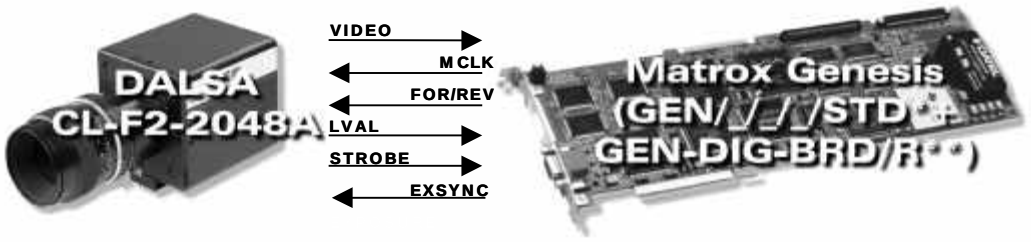
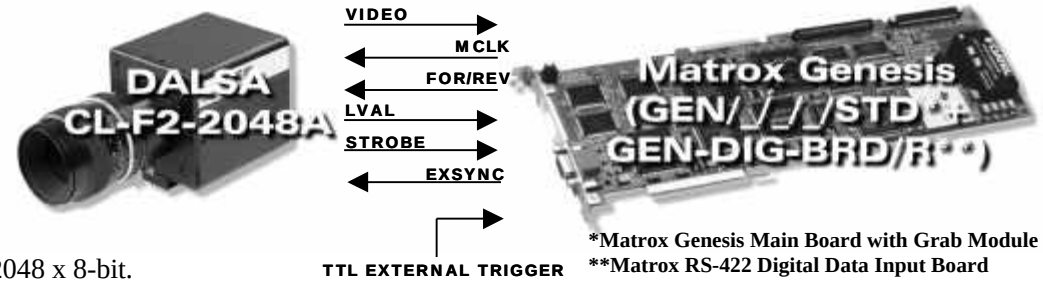
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

DALSA CL-F2-2048A

October 5, 1998

Camera Descriptions	• 2048 x 8-bit. • Single channel RS-422 digital video output. • 96 TDI stages. • External synchronization required. • Maximum data rate: 15 MHz.
Interface mode	• 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 RS-422 Digital Data Input Board** • 2048 x 8-bit. • Single channel RS-422 digital video output. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and is determined by frequency of EXSYNC signal. • Matrox Genesis sending RS-422 USER0 (FOR/REV), RS-422 MASTER CLOCK (MCLK) and RS-422 EXPOSURE1 (EXSYNC) signals to camera; the EXPOSURE1 signal initiates line readout. • Matrox Genesis receiving RS-422 PIXEL CLOCK (STROBE @ 15 MHz), RS-422 HSYNC (LVAL) and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLF2DL.DCF **Mode 2: Variable line scan rate**  ***Matrox Genesis Main Board with Grab Module** ****Matrox RS-422 Digital Data Input Board** • 2048 x 8-bit. • Single channel RS-422 digital video output. • 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 RS-422 USER0 (FOR/REV), RS-422 MASTER CLOCK (MCLK) and RS-422 EXPOSURE1 (EXSYNC) signals to camera; the EXPOSURE1 initiates line readout. • Matrox Genesis receiving RS-422 PIXEL CLOCK (STROBE @ 15 MHz), RS-422 HSYNC (LVAL) and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CLF2DAL.DCF

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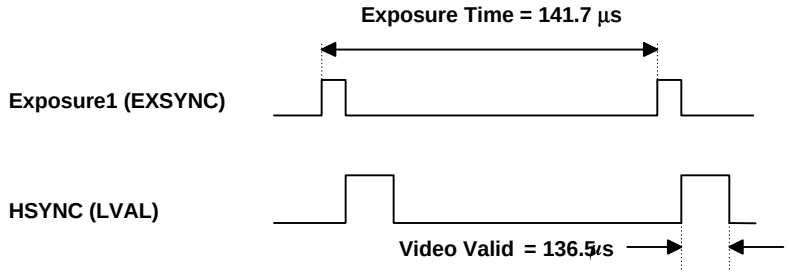
Camera Interface Details

Mode 1: Fixed line scan rate

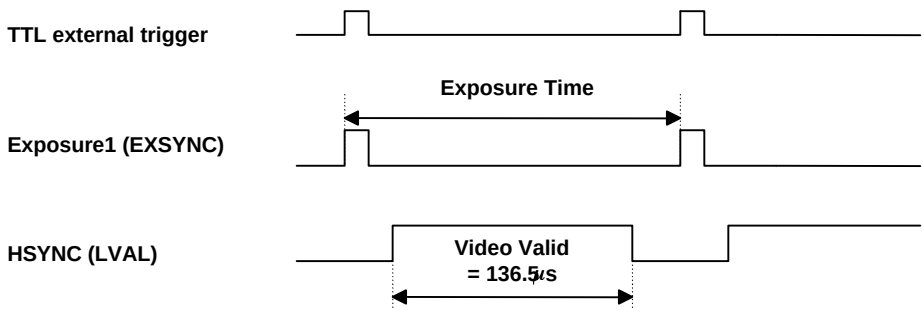
- Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the EXPOSURE1 (EXSYNC) signal and after a short (constant) delay initiates line readout.
- **Line rate**: The EXPOSURE1 (EXSYNC) frequency in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) frequency is currently set to **2125 pixels**. With a **15 MHz** pixel clock, this translate to a **7.06 kHz** line rate.
- **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 **141.7 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 65536/15 MHz = **4.37 ms**. The maximum line rate of the camera is **7.06 kHz**, therefore the minimum exposure time is **141.7 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 **66.7 ns**.
- **Scan direction selection**: The direction of the scan direction is controlled by the USER0 (FOR/REV) signal. The USER0 (FOR/REV) 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 additionla 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 rate**: The line rate is variable and controlled by the frequency of the external trigger signal.
- **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 **141.7 µs**.

Camera Interface Details (continued)



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 Forward/Reverse (FOR/REV), and using GEN-TO-DALSA/16 will require changing the polarity of EXPOSURE2 to control Forward/Reverse (FOR/REV).
- 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-F2-2048A (20-pin dual row connector - OS1)			**GEN-DIG-BRD/R (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
LVALB	20	→	HSYNC, INPUT, -	34

*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.

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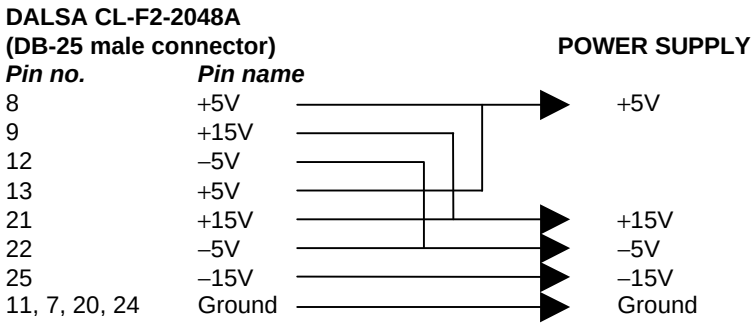
Cabling Requirements (continued)

- 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-F2-2048A (DB-25 male connector)			**GEN-DIG-BRD/R (GEN/CBL/OPEN connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
MCLK	06	←	CLOCK, OUTPUT, +	89
MCLKB	19	←	CLOCK, OUTPUT, -	90
EXSYNC	17	←	EXPOSURE, OUTPUT, 1+	95
EXSYNCB	04	←	EXPOSURE, OUTPUT, 1-	96
FOR/REV	05	←	USER, OUTPUT, 0+	91
FOR/REV	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 cable required for TTL external trigger source and GEN/DIG/BRD/R 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*

Corporate Headquarters:
Canada and U.S.A.
Matrox Electronic Systems Ltd.
1055 St.Regis Blvd.
Dorval, Quebec, Canada
H9P 2T4
Tel: (514) 685-7230
Fax: (514) 822-6273
GEN-CID-045

MATROX IMAGING