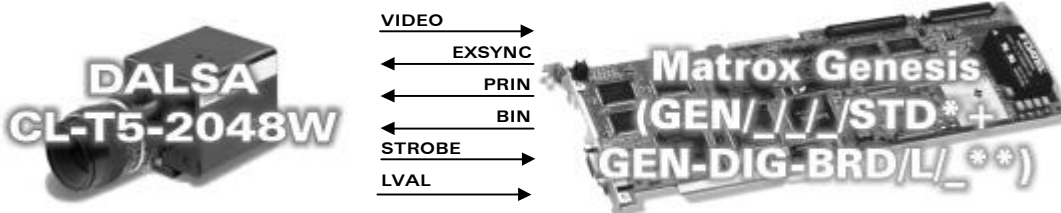# Application Note:
Interfacing non-standard cameras to Matrox Genesis

DALSA CL-T5-2048W
November 9, 2000

Camera Descriptions	• 2048 × 8-bit (RGB). • Three channel LVDS digital video output. • Up to 96 selectable TDI stages. • External synchronization required. • Exposure control. • Maximum data rate: 25 MHz per output.
Interface mode	• Fixed line scan rate, variable line scan
Camera Interface Briefs	**Mode 1: Fixed line scan rate** VIDEO · EXSYNC · PRIN · BIN · STROBE · LVAL *Matrox Genesis main board with grab module **Matrox LVDS digital data input board • 2048 × 8-bit (RGB). • Three 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 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 @ 25 MHz), HSYNC (LVAL) and video signals from camera; a high HSYNC (LVAL) signal indicates valid pixels. • DCFs used: CLT5DEL.DCF or CLT5DEL1.DCF (Color alignment) **Mode 2: Mode 2: Variable line scan rate** VIDEO · EXSYNC · PRIN · BIN · STROBE · LVAL TTL EXTERNAL TRIGGER • 2048 × 8-bit (RGB). • Three channel LVDS digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is variable and controlled by the external trigger signal frequency. • Matrox Genesis receiving TTL external trigger 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 @ 25 MHz), HSYNC (LVAL) and video signals from camera; a high HSYNC (LVAL) signal indicates valid pixels. • DCFs used: CLT5DAE.DCF or CLT5DAE1.DCF (Color alignment)

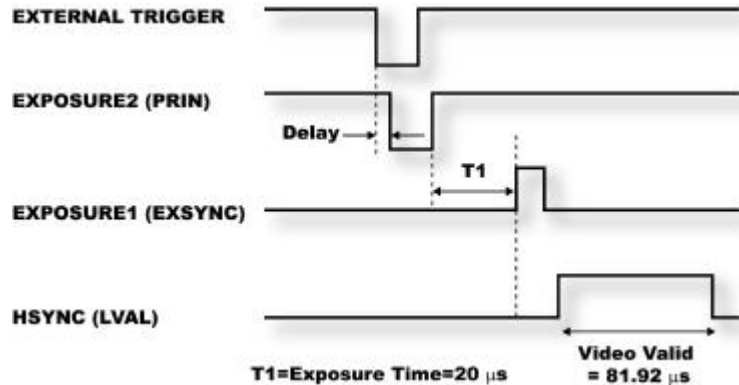|	
Camera Interface Details	**Mode 1: Fixed line scan rate mode** • Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the signal and after a short (constant) delay initiates line readout. • **Line rate**: The EXPOSURE2 (PRIN) period in the DCF specifies the line rate of the camera. The EXPOSURE2 (PRIN) period is currently set to **2610 pixels**. With a **25 MHz** pixel clock, this translates to a **9.96 kHz** line rate. • **Virtual frame rate**: for this mode equals **19.45 Hz**. • **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 **20 µs**. To adjust the exposure time, the width and deployment time of EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) must 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**. 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 equal to **240 ns**. • **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.** • **Timing diagram**:
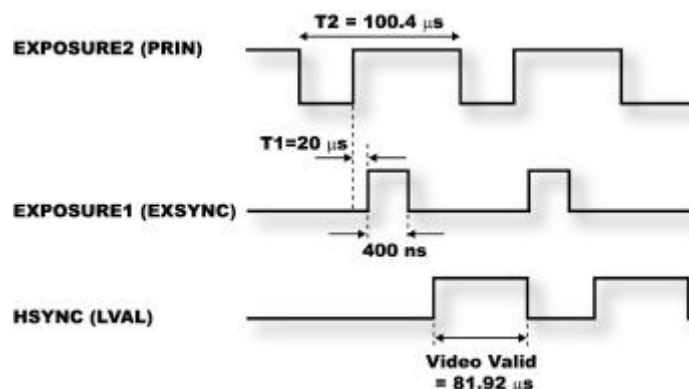
Mode 2: Variable line scan rate

• 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.

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, Minimum, Maximum, Smallest exposure time increments**: are the same as in Mode 1: *Fixed line scan rate* • **Timing diagram**:

Timing diagram showing EXTERNAL TRIGGER, EXPOSURE2 (PRIN), EXPOSURE1 (EXSYNC), HSYNC (LVAL), Delay, T1, Video Valid = 81.92 µs, T1=Exposure Time=20 µs

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 (**OSGreen/OSRed**) of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:

DALSA CL-T5-2048W

(37-pin connector – OSGreen/OSRed)

GEN-DIG-BRD/L/_

(100-pin connector)

Pin name	Pin no.		Pin name	Pin no.
RED0	16	→	DATA, INPUT, 0+	01
$\overline{RED0}$	35	→	DATA, INPUT, 0-	02
RED1	15	→	DATA, INPUT, 1+	03
$\overline{RED1}$	34	→	DATA, INPUT, 1-	04
RED2	14	→	DATA, INPUT, 2+	05
$\overline{RED2}$	33	→	DATA, INPUT, 2-	06
RED3	13	→	DATA, INPUT, 3+	07
$\overline{RED3}$	32	→	DATA, INPUT, 3-	08
RED4	12	→	DATA, INPUT, 4+	09
$\overline{RED4}$	31	→	DATA, INPUT, 4-	10
RED5	11	→	DATA, INPUT, 5+	11
$\overline{RED5}$	30	→	DATA, INPUT, 5-	12
RED6	10	→	DATA, INPUT, 6+	13
$\overline{RED6}$	29	→	DATA, INPUT, 6-	14
RED7	09	→	DATA, INPUT, 7+	15
$\overline{RED7}$	28	→	DATA, INPUT, 7-	16

continued

Application Note:
Interfacing non-standard cameras to Matrox Genesis

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DALSA CL-T5-2048W

November 9, 2000

	DALSA CL-T5-2048W			GEN-DIG-BRD/L/_	
Cabling Requirements (continued)	**(37-pin connector – OSGreen/OSRed)**			**(100-pin connector)**	
	Pin name	*Pin no.*		*Pin name*	*Pin no.*
	GREEN0	08	→	DATA, INPUT, 8+	17
	GREEN0	27	→	DATA, INPUT, 8-	18
	GREEN1	07	→	DATA, INPUT, 9+	19
	GREEN1	26	→	DATA, INPUT, 9-	20
	GREEN2	06	→	DATA, INPUT, 10+	21
	GREEN2	25	→	DATA, INPUT, 10-	22
	GREEN3	05	→	DATA, INPUT, 11+	23
	GREEN3	24	→	DATA, INPUT, 11-	24
	GREEN4	04	→	DATA, INPUT, 12+	25
	GREEN4	23	→	DATA, INPUT, 12-	26
	GREEN5	03	→	DATA, INPUT, 13+	27
	GREEN5	22	→	DATA, INPUT, 13-	28
	GREEN6	02	→	DATA, INPUT, 14+	29
	GREEN6	21	→	DATA, INPUT, 14-	30
	GREEN7	01	→	DATA, INPUT, 15+	31
	GREEN7	20	→	DATA, INPUT, 15-	32
	STROBE	17	→	CLOCK, INPUT, +	39
	STROBE	36	→	CLOCK, INPUT, -	40
	LVAL	18	→	HSYNC, INPUT, +	33
	LVAL	37	→	HSYNC, INPUT, -	34

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

Pin name	Pin no.		Pin name	Pin no.
BLUE0	16	→	DATA, INPUT, 16+	51
BLUE0	35	→	DATA, INPUT, 16-	52
BLUE1	15	→	DATA, INPUT, 17+	53
BLUE1	34	→	DATA, INPUT, 17-	54
BLUE2	14	→	DATA, INPUT, 18+	55
BLUE2	33	→	DATA, INPUT, 18-	56
BLUE3	13	→	DATA, INPUT, 19+	57
BLUE3	32	→	DATA, INPUT, 19-	58
BLUE4	12	→	DATA, INPUT, 20+	59
BLUE4	31	→	DATA, INPUT, 20-	60
BLUE5	11	→	DATA, INPUT, 21+	61
BLUE5	30	→	DATA, INPUT, 21-	62
BLUE6	10	→	DATA, INPUT, 22+	63
BLUE6	29	→	DATA, INPUT, 22-	64
BLUE7	09	→	DATA, INPUT, 23+	65
BLUE7	28	→	DATA, INPUT, 23-	66

continued

Cabling Requirements (continued)

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

DALSA CL-T5-2048W (15-pin connector –CONTROL)			GEN-DIG-BRD/L/_ (100-pin connector)	
Pin name	*Pin no.*		*Pin name*	*Pin no.*
EXSYNC	12	←	EXPOSURE1, OUTPUT, +	95
EXSYNC	04	←	EXPOSURE1, OUTPUT, -	96
PRIN	05	←	EXPOSURE2, OUTPUT, +	97
PRIN	13	←	EXPOSURE2, OUTPUT, -	98
BIN	01	←	USER, OUTPUT1, +	93
BIN	09	←	USER, OUTPUT1, -	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 & 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*

MATROX IMAGING

GEN-CID-096