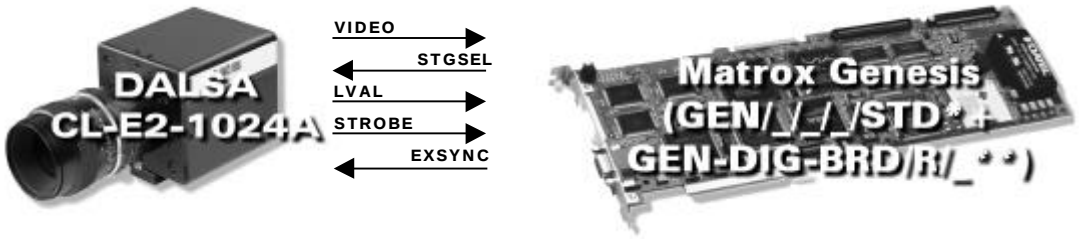
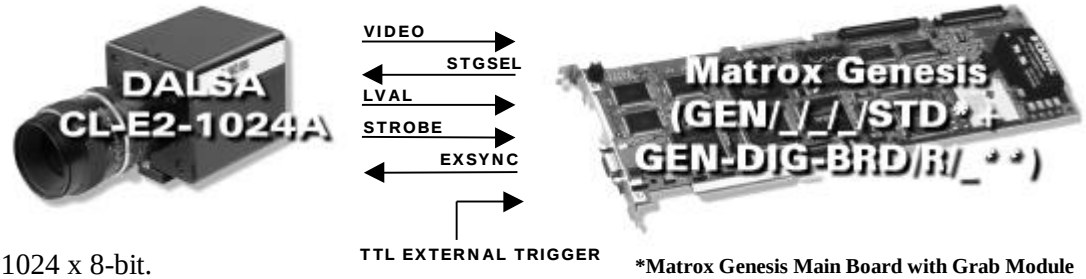
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

DALSA CL-E2-1024A

July 23, 1999

Camera Descriptions	• 1024 x 8-bit. • Single channel RS-422 digital video output. • Selectable number of TDI stages. • External synchronization required. • 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** • 1024 x 8-bit. • Single channel RS-422 digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by EXPOSURE1 (EXSYNC) signal frequency. • Matrox Genesis sending USER0 (STGSEL) and EXPOSURE1 (EXSYNC) signals to camera; the EXPOSURE1 (EXSYNC) signal initiates line readout. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 20 MHz), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLE2DL.DCF **Mode 2: Variable line scan rate**  ***Matrox Genesis Main Board with Grab Module** ****Matrox Digital Data Input Board** • 1024 x 8-bit. • Single channel RS-422 digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is variable and is controlled by external trigger signal. • Matrox Genesis receiving TTL external trigger. • Matrox Genesis sending USER0 (STGSEL) and EXPOSURE1 (EXSYNC) signals to camera; the EXPOSURE1 (EXSYNC) initiates line readout. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 20 MHz), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLE2DAL.DCF

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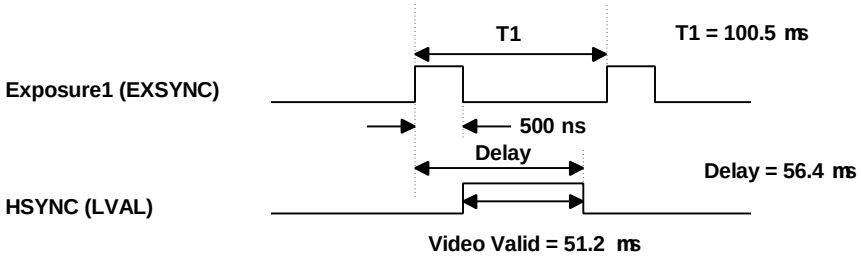
Camera Interface Details

Mode 1: Fixed line scan rate

- Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the EXPOSURE1 (EXSYNC) signal and after a short (constant) delay initiates line readout.
- **Line rate**: The EXPOSURE1 (EXSYNC) period in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **2010 pixels**. With a **20 MHz** pixel clock this translates to a **9.95 kHz** line rate.
- **Virtual frame rate**: The virtual frame rate for the current settings of the DCF is **19.4 Hz**.
- **Exposure time**: The time between the rising edges of the EXPOSURE1 (EXSYNC) signal is the exposure time. The default exposure time for this DCF is **100.5 µs**. In order to select the exposure time, the width and deployment time of EXPOSURE1 (EXSYNC) 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 timer is 16-bit wide, the maximum exposure time is calculated to be 65536/20 MHz = **3.27 ms**. The maximum line rate of the camera is **17.0 kHz**, therefore the minimum exposure time is **58.8** µs.
- **Smallest exposure time increment**: The pixel clock is the reference clock that the exposure time is being set by. The smallest increment of the exposure time is **50 ns**.
- **Stage selection**: The number of TDI stages used by the camera is controlled by the USER0 (STGSEL) signal. The USER0 (STGSEL) signal value 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.



Mode 2 : Variable line scan rate

- Once it has received the external trigger signal, Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera. 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.
- **Line and virtual frame rate**: Line and virtual frame are variable and controlled by the frequency of the external trigger signal.

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Camera Interface Details (continued

- **Exposure time**: Since the EXPOSURE1 (EXSYNC) signal is controlled by the external trigger signal, the time between the rising edges of the external trigger signal is the exposure time.
- **Maximum / minimum exposure time:** The maximum exposure time is equal to the maximum delay between rising edges of the external trigger signal. The minimum exposure time is **58.8** ms.
- **Smallest exposure time:** Smallest exposure time is controlled by the external trigger signal.

Cabling Requirements

Mode 1: Fixed line scan rate

- Matrox cable kit (GEN-TO-DALSA/16) is available for this mode as an alternative to custom cable development based on the pin-outs listing below. Note, EXPOSURE2 is connected to stage select (STGSEL), and using GEN-TO-DALSA/16 cable will require changing the polarity of EXPOSURE2 to control stage select (STGSEL).
- DBHD100-TO-OPEN cable and GEN/DIG/BRD/R/_ board required for digital data, synchronization and control signals.
- Connections between the 20-pin dual row connector (labeled **OS1**) of the camera and the 100-pin connector of the GEN-DIG-BRD/R/_ are as follows:

DALSA CL-E2-1024A (20-pin dual row connector - OS1)			**GEN-DIG-BRD/R/_ (100-pin 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
LVALB	20	→	HSYNC, INPUT, -	34

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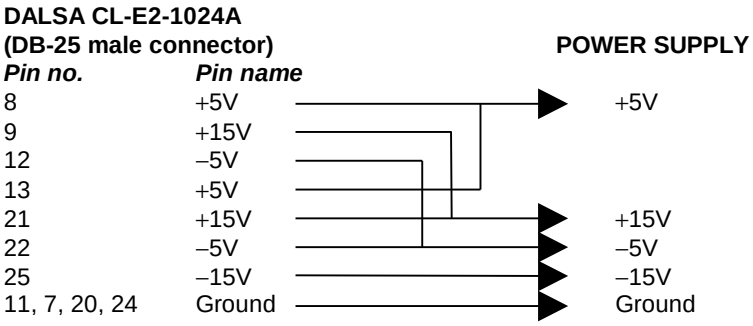
Cabling Requirements (continued)

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

DALSA CL-E2-1024A (DB-25 male connector)			**GEN-DIG-BRD/R/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
EXSYNC	17	←	EXPOSURE, OUTPUT, 1+	95
EXSYNCB	04	←	EXPOSURE, OUTPUT, 1-	96
STGSEL	05	←	USER, OUTPUT, 0+	91
STGSELB	18	←	USER, OUTPUT, 0-	92
GROUND	07		GROUND	50*
GROUND	11		GROUND	37*
GROUND	20		GROUND	38*
GROUND	24		GROUND	50*

* Any pin can be used at any position: all grounds are connected on the GEN-DIG-BRD/R/_.

- 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.

Mode 2: Variable line scan rate

- IMG-7W2-TO-5BNC and DBHD100-TO-OPEN cables, and GEN/DIG/BRD/R/_ board required for digital data, synchronization and control signals.
- 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*

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