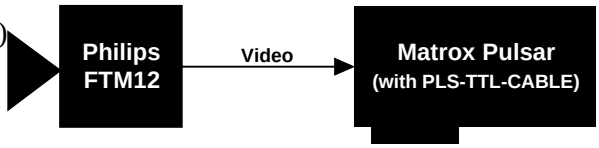
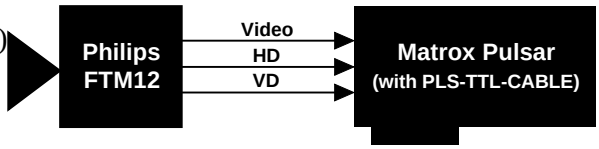
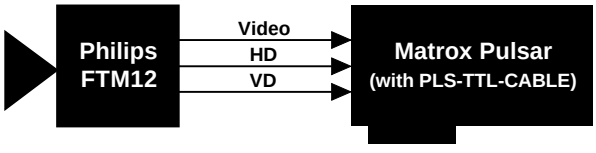
Application Note:
Interfacing non-standard cameras to Matrox Pulsar

Phillips FTM12 **February 7, 1996**

Camera Interface Overview	• 1024 x 1024 x 8-bit @ 30fps (max) or 1024 x 512 x 8-bit @ 60fps (max) • Analog video output • Interlaced or non-interlaced • Internal TTL hsync and vsync signals supplied externally • Internal or external exposure (frame integration time) control • Accepts asynchronous TTL external trigger • 60Hz maximum frame rate/40MHz clock rate version • 3 modes of operation: continuous (3 submodes), trigger, control • Modification of the integration (or exposure) time is possible in each of these 3 modes; the frame rate is determined by the integration time (in addition to a constant frameshift duration of 0.7ms)
Camera Interface Details	**1. Continuous Mode** **Submode 1:** • 1024 x 1024 x 8-bit @ 30fps (max) • Analog (composite) video output • Interlaced • Continuous video • Internal exposure control: 1.024ms to 19.328ms in increments of 1.024ms (frame rate is altered accordingly) • DCF used: FTM12.DCF **Submode 2:** • 1024 x 1024 x 8-bit @ 30fps (max) • Analog video output • Interlaced • Continuous video • Internal exposure control: 1.024ms to 19.328ms in increments of 1.024ms (frame rate is altered accordingly) • Matrox Pulsar receiving TTL hsync (HD) and vsync (VD) signals from camera • DCF used: FTM12S.DCF **Submode 3:** • 1024 x 512 x 8-bit @ 60fps (max) • Analog video output • Non-interlaced • Continuous video • Internal exposure control: 1.024ms to 19.328ms in increments of 1.024ms (frame rate is altered accordingly) • Matrox Pulsar receiving TTL hsync (HD) and vsync (VD) signals from camera • DCF used: FTM12NS.DCF







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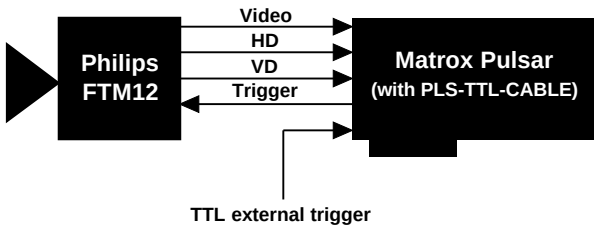
2. Trigger Mode

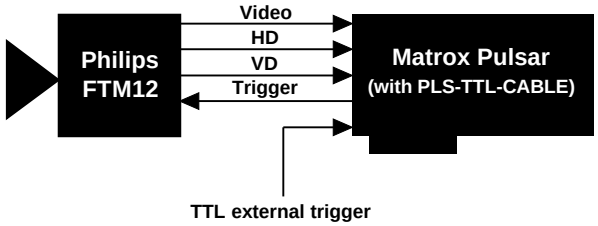


- 1024 x 512 x 8-bit @ 60fps (max)
- Analog video output
- Non-interlaced
- Internal exposure control:

Range 1: 819.2µs to 25.395ms in increments of 819.2µs
Range 2: 26.214ms to 812.65ms in increments of 26.214ms
(frame rate is altered accordingly)

- Matrox Pulsar receiving TTL hsync (HD) and vsync (VD) signals from camera
- Matrox Pulsar receiving TTL external trigger
- Matrox Pulsar sends TTL exposure signal to trigger input of camera to initiate exposure
- DCF used: FTM12ANS.DCF

3. Control Mode



- 1024 x 512 x 8-bit @ 60fps (max)
- Analog video output
- Non-interlaced
- External exposure control with times starting at 88.8µs (frame rate is altered accordingly)
- Matrox Pulsar receiving TTL hsync (HD) and vsync (VD) signals from camera
- Matrox Pulsar receiving TTL external trigger
- Matrox Pulsar sends TTL exposure signal to trigger input of camera to initiate exposure; the exposure signal both initiates exposure and controls exposure time
- DCF used: FTM12ANE.DCF

Cabling Requirements

1. Continuous Mode

Submode 1:

- IMG-7W2-TO-1BNC required
- Video input BNC of IMG-7W2-TO-1BNC cable should be connected to VIDEO OUT BNC connector of camera
- Camera must be configured in interlaced mode

Submode 2:

- 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
- Camera must be configured in interlaced mode

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Cabling Requirements

- The following connections should be made between the DB-37 connector of the PLS-TTL-CABLE and the 25-pin sub/D connector of the camera:

PLS-TTL-CABLE (DB-37 connector)			PHILIPS FTM12 (25-pin sub/D connector)	
Pin name	**Pin no.**		**Pin name**	**Pin no.**
TTL_HSYNC	26	←	HDB	22
TTL_EXPOSURE1	9	→	TRIGR	18
TTL_VSYNC	11	←	VDB	23

- Note here that the trigger input of the camera is tied to the exposure output of the Pulsar, though the exposure output itself is not used; this precaution prevents the trigger input from picking up stray signals that might lead to unwanted triggering of the camera

Submode 3:

- 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
- Camera must be configured in non-interlaced mode
- The following connections should be made between the DB-37 connector of the PLS-TTL-CABLE and the 25-pin sub/D connector of the camera:

PLS-TTL-CABLE (DB-37 connector)			PHILIPS FTM12 (25-pin sub/D connector)	
Pin name	**Pin no.**		**Pin name**	**Pin no.**
TTL_HSYNC	26	←	HDB	22
TTL_EXPOSURE1	9	→	TRIGR	18
TTL_VSYNC	11	←	FVDB	20

- Note here that the trigger input of the camera is tied to the exposure output of the Pulsar, though the exposure output itself is not used; this precaution prevents the trigger input from picking up stray signals that might lead to unwanted triggering of the camera

2. Trigger 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
- Camera must be configured in non-interlaced mode
- The connections between the DB-37 connector of the PLS-TTL-CABLE and the 25-pin sub/D connector of the camera are the same as those in Continuous mode: Submode 3. The connection between the trigger input of the camera and the exposure output of the Pulsar is now used to send asynchronous reset and exposure signals to the cameraTTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable

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Cabling Requirements	**3. Control Mode** • IMG-7W2-TO-5BNC cable and PLS-TTL-CABLE required continued • Video input BNC of IMG-7W2-TO-5BNC cable should be connected to VIDEO OUT BNC connector of camera • Camera must be configured in non-interlaced mode • The connections between the DB-37 connector of the PLS-TTL-CABLE and the 25-pin sub/D connector of the camera are the same as those in Continuous mode: Submode 3. The connection between the trigger input of the camera and the exposure output of the Pulsar is now used to send asynchronous reset and exposure signals to the camera • TTL external trigger source should be connected to the TTL Trigger Input of the IMG-7W2-TO-5BNC cable **4. Continuous Mode:** • A table of integration time settings for the Continuous mode can be found in appendix 2 of the User Manual for the FTM12 camera **5. Trigger Mode:** • Once it has received the external signal to trigger, the Pulsar sends a TTL exposure signal to the camera. The camera awaits the rising edge of the signal, at which point it initiates exposure. The exposure time is set on the camera by using the camera control software • A table of integration time settings (for both ranges 1 and 2) for the Trigger mode can be found in appendix 3 of the User Manual for the FTM12 camera • An exposure pulse going high before the integration period has ended will result in a charge reset; the integration time counter resets and starts again from zero • Minimum duration of an exposure pulse must be 3.2µs
Special Considerations	**3. 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 rising 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 high • When the exposure pulse goes down, frameshift will start. If there is an exposure pulse before the complete storage part is read out, the rest of the image will be lost and the sequence starts again. Using this feature it is possible to get a higher frame rate if part of the image is not needed

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Special Considerations	• Exposure time can be modified using Matrox Intellicam. Consult the Matrox Intellicam User Guide for more information • Default exposure time is 10ms

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