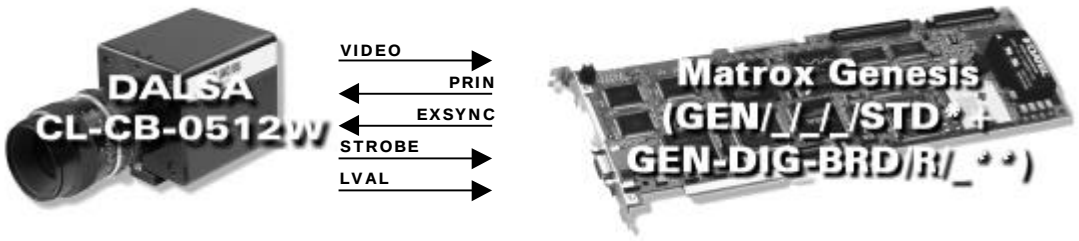
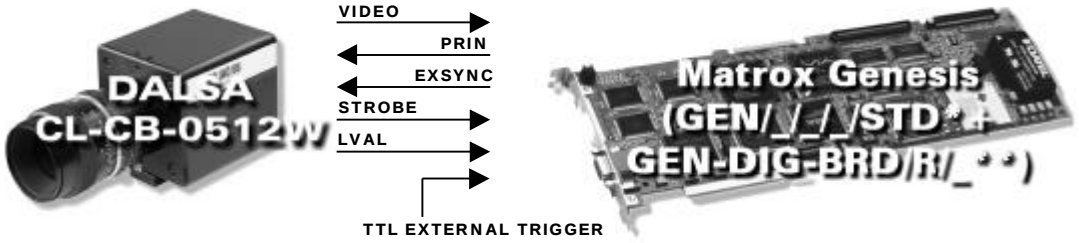
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

DALSA CL-CB-0512W

May 21, 1999

Camera Descriptions	• 512 × 8-bit. • Single channel RS-422 digital video. • External synchronization required. • Exposure control. • Maximum data rate: 20 MHz.
Interface modes	• Fixed line scan rate, variable line scan rate (binning, no binning)
Camera Interface Briefs	**Mode 1: Fixed line scan rate**  • 512 × 8-bit (no binning), 256 × 8-bit (binning). • Single channel RS-422 digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by the frequency of the EXPOSURE1 (EXSYNC) signal. • Matrox Genesis sending EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and EXPOSURE2 (PRIN) signal controls exposure time. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 20 MHz - no binning, 10 MHz - binning), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLCBDEL3.DCF (no binning) • DCF used: CLCBDEL4.DCF (binning) ***Matrox Genesis Main Board with Grab Module** ****Matrox RS-422 Digital Data Input Board** **Mode 2: Variable line scan rate**  • 512 × 8-bit (no binning), 256 × 8-bit (binning). • Single channel RS-422 digital video. • 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. ***Matrox Genesis Main Board with Grab Module** ****Matrox RS-422 Digital Data Input Board** (Briefs continued)

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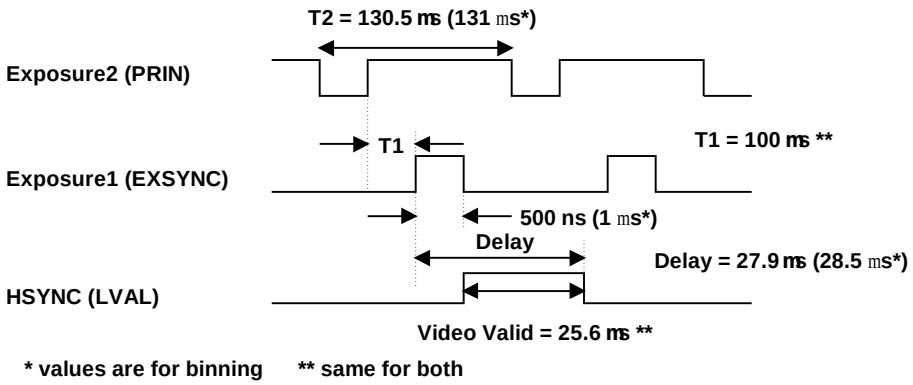
Camera Interface Briefs (continued)	• Matrox Genesis sending EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and EXPOSURE2 (PRIN) signal controls exposure time. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 20 MHz - no binning, 10 MHz - binning), HSYNC (LVAL), and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLCBDAE3.DCF (no binning) • DCF used: CLCBDAE4.DCF (binning)
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. • **Line rate**: The EXPOSURE2 (PRIN) period in the DCF specifies the line rate of the camera. The EXPOSURE2 (PRIN) period is currently set to **2610 pixels**. With a **20 MHz** pixel clock, this translates to a **7.7 kHz** line rate (**7.6 kHz** for binning). • **Virtual frame rate**: The virtual frame rate for the current settings of the DCF is **14.9 Hz (14.9 Hz** for binning**)**. • **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 **100 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 timer is 16-bit wide, the maximum exposure time is calculated to be 65536/20 MHz = **3.27 ms (6.55 ms** for binning**)**. For proper operation, the exposure signal must remain inactive for a minimum of 6 clock pulses before being asserted. Therefore the minimum exposure time is **300 ns (600 ns** for binning**)**. 

Camera Interface Details (continued)

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 (100 ns** for binning**)**.

Mode 2 : Variable line scan rate

- Once it has received the external trigger signal, Matrox Genesis sends the EXPOSURE2 (PRIN) signal to the camera to initiate exposure. Matrox Genesis will send the EXPOSURE1 (EXSYNC) signal to the camera following a delay that is equal to the desired exposure time. A short (constant) 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 rates are variable and controlled by the frequency of the external trigger signal.
- **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

- DBHD100-TO-OPEN cable and GEN/DIG/BRD/R/_ board required for digital data, synchronization and control signals.
- Connections between the 25-pin connector (**OS1**) of the camera and the 100-pin connector of the GEN-DIG-BRD/R/_ are as follows:

DALSA CL-CB-0512W (25-pin connector - OS1)			**GEN-DIG-BRD/R/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D7 (MSB)	01	→	DATA, INPUT, 7+	15
D7B	14	→	DATA, INPUT, 7-	16
D6	02	→	DATA, INPUT, 6+	13
D6B	15	→	DATA, INPUT, 6-	14
D5	03	→	DATA, INPUT, 5+	11
D5B	16	→	DATA, INPUT, 5-	12
D4	04	→	DATA, INPUT, 4+	09
D4B	17	→	DATA, INPUT, 4-	10
D3	05	→	DATA, INPUT, 3+	07
D3B	18	→	DATA, INPUT, 3-	08
D2	06	→	DATA, INPUT, 2+	05
D2B	19	→	DATA, INPUT, 2-	06
D1	07	→	DATA, INPUT, 1+	03
D1B	20	→	DATA, INPUT, 1-	04

continued

Cabling Requirements (continued)

DALSA CL-CB-0512W (25-pin connector – OS1)			GEN-DIG-BRD/R/_ (100-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D0	08	→	DATA, INPUT, 0+	01
D0B	21	→	DATA, INPUT, 0-	02
STROBE	09	→	CLOCK, INPUT, -	39
STROBEB	22	→	CLOCK, INPUT, +	40
LVAL+	10	→	HSYNC, INPUT, +	33
LVAL-	23	→	HSYNC, INPUT, -	34

- Connections between the 15-pin female connector (**Control**) of the camera and the 100-pin connector of the GEN-DIG-BRD/R/_ are as follows:

DALSA CL-CB-0512W (DB-15 connector)			GEN-DIG-BRD/R/_ (100-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
EXSYNC	12	←	EXPOSURE1, OUTPUT, +	95
EXSYNCB	04	←	EXPOSURE1, OUTPUT, -	96
PRIN	05	←	EXPOSURE2, OUTPUT, +	97
PRINB	13	←	EXPOSURE2, OUTPUT, -	98
BIN	09	←	USER, OUTPUT, 1+	93
BINB	01	←	USER, OUTPUT, 1-	94

- Connections between the 15-pin male power connector of the camera and the power supply are as described in the DALSA camera manual.

Mode 2: Variable line scan rate

- DBHD100-TO-OPEN and IMG-7W2-TO-5BNC cables, and GEN/DIG/BRD/R/_ board required for external trigger, digital data, synchronization and control signals.
- TTL external trigger source should be connected to the TTL trigger input of 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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