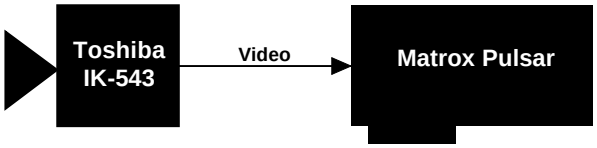
Application Note:
Interfacing non-standard cameras to Matrox Pulsar

Toshiba IK-543 **April 12, 1996**

Camera Interface Overview	• 640 x 492 (max) x 8-bit @ 30fps or 640 x 240 x 8-bit @ 60fps • analog video output • interlaced or non-interlaced • internal sync • internal exposure control • 6 modes: continuous mode (3 submodes), asynchronous reset mode (3 submodes)
Camera Interface Details	**1. Continuous mode**  **Submode 1:** • 640 x 484 x 8-bit @ 30fps • analog (composite) video output • interlaced • continuous video • internal exposure control with times ranging from (1/30)s to (1/50000)s • DCF used: IK543.DCF **Submode 2:** • 640 x 492 x 8-bit @ 30fps • analog (composite) video output • non-interlaced • continuous video • internal exposure control with times ranging from (1/60)s to (1/50000)s • DCF used: IK543N.DCF **Submode 3:** • 640 x 240 x 8-bit @ 60fps • analog (composite) video output • non-interlaced • continuous video • internal exposure control with times ranging from (1/30)s to (1/50000)s • DCF used: IK543N2.DCF

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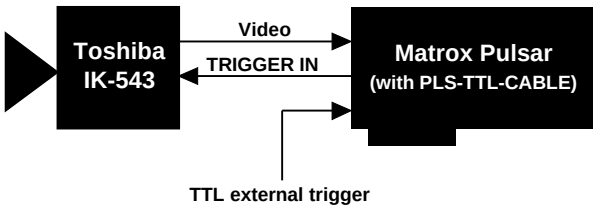
Camera Interface Details Continued

2. Asynchronous reset mode



Submode 1:
- 640 x 484 x 8-bit @ 30fps (max)
- analog (composite) video output
- interlaced
- internal exposure control with times ranging from (1/60)s to (1/50000)s
- DCF used: IK543A.DCF

Submode 2:
- 640 x 492 x 8-bit @ 30fps (max)
- analog (composite) video output
- non-interlaced
- internal exposure control with times ranging from (1/60)s to (1/50000)s
- DCF used: IK543AN.DCF

Submode 3:
- 640 x 240 x 8-bit @ 60fps (max)
- analog (composite) video output
- non-interlaced
- internal exposure control with times ranging from (1/60)s to (1/50000)s
- DCF used: IK543AN2.DCF

Cabling Requirements

1. Continuous mode

- IMG-7W2-TO-1BNC cable required
- video input BNC of IMG-7W2-TO-1BNC cable should be connected to VIDEO OUT BNC connector of camera

Submode 1:
- the SELECT switch is set to 1/30I and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The S201 internal switches of the camera are all set to OFF

Cabling Requirements Continued

Submode 2:

- the SELECT switch is set to *1/30N* and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The S201 internal switches of the camera are all set to *OFF*

Submode 3:

- the SELECT switch is set to *1/60N* and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The S201 internal switches of the camera are all set to *OFF*

2. Asynchronous reset mode

- IMG-7W2-TO-5BNC cable and PLS-TTL-CABLE required
- video input BNC of IMG-7W2-TO-5BNC cable should be connected to VIDEO OUT BNC connector of camera
- the connections between the DB-37 connector of the PLS-TTL-CABLE and the 12-pin DC IN/SYNC connector of the camera are as follows:

PLS-TTL-CABLE (DB-37 connector)			**Toshiba IK-543 (12-pin DC IN/SYNC connector)**	
Pin name	***Pin no.***		***Pin name***	***Pin no.***
TTL_EXPOSURE1	9	→	TRIGGER IN	11
GROUND	7		TRIGGER IN (GND)	12

- TTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable

Submode 1:

- the SELECT switch is set to *1/30I* and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The internal switches of the camera are set in the following way: S201/1 = *OFF*; S201/2 = *ON*; S201/3 = *OFF*; S201/4 = *ON*; S201/5 = *OFF*; S201/6 = *OFF*; S202 = *TTL*

Submode 2:

- the SELECT switch is set to *1/30N* and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The internal switches of the camera are set as in *asynchronous reset mode: submode 1*

Submode 3:

- the SELECT switch is set to *1/60N* and the exposure time is selected using the SHUTTER switch; these two switches are located on the rear of the camera. The internal switches of the camera are set as in *asynchronous reset mode: submode 1*

Special Considerations Continued

Continuous and asynchronous reset modes

- the exposure time is selected using the SHUTTER switch on the rear panel of the camera. The positions on the SHUTTER switch correspond to the following exposure times:

SHUTTER switch position	*exposure time (s)*	*SHUTTER switch position*	*exposure time (s)*
0	1/60	9	1/4000
1	1/100	A	1/6000
2	1/125	B	1/8000
3	1/250	C	1/10000
4	1/500	D	1/30000
5	1/1000	E	1/50000
6	1/1500	F	for use with
7	1/2000		2 pulse trigger
8	1/3000		camera mode

- to select an exposure time of (1/30)s, set the SHUTTER switch on the rear of the camera to *0* and set switch S201/6 located inside the camera to *ON*

- the camera manual states that in the *1/60N mode*, the camera provides the ODD fields of the output signal on VIDEO1 of the 12-pin connector and the EVEN fields on VIDEO2; however, this was not the case with the camera we tested. Instead, both VIDEO1 and VIDEO2 were alternating between ODD and EVEN fields, i.e., if the output on VIDEO1 was ODD-EVEN-ODD then the output on VIDEO2 was EVEN-ODD-EVEN (the Pulsar can grab from only one of these two outputs at a time). Although we have received confirmation that the camera currently does operate in this way, we are told that its functionality will be altered to match the one described in the manual. This revised functionality will cause the DCFs for the 1/60N camera mode to require modification. Please contact Matrox Imaging Applications at (514) 969-6061 in order to obtain assistance in making these modifications

- another modification that we are told will be made to the camera concerns the polarity of the first field to be output by the camera *when in 1/30I mode*. Currently the first field that is output is said to be ODD. After modification, the first field to be output will be EVEN. Once this alteration is made there will be a problem with the setting of the field polarity in the DCFs that will manifest itself in one or two ways: the jagged appearance of diagonal lines and/or the absence of either all the odd lines or all the even lines in the acquired image. These problems can be solved by modifying the DCFs at the hardware register level. A hardware register editor is provided by running Intellicam with the *-hwreg* option (specifically by running *INTELCAM -hwreg*). An additional menu item, "HW REGISTER EDITOR," appears on the main menu screen; select this option using the cursor and the *enter* key. If diagonal lines appear jagged in the acquired image, the FLDPOL bit of the 16-bit PSG_POLCTL register must be changed. Use the arrow keys to find the PSG_POLCTL register and once there, use the *F2* key to view the individual bits of this register.

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Special Considerations Continued	Again use the arrow keys to find the FLDPOL bit of the PSG_POLCTL register and once this bit is found, use the *F2* key to view the options; use the arrow keys and the *enter* key to make a selection. When operating the camera in continuous mode, only the FLDPOL bit need be changed to correct for a field inversion. If every second line of the image is missing, causing the image to appear darker, either the odd lines or the even lines are missing from the frame. If this is the case, the FLDSEL bit of the 16-bit PSG_EXTCTL register must be changed. Use the arrow keys to find the PSG_EXTCTL register and once there, use the *F2* key to view the individual bits of this register. Use the arrow keys to find the FLDSEL bit of the PSG_EXTCTL register and once this bit is found, use the *F2* key to view the options; use the arrow keys and the enter key to make a selection. In asychronous reset mode, both the FLDPOL bit and the FLDSEL bit will have to be changed to correct for a field inversion. If assistance is required in making any necessary modifications to the DCFs, please contact Matrox Imaging Applications at (514) 822-6061 • for the camera we tested, we found that in *asynchronous reset mode* the connection from the TTL_EXPOSURE1 output of the PLS-TTL-CABLE to the TRIGGER IN input of the camera had to be made before power was supplied to the camera or the camera would not reset on the trigger • in addition to the DCFs, PSG FPGA version 3.53 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

Corporate Headquarters: Canada and U.S.A.
Matrox Electronic Systems Ltd.
1055 St.Regis Blvd.
Dorval, Quebec, Canada
H9P 2T4
Tel: (514) 685-7230
Fax: (514) 822-6273

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