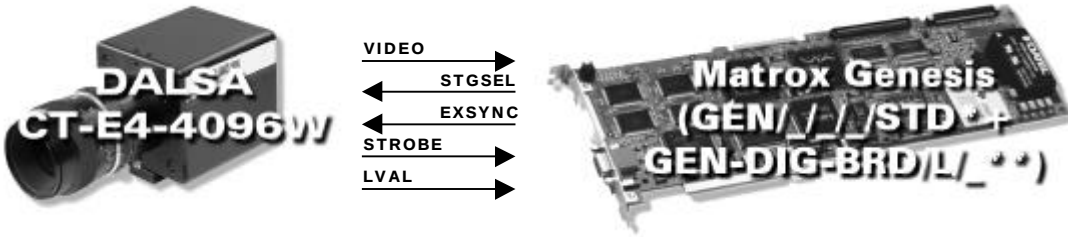
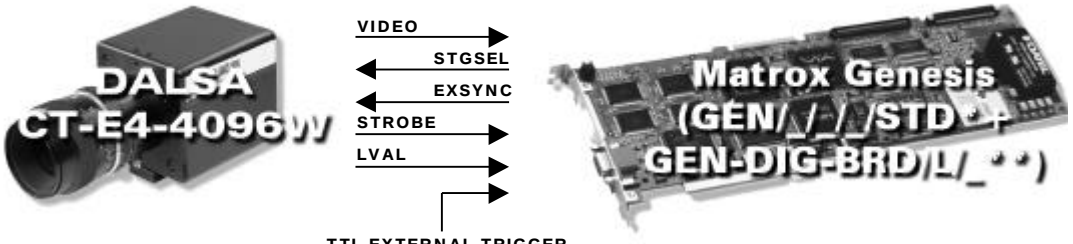
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

DALSA CT-E4-4096W

July 23, 1999

Camera Descriptions	• 4096 × 8-bit. • Quad channel LVDS digital video. • Selectable number of TDI stages. • External synchronization required. • Maximum data rate: 25 MHz per output.
Interface modes	• Fixed line scan rate, variable line scan
Camera Interface Briefs	**Mode 1: Fixed line scan rate**  *** Matrox Genesis Main Board and Genesis-LC with PNS # 5245 and 5246 respectively** **** Matrox LVDS Digital Data Input Board** • 4096 × 8-bit. • Quad channel LVDS 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 EXPOSURE1 (EXSYNC) and USER0 (STGSEL) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and the USER0 (STGSEL) signal controls number of TDI stages used. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 25 MHz), HSYNC (LVAL) and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CTE4DL.DCF **Mode 2: Variable line scan rate**  *** Matrox Genesis Main Board and Genesis-LC with PNS # 5245 and 5246 respectively** **** Matrox LVDS Digital Data Input Board** • 4096 × 8-bit. • Quad channel LVDS 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 sending EXPOSURE1 (EXSYNC) and USER0 (STGSEL) signals to camera; the EXPOSURE1 (EXSYNC) signal controls line readout and the USER0 (STGSEL) signal controls number of TDI stages used. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 25 MHz), HSYNC (LVAL) and video signals from camera; a high LVAL signal indicates valid pixels. • DCF used: CTE4DAL.DCF

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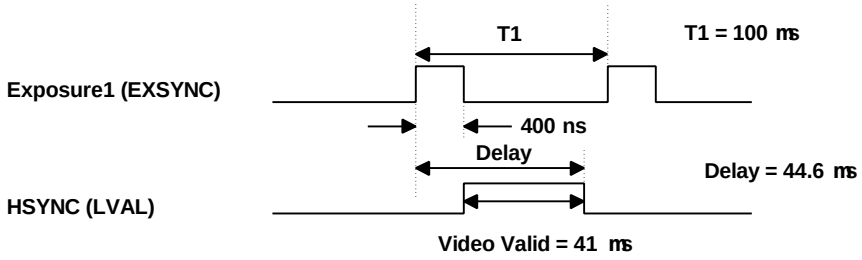
Camera Interface Details

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. **Note** that this camera model features inverted outputs. While additional software commands are require to invert the mirrored output, additional processing time is not required.
- **Line rate**: The EXPOSURE1 (EXSYNC) period in the DCF specifies the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **2510 pixels**. With a **25 MHz** pixel clock, this translates to a **10.0 kHz** line rate.
- **Virtual frame rate**: The virtual frame rate for the current settings of the DCF is **19.5 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 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 65536/25 MHz = **2.62 ms**. The maximum line rate of the camera is **23 kHz**, therefore the minimum exposure time is **43.3 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 **40 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 EXPOSURE1 (EXSYNC) signal to the camera to initiate exposure. 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. **Note** that this camera model features inverted outputs. While additional software commands are require to invert the mirrored output, additional processing time is not required.

Camera Interface Details (continued)

- **Line and virtual frame rate**: Line and virtual frame rates are 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 **43.3** ms.
- **Smallest exposure time:** Smallest exposure time is controlled by the external trigger signal.

Cabling Requirements

Mode 1: Fixed line scan rate

- DBHD100-TO-OPEN cable and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.
- Connections between the 37-pin connector (**OS1/OS2**) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:

DALSA CT-E4-4096W (37-pin connector – OS1/OS2)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D0	16	→	DATA, INPUT, 0+	01
D0B	35	→	DATA, INPUT, 0-	02
D1	15	→	DATA, INPUT, 1+	03
D1B	34	→	DATA, INPUT, 1-	04
D2	14	→	DATA, INPUT, 2+	05
D2B	33	→	DATA, INPUT, 2-	06
D3	13	→	DATA, INPUT, 3+	07
D3B	32	→	DATA, INPUT, 3-	08
D4	12	→	DATA, INPUT, 4+	09
D4B	31	→	DATA, INPUT, 4-	10
D5	11	→	DATA, INPUT, 5+	11
D5B	30	→	DATA, INPUT, 5-	12
D6	10	→	DATA, INPUT, 6+	13
D6B	29	→	DATA, INPUT, 6-	14
D7	09	→	DATA, INPUT, 7+	15
D7B	28	→	DATA, INPUT, 7-	16
D0	08	→	DATA, INPUT, 8+	17
D0B	27	→	DATA, INPUT, 8-	18
D1	07	→	DATA, INPUT, 9+	19
D1B	26	→	DATA, INPUT, 9-	20
D2	06	→	DATA, INPUT, 10+	21
D2B	25	→	DATA, INPUT, 10-	22
D3	05	→	DATA, INPUT, 11+	23
D3B	24	→	DATA, INPUT, 11-	24
D4	04	→	DATA, INPUT, 12+	25
D4B	23	→	DATA, INPUT, 12-	26
D5	03	→	DATA, INPUT, 13+	27
D5B	22	→	DATA, INPUT, 13-	28
D6	02	→	DATA, INPUT, 14+	29
D6B	21	→	DATA, INPUT, 14-	30
D7	01	→	DATA, INPUT, 15+	31
D7B	20		DATA, INPUT, 15-	32

continued

Cabling Requirements (continued)

DALSA CT-E4-4096W (37-pin connector – OS1/OS2)			GEN-DIG-BRD/L/_ (100-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
STROBE	17	→	CLOCK, INPUT, +	39
STROBEB	36	→	CLOCK, INPUT, -	40
LVAL	18	→	HSYNC, INPUT, +	33
LVALB	37	→	HSYNC, INPUT, -	34

- Connections between the 37-pin connector (**OS3/OS4**) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:

DALSA CT-E4-4096W (37-pin connector – OS3/OS4)			GEN-DIG-BRD/L/_ (100-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D0	16	→	DATA, INPUT, 16+	51
D0B	35	→	DATA, INPUT, 16-	52
D1	15	→	DATA, INPUT, 17+	53
D1B	34	→	DATA, INPUT, 17-	54
D2	14	→	DATA, INPUT, 18+	55
D2B	33	→	DATA, INPUT, 18-	56
D3	13	→	DATA, INPUT, 19+	57
D3B	32	→	DATA, INPUT, 19-	58
D4	12	→	DATA, INPUT, 20+	59
D4B	31	→	DATA, INPUT, 20-	60
D5	11	→	DATA, INPUT, 21+	61
D5B	30	→	DATA, INPUT, 21-	62
D6	10	→	DATA, INPUT, 22+	63
D6B	29	→	DATA, INPUT, 22-	64
D7	09	→	DATA, INPUT, 23+	65
D7B	28	→	DATA, INPUT, 23-	66
D0	08	→	DATA, INPUT, 24+	67
D0B	27	→	DATA, INPUT, 24-	68
D1	07	→	DATA, INPUT, 25+	69
D1B	26	→	DATA, INPUT, 25-	70
D2	06	→	DATA, INPUT, 26+	71
D2B	25	→	DATA, INPUT, 26-	72
D3	05	→	DATA, INPUT, 27+	73
D3B	24	→	DATA, INPUT, 27-	74
D4	04	→	DATA, INPUT, 28+	75
D4B	23	→	DATA, INPUT, 28-	76
D5	03	→	DATA, INPUT, 29+	77
D5B	22	→	DATA, INPUT, 29-	78
D6	02	→	DATA, INPUT, 30+	79
D6B	21	→	DATA, INPUT, 30-	80
D7	01	→	DATA, INPUT, 31+	81
D7B	20		DATA, INPUT, 31-	82

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Cabling Requirements (continued)

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

DALSA CT-E4-4096W (15-pin connector – Control)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
EXSYNC	12	←	EXPOSURE1, OUTPUT, +	95
EXSYNCB	04	←	EXPOSURE1, OUTPUT, -	96
STGSEL	05	←	USER, OUTPUT, 0+	91
STGSELB	13	←	USER, OUTPUT, 0-	92

- 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/L/_ board required for TTL 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*

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