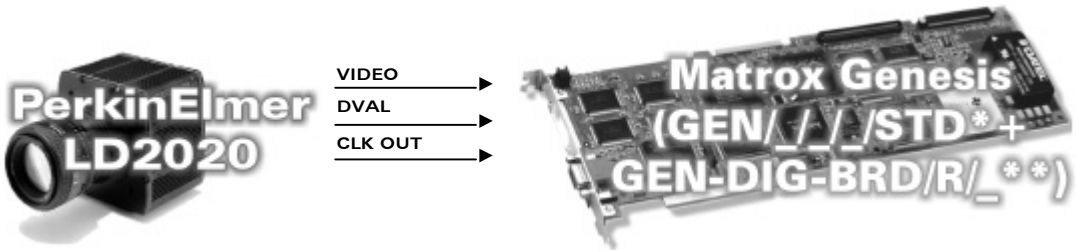
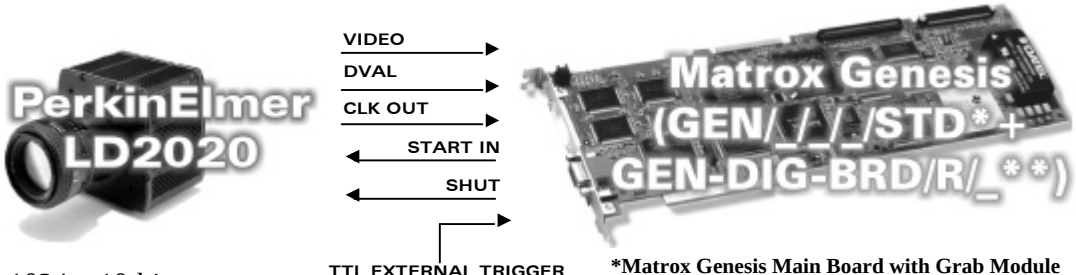
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

PerkinElmer (EG&G RETICON) LD2020

June 16, 2000

Camera Descriptions	• 1024 × 10-bit • Single or dual channel RS-422 digital video. • Internal or external exposure control. • RS-232 interface for camera calibration and control. • Pixel clock rate: 33 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 RS-422 Digital Data Input Board** • 1024 × 10-bit. • Single channel RS-422 digital video. • DCF configured for 500 lines per virtual frame. • Matrox Genesis receiving PIXEL CLOCK (CLK_OUT @ 33 MHz), HSYNC (DVAL), and video signals from camera. • DCF used: LD2020.DCF **Mode 2: Variable line scan rate**  ***Matrox Genesis Main Board with Grab Module** ****Matrox RS-422 Digital Data Input Board** • 1024 × 10-bit • Single channel RS-422 digital video. • DCF configured for 500 lines per virtual frame. • Matrox Genesis receiving TTL external trigger signal. • Matrox Genesis sending EXPOSURE1 (START_IN) and EXPOSURE2 (SHUT) signals to camera; the EXPOSURE1 (START_IN) controls exposure time and EXPOSURE2 (SHUT) resets pixels and initiates exposure. • Matrox Genesis receiving PIXEL CLOCK (CLK_OUT @ 33 MHz), HSYNC (DVAL), and video signals from camera. • DCF used: LD2020A.DCF

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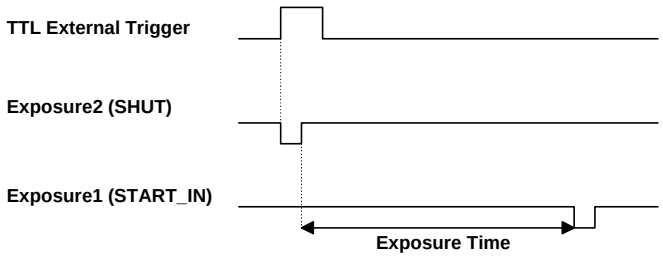
Camera Interface Details

Mode 1: Fixed line scan rate

- **Line rate:** The line scan rate is fixed and configured through the RS-232 interface.
- **Camera settings:** Using a null modem cable connected to the RS-232 serial port, a user can select optional inputs, define scan rate, select number of outputs, and calibrate offset and gain. Refer to the camera user manual for serial communication set up and available menu options. Camera must be in **Internal Start Enabled**, **Internal Clock Enabled** and **Outputs Multiplexed** settings.

Mode 2: Variable line scan rate

- Matrox Genesis sends the EXPOSURE2 (SHUT) and EXPOSURE1 (START_IN) signals to the camera; EXPOSURE2 (SHUT) reset the pixels and initiate exposure, and EXPOSURE1 (START_IN), after a short (constant) delay determines the exposure time.
- **Line rate**: The line rate is variable and controlled by the frequency of the external trigger signal.
- **Exposure time**: The Matrox Genesis will send the RS-422 EXPOSURE1 (START) signal to the camera following a delay that is equal to the desired exposure time. 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 or with the MIL digitizer control function **MdigControl()**. Refer to the appropriate manual or user guide for additional information.
- **Camera settings:** Using a null modem cable connected to the RS-232 serial port, a user can select optional inputs, define scan rate, select number of outputs, and calibrate offset and gain. Refer to the camera user manual for serial communication set up and available menu options. Camera must be in **External Start Enabled**, **Internal Clock Enabled** and **Outputs Multiplexed** settings.



Hyper terminal settings through COM port (RS-232/Null Modem cable)

- The following settings are used with a terminal application to allow access to the cameras internal computer menu options:

  BPS: 9600

  Stop bit: 1

  Parity: NONE

  Flow Control: Xon/Xoff

  Connnect: Type “h”

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Cabling Requirements

Mode 1: Fixed line scan rate

- DBHD100-TO-OPEN and IMG-7W2-TO-5BNC cables, and GEN/DIG/BRD/R/_ board required for digital data, syncs and control signals in RS-422 format.
- RS-232 cable (null modem) cable required for control signals via the serial RS-232 port.
- The connections between the 62-pin triple-row connector of the camera and the 100-pin connector of the GEN-DIG-BRD/R/_ are as follows:

PerkinElmer (EG&G RETICON) LD2010 (62-pin connector)			**GEN-DIG-BRD/R/_ (100-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
ADATA0+	48	→	DATA, INPUT + 0	1
ADATA0-	49	→	DATA, INPUT – 0	2
ADATA1+	06	→	DATA, INPUT + 1	3
ADATA1-	28	→	DATA, INPUT - 1	4
ADATA2+	27	→	DATA, INPUT + 2	5
ADATA2-	47	→	DATA, INPUT - 2	6
ADATA3+	05	→	DATA, INPUT + 3	7
ADATA3-	26	→	DATA, INPUT - 3	8
ADATA4+	25	→	DATA, INPUT + 4	9
ADATA4-	46	→	DATA, INPUT - 4	10
ADATA5+	03	→	DATA, INPUT + 5	11
ADATA5-	04	→	DATA, INPUT - 5	12
ADATA6+	44	→	DATA, INPUT + 6	13
ADATA6-	45	→	DATA, INPUT – 6	14
ADATA7+	02	→	DATA, INPUT + 7	15
ADATA7-	24	→	DATA, INPUT – 7	16
ADATA8+	23	→	DATA, INPUT - 8	17
ADATA8-	43	→	DATA, INPUT – 8	18
ADATA9+	01	→	DATA, INPUT + 9	19
ADATA9-	22	→	DATA, INPUT - 9	20
DVAL+	37	→	HSYNC, INPUT +	33
DVAL-	58	→	HSYNC, INPUT -	34
CCLK+	15	→	CLOCK, INPUT +	39
CCLK -	36	→	CLOCK, INPUT -	40
GND	16	--	GROUND	38
GND	17	--	GROUND	50
GND	18	--	GROUND	50
GND	19	--	GROUND	37
GND	20	--	GROUND	37
GND	57	--	GROUND	38
MCLK+	41	←	CLOCK, OUTPUT +	89
MCLK -	62	←	CLOCK, OUTPUT -	90
BDATA0+	35	→	DATA, INPUT + 16	51
BDATA0-	55	→	DATA, INPUT – 16	52
BDATA1+	13	→	DATA, INPUT + 17	53
BDATA1-	34	→	DATA, INPUT – 17	54
BDATA2+	33	→	DATA, INPUT + 18	55
BDATA2-	54	→	DATA, INPUT – 18	56

continued

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Cabling Requirements

PerkinElmer (EG&G RETICON) LD2010 (62-pin connector)			GEN-DIG-BRD/R/_ (100-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
BDATA3+	11	→	DATA, INPUT + 19	57
BDATA3-	12	→	DATA, INPUT – 19	58
BDATA4+	52	→	DATA, INPUT + 20	59
BDATA4-	53	→	DATA, INPUT – 20	60
BDATA5+	10	→	DATA, INPUT + 21	61
BDATA5-	32	→	DATA, INPUT – 21	62
BDATA6+	31	→	DATA, INPUT + 22	63
BDATA6-	51	→	DATA, INPUT – 22	64
BDATA7+	09	→	DATA, INPUT + 23	65
BDATA7-	30	→	DATA, INPUT – 23	66
BDATA8+	29	→	DATA, INPUT + 24	67
BDATA8-	50	→	DATA, INPUT – 24	68
BDATA9+	07	→	DATA, INPUT + 25	69
BDATA9-	08	→	DATA, INPUT – 25	70
MCLK+	41	←	CLOCK, OUTPUT +	89
MCLK -	62	←	CLOCK, OUTPUT -	90
START +	39	←	EXPOSURE1, OUTPUT +	95*
START -	60	←	EXPOSURE1, OUTPUT -	96*
SHUT +	40	←	EXPOSURE2, OUTPUT +	97*
SHUT -	61	←	EXPOSURE2, OUTPUT -	98*

* these connections are not required for this mode however are recommended to develop a single cable usable for both modes

Mode 2: Variable line scan rate

- DBHD100-TO-OPEN and IMG-7W2-TO-5BNC cables, and GEN/DIG/BRD/R/_ board required for digital data, syncs and control signals in RS-422 format.
- 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 plus the following RS-232 port connection:

PerkinElmer (EG&G RETICON) LD2010 (9-pin connector)			WORSTATION (COM1 connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
RS	02	→	RS (Receive Data)	03
TX	03	→	TX (Transmit Data)	02
GND	05	→	GROUND	05

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

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