

Application Note:

Interfacing non-standard cameras to Matrox Pulsar

i2S iVC185BC

May 27, 1996

Camera Interface Overview	• 5000 x 1 x 8-bit • analog or digital video output (RS-422) • internal sync • 3 modes of operation (analog or digital video output): continuous line scan mode, asynchronous line scan mode, periodic exposure control line scan mode
Camera Interface Details	1. Continuous line scan mode • 5000 x 1 x 8-bit • Analog or digital video output (RS-422) • DCF configured for 750 lines per virtual frame • The line scan rate and the exposure time are determined by the frequency of the hsync (CLTout) signal; the exposure time is the period of the CLTout signal, which is set using the thumb wheel on the rear of the camera • Continuous video • Camera sending RS-422 hsync (CLTout) and RS-422 pixel clock (RCLK @ 20MHz) signals to Matrox Pulsar • DCFs used: IV185L.DCF (analog video output) • IV185DL.DCF (digital video output) 2. Asynchronous line scan mode • 5000 x 1 x 8-bit • Analog or digital video output (RS-422) • DCF configured for 750 lines per virtual frame • The line scan rate and the exposure time are determined by the frequency of the external trigger signal; the exposure time is the time between external trigger signals • Matrox Pulsar receiving TTL external trigger • Matrox Pulsar sending asynchronous RS-422 EXPOSURE1 (LTin) signal to camera to initiate line readout • Camera sending RS-422 hsync (CLTout) and RS-422 pixel clock (RCLK @ 20MHz) signals to Matrox Pulsar • DCFs used: IV185AL.DCF (analog video output) • IV185DAL.DCF (digital video output)

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Camera Interface Details	3. Periodic exposure control line scan mode <pre>graph LR iVC[iVC-185BC] -- Video --> MP[Matrox Pulsar] iVC -- LTin --> MP MP -- CLTout --> iVC MP -- RCLK --> iVC MP -- EXPOSURE1 LTin --> iVC</pre> • 5000 x 1 x 8-bit • Analog or digital video output (RS-422) • DCF configured for 750 lines per virtual frame • The line scan rate and the exposure time are determined by the frequency of the periodic trigger signal supplied by the Pulsar; the exposure time is the reciprocal of the frequency of this signal • Matrox Pulsar sending periodic RS-422 EXPOSURE1 (LTin) signal to camera to initiate line readout • Camera sending RS-422 hsync (CLTout) and RS-422 pixel clock (RCLK @ 20MHz) signals to Matrox Pulsar • DCFs used: IV185EL.DCF (analog video output) • IV185DEL.DCF (digital video output)																																																																						
Cabling Requirements	1a. Continuous line scan: analog video output • IMG-7W2-TO-1BNC cable required for video signal and PLS-TTL-CABLE required for digital syncs and control signals in RS-422 format • The connections between the DB-15 connector on the rear panel of the camera and a BNC connector are as follows: <table><tr><td colspan="2">i2S iVC185BC (DB-15 male connector)</td><td></td><td colspan="2">BNC connector</td></tr><tr><td>Pin no.</td><td>Pin name</td><td></td><td></td><td></td></tr><tr><td>15</td><td>Video composite</td><td></td><td></td><td>VIDEO OUT</td></tr><tr><td>7</td><td>Analog ground</td><td></td><td></td><td>GROUND</td></tr></table> • The video input BNC of the IMG-7W2-TO-1BNC cable should be connected to the above BNC connector • The connections between the DB-15 connector on the rear panel of the camera and the DB-37 connector of the PLS-TTL-CABLE are as follows: <table><tr><td colspan="2">i2S iVC185BC (DB-15 male connector)</td><td></td><td colspan="2">PLS-TTL-CABLE (DB-37 female connector)</td></tr><tr><td>Pin name</td><td>Pin no.</td><td></td><td>Pin name</td><td>Pin no.</td></tr><tr><td>GROUND</td><td>2</td><td></td><td>GROUND</td><td>3</td></tr><tr><td>LT+</td><td>3</td><td>←</td><td>EXPOSURE1+</td><td>21</td></tr><tr><td>RCLK+</td><td>4</td><td>→</td><td>CLKIN+</td><td>4</td></tr><tr><td>CLT+</td><td>5</td><td>→</td><td>HSYNC+</td><td>16</td></tr><tr><td>GROUND</td><td>9</td><td></td><td>GROUND</td><td>33</td></tr><tr><td>LT-</td><td>10</td><td>←</td><td>EXPOSURE1-</td><td>2</td></tr><tr><td>RCLK-</td><td>11</td><td>→</td><td>CLKIN-</td><td>22</td></tr><tr><td>CLT-</td><td>12</td><td>→</td><td>HSYNC-</td><td>34</td></tr></table>	i2S iVC185BC (DB-15 male connector)			BNC connector		Pin no.	Pin name				15	Video composite			VIDEO OUT	7	Analog ground			GROUND	i2S iVC185BC (DB-15 male connector)			PLS-TTL-CABLE (DB-37 female connector)		Pin name	Pin no.		Pin name	Pin no.	GROUND	2		GROUND	3	LT+	3	←	EXPOSURE1+	21	RCLK+	4	→	CLKIN+	4	CLT+	5	→	HSYNC+	16	GROUND	9		GROUND	33	LT-	10	←	EXPOSURE1-	2	RCLK-	11	→	CLKIN-	22	CLT-	12	→	HSYNC-	34
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- The connections between the DB-25 connector on the rear panel of the camera and the power supply are as follows:

i2S iVC185BC (DB-25 male connector)		POWER SUPPLY
Pin no.	Pin name	
1	DCin	+9V < Dcin < +18V
13	GROUND	GROUND

2a. Asynchronous line scan: analog video output

- IMG-7W2-TO-5BNC cable required for video signal and TTL external trigger source; PLS-TTL-CABLE required for digital syncs and control signals in RS-422 format
- The connections between the DB-15 connector on the rear panel of the camera and a BNC connector are as in continuous line scan: analog video output; this BNC connector should be connected to the video input BNC of the IMG-7W2-TO-5BNC cable
- The connections between the DB-15 connector on the rear panel of the camera and the 37-pin connector of the PLS-TTL-CABLE are as in continuous line scan: analog video output
- The connections between the DB-15 connector on the rear panel of the camera and the power supply are as in continuous line scan: analog video output;
- Pins 8,7 and 2 of the DB-15 connector of the camera are shorted together
- TTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable

2b. Asynchronous line scan: digital video output

- IMG-7W2-TO-5BNC cable required for TTL external trigger source; PULSAR/DIG/MOD required for digital data, syncs and control signals in RS-422 format
- The connections between the DB-25 connector on the rear panel of the camera and the 68-pin SCSI-2 connector of the PULSAR/DIG/MOD are as in continuous line scan: digital video output
- The connections between the DB-25 connector on the rear panel of the camera and the power supply are as in continuous line scan: digital video output
- TTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable

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Cabling Requirements	3a. Periodic exposure control line scan: analog video output • IMG-7W2-TO-1BNC cable required for video signal and PLS-TTL-CABLE required for digital syncs and control signals in RS-422 format • The connections between the DB-15 connector on the rear panel of the camera and a BNC connector are as in continuous line scan: analog video output; this BNC connector should be connected to the video input BNC of the IMG-7W2-TO-1BNC cable • The connections between the DB-15 connector on the rear panel of the camera and the 37-pin connector of the PLS-TTL-CABLE are as in continuous line scan: analog video output • The connections between the DB-15 connector on the rear panel of the camera and the power supply are as in continuous line scan: analog video output • Pins 8,7 and 2 of the DB-15 connector of the camera are shorted together 3b. Periodic exposure control line scan: digital video output • PULSAR/DIG/MOD required for digital data, syncs and control signals in RS-422 format • The connections between the DB-25 connector on the rear panel of the camera and the 68-pin SCSI-2 connector of the PULSAR/DIG/MOD are as in continuous line scan: digital video output • The connections between the DB-25 connector on the rear panel of the camera and the power supply are as in continuous line scan: digital video output
Special Considerations	• In addition to the DCFs, PSG FPGA version 3.01 or newer is required; if this version is not on your release of the MIL driver for Pulsar, the newest version can be found on the BBS or at the FTP site 1. Continuous line scan (analog or digital video outputs) • The line scan rate and the exposure time are determined by the frequency of the hsync (CLTout) signal; the exposure time is the period of the CLTout signal, which is set using the thumb wheel on the rear of the camera.

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Special Considerations	• The thumb wheel settings correspond to the following exposure times:<table><thead><tr><th>Position</th><th>Exposure time</th></tr></thead><tbody><tr><td>0</td><td>—</td></tr><tr><td>1</td><td>250μs</td></tr><tr><td>2</td><td>500μs</td></tr><tr><td>3</td><td>1ms</td></tr><tr><td>4</td><td>2ms</td></tr><tr><td>5</td><td>4ms</td></tr><tr><td>6</td><td>8ms</td></tr><tr><td>7</td><td>16ms</td></tr><tr><td>8</td><td>20ms</td></tr><tr><td>9</td><td>external mode</td></tr></tbody></table> 2. Asynchronous line scan (analog or digital video outputs) • The thumb wheel on the rear of the camera must be set to position 9: external mode • The line scan rate and the exposure time are determined by the frequency of the external trigger signal; the exposure time is the time between external trigger signals • Once it has received the external signal to trigger, the Pulsar sends the asynchronous RS-422 EXPOSURE1 (LTin) signal to the camera to initiate line readout. The camera returns the RS-422 hsync (CLTout) and pixel clock (RCLK) signals to the Pulsar • The first frame to be read out will be inaccurate; the exposure time is the time between trigger signals, therefore the first frame will correspond to the first trigger signal and the one previous to it. The correct frame will be read out on the second trigger signal • Trigger rate can vary between 50Hz and 3.9kHz 3. Exposure control line scan (analog or digital video outputs) • The thumb wheel on the rear of the camera must be set to position 9: external mode • The line scan rate and the exposure time are determined by the frequency of the periodic trigger signal supplied by the Pulsar; the exposure time is the reciprocal of the frequency of this signal • Once it has received the external signal to trigger, the Pulsar sends the periodic RS-422 EXPOSURE1 (LTin) signal to the camera. The camera returns the RS-422 hsync (CLTout) and pixel clock (RCLK) signals to the Pulsar	Position	Exposure time	0	—	1	250 μ s	2	500 μ s	3	1ms	4	2ms	5	4ms	6	8ms	7	16ms	8	20ms	9	external mode
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Special Considerations	• The frequency of the periodic EXPOSURE1 signal can vary between 50Hz and 3.9kHz. The frequency of this signal can be adjusted through the use of Intellicam: load the proper DCF and go into Camera Spec. Editor. Move the cursor down to EXPOSURE such that the words "periodic generated" are selected and press enter; an interface entitled "Exposure signal information" will open. The frequency of the periodic EXPOSURE1 signal, and thus the exposure time itself, can be modified by changing the time specified for Tlow. Under the heading of sec., select the exposure time in seconds. To complete this operation by accepting and computing the registers etc., follow the instructions in the Intellicam User Guide. The default setting of the exposure time is 4.55ms, which corresponds to a frequency of 220Hz • When the exposure time is changed, the first frame to be read out will be inaccurate; the exposure time is the time between trigger signals, therefore the first frame will correspond to an exposure time that is different from the desired one. The second frame read out, and those that follow, will be correct
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The DCF(s) mentioned in this application note can be found on the MIL and MIL-Lite CD, or our FTP site ([ftp.matrox.com](ftp: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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