

Application Note:

Interfacing non-standard cameras to Matrox Genesis

DALSA CL-G1-2098G

September 29, 1999

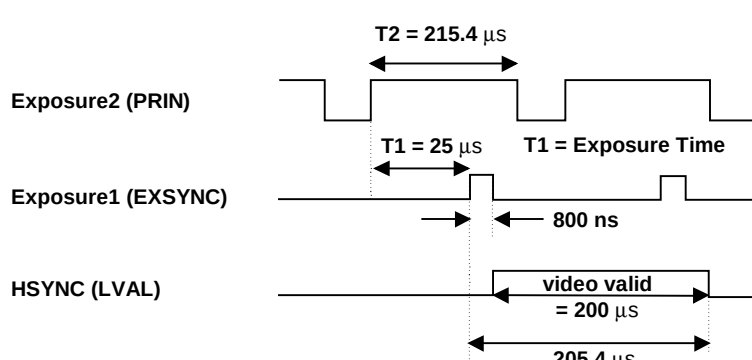
Camera Descriptions	• 2098 x 8-bit (RGB). • 3-channel RS-422 digital video output. • External exposure control. • Maximum data rate per output: 5 MHz.
Interface Modes	• Fixed line scan rate, variable line scan rate (Binning)
Camera Interface Briefs	Mode 1: Fixed line scan rate mode • 2098 x 8-bit (RGB). • 3-channels RS-422 digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by frequency of EXPOSURE1 (EXSYNC) signal. • Matrox Genesis sending EXPOSURE1 (EXSYNC), EXPOSURE2 (PRIN), user output (BIN) and reference clock (MCLK @ 20MHz) signals to camera: EXPOSURE1 (EXSYNC) signal initiates line readout and EXPOSURE2 (PRIN) signal controls the exposure time. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 5MHz) and HSYNC (LVAL) signals from camera. • DCF used: CLG1DE2.DCF Mode 2: Variable line scan rate mode (Binning) • 2098 x 8-bit (RGB). • 3-channels RS-422 digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is programmable and controlled by external trigger signal. • Matrox Genesis sending EXPOSURE1 (EXSYNC), EXPOSURE2 (PRIN), RS-422 user output (BIN) and RS-422 reference clock (MCLK @ 20MHz) signals to camera: the EXPOSURE1 (EXSYNC) signal initiates line readout and EXPOSURE2 (PRIN) signal controls the exposure time.

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Camera Interface Briefs (continued)	• Matrox Genesis receiving PIXEL CLOCK (STROBE @ 5MHz) and HSYNC (LVAL) signals from camera. • DCF used: CLG1DE4.DCF
Camera Interface Details	Mode 1: Fixed line scan rate mode • Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the signal and after a short (constant) delay initiates line readout. • EXPOSURE2 (PRIN) period in the DCF specifies the line rate of the camera. The EXPOSURE2 (PRIN) period is currently set to 1081 pixels. The pixel clock rate is 5 MHz; the line rate is therefore 4.62 kHz. The exposure time of the camera can be modified in the DCF using Matrox Intellicam. Consult the Matrox Intellicam User Guide for more information. • The <i>virtual frame</i> rate for the current settings of the DCF is $216.2\mu\text{s} \times 512 = 110694\mu\text{s} = 9\text{Hz}$. In each virtual frame there are 512 active lines. • The time between the rising edge of the EXPOSURE2 (PRIN) and EXPOSURE1 (EXSYNC) signals is the exposure time. In order to select the exposure time, the width and deployment time of each EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) must be set in Matrox Intellicam.  Mode 2 : Variable line scan rate (Binning) • Line rate is variable and is controlled by the external trigger signal. • Once it has received the external signal to trigger, the Matrox Genesis sends the EXPOSURE2 (PRIN) signal to the camera to initiate exposure. The Matrox Genesis will send the EXPOSURE1 (EXSYNC) signal to the camera following a delay that is equal to the desired exposure time. A short (variable) delay will follow after receiving the EXPOSURE1 (EXSYNC), followed by the camera sending the HSYNC (LVAL) signal to the Matrox Genesis to initiate line readout. Maximum line scan rate: the maximum trigger frequency, or the maximum line scan rate for this DCF is equal to 4.2 kHz. This maximum line scan rate is for a MCLK frequency of 20 MHz. The MCLK frequency can be reduced by a user through Matrox Intellicam, thereby changing the maximum line scan rate.

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Cabling Requirements	Mode 1: Fixed line scan rate			
	• GEN-DIG-BRD/R/_ required for digital data, syncs and control signals in RS-422. • Connections between the connector of the camera and the 100-pin connector of the GEN-DIG-BRD/R/_ are as follows:			
	DALSA CL-G1-2098G		GEN-DIG-BRD/R/_	
	(Red 20-pin dual row connector)		(GEN/CBL/OPEN connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	D7	→	DATA, INPUT, 7+	15
	D7B	→	DATA, INPUT, 7-	16
	D6	→	DATA, INPUT, 6+	13
	D6B	→	DATA, INPUT, 6-	14
	D5	→	DATA, INPUT, 5+	11
	D5B	→	DATA, INPUT, 5-	12
	D4	→	DATA, INPUT, 4+	09
	D4B	→	DATA, INPUT, 4-	10
	D3	→	DATA, INPUT, 3+	07
	D3B	→	DATA, INPUT, 3-	08
	D2	→	DATA, INPUT, 2+	05
	D2B	→	DATA, INPUT, 2-	06
	D1	→	DATA, INPUT, 1+	03
	D1B	→	DATA, INPUT, 1-	04
	D0	→	DATA, INPUT, 0+	01
	D0B	→	DATA, INPUT, 0-	02
	STROBE	→	CLOCK, INPUT, -	40*
	STROBEB	→	CLOCK, INPUT, +	39*
*Note these signals are intentionally reversed since data from the camera is clocked on the falling edge of the STROBE signal, and Matrox Genesis is clocked on the rising edge.				
	DALSA CL-G1-2098G		GEN-DIG-BRD/R/_	
	(Green 20-pin dual row connector)		(GEN/CBL/OPEN connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	D7	→	DATA, INPUT, 15+	31
	D7B	→	DATA, INPUT, 15-	32
	D6	→	DATA, INPUT, 14+	29
	D6B	→	DATA, INPUT, 14-	30
	D5	→	DATA, INPUT, 13+	27
	D5B	→	DATA, INPUT, 13-	28
	D4	→	DATA, INPUT, 12+	25
	D4B	→	DATA, INPUT, 12-	26
	D3	→	DATA, INPUT, 11+	23
	D3B	→	DATA, INPUT, 11-	24
	D2	→	DATA, INPUT, 10+	21
	D2B	→	DATA, INPUT, 10-	22
	D1	→	DATA, INPUT, 09+	19
	D1B	→	DATA, INPUT, 09-	20
	D0	→	DATA, INPUT, 08+	17
	D0B	→	DATA, INPUT, 08-	18
	---		Not connected	
	---		Not connected	

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Cabling Requirements (continued)	DALSA CL-G1-2098G (Blue 20-pin dual row connector)		GEN-DIG-BRD/R/_ (GEN/CBL/OPEN connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	D7	01	→ DATA, INPUT, 23+	65
	D7B	02	→ DATA, INPUT, 23-	66
	D6	03	→ DATA, INPUT, 22+	63
	D6B	04	→ DATA, INPUT, 22-	64
	D5	05	→ DATA, INPUT, 21+	61
	D5B	06	→ DATA, INPUT, 21-	62
	D4	07	→ DATA, INPUT, 20+	59
	D4B	08	→ DATA, INPUT, 20-	60
	D3	09	→ DATA, INPUT, 19+	57
	D3B	10	→ DATA, INPUT, 19-	58
	D2	11	→ DATA, INPUT, 18+	55
	D2B	12	→ DATA, INPUT, 18-	56
	D1	13	→ DATA, INPUT, 17+	53
	D1B	14	→ DATA, INPUT, 17-	54
	D0	15	→ DATA, INPUT, 16+	51
	D0B	16	→ DATA, INPUT, 16-	52
	---	17	Not connected	
	---	18	Not connected	
	DALSA CL-G1-2098G (DB-25 male connector)		GEN-DIG-BRD/R/_ (GEN/CBL/OPEN connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	LVAL	02	→ HSYNC, INPUT, +	33
	LVALB	15	→ HSYNC, INPUT, -	34
	MCLK	06	← CLOCK, OUTPUT, +	89
	MCLKB	19	← CLOCK, OUTPUT, -	90
	EXSYNC	17	← EXPOSURE, OUTPUT, 1+	95
	EXSYNCB	04	← EXPOSURE, OUTPUT, 1-	96
	PRIN	05	← EXPOSURE, OUTPUT, 2+	97
	PRINB	18	← EXPOSURE, OUTPUT, 2-	98
	BIN	23	← USER, OUTPUT, 1+	93
	BINB	10	← USER, OUTPUT, 1-	94
	GROUND	20	GROUND	50

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Cabling Requirements (continued)	DALSA CL-G1-2098G (DB-25 male connector)			POWER SUPPLY
	<i>Pin name</i>	<i>Pin no.</i>		<i>Pin name</i>
	+15V	09	←	+15V
	-5V	12	←	-5V
	+5V	13	←	+5V
	+15V	21	←	+15V
	-5V	22	←	-5V
	-15V	25	←	-15V
	+5V	08	←	+5V
	GROUND	07		GROUND
	GROUND	11		GROUND
	GROUND	24		GROUND
NOTE: it is very important that all the GROUNDS of the camera be connected together to the POWER SUPPLY GROUND, and to the GROUND of the Matrox Genesis. Do not use the cable shield as a ground, instead always use the ground pin of the power supply. Mode 2: Variable line scan rate mode (Binning) • IMG-7W2-TO-5BNC cable required for TTL external trigger source and GEN-DIG-BRD/R/_ required for digital data, syncs and control signals in RS-422. • TTL external trigger source should be connected to the TTL trigger input of the IMG-7W2-TO-5BNC cable. • All connections are as in Mode 1: Fixed line scan rate, plus TTL external trigger.				

The DCF(s) mentioned in this application note can be found on the MIL and Native Library CD, or our FTP site ([ftp.matrox.com](ftp:matrox.com)). The information furnished by Matrox Electronics System, Ltd. is believed to be accurate and reliable. Please verify all interface connections with camera documentation or manual. Contact your local sales representative or Matrox Sales office or Matrox Imaging Applications at 514-822-6061 for assistance.

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