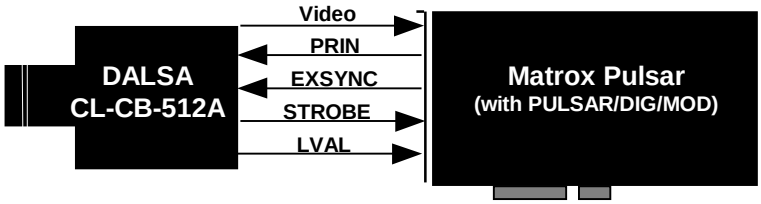
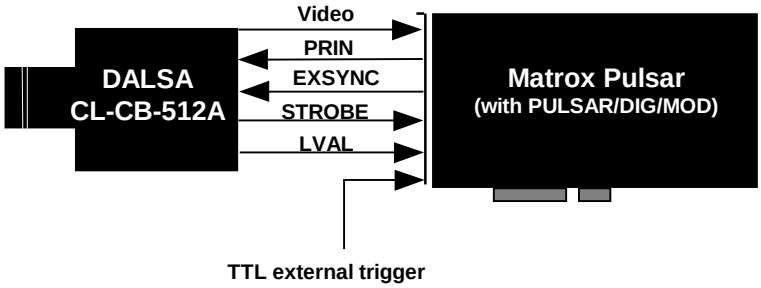
Application Note:
Interfacing non-standard cameras to Matrox Pulsar

DALSA CL-CB-512A

February 6, 1998

Camera Descriptions	• 512 x 1 x 8-bit • Digital video output (RS-422) • Max. data rate is 20MHz • External synchronization required • Exposure control
Interface Modes	• Fixed line scan rate and variable line scan rate (Binning or no Binning)
Camera Interface Briefs	**Mode 1: Fixed line scan rate**  • 512 x 1 x 8-bit. • Digital video (RS-422). • DCF configured for 512 lines per virtual frame (256 lines with Binning). • Line scan rate is fixed and is determined by frequency of EXSYNC signal. • Matrox Pulsar sending RS-422 EXPOSURE1 (PRIN), RS-422 EXPOSURE2 (EXSYNC) signals to camera; the RS-422 EXPOSURE1 (PRIN) signal control the exposure time and RS-422 EXPOSURE2 (EXSYNC) initiates line readout. • Matrox Pulsar receiving RS-422 pixel clock (STROBE @ 20 MHz, 10 MHz with Binning) and RS-422 HSYNC (LVAL) signals from camera; a high LVAL indicates valid pixels. • DCF used: CLCBDE1.DCF (no Binning) • DCF used: CLCBDE2.DCF (Binning) **Mode 2: Variable line scan rate**  • 512 x 1 x 8-bit. • Digital video (RS-422). • DCF configured for 512 lines per virtual frame (256 lines with Binning). • Line scan rate is variable and is controlled by external trigger signal • Matrox Pulsar receiving TTL external trigger. • Matrox Pulsar sending RS-422 EXPOSURE1 (PRIN), RS-422 EXPOSURE2 (EXSYNC) signals to camera; the RS-422 EXPOSURE1 (PRIN) signal control the exposure time and RS-422 EXPOSURE2 (EXSYNC) initiates line readout. • Matrox Pulsar receiving RS-422 pixel clock (STROBE @ 20 MHz, 10 MHz with Binning) and RS-422 HSYNC (LVAL) signals from camera; a high LVAL indicates valid pixels. • DCF used: CLCBDE3.DCF (no Binning) • DCF used: CLCBDE4.DCF (Binning)

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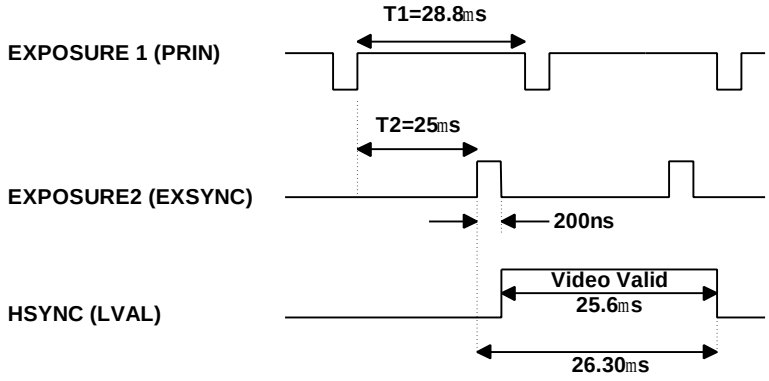
Camera Interface Details

Mode 1: Fixed line scan rate

- The Matrox Pulsar sends the RS-422 EXPOSURE2 (EXSYNC) signal to the camera; the camera awaits the rising edge of the signal and after a short (constant) delay initiates line readout. The line rate is fixed and is determined by the frequency of the EXSYNC signal.
- The Timer1 period in the DCF specifies the line rate of the camera and therefore the exposure time. The Timer1 period is currently set to 580 pixels. The pixel clock rate is 20 MHz; the line rate is therefore 34.482 kHz. The line rate and exposure time of the camera can be modified in the DCF using Matrox Intellicam. Consult the Matrox Intellicam User Guide for more information.
- The *virtual frame* rate for the current settings of the DCF is 29µs x 512 = 14848µs = 67Hz. In each virtual frame there are 512 active lines. The host buffer of the Matrox Pulsar can grab images of up to 2048 x 2048 (4MB) and the display buffer can grab images of up to 2048 x 1024 (2MB)
- The time between the rising edge of the EXPOSURE1 and EXPOSURE2 signals is the exposure time. In order to select the exposure time, the width and deployment time of each EXPOSURE 1and EXPOSURE 2 must be set in Matrox Intellicam.



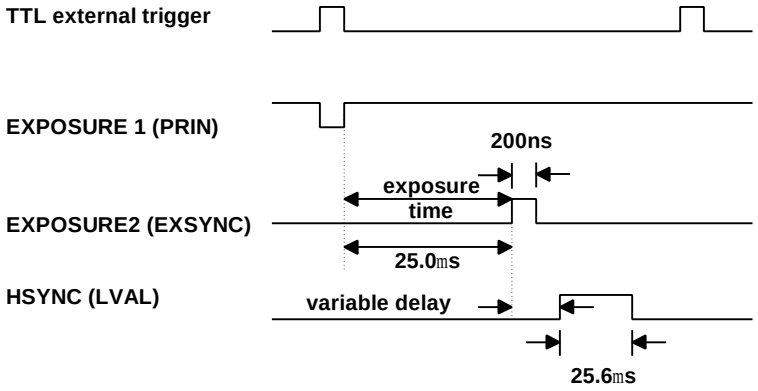
- For CLCBDE2.DCF (Binning), all details are the same as for CLCBDE1.DCF (no Binning) except that T1 = 31.8µs and T2 = 25µs and the *virtual frame* rate for the current settings of the DCF is 32.2µs x 256 = 8243µs = 121Hz. In each virtual frame there are 256 active lines.

Mode 2: Variable line scan rate

- Line rate is variable and is controlled by the external trigger signal.
- Once it has received the external signal to trigger, the Matrox Pulsar sends the RS-422 EXPOSURE1 (PRIN) signal to the camera to initiate exposure. The Matrox Pulsar will send the RS-422 EXPOSURE2 (EXSYNC) signal to the camera following a delay that is equal to the desired exposure time. A short (variable) delay after receiving the EXPOSURE2 pulse, the camera sends the RS-422 LVAL signal to the Matrox Pulsar to initiate line readout.
- The time between the rising edge of the EXPOSURE1 and EXPOSURE2 signals is the exposure time. In order to select the exposure time, the width and deployment time of each EXPOSURE 1 and EXPOSURE 2 must be set in Matrox Intellicam.

Camera Interface Details (continued)

- In no Binning mode, the maximum possible delay between the EXPOSURE2 (EXSYNC) pulse and the HSYNC (LVAL) pulse is calculated to be = 26 strobe pulses = 1.3µs.
- For CLCBDE4.DCF (Binning), all details are the same as for CLCBDE3.DCF (no Binning) except that in each virtual frame there are 256 active lines.



Cabling Requirements

Mode 1: Fixed line scan rate

- PULSAR/DIG/MOD required for digital data, syncs and control signals in RS-422 format.
- The connections between the **OS1** 20-pin dual row connector of the camera and the 68-pin connector of the PULSAR/DIG/MOD are as follows:

DALSA CL-CB-512A (20-pin dual row connector - OS1)			**PULSAR/DIG/MOD (68-pin connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
D7	1	→	DATA7+	10
D7B	2	→	DATA7–	44
D6	3	→	DATA6+	11
D6B	4	→	DATA6–	45
D5	5	→	DATA5+	13
D5B	6	→	DATA5–	47
D4	7	→	DATA4+	14
D4B	8	→	DATA4–	48
D3	9	→	DATA3+	15
D3B	10	→	DATA3–	49
D2	11	→	DATA2+	16
D2B	12	→	DATA2–	50
D1	13	→	DATA1+	19
D1B	14	→	DATA1–	53
D0	15	→	DATA0+	20
D0B	16	→	DATA0–	54
STROBE	17	→	CLKIN-	63
STROBEB	18	→	CLKIN+	29
LVAL	19	→	HSYNC+	26
LVALB	20	→	HSYNC–	60

Cabling Requirements (continued)

- The connections between the DB-25 connector on the rear panel of the camera and the 68-pin connector of the PULSAR/DIG/MOD are as follows:

DALSA CL-C3-1024N (DB-25 male connector)			PULSAR/DIG/MOD (68-pin connector)	
Pin name	*Pin no.*		*Pin name*	*Pin no.*
EXSYNC	17	←	EXPOSURE2+	28
EXSYNCB	4	←	EXPOSURE2–	62
PRIN	5	←	EXPOSURE1+	30
PRINB	18	←	EXPOSURE1–	64
BIN	23	←	CTRL 1+	23
BINB	10	←	CTRL 1–	57
GROUND	7		GROUND	1
GROUND	11		GROUND	12
GROUND	20		GROUND	34
GROUND	24		GROUND	35
POWER SUPPLY GROUND			GROUND	46
POWER SUPPLY GROUND			GROUND	68

Any pin can be used at any position: all grounds are connected on the PULSAR/DIG/MOD

NOTE: it is very important that all power supply grounds are connected together at the power supply AND at the back of the camera in the DB-25 connector, which in turn must be connected to the GROUND of the Matrox Pulsar.

- The connections between the DB-25 connector on the rear panel of the camera and the power supply are as follows:

DALSA CL-CB-512A (DB-25 male connector)		
Pin no.	*Pin name*	
MCLKB	19	→ GROUND
MCLK	6	→ +5V
8	+5V	
9	+15V	
12	-5V	
13	+5V	→ +5V
21	+15V	→ +15V
22	-5V	→ -5V
25	-15V	→ -15V

- **Pretrigger** setting (refer to manual for a full description) located on the camera's side should be adjusted to allow sufficient setup time. Matrox recommends trying position 'C' first and then trying a different switch position if necessary. Camera is shipped with a pretrigger setting of "0".
- All connections between the camera and the Matrox Pulsar are as the same for DALSA models CL-CB-1024 and CL-CB-2048, however timings in the DCF will require modification through Matrox Intellicam.

Cabling Requirements (continued)	**Mode 2: Variable line scan rate** • IMG-7W2-TO-5BNC cable required for TTL external trigger source and PULSAR/DIG/MOD 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 other connections between the camera and the Matrox Pulsar are as in Mode 1: *Fixed line scan rate*.

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