KAYA INSTRUMENTS

Datasheet

FXP II Acquisition system

CXP-12カメラをFiber変換してそのままフレームグラバ へ。

Innovative Approach

FXP II Acquisition system is the industry first CoaXPress image acquisition system without range limitations. The system uses fiber optic cables to provide high resolution image acquisition interface for distances up to 80 km in single-mode and up to 300 m in multi-mode. The FXP II Acquisition system is capable of receiving video streams from up to 4 CoaXPress links in single, dual or quad modes. It is used for simultaneous capture from up to four cameras. Each link supports standard CoaXPress bitrates up to 12.5 Gbps. These features make the **FXP II Acquisition system** ideally suited for industrial, defense and aerospace Machine Vision Systems and applications.

Intelligent Design

The system consists of Komodo II CoaXPress over Fiber (CoF) Frame Grabber and CoaXPress to CoF Device. The remote unit converts CoaXPress links to standard CoF interface.

The **FXP II Acquisition system** uses a high-performance flow through DMA to transmit video streams to computer memory through PCIe interface with minimal latency. This product also provides GPIO for machine control signals, such as triggers, shaft encoders, exposure control and general I/O, which can be control aside video stream acquisition. The Frame Grabber utilizes PCIe Gen3 x8 links for communication with Host PC for video uploading and configuration.

Key Features:

- Solves distance limitation of CoaXPress
- Extension for distances up to 80 km in single-mode and up to 300 m in multi-mode
- Plug and Play, no need to configure
- Up to 4 CoaXPress links support
- Up to 4 Multi-streams
- PCIe Gen3 x8 Half-length card
- Camera controls and triggers
- Flexible machine I/O:
  - 4 TTL configurable I/Os
  - 4 LVCMOS configurable I/Os
  - 2 LVDS inputs; 2 LVDS outputs
  - 4 opto-isolated inputs
  - 4 opto-isolated outputs
  - 8 quadrature rotary encoders
  - Integrated strobe controller
  - 4 timers
- CoaXPress v2.1 compliant
- Power over CoaXPress with 13 W per link
- Multiple Camera synchronization
- Multiple Frame Grabbers synchronization
- GUI interface
- Supporting Windows, Linux OS and Nvidia Jetpack
- API for custom application development
- Plug-in modules for Matlab, HALCON and Labview
- Gen<i>Cam compliant
- GenTL support
- Data rates up to 12.5 Gbps per link
- Transfer Rate of up to 55 Gbps
- -40°C to +70°C operating environment temperature

TECHNICAL DATA

General	
Form factor	PCI Express card + remote device
Format	Standard profile, half-length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink (Optional passive heatsink)
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Frame Grabber's Dimensions	Frame Grabber: 167.65 mm x 111.15 mm (6.6" x 4.4") Remote device: 117 mm x 114.5 mm x 23.5 mm (4.6" x 4.5" x 0.92")
Frame Grabber's Weight	Frame Grabber: 183 g (6.5 oz) Remote device: 300 g (10.58 oz)

Host bus	
Standard	PCI Express 3.0
Link width	• 8 lanes • 1, 2 or 4 lanes with reduced performance
Link speed	• 8.0 GT/s (PCIe 3.0) • 5.0 GT/s (PCIe 2.0) with reduced performance
Maximum payload size	2,048 bytes
DMA	• 64-bit addressing support • Scatter gather support • Physical address support (GPU transfers)
Peak delivery bandwidth	7,877 MB/s
Effective (sustained), delivery bandwidth	6,695 MB/s (Host PC dependent)
Power consumption	Frame Grabber:16.8 W, excluding camera and I/O power output Remote device: < 11 W (Self consumption not including cameras)

Camera / video inputs	
Interface standard(s)	CoaXPress v2.1
Status LEDs	• 1 bicolor status LED per connector • 4 System status LEDs
Number of cameras	Up to 4
Synchronization between cameras	Yes
Line-scan cameras supported	Yes
Maximum aggregated camera data transfer rate	63.8 Gbit/s
Supported down-connection speeds	• 10.3 Gbit/s • 12.5 Gbit/s • 13.75 Gbit/s • 15.9375 Gbit/s
Maximum stream packet size	• 8,192 bytes
Camera types	Area-scan cameras: • Gray-scale and color (RGB and Bayer CFA) • Single-tap (1X-1Y) progressive-scan • Single-tap (1X-1Y) interlaced Line-scan cameras: • Gray-scale and color RGB

General Purpose Inputs and Outputs	
Number of lines	20 I/O lines: • 2 differential inputs • 2 differential outputs • 4 singled-ended TTL inputs/outputs • 4 single-ended LVTTL inputs/outputs • 4 opto-isolated inputs

	• 4 opto-isolated outputs
Usage	• Any System I/O input lines can be connected to any I/O output line • Any I/O input line can be used to decode A/B and Z signals of a motion encoder • Any I/O input line can generate any trigger event • Any I/O input line can trigger a timer
Electrical specifications	• Differential lines - LVDS compatible • TTL lines - 5V TTL compliant • LVTTL lines - 3.3V LVTTL compliant • Isolated lines - opto isolated lines with voltage range up to 30 V
Filter control	• Glitch removal filter for Encoders and Triggers • Configurable filter time between 0 µs and 34 ms • Filter time resolution of 8 ns • Glitch removal filter for Encoders and Triggers
Polarity control	Yes
Encoders	• 4 quadrature encoders with A/B and Z inputs • 32bit position counter • Forward and backward counting • Position trigger support • Noise filtering
Timers	• 4 general-purpose timers • Configurable delay and duration • 32-bit accumulator
Event reporting	• 64-bit system timestamp event reporting • Each I/O line can generate an event on a configurable edge • Each Timer can generate an event • Each encoder can generate an event

Frame Grabber synchronization	
Synchronization	Precise area and line-scan cameras synchronization across different frame grabbers

Area-scan camera control	
Trigger	• Precise control of asynchronous reset cameras, with exposure control • Support of camera exposure/readout overlap • Support of triggering from encoder or timer • Support of external hardware trigger, with optional delay, filtering and trigger decimation
Strobe	Accurate control of the strobe position for strobe 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 and filtering • Support of triggering from an encoder • Support of infinite acquisition, without missing lines
Line trigger	Support for quadrature motion encoders, with programmable filters, selection of acquisition direction and backward motion compensation
Line strobe	Accurate control of the strobe position for strobe light sources

On-board processing	
On-board memory	4 GByte DDR4
Bayer de-mosaic	• Full 16-bit resolution • Bilinear 3x3 • Bilinear 3x2 for linescan with gradient correction
Color transformation	• Full 16bit resolution 18bit coefficients table: • Color space conversion • Gain and Offset
Decimation	Line skip
Additional features	Unpacking of 10-/12-/14-bit to 16-bit LSB aligned
Frame timestamp	64-bit with 8 ns precision

Data stream statistics	Measurement of: • Frame rate • CRC Errors • Received/Dropped frames • Received/Dropped packets • Test packets
Event signaling and counting	The application software can be notified of the occurrence of various events: • Newly acquired buffers • Camera and Illumination control events • I/O events • Timer events • Encoder events

Software	
Host PC operating system	• Microsoft Windows 10 64-bit version • Microsoft Windows 11 64-bit version • Signed and certified kernel driver supporting Windows 10 and 11 • Source code Linux kernel driver (Automaticlly compiled during installation) • Tested for Ubuntu 18.04, 20.04 and 22.04 versions • Nvidia Xavier AGX (Jetpack 5.1.1 and 4.6.1) • Nvidia Orin AGX (Jetpack 5.1.1)
Gen<i>Cam	• Support of Gen<i>Cam 3.2 • Full camera and Frame Grabber parameters configuration
Buffer management	• Circular buffer support • Accumulation of several frames/lines to single buffer to reduce CPU load • Flexible buffer queuing • DMA Buffer filling directly to system memory
GUI	• Supported for Windows and Linux OS • Multi camera display and configuration • Image/video recording and playback
Debugging capabilities	• Event logging • Statistics counters
APIs	• Gen<i>Cam, GenTL producer libraries, ANSI C, Python and NET bindings • x86_64 dynamic library designed to be used with ISO-compliant C runtime • Allows for development of x86_64 applications • Plug-in modules for Matlab, HALCON, Cognex and Labview • Export straightforward, unified and easy-to-use API across all Grabber types • Include practical examples based on API functions, for supported language wrappers • Documentation includes sample snippets for API usage

Environmental conditions	
Operating ambient air temperature	-40 °C to +70 °C (-40°F to +158 °F)
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-40 °C to +70 °C (-40 °F to +158 °F)
Storage ambient air humidity	10% to 90% RH non-condensing

Certifications	
Electromagnetic - EMC standards	• The European Council EMC Directive 2004/108/EC • The Unites 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 61000-4-6
Flammability	PCB compliant with UL 94 V-0
RoHS	Compliant with the European Union Directive 2011/65/EU (ROHS2)
REACH	Compliant with the European Union Regulation No 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations

Ordering Information	
FXP II Acquisition system	KY-FXP-II
CoaXPress Range Extender – Device unit	KY-FEXT-II-D
Komodo II CoaXPress over Fiber Frame Grabber	KY-FGF-II-COF
SFP+ single-mode module	KY-SFP-10G31-10
SFP+ multi-mode module	KY-SFP-10G85-3M
SFP+ single-mode bidirectional module	KY-SFP-BD-10G-10
Fiber cable (*)	KY-FCA-X-XX
CoaXPress Cable (*)	KY-CCA-X-XX
Power supply 24V, 90W	KY_PWR24_90

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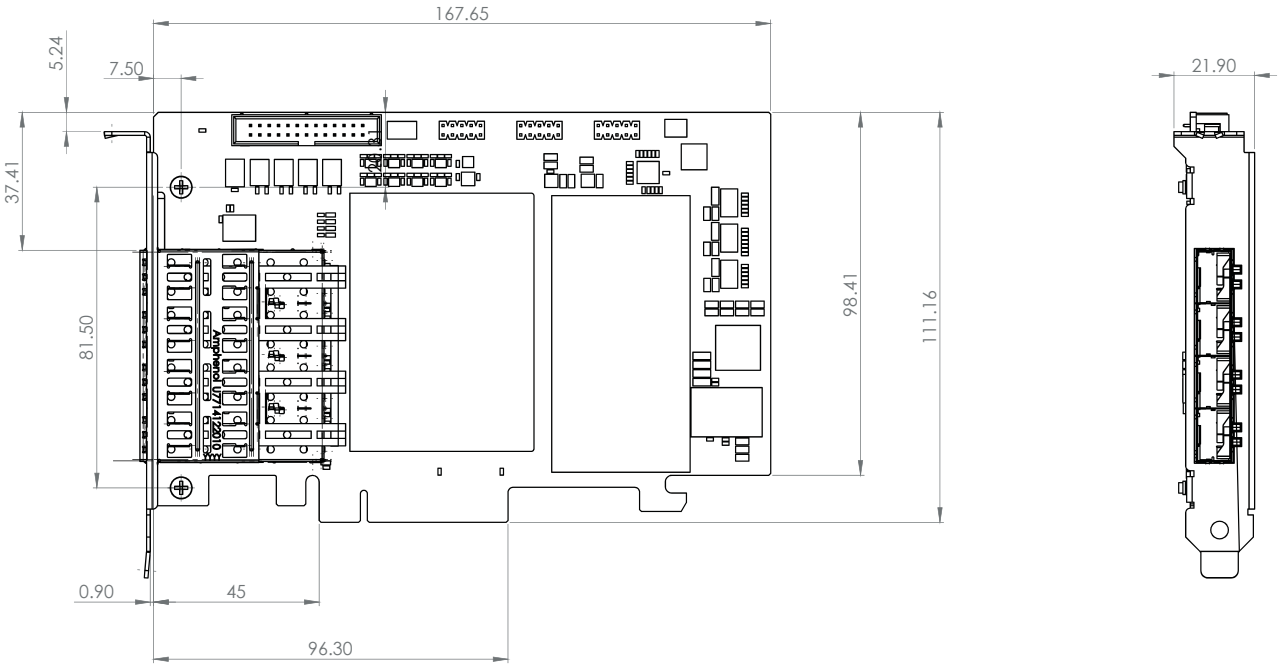
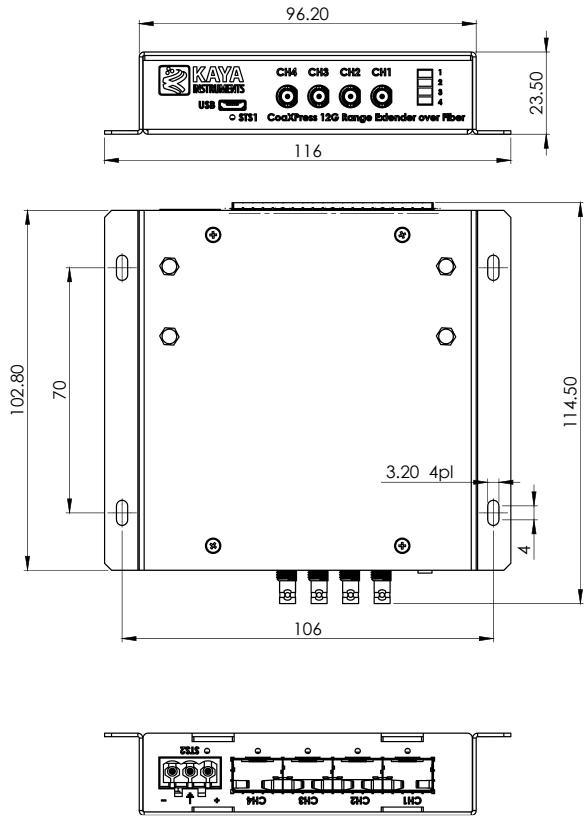
MECHANICAL DRAWINGS

Komodo II CoaXPress over Fiber



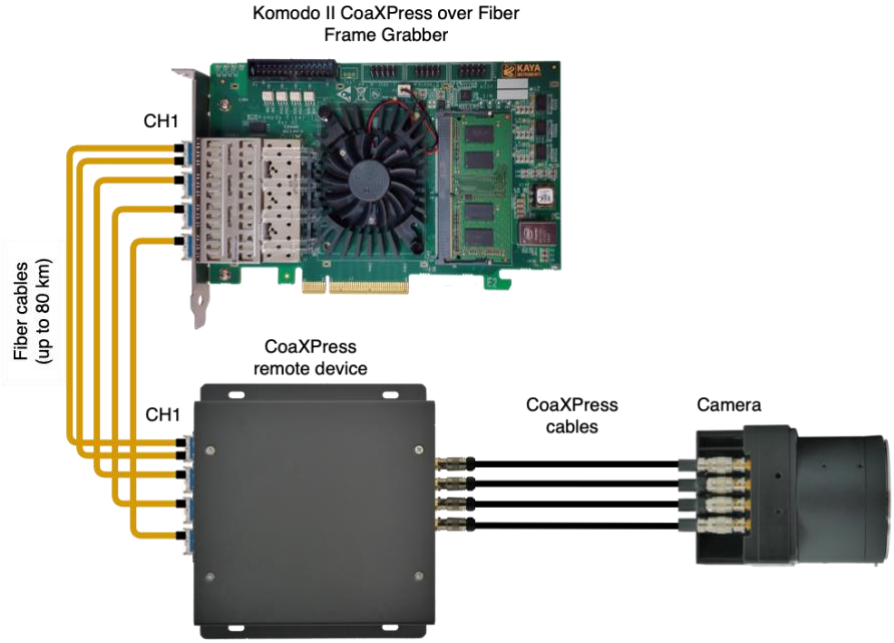
CoaXPress remote device



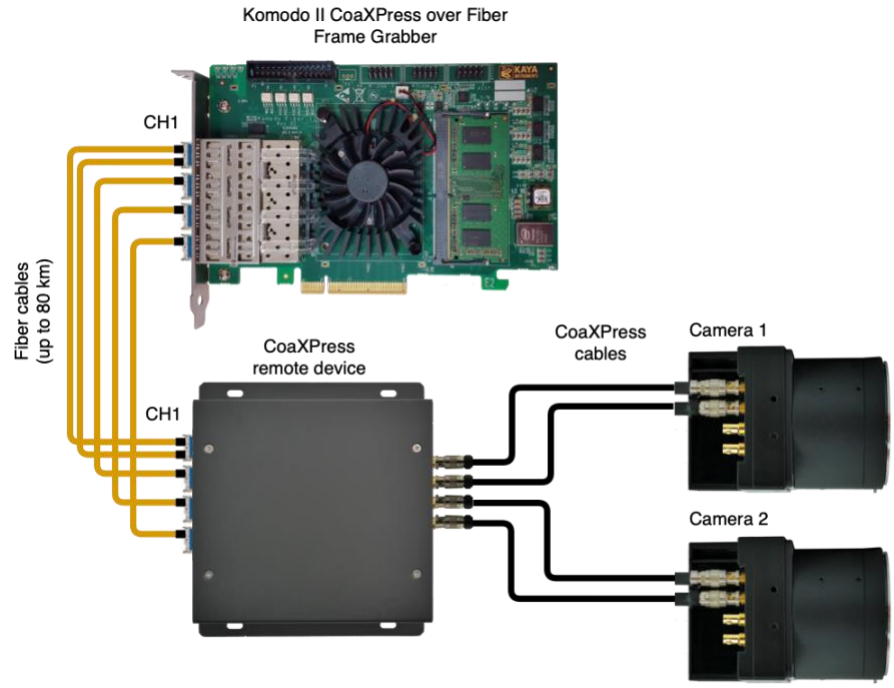
Dimensions are in millimeters.

SYSTEM STRUCTURE

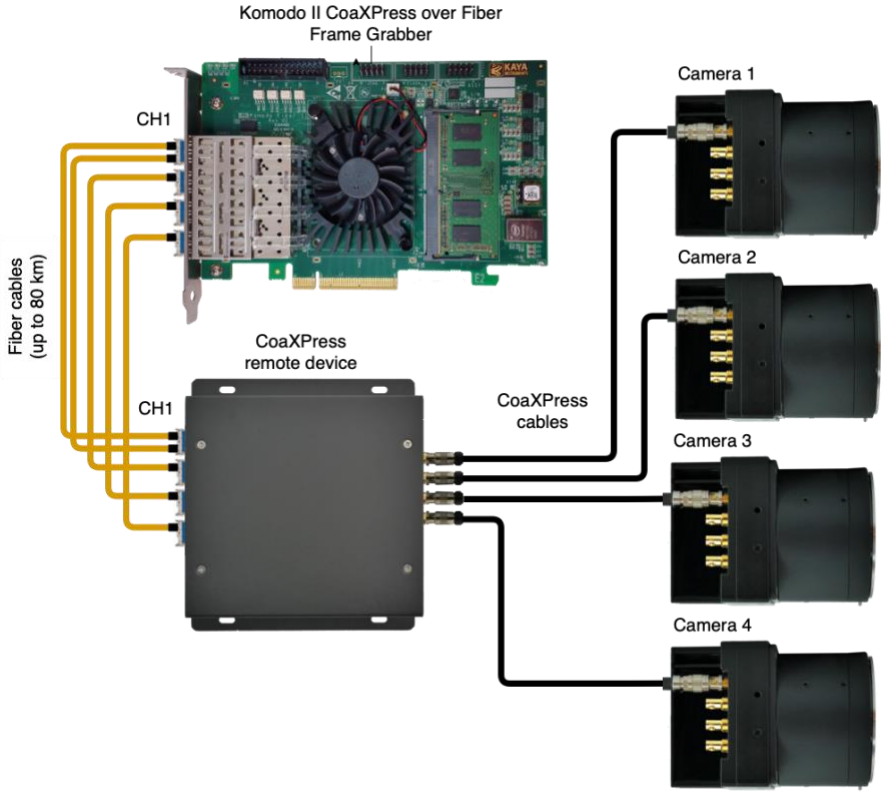
Single FEXT - Single camera topology diagram:



Single FEXT - Dual camera topology diagram:



Single FEXT - Quad camera topology diagram:



COMPATIBILITY

KAYA Instruments creates and maintains compatibility and interfaces for the most common and advanced vision image processing libraries and applications. Major support is available for **MVTec Halcon, National Instruments' LabVIEW** and **MathWorks' MATLAB**.

Supported vision standards:

CoaXPress GEN<i>CAM CoaXPress over-Fiber SMPTE

Supported vision libraries:

HALCON a product of MVTec OpenCV LabVIEW MATLAB COGNEX NORPIX

Supported operating systems:

Windows LINUX NVIDIA JetPack

Please check our website for an up-to-date list of other supported libraries and software package

KAYA Instruments

Please feel free to contact our sales team for pricing, availability, documentation or customization at our e-mails – we will be happy to provide assistance and consultation.
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