

# Reference Manual

## C MX 5710

**HD/SD Analog Video to SDI Converter with Frame Synchronizer,  
Analog Audio Inputs and AES Ports**

**Revision 1.0 – July 2015**

<b>This Manual Supports Device Revisions:</b>	
C MX 5710 Firmware Revision	688
Control System GUI Release	8.4.0

Information in this document is subject to change without notice. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical for any purpose, without express written permission of LYNX Technik AG.

LYNX Technik AG may have patents, patent applications, trademarks, copyrights or other intellectual property rights covering the subject matter in this document. Except as expressly written by LYNX Technik AG, the furnishing of this document does not give you any license to patents, trademarks, copyrights or other intellectual property of LYNX Technik AG or any of its affiliates.

**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>4</b>
<b>Regulatory information .....</b>	<b>5</b>
Europe .....	5
Declaration of Conformity .....	5
USA .....	5
FCC 47 Part 15 .....	5
<b>Getting Started.....</b>	<b>6</b>
Packaging.....	6
ESD Warning.....	6
Preventing ESD Damage.....	6
Caution.....	6
<b>Product Description .....</b>	<b>7</b>
Functional Diagram .....	8
Connection Panel and Module Layout .....	9
Connections .....	10
Video .....	10
Sub-D 25 Pinout.....	10
Video Processing .....	11
A/D Converter Functions.....	11
Proc Amp Functions.....	11
Aperture Correction.....	11
Test Pattern .....	11
Programmable Video Output Delay .....	11
Audio Processing .....	12
Analog Audio Inputs.....	12
Digital Audio I/O .....	12
Processing .....	12
Frame Synchronization .....	12
<b>Installation .....</b>	<b>13</b>
<b>Local Control and LEDs.....</b>	<b>14</b>
<b>Switch Settings.....</b>	<b>14</b>
Alarm/LED Status Indicators .....	15
LED: Video Status.....	15
LED: Audio Status.....	15
LED: Local / Remote.....	15
Alarm LED.....	15
Power LEDs .....	15
<b>Control System GUI.....</b>	<b>16</b>
Overview .....	17
flexGUI path highlighting and signal patching .....	17
A/D Converter Control.....	18
Frame Synchronizer.....	18

Reference Source Selection .....	19
Video Processing .....	19
Aperture Correction.....	19
Clip CR/Cb Headroom .....	20
Output if no input.....	20
Test Pattern Pre-select .....	20
Test Pattern Standard.....	20
Test Pattern Enable .....	20
Video Adjustments .....	21
Audio Infastructure .....	21
AES Audio Content Detection.....	21
Sample Rate Conversion.....	21
AES Port Setup.....	22
Analog Audio Inputs.....	22
Audio Processing .....	22
Audio Crossbars .....	23
Embedder .....	25
Meta Data .....	26
Time Code .....	26
Format Description.....	27
Timing and Delays.....	28
Video Timing Adjustments .....	28
Audio Timing Adjustments .....	28
Timing Tab .....	29
<b>Device Event Tab .....</b>	<b>29</b>
<b>Parameters .....</b>	<b>30</b>
Parameters control everything .....	31
<b>General GUI functions.....</b>	<b>32</b>
Device Properties.....	32
Locate .....	32
New Control Window .....	32
Rename.....	33
Save Settings Now.....	33
Lock.....	33
Reset Factory Defaults .....	33
Settings Management .....	33
<b>Specifications .....</b>	<b>34</b>
<b>Service .....</b>	<b>36</b>
Parts List .....	36
Technical Support .....	36
<b>Contact Information .....</b>	<b>36</b>

# 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.

**THIS WARRANTY IS GIVEN BY LYNX TECHNIK WITH RESPECT TO THIS PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. LYNX TECHNIK AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. LYNX TECHNIK'S RESPONSIBILITY TO REPAIR AND REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. LYNX TECHNIK AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER LYNX TECHNIK OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.**

# Regulatory information

## Europe

### Declaration of Conformity

We	LYNX Technik AG Brunnenweg 3 D-64331 Weiterstadt Germany
<i>Declare under our sole responsibility that the product</i>	
<b>TYPE: C MX 5710</b>	
<i>To which this declaration relates is in conformity with the following standards (environments E1-E3):</i>	
EN 55103-1 /1996	
EN 55103-2 /1996	
EN 60950-1 /2006	
<i>Following the provisions of 89/336/EEC and 73/23/EEC directives.</i>	
	Winfried Deckelmann
Weiterstadt, July 2015	
<i>Place and date of issue</i>	<i>Legal Signature</i>

## 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 Megohms.

## Product Description

The C MX 5710 provides high quality composite / component SDTV and HDTV video A/D conversion, audio A/D conversion plus frame synchronisation and audio embedding functionality in a single, versatile self-contained module.

The video conversion capabilities include high quality 12 bit A/D conversion with 54 MHz sampling. 5-line adaptive comb filter decoder plus a choice of CVBS / RGB / YUV / YC SDTV analog video inputs or RGB / YUV HDTV analog inputs. The module provides the quality and versatility for use in the most demanding applications.

Audio capability includes support for 2 sets of analog stereo pair inputs 24 bit A/D conversion and selectable full scale range.

In addition 2 x digital AES audio ports are provided which can be individually configured as inputs or outputs.

Integrated audio processing includes adjustable gain, phase, invert and a sum function. Audio channels can also be shuffled using the integrated audio crossbar. Automatic timing compensation is provided with a user adjustable offset. A fully featured audio embedder includes a 8 x 16 audio crossbar for audio assignments.

An adjustable video delay of up to 62 frames adjustable in frame, lines and pixels increments is provided for system timing.

Full remote control is provided via the APPolo control system.

# Functional Diagram

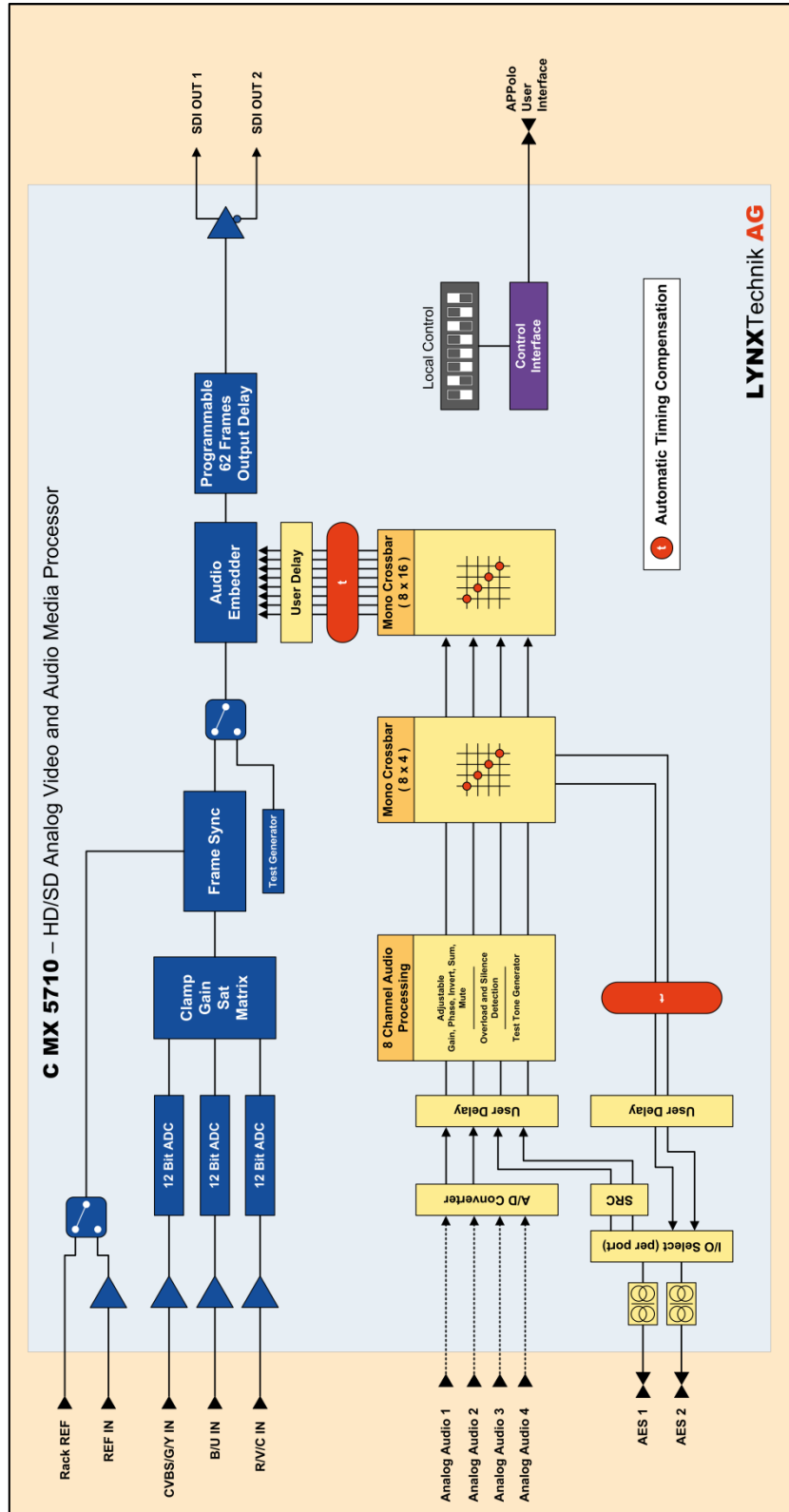


Figure 1: Functional Diagram



## Connection Panel and Module Layout

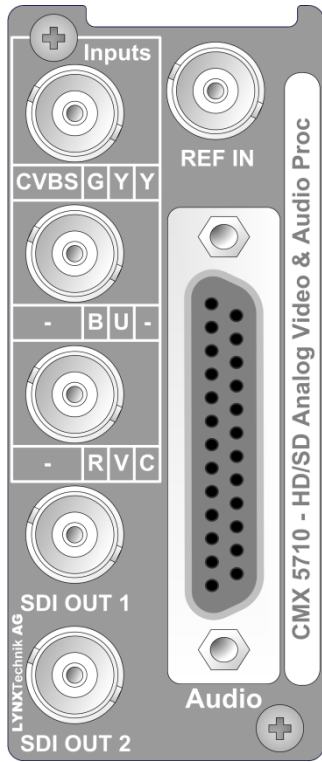


Figure 2: Connections

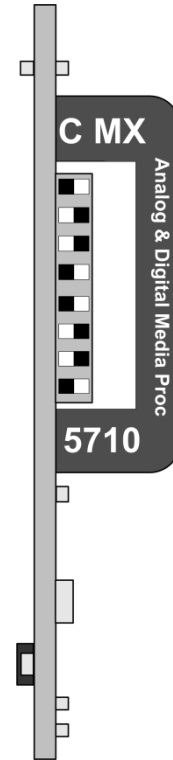


Figure 3: Board Edge



Figure 4: Board

## Connections

### Video

The C MX 5710 uses standard 75 Ohm BNC connectors for the analog video and reference input connections as well as for the SDI output. 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 output cable lengths the module will support are shown below.

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

HDTV = 140m Belden 1694A (1.4Gbits/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.

### Sub-D 25 Pinout

The module has a Sub-D 25 connector for the analog audio, AES audio and GPI in and outputs. The pinout is as shown in Table 1: Sub-D 25 Pinout.

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

Table 1: Sub-D 25 Pinout

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 signals to in line XLR connectors. Model numbers RAC M/F 25-4/4, RAC M 25-8 or RAC M 25-8.

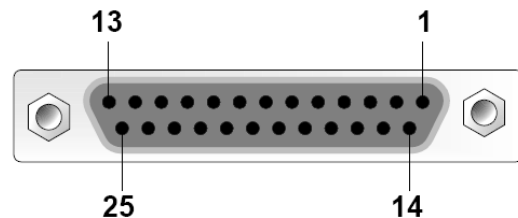


Figure 5: SubD25 Audio connector  
(looking into connector from back of module)

## Video Processing

### A/D Converter Functions

The A/D converter provides a high quality 12 bit A/D conversion with 54 MHz sampling. Adjustable Chroma, Pedestal and Hue are available with the APPolo control software.

A wide range of comb filter settings as well as Luminance, Chrominance, Cb and Cr Gain and Cb, Cr Offset settings are provided.

### Proc Amp Functions

The output has an associated video processing amp which provides user adjustable **Gain**, **Saturation**, **Black Level** and **Hue** using GUI sliders.

### Aperture Correction

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

### Test Pattern

The output has an integrated test pattern generator which provides a wide selection of test patterns.

The selected test pattern can also be setup to turn on automatically if no input signal is detected.

### Programmable Video Output Delay

The SDI output has a programmable video output delay which can be set between 0 and 62 frames (max). The adjustment is available in pixel, line and full frame increments.

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

*NOTE: The Synchronizer has fixed frame delays depending on the signal path and selected function. The 0 > 62 frame user adjustment is additional delay relative to the fixed delays.*

## Audio Processing

### Analog Audio Inputs

The full scale level of the analog audio inputs can be adjusted in addition a manual delay is available.

### Digital Audio I/O

The AES ports can individually be configured to either be an input or output

When setup as an input the type of audio (PCM, Dolby E or Audio Data) is detected by the module automatically.

The module provides manual delay stages on the input and output of the AES signals.

### Processing

Four AES channels (8 audio channels) of audio processing are available with gain, mute and phase invert functions. In addition to this, each channel has a sine test signal generator as well as over level and silence detection.

## Frame Synchronization

The frame synchronizer will output a stable SDI in sync to the connected reference signal. The module will accept black & burst reference as well as bi-level and tri-level sync signals.

Adjusting the output timing of the module will adjust the SDI output relative to the reference signal.

# 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. Up to ten C MX 5710 modules can be accommodated in a single Series 5000 2RU rack frame.

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. 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.*

## Local Control and LEDs

The C MX 5710 module has an integrated micro-controller, which enables the module to be configured and controlled locally using the dip switches at the edge of the board.

Advanced settings are available via the APPolo control software.

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

## Switch Settings

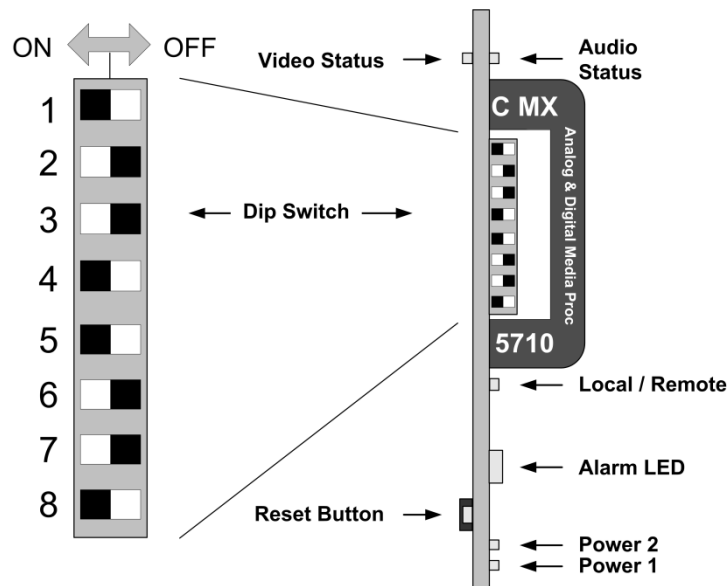





Figure 6: Board Edge

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	Ref Source Board
	OFF	Ref Source Rack
7	ON	No Function
	OFF	No Function
8	ON	Output if no Input "Testpattern"
	OFF	Output if no input "OFF"

## Alarm/LED Status Indicators



### LED: Video Status

LED Color	Indication
Green 	Video input ok
Yellow 	Frame Rate Mismatch (Mismatch between the video frame rate and the connected reference).
Red 	Video input missing

### LED: Audio Status






LED Color	Indication
Green 	All used audio inputs present and o.k.
Yellow 	Warning condition. Any of: - At least one embedded group is missing one AES signal. - At least one external Audio Input is missing but routed to be embedded.
Red 	Error condition. Any of: - At least one external Audio Input has no signal. - At least one embedded group is missing both AES signals and Embedder event is enabled.

### LED: Local / Remote





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

### Alarm LED

The Alarm LED is visible through the RackFrame's front cover.

LED Color	Indication
Green 	Normal Operation .
Yellow 	Problem with the video inputs and/or reference missing.
Yellow flashing 	"Locate Device" activated from Control System
triple yellow flash 	Saving current configuration to local flash-RAM
Red 	No video input detected

### 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.

# Control System GUI

All LYNX CardModules support a computer interface which allows setting the modules parameters using the simple APPolo control software GUI interface. Access to all standard features *and in some cases* extended features is possible using this interface.

**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.

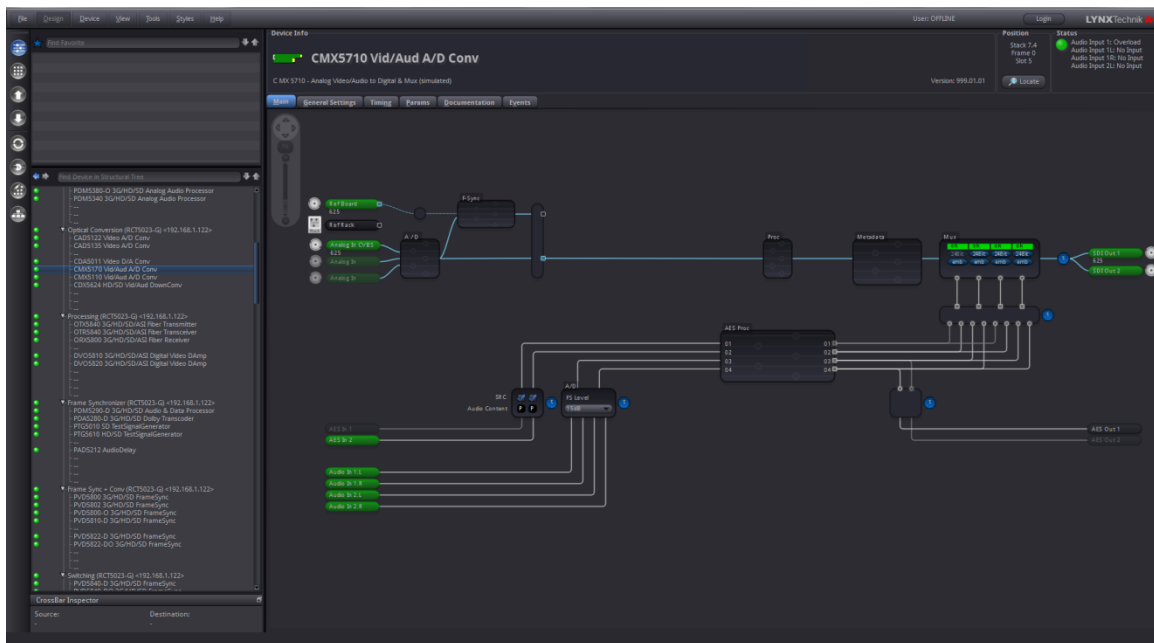


Figure 7: C MX 5710 in APPolo GUI

Figure 7 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 anyway). This function will be stopped automatically (timeout).

The “Error Log” at the bottom of the screen displays an individual time stamped 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.



## Overview

The MAIN Tab (Figure 8) 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.

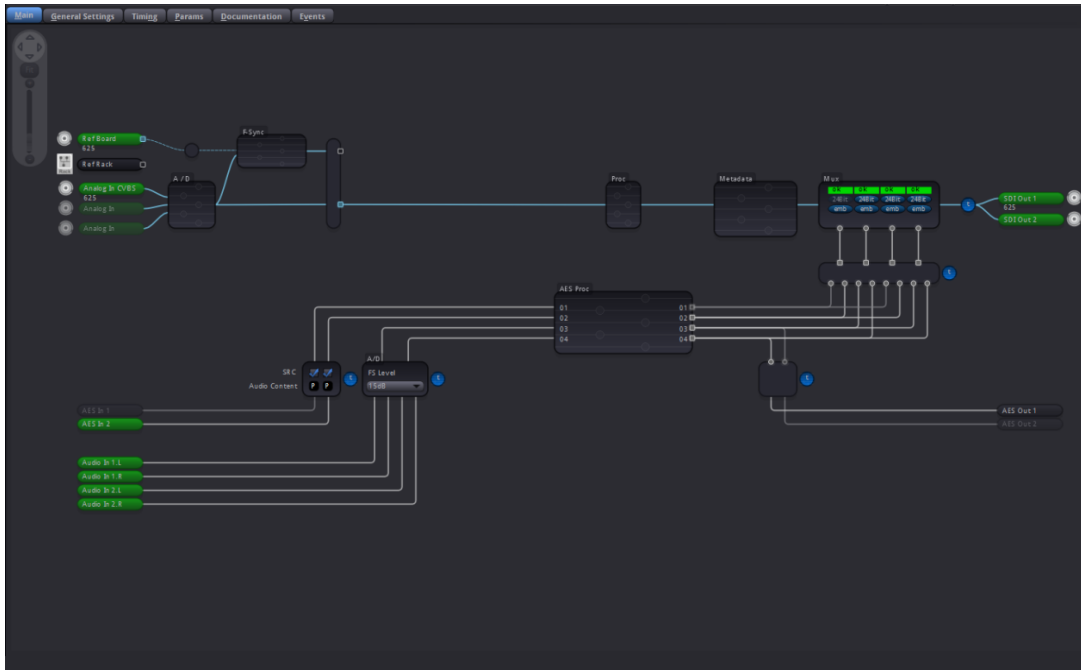


Figure 8: P VD 5840 MAIN Tab

### 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.

## A/D Converter Control

The A/D converter control is divided into three tabs:

- **Analog**  
Settings relevant for the analog video input (e.g. analog video input type selection, Chroma, Pedestal, Hue, etc.).
- **Digital**  
Settings for the digital video output (e.g. comb filter selection, luminance and chrominance gain, etc.).
- **Advanced**  
General advanced settings not specifically related to the analog input or digital output (e.g. VBI blanking, Color Transmission Improvement Control, etc.).



Figure 9: A/D Converter

## Frame Synchronizer

The C MX 5710 provides a frame synchronizer functionality which will synchronize the converted analog video input to an SDI output referenced to the connected reference input.

If the module is used as a straight forward A/D converter (i.e. the synchronization isn't required), the frame synchronizer can be bypassed (Figure 10: Frame Sync). Simply drag & drop the signal path on the output of the frame synchronizer block to the straight through path. When the frame sync is bypassed the module is set to minimum delay mode.

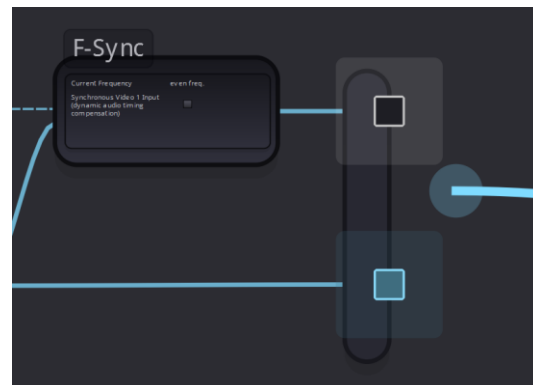


Figure 10: Frame Sync

## Reference Source Selection

The reference of the C MX 5710 for the frame sync functionality can either be connected to the rear connection panel or the reference input of the rack frame.

To determine from where the module receives the reference signal, simply drag and drop the line either to the “Ref Board” or “Ref Rack” input node of the flexGUI (Figure 11: Selecting Analog REF Source).

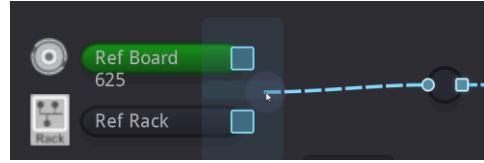


Figure 11: Selecting Analog REF Source

## Video Processing

Each SDI output has its own Video Processor. The following description applies to all of the SDI outputs equally (unless otherwise noted).



Figure 12: Video Output Processing

## Aperture Correction

Horizontal aperture correction is provided for each output channel, 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. Setting the Aperture Correction to “OFF” has the same effect as setting in the numerical value to zero.

## 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.

## Output if no input

This selection defines the behavior of the respective SDI output signal if no input signal is present on the connected input channel. Choices are:

- Off No image will be output.
- Test Pattern The selected test pattern will be shown.

## 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 can explicitly be switched ON (see below). This same pre-selected pattern will be used if the “Output if no Input” mode is set to “Test Pattern” (see above). The following patterns are provided:

- 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

The P VD 5840 can be used a standalone test. In this case, this setting can be used to select the exact video format that shall be generated from the SDI output. By default, the output standard will follow the last input standard. If this setting is modified from its default, it will fall back to the default setting as soon as a regular input standard is connected again.

Otherwise, the selection is limited to those video standards that use the exact same framerate as the reference signal, or half or double that frame rate.

## Test Pattern Enable

This checkbox simply switches on the pre-selected test Pattern. When activated, the whole processing box will appear in yellow background color.

## Video Adjustments

Four sliders are provided to allow for the adjustment of individual video parameters. Separate sliders are provided for

- Gain
- Saturation
- Black
- Hue

Double-clicking the slider handle sliders will reset the value to default setting.

## Audio Infrastructure

The module can receive up to two AES streams in addition to four analog audio channels. If required the AES inputs can individually set to work as outputs.

### AES 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 doesn't contain any data.

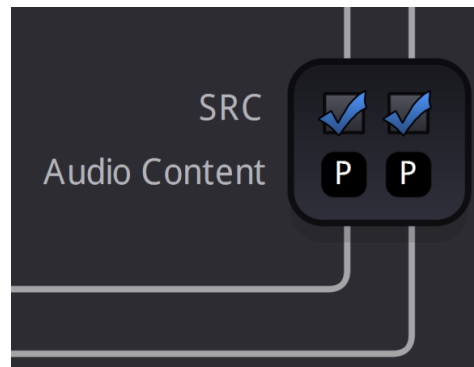


Figure 13: Content Detection and SRC

**NOTE:** Automatic Content Detection can be overwritten by manual decision (click onto the box with the letter 'P'). This is only recommended for testing purposes. It is strongly recommended to leave the Content Detection algorithm in "automatic" mode.

### Sample Rate Conversion

A Sample Rate Converter (SRC) is provided for each AES input stream. The SRC will re-sample the input to a 48kHz sampling rate as derived from the current REF source. 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 possible 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 48 kHz, but not genlocked to the REF connected to the module, then the use of the built-in SRC's is mandatory to achieve the correct sampling structure for the internal processing.

## AES Port Setup

The AES connections of the C MX 5710 can individually be configured either as inputs or outputs. By default, i.e. when delivered from the factory, both AES ports are set to be inputs.

This default port configuration can be modified at any time. To do this change to the “General Settings” tab of the module. Check the check box “Unlock AES Port Settings” and press “ok” on the pop-up window. This explicit un-locking of these configuration switches is required to prevent 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 33).

**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.

## Analog Audio Inputs

Four analog audio inputs are available on the C MX 5710. Internally the signals are converted to AES signals. In the converting stage the full scale level can be determined.

Available full scale levels are:

- 12dB
- 15dB
- 18dB
- 22dB
- 24dB

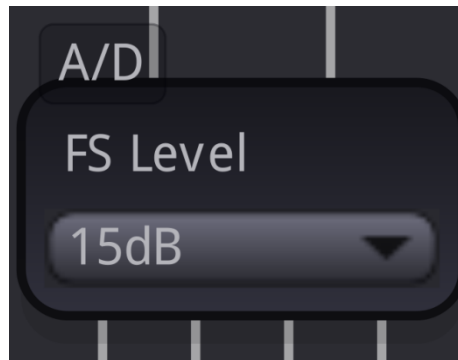


Figure 14: Full Scale Level

## Audio Processing

The AES 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 0xFFFF).

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 1 kHz 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 15: AES processing

## 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 outputs) can select from all of the available signals.

The APPolo Control software offers two different types of audio cross bar controls. The type of control can be determined in the “view” menu of the APPolo Control software.

## Matrix Control

With this control mode activated, hovering over the audio crossbars will show a checkered matrix field.

The switching principal is identical to a traditional matrix. Move the mouse pointer to the cross point where the desired input and output cross and press the left mouse button.

The switched cross points are indicated by a blue frame around the cross point

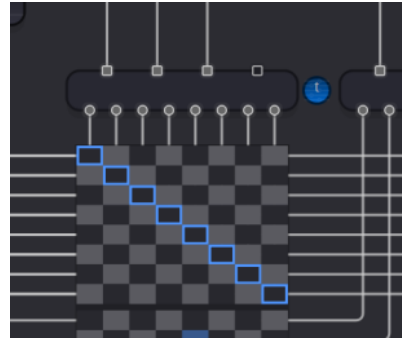


Figure 16: Audio Matrix

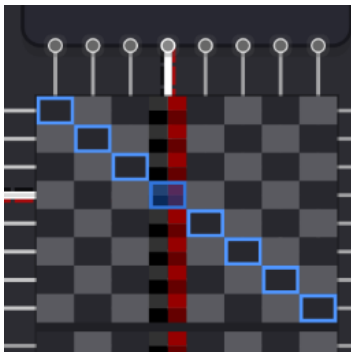


Figure 17: Mono Controls

To access the mono controls, right click on the desired cross point and select “Show Mono Controls”. The column of the selected cross point will then be shown with left and right selection cross points.

To exit the mono control simply move the mouse outside of the audio cross bar matrix.

## Drag & Drop

To have this switching mode activated, the entry “Audio Crossbar Matrix” needs to be de-selected.

An 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 18: Audio Crossbar Operation).

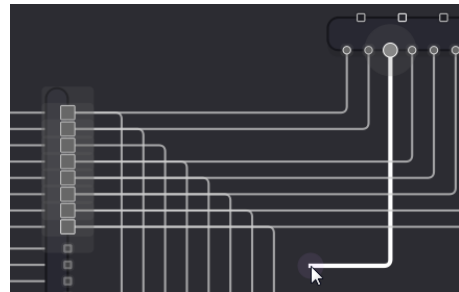


Figure 18: Audio Crossbar Operation

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 19: Audio Mono Crossbar).

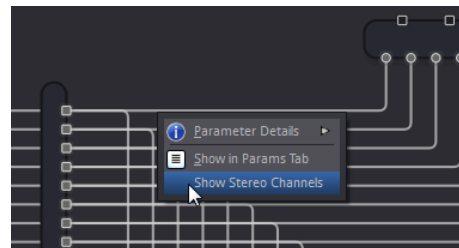


Figure 19: Audio Mono Crossbar



## Embedder

The SDI output of the C MX 5710 has an embedder stage which can be used to embed the external audio inputs into the SDI output.

The outputs of the AES processing stage are the sources for the embedder. Any one of these sources can be routed to any of the embedding channels.

To turn off any of the four group embedders, simply click the “emb” button just above the audio signal path going into the embedder stage.



Figure 20: Audio Embedder

Embedding audio into an HD-SDI output 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.

## Meta Data

The C MX 5710 can extract meta data from the video input which can be converted and inserted into the SDI output.

### Time Code

TimeCode meta data can be retrieved from the video input and converted to any of the below standards:

- ATC-LTC** Ancillary Time Code (SMPTE 291M 2008) carrying LTC codeword data.
- ATC-VITC** Ancillary Time Code (SMPTE 291M 2008) carrying VITC codeword data.
- DVITC** Digitized Vertical Interval Time Code (SMPTE 266M 2008)  
*DVITC is only supported in SD-SDI signals (525/625).*



Figure 21: Time Code Control

### Time Code input detection

DVITC will be detected if present in the incoming video signal. The detection of the Time Code is indicated with “present” on a green background. The insertion lines are also indicated. For DVITC two insertions per video signals are possible, normally the second insertion is a duplicate of the first one.

### DVITC Reader line selection

The reading line of the DVITC Reader can be specified. Only the specified input lines will be searched for DVITC data. The reading line can be set to “AUTO”. In this case, all possible lines will be searched for DVITC content. It can take a while until the correct line is identified.

### Time Code output insertion

Activating the respective checkboxes will insert the various transport packets into the output SDI stream.

## DVITC Inserter line selection

DVITC can be inserted in two different lines (Inserter A and B) of the output SDI signal with selectable line numbers of the vertical blanking. See table below for standard recommendations.

Table 4 – VITC Line select number (SDTV interfaces only)

(VITC line select number)					525/60		625/50	
					bit b5 = 0	bit b5 = 1	bit b5 = 0	bit b5 = 1
DBB2 bits b4 through b0					VITC on line N	Repeated VITC on line (N+2)	VITC on line N	Repeated VITC on line (N+2)
b4	b3	b2	b1	b0	field 1/field 2 <sup>3</sup>	field 1/field 2	field 1/field 2	field 1/field 2
0	0	1	1	0	—	—	6/319	8/321
0	0	1	1	1	—	—	7/320	9/322
0	1	0	0	0	—	—	8/321	10/323
0	1	0	0	1	—	—	9/322	11/324
0	1	0	1	0	10/273	12/275	10/323	12/325
0	1	0	1	1	11/274	13/276	11/324	13/326
0	1	1	0	0	12/275	14/277	12/325	14/327
0	1	1	0	1	13/276	15/278	13/326	15/328
0	1	1	1	0	14/277	16/279	14/327	16/329
0	1	1	1	1	15/278	17/280	15/328	17/330
1	0	0	0	0	16/279	18/281	16/329	18/331
1	0	0	0	1	17/280	19/282	17/330	19/332
1	0	0	1	0	18/281	20/283	18/331	20/333
1	0	0	1	1	19/282	—	19/332	21/334
1	0	1	0	0	20/283	—	20/333	22/335
1	0	1	0	1	—	—	21/334	—
1	0	1	1	0	—	—	22/335	—

## Format Description

A detected WSS signal on the input video can be reinserted into the SDI output or converted to AFD or VI.



Figure 22: Time Code Control

## Timing and Delays

The C MX 5710 provides a multitude of different timing options. Each audio input and output path can be delayed as well as the video output path.

### Video Timing Adjustments

By default, all video outputs deliver their SDI stream with a correct H/V alignment to the REF signal. A manual additional User Delay can be applied to each 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.

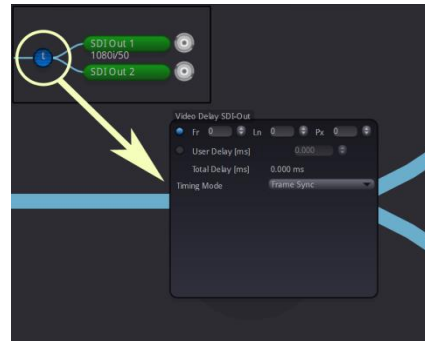


Figure 23: Video Output Delay

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).

**NOTE:** *The adjustable delay applied is in addition to the internal processing delay of the module.*

**NOTE:** *Adjusting the Video Output delay always delays embedded audio contents together with the video content. 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

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).

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.

## Timing Tab

The Timing Tab provides an overview of the video and audio delays in relation to each other. The displayed delays are displayed:

- Processing Delay
- Auto Compensation Delay
- User Delays
- Total Delay

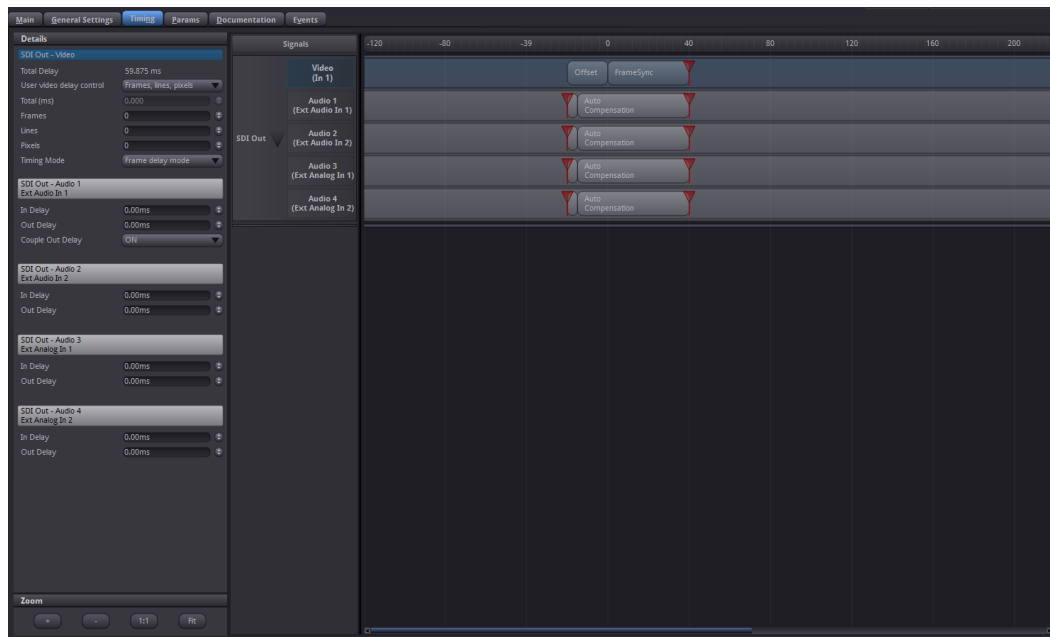


Figure 24: Timing Tab

In addition to providing a complete overview of the timing, the timing tab can be used to setup all timing related configurations.

## 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-Tab, 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.

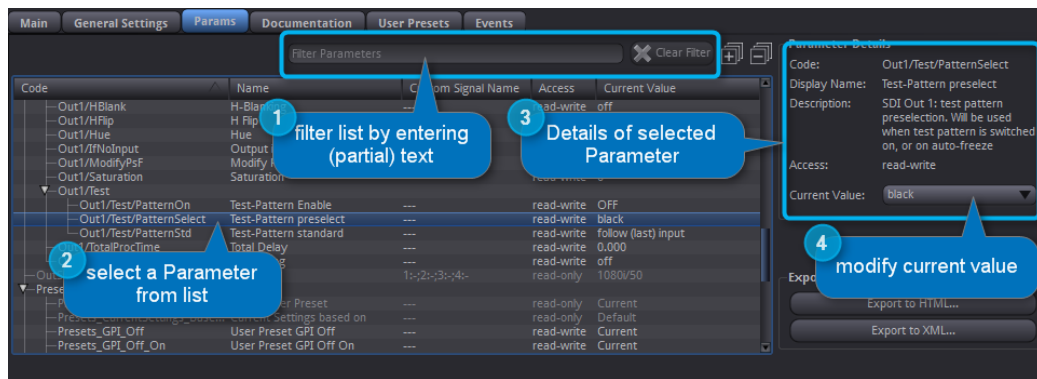


Figure 25: Param Tab

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 module 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.*

## Parameters control everything

As stated in the previous chapter, the complete behavior of any LYNX Device can be controlled and monitored with the parameters listed on the “Params” tab. All other parts of the LYNX APPolo Control System use exactly the same parameters access and control the devices.

- 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.

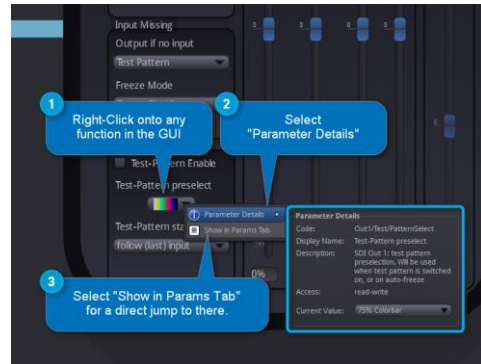


Figure 26: Parameter Details from GUI

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 26).

## 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:

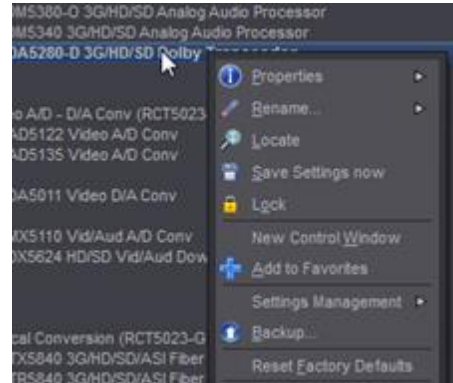


Figure 27: Device Menu from Tree

### Device Properties

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

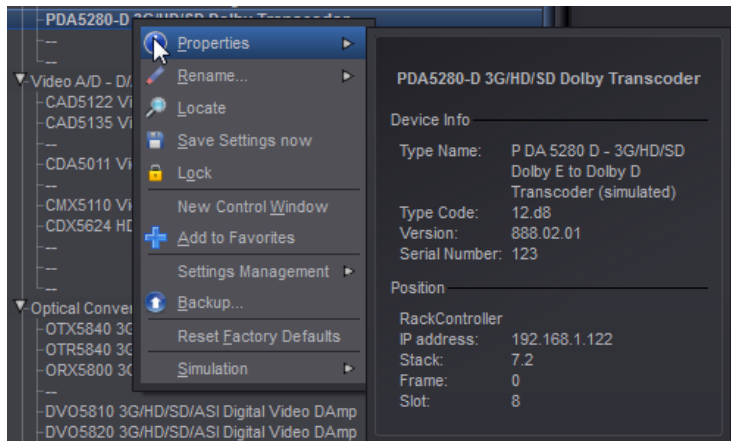


Figure 29: Device Properties Menu

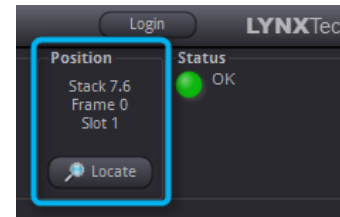


Figure 28: Locate Position

### 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 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).

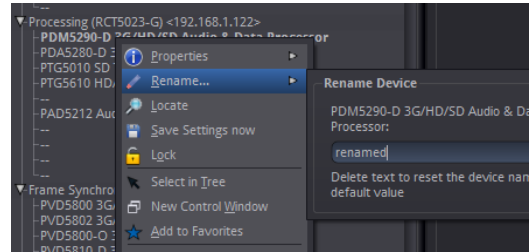


Figure 30: Rename Device

**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 adaptations 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

<b>Analog Video Inputs</b>	
Signal Type	- PAL (B/D/G/H/I/M) according to CCIR624 - NTSC (MN) according to SMPTE 170M - HD/SD analog components RGB, YUV - YC (S-VHS) 525 or 625
Input Coupling	AC differential
No. of Inputs	1 set (selectable)
Connector	75 Ohm BNC
Return Loss	> 35 dB to 5.5 MHz
<b>Supported Video Standards</b>	
SDTV	525/59.94Hz, 625/50Hz
HDTV (1.5Gbit)	720p 60/ 59.94 / 50 Hz 1080i 60/ 59.94 / 50 Hz
<b>Analog Audio Inputs</b>	
Signal Type	Balanced analog audio
No. of Inputs	4 (2 stereo pairs)
Connector	25 pin SubD female connector
Input Impedance	>10k Ohms
Max Input Level	24 dBu
0dB Full Scale Range	(Selectable) 12,15,18,20,22 and 24 dBu
<b>AES Audio I/O</b>	
Signal Type	Balanced AES3
Input / Output Coupling	Transformer isolated
No. of Inputs	4 channels on 2x AES channels configured as input or output
Output Level	4V peak to peak nominal
Connector	25 pin SubD female connector
<b>Reference Input</b>	
Signal Type	Analog bi-level (SDTV) or tri-level (HDTV) Auto-detect and cross lock compatible
Connector	75 Ohm BNC
Return Loss	> 35dB to 5.5 MHz
Reference Source	External reference or common rack reference (selectable)
<b>Video Outputs</b>	
No. of Outputs	2
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C
Output Format	Follows input format
Connector	75 Ohm BNC
Return Loss	> 15dB (270MHz)
Timing Jitter	< 0.2 UI @ 270Mbit/s, < 1.0 UI @ 1.5Gbit/s
Alignment Jitter	< 0.2 UI @ 270Mbit/s, < 0.2 UI @ 1.5Gbit/s
<b>Audio Processing</b>	
Processing Functions	8 channels adjustable gain, phase, invert, mute, sum plus overload and silence detection.
Crossbars	- 8 x 4 channel (mono) output select crossbar - 8 x 16 channel (mono) embedder select crossbar
Sample Rate Converters	48 kHz – one per AES input, selectable ON/OFF

<b>Video and Audio Delay</b>	
Automatic	Automatic AV timing compensation
Video Output Delay	Up to 62 frames manually adjustable in frame / lines / pixel or milliseconds increments
Audio Delay	Up to 1.3s (1300ms) total. Adjustable for each incoming and out-going audio. Note: These adjustments are offsets to the automatic processing compensation.
Adjustment Offsets	Manual delay adjustments are offset to the automatic processing compensation.

<b>Performance</b>	
Cable Equalization	- Cable Equalization 270Mbit: Up to 250m (820ft) using Belden 8281 - Cable Equalization 1.485Gbit: Up to 140m (459ft) using Belden 1694A
<b>Electrical Specifications</b>	
Operating Voltage	12 VDC
Power Consumption	< 12 W
Safety	IEC 60950/ EN 60950/ VDE 0805
<b>Mechanical</b>	
Size	283mm x 78mm
Weight	CardModule 120g (4.2oz), connector plate 80g (1.8oz)
<b>Ambient</b>	
Temperature	5°C to 40°C (41°F to 104°F) 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.

### 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:

<http://support.lynx-technik.com/support/home>

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.

<b>Address</b>	LYNX Technik AG Brunnenweg 3 D-64331 Weiterstadt Germany
<b>Website</b>	<a href="http://www.lynx-technik.com">www.lynx-technik.com</a>
<b>E-Mail</b>	<a href="mailto:info@lynx-technik.com">info@lynx-technik.com</a>

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