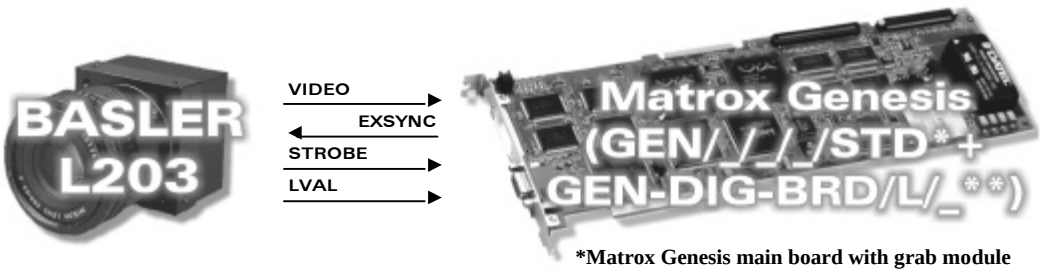
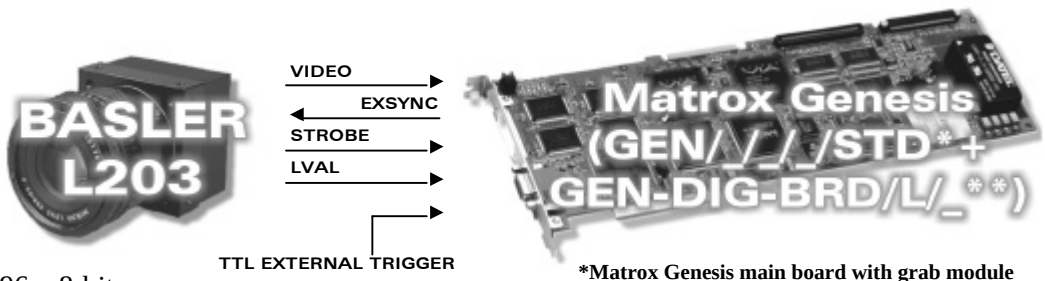
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

BASLER-MVC L203

March 29, 2000

Camera Descriptions	• 4096 × 8-bit. • Single or dual tap LVDS digital video output. • External exposure control and synchronization. • Pixel clock: 40 MHz
Interface modes	• Fixed line scan rate, variable line scan rate
Camera Interface Briefs	**Mode 1: Fixed line scan rate**  ***Matrox Genesis main board with grab module** **** Matrox LVDS digital data input board** • 4096 × 8-bit. • Single tap LVDS digital video. • DCF configured for 512 lines per virtual frame. • Line scan rate is fixed and determined by the frequency of the EXSYNC signal. • Matrox Genesis sending periodic EXPOSURE1 (EXSYNC) signals to camera, the EXPOSURE1 (EXSYNC) signal initiates line readout and controls exposure time. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 40 MHz) and HSYNC (LVAL) signals from camera; a high LVAL signal indicates valid pixels. • DCF used: GL240FS.DCF **Mode 2: Variable line scan rate**  ***Matrox Genesis main board with grab module** **** Matrox LVDS digital data input board** • 4096 × 8-bit. • Single tap 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 external trigger. • Matrox Genesis sending EXPOSURE1 (EXSYNC) signals to camera, the EXPOSURE1 (EXSYNC) signal initiates line readout and controls exposure time. • Matrox Genesis receiving PIXEL CLOCK (STROBE @ 40 MHz) and HSYNC (LVAL) signals from camera; a high LVAL signal indicates valid pixels. • DCF used: GL240FS.DCF

Camera Interface Details	**Mode 1: Fixed line scan rate** • Matrox Genesis sends the periodic EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the EXPOSURE1 (EXSYNC) signal to initiate line readout. • **Line rate**: The EXPOSURE1 (EXSYNC) frequency determines the line rate of the camera. The EXPOSURE1 (EXSYNC) period is currently set to **6500 pixels**. With a **40 MHz** pixel clock rate, the line rate is **6.2 kHz** (maximum is **9.54 kHz**). • **Exposure time**: There are three modes of exposure time control, which can be selected by programming through the serial port or the EXPOSURE menu tab located in the BASLER Configuration Tool L2x0. See Camera User Manual for more information. ▪ Edge controlled mode- Exposure time is the period between the rising edges of the EXPOSURE1 (EXSYNC) signal. To change the exposure time, modify the active and inactive periods of the EXPOSURE1 (EXSYNC) signal in the DCF. ▪ Programmable mode- Exposure time is controlled through the BASLER Configuration Tool L1x0. ▪ Level controlled mode- Exposure time is during the inactive period of EXPOSURE1 (EXSYNC) signal. To change the exposure time, modify the next falling edge of the EXPOSURE1 (EXSYNC) signal in the DCF. • For Edge-controlled mode and Level controlled mode, the width and deployment time of each EXPOSURE1 (EXSYNC) 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 65536/40 MHz = **1.64 ms**. A minimum exposure time of **100 clock periods** or **2.5 ms** is recommended by the camera manufacturer for all modes. • **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 **25 ns.** **Mode 2: Variable line scan rate** • Once it has received the external line trigger signal, Matrox Genesis sends the EXPOSURE1 (EXSYNC) signal to the camera; the camera awaits the rising edge of the EXPOSURE1 (EXSYNC) signal and initiates line readout. • **Line rate**: The line rate is variable and controlled by the frequency of the external trigger signal. • **Exposure time**: Same as in *Mode 1: Fixed line scan rate* • **Maximum/minimum exposure time:** Same as in *Mode 1: Fixed line scan rate* • **Smallest exposure time increment**: Same as in *Mode 1: Fixed line scan rate*

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 44-pin HD SUB connector of the camera and the 100-pin connector of the GEN-DIG-BRD/S are as follows:

BASLER L203 (44-pin HD SUB connector)			**GEN-DIG-BRD/L/_ (100-pin connector)**	
DOUT0	01	→	DATA, INPUT, 0+	01
DOUT1	02	→	DATA, INPUT, 1+	03
DOUT2	03	→	DATA, INPUT, 2+	05
DOUT3	04	→	DATA, INPUT, 3+	07
DOUT4	05	→	DATA, INPUT, 4+	09
DOUT5	06	→	DATA, INPUT, 5+	11
DOUT6	07	→	DATA, INPUT, 6+	13
DOUT7	08	→	DATA, INPUT, 7+	15
DOUT8	09	→	DATA, INPUT, 8+	17
DOUT9	10	→	DATA, INPUT, 9+	19
DOUT10	11	→	DATA, INPUT, 10+	21
DOUT11	12	→	DATA, INPUT, 11+	23
DOUT12	13	→	DATA, INPUT, 12+	25
DOUT13	14	→	DATA, INPUT, 13+	27
DOUT14	15	→	DATA, INPUT, 14+	29
DOUT15	31	→	DATA, INPUT, 15+	31
/DOUT0	16	→	DATA, INPUT, 0-	02
/DOUT1	17	→	DATA, INPUT, 1-	04
/DOUT2	18	→	DATA, INPUT, 2-	06
/DOUT3	19	→	DATA, INPUT, 3-	08
/DOUT4	20	→	DATA, INPUT, 4-	10
/DOUT5	21	→	DATA, INPUT, 5-	12
/DOUT6	22	→	DATA, INPUT, 6-	14
/DOUT7	23	→	DATA, INPUT, 7-	16
/DOUT8	24	→	DATA, INPUT, 8-	18
/DOUT9	25	→	DATA, INPUT, 9-	20
/DOUT10	26	→	DATA, INPUT, 10-	22
/DOUT11	27	→	DATA, INPUT, 11-	24
/DOUT12	28	→	DATA, INPUT, 12-	26
/DOUT13	29	→	DATA, INPUT, 13-	28
/DOUT14	30	→	DATA, INPUT, 14-	30
/DOUT15	32	→	DATA, INPUT, 15-	32

continued

Cabling Requirements (continued)

BASLER L203 (44-pin HD SUB connector)			GEN-DIG-BRD/L/_ (100-pin connector)	
LVAL	33	→	HSYNC, INPUT, +	33
/ LVAL	34	→	HSYNC, INPUT, -	34
PIXEL CLOCK	35	→	CLOCK, INPUT, +	39
/ PIXEL CLOCK	36	→	CLOCK, INPUT, -	40
EXSYNC	37	←	EXPOSURE1, OUTPUT, +	95*
/ EXSYNC	38	←	EXPOSURE1, OUTPUT, -	96*
GND	43	--	GROUND	37
GND	44	--	GROUND	38

* These connections are not required for this mode, however allows this cable to be used with all modes.

Mode 2: Variable line scan rate

- IMG-7W2-TO-5BNC and DBHD100-TO-OPEN cables, and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.
- TTL external trigger source should be connected to the TTL trigger input of the IMG-7W2-TO-5BNC cable
- All connections are as in *Mode 1: Fixed line scan rate*

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