Model 5821-D

Down Converter
Aspect Ratio Converter

NEP Version

Configured for Single Slot (5-BNC)

Leitch™ 6800+ Frames

Owner's Manual

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Overview

The 5821-D is a high quality 10-bit, HD down-converter with SD pass-through and individual ARC controls for HD and SD inputs. The 5821-D bridges SMPTE 292 high definition (HD) and 259M-C standard definition (SD) signal formats; allowing high density and low power conversion of HD signals. Conversion densities can be as high as 15 cards (conversions) per 2U frames.

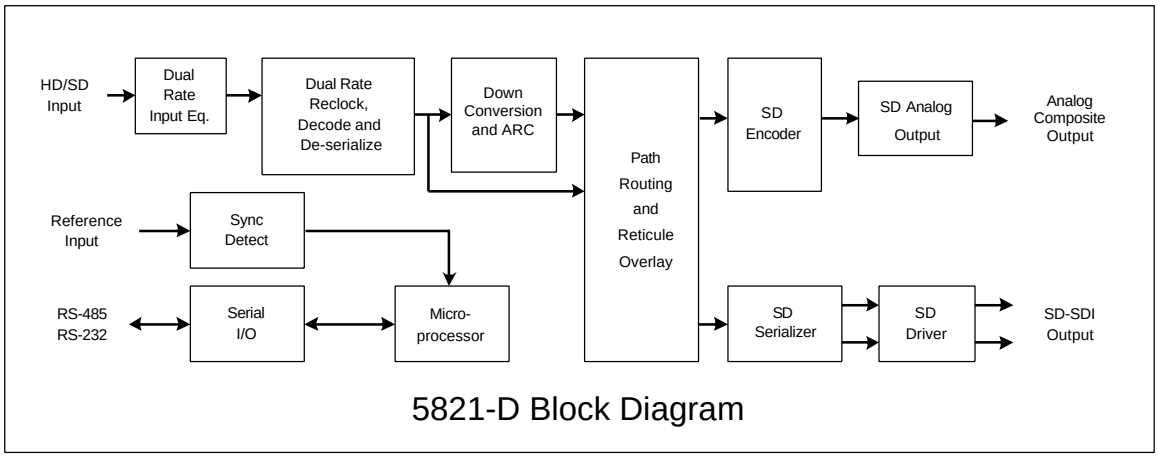
The 5821-D will down-convert HD to SD 4:2:2 270-Mbit digital and analog composite video. This unit can re-aspect the image with separate rules for HD vs. SD inputs and adds 3:2 pull-down to 23.98 p/sF or i inputs. In addition, safe area reticule overlays, 4x3 and 16x9, full aperture for 4x3 and center cross can be selected on the SD-SDI and/or composite outputs.

The image processing is full 10-bit using a 24-tap spatial filter. Down-conversions of HD to SD signals are de-jittered to reduce chroma phase jitter of SD analog signals. The analog output is encoded at 12-bits to preserve the 10-bit video signal.

The input and outputs of the 5821-D are the following. One dual-rate HD/SD serial digital input, two SDI of down-converted HD or SD pass through or ARC'd digital outputs and one SD Analog composite output.

Block Diagram

The 5821-D has a very flexible signal flow path and feature set that combines several products into one compact package. To understand the capabilities of the 5821-D, this section reviews the basic structure of the 5821-D.



5821-D Block Diagram

Signal Flow

Starting in the upper left of the block diagram, the dual-rate (HD/SD) serial digital signal is equalized, reclocked and then deserialized. During this process, the video standard and frame rate is determined.

Coming out of the deserializer, the parallel video data path goes in two directions. The first is to the conversion engine where it is down, aspect and/or frame rate converted depending on the signal input and User settings. The second copy of the deserializer goes is to an FPGA who's function is to select which input goes to which output (SD digital and/or analog) and what overlays are to be applied to individual outputs.

Conversion Capabilities

The 5821-D has extensive re-format and up/down conversion capabilities. It can act as an upconverted, downconverter, format (1080-720) converter, aspect ratio converter (ARC), frame rate converter and DVE.

The Format conversions are listed in the chart below.

From ✍ To	SD
1080 sF 23.98	486 i 29.97
1080 p 23.98	486 i 29.97
1080 sF 24	----
1080 p 24	----
1080 i 25	575 i 25
1080 p 25	575 i 25
1080 i 29.97	486 i 29.97
1080 p 29.97	486 i 29.97
1080 i 30	----
1080 p 30	----
720 p 25	575 i 25
720 p 29.97	486 i 29.97
720 p 30	----
720 p 50	575 i 25
720 p 59.94	486 i 29.97
720 p 60	----
486 i 29.97	486 i 29.97
575 i 25	575 i 25

Notes:

1. All rates translated to effective frame rates, interlaced rates " i " are two times the number shown. For example, i 29.97 is 59.94 fields per second (two fields per frame thus the interlaced frame rate is 29.97); but progressive " p " 29.97 is 29.97 frames per second.

2. SD active line rates are PAL (575) and NTSC (486).

3. The 5821-D cannot accept native 720 p24/23.98 or sF24/23.98, however it <u>can</u> convert those signals if they are delivered inside a 59.94/60 transportation wrapper (as typically done with this format) and processed as 59.94/60.

Configuring an 5821-D

The 5821-D is configured via an eight position card edge switch for main functions, a ten position surface mount board switch for extended functions and two card edge rotary switches with an up down switch to access advanced controls. The configuration is broken down into four areas: HD/SD conversion mode, Aspect ratio rules (ARC), output configuration and overlay reticules.

Switch 9 on Card Edge

1	2	3	4	5	6	7	8	SETTINGS
ON	ON							SD to SD User Aspect Settings (ARC and PAN)
ON	OFF							SD to SD 0.75 Vert Expansion (common sides)
OFF	ON							SD to SD 0.75 Horz Reduction (pillar box)
OFF	OFF							SD to SD No Aspect Change.
		ON	ON					HD to SD User Aspect settings (ARC and PAN)
		ON	OFF					HD to SD 0.75 Vert Reduction (letter box)
		OFF	ON					HD to SD 1.33 Horz Expansion (center cut)
		OFF	OFF					HD to SD No Aspect Change
				ON				Underscan (10% overall)
				OFF				Underscan (10% overall)
					ON			Reticules 4x3 Safe Area ON
					OFF			Reticules 4x3 Safe Area OFF
						ON		Reticules 4x3 Full Aperture ON
						OFF		Reticules 4x3 Full Aperture OFF
							ON	Reticules 16x9 Safe Area ON
							OFF	Reticules 16x9 Safe Area OFF

Switch 3 on PCB

1	2	3	4	5	6	7	8	9	10	SETTINGS
ON										Reticules User Settings
OFF										Reticules Factory Settings
	ON									Reticules Shadow Enabled
	OFF									Reticules Shadow Disabled
		ON								Reticules Center Cross (+) ON
		OFF								Reticules Center Cross (+) OFF
			ON							Reticules Tracking ON (follows ARC)
			OFF							Reticules Tracking OFF (follows ARC)
				ON	ON					Reticule Color – WHITE
				ON	OFF					Reticule Color – BLACK
				OFF	ON					Reticule Color – BLUE
				OFF	OFF					Reticule Color – RED
						ON				Enable Reticule on SDI output
						OFF				Disable Reticule on SDI output
							ON			Enable Reticule on Analog output
							OFF			Disable Reticule on Analog output
								ON		SD Analog Color ON
								OFF		SD Analog Color OFF (B&W)
									ON	Enable External Ref
									OFF	Disable External Ref

Switch 9 – Aspect and Overlay Configuration

Switch S9, located on the card edge, controls the seperate aspect ratio rules for HD and SD inputs as well as selecting the reticule overlays. See chart on previous page.

The first two positions S9-1&2 set the ARC for SD inputs and the next two switches S9-3&4 select the ARC setting for HD inputs. S9-5, when enable adds an additional 10% image reduction simulating underscan on a monitor.

S9-6,7&8 selects which overlay patterns to apply. This switch in combination with S3 configures the reticule overlay settings. There are four overlays, three selected on this switch and the fourth via. switch 3. Factory default overlays or user set overlays can be configured by S9, S3 and the two rotary switches S5 and S6.

Switch 3 – Overlay and Analog Configuration

S3, is a surface mount dip switch located near the card bottom adds the following controls. See chart on previous page.

S3-1 selects factory overlay patters or user configured patterns. The default user pattern is the same as the factory pattern until the user configures the overlays to their needs under the user settings (see rotary switch chart) and saves those settings to non-volatile memory. When S3-1 is on, the user settings are enabled, when S3-1 is off the factory defaults are enabled. In user mode, the overlay dimensions, overlay width and overlay color can be user controlled.

S3-2 enables shadow mode.

S3-4 enables reticule size tracking with ARC function or static, overlays that don't move as the image is ARC adjusted.

S3-5&6 select reticule color.

S3-7 enables overlays on SDI output.

S3-8 enables overlays on composite analog output.

S3-9 sets the analog output to B&W when enabled. This is useful when driving a monochrome monitor.

S3-20 enables P to I field order tracking to input reference. When enabled the odd/even output of the P to I conversion tracks the reference input. When not enabled the start of the P to I conversion is random and can vary from down-converter to down converter.

Switch 5 & 6 Rotary Settings

The 5821-D has additional configuration controls via internal register rotary selection and input (up/down) switches. To access these controls, use rotary switches S5&6 and the up/down input switch located on the card edge.

Default convention: Use S6 (UP) to increment or turn function on. Use S5 (Down) to decrement or turn function off.

To save user settings, select 99 and press either the Up or Down switch.

S6S5
00: Normal User Mode
Restore to 00 prior to device use

10-19: Reserved

20-29: Reserved

30-39: Reserved

40: User H & V aspect zoom

41: User H aspect zoom

42: User V aspect zoom

43: User H aspect pan

44: User V aspect pan

50-53: Reserved

54: Background color Y
Push both buttons default to black
55: Background Cb color
Push both buttons default to black
56: Background Cr color
Push both buttons default to black

57: Enable over sampling on Analog Encoder
Default is on

58: Reserved

59: Enable SD VB
Default is on

60: User Reticule Mode Vert bars size H
61: User Reticule Mode Vert bars thickness
62: User Reticule Mode 4x3 box Horz size
63: User Reticule Mode 4x3 box Vert size
64: User Reticule Mode 4x3 box Horz Thickness
65: User Reticule Mode 4x3 box Vert Thickness
66: User Reticule Mode 16x9 box Horz size
67: User Reticule Mode 16x9 box Vert size
68: User Reticule Mode 16x9 box Horz Thickness
69: User Reticule Mode 16x9 box Vert Thickness

70: User Reticule Mode Cross Horz size
71: User Reticule Mode Cross Vert size
72: User Reticule Mode Cross Horz Thickness
73: User Reticule Mode Cross Vert Thickness
74: User Reticule Mode Y Level
75: User Reticule Mode Cb Level
76: User Reticule Mode Cr Level

74-79
80: Horizontal offset
81 Vertical offset

83, 86: Reserved

84: Reserved

85: SD-SDI/Analog Dejitter
UP = Filter ON
Down = Filter OFF

87: HD < > SD Color Matrix Bypass
UP = Bypass color matrix
Down = enable color matrix

88: Restore factory defaults

89-97: Reserved

98: NTSC Analog setup ON/OFF (default is ON)

99: Save current values

Make certain that the rotary switches are restored to 0, 0 before putting the 5821-D back into service.

5821-D Delay Characteristics

The processing delay varies with the type of conversion being performed. The charts below list the electrical length or processing time for the HD/SD-SDI and Analog HD/SD outputs. Select the input rate on the left and the output rate and type on the top. The intersecting box contains the conversion time information.

f = field; F = Frame – Delay rates (in f or F) are shown with respect to the input signal.

From ✍ To	SD-SDI or SD-Analog Output 486 = NTSC & 575 = PAL	
1080 sF 23.98	486 i 29.97	1/13.32-1/11.99 sec – 3.6-4f
1080 p 23.98	486 i 29.97	1/13.32-1/11.99 sec – 1.8-2F
1080 sF 24	----	
1080 p 24	----	
1080 i 25	575 i 25	1/25 sec – 2f
1080 p 25	575 i 25	1/12.5 sec – 2F
1080 i 29.97	486 i 29.97	1/29.97 sec – 2f
1080 p 29.97	486 i 29.97	1/14.98 sec – 2F
1080 i 30	----	
1080 p 30	----	
720 p 25	575 i 25	1/12.5 sec – 2F
720 p 29.97	486 i 29.97	1/14.98 sec – 2F
720 p 30	----	
720 p 50	575 i 25	1/25 sec – 2F
720 p 59.94	486 i 29.97	1/29.97 sec – 2F
720 p 60	----	
486 i 29.97	486 i 29.97	1/29.97 sec – 2f
575 i 25	575 i 25	1/25 sec – 2f

Glossary

Aspect ratio:	Performing an aspect change on HD or SD raster, for example converting the image from 16x9 to 4x3 with letter box (0.75V) or non-letter box by expanding H by 1.333.
Downconvert:	Taking HD and down converting it to SD or XGA.
Format convert:	Taking HD from one resolution and crossing converting it over to another HD standard, for example (1080 to 720) or (720 to 1080). Sometimes this is referred to as crossconvert.
HD SDI:	High Definition – SMPTE 274M (1080) and 296M (720) 1.485-Gbit or 1.485/1.001-Gbit
i > p Output:	Used to convert interlaced images to progressive.
Safe area:	Adding an additional 10% aspect ratio reduction to the H and V axis to allow the image to be seen on a monitor that does not support safe area raster reduction. This applies mainly to CRT based devices as they are manufactured with intentional over scan.
SD SDI:	Standard Definition – SMPTE 259M-C 4:2:2 SDI 270-Mbit video in either NTSC (720x486 i30) or PAL (720x575 i25).
Upconvert:	Taking SD and up converting it to a HD or XGA.
3:2:	Adding a copy of a field every fourth field to convert i 24/23.98 to i 30/29.97.

Specifications

DIGITAL INPUTS

Input – Dual-Rate	SMPTE-292 HDSDI (10/8-bit) and SMPTE259M-C (10/8-bit) ? HD: 720 i25/29.97/30/59.94/60 and p/23.98/24 in p59.94/60 wrapper ? HD: 1080 i23.98/24/25/29.97/30 - p23.98/24/25/29.97/30 -sF 23.98/24 ? SD: 486 i29.97 NTSC - 575 i25 PAL
Input Equalization:	330ft (100 Meters) Belden 1505A
Return Loss:	> 15 dB

DIGITAL OUTPUTS

Processed	SMPTE259M-C (10-bit) ? 488 i29.94 NTSC ? 576 i25 PAL
Return Loss:	> 17 dB

IMAGE PROCESSING

Scaling:	24-tap poly-phase with 10-bit processing
Resizing:	Full zoom and pan functions (2-axis DVE) Presets for Letterbox, Pillar Box and Center Cut
Film Modes:	3:2 pull down, and p > i modes

ANALOG OUTPUT

Output Signal:	SD Analog Composite
Frequency Response:	SD: 0-5.2 MHz +/- 0.25 dB
Encoding Path:	12-bit encoding and DAC – 10-bit input
Return Loss:	>36dB

RETICULE OVERLAY

Types:	4x3, 16X9 Safe Area, 4x3 full aperture, and center cross - each type can be individually enabled and User size adjusted
Reticule Color:	Black, White, Blue, Red or User adjustable
Reticule Outputs:	Individually enabled on SD-SDI and Composite Analog
Options:	Remote Reticule control
Operating Range:	40-100 degrees F. (non-condensing)
Input Power:	+ 6.5 VDC +/- 2V (6.1 watts) - 6.5 VDC +/- 2V (0.1 watts)
Size:	10 x 3" (260 x 150 x 25mm)

This product is not authorized for use in life support systems. Product liability is limited only to the replacement of this unit. Cobalt Digital Inc. does not assume any liability for loss of use due to failure of this component.

Specifications subject to change without notice.

Cobalt Digital Inc. 2406 E. University Avenue, Urbana, IL 61802 Office: 217-344-1243 Fax:217-344-1245
www.cobaltdigital.com Rev. 0.3 gjz