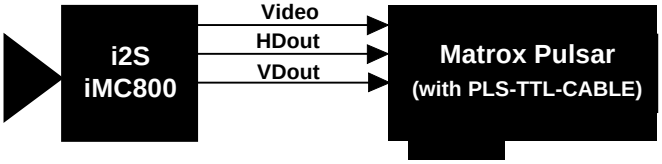
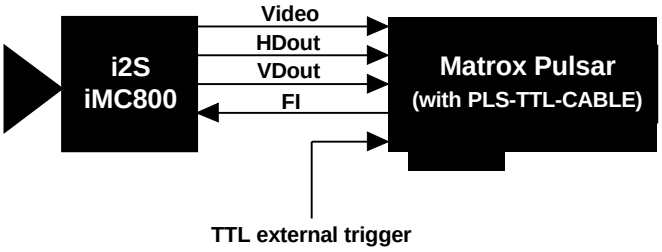
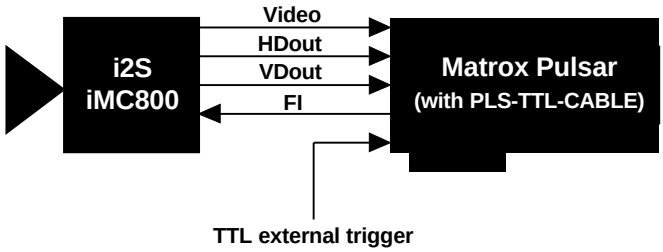
Application Note:
Interfacing non-standard cameras to Matrox Pulsar

i2S iMC800 **February 15, 1996**

Camera Interface Overview	• 752 x 560 x 8-bit or 752 x 280 x 8-bit (CCIR timings) • Analog video output • Interlaced or non-interlaced • Internal TTL hsync and vsync signals supplied externally • Internal or external exposure control • Accepts asynchronous TTL external trigger • 3 modes of operation: pseudo-continuous mode, trigger mode and control mode
Camera Interface Details	**1. Pseudo-continuous mode (Electronic Shutter mode)**  • 752 x 280 x 8-bit • Analog video output • Non-interlaced • Internal exposure control: one of nine exposure times can be selected via the coding switch on the Monoshot Driver; positions 0 through 8 correspond to exposure times of 10ms through 50µs respectively. In this mode the exposure time determines the frame rate • Continuous video • Camera sending TTL hsync (HDout) and vsync (VDout) signals to Matrox Pulsar • DCF used: IMC800N.DCF **2. Trigger mode(Monoshot mode)**  • 752 x 280 x 8-bit • Analog video output • Non-interlaced • Internal exposure control: one of nine exposure times can be selected via the coding switch on the Monoshot Driver; positions 0 through 8 correspond to exposure times of 10ms through 50µs respectively • Camera sending TTL hsync (HDout) and vsync (VDout) signals to Matrox Pulsar • Matrox Pulsar receiving TTL external trigger • Matrox Pulsar sending TTL exposure (FI) signal to camera; the exposure signal only initiates exposure • DCF used: IMC800AN.DCF

3. Control mode (Long Exposure mode)



- 752 x 560 x 8-bit
- Analog video output
- Interlaced
- External exposure control: the coding switch on the Monoshot Driver must be set to 9
- Camera sending TTL hsync (HDout) and vsync (VDout) signals to Matrox Pulsar
- Matrox Pulsar receiving TTL external trigger
- Matrox Pulsar sending TTL exposure (FI) signal to camera; the exposure signal both initiates exposure and controls exposure time
- DCF used: IMC800AE.DCF

Cabling Requirements

IMPORTANT: the capacitors C274 and C275 (1nF) must be included on the solder side of the Matrox Pulsar baseboard to ensure proper functionality between the Pulsar and the i2S iMC800 camera. Holding the front end (retainer brace end) of the board in your left hand so that the long axis of the board is horizontal, these capacitors are located approximately 3.5 cm both from the left and from the top of the board. If your board does not include these capacitors, please contact Matrox for an upgrade.

1. Pseudo-Continuous mode (Electronic Shutter mode)

- IMG-7W2-TO-1BNC and PLS-TTL-CABLE required
- Video input BNC of IMG-7W2-TO-1BNC cable should be connected to VIDEO OUT BNC connector of camera
- The connections between the 25-pin sub/D connector of the camera's Monoshot Driver and the DB-37 connector of the PLS-TTL-CABLE are as follows:

i2S iMC800 Monoshot Driver (25-pin sub/D connector)			**PLS-TTL-CABLE (DB-37 connector)**	
Pin name	**Pin no.**		**Pin name**	**Pin no.**
VD out	3	→	TTL_VSYNC	11
HD out	11	→	TTL_HSYNC	26
MS*	6	←	CTRL1	36
DGD	1		GROUND	6&7

Cabling Requirements

2. Trigger mode (Monoshot 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 25-pin sub/D connector of the camera's Monoshot Driver and the DB-37 connector of the PLS-TTL-CABLE are as follows:

i2S iMC800 Monoshot Driver (25-pin sub/D connector)			**PLS-TTL-CABLE (DB-37 connector)**	
Pin name	**Pin no.**		**Pin name**	**Pin no.**
FI	2	←	TTL_EXPOSURE1	9
VD out	3	→	TTL_VSYNC	11
HD out	11	→	TTL_HSYNC	26
MS*	6	←	CTRL1	36
DGD	1		GROUND	6&7

Note 1: to enable the use of the FI TTL trigger input on the Monoshot Driver, the CAV1 jumper on the Monoshot Driver must be connected!

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

3. Control mode (Long Exposure 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 25-pin sub/D connector of camera's Monoshot Driver and the DB-37 connector of the PLS-TTL-CABLE are as in Trigger mode
- TTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable

Trigger mode (Monoshot mode)

- Once it has received the external signal to trigger, the Pulsar sends a TTL exposure signal to the camera. The camera awaits the falling edge of the signal, at which point it initiates exposure. The exposure time is set on the camera by using the coding switch

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Special Considerations

Pseudo-Continuous and Trigger modes (Electronic Shutter and Monoshot modes)

- The coding switch on the Monoshot Driver must be set to a position between 0 and 8. The positions on the coding switch correspond to the following exposure times:

coding switch position	exposure time
0	10ms
1	8ms
2	4ms
3	2ms
4	1ms
5	500µs
6	250µs
7	100µs
8	50µs

Control mode (Long Exposure mode)

- The coding switch on the Monoshot Driver must be set to 9 in order to operate the camera in Control mode
- Once it has received the external signal to trigger, the Pulsar sends a TTL exposure signal to the camera. The camera awaits the falling edge of the signal, at which point it initiates exposure. The exposure time is set by the Pulsar; the camera will expose for as long as the exposure signal is low
- Use Matrox Intellicam to modify the DCF in order to specify the exposure time. The exposure time may take on values that satisfy the following two equations:

$$T_i = (K+1)\times 40ms$$

and

$$d = ((K\times 40)+20)ms\,,$$

where T_i is the exposure time, d is the width of the low portion of the exposure signal and K is the exposure time in terms of the number of frame times minus 1, that is, $K = \#\ frame\ times - 1$. K must be an integer. One frame time is equal to 40ms. Failure to choose exposure times that satisfy these equations will result in an uncertainty in the actual exposure time of ±20ms

- Default exposure time is 100ms

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). 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.

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

MATROX IMAGING