LYNXTechnik AG
Broadcast Television Equipment

Reference Manual

P DL 5600

Dual Channel SD/HD Multi-rate Video Delay Line

Revision 1.1 - October 2008

This Manual Supports Device Revisions:	
P DL 5600 Firmware Revision	278
Control System GUI Release	4.4.0

LYNX
TECHNIK AG

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: **P DL 5600**

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, October 2008

Place and date of issue   *Legal Signature*

USA

FCC 47 Part 15

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

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

Getting Started

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

Packaging

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

ESD Warning

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

Preventing ESD Damage

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

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

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

Product Description

The P DL 5600 is a high performance dual channel SD/HD video delay line with an user adjustable delay of up to 12 frames max. per channel in increments of one pixel. The second input is optional.

Firmware options provide the ability to easily add additional options which includes:

- Second Input *(option code OC-5600-SCND)*
- Stored module presets with GPI recall *(option code OC-5600-USET)*

Firmware options can be added at any time with a license code. No hardware or Firmware modifications are required.

Input Video Formats

The module has two multi-format serial digital inputs (second input is optional) 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 / 59.94Hz
625 / 50Hz	1080i / 60Hz
	1080i / 50Hz
	720P / 59.94Hz
	720P / 60Hz
	720P / 50Hz

Note. Both input signals should be the same input format as the reference for normal operation is input 1.

Output Video

The module provides two SDI outputs, which can be mapped independently to any of the two input channels (second input is optional). The first output is a dual output.

Video Processing

Proc Amp Functions

Each of the two output channels (second input is optional) has an associated video proc amp which provides user adjustable *Gain* / *Saturation* / *Black Level*/ *Hue* and horizontal **Aperture Correction** using on screen sliders.

Aperture Correction

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

Test Patterns

Each of the two output channels has its own independent test pattern generator which provides a wide selection of test patterns which can be switched into each output. *(The Test pattern will follow the selected output standard selected for each channel).*

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

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

Programmable Video Delay

Each of the two SDI outputs (second input optional) has separate programmable video delays which can be set (independently) between 0 and 12 frames (max). The adjustment is available in pixel, line and full frame increments.

> **Note** *The Video Delay Line has a fixed processing delay of 0.5 lines. The 0 > 12 frame user adjustment is additional delay relative to the fixed delays.*

Fixed Delays

The video delay line has fixed delays depending on the video format - see below :

Format	Delay[us]
525	7.5
625	7.7
1080i50	5.5
1080i59.94	2.6
720p50	5.5
720p59,94	3.3

GPI Function

The GPI input (**G**eneral **P**urpose **I**nput) which is a switch input function (contact closure) can be used to perform a number of functions. The influence of this input can be set by the user using the control system on the Video Proc Tab.
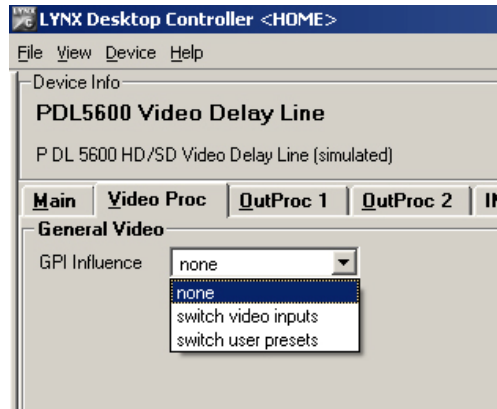
Switch Inputs (Option Second Input required)

With the GPI "Switch Video Inputs" mode selected the internal video cross bar is not accessible through the control system anymore.

With the GPI contact open output 1 is switched to Input 1, output 2 to input 2, with GPI contact closed output 1 to Input 2 and output 2 to input 1.
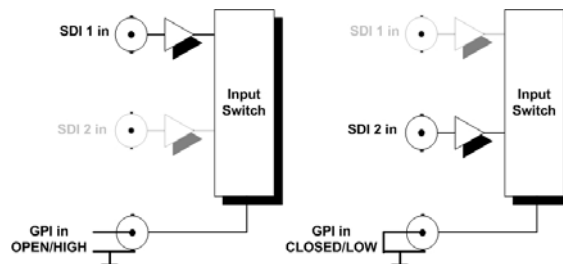
GPI Options

The GPI functionality can be enhanced with the addition of the OC-5660-USET firmware option. This allows to store 4 complete sets of module settings (snapshots) in module flash ram. The GPI can then be configured to toggle between any 2 of the 4 stored presets if required.

Functional Diagram

A functional diagram of the P DL 5600 is shown below
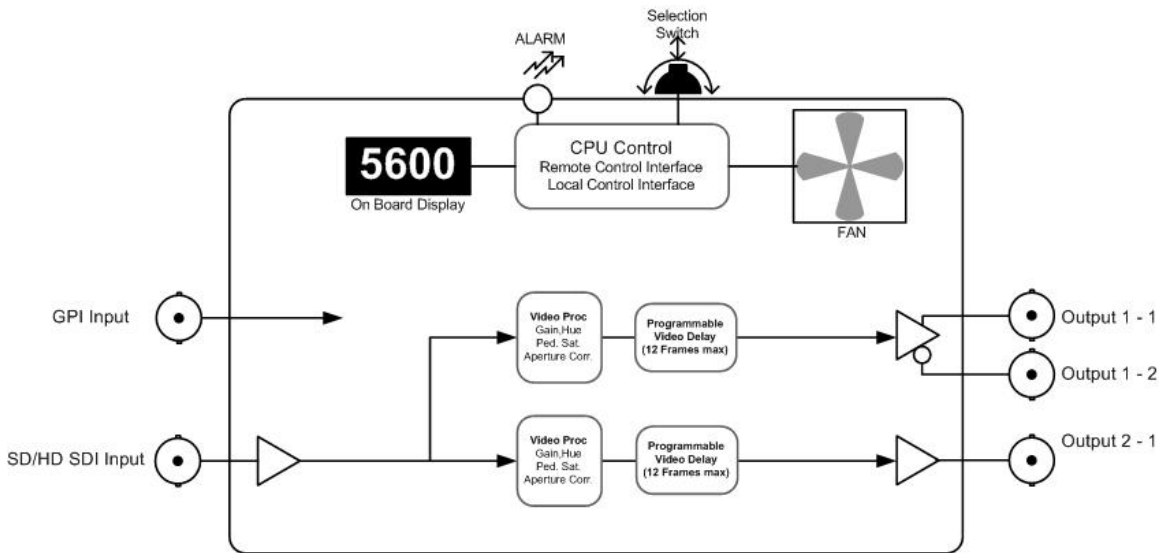
Module Layout
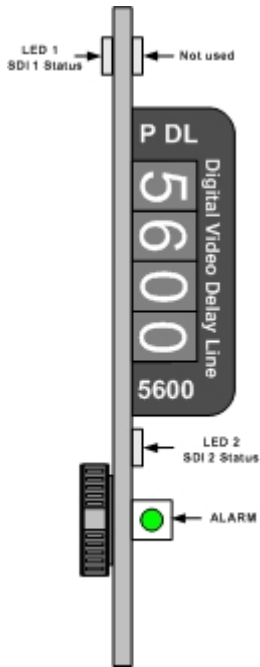
Module Front Panel
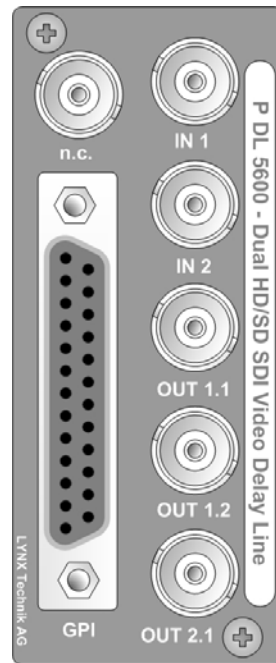
Module Rear Termination Panel
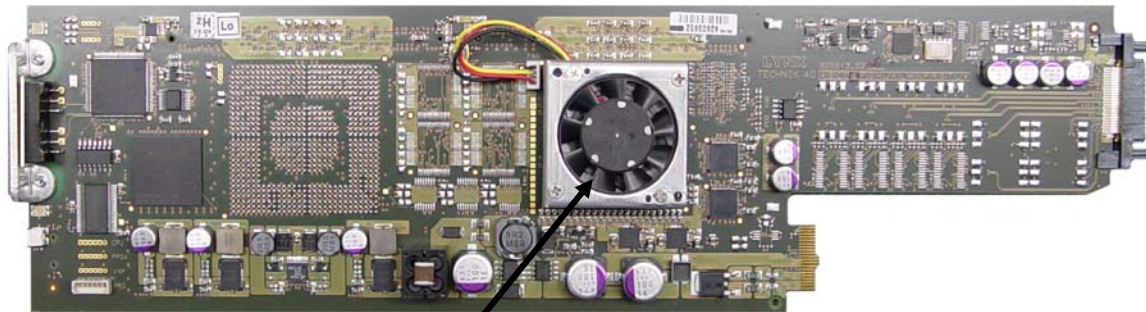
Cooling Fan

Note. Cooling fan operation is monitored and alarmed with the module alarm LED and also within the LYNX control system.

Connections

Video

The P DL 5660 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.

This module has a double width rear connection panel, meaning it will occupy two slots of a standard Series 5000 Card Rack. This is to accommodate the additional connections needed for this module and to also provide adequate space for cooling in the rack. Up to 10 x P DL 5600 modules can be accommodated in a single Series 5000 rack frame.

NOTE. *When using this module we highly recommend the use of the* **R FR 5011 Fan Front Rack Frame** *which provides additional airflow into the rack. If you plan to install this module into empty slots in an existing rack with no fan front cover - then please purchase the* **R FR 5001 Fan Front update kit.**

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 high 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)*

NOTE. *The use of the optional control system is* **recommended** *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 rack with the LYNX control system.*

Firmware Options

The basic module is a single channel video delay line. With the addition of the following firmware options the performance and features of the module can be enhanced and tailored to meet a specific application.

> **Note.** *Firmware options can be added at any time by simply purchasing and installing a license code string. No hardware or firmware modifications are needed.*

For information on how to install a licensed option please refer to the GUI section of this manual.

Second Input Option (OC-5600-SCND)

The addition of this option will enable the second input and provide a second channel of video delay.

It is possible to switch between the two inputs, which can be configured to trigger via GPI input or can be switched via the control system.

> **Note:** *Both inputs are referenced to input 1 in normal operation*

User Setting with GPI Control (OC-5600-USET)

This module has a wide variety of user settings and configuration possibilities. The module automatically retains the last used settings in flash ram which will survive power cycles. The addition of the OC-5600-USET firmware option allows the user to store 4 individual sets of module settings (snapshots) into module flash ram. These can then be recalled using the control system to quickly re-purpose the modules settings. The GPI can also be configured to toggle between any 2 of the 4 stored presets if required.

Settings and Control

The P DL 5600 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.

!   **NOTE.** *This module is extremely compact and flexible with hundreds of possible user settings. It is not practical to make all these settings available on the local dot matrix display. The use of the control system is **recommended** to access the vast array of settings possible. Please refer to the GUI section of this manual for details on the control provided. Some basic module settings are possible via the local controls, which are detailed below.*

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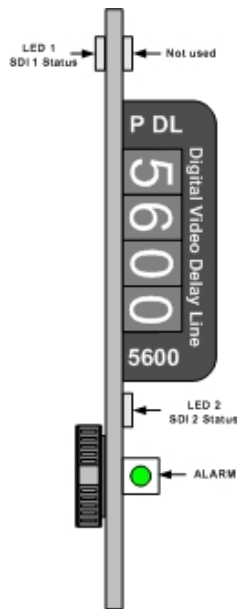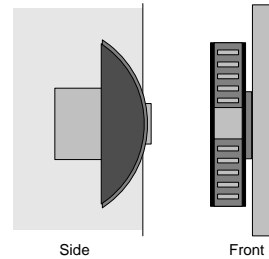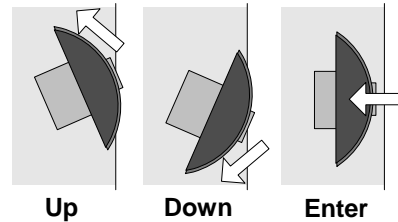
Multi Function Switch

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 can be used to help navigating through the menu system.

ENTER moves between levels

UP/DOWN moves between items within the level

When a new setting is entered 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 short timeout.

Level 1	Level 2	Level 3	Level 4	Level 5	Description
PDL 5600					Root Display
	OUT1/2				Output Select
		INPT			Input to output select
			In 1		Input 1
			In 2		Input 2
			back		
		DEL			Delay adjustment
			FRAM		Frame Delay
				0000	
			LINE		Line Delay
				00000	
			PIX		Pixel Delay
				0000	
			back		
		APRT			Aperture Correction
			ENAB		Enable
				ON	
				OFF	
				back	
			LEVL		Level
				+/- xyz	
			back		
		TEST			Testpattern Settings
			ENAB		Enable
				ON	
				OFF	
				back	
			PATT		Pattern select

				BAR	75% Colorbar
				BRED	Colorbar over Red
				EQPL	EQ/PLL path.
				PLL	PLL-path
				EQ	EQ-path
				15GR	15% Grey
				WHTE	White
				YELL	Yellow
				MGNT	Magenta
				CYAN	Cyan
				BLUE	Blue
				GREE	Green
				RED	Red
				BLK	Black
				back	
			noIN		Output if no Input
				BLCK	Black
				PATT	Testpattern
				back	
			back		
		back			
	GPI				GPI Influence
		NONE			none
		swIN			Switch Inputs
		swPR			Switch User Presets
		back			
	USET				User Preset Settings
		LOAD			Load User Preset to Current
			PRE1		Preset 1
			PRE2		Preset 2
			PRE3		Preset 3
			back		
		Gon			GPI on settings
			CURR		Current
			PRE1		Preset 1
			PRE2		Preset 2
			PRE3		Preset 3
			back		
		Goff			GPI Off settings
			CURR		Current
			PRE1		Preset 1
			PRE2		Preset 2
			PRE3		Preset 3
			back		
		back			
	RSET	YES/NO			Factory Reset
	back				

LED Status Indicators

The P DL 5600 module has LED indicators that serve as alarm and status indication for the module. Function is described below.

SDI 1 Status LED 1

LED Color	Indication
Green	SDI 1 Present and OK
Red	No SDI 1 Signal Connected

SDI 2 Status LED 2

(if Option Second Input active)

LED Color	Indication
Green	SDI 2 Present and OK
Yellow	SDI 2 Frame Rate Mismatch *(Mismatch between SDI 1 input frame rate and the SDI 2 input.*
Red	No SDI 2 Signal Connected

ALARM LED

LED Color	Indication
Green	Normal Operation
Yellow	Problem with one of the SDI inputs (if Option Second Input active)
Red	No SDI1 input or both Inputs missing (if Option Second Input active)
Red Flashing	Cooling Fan Failure

**Note.** *The Alarm LED can be seen with the rack front cover fitted*
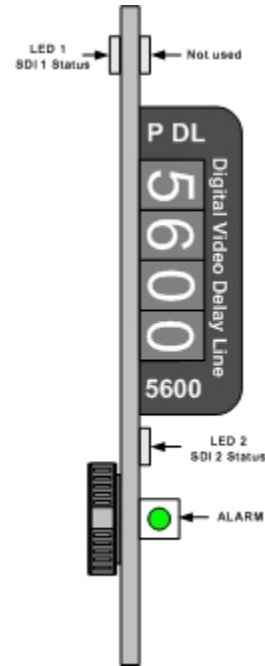
Control System GUI

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.

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

The following GUI screenshots and descriptions shown below describe the settings and adjustments possible for the P DL 5600 CardModule.
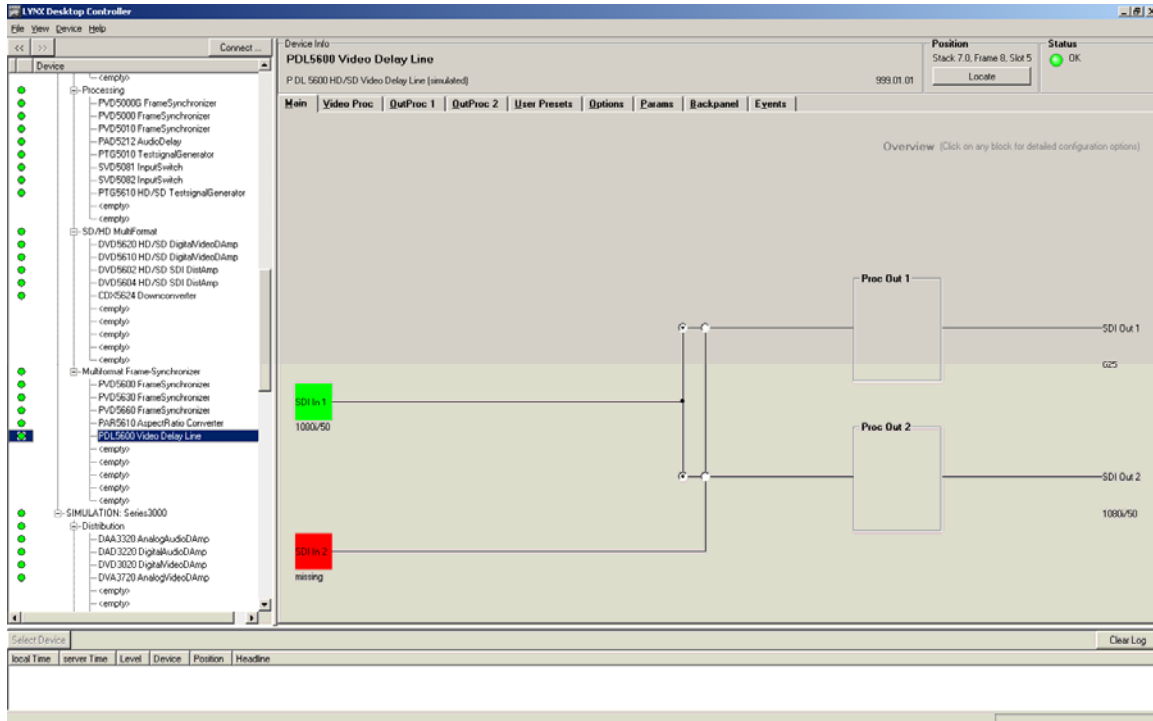
The above screenshot shows the complete module GUI. The Device info area contains information about the module including name and firmware revision. If used as part of a larger system (using the LYNX central control system) the modules position and physical location is displayed above the "locate" button.

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

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

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

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

Main Tab

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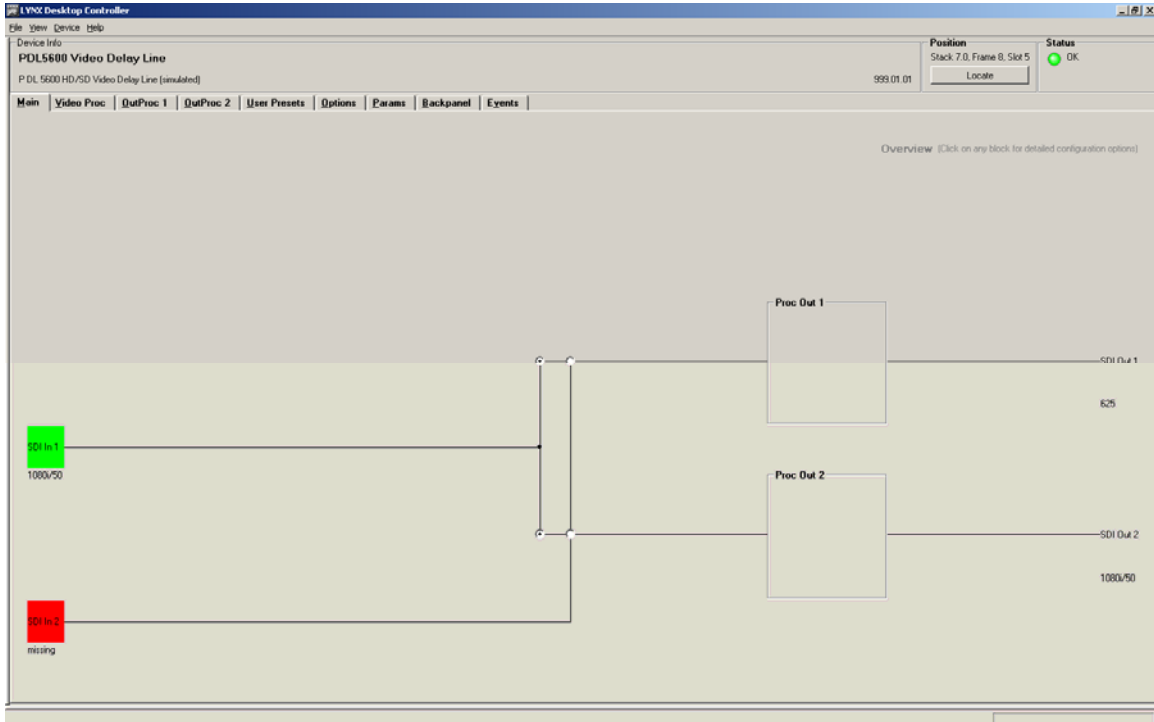
The primary purpose of this screen is to show the overall signal flow through the module and allow easy navigation to other areas. Input standards and formats are auto detected and displayed in the GUI. Parameters will be annunciated in different colors to show status (green = good, red = problem, yellow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

Video Proc Tab

This tab allows configuration of the GPI contact and gives some general status feedback
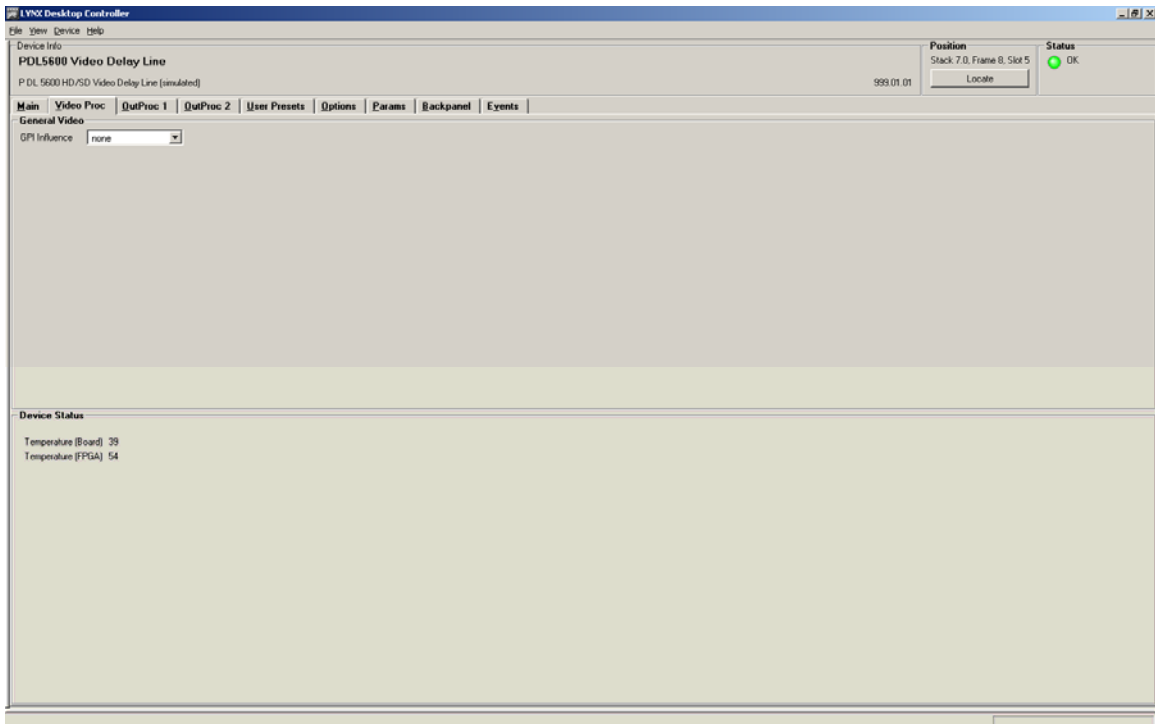
Device Status

This area is used to show the detected internal and external temperature of the Module. If the internal temperature exceeds 80ºC then the module will log a "over temperature" event in the control system error log.

Output Proc Tabs

There are two "Out Proc" tabs provided, one for each of the two outputs provided. This is where the individual video processing functions are set for each channel. The two tabs have identical adjustments.
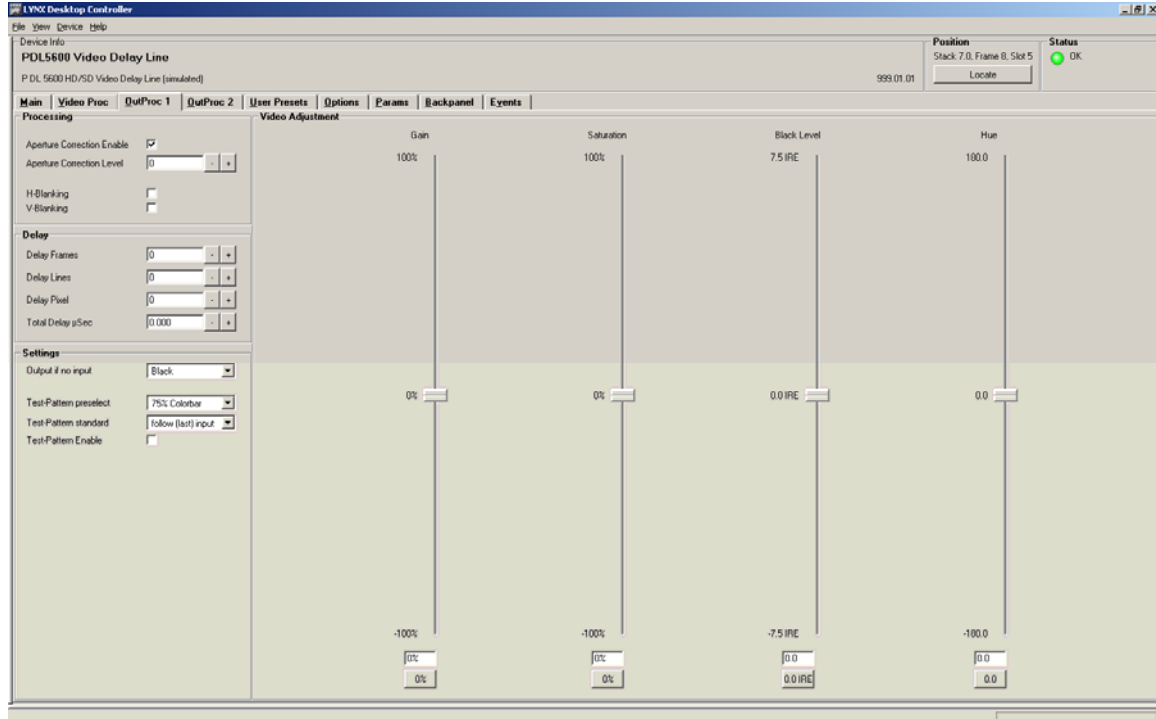
Aperture Correction

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 and an adjustment range The numerical adjustment range provided is + 80 to -30, and is changed by clicking on the "+" or "-" Buttons.

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

H and V Blanking

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

Video Delay Adjustment

Each video output can be delayed relative to the reference sync up to a maximum of 12 frames. This is usually used for downstream system timing applications. The delay is adjustable in the following increments:

- Frames
- Lines
- Pixels
- Time (ns)

Depending on preferences you can use one or all of the adjustments provided to set the total video delay.

> **Note.** *The adjustable delay applied is **in addition** to the fixed processing delay of the module. Please refer to the table provided in the "Fixed Video Delays" section for more information on processing delays.*

Settings

This area is where the action (and settings) of the integrated test pattern generator is defined. (Each channel has its own independent test pattern generator)

Test Pattern Pre-select

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

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

Test Pattern Standard

If no input signal is present the test generator will be set according to the last detected input format.

Test Pattern Enable

This checkbox simply switches on the pre-selected test Pattern. (The same can be done using the Test Pattern checkbox on the **Main** Tab)

Video Adjustments

Four on screen sliders are provided to allow for the adjustment of individual video parameters. Separate sliders are provided for video Brightness (gain), Saturation, Pedestal (Black level) and Hue.
Default (null) settings are 0% (this is the default). Sliders can be quickly returned to the factory null (or transparent) settings using the buttons provided at the bottom of each slider.

Options Tab

One tab on the GUI is reserved for "Options" This is where the option license codes are entered to unlock the embedded firmware options.
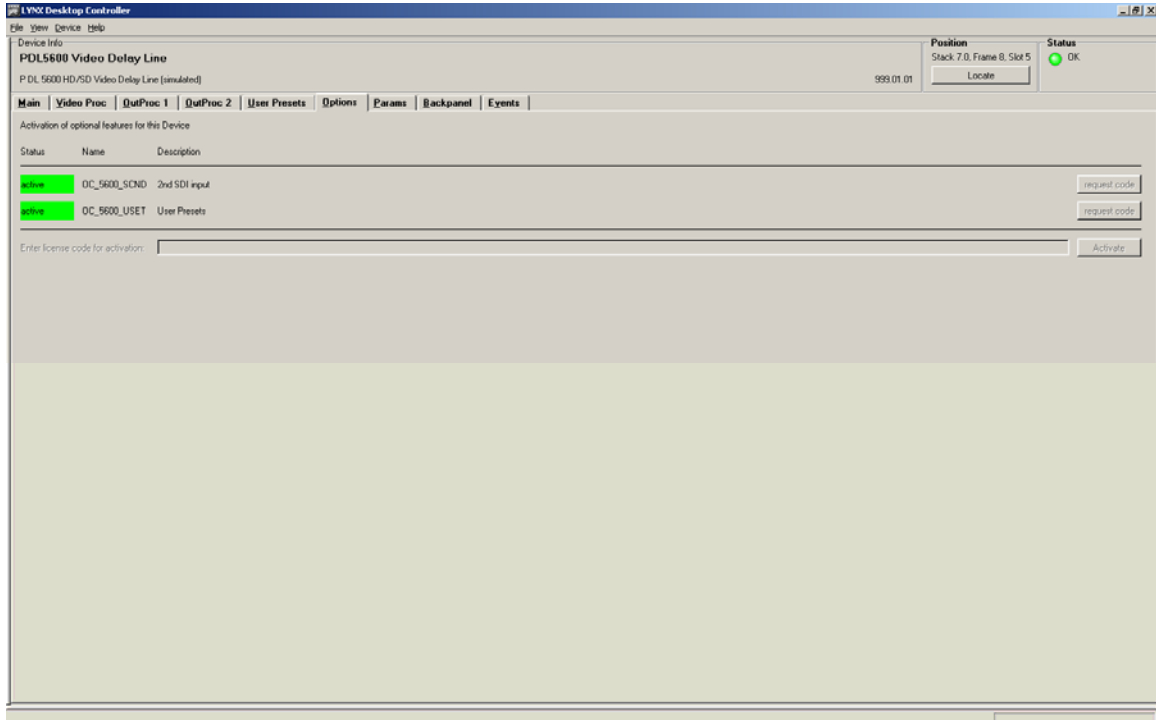
If the module was purchased with options pre-installed then you will see the option status as green (Active).

If you would like to add any option after delivery, then you will need to purchase the specific license codes from LYNX Technik.

Click the "request code" button next to the channel you wish to activate. A number will be displayed, Please forward this number with your purchase order to your authorized LYNX dealer or representative. When you receive the license string simply type it (or paste it using the windows clipboard) into the area provided and press "activate".

Activation is confirmed when the option status turns green.

Specifications

Video Inputs	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C
Input standards	HDTV: 1080i 59.94Hz / 60Hz / 50Hz / 720P 59.94Hz / 60Hz / 50Hz SDTV: 525 59.94Hz / 625 50Hz. (Upgradeable if additional format support is released)
No. of inputs	2 inputs**, (second input optional)**
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)
Video Outputs	
Signal Type	Serial digital video SMPTE 292M, 344M, 259M-C
Output standards	1080i 59.94Hz / 60Hz / 50Hz 720P 59.94Hz / 60Hz / 50Hz 525 59.94Hz / 625 50Hz.
No. Of outputs	2 separate outputs with 2 x SDI out for SDI out 1 and 1 x SDI out for SDI out 2
Connector	BNC
Impedance	75 Ohms
Jitter	< 0.2 ui (270MHz) < 0.25 ui (1.485GHz)
Return Loss	> 15 dB (1.5GHz)
Video Processing	
Delay adjustment range	Up to 12 frames of programmable delay in pixel / line / frame increments. Independent for all 3 outputs
Minimum delay	Please refer to "Fixed Video Delays" table in this manual
Video adjustments	Gain / Saturation / Hue / Black Level
Aperture correction	Horizontal only, adjustable for each output channel (3)
Operating Modes	
Frame Sync	Basic SD / HD Multi-rate Frame Synchronizer
Down conversion + ARC + frame sync	Requires Firmware option for Down Conversion
Control	
Local Controls	Local alphanumeric display with integrated menu system for setting "basic" module parameters.
Remote Control	Comprehensive remote control and status monitoring supported when used with a LYNX Controller option. The use of the control system is mandated for this module
External GPI	Single GPI input on BNC connector. GPI influence configured in control system.
Electrical Specifications	
Operating Voltage	12 VDC
Power Consumption	8 W
Safety	IEC 60950/ EN 60950/ VDE 0805
Mechanical	
Size	283mm x 78mm
Weight	CardModule 160g, connector plate 100g
Rack space	Requires 1 slot in rack frame (max 10 modules per frame)
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.

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                        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.