

Application Note:

Interfacing non-standard cameras to Matrox Genesis

Kodak Megaplus ES 1.0

March 20, 2000

Camera Descriptions	<ul style="list-style-type: none"> • 1008 x 1018 x 8-bit or 10-bit @ 15 or 30fps • Single or dual tap RS-422 digital video output. • Progressive scan. • Internal or external exposure and shutter control. • Pixel clock rate: 20 MHz/tap.
Interface Modes	<ul style="list-style-type: none"> • Continuous/Pseudo-continuous, asynchronous reset (controlled, triggered, dbl exp triggered).
Camera Interface Briefs	<p>Mode 1: Continuous/Pseudo-continuous</p> <p>*Matrox Genesis main board with grab module **Matrox RS-422 digital data input board</p> <ul style="list-style-type: none"> • 1008 x 1018 x 8-bit or 10-bit @ 15 or 30fps. • Single or dual tap RS-422 digital video. • Progressive scan. • Continuous video. • Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK (20 MHz/tap), and video signals from camera. • DCF used: KES8D.DCF (8-bit @ 15fps) • DCF used: ES103D.DCF (8-bit @ 30fps) • DCF used: KES10D.DCF (10-bit @ 15fps) • DCF used: KES103D.DCF (10-bit @ 30fps) <p>Mode 2: Asynchronous reset (Triggered)</p> <p>*Matrox Genesis main board with grab module **Matrox RS-422 digital data input board</p> <ul style="list-style-type: none"> • 1008 x 1018 x 8-bit or 10-bit. • Single or dual tap RS-422 digital video. • Progressive scan. • Matrox Genesis receiving TTL external trigger. • Matrox Genesis sends EXPOSURE1 (EXPOSE) signal to camera to initiate exposure. • Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK (20 MHz/tap), and video signals from camera. • DCF used: KES8DA.DCF (8-bit, single tap) • DCF used: ES103DA.DCF (8-bit, dual tap) • DCF used: KES10DA.DCF (10-bit, single tap) • DCF used: KES103DA.DCF (10-bit, dual tap)

Application Note:

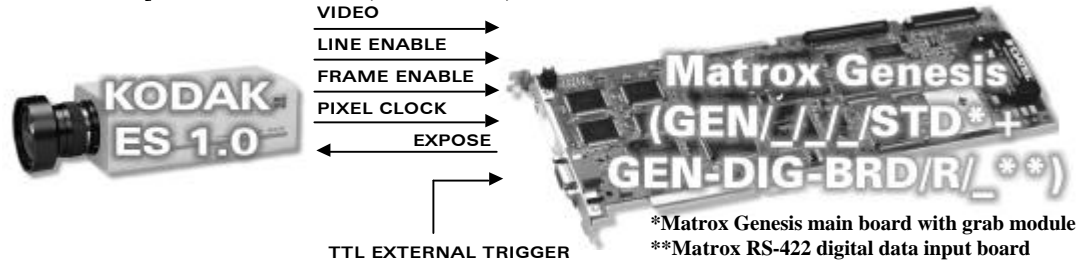
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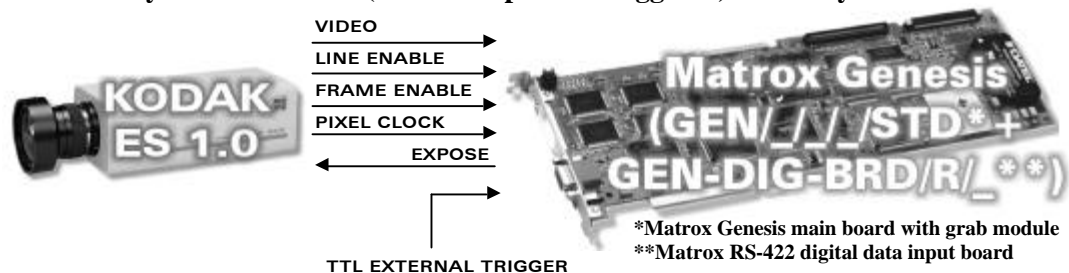
Camera Interface Briefs (continued)

Mode 3: Asynchronous reset (Controlled)



- 1008 x 1018 x 8-bit or 10-bit.
- Single or dual tap RS-422 digital video.
- Progressive scan.
- External exposure control with times starting at 1 ms.
- Matrox Genesis receiving TTL external trigger.
- Matrox Genesis sends EXPOSURE1 (EXPOSE) signal to camera to initiate exposure control exposure time.
- Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK (20 MHz/tap), and video signals from camera.
- DCF used: [KES8DAE.DCF](#) (8-bit, single tap)
- DCF used: [ES103DAE.DCF](#) (8-bit, dual tap)
- DCF used: [KES10DAE.DCF](#) (10-bit, single tap)
- DCF used: [KES103DE.DCF](#) (10-bit dual tap)

Mode 4: Asynchronous reset (Double Exposure Triggered) 8-bit only



- 1008 x 1018 x 8-bit (frame rate to be determined by the TTL ext. trigger period).
- Single or dual tap RS-422 digital video.
- Progressive scan.
- External exposure control with times starting at 1ms.
- Matrox Genesis receiving TTL external trigger.
- Matrox Genesis sends an EXPOSURE1 (EXPOSE) signal to camera to initiate exposure; in this mode the exposure duration corresponds to the exposure signal length.
- Matrox Genesis receiving HSYNC (LINE ENABLE), VSYNC (FRAME ENABLE), PIXEL CLOCK (20 MHz/tap), and video signals from camera.
- Two images captured in rapid succession in this mode.
- DCF used: [ES10DB.DCF](#) (8-bit, single tap)
- DCF used: [ES103DB.DCF](#) (8-bit, dual tap)

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Camera Interface Details

Mode 1: Continuous/Pseudo-continuous

- **Operating Mode:** set to **Continuous** in the Kodak Megaplug Remote Panel Software.
- **Frame Rate:** frame rate is inversely proportionate to the exposure time.
- **Exposure time:** exposure time can be adjusted and controlled through the Kodak Megaplug Remote Panel Software. **Note** settings listed below are for the 15fps DCF. For the 30fps DCF, change the RDM setting from '1' to '2'.

Kodak Remote Panel Software camera settings (8-bit and 10-bit)

DEF	GAB	BKB	BKE	MDE	EXE	STP	TRM	TRS	TRE	RDM	TPD	TPW	DGN
on	-22	0	0	CS	15.096*	P	P	AIA	1	1**	255	5	2

* User selectable ** See note above

• Mode 2: Asynchronous reset (Triggered)

- Once it has received the external trigger signal, Matrox Genesis sends the 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 camera control software or by sending the control commands via the serial port.
- **Operating Mode:** set to **Trigger** in the Kodak Megaplug Remote Panel Software.
- **Frame Rate:** frame rate is determined by the frequency of the TTL external trigger.
- **Exposure Time:** exposure time can be adjusted and controlled through the Kodak Megaplug Remote Panel Software. **Note** settings listed below are for the single tap DCF. For the dual tap DCF, change the RDM setting from '1' to '2'.

Kodak Remote Panel Software camera settings (8-bit and 10-bit)

DEF	GAB	BKB	BKE	MDE	EXE	STP	TRM	TRS	TRE	RDM	TPD	TPW	DGN
on	-22	0	0	TR	15.096*	P	P	AIA	1	1**	255	5	2

* User selectable ** See note above

Mode 3: 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 exposure signal is high
- **Operating Mode:** set to **Control** in the Kodak Megaplug Remote Panel Software.
- **Frame Rate:** frame rate is determined by the frequency of the TTL external trigger.
- **Exposure Time:** exposure time can be adjusted and controlled through Matrox Intellicam. Consult the Matrox Intellicam User Guide for more information. The default exposure time for this DCF is **1 second**. **Note** settings listed below are for the single tap DCF. For the dual tap DCF, change the RDM setting from '1' to '2'.

Kodak Remote Panel Software camera settings (8-bit and 10-bit)

DEF	GAB	BKB	BKE	MDE	EXE	STP	TRM	TRS	TRE	RDM	TPD	TPW	DGN
on	-22	0	0	CD	15.096*	P	P	AIA	1	1**	255	5	1

* Selectable within DCF ONLY, currently set to 20 ms for this DCF ** See note above

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<div>Camera Interface Details (continued)</div>	<div>Mode 4: Asynchronous reset (Double Exposure Triggered) 8-bit only</div> <div><ul style="list-style-type: none">Once it has received the external trigger signal, Matrox Genesis sends a double pulse EXPOSURE1 (EXPOSE) signal (Timer1 XOR Timer2) to the camera. When the camera receives the rising edge of the double pulse EXPOSURE1 (EXPOSE) signal, it then initiate exposure. The delay period between the rising edge of Timer1 and Timer2 is controlled using the Exposure Settings in Matrox Intellicam.Two frames are captured in rapid succession in this mode. The camera generates two frames, separated by the TPD (transfer pulse delay), which can be set in the Kodak Megaplus Remote Panel Software. Refer to the camera manual for more information.Operating Mode: set to Trigger Dbl. Exp. in the Kodak Megaplus Remote Panel Software. Note you need to put the camera (through the console command window) in double exposure mode with the following command: MDE DEExposure Time: exposure time can be adjusted and controlled through Matrox Intellicam. Consult the Matrox Intellicam User Guide for more information.Minimum Trigger Rate = (camera frame rate x 2) + (camera exposure time x 2)</div> <div><div>Mode 4: Asynchronous reset (Double Exposure Triggered)</div><div><div>TTL External trigger</div><div>Exposure1 (Timer1 XOR Timer2)</div><div>VSYNC (Frame Enable)</div><div>HSYNC (Line Enable)</div></div><div></div></div>																														
<div>Cabling Requirements</div>	<div>Mode 1: Continuous/Pseudo-continuous (single or dual tap mode - 8-bit)</div> <div><ul style="list-style-type: none">DBHD100-TO-OPEN cable and GEN/DIG/BRD/R/_ 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/R/_ are as follows:</div> <div><table><tr><th colspan="2">GEN-DIG-BRD/R/_ (100-pin connector)</th><th></th><th colspan="2">KODAK MEGAPLUS 1.0 (68-pin connector)</th></tr><tr><th>Pin name</th><th>Pin no.</th><th></th><th>Pin name</th><th>Pin no.</th></tr><tr><td>DATA, INPUT, 7+</td><td>15</td><td>←</td><td>BMSB+</td><td>10</td></tr><tr><td>DATA, INPUT, 7-</td><td>16</td><td>←</td><td>BMSB-</td><td>44</td></tr><tr><td>DATA, INPUT, 6+</td><td>13</td><td>←</td><td>BMSB1+</td><td>11</td></tr><tr><td>DATA, INPUT, 6-</td><td>14</td><td>←</td><td>BMSB1-</td><td>45</td></tr></table><div>continued</div></div>	GEN-DIG-BRD/R/_ (100-pin connector)			KODAK MEGAPLUS 1.0 (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
GEN-DIG-BRD/R/_ (100-pin connector)			KODAK MEGAPLUS 1.0 (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																											

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Cabling Requirements (continued)	GEN-DIG-BRD/R/_ (100-pin connector)		KODAK MEGAPLUS 1.0 (68-pin connector)	
	Pin name	Pin no.	Pin name	Pin no.
	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
	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	← AMSB-1+	03
	DATA, INPUT, 14-	30	← AMSB-1-	37
	DATA, INPUT, 13+	27	← AMSB-2+	04
	DATA, INPUT, 13-	28	← AMSB-2-	38
	DATA, INPUT, 12+	25	← AMSB-3+	05
	DATA, INPUT, 12-	26	← AMSB-3-	39
	DATA, INPUT, 11+	23	← AMSB-4+	06
	DATA, INPUT, 11-	24	← AMSB-4-	40
	DATA, INPUT, 10+	21	← AMSB-5+	07
	DATA, INPUT, 10-	22	← AMSB-5-	41
	DATA, INPUT, 09+	19	← AMS-6+	08
	DATA, INPUT, 09-	20	← AMSB-6-	42
	DATA, INPUT, 08+	17	← AMSB-7+	09
	DATA, INPUT, 08-	18	← AMSB-7-	43

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

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Cabling Requirements (continued)

Mode 1: Continuous/Pseudo-continuous (single or dual tap mode - 10-bit)

- DBHD100-TO-OPEN cable and GEN/DIG/BRD/R/_ 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/R/_ are as follows:

GEN-DIG-BRD/R/_ (100-pin connector)

Pin name

Pin no.

DATA, INPUT, 9+

19

DATA, INPUT, 9-

20

DATA, INPUT, 8+

17

DATA, INPUT, 8-

18

DATA, INPUT, 7+

15

DATA, INPUT, 7-

16

DATA, INPUT, 6+

13

DATA, INPUT, 6-

14

DATA, INPUT, 5+

11

DATA, INPUT, 5-

12

DATA, INPUT, 4+

09

DATA, INPUT, 4-

10

DATA, INPUT, 3+

07

DATA, INPUT, 3-

08

DATA, INPUT, 2+

05

DATA, INPUT, 2-

06

DATA, INPUT, 1+

03

DATA, INPUT, 1-

04

DATA, INPUT, 0+

01

DATA, INPUT, 0-

02

CLOCK, INPUT, +

39

CLOCK, INPUT, -

40

HSYNC, INPUT, +

33

HSYNC, INPUT, -

34

VSYNC, INPUT, +

35

VSYNC, INPUT, -

36

EXPOSURE1, OUTPUT, +

95

EXPOSURE1, OUTPUT, -

96

GROUND

50

KODAK MEGAPLUS 1.0

(68-pin connector)

Pin name

Pin no.

BMSB+

10

BMSB-

44

BMSB1+

11

BMSB1-

45

BMSB2+

13

BMSB2-

47

BMSB3+

14

BMSB3-

48

BMSB4+

15

BMSB4-

49

BMSB5+

16

BMSB5-

50

BMSB6+

19

BMSB6-

53

BMSB7+

20

BMSB7-

54

BMSB8+

32

BMSB8-

66

BMSB9+

33

BMSB9-

67

PIX DATA STRB +

29

PIX DATA STRB -

63

LINE ENA +

26

LINE ENA -

60

FRME ENA +

25

FRME ENA -

59

EXPOSE +

30*

EXPOSE -

64*

GROUND

01

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

continued

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Cabling Requirements (continued)	GEN-DIG-BRD/R/_ (100-pin connector)		KODAK MEGAPLUS 1.0 (68-pin connector)	
	Pin name	Pin no.	Pin name	Pin no.
	DATA, INPUT, 25+	69	← AMSB+	02
	DATA, INPUT, 25-	70	← AMSB-	36
	DATA, INPUT, 24+	67	← AMSB-1+	03
	DATA, INPUT, 24-	68	← AMSB-1-	37
	DATA, INPUT, 23+	65	← AMSB-2+	04
	DATA, INPUT, 23-	66	← AMSB-2-	38
	DATA, INPUT, 22+	63	← AMSB-3+	05
	DATA, INPUT, 22-	64	← AMSB-3-	39
	DATA, INPUT, 21+	61	← AMSB-4+	06
	DATA, INPUT, 21-	62	← AMSB-4-	40
	DATA, INPUT, 20+	59	← AMSB-5+	07
	DATA, INPUT, 20-	60	← AMSB-5-	41
	DATA, INPUT, 19+	57	← AMSB-6+	08
	DATA, INPUT, 19-	58	← AMSB-6-	42
	DATA, INPUT, 18+	55	← AMSB-7+	09
	DATA, INPUT, 18-	56	← AMSB-7-	43
	DATA, INPUT, 17+	53	← AMSB-8+	21
	DATA, INPUT, 17-	54	← AMSB-8-	55
	DATA, INPUT, 16+	51	← AMSB-9+	31
	DATA, INPUT, 16-	52	← AMSB-9-	65
Kodak Megaplug Remote Panel Software				
• Connections between the 68-pin row connector of the camera and the 9-pin serial port connector of the system are as follows:				
	PC serial port (9-pin connector)		KODAK MEGAPLUS ES 1.0 (68-pin connector)	
	Pin name	Pin no.	Pin name	Pin no.
	--	02	← SER INTRL OUT+	22
	--	03	→ SER INTRL IN+	23
	--	05	GND	34, 68

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Cabling Requirements (continued)	<p>Modes 2 – 4: Asynchronous reset</p> <ul style="list-style-type: none"> • DBHD100-TO-OPEN and IMG-7W2-TO-5BNC cables, and GEN/DIG/BRD/R/_ 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: <i>Continuous/Pseudo-continuous</i>
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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](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 Imaging Applications at 514-822-6061 for assistance.

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