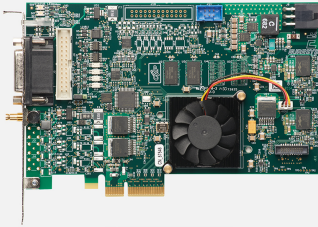EURESYS™
Excellence in vision

Coaxlink Mono

One-connection CoaXPress frame grabber

At a Glance

- One CoaXPress CXP-6 connection: 625 MB/s camera bandwidth
- PCIe 2.0 (Gen 2) x4 bus: 1,700 MB/s delivery bandwidth
- Feature-rich set of 10 digital I/O lines
- Extensive camera control functions
- Memento Event Logging Tool

Benefits

Acquire images from the fastest and highest resolution cameras

- Highest data acquisition rate in the industry
- 6.25 Gbit/s (625 MB/s) bandwidth from camera to host PC memory

Long cable support

- 40 meters at CXP-6 speed (6.25 Gbps)
- 100 meters at CXP-3 speed (3 Gbps)

Use standard coaxial cables

- A single inexpensive cable for data transfer, camera control, trigger and power supply
- Top reliability and flexibility, performs in the harshest environments

Robust connectors

Coaxlink uses DIN 1.0/2.3 connectors with push/pull latching system for reliable connections

Memento Event Logging Tool

- Memento is an advanced development and debugging tool available for Coaxlink cards.
- Memento records an accurate log of all the events related to the camera, the frame grabber and its driver as well as the application.
- It provides the developer with a precise timeline of time-stamped events, along with context information.
- It provides valuable assistance during application development and debugging, as well as during machine operation.

Direct GPU transfer

- Sample programs for AMD DirectGMA and NVIDIA (CUDA) available.
- Direct GPU transfer eliminates unnecessary system memory copies, dramatically lowers CPU overhead, and reduces latency, resulting in significant performance improvements in data transfer times for applications.
- Direct capture of image data to GPU memory is available using AMD's DirectGMA. Compatible with AMD FirePro W5x00 and above and all AMD FirePro S series products.

PCIe 2.0 (Gen 2) x4 bus

- 1,700 MB/s sustained bus bandwidth

General purpose I/O lines

- Compatible with a wide range of sensors and motion encoders.
- High-speed differential inputs: Quadrature motion encoder support up to 5 MHz.
- Isolated current-sense inputs: 5V, 12V, 24V signaling voltages accepted, up to 50 kHz, individual galvanic isolation up to 500VAC RMS.
- Isolated contact outputs.
- High-speed 5V-compliant TTL inputs/ LVTTL outputs.

High-performance DMA (Direct Memory Access)

- Direct transfer into user-allocated memory
- Hardware scatter-gather support
- 64-bit addressing capability

Area-scan triggering capabilities

- A trigger is used to start the acquisition when the part is in position. Hardware triggers come from the Coaxlink's I/O lines. Software triggers come from the application.
- An optional trigger delay is available to postpone the acquisition for a programmable time.
- A trigger decimation function allows to skip some of the triggers.
- Camera exposure control allows the application to control the exposure time of the camera.
- When the acquisition starts, at the appropriate timing, the Coaxlink board generates a signal to control an illumination device connected to one of its output lines.

The Coaxlink driver includes the following tools:

- Genicam Browser: An application giving access to the GenICam features exposed by the GenTL Producer(s) in the system.
- GenTL Console: A command-line tool giving access to the functions and commands exposed by the Euresys GenTL Producer.

Compliant with Genicam

Including support for

- GenApi
- The Standard Feature Naming Convention (SFNC)
- GenTL

Windows and Linux drivers available

- Including support for the AArch64 64-bit ARM architecture for Linux

Applications

Machine Vision for the Electronic Manufacturing Industry

- High speed image acquisition for AOI, 3D SPI, 3D lead/ball inspection machines.

Machine Vision for the General Manufacturing Industries
- High frame rate image acquisition for inspection machines
- Image acquisition for robots

Video Acquisition and Recording
- High-frame-rate video acquisition for motion analysis and recording

Video Monitoring, Surveillance & Security
- Transmission and acquisition of high-definition video over long coaxial cables for traffic surveillance, monitoring and control

Specifications

Mechanical

Form Factor	PCI Express card
Format	Standard profile, half length, 4-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink
Mounting	For insertion in a standard height, 4-lane or higher, PCI Express card slot
Connectors	'A' on bracket: - DIN 1.0/2.3 female connector - CoaXpress host interface - EXTERNAL I/O' on bracket: 26-pin 3-row high-density female sub-D connector - I/O lines and power output - INTERNAL I/O 1' on PCB: 26-pin 2-row 0.1" pitch pin header with shrouding - I/O lines and power output 'AUXILIARY POWER INPUT' on module: 6-pin PEG power socket 12 VDC power input for PoCXP camera(s) and I/O 'C2C-LINK' on module: 6-pin 2-row 0.1-in header - Card to card link
Lamp indicators	'A' on bracket: 2x bi-color red/green LEDs - CoaXPress Host connector indicator lamps 'FPGA STATUS LAMP' on PCB: - Bi-color red/green LED - FPGA status lamp 'BOARD STATUS LAMP' on PCB: - Bi-color red/green LED
Switches	'RECOVERY' on card PCB: 3-pin 1-row 0.1" header - Firmware emergency recovery
Dimensions	L 167.65 mm x H 111.15 mm L 6.6 in x H 4.38 in
Weight	150 g, 5.29 oz

Host bus

Standard	PCI Express 2.0
Link width	• 4 lanes • 1 lane or 2 lanes with reduced performance
Link speed	• 5.0 GT/s (PCIe 2.0) • 2.5 GT/s (PCIe 1.0) with reduced performance
Maximum payload size	512 bytes
DMA	32- and 64-bit
Peak delivery bandwidth	2,000 MB/s
Effective (sustained) delivery bandwidth	1,700 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 9.3 W (2.1 W @ +3.3V, 7.2 W @ +12V), excluding camera and I/O power output

Camera / video inputs

Interface standard(s)	CoaXPress 1.0 and 1.1
Connectors	1x DIN1.0/2.3 CXP-6
Status LEDs	1 CoaXPress Host connection status per connector
Number of cameras	One 1-connection area-scan camera
Line-scan cameras supported	No
Maximum aggregated camera data transfer rate	6.25 Gbit/s (625 MB/s)
Supported CXP down-connection speeds	1.25 GT/s (CXP-1), 2.5 GT/s (CXP-2), 3.125 GT/s (CXP-3), 5 GT/s (CXP-5), and 6.25 GT/s (CXP-6)
Number of CXP data streams (per camera)	1 data stream per camera
Maximum CXP stream packet size	16,384 bytes
PoCXP (Power over CoaXPress)	• PoCXP Safe Power: 　− 17 W of 24V DC regulated power per CoaXPress connector 　− PoCXP Device detection and automatic power-on 　− Overload and short-circuit protections • On-board 12V to 24V DC/DC converter • A +12V power source must be connected to the AUXILIARY POWER INPUT connector using a 6-pin PEG cable
Camera types	• Area-scan cameras: 　− Gray-scale and color (RGB and Bayer CFA) 　− Single-tap (1X-1Y) progressive-scan
Camera pixel formats supported	Raw, Monochrome, Bayer, RGB, and RGBA (PFNC names): • Raw • Mono8, Mono10, Mono12, Mono14, Mono16 • BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 where XX = GR, RG, GB, or BG • RGB8, RGB10, RGB12, RGB14, RGB16 • RGBA8, RGBA10, RGBA12, RGBA14, RGBA16

Area-scan camera control

Trigger	• Precise control of asynchronous reset cameras, with exposure control.
	• Support of camera exposure/readout overlap.
	• Support of external hardware trigger, with optional delay and trigger decimation.
Strobe	• Accurate control of the strobe position for strobed light sources.
	• Support of early and late strobe pulses.

Line-scan camera control

Scan/page trigger	• Precise control of start-of-scan and end-of-scan triggers.
	• Support of external hardware trigger, with optional delay.
	• Support of infinite acquisition, without missing line, for web inspection applications.
Line trigger	• Support for quadrature motion encoders, with programmable noise filters, selection of acquisition direction and backward motion compensation.
	• Rate Converter tool for fine control of the pixel aspect ratio: Rate Conversion Ratio in the range 0.001 to 1000 with an accuracy better than 0.1%.
	• Rate Divider tool
Line strobe	• Accurate control of the strobe position for strobed light sources.

On-board processing

On-board memory	512 MB
Image data stream processing	• Unpacking of 10-/12-/14-bit to 16-bit with selectable justification to LSb or MSb
	• Optional swap of R and B components
	• Little endian conversion
Data stream statistics	• Measurement of:
	− Frame rate (Area-scan only)
	− Line rate
	− Data rate
	• Configurable averaging interval
Event signaling and counting	• The application software can be notified of the occurrence of various events:
	− Standard event: the EVENT_NEW_BUFFER event notifies the application of newly filled buffers
	− A large set of custom events
	• Custom events sources:
	− I/O Toolbox events
	− Camera and Illumination control events
	− CoaXPress data stream events
	− CoaXPress host interface events
	• Each custom event is associated with a 32-bit counter that counts the number of occurrences
	• The last three 32-bit context data words of the event context data can be configured with event-specific context data:
	− Event-specific data
	− State of all System I/O lines sampled at the event occurrence time
	− Value of any event counter
Input LUT (Lookup Table)	• Available for monochrome cameras
	− 8 to 8 bits
	− 10 to 8, 10 or 16 bits
	− 12 to 8, 12 or 16 bits

General Purpose Inputs and Outputs

Number of lines	10 I/O lines: • 2 differential inputs (DIN) • 2 singled-ended TTL inputs/outputs (TTLIO) • 4 isolated inputs (IIN) • 2 isolated outputs (IOUT)

Usage	• Any I/O input lines can be used by any LIN tool of the I/O Toolbox
	• Selected pairs of I/O input lines can be used by any QDC tool of the I/O toolbox to decode A/B signals of a motion encoder
	• The LIN and QDC tools outputs can be further processed by the other tools (DIV, MDV, DEL) of the I/O toolbox to generate any of the following "trigger" events:
	  − The "cycle trigger" of the Camera and Illumination controller
	  − The "cycle sequence trigger" of the Camera and Illumination controller
	  − The "start-of-scan trigger" of the Acquisition Controller (line-scan only)
	  − The "end-of-scan trigger" of the Acquisition Controller (line-scan only)

Electrical specifications	• DIN: High-speed differential inputs compatible with ANSI/EIA/TIA-422/485 differential line drivers and complementary TTL drivers • TTLIO: High-speed 5V-compliant TTL inputs or LVTTL outputs, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers or LVTTL, TTL, 3V CMOS receivers • IIN: Isolated current-sense inputs with wide voltage input range up to 30V, compatible with totem-pole LVTTL, TTL, 5V CMOS drivers, RS-422 differential line drivers, potential free contacts, solid-state relays and opto-couplers • IOUT: Isolated contact outputs compatible with 30V / 100mA loads

Filter control	• Glitch removal filter available on all System I/O input lines
	• Configurable filter time constants:
	  − for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns, 1 µs
	  − for IIN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs

Polarity control	Yes
Power output	Non-isolated, +12V, 1A, with electronic fuse protection

I/O Toolbox tools	The I/O Toolbox is a configurable interconnection of tools that generates events (usually triggers) from input lines. The composition of the toolset is product- and firmware-dependent.
	• Line Input tool (LIN): Edge detector delivering events on rising or falling edges of any selected input line.
	• Quadrature Decoder tool (QDC): A composite tool including:
	  − A quadrature edge detector delivering events on selected transitions of selected pairs of input lines.
	  − An optional backward motion compensator for clean line-scan image acquisition when the motion is unstable.
	  − A 32-bit up/down counter for delivering a position value.
	• Divider tool (DIV): to generate an event every nth input events from any I/O toolbox event source.
	• Multiplier/divider tool (MDV): to generate m events every d input events from any I/O toolbox event source.
	• Delay tool (DEL): to delay up to 16 events from one or two I/O toolbox event sources, by a programmable time or number of motion encoder ticks (any QDC events).
	• User Actions Scheduler tool (UAS): to delegate the execution of User Actions at a scheduled time or encoder position. Possible user actions include setting low/high/toggle any bit of the User Output Register or generation of any User Events.

I/O Toolbox composition	Firmware-dependent I/O toolbox composition: • 1-camera: 8 LIN, 1 QDC, 1 DIV, 1 MDV, 2 DEL, 1 UAS

C2C-Link

Description	• Allows to accurately synchronize the trigger and start-of-exposure of multiple grabber-controlled area-scan and line-scan cameras.
	• C2C-Link is able to synchronize cameras connected
	  − to the same Coaxlink card
	  − to different cards in the same PC (requires an accessory cable such as the "3303 C2C-Link Ribbon Cable" or a custom-made C2C-Link cable)
	  − to different cards in different PCs (requires one "1636 InterPC C2C-Link Adapter" for each PC and one RJ 45 CAT 5 STP straight LAN cable for each adapter but the last one)

Specification	• Maximum distance
	  − 60 cm inside a PC
	  − 1200 m cumulated adapter to adapter cable length
	• Maximum trigger rate
	  − 2.5 MHz for configurations using a single PC, or up to 10 PCs and 100 m total C2C-Link cable length
	  − 200 kHz for configurations up to 32 PCs and 1200m total C2C-Link cable length
	• Trigger propagation delay from master to slave devices
	  − Less than 10 ns for cameras on the same Coaxlink card or on different Coaxlink cards in the same PC
	  − Less than 265 ns for cameras on different Coaxlink cards in different PCs (3 PCs and 40m total C2C-Link cable length)

Software

Host PC Operating System	• Microsoft Windows 10, 8.1, 7 for x86 (32-bit) and x86-64 (64-bit) processor architectures • Linux for x86 (32-bit), x86-64 (64-bit) and aarch64 (64-bit) processor architectures • macOS for x86-64 (64-bit) processor architecture Refer to release notes for details
APIs	EGrabber class, with C++ and .NET APIs: • .NET assembly designed to be used with development environments compatible with .NET frameworks version 2.0 or higher GenICam GenTL producer libraries compatible with C/C++ compilers: • x86 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86 applications • x86_64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of x86_64 applications • aarch64 dynamic library designed to be used with ISO-compliant C/C++ compilers for the development of aarch64 applications
Memento	Compatible with Memento Event Logging tool

Environmental conditions

Operating ambient air temperature	0 to +55 °C / +32 to +131 °F
Operating ambient air humidity	10 to 90% RH non-condensing
Storage ambient air temperature	-20 to +70 °C / -4 to +158 °F
Storage ambient air humidity	10 to 90% RH non-condensing

Certifications

Electromagnetic - EMC standards	• European Council EMC Directive 2004/108/EC • United States FCC rule 47 CFR 15
EMC - Emission	• EN 55022:2010 Class B • FCC 47 Part 15 Class B
EMC - Immunity	• EN 55024:2010 Class B • EN 61000-4-3 • EN 61000-4-4 • EN 61000-4-5 • EN 61000-4-6
Flammability	PCB compliant with UL 94 V-0
RoHS	European Union Directive 2011/65/EU (ROHS2)
REACH	European Union Regulation 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations

Ordering Information

Product code - Description	• 1630 - Coaxlink Mono
Optional accessories	• 1636 - InterPC C2C-Link Adapter • 3303 - C2C-Link Ribbon Cable

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