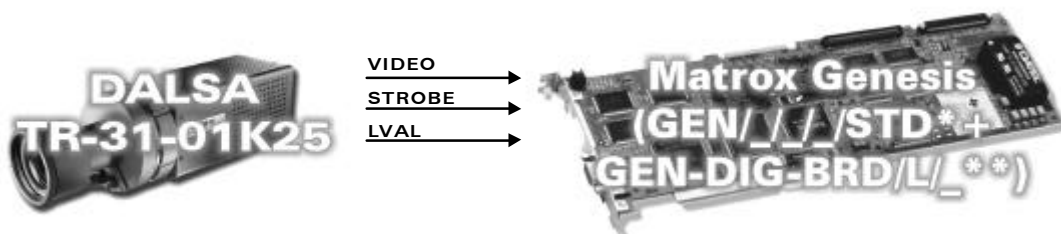
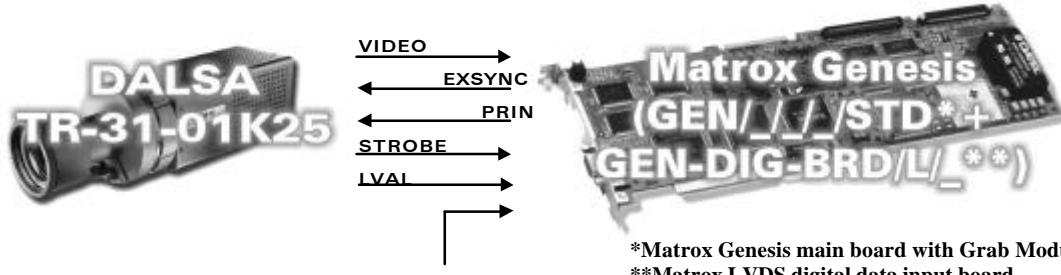


# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

**DALSA TR-31-01k25**

**July 24, 2000**

<b>Camera Descriptions</b>	<ul style="list-style-type: none"> <li>1024 x 8-bit (RGB).</li> <li>3-channel LVDS digital video output.</li> <li>Internal and external exposure control.</li> <li>Maximum data rate per output: 25 MHz.</li> </ul>
<b>Interface mode</b>	<ul style="list-style-type: none"> <li>Fixed line scan rate (programmable exposure mode, external trigger control), variable line scan rate</li> </ul>
<b>Camera Interface Briefs</b>	<p><b>Mode 1: Fixed line scan rate (programmable exposure mode)</b></p>  <p>*Matrox Genesis main board with Grab Module  **Matrox LVDS digital data input board</p> <ul style="list-style-type: none"> <li>1024 x 8-bit (RGB).</li> <li>3-channels LVDS digital video.</li> <li>DCF configured for 512 lines per virtual frame.</li> <li>Line scan rate is fixed, exposure time controlled by camera serial interface control.</li> <li>Matrox Genesis receiving PIXEL CLOCK (STROBE @ 25MHz), HSYNC (LVAL) and video signals from camera.</li> <li>DCF used: <a href="#">GTR31FI.DCF</a></li> </ul> <p><b>Mode 2: Fixed line scan rate (external trigger control)</b></p>  <p>*Matrox Genesis main board with Grab Module  **Matrox LVDS digital data input board</p> <ul style="list-style-type: none"> <li>1024 x 8-bit (RGB).</li> <li>3-channels LVDS digital video.</li> <li>DCF configured for 512 lines per virtual frame.</li> <li>Line scan rate is fixed and determined by frequency of EXPOSURE1 (EXSYNC) signal.</li> <li>Matrox Genesis sending EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) signals to camera: EXPOSURE1 (EXSYNC) signal initiates line readout and EXPOSURE2 (PRIN) signal controls the exposure time.</li> <li>Matrox Genesis receiving PIXEL CLOCK (STROBE @ 25MHz) and HSYNC (LVAL) signals from camera.</li> <li>DCF used: <a href="#">GTR31FE.DCF</a></li> </ul>

# Application Note:

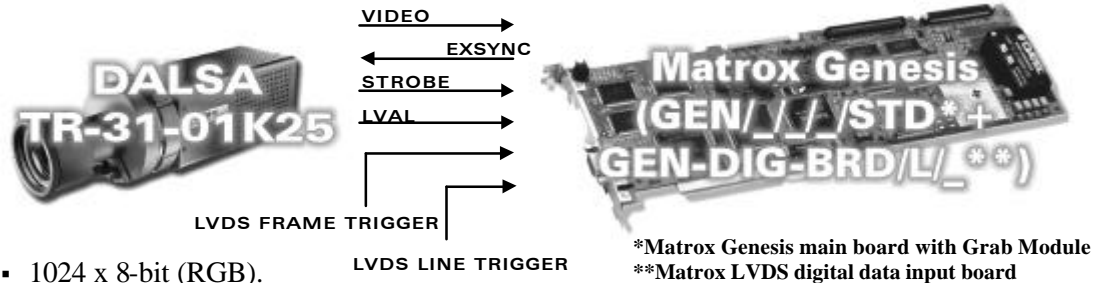
## Interfacing non-standard cameras to Matrox Genesis

DALSA TR-31-01k25

July 24, 2000

### Camera Interface Briefs (Continued)

#### Mode 3: Variable line scan (level exposure mode)



- 1024 x 8-bit (RGB).
- 3-channels LVDS digital video.
- DCF configured for 500 lines per virtual frame.
- Line scan rate is variable and controlled by external frame trigger signal frequency.
- Number of lines per virtual frame is fixed and determined by external line trigger signal (lines are grabbed when trigger is active).
- Matrox Genesis receiving external LVDS trigger signals (frame and line).
- Matrox Genesis sending EXPOSURE1 (EXSYNC) signals to camera to initiate exposure and line readout.
- Matrox Genesis receiving PIXEL CLOCK (STROBE @ 25MHz) and HSYNC (LVAL) signals from camera.
- DCF used: [GTR31V.DCF](#)

### Camera Interface Details

#### Mode 1: Fixed line scan rate (programmable exposure mode)

- Matrox Genesis is operating in a slave mode (free running mode) and receiving PIXEL CLOCK (STROBE @ 25 MHz), HSYNC (LVAL) and video signals from camera. The line rate and exposure period are controlled by camera through the RS-232 serial interface.
- **Line rate:** The line rate is determined by the EXSYNC frequency. In programmable exposure mode (free running mode), the EXSYNC signal is internal to the camera and set using the Camera configuration settings (RS-232). The line rate (frequency) can be set between **300 Hz** and **21 000 Hz**.
- **Exposure time:** The exposure time is inversely proportionate to the line rate (EXSYNC) setting (ssf).
- **Maximum/minimum exposure time:** The maximum exposure time is **3.3 ms** and the minimum exposure time is **47.6 μs**.
- **Camera configuration settings (RS-232 settings):** refer to the camera manual for more information.

Setting Type	RS232 Command
ssm (set sync mode)	6
sa (set aperature)	100
ssf (set sync frequency)	xxxx (Hz)

# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

DALSA TR-31-01k25

July 24, 2000

### Camera Interface Details (Continued)

#### Mode 2: Fixed line scan rate (programmable exposure mode)

- Matrox Genesis sends the periodic EXPOSURE1 (EXSYNC) signal to the camera; the EXPOSURE1 (EXSYNC) signal initiates and controls exposure time.
- Line rate:** The line rate is determined by the EXSYNC frequency. The EXPOSURE1 (EXSYNC) signal period is currently set to **2510 pixels**. With a **25 MHz** pixel clock, this translates to a **9.96 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 **100.4 µs**. In order to change 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 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  $65536/25 \text{ MHz} = 2.62 \text{ ms}$ . (**3.3 ms** for camera as per manual). The maximum line rate of the camera is **21 kHz**, therefore the minimum exposure time is **47.6 µs**.
- Camera configuration settings (RS-232 settings):** refer to the camera manual for more information

Setting Type	RS232 Command
ssm (set sync mode)	5
sa (set aperture)	100
ssf (set sync frequency)	xxxx (Hz)

#### Mode 3: Variable line scan (level exposure mode)

- Once it has received the external frame and line triggers, Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera. A short 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 determined by the line trigger frequency.
- Exposure time:** The time between the falling and rising edge (low level) of the EXPOSURE1 (EXSYNC) signal is the exposure time. The default exposure time for this DCF is **320 µs**. In order to change 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 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  $65536/25 \text{ MHz} = 2.62 \text{ ms}$ . (**3.3 ms** for camera as per manual). The maximum line rate of the camera is **21 kHz**, therefore the minimum exposure time is **47.6 µs**.

# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

**DALSA TR-31-01k25**

**July 24, 2000**

Camera Interface Details (continued)	<ul style="list-style-type: none"><li>▪ <b>Camera configuration settings (RS-232 settings):</b> refer to the camera manual for more information</li></ul> <table><tr><th>Setting Type</th><th>RS232 Command</th></tr><tr><td>ssm (set sync mode)</td><td>3</td></tr><tr><td>sa (set aperature)</td><td>100</td></tr><tr><td>ssf (set sync frequency)</td><td>xxxx (Hz)</td></tr></table>	Setting Type	RS232 Command	ssm (set sync mode)	3	sa (set aperature)	100	ssf (set sync frequency)	xxxx (Hz)																																																																																																																																														
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Cabling Requirements	<p><b>Mode 1: Fixed line scan rate (programmable exposure mode)</b></p> <ul style="list-style-type: none"><li>▪ DBHD68-TO-OPEN and DBHD100-TO-OPEN cables, and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.</li><li>▪ Connections between the 68-pin connector (<b>MDR68F</b>) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:</li></ul> <table><tr><th colspan="2"><b>DALSA TR-31-01k25</b> (68-pin connector – MDR68F)</th><th></th><th colspan="2"><b>GEN-DIG-BRD/L/_</b> (100-pin connector)</th></tr><tr><th><i>Pin name</i></th><th><i>Pin no.</i></th><th></th><th><i>Pin name</i></th><th><i>Pin no.</i></th></tr><tr><td>G7 (MSB)</td><td>05</td><td>→</td><td>DATA, INPUT, 15+</td><td>31</td></tr><tr><td>G7B</td><td>39</td><td>→</td><td>DATA, INPUT, 15-</td><td>32</td></tr><tr><td>G6</td><td>06</td><td>→</td><td>DATA, INPUT, 14+</td><td>29</td></tr><tr><td>G6B</td><td>40</td><td>→</td><td>DATA, INPUT, 14-</td><td>30</td></tr><tr><td>G5</td><td>07</td><td>→</td><td>DATA, INPUT, 13+</td><td>27</td></tr><tr><td>G5B</td><td>41</td><td>→</td><td>DATA, INPUT, 13-</td><td>28</td></tr><tr><td>G4</td><td>08</td><td>→</td><td>DATA, INPUT, 12+</td><td>25</td></tr><tr><td>G4B</td><td>42</td><td>→</td><td>DATA, INPUT, 12-</td><td>26</td></tr><tr><td>G3</td><td>09</td><td>→</td><td>DATA, INPUT, 11+</td><td>23</td></tr><tr><td>G3B</td><td>43</td><td>→</td><td>DATA, INPUT, 11-</td><td>24</td></tr><tr><td>G2</td><td>10</td><td>→</td><td>DATA, INPUT, 10+</td><td>21</td></tr><tr><td>G2B</td><td>44</td><td>→</td><td>DATA, INPUT, 10-</td><td>22</td></tr><tr><td>G1</td><td>11</td><td>→</td><td>DATA, INPUT, 9+</td><td>19</td></tr><tr><td>G1B</td><td>45</td><td>→</td><td>DATA, INPUT, 9-</td><td>20</td></tr><tr><td>G0</td><td>12</td><td>→</td><td>DATA, INPUT, 8+</td><td>17</td></tr><tr><td>G0B</td><td>46</td><td>→</td><td>DATA, INPUT, 8-</td><td>18</td></tr><tr><td>B7 (MSB)</td><td>15</td><td>→</td><td>DATA, INPUT, 23+</td><td>65</td></tr><tr><td>B7B</td><td>49</td><td>→</td><td>DATA, INPUT, 23-</td><td>66</td></tr><tr><td>B6</td><td>16</td><td>→</td><td>DATA, INPUT, 22+</td><td>63</td></tr><tr><td>B6B</td><td>50</td><td>→</td><td>DATA, INPUT, 22-</td><td>64</td></tr><tr><td>B5</td><td>17</td><td>→</td><td>DATA, INPUT, 21+</td><td>61</td></tr><tr><td>B5B</td><td>51</td><td>→</td><td>DATA, INPUT, 21-</td><td>62</td></tr><tr><td>B4</td><td>18</td><td>→</td><td>DATA, INPUT, 20+</td><td>59</td></tr><tr><td>B4B</td><td>52</td><td>→</td><td>DATA, INPUT, 20-</td><td>60</td></tr><tr><td>B3</td><td>19</td><td>→</td><td>DATA, INPUT, 19+</td><td>57</td></tr><tr><td>B3B</td><td>53</td><td>→</td><td>DATA, INPUT, 19-</td><td>58</td></tr><tr><td>B2</td><td>20</td><td>→</td><td>DATA, INPUT, 18+</td><td>55</td></tr><tr><td>B2B</td><td>54</td><td>→</td><td>DATA, INPUT, 18-</td><td>56</td></tr></table> <p>continued</p>	<b>DALSA TR-31-01k25</b> (68-pin connector – MDR68F)			<b>GEN-DIG-BRD/L/_</b> (100-pin connector)		<i>Pin name</i>	<i>Pin no.</i>		<i>Pin name</i>	<i>Pin no.</i>	G7 (MSB)	05	→	DATA, INPUT, 15+	31	G7B	39	→	DATA, INPUT, 15-	32	G6	06	→	DATA, INPUT, 14+	29	G6B	40	→	DATA, INPUT, 14-	30	G5	07	→	DATA, INPUT, 13+	27	G5B	41	→	DATA, INPUT, 13-	28	G4	08	→	DATA, INPUT, 12+	25	G4B	42	→	DATA, INPUT, 12-	26	G3	09	→	DATA, INPUT, 11+	23	G3B	43	→	DATA, INPUT, 11-	24	G2	10	→	DATA, INPUT, 10+	21	G2B	44	→	DATA, INPUT, 10-	22	G1	11	→	DATA, INPUT, 9+	19	G1B	45	→	DATA, INPUT, 9-	20	G0	12	→	DATA, INPUT, 8+	17	G0B	46	→	DATA, INPUT, 8-	18	B7 (MSB)	15	→	DATA, INPUT, 23+	65	B7B	49	→	DATA, INPUT, 23-	66	B6	16	→	DATA, INPUT, 22+	63	B6B	50	→	DATA, INPUT, 22-	64	B5	17	→	DATA, INPUT, 21+	61	B5B	51	→	DATA, INPUT, 21-	62	B4	18	→	DATA, INPUT, 20+	59	B4B	52	→	DATA, INPUT, 20-	60	B3	19	→	DATA, INPUT, 19+	57	B3B	53	→	DATA, INPUT, 19-	58	B2	20	→	DATA, INPUT, 18+	55	B2B	54	→	DATA, INPUT, 18-	56
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# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

**DALSA TR-31-01k25**

**July 24, 2000**

Cabling Requirements (continued)	DALSA TR-31-01k25 (68-pin connector – MDR68F)		GEN-DIG-BRD/L/_ (100-pin connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	B1	21	→ DATA, INPUT, 17+	53
	B1B	55	→ DATA, INPUT, 17-	54
	B0	22	→ DATA, INPUT, 16+	51
	B0B	56	→ DATA, INPUT, 16-	52
	R7 (MSB)	25	→ DATA, INPUT, 7+	15
	R7B	59	→ DATA, INPUT, 7-	16
	R6	26	→ DATA, INPUT, 6+	13
	R6B	60	→ DATA, INPUT, 6-	14
	R5	27	→ DATA, INPUT, 5+	11
	R5B	61	→ DATA, INPUT, 5-	12
	R4	28	→ DATA, INPUT, 4+	09
	R4B	62	→ DATA, INPUT, 4-	10
	R3	29	→ DATA, INPUT, 3+	07
	R3B	63	→ DATA, INPUT, 3-	08
	R2	30	→ DATA, INPUT, 2+	05
	R2B	64	→ DATA, INPUT, 2-	06
	R1	31	→ DATA, INPUT, 1+	03
	R1B	65	→ DATA, INPUT, 1-	04
	R0	32	→ DATA, INPUT, 0+	01
	R0B	66	→ DATA, INPUT, 0-	02
	STROBE	33	→ CLOCK, INPUT, +	39
	STROBEB	67	→ CLOCK, INPUT, -	40
	LVAL	34	→ HSYNC, INPUT, +	33
	LVALB	68	→ HSYNC, INPUT, +	34
	<ul style="list-style-type: none"> <li>Connections between the 15-pin connector (<b>DB15F</b>) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:</li> </ul>			
	DALSA TR-31-01k25 (15-pin connector – DB15F)		GEN-DIG-BRD/L/_ (100-pin connector)	
	<i>Pin name</i>	<i>Pin no.</i>	<i>Pin name</i>	<i>Pin no.</i>
	EXSYNC	04	← EXPOSURE1, OUTPUT, +	95*
	EXSYNCB	12	← EXPOSURE1, OUTPUT, -	96*
	PRIN	05	← EXPOSURE2, OUTPUT, +	97*
	PRINB	13	← EXPOSURE2, OUTPUT, -	98*
	GND	08	-- GROUND	50
	* These connections are not required for this mode, however allows this cable to be used with all modes.			

# Application Note:

## Interfacing non-standard cameras to Matrox Genesis

**DALSA TR-31-01k25**

**July 24, 2000**

<b>Cabling Requirements (continued)</b>	<b>Mode 2: Fixed line scan rate (programmable exposure mode)</b>			
	<ul style="list-style-type: none"> <li>IMG-7W2-TO-5BNC and DBHD100-TO-OPEN cables, and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.</li> <li>TTL external trigger source should be connected to the TTL trigger input of the IMG-7W2-TO-5BNC cable.</li> <li>Connections between the 68-pin connector (<b>MDR68F</b>) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as <i>Mode 1: Fixed line scan rate</i></li> </ul>			
	<b>Mode 3: Variable line scan (level exposure mode)</b>			
	<ul style="list-style-type: none"> <li>DBHD100-TO-OPEN cable and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.</li> <li>Connections between the 68-pin (<b>MDR68F</b>) and 15-pin (<b>DB15F</b>) connectors of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as <i>Mode 1: Fixed line scan rate</i> <b>EXCEPT</b> for <b>PRIN</b> signal to <b>EXPOSURE2</b> connection (<b>not required</b>) and the following addition connections:</li> </ul>			

EXTERNAL TRIGGER SOURCE		GEN-DIG-BRD/L/_ (100-pin connector)	
Name	Pin no.	Pin name	Pin no.
FRAME TRIGGER LVDS+	--	→ USER, INPUT, 1+	43
FRAME TRIGGER LVDS-	--	→ USER, INPUT, 1-	44
LINE TRIGGER LVDS+	--	→ TRIGGER, INPUT, +	47
LINE TRIGGER LVDS-	--	→ TRIGGER, INPUT, -	48

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 Imaging Applications at 514-822-6061 for assistance.

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