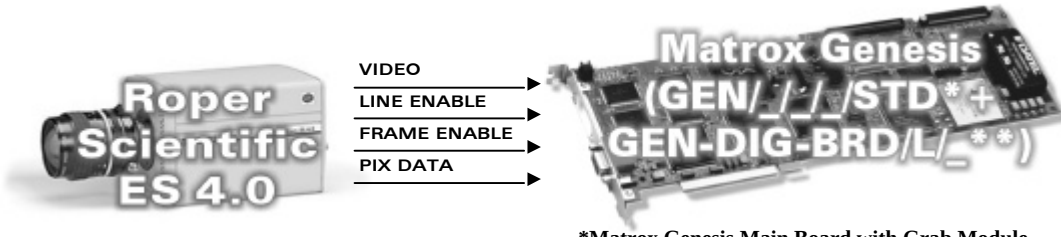
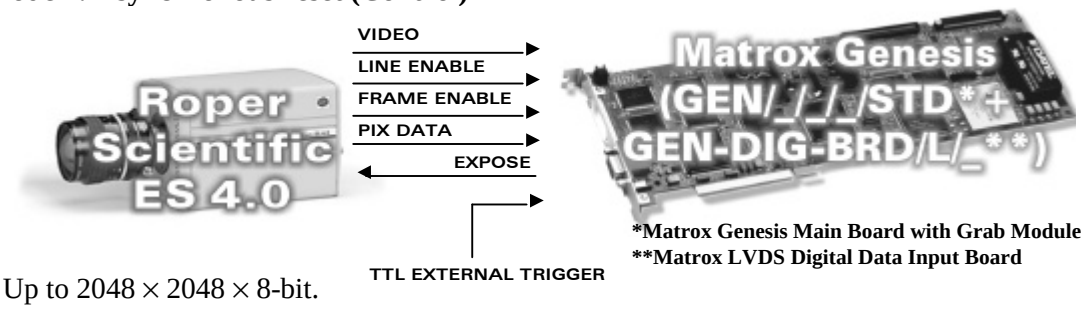
Application Note:
Interfacing non-standard cameras to Matrox Genesis

MATROX GENESIS

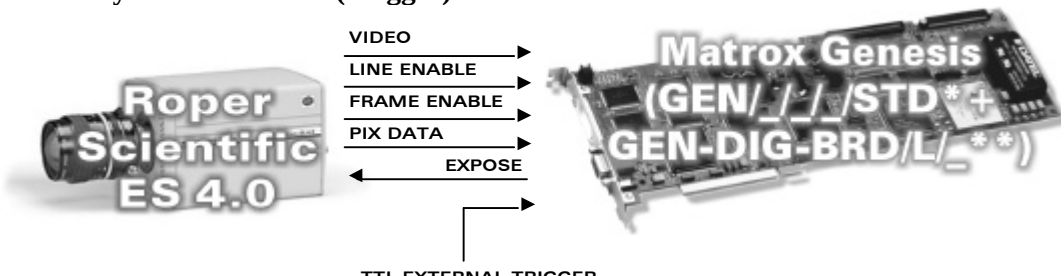
Roper Scientific MASD (Kodak) ES 4.0

June 13, 2000

Camera Descriptions	• Up to 2048 × 2048 × 8-bit @ up to 30fps • Single or dual channel LVDS digital video output. • Progressive scan. • Internal or external exposure and shutter control. • Pixel clock rate: 20 MHz/channel.
Interface Modes	• Continuous/pseudo-continuous, asynchronous reset mode (controlled, trigger).
Camera Interface Briefs	**Mode 1: Continuous/Pseudo-continuous**  ***Matrox Genesis Main Board with Grab Module** ****Matrox LVDS Digital Data Input Board** • Up to 2048 × 2048 × 8-bit @ up to 30fps. • Single or dual channel LVDS digital video. • Progressive scan. • Continuous video. • Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK (PIX DATA @ 20 MHz/channel), and video signals. • DCF used: ES4C1K1T.DCF (single channel - 1024 × 1024 @ 15 or 8 fps) • DCF used: ES4C1K2T.DCF (dual channel - 1024 × 1024 @ 30, 15, or 8 fps) • DCF used: ES4C2K1T.DCF (single channel - 2048 × 2048 @ 8 or 4 fps) • DCF used: ES4C2K2T.DCF (dual channel - 2048 × 2048 @ 15, 8, or 4 fps) **Mode 2: Asynchronous reset (Control)**  ***Matrox Genesis Main Board with Grab Module** ****Matrox LVDS Digital Data Input Board** • Up to 2048 × 2048 × 8-bit. • Single or dual channel LVDS digital video. • Progressive scan. • Matrox Genesis receiving TTL external trigger. • Matrox Genesis sends EXPOSURE1 (EXPOSE) signal to camera, EXPOSURE1 (EXPOSE) signal initiate exposure and controls exposure time. • Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK ((PIX DATA @ 20 MHz/channel), and video signals. • DCF used: ES4CT11T.DCF (single channel - 1024 × 1024) • DCF used: ES4CT12T.DCF (dual channel - 1024 × 1024) • DCF used: ES4CT21T.DCF (single channel - 2048 × 2048) • DCF used: ES4CT22T.DCF (dual channel - 2048 × 2048)

Camera Interface Briefs (continued)

Mode 3: Asynchronous reset (Trigger)



TTL EXTERNAL TRIGGER

***Matrox Genesis Main Board with Grab Module**
****Matrox LVDS Digital Data Input Board**

- Up to 2048 × 2048 × 8-bit.
- Single or dual channel LVDS digital video.
- Progressive scan.
- Matrox Genesis receiving TTL external trigger.
- Matrox Genesis sends EXPOSURE1 (EXPOSE) signal to camera, EXPOSURE1 (EXPOSE) signal initiate exposure.
- Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK ((PIX DATA @ 20 MHz/channel), and video signals.
- DCF used: ES4T1K1T.DCF (single channel – 1024 × 1024)
- DCF used: ES4T1K2T.DCF (dual channel – 1024 × 1024)
- DCF used: ES4T2K1T.DCF (single channel – 2048 × 2048)
- DCF used: ES4T2K2T.DCF (dual channel - 2048 × 2048)

Camera Interface Details

Mode 1: Continuous/Pseudo-continuous

- **Frame rate**: The frame rate is determined by the Remote panel setting (FRS). Refer to the camera manual for additional information.
- **Exposure time**: The exposure time is set in the Remote panel setting (EXE). Refer to the camera manual for additional information.
- **Software settings:** Set operating mode to **Continuous**, all other Remote Panel settings are as listed below:

ES4C1K1T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	OF	1	31.998	15/8*	CS	1	N	5	12	P	AIA	2

ES4C1K2T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	OF	1	31.998	30/15/8*	CS	2	N	5	12	P	AIA	2

ES4C2K1T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	OF	1	31.998	8/4*	CS	1	N	5	12	P	AIA	1

ES4C2K2T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	OF	1	31.998	15/8/4*	CS	2	N	5	12	P	AIA	1

***Can be set to one of the listed values, refer to manual for details**

Camera Interface Details (continued)

Mode 2: Asynchronous reset (Control)

- Once it has received the external trigger signal, Matrox Genesis sends the periodic EXPOSURE1 (EXPOSE) signal to the camera. The camera awaits the rising edge of the signal, at which point it initiates exposure. The camera will expose for as long as the EXPOSURE1 (EXPOSE) signal is high.
- **Frame rate**: The frame rate is determined by the frequency of the external trigger signal.
- **Exposure time**: The active portion of the EXPOSURE1 (EXPOSE) signal is the exposure time. The default exposure time for this DCF is **32.2 µs**. In order to select the exposure time, the width and deployment time of EXPOSURE1 (EXPOSE) 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.
- **Software settings:** Set operating mode to **Control**, all other Remote Panel settings are as listed below:

ES4CT11T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	N/A	8*	CD	2	N	5	12	N	AIA	2

ES4CT12T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	N/A	8*	CD	1	N	5	12	N	AIA	2

ES4CT21T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	N/A	8*	CD	2	N	5	12	N	AIA	1

ES4CT22T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	N/A	15*	CD	1	N	5	12	N	AIA	1

***Default**

Mode 3: Asynchronous reset (Trigger)

- Once it has received the external trigger signal, Matrox Genesis sends EXPOSURE1 (EXPOSE) signal to the camera. The camera awaits the rising edge of the signal, at which point it initiates exposure. The exposure time is set directly on the camera either by using the remote panel software or by sending the control commands via the serial port.
- **Frame rate**: The frame rate is determined by the frequency of the external trigger signal plus the EXPOSURE1 (EXPOSE) signal. Frame rate = (1/Trigger Frequency) + (Exposure Setting from the Remote Panel software)
- **Exposure time**: Exposure time is controlled through the Remote panel software setting (EXE). Refer to the camera manual for additional information.

Camera Interface Details (continued)

- **Software settings:** Set operating mode to **Trigger**, all other Remote Panel settings are as listed below:

ES4T1K1T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	31.998	8*	TR	1	N	5	12	N	AIA	2

ES4T1K2T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	31.998	8*	TR	2	N	5	12	N	AIA	2

ES4T2K1T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	31.998	8*	TR	1	N	5	12	N	AIA	1

ES4T2K2T.DCF

BDE	DEF	DGN	EXE	FRS	MDE	RDM	STP	TPD	TPW	TRM	TRS	BNS
0	ON	1	31.998	15*	TR	2	N	5	12	N	AIA	1

*** Controlled by external trigger frequency**

Cabling Requirements

Mode 1: Continuous/Pseudo-continuous

- DBHD100-TO-OPEN cable and GEN/DIG/BRD/L/_ board required for digital data, synchronization and control signals.
- Connections between the 68-pin connector of the camera and the 100-pin connector of the GEN-DIG-BRD/L/_ are as follows:

GEN-DIG-BRD/L/_ (100-pin connector)			**ROPER SCIENTIFIC (KODAK) ES 4.0 (68-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
DATA, INPUT, 7+	*15*	←	BMSB+	*10*
DATA, INPUT, 7-	16	←	BMSB-	44
DATA, INPUT, 6+	13	←	BMSB1+	11
DATA, INPUT, 6-	14	←	BMSB1-	45
DATA, INPUT, 5+	11	←	BMSB2+	13
DATA, INPUT, 5-	12	←	BMSB2-	47
DATA, INPUT, 4+	09	←	BMSB3+	14
DATA, INPUT, 4-	10	←	BMSB3-	48
DATA, INPUT, 3+	07	←	BMSB4+	15
DATA, INPUT, 3-	08	←	BMSB4-	49
DATA, INPUT, 2+	05	←	BMSB5+	16
DATA, INPUT, 2-	06	←	BMSB5-	50
DATA, INPUT, 1+	03	←	BMSB6+	19
DATA, INPUT, 1-	04	←	BMSB6-	53
DATA, INPUT, 0+	01	←	BMSB7+	20
DATA, INPUT, 0-	02	←	BMSB7-	54
CLOCK, INPUT, +	39	←	PIX DATA STRB +	29
CLOCK, INPUT, -	40	←	PIX DATA STRB -	63
HSYNC, INPUT, +	33	←	LINE ENA +	26
HSYNC, INPUT, -	34	←	LINE ENA -	60
VSYNC, INPUT, +	35	←	FRME ENA +	25
VSYNC, INPUT, -	36	←	FRME ENA -	59

continued

Cabling Requirements

GEN-DIG-BRD/L/_ (100-pin connector)			ROPER SCIENTIFIC (KODAK) ES 4.0 (68-pin connector)	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
EXPOSURE1, OUTPUT, +	95*	→	EXPOSE +	30*
EXPOSURE1, OUTPUT, -	96*	→	EXPOSE -	64*
GROUND	50		GROUND	01
DATA, INPUT, 15+	31	←	AMSB+	02
DATA, INPUT, 15-	32	←	AMSB-	36
DATA, INPUT, 14+	29	←	AMSB1+	03
DATA, INPUT, 14-	30	←	AMSB1-	37
DATA, INPUT, 13+	27	←	AMSB2+	04
DATA, INPUT, 13-	28	←	AMSB2-	38
DATA, INPUT, 12+	25	←	AMSB3+	05
DATA, INPUT, 12-	26	←	AMSB3-	39
DATA, INPUT, 11+	23	←	AMSB4+	06
DATA, INPUT, 11-	24	←	AMSB4-	40
DATA, INPUT, 10+	21	←	AMSB5+	07
DATA, INPUT, 10-	22	←	AMSB5-	41
DATA, INPUT, 09+	19	←	AMSB6+	08
DATA, INPUT, 09-	20	←	AMSB6-	42
DATA, INPUT, 08+	17	←	AMSB7+	09
DATA, INPUT, 08-	18	←	AMSB7-	43

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

Modes 2 and 3: Asynchronous reset

- 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: *Continuous/Pseudo-continuous*

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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