED positions

DIP Switch Settings

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		n.a.
		n.a.

DIP Switch 1 enables local adjustments. Setting it to ON enables the setting of the other DIP switches to configure the module. Setting it to OFF will prevent any local DIP switch settings from taking effect.

*NOTE: It is recommended to set DIP switch #1 to **OFF** to prevent from accidental changes to the stored module configuration if the switches are moved.*

DIP Switch 2 configures the audio embedder for embedded Group 1. Setting it to ON enables the embedder: Group 1 will be embedded, replacing the previous content of Group 1 (if any). Setting it to OFF disables the embedder for Group 1.

DIP switch 3 configures the audio embedder for embedded Group 2. Setting it to ON enables the embedder: Group 2 will be embedded, replacing the previous content of Group 2, if any. Setting it to OFF disables the embedder for Group 2.

DIP switch 4 configures the audio embedder for embedded Group 3. Setting it to ON enables the embedder: Group 3 will be embedded, replacing the previous content of Group 3, if any. Setting it to OFF disables the embedder for Group 3.

DIP switch 5 configures the audio embedder for embedded Group 4. Setting it to ON enables the embedder: Group 4 will be embedded, replacing the previous content of Group 4, if any. Setting it to OFF disables the embedder for Group 4.

DIP Switch 6 enables blanking of the complete horizontal blanking interval (all HANC data will be removed from SDI). Note that Audio Embedding (Group 1-4) also modifies the HANC space by adding / replacing data.

DIP Switch 7 enables blanking of the complete vertical blanking interval (all VANC data will be removed from SDI).

Factory Preset Condition

The P DA 5288 is delivered programmed and preset for the following mode of operation:

Switch 1	**ON**	Local Adjustment Enabled
Switch 2	**ON**	Embedders for Group 1 enabled
Switch 3	**ON**	Embedders for Group 2 enabled
Switch 4	**ON**	Embedders for Group 3 enabled
Switch 5	**ON**	Embedders for Group 4 enabled
Switch 6	**OFF**	HANC data passes unmodified (except Audio Groups)
Switch 7	**OFF**	VANC data passes unmodified

Auto Store

The current settings are stored to the local Flash RAM 10 seconds after the last modification. As a confirmation, the Alarm LED flashes three times, see below. See section “Save Settings Now” on page 32 for more details.

Reset Button

If this button is pressed for 5 seconds, all internal parameters will be reset to their factory default values. 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

LED 1: SDI Status

LED Color	Indication
Green ●	SDI input ok
Yellow ●	SDI ok but unsupported standard (no embedding takes place)
Red ●	SDI input missing

LED 2: Audio Status

LED Color	Indication
Green ●	All used audio inputs present and ok
Yellow ●	• At least one output embeeded group is missing one AES signal and Embedder event enabled • At least one external Audio Input is missing but routed to be embedded.
Red ●	• At least one output embedded group is missing both AES signals and Embedder event is enabled • At least one external Audio Input has no signal.

NOTE: LED 3 and LED 4 are not used (always OFF).

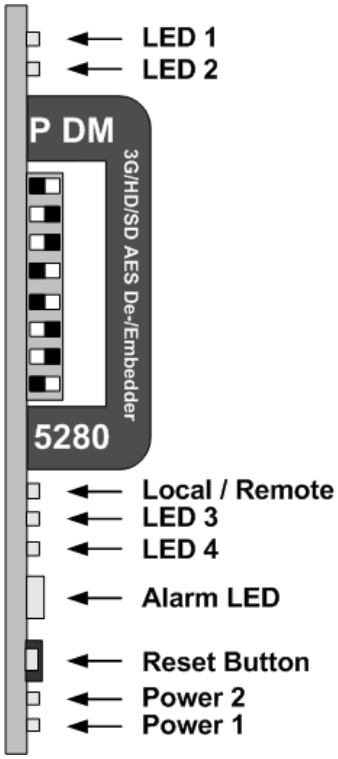

Figure 10: Card Edge LEDs

Alarm LED

The (slightly larger) Alarm LED on the lower edge of the module is visible through the RackFrame's front cover and provides a general indication of the module status.

LED Color	Indication
Green ●	Normal Operation
Yellow ●	• SDI Input format not supported • Some audio input (ext. or embedded) is missing one or more channels
Red ●	• SDI Input missing • Some audio input (ext. or embedded) is missing all channels
Yellow flashing ●●	"Locate Device" activated from Control System
triple yellow flash ●●●●	Saving current configuration to local flash-RAM

Power LEDs

Power 1	Indication
Green ●	Power from Main PSU ok
Off ●	No power from Main Power Supply
Power 2	**Indication**
Green ●	Power from Redundant PSU ok
Off ●	No power from Redundant PSU

NOTE: If one of the Power LEDs should be OFF while the corresponding PSU is working correctly, then please contact technical support for a verification of the board's power input fuse.

Local/Remote LED

LED Color	Indication
Green ●	Local control via DIP switches active, all settings according to local DIP switches
Off ●	Current DIP settings may have been 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. The complex nature and extensive user settings provided on the P DM 5280 requires 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.

Figure 11: P DM 5280 in APPolo GUI

Figure 11 shows the complete module GUI. The “Device Info” area across the top contains information about the module including name and firmware revision. The “Position” area displays the modules position and physical location. This is useful if the device is installed as part of a larger installation.

NOTE: The Locate button (in the “Position” area) is a useful tool to quickly identify a module in larger systems. Activating “Locate” will flash the module’s alarm LED in yellow color. (this does not affect the module’s operation in any way). This function will be stopped automatically (timeout).

The “Error Log” at the bottom of the screen displays an individual timestamp’ed message for any error or warning condition in the system. The same information can always be found in the APPolo Control System’s textual logfiles.

The primary GUI screens and functions are described in the following sections.

Overview

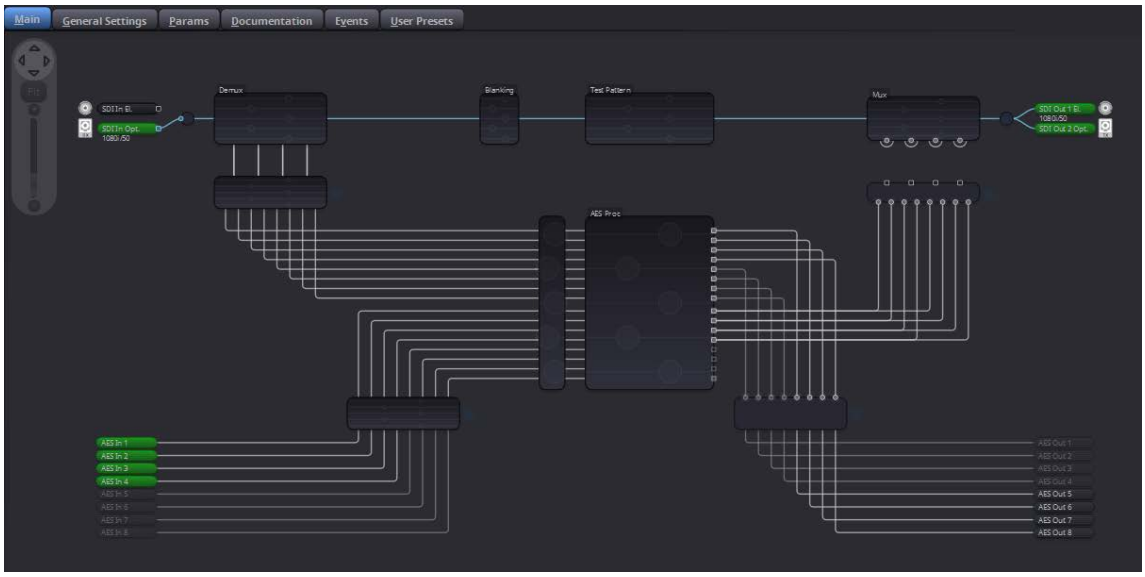

Figure 12: P DM 5280 MAIN Tab

The MAIN Tab (Figure 12) visualizes the module's functionality. The audio and video signals are presented flowing from left to right. Selections are made using onscreen sliders, radio buttons, drop down selections and checkboxes. The screen can be zoomed in/out using the mouse-wheel or the navigation tool in the top left corner of the screen. When zooming closer, the contents of the individual boxes will become visible.

Video Path

The SDI video input on the left can be selected from the electrical (SDI) or from the optical (SFP) input (Optical Versions only). Only one of these two inputs can be used at any one time. See Figure 13.

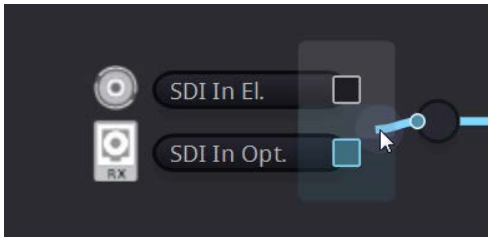

Figure 13: Selecting Optical SDI Input

The chosen SDI input delivers its signal first to an Audio Deembedder (for extraction of all contained audio channels).

Blanking of the H- and V- interval (HANC / VANC) can be enabled to completely remove all contents form the respective ANC area.

The Auto-Test pattern section defines if a generated test-image shall be generated on the output when no SDI input can be detected. If enabled, this test pattern will be generated in the same standard that was last detected on the SDI input. The generated standard can, however, be modified here.

NOTE: The standard of the generated SDI output can only be modified while there is NO current SDI input detected. Furthermore: as soon as a valid SDI input is detected, this setting will automatically fall back to the default setting "follow (last) input".

The Embedder will embed the specified groups into the SDI output stream, replacing an existing Audio Group, if already present. The resulting output SDI stream is available on both an electrical (BNC) as well as an optical (SFP) connector, if available.

Audio Routing

All 8 AES channels are deembedded from the SDI input. In addition, up to 8 external AES inputs can be used. This makes a total of up to 16 AES inputs that can be processed and then assigned to any one of the outputs (SDI embedder and up to 8 external AES outputs). Further details can be found in the following sections.

NOTE: there are a total of 8 external AES ports. Each of the port can be configured to be an input or an output port. See page 27.

flexGUI path highlighting and signal patching

The flexGUI shows all current signal connections as lines (i.e. it does not show any signal lines that are actually unused dead ends). Hovering the mouse pointer over any such signal line will highlight the complete signal path that leads to this point. This illustrates clearly where the particular signal is coming from. Similarly, the downstream path is highlighted to show where this signal is going to.

To re-connect a signal (change the routing) you can think of a signal line as a patch-cable that has to be connected to the desired source. Hovering the mouse-pointer over a flexible signal will show a handle. Grab the handle (click-and-hold) with the left mouse button and drag-and-drop it to the new desired source. More details are shown below.

Timing and Delays

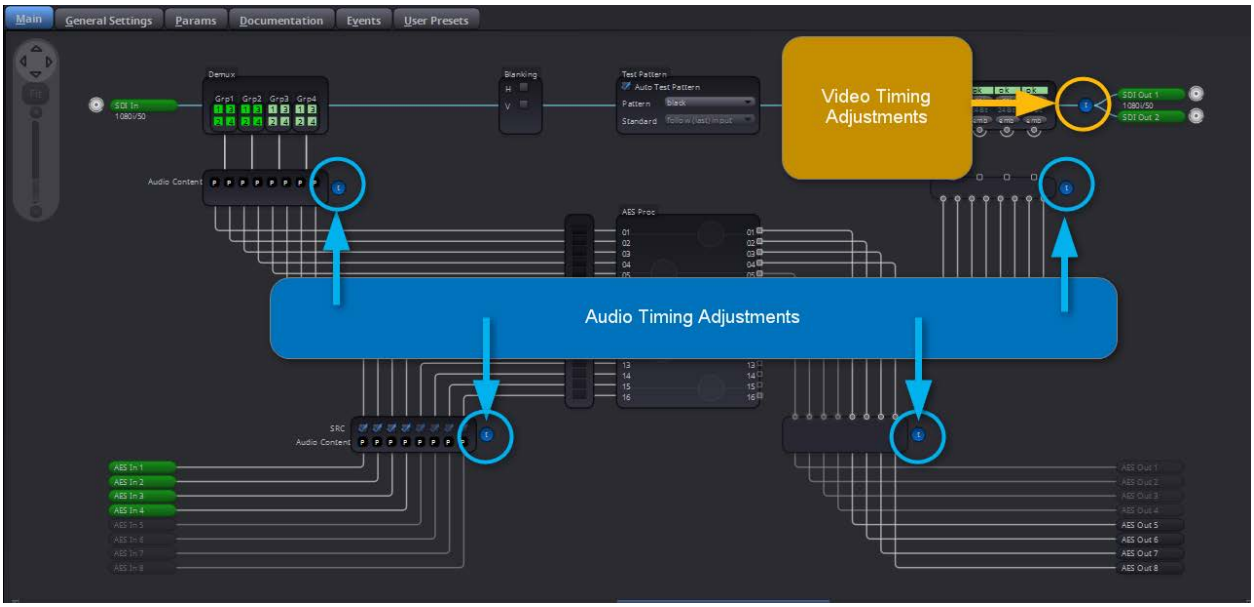

Figure 14: Audio and Video Timing Adjustments

Different internal processing paths for audio and video signals require different internal processing times. Independently from these internal processing delays, a sophisticated algorithm will make sure that all signals that are received on the input will be delivered from the outputs in the exact same relative timing.

As an example, embedded audio streams, which are separated from the video by the audio-deembedder near the input, and which are then routed on internal channels that are independent and separate from the video infrastructure, will be embedded back into

the video after they have been timing-adjusted to match the processing delay of the video path.

Video Timing Adjustments

By default, the video output is set to "**Frame Delay Mode**", which means that the SDI stream is delivered with a correct H/V alignment relative to the SDI input. Alternatively, the device can be configured to work in "**Minimum Delay Mode**" (see Figure 15). In this case, the total processing time through the device will be reduced to a few lines of video. Consequently, the SDI output will NOT be vertically aligned with the SDI input.

A manual additional User Delay can be applied to the SDI output, offering an additional delay of up to a maximum of 62 additional video frames. This manual user video delay is adjustable in one of two dimensions:

- User Delay in Frames, Lines, Pixels.
  The equivalent amount of Milliseconds will be calculated (depending on the current video standard) and displayed as read-only value.
- User Delay in Milliseconds.
  The equivalent amount of Frames, Lines and Pixels will be calculated (depending on the current video standard) and displayed as read-only values.

When the current video standard changes (e.g. because a different source signal is detected at the input), then the manual delay settings in the current dimensions are kept constant, while the corresponding other dimension might change their current values (depending on the current video standard).

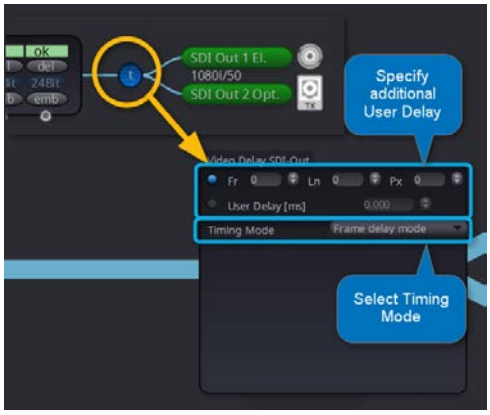

Figure 15: Video Output Delay

NOTE: Adjusting the Video Output delay always delays embedded audio contents together with the video content. It is NOT possible to influence the relative timing between audio and video contents with these controls. Relative audio-video timing (aka lip-sync) can only be influenced while audio and video are still kept on independent paths. See "Audio Timing Adjustments" below.

Audio Timing Adjustments

Audio signals are, by default processed as fast as possible. The minimum processing delay across the complete internal infrastructure is approx. 3ms. When an individual audio signal is embedded into the SDI output stream, then the audio content is implicitly delayed by the appropriate amount of time, so that the relative timing (lip-sync) between the affected audio and video content on the input (as these signals reached the device) is replicated on the output.

Additional User Audio Delay can be applied to any internal audio stream. This can be used to correct for mismatched relative audio timing (lip-sync), e.g. by delaying an early-audio signal by the appropriate amount of milliseconds (i.e. when video is later than audio). Such user delay will simply be added to the internal audio delay that is applied anyway "under the hood" (to compensate for video processing, see above).

Even a late-audio situation (when video is earlier than audio) can be corrected by entering negative values as user audio delay. These negative values will then be subtracted from the internal audio compensation delay (see above).

Input vs. Output Delay

User Audio Delay values can be manipulated in the context of Audio Inputs (next to the Audio Inputs on the left side of the GUI) as well as the Audio Outputs (audio destinations on right side of GUI). Technically, there is no difference between these two locations. Internally, both values will be added up, and the resulting total delay will be applied (i.e. it makes no difference if a signal is delayed in the context of the input or the output, or even both).

The main difference is the presence of the audio crossbar between those two locations.

The general recommendation is to correct for input-related timing problems with the controls that are located at the inputs. And output-related timing adjustments (e.g. compensating for a problem downstream) shall be corrected with the output-related controls. Following this rule will make it easy to operate the audio crossbars later, without having to re-adjust the timing compensation afterwards.

NOTE: The P DM 5280 provides the tools to correct for a timing problem in audio-video (lip-sync) relations. The measurement or verification of such lip-sync problems has to be done by use of external equipment.

Audio Infastructure

The complete audio payload of 8 AES is deembedded from the SDI input stream. In addition, up to 8 external AES inputs can be applied to the module. All of these AES streams are supplied to the internal audio infrastructure.

Phase Aligned Deembedding

The SDI Audio Deembedder deembedds all of the contained Audio Groups (up to four Groups) simultaneously. When the deembedder detects a new SDI stream (e.g. after connecting the signal or after a change of video standard), then the deembedding process starts for all groups, and all groups will be deembedded with correct phase alignment between all channels.

There is, however, a particular situation in which a phase aligned deembedding across all deembedded groups is NOT guaranteed by default: Consider the following scenario:

1. SDI contains audio groups 1 and 2 (audio groups 3 and 4 are not present in the SDI stream). Both groups are deembedded with a correct phase aligment between all of their AES streams, as explained above.
2. While SDI stream is being received without interruption, audio group 3 is added by the upstream embedder. I.e. the HANC content is re-arranged dynamically, and another additional audio group appears, which has not been present initially.
3. The SDI Audio Deembedder will start to de-embed the content of the additional group and deliver the AES content, as usual. The content of new group 3, however, is not guaranteed to be phase-aligned with the content of groups 1 and 2 (which had been there before already).

I.e. if the content of the HANC space is re-arranged to accommodate for an additional audio group while other audio groups remain present, the additional groups are, by default, not guaranteed to be deembedded phase-aligned to the previous content.

Such phase-aligned deembedding can optionally be guaranteed, even in the above case. This can be achieved by enabling the Parameter “DeembPhaseSync” on the “Params” tab (page 28). As a consequence, all deembedding will be re-initialized on a re-arrangement of the HANC content. In the above scenario, there would be an audible disturbance in the contents of groups 1 and 2 when group 3 appears in the HANC.

NOTE The Params-Tab contains another parameter with a similar name: “DeembPhaseSyncVerify”. This parameter is ON by default and it guarantees phase alignment within a stereo-pair. This is not the same as guaranteeing phase alignment across groups, as explained above.*

Audio Content Detection

For every input AES channel, the content type is automatically detected and displayed in the APPolo GUI by a single upper-case Letter. The following indications are supported:

P PCM stream (transparent stereo)

E DolbyE encoded stream

D Other encoded data (e.g. AC-3)

<none> If no letter is displayed at all, then this AES channel does not currently carry any data.

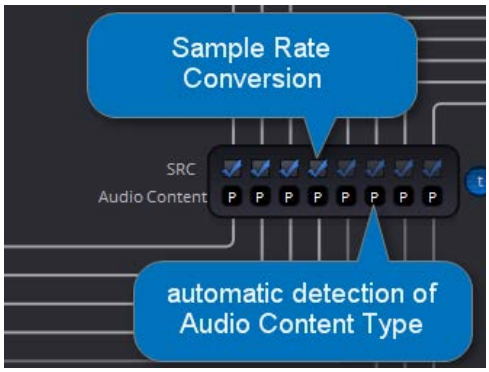

Figure 16: Content Detection and SRC

NOTE: Automatic Content Detection can be overwritten by manual decision (click onto the box with the letter ‘P’). This is, however, only recommended for testing purposes. I.e. in order to achieve best possible signal integrity, it is strongly recommended to leave the Content Detection algorithm in “automatic” mode.

Sample Rate Conversion

A Sample Rate Converter (SRC) is provided per each external AES input stream. The SRC will re-sample the input to a 48kHz samping rate as derived from the current SDI source signal. SRCs are enabled by default (checkbox in APPolo GUI is set to active). If the content type has been detected as anything but PCM (letter ‘P’, see above), then the SRC operation will automatically be bypassed. I.e. it is NOT possibile to destroy an encoded bitstream (such as DolbyE or AC-3) by accidentally leaving the SRC activated.

NOTE: If the input AES stream is already sampled at 48kHz, but if that sampling rate has not been genlocked to the same REF, then the use of the built-in SRC’s is mandatory to achieve the correct sampling structure for the internal processing.

Audio Processing

The Audio Processing block provides access to the detailed audio processing functionality. The following functions are available per mono-channel.

Gain Adjustment	[-66.3dB … +18dB]
Phase Inversion	[on / off]
Mute	[on / off]
Mono Downmix	per output mono-channel: enable the addition of the other (sibling) mono-channel as a simple (a+b)/2 downmix.

Overlevel Detection	a yellow warning indication will be displayed, if the signal content reaches the potential digital clipping (code values reach 0xFFF).
Silence Detection	a yellow warning indication will be displayed if the signal content is detected as silent (<60dB) for more than 10 sec)
Test Tone	A 1000 Hz Test Tone can be generated and applied to both mono channels at the same time. If enabled, the AES input stream is ignored and NOT delivered at the output.

NOTE: all AES processing is automatically disabled (neutralized) when the content type is NOT PCM audio. This guarantees that an encoded bitstream (such as DolbyE or AC-3) is not disturbed by such processing.

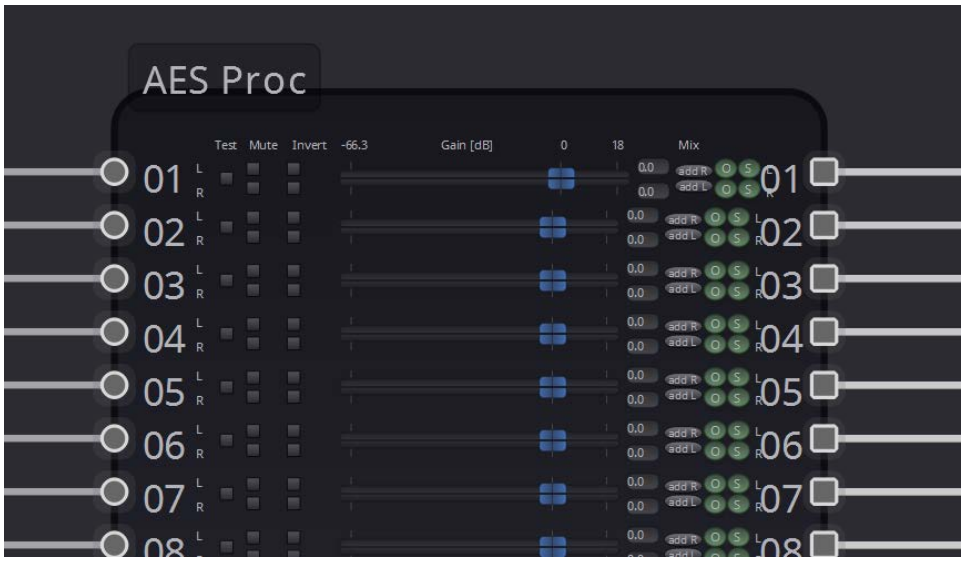

Figure 17: AES processing

DolbyE

The P DM 5280 provides automatic processing and correct synchronization of DolbyE encoded AES streams. As mentioned above, DolbyE contents can be detected as such. For DolbyE streams, all AES processing (such as SRC, gain/phase adjustment etc.) is disabled.

It is recommended to enable the DolbyE Synchronizer capability on the audio path that contains a DolbyE encoded bitstream. As a result, this audio path has additional capabilities to process DolbyE bitstreams in appropriate ways (see below).

NOTE: Enabling the DolbyE capability on any audio path does NOT take away any of its standard capabilities, which are required for processing of PCM streams though. I.e. PCM streams are not at all influenced by enabling the DolbyE capability on one of the internal audio paths.

DolbyE Frame-Synchronization: Similar to a Video-framesync, the DolbyE framesync drops or repeats a complete DolbyE frame at the point of roll-over (i.e. when the incoming asynchronous data would lead to a buffer overflow/underflow).

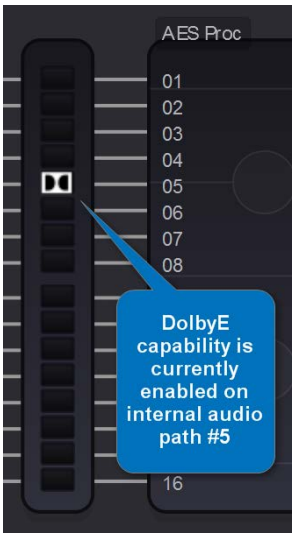

Figure 18: enabling DolbyE capability

The repeating / dropping of frames happens at the exact same moment for DolbyE audio frames as for video frames. This guarantees correct lip-sync even if DolbyE content is processed independently from the SDI path.

DolbyE Guardband Alignment: The AES path delay for DolbyE encoded streams will make sure that the DolbyE bitstream is embedded into the SDI stream with correct timing alignment of the Dolby Guardband.

NOTE: see here for more information on DolbyE Guardband Alignment:
http://www.dolby.com/us/en/technologies/dolby-e-preferred-alignment.html

Audio Crossbars

After going through the audio processing stage, each internal audio stream is delivered to the output audio crossbar. Here, each of the possible audio destinations (embedder and external output) can select from all of the available signals. The output can be connected to a new source by simply clicking onto an existing connection and dragging and connecting the open handle to the desired source signal (Figure 19).

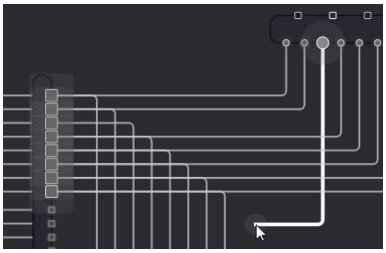

Figure 19: Audio Crossbar Operation

One single white line in this diagram represents a stereo-connection (containing a left and a right channel). If required, the left and right signals can be connected independently (to perform mono-switching). Access to the individual mono-channels is given by clicking the Right Mouse Button onto a white AES line and then selecting “Show Stereo Channels” from the menu (Figure 20)

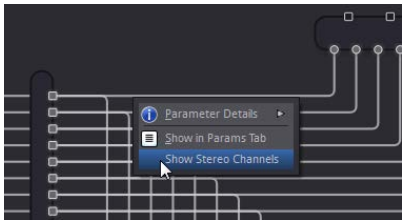

Figure 20: Audio Mono Crossbar

To switch audio signals you have the choice between the simple drag and drop operation described above or a matrix style control. To turn on the matrix style control, select “Audio CrossBar Matrix” in the View menu.

This additional audio crossbar style is available from Release 8.2.0. onwards.

You can also mute single audio channels by using the corresponding function in the pop-up menu (see Figure 21).

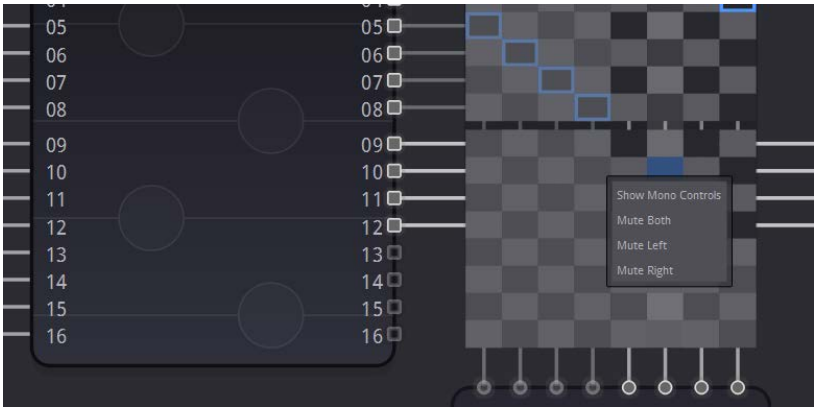

Figure 21: Muting audio channels

Embedder

All four embedded audio-groups can be (re-) embedded into the SDI output. An existing embedded group can also be removed from the SDI stream, even without embedding anything. (Re-) embedding a group will implicitly remove this same group from the input SDI stream, if applicable.

An embedded audio-group can only be embedded as a complete group containing two AES streams. If you want to replace only one out of the two AES streams in the SDI, you need to feed the other AES stream from the Deemedder (on the left) through the audio-processing block and the output crossbar to the Embedder, and re-embed it together with that other (new) AES content into the same group. This will, technically, replace the complete embedded group in the SDI stream.

Embedding audio into an HD-SDI and 3G-SDI stream will always be done in 24bit resolution. When embedding into SD-SDI, 24bit embedding is activated by default, but can be de-activated (reducing the embedding to 20bit). This may be required to satisfy some non-standard-compliant SDI deembedder.

AES Port Setup

The P DM 5280 provides a total of eight external AES ports. Each of these ports can be configured to be an AES input (receiver) or an AES output (source). By default, i.e. when delivered from the factory, AES ports 1 through 4 are configured as AES inputs, while AES ports 5 through 8 are configured as outputs.

This default port configuration can be modified at any time. An explicit un-locking of these configuration switches is required to prevent from accidental changes to these fundamental configuration settings.

A modified AES port configuration will NOT be reset by a “Reset to Factory Default” operation (see page 32).

NOTE: Please make sure NOT to configure an AES port as an output, while an external signal source might send a signal into that port. This misconfiguration might potentially result in permanent damage of hardware components.

User Presets

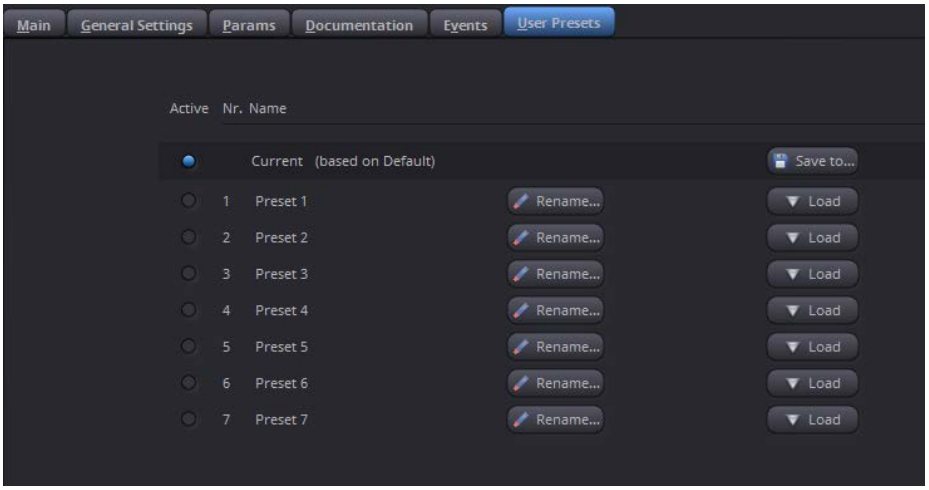

Figure 22: User Presets Tab

The User Presets Tab provides the ability to store and recall seven different sets of User Presets. Each such User Preset contains a current value for all settings (parameters) of the complete device. Restoring a User Preset means to apply these current values to all parameters at once. I.e. it is not possible to restore a User Preset and thereby modify only a subset of the internal parameters.

All User Presets are stored in on-board flash-RAM, where they are preserved even during long periods of no power supply.

Saving a User Preset

The current configuration of the complete device is stored into one of the User Presets by following these steps:

1. On the “User Presets” Tab, click the button “Save To” to open the dialog shown in Figure 22
2. Select one of the User Preset slots (click button to the right). Optionally: rename the User Preset. (max 8 characters).
3. Click “Save”

Figure 23: Saving a User Preset

Loading a User Preset

An existing User Preset can be restored into the Current Settings of the complete device by following these steps:

1. On the “User Presets” Tab, click the “Load …” button next to the User Preset.
2. In the next dialog, confirm that this is what you want.

Device Event Tab

The Events Tab is where the module alarming and error notifications are configured for the module. Any of the possible Events that the device can generate can be disabled here, which will declare such Events as irrelevant. Once an Event has been disabled in this Events-Tag, the Event will not be reported to the APPolo control system, it will not be logged in the logfiles, and it will not even influence the local LEDs of the device.

For all Events that are enabled (which is the default): as soon as the monitored condition becomes critical (e.g. input signal lost), the Event becomes ACTIVE. This change of state generates a message in the APPolo Control System. This message is stored in the APPolo Server logfile. Later, when the condition is not critical anymore (e.g. input signal present again), another message is logged in the APPolo Event System, and also saved in the logfile.

Additionally, these messages can be displayed in the APPolo GUI’s Event Log (bottom part of the APPolo GUI, enabled from the “View” menu). This can, however be disabled by removing the checkboxes from the “Log in GUI” columns (separately for “Event becomes Active” and “Event not active anymore” messages.

Similarly, an SNMP trap can be generated from the APPolo Server for any message in the APPolo Event System. Refer to the LYNX Remote Control Guide for more information on SNMP (available from http://appolo.lynx-technik.com)

Parameters

The “Params” tab lists all available control parameters of the complete device. Every switch and function in any other part of the GUI is actually just a graphical control of a parameter listed on this page. There are, however, a number of parameters for more detailed control that are only accessible in this list of parameters on the “Params” tab.

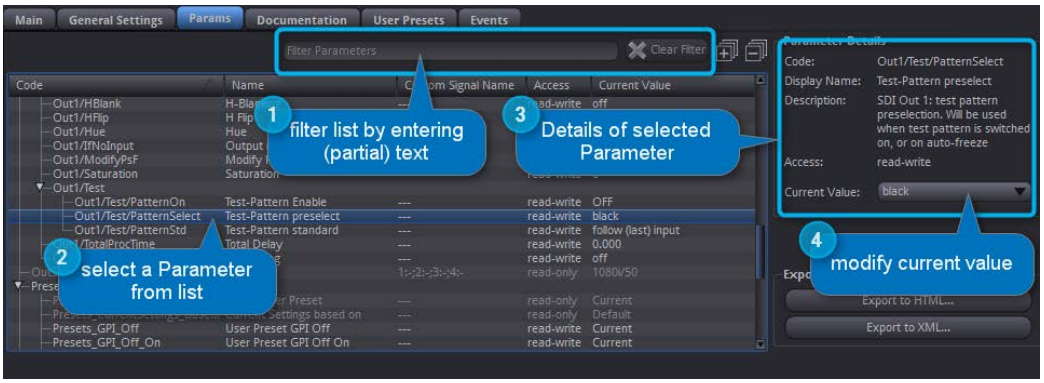

Figure 24: Param Tab

All parameters are defined by the following aspects:

- Code: This is a unique code to identify the parameter. The Code can contain the slash-character '/', to provide some structure to the total collection of parameters. The Parameter Code is always to be specified as the complete text string (i.e. including all slashes).
- Name: a human readable short parameter name, which is used as the default text label in most parts of the GUI, as well as in any CustomControl Panel.
- Access: read-write or read-only accessibility. Note that for some parameters, the accessibility status may potentially change, depending on the current value of other parameters. E.g. the value of parameter A might be controlled automatically by default, so the accessibility of A will be displayed as "read-only". But a boolean parameter B might be provided to switch off the automatic behavior. So when parameter B is set to MANUAL, then parameter A would dynamically change to "read-write".
- Current Value: This is the current value of the parameter. If Accessibility is "read-write" (see above), then the Current Value can be modified.
- Description: a textual explanation of the behavior of the individual parameter.

You can use the "Filter" function (located above the actual list of parameters) to show only a subset of the complete list, based on textual filtering. The filter will actually search in any part of the parameter definition, including the parameter code, the textual description and even the Current Value.

NOTE: In theory, it would be possible to manage and monitor the complete functionality of the P DA 5288 by accessing the relevant parameters on this tab only. All the other tabs in the GUI are only provided to provide better explanations and overview.

All Control is through Parameters

As stated above, the complete behavior of any LYNX Device can be controlled and monitored through the parameters listed on the “Params” tab. All other parts of the LYNX APPolo Control System use these Parameter to take access to any aspect of the Device.

- The LYNX CustomControl feature connects the individual elements of a custom-made Design to real device parameters by their Code.
  See http://appolo.lynx-technik.com/ -> CustomControl for details.
- The LYNX AutoControl automation rules access the individual Parameters (for both Conditions and Actions) by their Code.
  See http://appolo.lynx-technik.com/ -> AutoControl for details.
- The LYNX RemoteIF API addresses individual Parameters by Code.
  See http://appolo.lynx-technik.com/ -> RemoteControl for details.
- The LYNX SNMP Control provides one OID (numerical address in the MIB) per individual Parameters. The exact mapping of Parameter Code to OID is provided in the MIB files. See http://appolo.lynx-technik.com/ -> RemoteControl for details.

Finding the Parameter Code name for a given Parameter in the graphical GUI is made easy by clicking the Right-Mouse-Button onto the graphical control anywhere in the GUI and then selecting the “Parameter Details” option (see Figure 24).

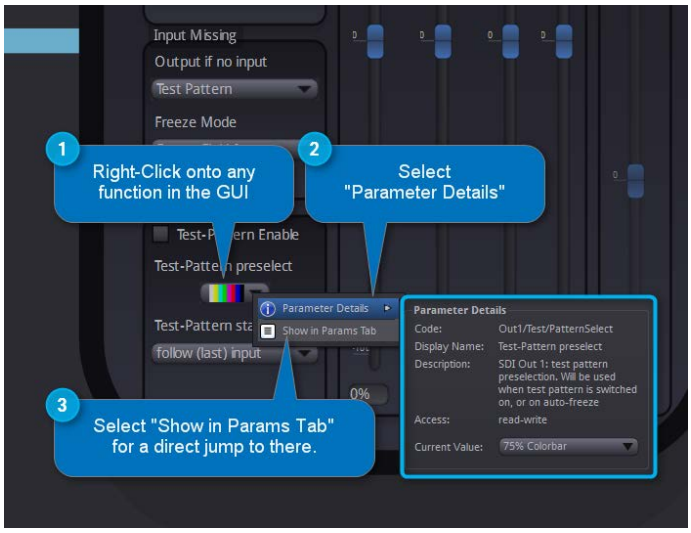

Figure 25: Parameter Details from GUI

General GUI functions

There are a number of functions and commands of the LYNX APPolo Control System which are common for all LYNX devices.

A click with the Right-Mouse-Button on any module in the DeviceTree will generate the same menu that is available from the "Device" menu. This menu provides the following options:

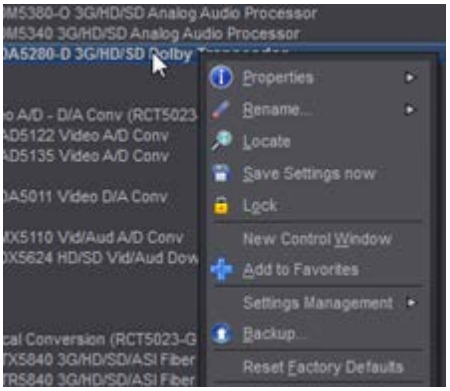

Figure 26: Device Menu from Tree

Device Properties

The first entry in the Device menu opens a sub-menu page which shows device specific properties about the selected module.

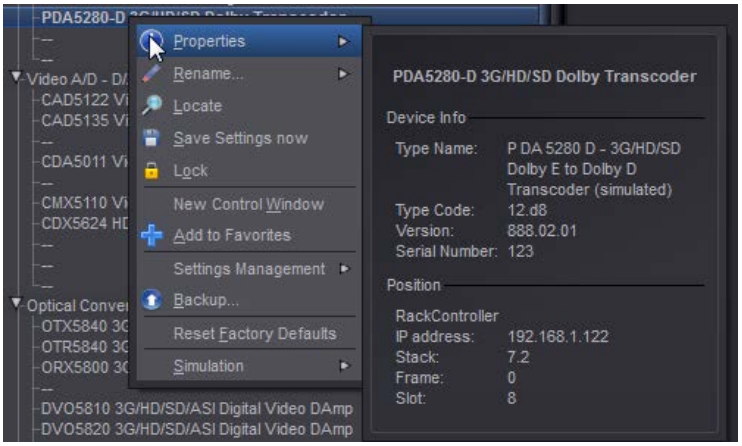

Figure 28: Device Properties Menu

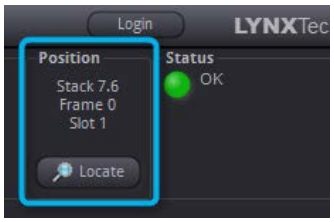

Figure 27: Locate Position

Locate

This function is useful if you need to physically locate a module in a larger system quickly (for removal or maintenance purposes) When Locate selected this will flash the module alarm LED yellow. This function does not impact normal module operation and will timeout after a short time period.

New Control Window

Selecting this option will open up a separate GUI window showing just the controls for the current module. This new window can be used to arrange multiple devices on your desktop or similar.

Rename

It is possible to rename individual items (RackFrames and individual devices) in the APPolo Device Tree. The default name of a device is the

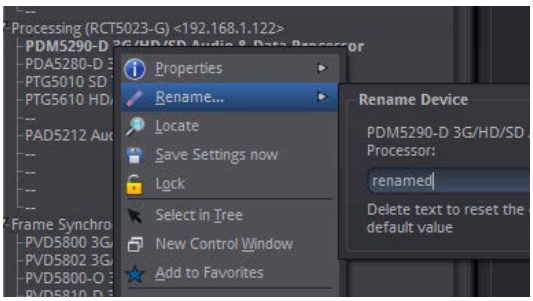

Figure 29: Rename Device

LYNX product name. This name can be modified at any time. The original (default) name can be restored by simply removing the custom name from that renaming-field (save this as an empty name).

NOTE: The names are stored inside the flash memory of a LYNX server (if installed) or the hard disk of the connected Computer respectively.

Save Settings Now

Any modification to any parameter of a device is immediately propagated from the APPolo GUI to the hardware device (card) and made effective. The current settings are saved in a local FlashRAM of the device, so that the device will continue to work in the exact same configuration after a power-cycle. But in order to reduce the number of write-operations on the physical FlashRAM, the actual storage of a modified configuration into the FlashRAM is only executed approximately 10 seconds after the last change to any setting in the whole card. This operation is visualized on the board by all local LEDs flashing three times in yellow color.

Consequently, if you remove a card from a system BEFORE the last changes have been saved to FlashRAM, those last changes will not be available on the next power-up.

The “Save Settings Now” operation in this menu can force the current configuration of this device to be stored to the local FlashRAM now. If in doubt, this function should be executed before a device is physically removed from the system, or before electrical power is shut down.

Lock

Selecting this will lock the device to prevent from any accidental changes being made to the modules settings. The module status can be seen but all the controls will be grayed out. To unlock simply deselect the lock control from the menu.

Reset Factory Defaults

Executing this function will reset all the individual settings of all parameters of the device back to the predefined state that has been defined by the manufacturer. All custom adaptions will be lost. This operation cannot be undone.

Settings Management

The complete current configuration of one device can be copied into an internal “clipboard” and pasted onto a different device of the same type. Alternatively, the complete current configuration can be stored to a local file (as a very simple single-device backup).

Specifications

Digital Video Input	
Signal Type	Serial Digital Video (SDI) SMPTE 292M, 259M, 424 M with automatic input standard and format detection
Supported Formats	See page 8
Input Imedance	75 Ω BNC
Input Level	0.8V
Return Loss	>15dB (<1.485Gbit/s); >10dB (>1.485Gbit/s)
OPTIONAL: Video Input (Fiber)	
Signal Type	SMPTE 297M-2006
No. of inputs	1
Connector	LC/PC (single mode transmit/receive – duplex connection)
Wavelength	1260nm – 1620nm (-19dBm sensitivity)
Digital Video Ouputs	
Signal	Serial Digital Video (SDI) SMPTE 292M, 259M, 424M
Output Impedance	75 Ω
Output Level	0.8V pp +/- 10%
Return Loss	>15dB (<1.485Gbit/s); >10dB (>1.485Gbit/s)
Connection	BNC
Video Delay	Up to 62 frames in steps of pixels, lines, frames
Jitter	< 0.2 UI (270Mbit/s) < 0.2 UI (Alignment Jitter); < 1.0 UI (Timing Jitter); (1.485Gbit/s) < 0.3 UI (Alignment Jitter); < 2.0 UI (Timing Jitter); (2.97Gbit/s)
OPTIONAL: Video Outputs (Fiber)	
Signal Type	SMPTE 297M-2006
No. of outputs	1
Connector	LC/PC (single mode transmit/receive – duplex connection)
Wavelength	Standard: 1310nm (non-CWDM), other wavelengths for CWDM as option
Transmission power	Standard: 1310nm (non-CWDM):-5dBm, other wavelengths for CWDM as option: -1dBm
AES Audio Inputs / outputs	
Signal	P DM 5280 U = AES3 id un-balanced on Mini DIN connectors P DM 5280 D = AES3 balanced on SubD 25 connector
No. of inputs / outputs	8 x AES ports
Coupling	Transformer
Performance	
Audio Group Deletion	Existing groups pass transparently or they can be deleted and/or replaced with new embedded audio (user selectable)
Audio Group Selection	Map AES inputs or deembedded audio into any of the 4 embedded audio groups
Audio Crossbar	Mono crossbar allows for individual (left and right) channel mapping
Audio Sync Frame	With no SDI input the audio is embedded into a test pattern video sync frame (last connected video standard, or a user selected standard).
Audio Delay	Up to 10s
Electrical	
Operating Voltage	+ 12 VDC
Power Consumption	*8W*
Safety	IEC 950 / EN 60950 / VDE 0805
Mechanical	
Size	283mm x 78mm
Weight	CardModule 120g, connector plate 70g
Ambient	
Temperature	5ºC – 40ºC Maintaining Specifications
Humidity	90% 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.

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

Technical Support

If you are experiencing problems, or have questions please contact your local distributor, authorized dealer or reseller for more details. Please do not return products to LYNX without an RMA.

For FAQs and Technical support visit **http://support.lynx-technik.com**

General product information is available on **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

E-Mail 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.

LYNXTechnik AG

Broadcast Television Equipment