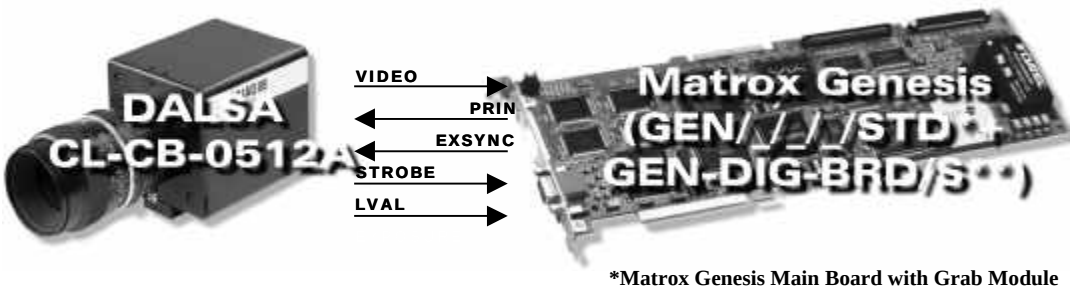
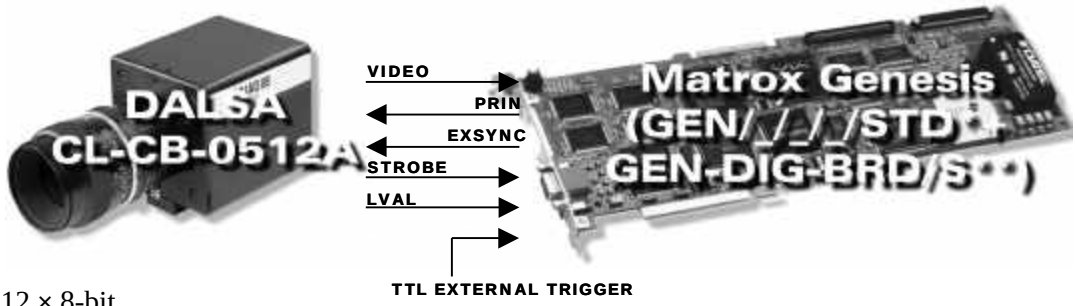
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

DALSA CL-CB-512A

July 6, 1998

Camera Descriptions	• 512 × 8-bit. • Single channel RS-422 digital output. • External synchronization required. • Exposure control. • Maximum data rate: 20 MHz.
Interface modes	• Fixed line scan rate, variable line scan rate
Camera Interface Briefs	**Mode 1: Fixed line scan rate**  ***Matrox Genesis Main Board with Grab Module** ****Matrox Digital Data Input Board** • 512 × 8-bit. • Single channel RS-422 digital output. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by the frequency of the EXSYNC signal. • Matrox Genesis sending RS-422 EXPOSURE1 (EXSYNC) and RS-422 EXPOSURE2 (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and EXPOSURE2 (PRIN) signal controls exposure time. • Matrox Genesis receiving RS-422 PIXEL CLOCK (STROBE @ 20 MHz) and RS-422 HSYNC (LVAL) signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLCBDEL2.DCF **Mode 2: Variable line scan rate**  ***Matrox Genesis Main Board with Grab Module** ****Matrox Digital Data Input Board** • 512 × 8-bit. • Single channel RS-422 digital output. • DCF configured for 512 lines per virtual frame. • Line scan rate is variable and controlled by external trigger signal. • Matrox Genesis receiving TTL external trigger. (Briefs continued)

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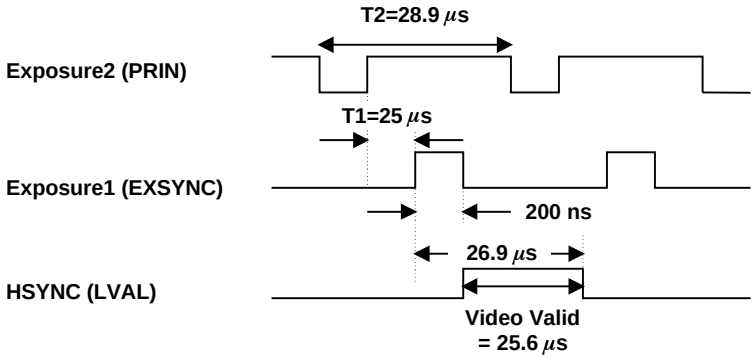
Camera Interface Briefs (continued)	• Matrox Genesis sending RS-422 EXPOSURE1 (EXSYNC) and RS-422 EXPOSURE2 (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and EXPOSURE2 (PRIN) signal controls exposure time. • Matrox Genesis receiving RS-422 PIXEL CLOCK (STROBE @ 20 MHz) and RS-422 HSYNC (LVAL) signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLCBDAE2.DCF
Camera Interface Details	**Mode 1: Fixed line scan rate mode** • Matrox Genesis sends the RS-422 EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the signal and after a short (constant) delay initiates line readout. • **Line rate**: The EXPOSURE2 (PRIN) period in the DCF specifies the line rate of the camera. The EXPOSURE2 (PRIN) period is currently set to **578 pixels**. The pixel clock rate is **20 MHz**; the default line rate for this DCF is **34.6 kHz**. • **Virtual frame rate**: The virtual frame rate for the current settings of the DCF is 28.9 µs x 512 = 14796 µs = **67.6 Hz**. In each virtual frame there are **512** lines. • **Exposure time**: The time between the rising edge of the EXPOSURE2 (PRIN) and EXPOSURE1 (EXSYNC) signals is the exposure time. The default exposure time for this DCF is **25 µs**. 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. The exposure time of the camera can be modified in the DCF using Matrox Intellicam, Genesis Native Library function **imCamControl()** or with the MIL digitizer control function **MdigControl()**. Refer to the appropriate manual or user guide for additional information. • **Maximum / minimum exposure time:** Since the Matrox Genesis can count up to 65536, and there is a delay of 26 clock pulses between EXPOSURE1 (EXSYNC) and the line readout, the maximum exposure time is calculated to be (65536-26)/20 MHz = **32.7 ms**. For proper operation, exposure signal must remain inactive for a minimum of 6 clock periods before being asserted. Therefore the minimum exposure time is **300 ns**. 

Camera Interface Details (continued)

Smallest exposure time increment: The pixel clock is the base clock that the exposure time is being set by. The smallest increment of the exposure time is **50 ns**.

Mode 2 : Variable line scan rate

- Once it has received the external signal to trigger, Matrox Genesis sends the RS-422 EXPOSURE2 (PRIN) signal to the camera to initiate exposure. Matrox Genesis will send the RS-422 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 RS-422 HSYNC (LVAL) signal to the Matrox Genesis to initiate line readout.
- **Line rate**: The Line rate is variable and controlled by the frequency of the external trigger signal.
- **Maximum line rate, Maximum exposure time, Minimum exposure time, and Smallest exposure time increments**: are the same as for Mode 1: *Fixed line scan rate*

Cabling Requirements

Mode 1: Fixed line scan rate

- GEN/DIG/BRD/S required for digital data, synchronization and control signals in RS-422 format.
- Connections between the 20-pin dual row connector (labeled **OS1**) of the camera and the 100-pin connector of the GEN-DIG-BRD/S are as follows:

DALSA CL-CB-512A (20-pin dual row connector - OS1)			**GEN-DIG-BRD/S (GEN/CBL/OPEN connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D7	01	→	DATA, INPUT, 7+	15
D7B	02	→	DATA, INPUT, 7-	16
D6	03	→	DATA, INPUT, 6+	13
D6B	04	→	DATA, INPUT, 6-	14
D5	05	→	DATA, INPUT, 5+	11
D5B	06	→	DATA, INPUT, 5-	12
D4	07	→	DATA, INPUT, 4+	09
D4B	08	→	DATA, INPUT, 4-	10
D3	09	→	DATA, INPUT, 3+	07
D3B	10	→	DATA, INPUT, 3-	08
D2	11	→	DATA, INPUT, 2+	05
D2B	12	→	DATA, INPUT, 2-	06
D1	13	→	DATA, INPUT, 1+	03
D1B	14	→	DATA, INPUT, 1-	04
D0	15	→	DATA, INPUT, 0+	01
D0B	16	→	DATA, INPUT, 0-	02
STROBE	17	→	CLOCK, INPUT, -	40
STROBEB	18	→	CLOCK, INPUT, +	39
LVAL+	19	→	HSYNC, INPUT, +	33
LVAL-	20	→	HSYNC, INPUT, -	34

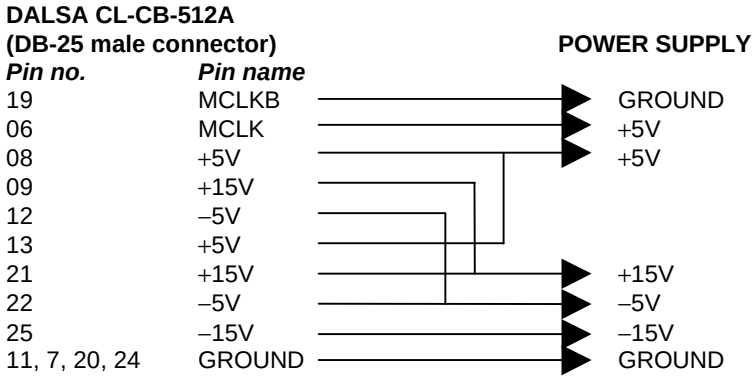
Cabling Requirements (continued)

- Connections between the DB-25 connector on the rear panel of the camera and the 100-pin connector of the GEN-DIG-BRD/S are as follows:

DALSA CL-CB-512A (DB-25 male connector)			**GEN-DIG-BRD/S (GEN/CBL/OPEN connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
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	07	→	GROUND	37*
GROUND	11	→	GROUND	38*
GROUND	20	→	GROUND	50*
GROUND	24	→	GROUND	37*

*Any pin can be used at any position: all Grounds are connected on the GEN-DIG-BRD/S

- Connections between the DB-25 connector on the rear panel of the camera and the power supply are as follows:



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.

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Cabling Requirements (continued)	**Mode 1: Variable line scan rate** • IMG-7W2-TO-5BNC cable required for TTL external trigger source and GEN/DIG/BRD/S required for digital data, synchronization and control signals in RS-422 format. • TTL external trigger source should be connected to the TTL trigger input of the IMG-7W2-TO-5BNC cable • All other connections are as in Mode 1: *Fixed line scan rate*

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). 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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