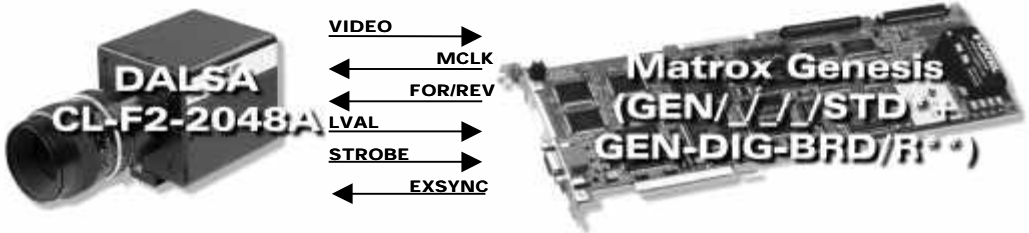
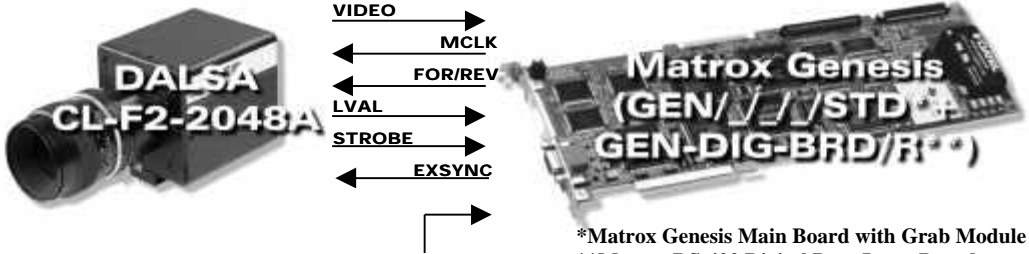


# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

DALSA CL-F2-2048A

October 5, 1998

<b>Camera Descriptions</b>	<ul style="list-style-type: none"> <li>• 2048 x 8-bit.</li> <li>• Single channel RS-422 digital video output.</li> <li>• 96 TDI stages.</li> <li>• External synchronization required.</li> <li>• Maximum data rate: 15 MHz.</li> </ul>
<b>Interface mode</b>	<ul style="list-style-type: none"> <li>• Fixed line scan rate, variable line scan rate</li> </ul>
<b>Camera Interface Briefs</b>	<p><b>Mode 1: Fixed line scan rate</b></p>  <p>*Matrox Genesis Main Board with Grab Module  **Matrox RS-422 Digital Data Input Board</p> <ul style="list-style-type: none"> <li>• 2048 x 8-bit.</li> <li>• Single channel RS-422 digital video output.</li> <li>• DCF configured for 512 lines per virtual frame.</li> <li>• Line scan rate is fixed and is determined by frequency of EXSYNC signal.</li> <li>• 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.</li> <li>• 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.</li> <li>• DCF used: <a href="#">CLF2DL.DCF</a></li> </ul> <p><b>Mode 2: Variable line scan rate</b></p>  <p>*Matrox Genesis Main Board with Grab Module  **Matrox RS-422 Digital Data Input Board</p> <ul style="list-style-type: none"> <li>• 2048 x 8-bit.</li> <li>• Single channel RS-422 digital video output.</li> <li>• DCF configured for 512 lines per virtual frame.</li> <li>• Line scan rate is variable and is controlled by external trigger signal.</li> <li>• Matrox Genesis receiving TTL external trigger.</li> <li>• 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.</li> <li>• 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.</li> <li>• DCF used: <a href="#">CLF2DAL.DCF</a></li> </ul>

# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

DALSA CL-F2-2048A

October 5, 1998

<b>Camera Interface Details</b>	<p><b>Mode 1: Fixed line scan rate</b></p> <ul style="list-style-type: none"> <li>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.</li> <li><b>Line rate:</b> The EXPOSURE1 (EXSYNC) frequency in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) frequency is currently set to <b>2125 pixels</b>. With a <b>15 MHz</b> pixel clock, this translate to a <b>7.06 kHz</b> line rate.</li> <li><b>Exposure time:</b> The time between the rising edges of the EXPOSURE1 (EXSYNC) signal is the exposure time. The default exposure time for this DCF is <b>141.7 <math>\mu</math>s</b>. 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 <b>imCamControl()</b> or with the MIL digitizer control function <b>MdigControl()</b>. Refer to the appropriate manual or user guide for additional information.</li> <li><b>Maximum / minimum exposure time:</b> Since the Matrox Genesis timer is 16-bit wide, the maximum exposure time is calculated to be <math>65536/15 \text{ MHz} = 4.37 \text{ ms}</math>. The maximum line rate of the camera is <b>7.06 kHz</b>, therefore the minimum exposure time is <b>141.7 <math>\mu</math>s</b>.</li> <li><b>Smallest exposure time increment:</b> The pixel clock is the reference clock that the exposure time is being set by. The smallest increment of the exposure time is <b>66.7 ns</b>.</li> <li><b>Scan direction selection:</b> 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 <b>imCamControl()</b> or with the MIL digitizer control function <b>MdigControl()</b>. Refer to the appropriate manual or user guide for additional information.</li> </ul> <div data-bbox="548 1150 1323 1417"> <p>Exposure Time = 141.7 <math>\mu</math>s</p> <p>Exposure1 (EXSYNC)</p> <p>HSYNC (LVAL)</p> <p>Video Valid = 136.5 <math>\mu</math>s</p> </div> <p><b>Mode 2 : Variable line scan rate</b></p> <ul style="list-style-type: none"> <li>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.</li> <li><b>Line rate:</b> The line rate is variable and controlled by the frequency of the external trigger signal.</li> <li><b>Exposure time:</b> 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.</li> <li><b>Maximum / minimum exposure time:</b> The maximum exposure time is equal to the maximum delay between rising edges of the external trigger signal. The minimum exposure time is <b>141.7 <math>\mu</math>s</b>.</li> </ul>
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# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

DALSA CL-F2-2048A

October 5, 1998

Camera Interface Details (continued)	<div><div>TTL external trigger</div><div>Exposure Time</div><div>Exposure1 (EXSYNC)</div><div>HSYNC (LVAL)</div><div>Video Valid = 136.5µs</div></div>																																																																																				
Cabling Requirements	<div><div>Mode 1: Fixed line scan rate</div><div><ul style="list-style-type: none"><li>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).</li><li>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:</li></ul></div><div><div><div>DALSA CL-F2-2048A</div><div>(20-pin dual row connector - OS1)</div><table><tr><th>Pin name</th><th>Pin no.</th></tr><tr><td>D7</td><td>01</td></tr><tr><td>D7B</td><td>02</td></tr><tr><td>D6</td><td>03</td></tr><tr><td>D6B</td><td>04</td></tr><tr><td>D5</td><td>05</td></tr><tr><td>D5B</td><td>06</td></tr><tr><td>D4</td><td>07</td></tr><tr><td>D4B</td><td>08</td></tr><tr><td>D3</td><td>09</td></tr><tr><td>D3B</td><td>10</td></tr><tr><td>D2</td><td>11</td></tr><tr><td>D2B</td><td>12</td></tr><tr><td>D1</td><td>13</td></tr><tr><td>D1B</td><td>14</td></tr><tr><td>D0</td><td>15</td></tr><tr><td>D0B</td><td>16</td></tr><tr><td>STROBE</td><td>17</td></tr><tr><td>STROBEB</td><td>18</td></tr><tr><td>LVAL</td><td>19</td></tr><tr><td>LVALB</td><td>20</td></tr></table></div><div><div>GEN-DIG-BRD/R</div><div>(GEN/CBL/OPEN connector)</div><table><tr><th>Pin name</th><th>Pin no.</th></tr><tr><td>DATA, INPUT, 7+</td><td>15</td></tr><tr><td>DATA, INPUT, 7-</td><td>16</td></tr><tr><td>DATA, INPUT, 6+</td><td>13</td></tr><tr><td>DATA, INPUT, 6-</td><td>14</td></tr><tr><td>DATA, INPUT, 5+</td><td>11</td></tr><tr><td>DATA, INPUT, 5-</td><td>12</td></tr><tr><td>DATA, INPUT, 4+</td><td>09</td></tr><tr><td>DATA, INPUT, 4-</td><td>10</td></tr><tr><td>DATA, INPUT, 3+</td><td>07</td></tr><tr><td>DATA, INPUT, 3-</td><td>08</td></tr><tr><td>DATA, INPUT, 2+</td><td>05</td></tr><tr><td>DATA, INPUT, 2-</td><td>06</td></tr><tr><td>DATA, INPUT, 1+</td><td>03</td></tr><tr><td>DATA, INPUT, 1-</td><td>04</td></tr><tr><td>DATA, INPUT, 0+</td><td>01</td></tr><tr><td>DATA, INPUT, 0-</td><td>02</td></tr><tr><td>CLOCK, INPUT, -</td><td>40*</td></tr><tr><td>CLOCK, INPUT, +</td><td>39*</td></tr><tr><td>HSYNC, INPUT, +</td><td>33</td></tr><tr><td>HSYNC, INPUT, -</td><td>34</td></tr></table></div></div></div>	Pin name	Pin no.	D7	01	D7B	02	D6	03	D6B	04	D5	05	D5B	06	D4	07	D4B	08	D3	09	D3B	10	D2	11	D2B	12	D1	13	D1B	14	D0	15	D0B	16	STROBE	17	STROBEB	18	LVAL	19	LVALB	20	Pin name	Pin no.	DATA, INPUT, 7+	15	DATA, INPUT, 7-	16	DATA, INPUT, 6+	13	DATA, INPUT, 6-	14	DATA, INPUT, 5+	11	DATA, INPUT, 5-	12	DATA, INPUT, 4+	09	DATA, INPUT, 4-	10	DATA, INPUT, 3+	07	DATA, INPUT, 3-	08	DATA, INPUT, 2+	05	DATA, INPUT, 2-	06	DATA, INPUT, 1+	03	DATA, INPUT, 1-	04	DATA, INPUT, 0+	01	DATA, INPUT, 0-	02	CLOCK, INPUT, -	40*	CLOCK, INPUT, +	39*	HSYNC, INPUT, +	33	HSYNC, INPUT, -	34
Pin name	Pin no.																																																																																				
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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.

# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

DALSA CL-F2-2048A

October 5, 1998

### 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:

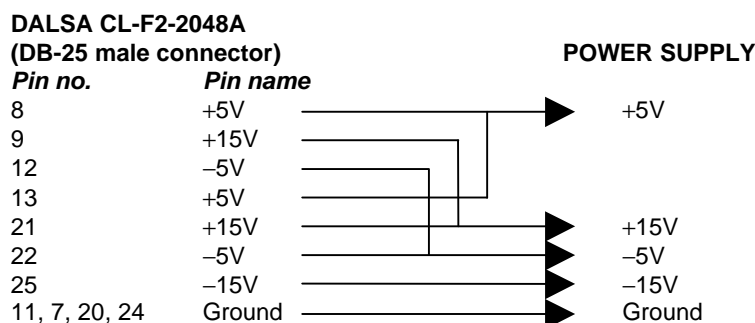
**DALSA CL-F2-2048A**  
(DB-25 male connector)

**GEN-DIG-BRD/R**  
(GEN/CBL/OPEN connector)

<i>Pin name</i>	<i>Pin no.</i>		<i>Pin name</i>	<i>Pin no.</i>
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*

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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