LYNXTechnik AG

Broadcast Television Equipment

Reference Manual

D VD 5602

Dual HD > SD Digital Down Converter

Revision 2.0
November 2009

This Manual Supports Device Revisions:	
D VD 5602 Firmware Revision	334
Control System GUI Release	4.6.6

LYNX
TECHNIK AG

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Contents

Warranty

LYNX Technik AG warrants that the product will be free from defects in materials and workmanship for a period of two (2) year 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 RESPONISIBILITY 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
Declare under our sole responsibility that the product

        TYPE: **D VD 5602**

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   /2001
Following the provisions of 89/336/EEC and 73/23/EEC directives.

                          Winfried Deckelmann

Weiterstadt, November 2009

 Place and date of issue   *Legal Signature*

USA

FCC 47 Part 15

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

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

Getting Started

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

Packaging

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

ESD Warning

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

Preventing ESD Damage

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

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

Caution

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

Product Description

The D VD 5602 is a dual channel high quality digital down converters providing down converted digital SDI video outputs with transparent pass through of all embedded audio.

Note: *Due to the new flexible design of the output matrix implemented in the D VD 5602, the D VD 5604 was discontinued*

Input Formats

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

> *Note. Both inputs must be at the same frame rate as a single genlock stage is shared.*

SDTV Formats	HDTV Formats
525 / 59.94Hz	1080i / 59.94Hz
625 / 50Hz	1080i / 60Hz
	1080i / 50Hz
	720P / 59.94Hz
	720P / 60Hz
	720P / 50Hz

Output Formats

The Module provides multiple digital (SDI) outputs in 525/59.94Hz or 625/50Hz output formats.

The D VD 5602 allows for user mapping of the outputs (in four groups of 2 outputs). The outputs can be mapped to either of the input signals or either of the down converted outputs. Please refer to the functional diagrams.

Conversion Modes

HDTV Inputs > Down Conversion

With a compatible HD source connected the module only supports down conversion between divisible frame rates. For example if a frame rate of 59.94Hz is connected to the input then the module can only output a down converted 59.94Hz output. This module will not function as standards converter.

Please refer to the table below which shows compatible conversion modes

Input Signal	Converted Output	Notes
1080i / 50Hz	625 / 50Hz	
1080i / 59.94Hz	525 / 59.94Hz	
1080i / 60Hz	525 / 59.94Hz	59.94Hz output will drop frame
720P / 50Hz	625 / 50Hz	
720P / 59.94Hz	525 / 59.94Hz	
720P / 60Hz	525 / 59.94Hz	59.94Hz output will drop frame

> *Note. It is possible to convert between 60Hz and 59.94Hz. The resulting cumulative error will result in dropped frames on the converted outputs.*

SDTV Inputs

When a SDTV input is detected the module functions as a distribution amplifier providing digital outputs of the connected SDTV input signal.

Aspect Ratios

The module supports three aspect ratio conversion modes which can be user selected using the integrated display or preset with the optional control system.

Letterbox

This takes the 16:9 aspect ratio of the input HD signal and fits it into the 4:3 SD aspect ratio screen with black bars at the top and bottom of the image.

Center Cut

This mode cuts the center portion of the 16:9 input signal and fills the 4:3 SD aspect ratio screen.

Stretch to Fill

This mode takes the 16:9 input signal and distorts (vertically stretches) the image to fit the available 4:3 SD aspect ratio space.

16:9 HDTV Source

4:3 Center Cut

4:3 Letterbox

4:3 Stretch to fill

Video Processing

Aperture Correction

Adjustable horizontal aperture correction is provided for each output. (The down conversion filtering process results in a slight roll off in frequency response). The aperture corrector is factory preset for a flat response but can be user set using the local display or control system. Positive and negative aperture adjustments are possible so the resulting image can be made more or less "sharper" than the factory default.

Color Space Conversion

To ensure the SDTV outputs are legal the module has automatic color space conversion which will convert the wider HDTV 709 color space into the more narrow SDTV 601 color space. This will prevent the possibility of illegal colors in SDTV.

The conversion can be bypassed (if required) providing a transparent pass through of the input color space or the mode can be changed to only convert the chrominance portion of the signal.

> *Note. All module settings are automatically stored in internal flash ram and will survive power cycles and long term storage.*

Audio Processing

The module provides full audio support and will de-embed the complete audio payload (8xAES) from each incoming SDI signal.

All audio is delayed to match the video processing delay (fixed at 1 frame) and then re-embedded into the digital down converted outputs.

DolbyE

If the incoming SDI signal has an encoded DolbyE stream this will be de-embedded, delayed one frame and re-embedded into the same channels on the down converted SDI outputs. DolbyE is not decoded or processed. The transport stream is passed transparently from input to output.

> *Note. Providing the Dolby "Guard Band" was timed correctly on the input then the SDI outputs will have the correct DolbyE audio timing and guard band timing will be preserved.*

Test Patterns

The module contains a selection of video test patterns which can be used for testing and fault finding. Each channel has its own independent Test Patterns.

The Patterns provided are 75% Colorbars, 75% Colorbars over Red, Full Field Black, Pathological PLL/EQ and Full field Blue (blue screen). All outputs have test patterns present when selected (SD and HD)

By pre-selecting the input format (with no input connected) the Module can be used as a stand alone multi-format Test Pattern Generator.

Functional Diagram
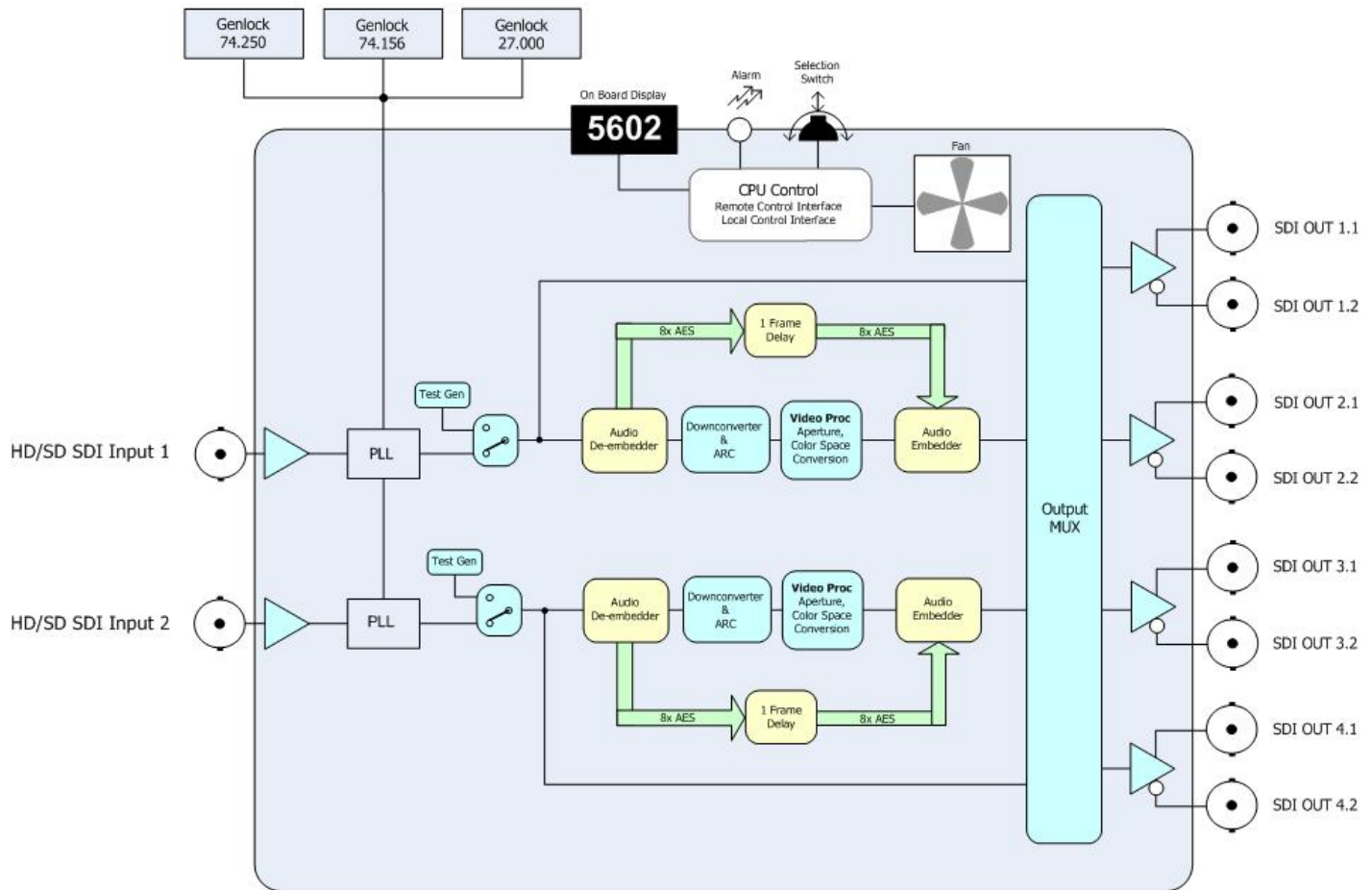
Module Layout
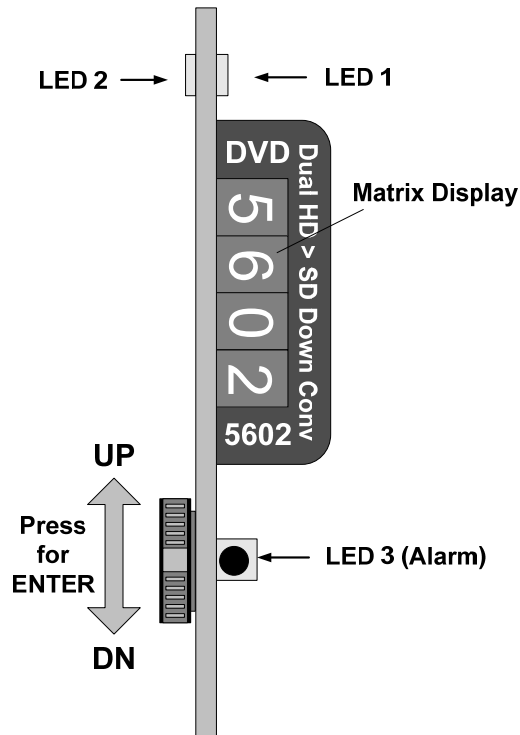
Module Front Panel

Module Rear Termination Panel

CardModule Layout

Note. *Cooling fan operation is monitored and alarmed when using the LYNX control system*

Connections

Video

The D VD 5602 uses standard 75 Ohm BNC connectors. We recommend the use of high quality video cable for digital video connections to reduce the risk of errors due to excessive cable attenuation. Max cable lengths the module will support are shown below.

SDTV = 250m Belden 8281 (270Mbits/s)
HDTV = 140m Belden 1694A (1.4Gbits/s)

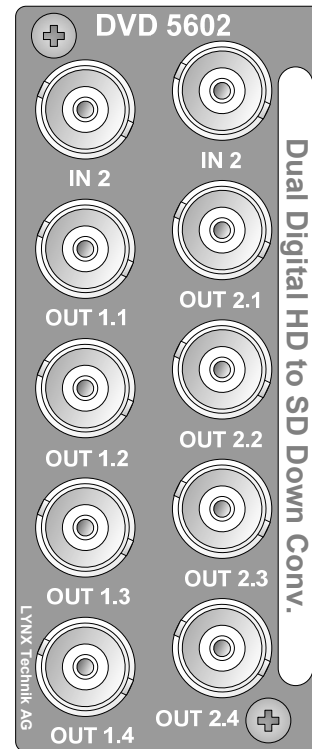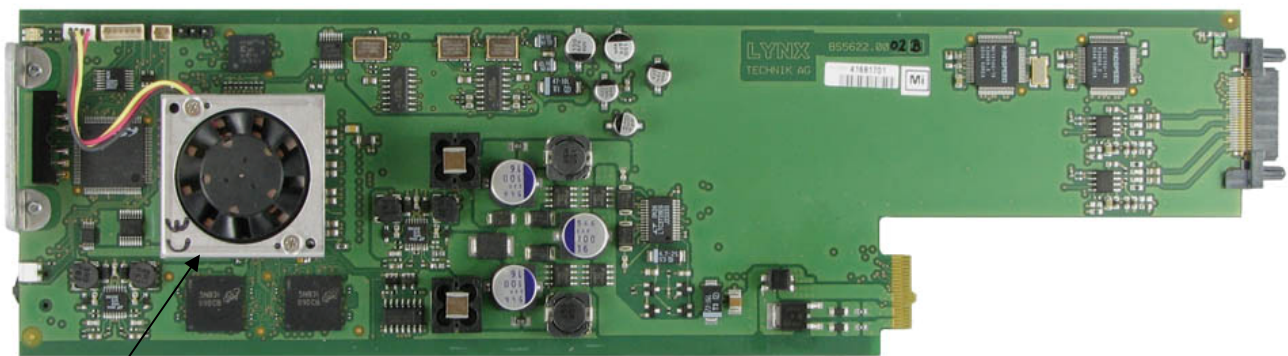> *Note. Due to the compact design of the connection plate it will be necessary to use a connection tool to secure the BNC video connectors.*

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 5.

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

1. Select a slot in the card frame where the CardModule will be located.

2. Remove the blank connection panel 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.

Settings and Control

The D VD 5602 module has an integrated micro-controller, which enables the module to be configured and controlled locally using the multifunction switch and 4 character dot matrix display (or from remote using a GUI interface 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 last used settings.
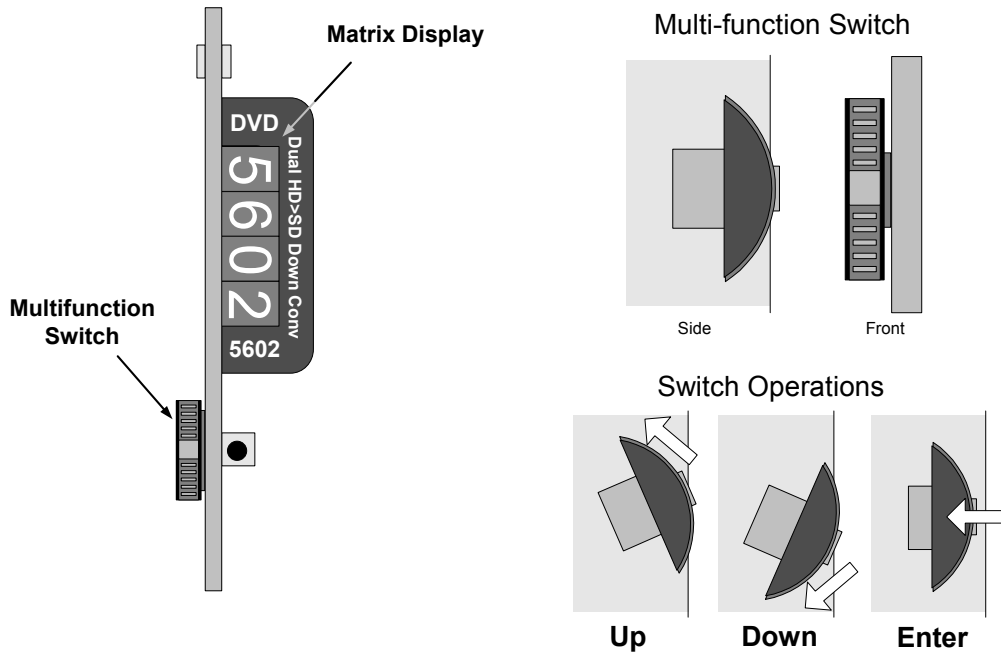
Multi Function Switch

The CardModule is equipped with a multi-function switch located on the front bottom edge of the card. (See above)

Using the Local Display Menus

Making local adjustments to the module is done using the multifunction switch and the integrated 4-character dot matrix display. The menu system is layered, and navigation through the system is done using the **UP** and **DOWN** functions of the switch. **ENTER** is used to move between menu levels and also enter a selection.

Switch Function	Operation
UP	Move UP within a level
DOWN	Move down within a level
ENTER	Change levels / Make selection

Menu Structure

The Menu structure is defined in the next table, and should be used when navigating through the system.

ENTER moves between levels
UP/DOWN moves between items within the level
When you enter a new setting the system will jump back one level in the menu system.

- The "back" selection in the menu structure will take you back one level when selected.

- When an item is selected which has several setting possibilities the first value displayed will be the value currently stored in the system. The order of the available settings for any menu item in the table supplied does not represent the order the settings will actually be displayed.

- If left unattended, the menu will default to the root display after a preset timeout.

Level 1	Level 2	Level 3	Level4	Level 5	Comment
5602					Root Display
	REF				Reference Source Select
		IN1			use IN1 as reference
		IN2			use IN2 as reference
		IN12			use IN1 (preferred) or IN2 as reference
		IN21			use IN2 (preferred)o r IN1 as reference
		back			
	IN1/2				
		TEST			
			AUTO		Auto Test Pattern Select
				OFF	(Transparent)
				BLK	Full Field Black
				PLL	Phase Lock Loop
				BAR	Full field Colorbars
				BRED	Colorbars and Red
				BLUE	Full Field Blue
				back	
			SEL		Select Test Pattern
				OFF	
				BLK	Full Field Black
				PLL	Phase Lock Loop
				BAR	Full field Colorbars
				BRED	Colorbars and Red
				BLUE	Full Field Blue
				back	

			STD		Test Pattern Standard
				LAST	Last Connected Standard
				525	525 / 59.94Hz
				625	625 / 50Hz
				720p 60	720P / 59.94Hz
				720p 50	720 P / 60 Hz
				1080i 60	1080i / 59.94 Hz
				1080i 50	1080i / 50 Hz
				back	
			back		
			DNCV		Down Conversion Mode
				LBOX	Letterbox
				FILL	Stretch to Fill
				CCUT	Center Cut
				back	
			CSCV		Color Space Conversion
				OFF	No Conversion
				ON	709>601 Conv
				LUMA off	Only convert Chroma
				back	
			APERT		Aperture Correction
				OFF	OFF
				ON	ON
				-128…128	Enter Level
				back	
			back		
	OUT1/2/3/4				
			SD1		Downconverted input 1
			IN1		Input 1
			SD2		Downconverted input 2
			IN2		Input 2
			back		
	RSET				Factory Reset
			NO		
			YES		
	back				

LED Status Indicators

The D VD 5602 module has LED indicators that serve as alarm and status indication for the module. Function is described below.
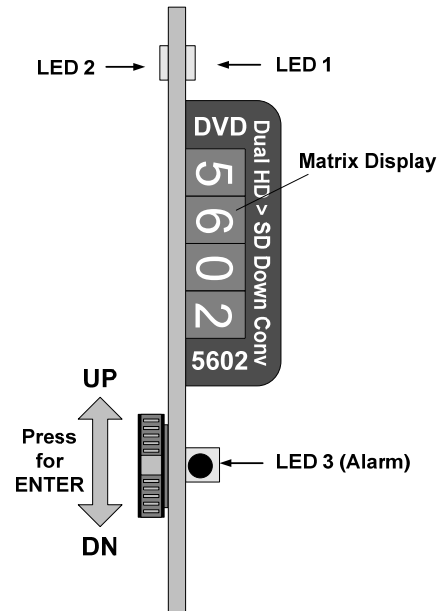
Status LED 1

LED Color	Indication
Green	Input 1 SDI Present
Red	Input Missing

Status LED 2

LED Color	Indication
Green	Input 2 SDI Present
Red	Input Missing

Alarm LED 3

| LED Color	Indication
Green	Both inputs OK
Yellow	One input Missing
Red	Both inputs Missing

Control System GUI

When using the module in a system with the optional LYNX control system all module settings are available on an intuitive Windows GUI interface.

Any settings made using the control system will override any settings made locally. All settings are stored automatically in the module flash RAM.
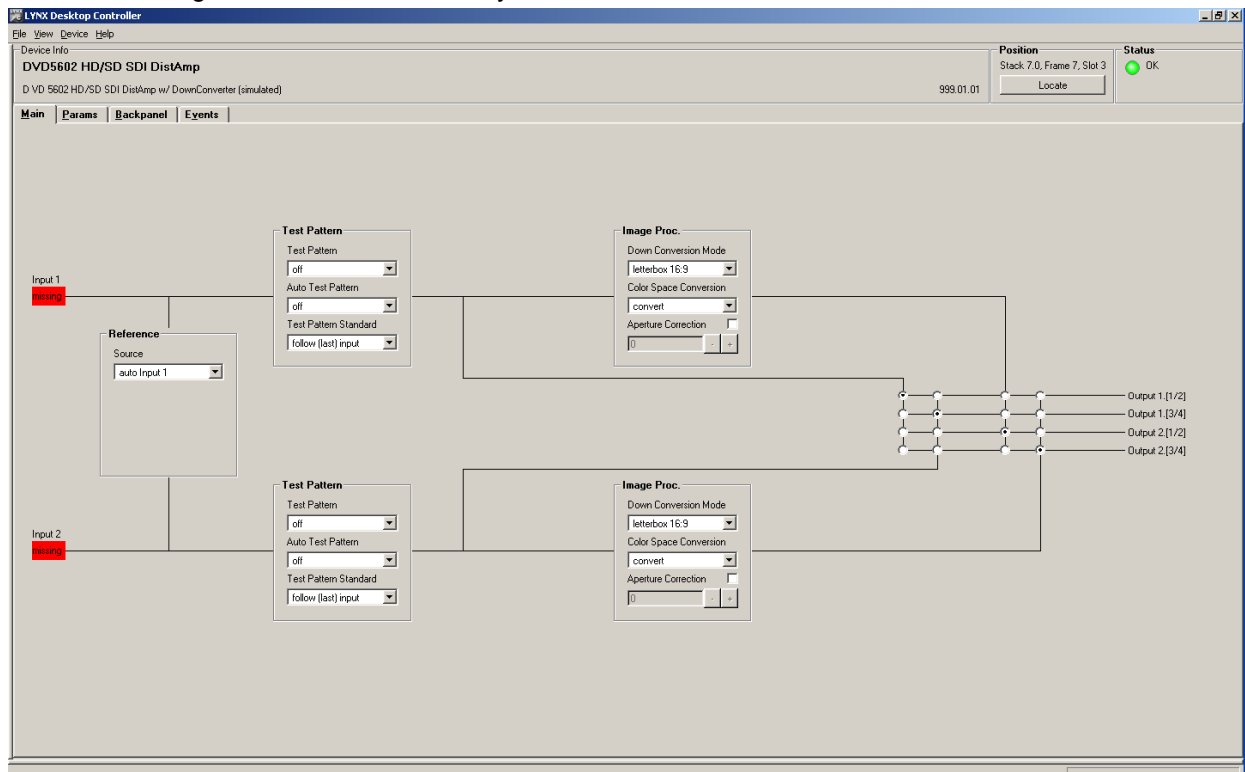
The layout of the GUI represents the signal flow through the two channels. Each function is described briefly below.

Input detection

Input standard detection is automatic and the module will detect and display the connected standard and operate in this mode.

Reference

The reference section is to pre-select the preference for the reference signal the module will use which is derived from the input source(s). Selections provided are:

- Input 1
- Input 2
- IN1 (preferred) or IN2
- IN2 (preferred) or IN1

Note: *Only 1 reference can be selected, i.e. the second input has to be in sync with the other one, which is selected as reference*

Test Pattern Selection

There are two modes for the test patterns.

Test Pattern	This selection is used to force a test pattern to the output of the module regardless of the input signal condition.
Auto Test Pattern	This is the pattern which will be used if the input signal is removed
Test Pattern Standard	Module always remembers the last video standard and it will default to this mode. This setting can be used to overwrite the last stored standard. This setting is only enabled if there no input connected.

Test Patterns Selections are:

- OFF
- Full Field Black
- Full Field 75% Colorbars
- Full Field 75% Colorbars over Red
- PLL / EQ Test
- Full Field Blue

Test Pattern Standard

This setting is used to configure the video standard the test pattern generator should use. This is typically the same as the connected standard but if using the converter with no input source its possible to force the unit into a given standard for use as a test pattern generator. Possible settings are:

- Follow last input
- 525 / 59.94 Hz
- 625 / 50Hz
- 1080i / 59.94 Hz
- 1080i / 60Hz
- 1080i / 50 Hz

- 720P / 59.94 Hz
- 720P/ 60Hz
- 720 P / 50 Hz

Down Conversion (image proc)

This area is used to specify video formatting for the output. Selections include "Letterbox", "Center Cut" and "Stretch to Fill"

Color Space Conversion

This is where the color space conversion mode is selected. The selections allow for 709 to 601 color space conversion, bypass (no conversion) or Chroma only conversion (Luminance channel is bypassed)

Aperture Correction

Use the checkbox to turn aperture correction ON, this will enable the setting of the amount of aperture correction using the + and – buttons. Settings between -128 and + 128 are possible allowing the images to be softened or sharpened

Output Selections
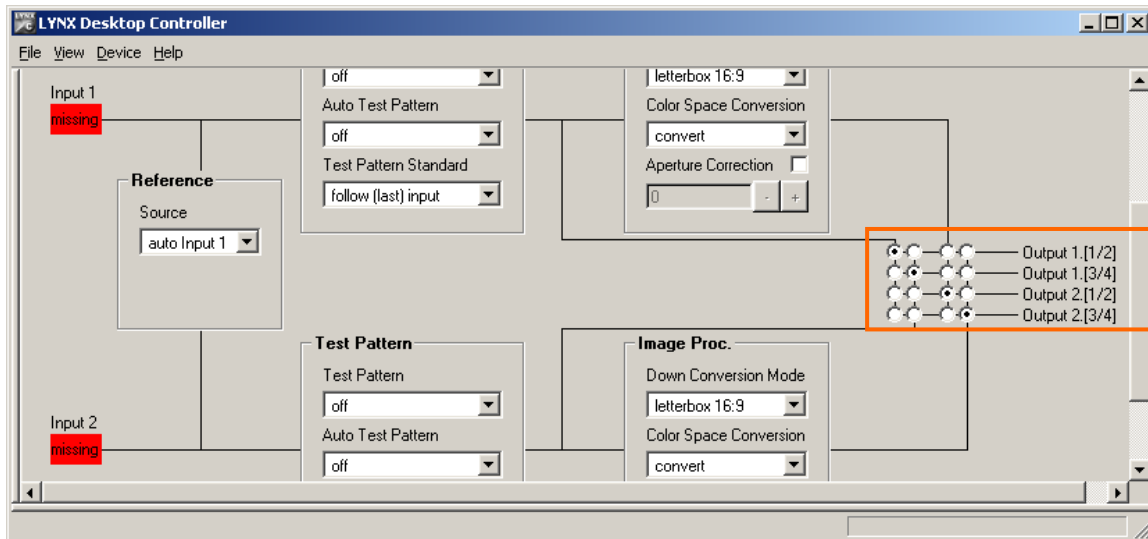
Each of the 4 outputs is fed into output buffers which provide two copies of each. This allows the module to be configured in a variety of ways for various applications.

Audio De-embedding and Embedding

The AES groups (8 x AES) are de-embedded from each input, it is then processed through a fixed delay (1 Frame) to maintain timing with the down converted video and then re-embedded into the SDTV outputs.

The re-clocked inputs pass all embedded audio transparently.

Specifications

Video Inputs	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C
Input standards	SDTV: 525 59.94Hz / 625 50Hz HDTV: 1080i 59.94Hz / 1080i 60Hz / 1080i 50Hz / 720P 59.94Hz / 720P 60Hz / 720P 50Hz (Field upgradeable for additional format support)
No. of inputs	2 (one for each channel)
Connector	BNC
Impedance	75 Ohm
Cable Equalization	Up to 250m Belden 8281 (270MHz) Up to 140m Belden 1694A (1.485GHz)
Return Loss	> 15 dB (270MHz) > 10dB (1.485GHz)

Digital Video Outputs	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C
Output standards	1080i 59.94Hz / 1080i 60Hz / 1080i 50Hz / 720P 59.94Hz / 720P 60Hz / 720P 50Hz / 525 59.94Hz / 625 50Hz.
No. of outputs	8 (4 outputs in pairs of 2)
Connector	BNC
Impedance	75 Ohms
Jitter	< 0.2 UI (270MHz) < 0.25 UI (1.485GHz)
Return Loss	> 15 dB (1.5GHz)

Audio Support	
Input	De-embed 4 audio groups (8xAES) from each input channel
Audio Proc	Fixed audio delay (1 frame) to maintain timing with processed video output
Output	4 audio groups (8xAES) re-embedded into SDTV SDI outputs in down converter mode. All embedded audio passed transparently when used as a HD distribution amplifier.

Conversion Modes	
Aspect ratio	4:3 SD output
Reproduction modes	Letterbox (bars at top and bottom of image) Center Cut - fixed center extraction of 16:9 input Stretch to fill - image is distorted to fill 4:3 aspect
Cross conversion	Input to output must be divisible frame frequency

Control	
Local Controls	Local alphanumeric display with integrated menu system for setting module parameters
Remote Control	Comprehensive remote control and status monitoring supported when used with a LYNX Controller option

Electrical Specifications	
Voltage	12 VDC
Power	10 W

Safety	IEC 60950/ EN 60950/ VDE 0805
Mechanical	
Size	283mm x 78mm
Weight	CardModule 150g, connector plate 70g
Ambient	
Temperature	5°C to 40°C Maintaining specifications
Humidity	90% Max non condensing

Service

Parts List

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

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

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

Technical Support

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

Technical support is also available from our website.

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

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

www.lynx-technik.com

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.