

# PC\_EYE/RGB / QUADRO

4-Channel PCI Express Frame Grabber for Simultaneous Synchronous or Color Analog Cameras

- PCI Express performance
- Quadro acquisition
- With large FIFO and 40-MHz ADCs

→ preliminary

### III Main Features

- PCI Express Frame Grabber Board
- Frame grabber for 4 simultaneous monochrome channels resp. one RGB channel
- Digitizes four parallel, separate images from synchronized cameras.
- Trigger inputs
- On-board sync generator
- Restart cameras supported
- Real-time acquisition of images or image sequences directly into main memory
- Image memory format: monochrome with 8 bits/pixel (PC\_EYE/QUADRO)
- Image memory format: monochrome with 32 bits/pixel (PC\_EYE/RGB)
- PCI Express (x1) interface

### III Technical Details

The PC\_EYE/QUADRO and PC\_EYE/RGB frame grabbers are intended for four monochrome cameras (quadro mode) resp. one RGB camera.

In quadro mode, the four images are stored in separate memory regions as separate monochrome images. The cameras (same type) must be synchronized for this operating mode and must be used with the same number of pixels. In RGB mode one pixel occupies one longword.

The PCI Express bus interface offers nearly twice the transfer speed of the older PCI bus.

The region of interest, i.e. the part of the video information that is acquired, can be defined on a pixel basis for all 4 video inputs with the same values - not always the full frame has to be acquired.

### Pixel Clock Generation

The clock used to digitize all four channels is generated either by an on-board PLL, synchronized to the horizontal camera sync with a pixel jitter of  $\leq 7$  ns or it is taken directly from the pixel clock input for camera-synchronous digitization.

### Analog-Digital Converter / Multiplexer

The four independent A/D converters digitize data each with 8 bits resolution at rates between 5 and 40 MHz. Each ADC can sample data from 4 input ports out of 8 total.

### Trigger Processing

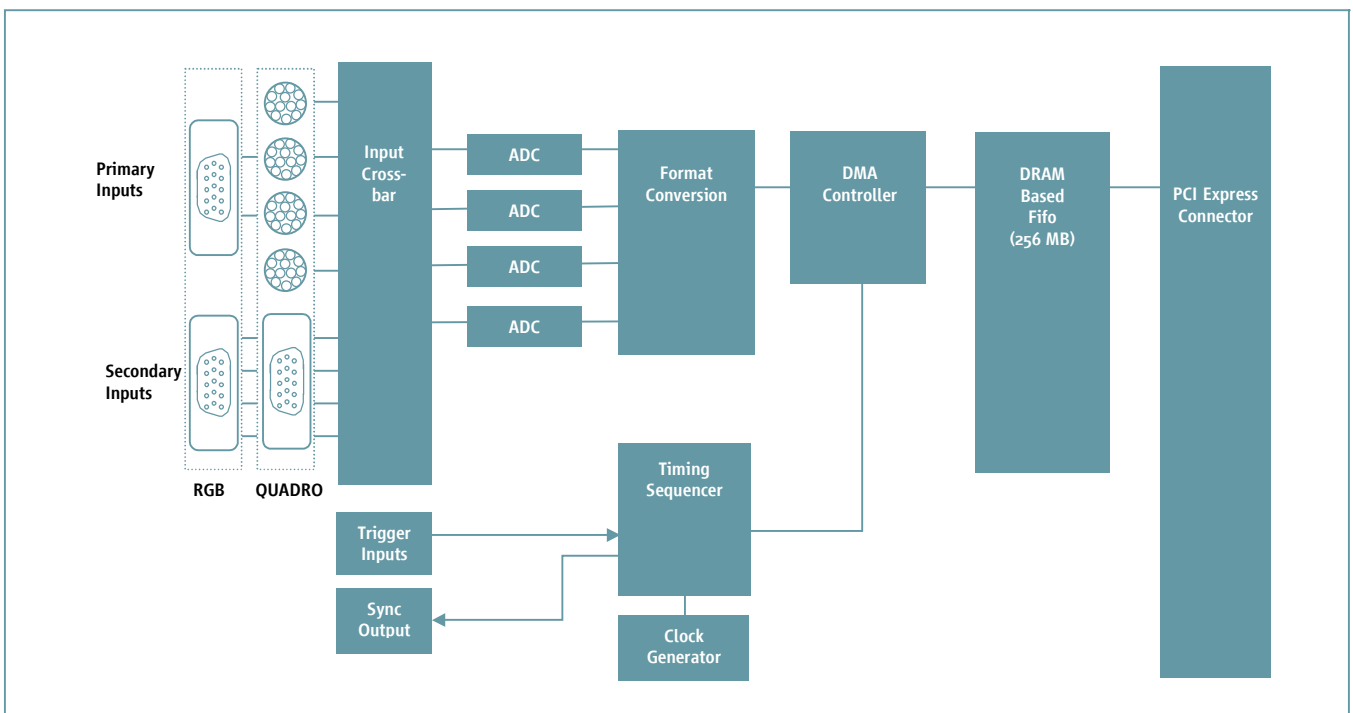
The PC\_EYE/QUADRO / PC\_EYE/RGB has opto-isolated trigger inputs with additional outputs used to trigger cameras. Strobe lights can also be triggered by the trigger inputs.

### DMA Controller

In the last step image data is transmitted by DMA directly into main memory or into the graphics card.

Bus	PCI Express
width	(1+1) bits in+out
speed	2500 MHz
Usable bandwidth (PC_EYE/ASYNC)	160 MB/s (typ.)

This DMA controller consists actually of four independent controllers, capable of transferring four video data streams into four independent memory regions.



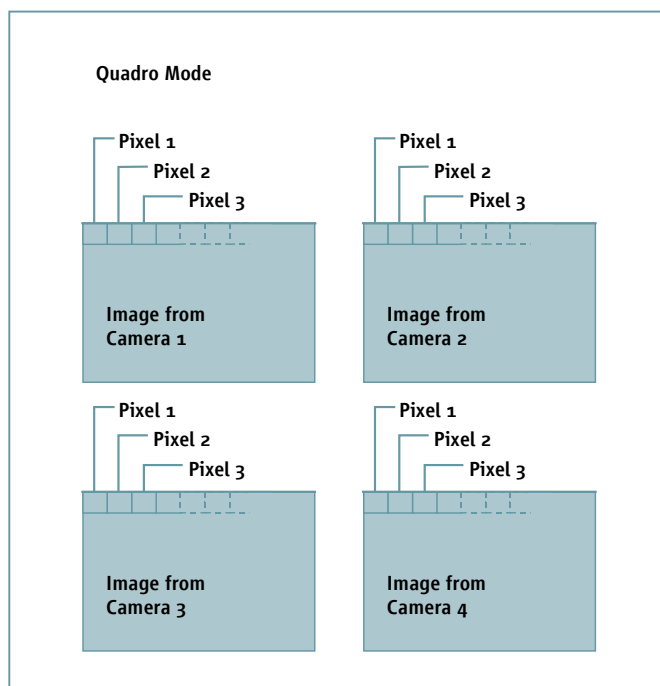
The PCI Express (x1) single-lane interface offers transfer rates of theoretical up to 250 MB/s in full duplex. Due to the PCI Express architecture with point-to-point connections instead of a common bus, each PCI Express card can utilize the full bandwidth.

### Extended FIFO

For applications with high bandwidth requirements there is a DRAM-based FIFO with additional SO-DIMM memory with SDRAM chips and with a capacity of 256 MB. So, no image data is lost even when the PCI Express bus is not available for more than a second.

### Pixel Packing Modes

Pixels are always stored in memory in four separate regions as four different monochrome images.. Each image consists of adjacent byte values. For RGB however, the image is stored with 32 bits in one longword.



### Frame Grabber Basic Tools

Drivers for Windows come in the form of a DLL for Windows 2000/XP. Setup of the ADC, offset/gain, region-of-interest adjustment, camera selection, and camera setup files are supported. Permanent (live), single-shot, and double-buffered acquisition of images can be requested and the status of the acquisition (active / finished) can be inquired.

Memory allocation for image buffers is also handled by the DLL at runtime; frame buffers appear in linear memory for easy addressing.

A setup program supports test and configuration of the board under Windows. Display routines using the DirectDraw standard are supplied in source. This software level is intended for users who already have their own software support available, such as image processing libraries, or wish to create application programs by themselves.

Frame Grabber Basic Tools is available for Windows 2000/XP and for Linux. For the real-time operating systems VxWorks and OS-9 there is a reduced version (available on request), where parameters are set in configuration files only and where no display routines are included.

### Cameras Supported

Cameras with reset/restart features are supported, as well as pixel clock input to the frame grabber for sub-pixel accuracy.

Generic (Free-running), Generic CCIR625 (Free-running), Generic EIA (Free-running), Sony XC-55 (Full frame, Interlaced, Restart, Long time exp., E-Donpisha II), Sony 003 P (Restart), Sony XC-ST50CE (t.b.d.), Sony XC-ST70CE (t.b.d., Full frame, Donpisha), Sony XC 8500 (Dual, Restart), Teli 3910 (Full frame, fixed, RTS pulsed Megapixel), JAI M-10 RS (Dual, Full frame, Restart), JAI M50 (Restart), JAI M70 (Full frame, Restart), JAI M1 (Free-running), JAI A11 (Full frame, Restart), JAI A50/A60 (Interlaced, Restart)

### High-Level Software

Support for several 3rd-party imaging tools is available under Windows:

AdOculus (The Imaging Source) is a tool for visual image processing algorithm development. All of the basic algorithms are supplied in source form for easy modification and expansion.

Heurisko (Aeon Verlag+Studio) is a tool for development of highly optimized imaging algorithms using a C-like scripting language.

Halcon (MVTec) is a very complete tool set with an integrated scripting language.

The freeware imaging library IPL98 has been tested to work; there is a demo source, showing how to use it.

DB15		Hirose	
Pin	Signal	Pin	Signal
1	Video4 / Trig 2+	1	Gnd
2	Video5 / Trig 2-	2	+12V
3	Video6 / Trig 3-	3	Gnd
4	Video7 / Trig 3-	4	Video
5	Gnd	5	Gnd
6	Gnd	6	GPout
7	Gnd	7	Gpout/ExtClk
8	Gnd	8	Gnd
9	Pout4 / Trig 1+	9	GPout/ExtClk/Video
10	Gnd	10	Gnd/GPin
11	Pout11 / Trig 1-	11	+12V/GPout
12	Clock	12	Gnd
13	Pout3 / Trig 0+		
14	Pout4 / Trig 0-		
15	+12V		

Note: Depend on jumper settings

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### III Specifications

#### ADC

→ 8-bit, 40 MHz, 4 channels parallel

#### Connectors (PC\_EYE/QUADRO)

- 4 \* 12-pin Hirose + 1 \* DB 15 (for triggers)
- 4 \* 12V-camera supplies
- 8 \* video input DB-15
- 12 \* sync/restart outputs (75 Ohm)
- 4 \* Pixel clock input (TTL, 75 Ohm)
- 4 \* Trigger input (TTL)

#### Connectors (PC\_EYE/RGB)

- 2 \* 12V-camera supplies
- 8 \* video input on 2 \* DB-15
- 2 \* sync/restart outputs (75 Ohm)
- 2 \* Pixel clock input (TTL, 75 Ohm)
- 2 \* Trigger input (TTL)

#### Environmental Conditions

- Storage Temperature: -20 °C - 70 °C
- Operating Temperature: 0 °C - 45 °C (2 m/s forced air cooling)
- Maximum Operating Humidity: 85 % relative

#### Power Requirements

- 1.5A max., 0.9A typ. at + 3.3 VDC ± 5 %
- 0.5A max., 0.3A typ. at + 12 VDC ± 5 %
- 2A max. total, 12V for camera supply (voltage supplied through on-board power-supply connector [floppy-type])
- 1.1A max. for each of the 4 camera supply outputs

#### PCI bus Requirements

- PCI Express (x1) compliant (Rev 1.0a)

#### MTBF

- T.b.d. hrs (computed after MIL-HDBK-217E)

#### Documentation

- Free Internet

Please contact your local sales office for detailed information.

