MATROX GENESIS
CAMERA INTERFACE APPLICATION NOTE
DALSA SP-14-0xk40 DECEMBER 21, 2001

Basics about the camera

Camera Descriptions

- Effective resolution: up to 2048 pixels/line × 8-bit @ up to 18K LPS.
- Single channel LVDS digital video output.
- External exposure control.
- 40 MHz pixel clock rate.

Mode of operations as per Matrox Imaging (in parentheses as per camera manufacturer)

Interface Modes

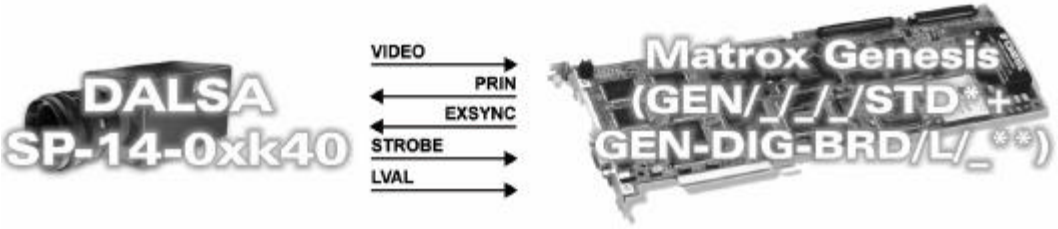
- Fixed line scan (level mode),
- Variable line scan (level mode)

Basics about the interface modes

Camera Interface Briefs

Mode 1: Fixed line scan (level mode)

- Up to 2048 pixels/line × 8-bit.
- Single channel LVDS digital video.
- DCF configured for 800 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 to initiate and control exposure.
- Matrox Genesis receiving HSYNC (LVAL), PIXEL CLOCK (STROBE) and video signals from camera.
- DCF used: SP2KDEL.DCF (2048 pixels/line × 8-bit @ 14K LPS)
- DCF used: SP1KDEL.DCF (1048 pixels/line × 8-bit @ 21.74K LPS)



Mode 2: Variable line scan (level mode)

- 2048 pixels/line × 8-bit.
- Single channel LVDS digital video.
- DCF configured for 800 lines per virtual frame.
- Line scan rate is variable and determined by external trigger frequency.
- Matrox Genesis receiving external trigger signal.
- Matrox Genesis sending EXPOSURE1 (EXSYNC) and EXPOSURE2 (PRIN) signals to camera to initiate and control exposure time.

Continued…

***Matrox Genesis main board with grab module**
****Matrox LVDS digital input board**

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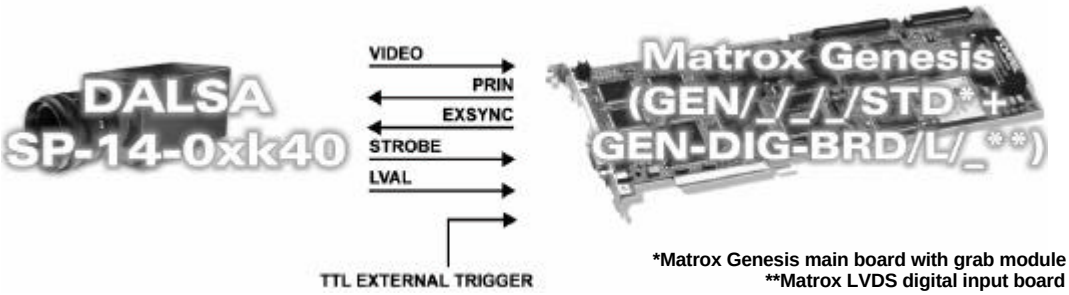
Basics about the interface modes

Camera Interface Briefs (continued)

Mode 2: Variable line scan (level mode)

- Matrox Genesis receiving HSYNC (LVAL), PIXEL CLOCK (STROBE) and video signals from camera.
- DCF used: SP2KDAE.DCF (2048 pixels/line × 8-bit)
- DCF used: SP1KDAE.DCF (1048 pixels/line × 8-bit)



***Matrox Genesis main board with grab module**
****Matrox LVDS digital input board**

Specifics about the interface modes

Camera Interface Details

Mode 1: Fixed line scan (level mode)

- **Line rate:** The frequency of the periodic EXPOSURE1 (EXSYNC) signal controls the camera's line rate. The EXPOSURE1 (EXSYNC) signal period is set to **1424/912** pixels (model 02k40/01k40), with a **20 MHz** pixel clock, this translates to a **14.08/21.74 kHz** line rate (model 02k40/01k40). EXPOSURE2 (PRIN) signal is used to set the level mode (continuous low level). Refer to the camera manual for more information.
- **Exposure time:** Exposure time is the duration between the rising and falling edge of the EXPOSURE1 (EXSYNC) signal. The default exposure time for this DCF is equal to **20 ms**. The exposure time can be modified in the DCF using Matrox Intellicam, Genesis Native Library (GNL) imCamControl() or with the MIL MdigControl() function. Consult the respective manual for more information.
- **Maximum/Minimum exposure times:** Since the Matrox Genesis timer is 16-bit wide, the maximum exposure time is calculated to be (65536-2048)/20MHz = **3.17 ms**. The maximum line rate of the camera is **18.7/36.1 kHz** (model 02k40/01k40); therefore the minimum exposure time is ≈ **2.3 ms.**
- **Smallest exposure time increments:** The pixel clock is the reference clock in which the exposure time is being set by, therefore the smallest exposure time increment is **50 ns**.

Specifics about the interface modes

Camera Interface Details (continued)

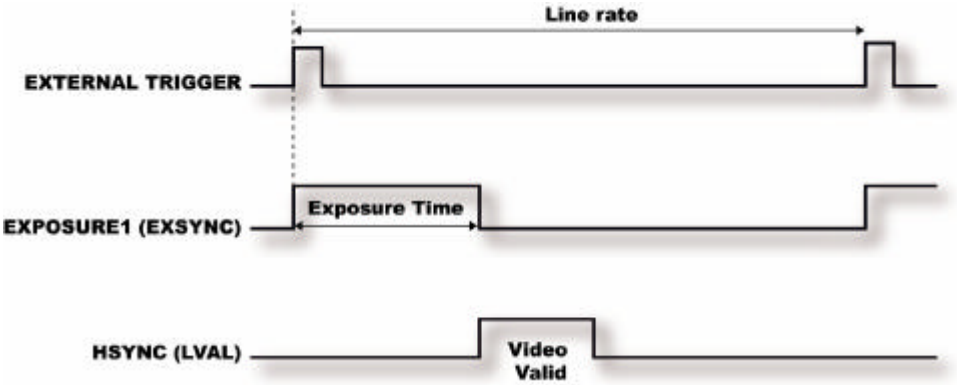
Mode 1: Fixed line scan (level mode)

- **User-supplied input signals**: Refer to the camera manual for more information about the following user-supplied input signals:

Signal	Control	Controlled by
BIN	Binning	OUTPUT 1 BIT 1
PRIN	Exposure	EXPOSURE2, OUTPUT
SPEED	MCLK Frequency	Not Connected
GAIN 0	Gain	OUTPUT BIT 0
GAIN 1	Gain	Not Connected

Mode 2: Variable line scan (level mode)

- **Line rate:** The line rate is variable and controlled by the external trigger signal frequency.
- **Exposure time:** Exposure time is the active (high level) period between the rising and falling edge of the EXPOSURE1 (EXSYNC) signal. The default exposure time for this DCF is equal to **20 ms**. The exposure time can be modified in the DCF using Matrox Intellicam, Genesis Native Library (GNL) imCamControl() or with the MIL MdigControl() function. Consult the respective manual for more information.
- **Maximum/Minimum exposure times:** Since the Matrox Genesis timer is 16-bit wide, the maximum exposure time is calculated to be (65536-2048)/20MHz = **3.17 ms**. The maximum line rate of the camera is **18.7/36.1 kHz** (model 02k40/01k40); therefore the minimum exposure time is ≈ **2.3 ms.**
- **Smallest exposure time increments:** The pixel clock is the reference clock in which the exposure time is being set by, therefore the smallest exposure time increment is **50 ns**.
- **User-supplied input signals**: Same as in Mode 1: *Fixed line scan*.
- **Timing diagram**:



Cabling details for this interface mode

Cabling Requirements

Mode 1: Fixed line scan (level mode)

- **Cable:** DBHD100-TO-OPEN (open ended) cable required for video, synchronization and control signals.
- **Connection:** Connections between the 36-pin connector of the camera and the 100-pin connectors of the Matrox Genesis are as follows:

DALSA SP-14-0xk40 (36-pin connector)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D7 (MSB)	09	→	DATA, INPUT, 7+	15
D7B	27	→	DATA, INPUT, 7-	16
D6	10	→	DATA, INPUT, 6+	13
D6B	28	→	DATA, INPUT, 6-	14
D5	11	→	DATA, INPUT, 5+	11
D5B	29	→	DATA, INPUT, 5-	12
D4	12	→	DATA, INPUT, 4+	09
D4B	30	→	DATA, INPUT, 4-	10
D3	13	→	DATA, INPUT, 3+	07
D3B	31	→	DATA, INPUT, 3-	08
D2	14	→	DATA, INPUT, 2+	05
D2B	32	→	DATA, INPUT, 2-	06
D1	15	→	DATA, INPUT, 1+	03
D1B	33	→	DATA, INPUT, 1-	04
D0	16	→	DATA, INPUT, 0+	01
D0B	34	→	DATA, INPUT, 0-	02
STROBE	17	→	CLOCK, INPUT, +	39
STROBEB	35	→	CLOCK, INPUT, -	40
LVAL	18	→	HSYNC, INPUT, +	33
LVALB	36	→	HSYNC, INPUT, +	34
PRIN	06	←	EXPOSURE2, OUTPUT +	97
PRINB	24	←	EXPOSURE2, OUTPUT -	98
BIN	08	←	USER, OUTPUT, 1+	93
BINB	26	←	USER, OUTPUT, 1-	94
MCLK	05	←	CLOCK, OUTPUT, +	89
MCLKB	23	←	CLOCK, OUTPUT, -	90
GAIN0	02	←	USER, OUTPUT, 0+	91
GAIN0B	20	←	USER, OUTPUT, 0-	92
EXSYNC	07	←	EXPOSURE1, OUTPUT, +	95
EXSYNCB	25	←	EXPOSURE1, OUTPUT, -	96

Continued…

Cabling details for the interface modes

Cabling Requirements (Continued)

Mode 2: Variable line scan (level mode)

- **Cable:** IMG-7W2-TO-5BNC and DBHD100-TO-OPEN (open ended) cables required for video, synchronization and control signals.
- **External trigger:** TTL external trigger should be connected to the TTL trigger input of the IMG-7W2-TO-5BNC cable (gray BNC).
- **Connection:** Same as in Mode 1: *Fixed line scan*, except for the following additional connection:

Matrox Genesis (BNC connector)			**TTL External Trigger Source**	
Pin name	***Pin no.***			
GRAY BNC	--	←	SIGNAL	--

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 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 Matrox Imaging Applications at 514-822-6061 for assistance.

Corporate headquarters:

Canada and U.S.A.

Matrox Electronic Systems Ltd.
1055 St. Regis Blvd.
Dorval, Quebec H9P 2T4
Canada
Tel: (514) 685-2630
Fax: (514) 822-6273